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

## Campus Point NDP Entitlements

PTS 651935

Pending

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

**Engineer of Work:**

---

Christopher Leary, PE 87309

Provide Wet Signature and Stamp Above Line

**Prepared For:**

Alexandria Estate Equities, Inc.
10996 Torreyana Rd, Suite 250
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(858) 638-2800

**Prepared By:**

Michael Baker INTERNATIONAL

Michael Baker International
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**Date:**

04-30-2020

Approved by: City of San Diego Date

The City of SAN DIEGO

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# Table of Contents

- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
- Attachment 5: Project's Drainage Report
- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

# Acronyms

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

# Certification Page

**Project Name:** Campus Point - Entitlements
**Permit Application** Pending

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

87309
PE#

06/30/2021
Expiration Date

Christopher Leary, PE
Print Name

Michael Baker International
Company

Date

Engineer's Stamp

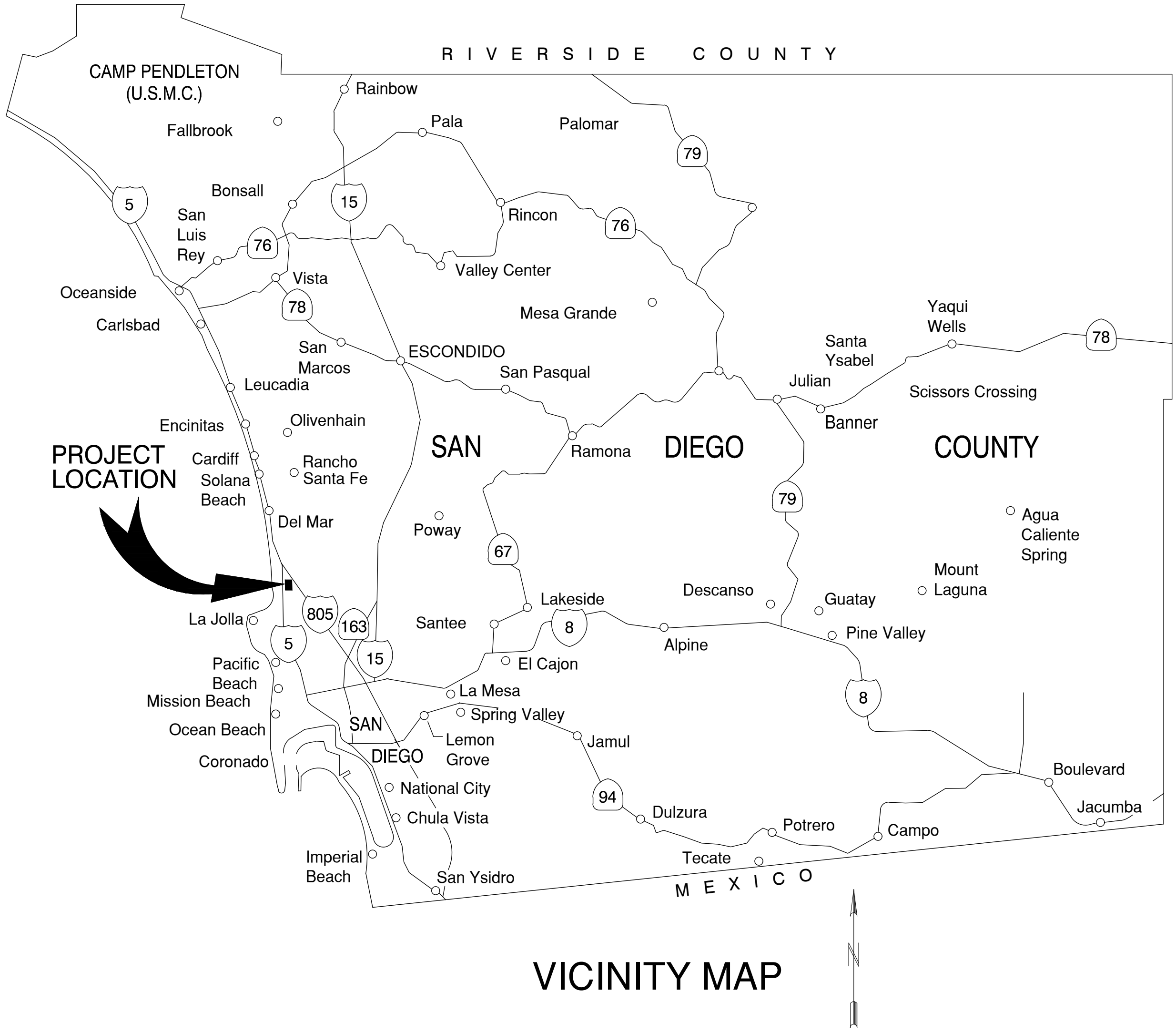
# Submittal Record

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 | 10-31-19 | ☑ Preliminary Design/Planning/CEQA<br>☐ Final Design | **Initial Submittal** |
| 2 | 01-31-2020 | ☑ Preliminary Design/Planning/CEQA<br>☐ Final Design | Second Submittal |
| 3 | 4-30-2020 | ☑ Preliminary Design/Planning/CEQA<br>☐ Final Design | Third Submittal (New Site Plan) |
| 4 | | ☐ Preliminary Design/Planning/CEQA<br>☐ Final Design | |

# Project Vicinity Map

**Project Name:** Campus Point NDP Entitlements
**Permit Application** Pending



VICINITY MAP

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

# Storm Water Requirements Applicability Checklist

**FORM**
# DS-560
**OCTOBER 2016**

Project Address: Campus Point Drive, San Diego, CA 92121

Project Number *(for City Use Only)*: Pending

## SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State 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 resulting in ground disturbance and contact with storm water runoff?

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

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

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

☐ Yes; no document required

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

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

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

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

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

Clear Page 1

## PART B: Determine Construction Site Priority

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

### Complete PART B and continued to Section 2

**1.** ☐ **ASBS**

a. Projects located in the ASBS watershed.

**2.** ☐ **High Priority**

a. Projects 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 requiring a Water Pollution Control Plan but 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 |

Clear Page 2

## PART D: PDP Exempt Requirements.

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

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

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

**1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**

- **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
- **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
- **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

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

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

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

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

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

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

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

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☐ Yes ☐ No

2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☒ Yes ☐ No

3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ☐ Yes ☐ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ☐ Yes ☐ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ☒ Yes ☐ No

6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ☒ Yes ☐ No

Clear Page 3

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☐ Yes ☐ No

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

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

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

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

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

Name of Owner or Agent *(Please Print)* Title

Signature Date

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## Applicability of Permanent, Post-Construction Storm Water BMP Requirements

## Form I-1

### Project Identification

Project Name: Campus Point NDP Entitlements

Permit Application Number: Pending

Date: 4-20-2020

### Determination of Requirements

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

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

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

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

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

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

Project Name: Campus Point NDP Entitlements

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

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| | |
|---|---|
| **Site Information Checklist For PDPs** | **Form I-3B** |
| **Project Summary Information** | |
| Project Name | Campus Point NDP Entitlements |
| Project Address | Campus Pointe Court, San Diego, CA 92121 |
| Assessor's Parcel Number(s) (APN(s)) | 343-230-38, 42 ,43 14 |
| Permit Application Number | Pending |
| Project Watershed | Select One:<br>☐ San Dieguito River<br>☐ Penasquitos<br>☐ Mission Bay<br>☐ San Diego River<br>☐ San Diego Bay<br>☐ Tijuana River |
| Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX) | 906.10 Penasquitos, Miramar Reservoir, Undefined |
| Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way) | 19.43 Acres (846,370 Square Feet) |
| Area to be disturbed by the project (Project Footprint) | 19.43 Acres (846,370 Square Feet) |
| Project Proposed Impervious Area (subset of Project Footprint) | 17.5 Acres (762,300 Square Feet) |
| Project Proposed Pervious Area (subset of Project Footprint) | 1.93 Acres (84,070 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 | 10 % |

## Form I-3B Page 2 of 11

### Description of Existing Site Condition and Drainage Patterns

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

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

Description / Additional Information:

The site is currently occupied by two office buildings and accompanying parking lots.

Existing Land Cover Includes (select all that apply):

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

Description / Additional Information:

Landscape area exist around the perimeter of the site and within medians in the parking area.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

☐ NRCS Type A
☐ NRCS Type B
☐ NRCS Type C
☑ NRCS Type D

Approximate Depth to Groundwater:

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

Existing Natural Hydrologic Features (select all that apply):

☐ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☑ None

Description / Additional Information:

There are no 'natural' hydrologic features found on the site.

## 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.

### Descriptions/Additional Information

1. The existing drainage system is entirely urban.

2. Offsite runoff is not expected to be conveyed through the site.

3. Existing storm water infrastructure includes a network of storm drain, curb inlets, and catch basins.

4. Three discharge points exist on site.
Discharge Point 1 is approximately 2.02-acres and includes a portion of the parking lot on the northern edge of the site. Runoff is collected by curb inlets and conveyed north. Runoff ultimately exits the project area through a 24” PVC pipe, which discharges into the canyon just west of the site. Peak flow to this point is expected to be 7.7 CFS

Discharge Point 2 is approximately 23.26-acres and includes both existing structures with a majority of the existing parking lot. Runoff is collected via area drains and is conveyed west. Runoff ultimately exits the project area through a 36” RCP, which discharges into the canyon just west of the site. Peak flow to this point is expected to be 89 CFS

Discharge Point 3 is approximately 0.69-acres and includes existing parking area. Peak flow to this point from the project site is expected to be 2.6 CFS

**Project Name:** Campus Point NDP Entitlements

## Form I-3B Page 4 of 11

### Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The project includes the demolition of the two existing structures and surrounding parking lot. Seven new structures are proposed including six commercial buildings and one parking structure. New surface level parking with access roads are also proposed.

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

Roofs, hardscape, driveways

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

Landscape areas

Does the project include grading and changes to site topography?

☐ Yes
☐ No

Description / Additional Information:

The overall site topography is not significantly changed.

**Project Name:** Campus Point NDP Entitlements

## 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 project proposes to install a new drainage system that will collect and convey storm water to treatment facilities and ultimately to one of three separate outfalls.

Discharge Location 1 is located at the northwesterly extent of the site and receives flow from Basin 1.
EX: 2.02 Ac 7.7cfs
PR: 1.93 Ac Un-mitigated 2.6cfs

Discharge Location 2 is located at the westerly extent of the site and receives flow from Basin 2 through 14 & 17.
EX: 23.26 Ac 89cfs
PR: 21.32 Ac Un-mitigated 77.1cfs

Discharge Location 3 is located at the north easterly extent of the site and receives flow from Basin 15 & 16.
EX: 0.69 Ac 2.6 cfs
PR: 2.71 Ac Un-mitigated10.5 cfs, Mitigated 2.2 cfs

**Project Name:** Campus Point NDP Entitlements

## 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):

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

Description/Additional Information:

## 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)

After entering the public storm drain system project site runoff is conveyed north to Los Penasquitos Creek. Los Penasquitos Creek flows westwards before discharging into Los Penasquitos Lagoon. Los Penasquitos Lagoon discharges to the Pacific Ocean.

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations

Los Penasquitos Creek - AGR, COLD, IND, REC1, REC2, WARM, WILD

Los Penasquitos Lagoon - BIOL, EST, MAR, MIGR, RARE, REC1, REC2, SHELL, WILD

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations

None

Provide distance from project outfall location to impaired or sensitive receiving waters

Approximately 0.8 miles

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

0.5 miles north of the project a section of Sorrento Valley Canyon is an environmentally sensitive land

## Form I-3B Page 8 of 11

### Identification of Receiving Water Pollutants of Concern

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

| 303(d) Impaired Water Body (Refer to Appendix K) | Pollutant(s)/Stressor(s) (Refer to Appendix K) | TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1) |
|---|---|---|
| Los Penasquitos Creek | Benthic community effects | Hydromodification, Siltation |
|  | Bifenthrin, Chlopyrifos, Indicator Bacteria | Freshwater Discharges |
|  | Nitrogen, Phosphate | Indicator Bacteria |
|  | Total dissolved solids. toxicity |  |
|  |  |  |
| Los Penasquitos Lagoon | Sedimentation/siltation |  |
|  | Toxicity |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Identification of Project Site Pollutants*

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

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

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

## Form I-3B Page 9 of 11

### Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☑ Yes, hydromodification management flow control structural BMPs required.

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

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

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

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

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

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

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

☐ Yes

☐ No

Discussion / Additional Information:

Per WMAA maps the critical coarse sediment areas do not exist on site or in any upstream areas.

## 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.

Three POC exists for the project.

POC-1 is located in the northwest corner of the project where DMA 1 discharges into the existing canyon.

POC-2 is located in the westerly boundary of the project where DMAs 2 through 14 & 17 discharges into the existing canyon.

POC-3 is located in the northeast corner of the project where DMA 15 & 16 connect to the existing storm drain system that flow east.

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

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

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

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

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

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

Discussion / Additional Information: (optional)

**Project Name:** Campus Point NDP Entitlements

| 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. |
| **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. |

Project Name: Campus Point NDP Entitlements

## Source Control BMP Checklist for PDPs

## Form I-4B

### Source Control BMPs

All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

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

| Source Control Requirement | Applied? | | |
|---|---|---|---|
| 4.2.1 Prevention of Illicit Discharges into the MS4 | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.2.1 not implemented: | | | |
| 4.2.2 Storm Drain Stenciling or Signage | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.2.2 not implemented: | | | |
| 4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | ☐ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.2.3 not implemented:<br>The project does not propose outdoor material storage areas | | | |
| 4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | ☐ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.2.4 not implemented:<br>The project does not propose outdoor work areas | | | |
| 4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.2.5 not implemented: | | | |

**Project Name:** Campus Point NDP Entitlements

| Form I-4B Page 2 of 2 | |
|---|---|
| **Source Control Requirement** | **Applied?** |
| 4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below) | |
| On-site storm drain inlets | ☑ Yes ☐ No ☐ N/A |
| Interior floor drains and elevator shaft sump pumps | ☑ Yes ☐ No ☐ N/A |
| Interior parking garages | ☑ Yes ☐ No ☐ N/A |
| Need for future indoor & structural pest control | ☑ Yes ☐ No ☐ N/A |
| Landscape/Outdoor Pesticide Use | ☑ Yes ☐ No ☐ N/A |
| Pools, spas, ponds, decorative fountains, and other water features | ☐ Yes ☐ No ☐ N/A |
| Food service | ☑ Yes ☐ No ☐ N/A |
| Refuse areas | ☑ Yes ☐ No ☐ N/A |
| Industrial processes | ☐ Yes ☐ No ☐ N/A |
| Outdoor storage of equipment or materials | ☐ Yes ☐ No ☐ N/A |
| Vehicle/Equipment Repair and Maintenance | ☐ Yes ☐ No ☐ N/A |
| Fuel Dispensing Areas | ☐ Yes ☐ No ☐ N/A |
| Loading Docks | ☐ Yes ☐ No ☐ N/A |
| Fire Sprinkler Test Water | ☑ Yes ☐ No ☐ N/A |
| Miscellaneous Drain or Wash Water | ☑ Yes ☐ No ☐ N/A |
| Plazas, sidewalks, and parking lots | ☑ Yes ☐ No ☐ N/A |
| SC-6A: Large Trash Generating Facilities | ☐ Yes ☐ No ☐ N/A |
| SC-6B: Animal Facilities | ☐ Yes ☐ No ☐ N/A |
| SC-6C: Plant Nurseries and Garden Centers | ☐ Yes ☐ No ☐ N/A |
| SC-6D: Automotive Facilities | ☐ Yes ☐ No ☐ N/A |
| Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above. | |

**Project Name:** Campus Point NDP Entitlements

## Site Design BMP Checklist for PDPs

## Form I-5B

### Site Design BMPs

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

Answer each category below pursuant to the following.

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

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

| Site Design Requirement | Applied? | | |
|---|---|---|---|
| 4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features | ☐ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.3.1 not implemented:<br>Natural drainage pathways or hydrologic features do not currently exist on site | | | |
| 1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map? | ☐ Yes | ☐ No | ☐ N/A |
| 1-2 Are trees implemented? If yes, are they shown on the site map? | ☐ Yes | ☐ No | ☐ N/A |
| 1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)? | ☐ Yes | ☐ No | ☐ N/A |
| 1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E? | ☐ Yes | ☐ No | ☐ N/A |
| 4.3.2 Have natural areas, soils and vegetation been conserved? | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.3.2 not implemented: | | | |

**Project Name:** Campus Point NDP Entitlements

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

**Project Name:** Campus Point NDP Entitlements

## Form I-5B Page 3 of 4

| Site Design Requirement | Applied? | | |
|---|---|---|---|
| 4.3.6 Runoff Collection | ☐ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.3.6 not implemented:<br>The project is not anticipated to have adequate need for runoff collection to make it practical | | | |
| 6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map? | ☐ Yes | ☐ No | ☐ N/A |
| 6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E? | ☐ Yes | ☐ No | ☐ N/A |
| 6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map? | ☐ Yes | ☐ No | ☐ N/A |
| 6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E? | ☐ Yes | ☐ No | ☐ N/A |
| 4.3.7 Landscaping with Native or Drought Tolerant Species | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.3.7 not implemented: | | | |
| 4.3.8 Harvest and Use Precipitation | ☐ Yes | ☐ No | ☐ N/A |
| Discussion / justification if 4.3.8 not implemented:<br>The project is not anticipated to have adequate need for harvest and reuse to make it practical | | | |
| 8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map? | ☐ Yes | ☐ No | ☐ N/A |
| 8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E? | ☐ Yes | ☐ No | ☐ N/A |

**Project Name:** Campus Point NDP Entitlements

| Form I-5B Page 4 of 4 |
|---|
| Insert Site Map with all site design BMPs identified: |
| |

Project Name: Campus Point NDP Entitlements

| 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).<br>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).<br>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.<br>Harvest and re-use is considered infeasible per Form I-7<br>Infiltration is considered infeasible per Form I-8<br>DMA-6, 7, 8, 9, & 13: Storm water is treated and HMP mitigation is conducted with a biofiltration basin BMP.<br>DMA-1, 2, 3, 4, 5, 10, 11, 12, 15, 16: Storm water is treated with a proprietary compact biofiltration BMP and HMP mitigation is provided with an underground vault.<br>DMA-17: Is a self mitigating area per section<br>(Continue on page 2 as necessary.) | |

# Form I-6 Page of (Copy as many as needed)

## Structural BMP Summary Information

Structural BMP ID No. Biofiltration Basin 1

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

**Form I-6 Page of (Copy as many as needed)**

Structural BMP ID No. Biofiltration Basin 1

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Biofiltration Basin 1 detains runoff from DMA 6. The basin features a volume of 1,815 cubic feet and a 0.80" orifice.

## Form I-6 Page of (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Biofiltration Basin 2

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page of (Copy as many as needed) |
|---|
| Structural BMP ID No. Biofiltration Basin 2 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>Biofiltration Basin 2 detains runoff from DMA 7. The basin features a volume of 2,465 cubic feet and a 1.0" orifice. |

| Form I-6 Page of (Copy as many as needed) | |
|---|---|
| **Structural BMP Summary Information** | |
| Structural BMP ID No. Biofiltration Basin 3 | |
| Construction Plan Sheet No. C.2-1 | |
| Type of Structural BMP:<br>☐ Retention by harvest and use (e.g. HU-1, cistern)<br>☐ Retention by infiltration basin (INF-1)<br>☐ Retention by bioretention (INF-2)<br>☐ Retention by permeable pavement (INF-3)<br>☐ Partial retention by biofiltration with partial retention (PR-1)<br>☒ Biofiltration (BF-1)<br>☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)<br>☐ 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)<br>☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)<br>☒ Detention pond or vault for hydromodification management<br>☐ Other (describe in discussion section below) | |
| Purpose:<br>☐ Pollutant control only<br>☐ Hydromodification control only<br>☒ Combined pollutant control and hydromodification control<br>☐ Pre-treatment/forebay for another structural BMP<br>☐ 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 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page  of  (Copy as many as needed)

Structural BMP ID No. Biofiltration Basin 3

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Biofiltration Basin 3 detains runoff from DMA 8. The basin features a volume of 626 cubic feet and a 0.5" orifice.

## Form I-6 Page of (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Biofiltration Basin 4

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

**Form I-6 Page of (Copy as many as needed)**

Structural BMP ID No. Biofiltration Basin 4

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Biofiltration Basin 4 detains runoff from DMA 9. The basin features a volume of 3,495 cubic feet and a 1.20" orifice.

## Form I-6 Page of (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Biofiltration Basin 5

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☐ Hydromodification control only
☒ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page of (Copy as many as needed)

Structural BMP ID No. Biofiltration Basin 5

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Biofiltration Basin 5 detains runoff from DMA 13. The basin features a volume of 1,946 cubic feet and a 1.20" orifice.

Project Name: Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-1

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page 4 of 28 (Copy as many as needed)

Structural BMP ID No. MWS-1

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

MWS-1 is a MWS-L-8-20 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.577 CFS, which is in excess of the required treatment flowrate of 0.475 CFS. The unit treats runoff from DMA-1 and is located downstream of Storage Vault 1.

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-2

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-2 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-2a & -2b are MWS-L-8-16 type proprietary biofiltration BMPs manufactured by BioClean.<br>Each unit features a treatment flowrate of 0.462 CFS. The two units would treat a combined  0.924CFS which is in excess of the required treatment flowrate of 0.760 CFS. The unit treats runoff from DMA-2 and islocated downstream of Storage Vault 2. |

**Project Name:** Campus Point - Entitlements

| Form I-6 Page 3 of 28 (Copy as many as needed) | |
|---|---|
| **Structural BMP Summary Information** | |
| Structural BMP ID No. MWS-3 | |
| Construction Plan Sheet No. C.2-1 | |
| Type of Structural BMP:<br>☐ Retention by harvest and use (e.g. HU-1, cistern)<br>☐ Retention by infiltration basin (INF-1)<br>☐ Retention by bioretention (INF-2)<br>☐ Retention by permeable pavement (INF-3)<br>☐ Partial retention by biofiltration with partial retention (PR-1)<br>☒ Biofiltration (BF-1)<br>☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)<br>☐ 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)<br>☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)<br>☐ Detention pond or vault for hydromodification management<br>☐ Other (describe in discussion section below) | |
| Purpose:<br>☒ Pollutant control only<br>☐ Hydromodification control only<br>☐ Combined pollutant control and hydromodification control<br>☐ Pre-treatment/forebay for another structural BMP<br>☐ 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 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-3 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-3 is a MWS-L-4-21 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.268 CFS, which is in excess of the required treatment flowrate of 0.238 CFS. The unit treats runoff from DMA-3 and is located downstream of Storage Vault 3. |

**Project Name:** Campus Point - Entitlements

| Form I-6 Page 3 of 28 (Copy as many as needed) | |
|---|---|
| **Structural BMP Summary Information** | |
| Structural BMP ID No. MWS-4 | |
| Construction Plan Sheet No. C.2-1 | |
| Type of Structural BMP:<br>☐ Retention by harvest and use (e.g. HU-1, cistern)<br>☐ Retention by infiltration basin (INF-1)<br>☐ Retention by bioretention (INF-2)<br>☐ Retention by permeable pavement (INF-3)<br>☐ Partial retention by biofiltration with partial retention (PR-1)<br>☒ Biofiltration (BF-1)<br>☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)<br>☐ 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)<br>☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)<br>☐ Detention pond or vault for hydromodification management<br>☐ Other (describe in discussion section below) | |
| Purpose:<br>☒ Pollutant control only<br>☐ Hydromodification control only<br>☐ Combined pollutant control and hydromodification control<br>☐ Pre-treatment/forebay for another structural BMP<br>☐ 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 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

**Project Name:** Campus Point - Entitlements

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-4 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-4 is a MWS-L-4-15 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.175 CFS, which is in excess of the required treatment flowrate of 0.169 CFS. The unit treats runoff from DMA-4 and is located downstream of Storage Vault 4. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-5

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

- ☐ Retention by harvest and use (e.g. HU-1, cistern)
- ☐ Retention by infiltration basin (INF-1)
- ☐ Retention by bioretention (INF-2)
- ☐ Retention by permeable pavement (INF-3)
- ☐ Partial retention by biofiltration with partial retention (PR-1)
- ☒ Biofiltration (BF-1)
- ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
- ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
- ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

- ☒ Pollutant control only
- ☐ Hydromodification control only
- ☐ Combined pollutant control and hydromodification control
- ☐ Pre-treatment/forebay for another structural BMP
- ☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

**Project Name:** Campus Point - Entitlements

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-5 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-5 is a MWS-L-8-12 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.346 CFS, which is in excess of the required treatment flowrate of 0.329 CFS. The unit treats runoff from DMA-5 and is located downstream of Storage Vault 5. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-6

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-6 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-6 is a MWS-L-8-24 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.693 CFS, which is in excess of the required treatment flowrate of 0.579 CFS. The unit treats runoff from DMA-10 and is located downstream of Storage Vault 6. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-7

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

- ☐ Retention by harvest and use (e.g. HU-1, cistern)
- ☐ Retention by infiltration basin (INF-1)
- ☐ Retention by bioretention (INF-2)
- ☐ Retention by permeable pavement (INF-3)
- ☐ Partial retention by biofiltration with partial retention (PR-1)
- ☒ Biofiltration (BF-1)
- ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
- ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
- ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

- ☒ Pollutant control only
- ☐ Hydromodification control only
- ☐ Combined pollutant control and hydromodification control
- ☐ Pre-treatment/forebay for another structural BMP
- ☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

**Project Name:** Campus Point - Entitlements

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-7 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-7 is a MWS-L-8-20 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.577 CFS, which is in excess of the required treatment flowrate of 0.501 CFS. The unit treats runoff from DMA-11 and is located downstream of Storage Vault 7. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-8

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-8 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): |
| MWS-8 is a MWS-L-8-16 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.462 CFS, which is in excess of the required treatment flowrate of 0.455 CFS. The unit treats runoff from DMA-12 and is located downstream of Storage Vault 8. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-9

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page 4 of 28 (Copy as many as needed)

Structural BMP ID No. MWS-9

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

MWS-9a & -9b are MWS-L-8-20 type proprietary biofiltration BMPs manufactured by BioClean.
Each unit features a treatment flowrate of 0..577 CFS. The two units would treat a combined 1.154CFS which is in excess of the required treatment flowrate of 1.031 CFS. The unit treats runoff from DMA-14 and islocated downstream of Storage Vault 9

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-10

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☒ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-10 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-10 is a MWS-L-8-24 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.693 CFS, which is in excess of the required treatment flowrate of 0.663 CFS. The unit treats runoff from DMA-15 and is located downstream of Storage Vault 10. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 3 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. MWS-11

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

- ☐ Retention by harvest and use (e.g. HU-1, cistern)
- ☐ Retention by infiltration basin (INF-1)
- ☐ Retention by bioretention (INF-2)
- ☐ Retention by permeable pavement (INF-3)
- ☐ Partial retention by biofiltration with partial retention (PR-1)
- ☒ Biofiltration (BF-1)
- ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
- ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
- ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

- ☒ Pollutant control only
- ☐ Hydromodification control only
- ☐ Combined pollutant control and hydromodification control
- ☐ Pre-treatment/forebay for another structural BMP
- ☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

**Project Name:** Campus Point - Entitlements

| Form I-6 Page 4 of 28 (Copy as many as needed) |
|---|
| Structural BMP ID No. MWS-11 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>MWS-11 is a MWS-L-4-4 type proprietary biofiltration BMP manufactured by BioClean. The unit features a treatment flowrate of 0.052 CFS, which is in excess of the required treatment flowrate of 0.041 CFS. The unit treats runoff from DMA-16 and is located downstream of Storage Vault 11. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 1

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page 6 of 44 (Copy as many as needed)

Structural BMP ID No. Storage Vault 1

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Storage Vault 1 detains runoff from DMA-1 and is located upstream of MWS-1. The vault features a volume of 8,320 cubic feet at the weir elevation. The weir is located 4' above the bottom of the tank. Runoff detained is also metered out by a 1.4" diameter orifice.

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 2

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

**Form I-6 Page 6 of 44 (Copy as many as needed)**

Structural BMP ID No. Storage Vault 2

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Storage Vault 2 detains runoff from DMA 2 and is located upstream of MWS-2. The vault features a volume of 13,246 cubic feet at the weir elevation. The weir is located 4' above the bottom of the tank. Runoff detained is also metered out by a 1.9" diameter orifice.

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 3

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 6 of 44 (Copy as many as needed) |
|---|
| Structural BMP ID No. Storage Vault 3 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>Storage Vault 3 detains runoff from DMA 3 and is located upstream of MWS-3. The vault features a volume of 4,163 cubic feet at the weir elevation. The weir is located 4' above the bottom of the tank. Runoff detained is also metered out by a 0.9" diameter orifice. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 4

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 6 of 44 (Copy as many as needed) |
|---|
| Structural BMP ID No. Storage Vault 4 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>Storage Vault 4 detains runoff from DMA 4 and is located upstream of MWS-4. The vault features a volume of 2,959 cubic feet at the weir elevation. The weir is located 6' above the bottom of the tank. Runoff detained is also metered out by a 0.6" diameter orifice. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 5

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page 6 of 44 (Copy as many as needed)

Structural BMP ID No. Storage Vault 5

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Storage Vault 5 detains runoff from DMA 5 and is located upstream of MWS-5. The vault features a volume of 5,760 cubic feet at the weir elevation. The weir is located 6' above the bottom of the tank. Runoff detained is also metered out by a 1.0" diameter orifice.

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 6

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 6 of 44 (Copy as many as needed) |
|---|
| Structural BMP ID No. Storage Vault 6 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>Storage Vault 6 detains runoff from DMA 10 and is located upstream of MWS-6. The vault features a volume of 10,100 cubic feet at the weir elevation. The weir is located 4' above the bottom of the tank. Runoff detained is also metered out by a 0.5" diameter orifice. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 7

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 6 of 44 (Copy as many as needed) |
|---|
| Structural BMP ID No. Storage Vault 7 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>Storage Vault 7 detains runoff from DMA 11 and is located upstream of MWS-7. The vault features a volume of 8,800 cubic feet at the weir elevation. The weir is located 3.5' above the bottom of the tank. Runoff detained is also metered out by a 0.75" diameter orifice. |

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 8

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 6 of 44 (Copy as many as needed) |
|---|
| Structural BMP ID No. Storage Vault 8 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>Storage Vault 8 detains runoff from DMA 12 and is located upstream of MWS-8. The vault features a volume of 7,965 cubic feet at the weir elevation. The weir is located 4.5' above the bottom of the tank. Runoff detained is also metered out by a 0.8" diameter orifice. |

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 9

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page 6 of 44 (Copy as many as needed)

Structural BMP ID No. Storage Vault 9

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Storage Vault 9 detains runoff from DMA 14 and is located upstream of MWS-9. The vault features a volume of 18,000 cubic feet at the weir elevation. The weir is located 5' above the bottom of the tank. Runoff detained is also metered out by a 2" diameter orifice.

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 10

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

| Form I-6 Page 6 of 44 (Copy as many as needed) |
|---|
| Structural BMP ID No. Storage Vault 10 |
| Construction Plan Sheet No. C.2-1 |
| Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):<br>Storage Vault 10 detains runoff from DMA 14 and is located upstream of MWS-10. The vault features a volume of 11,592 cubic feet at the weir elevation. The weir is located 4' above the bottom of the tank. Runoff detained is also metered out by a 1.5" diameter orifice. |

**Project Name:** Campus Point - Entitlements

## Form I-6 Page 5 of 28 (Copy as many as needed)

### Structural BMP Summary Information

Structural BMP ID No. Storage Vault 11

Construction Plan Sheet No. C.2-1

Type of Structural BMP:

☐ Retention by harvest and use (e.g. HU-1, cistern)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☒ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only
☒ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

| | |
|---|---|
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563 | Jay Sullivan, PE, CFM<br>9755 Clairemont Mesa Blvd<br>San Diego, CA 92124<br>858.614.5000<br>RCE 77445 |
| Who will be the final owner of this BMP? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| Who will maintain this BMP into perpetuity? | ARE-SD Region No. 44, LLC<br>10996 Torreyana Rd, Suite 250 San Diego, CA 92121<br>(858) 638-2800 |
| What is the funding mechanism for maintenance? | Owners on-going maintenance funding |

## Form I-6 Page 6 of 44 (Copy as many as needed)

Structural BMP ID No. Storage Vault 11

Construction Plan Sheet No. C.2-1

Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Storage Vault 11 detains runoff from DMA 16 and is located upstream of MWS-11. The vault features a volume of 725 cubic feet at the weir elevation. The weir is located 2.5' above the bottom of the tank. Runoff detained is also metered out by a 0.5" diameter orifice.

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# Attachment 1
# Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: Campus Point NDP Entitlements

**Indicate which Items are Included:**

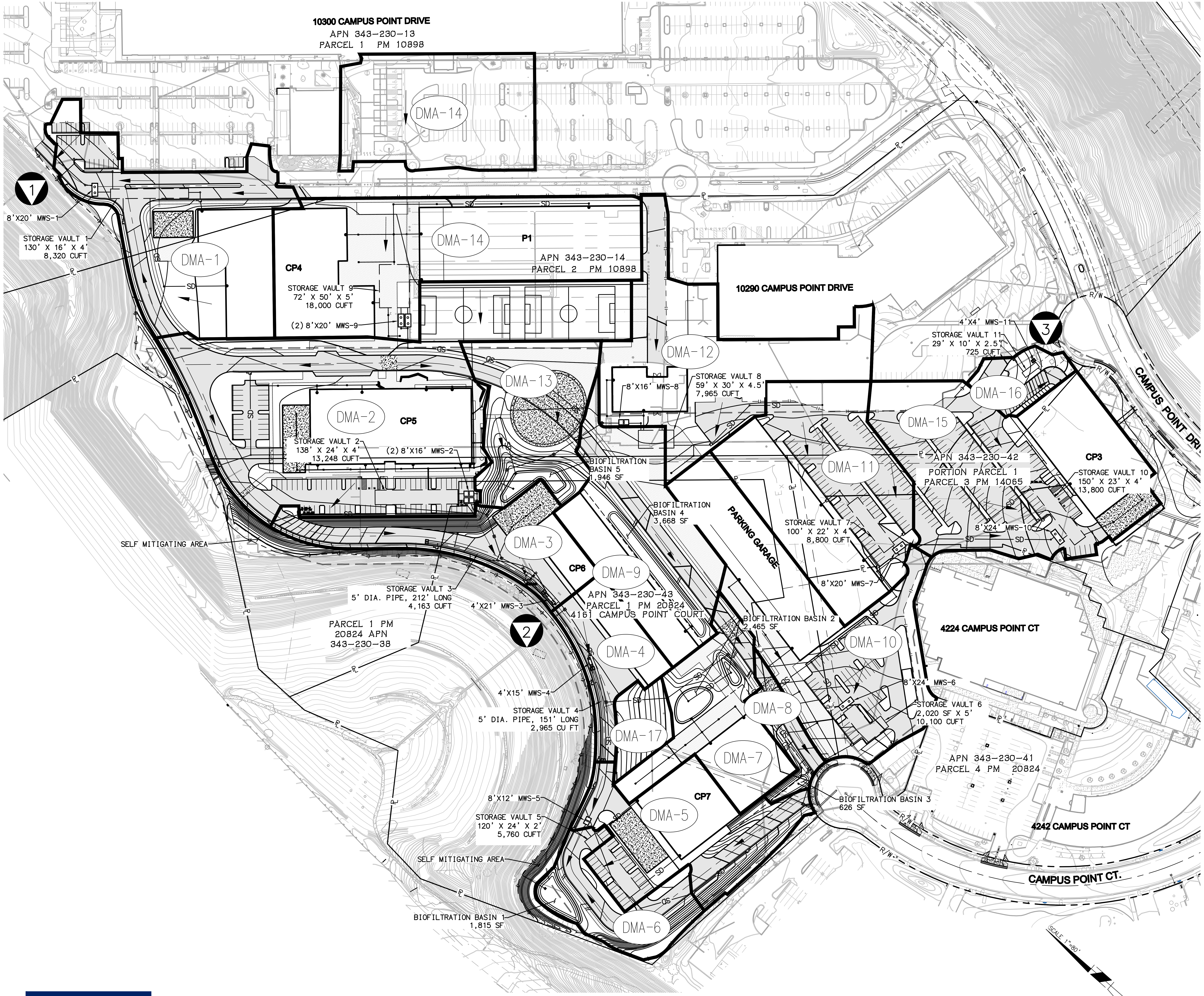
| Attachment Sequence | Contents | Checklist |
|---|---|---|
| **Attachment 1a** | DMA Exhibit (Required) See<br>DMA Exhibit Checklist. | ☑ Included |
| **Attachment 1b** | Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)*<br>*Provide table in this Attachment OR on DMA Exhibit in Attachment 1a | ☐ Included on DMA Exhibit in Attachment 1a<br>☑ 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)<br>Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7. | ☑ Included<br>☐ Not included because the entire project will use infiltration BMPs |
| **Attachment 1d** | Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition:<br>• No Infiltration Condition:<br>○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*)<br>○ Form I-8A (optional)<br>○ Form I-8B (optional)<br>• Partial Infiltration Condition:<br>○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*)<br>○ Form I-8A<br>○ Form I-8B<br>• Full Infiltration Condition:<br>○ Form I-8A<br>○ Form I-8B<br>○ Worksheet C.4-3<br>○ Form I-9<br>Refer to Appendices C and D of the BMP Design Manual for guidance. | ☑ Included<br>☐ Not included because the entire project will use harvest and use BMPs |
| **Attachment 1e** | Pollutant Control BMP Design Worksheets / Calculations (Required)<br>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: Campus Point NDP Entitlements

**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, size/detail, and include cross-section)



## LEGEND

| | |
|---|---|
| OVERALL BASIN LIMIT | ━━━ |
| BASIN ID NUMBER | DMA-X |
| FLOW DIRECTION | → |
| DISCHARGE POINT | ▼1 |
| MODULAR WETLAND SYSTEM | ◯◯ |
| STORAGE VAULT | [ ] |

NOTES

NO NATURAL HYDROLOGIC FEATURES CURRENTLY EXIST ON SITE
ALL SOILS URBAN LANDS SOIL TYPE "D"

GROUNDWATER DEPTH EXCEEDS 20 FEET

NO CRITICAL COARSE SEDIMENT YIELD AREAS EXIST ON SITE. REFER TO ATTACHMENT 2b

REFER TO ATTACHMENT 1B FOR DMA SUMMARY

SOURCE CONTROL BMPS

1. PREVENTION OF ILLICIT DISCHARGES INTO MS4 (4.2.1)
2. STORM DRAIN STENCILING OR SIGNAGE (4.2.2)
3. PROTECT TRASH STORAGE AREAS (4.2.5)

SITE DESIGN BMPS

1. CONSERVE NATURAL AREAS (4.3.2)
2. MINIMIZE IMPERVIOUS AREAS (4.3.3)
3. MINIMIZE SOIL COMPACTION (4.3.4)
4. IMPERVIOUS AREA DISPERSION (4.3.5)
5. LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES (4.3.7)

**SELF MITIGATING AREA**

DMS 8 AND 9 ARE SELF-MITIGATING DMAS AS THEY MEETS ALL THE FOLLOWING CRITERIA AS SET BY THE CITY OF SAN DIEGO:

- VEGETATION IN NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA (3.5%).
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

80 40 0 80 160 240
SCALE: 1"=80'

# CAMPUS POINT NDP
## On-Site Hydrologic Work Map Proposed

Michael Baker
INTERNATIONAL
9755 Clairemont Mesa Boulevard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

**Project Name:** Campus Point NDP Entitlements

## Tabular Summary of DMAs

## Worksheet B-1

| DMA Unique Identifier | Area (acres) | Impervious Area (acres) | % Imp | HSG | Area Weighted Runoff Coefficient | DCV (cubic feet) | Treated By (BMP ID) | Pollutant Control Type | Drains to (POC ID) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.93 | 1.54 | 80 | D | 0.82 | - | MWS-1 | Biofiltration | 1 |
| 2 | 3.96 | 2.36 | 60 | D | 0..64 | - | MWS-2 | Biofiltration | 2 |
| 3 | 0.98 | 0.77 | 79 | D | 0..81 | - | MWS-3 | Biofiltration | 2 |
| 4 | .58 | 0.56 | 97 | D | 0..97 | - | MWS-4 | Biofiltration | 2 |
| 5 | 1.29 | 1.07 | 83 | D | 0..85 | - | MWS-5 | Biofiltration | 2 |
| 6 | 0.65 | 0.30 | 46 | D | 0.51 | 1,815 | Basin 1 | Biofiltration | 2 |
| 7 | 1.03 | 0.77 | 75 | D | 0.78 | 2,465 | Basin 2 | Biofiltration | 2 |
| 8 | 0.27 | 0.16 | 60 | D | 0.64 | 626 | Basin 3 | Biofiltration | 2 |
| 9 | 1.47 | 1.1 | 75 | D | 0.78 | 3,668 | Basin 4 | Biofiltration | 2 |
| 10 | 2.12 | 1.9 | 90 | D | 0.91 | - | MWS-6 | Biofiltration | 2 |

## Summary of DMA Information (Must match project description and SWQMP Narrative)

| No. of DMAs | Total DMA Area (acres) | Total Impervious Area (acres) | % Imp |  | Area Weighted Runoff Coefficient | Total DCV (cubic feet) | Total Area Treated (acres) |  | No. of POCs |
|---|---|---|---|---|---|---|---|---|---|
| 17 | 25.96 | 19.92 | 77 |  | 0.77 | 16,655 | 25.96 |  | 3 |

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

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**Project Name:** Campus Point NDP Entitlements

## Tabular Summary of DMAs

## Worksheet B-1

| DMA Unique Identifier | Area (acres) | Impervious Area (acres) | % Imp | HSG | Area Weighted Runoff Coefficient | DCV (cubic feet) | Treated By (BMP ID) | Pollutant Control Type | Drains to (POC ID) |
|---|---|---|---|---|---|---|---|---|---|
| 11 | 1.92 | 1.65 | 86 | D | 0.87 | - | MWS-7 | Biofiltration | 2 |
| 12 | 1.85 | 1.48 | 86 | D | 0.82 | - | MWS-8 | Biofiltration | 2 |
| 13 | 1.08 | 0.55 | 51 | D | 0.56 | 1,852 | Basin 5 | Biofiltration | 2 |
| 14 | 3.86 | 3.4 | 88 | D | 0.89 | - | MWS-9 | Biofiltration | 2 |
| 15 | 2.43 | 2.19 | 90 | D | 0.91 | - | MWS-10 | Biofiltration | 3 |
| 16 | 0.28 | 0.12 | 43 | D | 0.49 | - | MWS-11 | Biofiltration | 3 |
| 17 | 0.26 | 0 | 0 | - | - | - | Self Retaining | N/A | 2 |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

## Summary of DMA Information (Must match project description and SWQMP Narrative)

| No. of DMAs | Total DMA Area (acres) | Total Impervious Area (acres) | % Imp |  | Area Weighted Runoff Coefficient | Total DCV (cubic feet) | Total Area Treated (acres) |  | No. of POCs |
|---|---|---|---|---|---|---|---|---|---|
| 17 | 25.96 | 19.92 | 77 |  | 0.91 | 16,655 | 25.96 |  | 3 |

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

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

<table>
<tr><th colspan="2">Harvest and Use Feasibility Screening</th><th colspan="2">Worsksheet B.3-1</th></tr>
<tr><td colspan="4">1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?<br>☐ Toilet and urinal flushing<br>☒ Landscape irrigation<br>☐ Other:____________________</td></tr>
<tr><td colspan="4">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.<br>[Provide a summary of calculations here]<br>1.17 AC * 1470 g/AC = 441 gallons<br>441 gallons = 59.0 cubic feet</td></tr>
<tr><td colspan="4">3. Calculate the DCV using worksheet B-2.1.<br>[Provide a results here]<br>DCV = 6251 cubic feet</td></tr>
<tr><td>3a. Is the 36-hour demand greater than or equal to the DCV?<br>Yes / [✓ No ⇨]<br>⇩</td><td colspan="2">3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?<br>Yes / [✓ No ⇨]<br>⇩</td><td>3c. Is the 36-hour demand less than 0.25DCV?<br>[✓ Yes ⇩]</td></tr>
<tr><td>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.</td><td colspan="2">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.</td><td>Harvest and use is considered to be infeasible.</td></tr>
</table>

**Note**: 36-hour demand calculations are for feasibility analysis only, once the feasibility analysis is complete the applicant may be allowed to use a different drawdown time provided they meet the 80 percent of average annual (long term) runoff volume performance standard.

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# APPENDIX D

## STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the *2018 City of San Diego Storm Water Standards* (SWS). If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

### Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table D-I presents the descriptions of the hydrologic soil groups. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

TABLE D-I
HYDROLOGIC SOIL GROUP DEFINITIONS

| Soil Group | Soil Group Definition |
|---|---|
| A | Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission. |
| B | Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission. |
| C | Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission. |
| D | Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission. |

The property is underlain by man-made previously placed fill and should be classified as Soil Group D. The Hydrologic Soil Group Map presents output from the USDA website showing the limits of the soil units.

Hydrologic Soil Group Map

Table D-II presents the information from the USDA website for the subject property.

TABLE D-II
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP*

| Map Unit Name | Map Unit Symbol | Approximate Percentage of Property | Hydrologic Soil Group | $k_{SAT}$ of Most Limiting Layer (Inches/ Hour) |
|---|---|---|---|---|
| Altamont Clay, 30 to 50 percent Slopes, Warm MAAT, MLRA 20 | AtF | 73.4 | C | 0.06 – 0.57 |
| Chesterton Fine Sandy Loam, 5 to 9 percent Slopes | CfC | 26.6 | D | 0.00 – 0.06 |

*The property should be considered to possess a Hydrologic Soil Group D due to the existing fill materials.

## In Situ Testing

We performed four constant-head infiltration tests at the locations shown on the Geologic Map, Figure 2. Table D-III presents the results of the infiltration tests. The field data sheets are attached herein. We applied a feasibility factor of safety of 2.0 to our estimated infiltration rates to provide input on Worksheet C.4-1. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil.

### TABLE D-III
### INFILTRATION TEST RESULTS

| Test No. | Geologic Unit | Test Elevation (feet, MSL) | Field-Saturated Hydraulic Conductivity/Infiltration Rate, $k_{sat}$ (inch/hour) | Worksheet Infiltration Rate[1] (inch/hour) |
|---|---|---|---|---|
| P-1 (B-9) | Ta | 297 | 0.003 | 0.002 |
| P-2 (B-10) | Ta | 298 | 0.015 | 0.008 |
| P-3 (B-11) | Tsc | 295 | 0.091 | 0.046 |
| P-4 (B-12) | Tsc | 298 | 0.071 | 0.036 |
| Average | | | 0.045 | 0.023 |

*Using a Factor of Safety of 2.

Infiltration categories include full infiltration, partial infiltration and no infiltration. Table D-IV presents the commonly accepted definitions of the potential infiltration categories based on the infiltration rates.

### TABLE D-IV
### INFILTRATION CATEGORIES

| Infiltration Category | Field Infiltration Rate, I (Inches/Hour) | Factored Infiltration Rate*, I (Inches/Hour) |
|---|---|---|
| Full Infiltration | $I > 1.0$ | $I > 0.5$ |
| Partial Infiltration | $0.10 < I \leq 1.0$ | $0.05 < I \leq 0.5$ |
| No Infiltration (Infeasible) | $I < 0.10$ | $I < 0.05$ |

*Using a Factor of Safety of 2.

Based on our observations and test results, the infiltration rates for the formational materials onsite (Scripps Formation and Ardath Shale) are less than 0.05 inches per hour. Therefore, full and partial infiltration on the property should be considered infeasible based on the calculated infiltrations rates. Vertical cutoff walls or liners should be installed on the sides and bottom of the infiltration basin and a drain should be installed at the base of the basin.

# GEOTECHNICAL CONSIDERATIONS

## Groundwater Elevations

We did not encounter groundwater or seepage during our site investigation. We expect groundwater is deeper than about 200 feet below existing grade.

## New or Existing Utilities

Utilities are located on and adjacent to the property within the existing parking area and roadways. Therefore, full and partial infiltration within the areas near these utilities should be considered infeasible. Setbacks for infiltration should be incorporated. The setback for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility.

## Existing or Planned Structures

Structures are present along the northern, eastern and southern boundaries of the property, and several structures are proposed on-site as described herein. Water should not be allowed to infiltrate in areas where it could affect the neighboring properties and adjacent structures. Mitigation for existing structures consists of not allowing water infiltration within 10 feet of the existing foundations.

## Slopes

A descending slope with a height of approximately 150 feet exists on the western portion of the property. Infiltration should not be allowed within a distance of 50 feet or a distance of 1.5H from a slope where H is the height of the slope (about 225 feet from the top of the existing slope).

## Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

# CONCLUSIONS AND RECOMMENDATIONS

## Storm Water Evaluation Narrative

The majority of the site is underlain by varying depths of fill overlying the Scripps Formation and Ardath Shale (see Geologic Map, Figure 2). Infiltration is not allowed in areas with 5 feet and thicker of fill. Descending slopes exist west of the property along Campus Point Drive with a height up to approximately 150 feet. Infiltration should not be allowed within 50 feet or 1.5 times the height of existing slopes (225 feet).

We performed two infiltration tests within the Scripps Formation and two within the Ardath Shale in the northeastern portion of the site where formational materials are present near existing and proposed grade. We located our infiltration tests within the area of the site with adequate setbacks from slopes and fills of less than 5 feet. The results indicate an average rate of less than 0.05 inches per hour (with an applied factor of safety of 2).

## Storm Water Evaluation Conclusion

Infiltration should be considered infeasible within the existing fill soils on the southern and western portions of the property. Full and partial infiltration should be considered infeasible at the site because the average infiltration rate is less than 0.05 inches per hour within formational materials. Mitigation measures do not exist that allow an increase to the infiltration rates.

## Storm Water Management Devices

Liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

## Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. Worksheet C.4-1 presents the completed information for the submittal process and is attached herein.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table D-IV describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

## TABLE D-V
## SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

| Consideration | High Concern – 3 Points | Medium Concern – 2 Points | Low Concern – 1 Point |
|---|---|---|---|
| Assessment Methods | Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods | Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., Infiltrometer). Moderate spatial resolution | Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods. |
| Predominant Soil Texture | Silty and clayey soils with significant fines | Loamy soils | Granular to slightly loamy soils |
| Site Soil Variability | Highly variable soils indicated from site assessment or unknown variability | Soil boring/test pits indicate moderately homogenous soils | Soil boring/test pits indicate relatively homogenous soils |
| Depth to Groundwater/ Impervious Layer | <5 feet below facility bottom | 5-15 feet below facility bottom | >15 feet below facility bottom |

Based on our geotechnical investigation and the previous table, Table D-V presents the estimated factor values for the evaluation of the factor of safety. This table only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

## TABLE D-VI
## FACTOR OF SAFETY WORKSHEET DESIGN VALUES – PART A1

| Suitability Assessment Factor Category | Assigned Weight (w) | Factor Value (v) | Product (p = w x v) |
|---|---|---|---|
| Assessment Methods | 0.25 | 2 | 0.50 |
| Predominant Soil Texture | 0.25 | 3 | 0.75 |
| Site Soil Variability | 0.25 | 2 | 0.50 |
| Depth to Groundwater/ Impervious Layer | 0.25 | 1 | 0.25 |
| Suitability Assessment Safety Factor, $S_A = \sum p$ | | | 2.00 |

*The project civil engineer should complete Worksheet D.5-1 or Form I-9 using the data on this table. Additional information is required to evaluate the design factor of safety.

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

---

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

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

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

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

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

The majority of the site is underlain by varying depths of fill overlying the Scripps Formation and Ardath Shale (see Geologic Map, Figure 2). Infiltration is not allowed in areas with 5 feet and thicker of fill. Descending slopes exist west of the property along Campus Point Drive with a height up to approximately 150 feet. Infiltration should not be allowed within 50 feet or 1.5 times the height of existing slopes (225 feet).

We performed two infiltration tests within the Scripps Formation and two within the Ardath Shale in the northeastern portion of the site. The results indicate an average rate of less than 0.05 inches per hour (with an applied factor of safety of 2). Therefore, infiltration is considered infeasible within the formational Scripps Formation and infeasible at the site.

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

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

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

| Part 1 Result – Full Infiltration Geotechnical Screening[12] | Result |
|---|---|
| If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only.<br>If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required. | ☐ Full infiltration Condition<br>☒ Complete Part 2 |

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

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

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

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

The majority of the site is underlain by varying depths of fill overlying the Scripps Formation and Ardath Shale (see Geologic Map, Figure 2). Infiltration is not allowed in areas with 5 feet and thicker of fill. Descending slopes exist west of the property along Campus Point Drive with a height up to approximately 150 feet. Infiltration should not be allowed within 50 feet or 1.5 times the height of existing slopes (225 feet).

We performed two infiltration tests within the Scripps Formation and two within the Ardath Shale in the northeastern portion of the site. The results indicate an average rate of less than 0.05 inches per hour (with an applied factor of safety of 2). Therefore, infiltration is considered infeasible within the formational Scripps Formation and infeasible at the site.

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

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

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

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

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

GEOCON

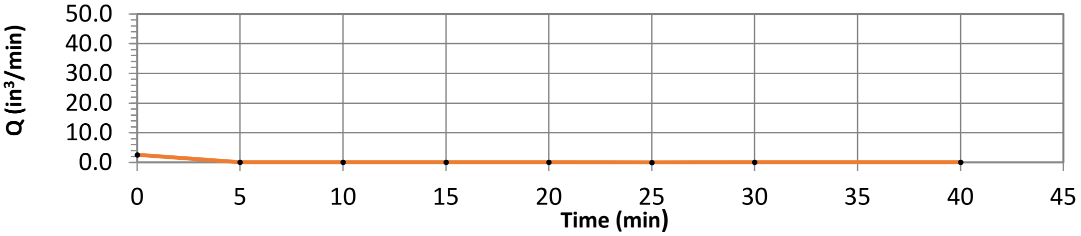
## Aardvark Permeameter Data Analysis

Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-1
Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 302.0
Bottom EL (feet, MSL): 297.0

| | |
|---|---|
| Borehole Diameter, d (in.): | 8.00 |
| Borehole Depth, **H** (in): | 60.00 |
| Distance Between Reservoir & Top of Borehole (in.): | 29.00 |
| Estimated Depth to Water Table, **S** (feet): | 200.00 |
| Height APM Raised from Bottom (in.): | 2.00 |
| Pressure Reducer Used: | No |

| | |
|---|---|
| Distance Between Resevoir and APM Float, **D** (in.): | 79.75 |
| Head Height Calculated, **h** (in.): | 5.77 |
| Head Height Measured, **h** (in.): | 5.00 |
| Distance Between Constant Head and Water Table, **L** (in.): | 2345.00 |

| Reading | Time Elapsed (min) | Water Weight Consummed (lbs) | Water Volume Consummed ($in^3$) | Q ($in^3$/min) |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 5.00 | 0.465 | 12.88 | 2.575 |
| 3 | 5.00 | 0.005 | 0.14 | 0.028 |
| 4 | 5.00 | 0.010 | 0.28 | 0.055 |
| 5 | 5.00 | 0.010 | 0.28 | 0.055 |
| 6 | 5.00 | 0.005 | 0.14 | 0.028 |
| 7 | 5.00 | 0.000 | 0.00 | 0.000 |
| 8 | 10.00 | 0.010 | 0.28 | 0.028 |
| 9 | 5.00 | 0.005 | 0.14 | 0.028 |
| | | | Steady Flow Rate, Q ($in^3$/min): | 0.018 |



**Soil Matric Flux Potential, $\Phi_m$**

$\Phi_m$= 0.0001 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

$K_{sat}$ = 5.39E-05 in/min 0.003 in/hr

## Aardvark Permeameter Data Analysis

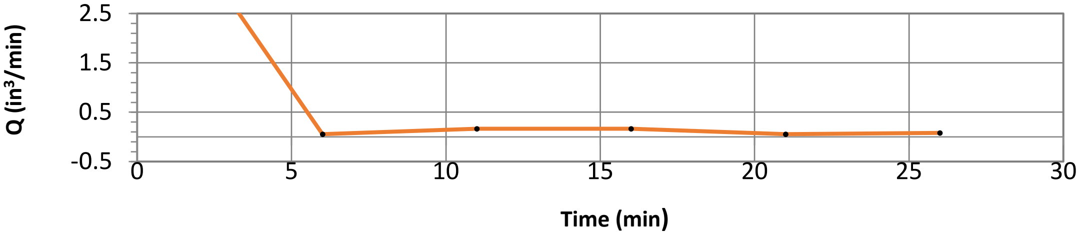
Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-2

Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 301.0
Bottom EL (feet, MSL): 296.7

| | |
|---|---|
| Borehole Diameter, d (in.): | 8.00 |
| Borehole Depth, **H** (in): | 52.00 |
| Distance Between Reservoir & Top of Borehole (in.): | 29.00 |
| Estimated Depth to Water Table, **S** (feet): | 200.00 |
| Height APM Raised from Bottom (in.): | 1.00 |
| Pressure Reducer Used: | No |

| | |
|---|---|
| Distance Between Resevoir and APM Float, **D** (in.): | 72.75 |
| Head Height Calculated, **h** (in.): | 4.74 |
| Head Height Measured, **h** (in.): | 4.00 |
| Distance Between Constant Head and Water Table, **L** (in.): | 2352.00 |

| Reading | Time Elapsed (min) | Water Weight Consummed (lbs) | Water Volume Consummed ($in^3$) | Q ($in^3$/min) |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 6.00 | 0.800 | 22.15 | 3.692 |
| 3 | 5.00 | 0.990 | 27.42 | 5.483 |
| 4 | 5.00 | 0.010 | 0.28 | 0.055 |
| 5 | 5.00 | 0.030 | 0.83 | 0.166 |
| 6 | 5.00 | 0.030 | 0.83 | 0.166 |
| 7 | 5.00 | 0.010 | 0.28 | 0.055 |
| 8 | 5.00 | 0.015 | 0.42 | 0.083 |
| | | | Steady Flow Rate, Q ($in^3$/min): | 0.069 |



**Soil Matric Flux Potential, $\Phi_m$**

$\Phi_m$= 0.0003 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

$K_{sat}$ = 2.48E-04 in/min 0.015 in/hr

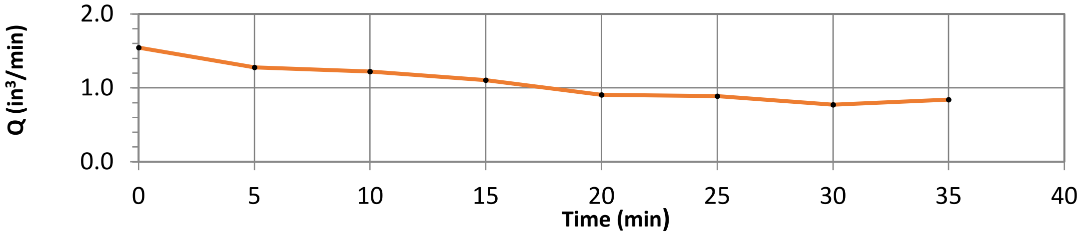
## Aardvark Permeameter Data Analysis

Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-3
Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 300.0
Bottom EL (feet, MSL): 294.7

|  |  |
|---|---|
| Borehole Diameter, d (in.): | 8.00 |
| Borehole Depth, **H** (in): | 64.00 |
| Distance Between Reservoir & Top of Borehole (in.): | 27.00 |
| Estimated Depth to Water Table, **S** (feet): | 200.00 |
| Height APM Raised from Bottom (in.): | 4.00 |
| Pressure Reducer Used: | No |

|  |  |
|---|---|
| Distance Between Resevoir and APM Float, **D** (in.): | 79.75 |
| Head Height Calculated, **h** (in.): | 7.77 |
| Head Height Measured, **h** (in.): | 8.00 |
| Distance Between Constant Head and Water Table, **L** (in.): | 2344.00 |

| Reading | Time Elapsed (min) | Water Weight Consummed (lbs) | Water Volume Consummed ($in^3$) | Q ($in^3$/min) |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 5.00 | 0.108 | 2.99 | 0.598 |
| 3 | 5.00 | 0.279 | 7.73 | 1.545 |
| 4 | 5.00 | 0.231 | 6.40 | 1.279 |
| 5 | 5.00 | 0.220 | 6.11 | 1.221 |
| 6 | 5.00 | 0.200 | 5.52 | 1.105 |
| 7 | 5.00 | 0.164 | 4.53 | 0.906 |
| 8 | 5.00 | 0.161 | 4.44 | 0.889 |
| 9 | 5.00 | 0.140 | 3.86 | 0.773 |
| 10 | 5.00 | 0.152 | 4.20 | 0.839 |
|  |  |  | Steady Flow Rate, Q ($in^3$/min): | 0.834 |



**Soil Matric Flux Potential, $\Phi_m$**

$\Phi_m$= 0.0017 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

$K_{sat}$ = 1.51E-03 in/min 0.091 in/hr

GEOCON

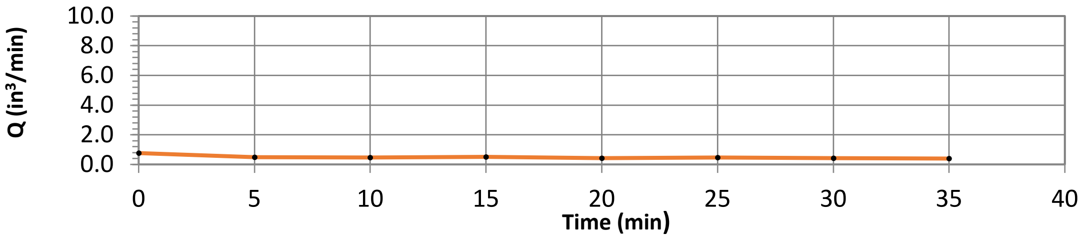
## Aardvark Permeameter Data Analysis

Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-4
Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 300.0
Bottom EL (feet, MSL): 298.0

Borehole Diameter, d (in.): 8.00
Borehole Depth, **H** (in): 24.00
Distance Between Reservoir & Top of Borehole (in.): 28.00
Estimated Depth to Water Table, **S** (feet): 200.00
Height APM Raised from Bottom (in.): 2.00
Pressure Reducer Used: No

Distance Between Resevoir and APM Float, **D** (in.): 42.75
Head Height Calculated, **h** (in.): 5.64
Head Height Measured, **h** (in.): 5.00
Distance Between Constant Head and Water Table, **L** (in.): 2381.00

| Reading | Time Elapsed (min) | Water Weight Consummed (lbs) | Water Volume Consummed ($in^3$) | Q ($in^3$/min) |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 5.00 | 0.138 | 3.82 | 0.764 |
| 3 | 5.00 | 0.089 | 2.48 | 0.495 |
| 4 | 5.00 | 0.083 | 2.29 | 0.459 |
| 5 | 5.00 | 0.092 | 2.54 | 0.508 |
| 6 | 5.00 | 0.077 | 2.14 | 0.429 |
| 7 | 5.00 | 0.083 | 2.31 | 0.462 |
| 8 | 5.00 | 0.075 | 2.08 | 0.415 |
| 9 | 5.00 | 0.071 | 1.98 | 0.395 |
| | | | Steady Flow Rate, Q ($in^3$/min): | 0.405 |

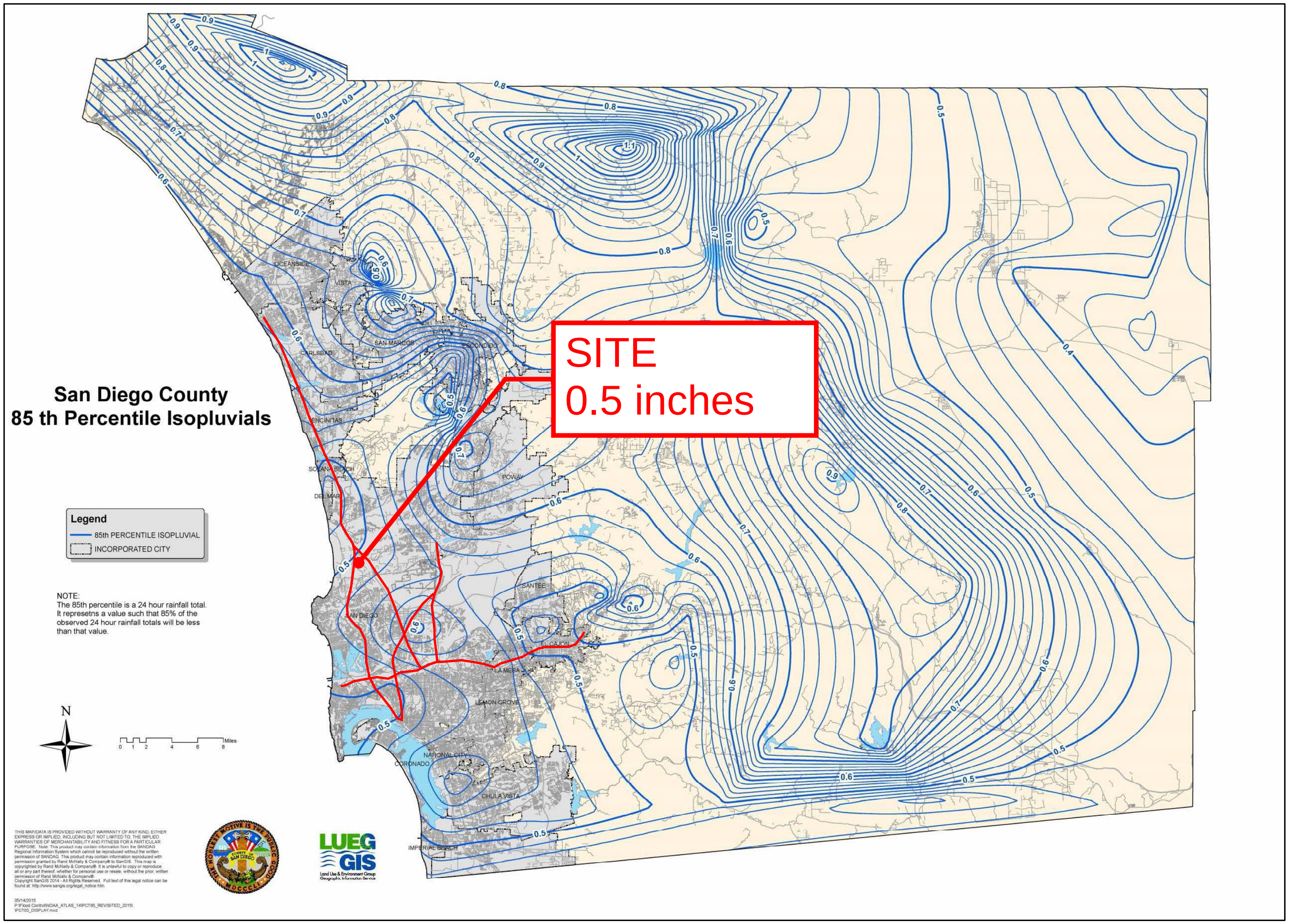


**Soil Matric Flux Potential, $\Phi_m$**

$\Phi_m$= 0.0013 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

$K_{sat}$ = 1.18E-03 in/min 0.071 in/hr



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

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\PCT85_DISPLAY.mxd

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

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The City of SAN DIEGO

| | | | |
|---|---|---|---|
| | **Project Name** | Campus Point - Entitlements | |
| | **BMP ID** | Biofiltration Basin 1 (DMA-6) | |
| | **Sizing Method for Pollutant Removal Criteria** | **Worksheet B.5-1** | |
| 1 | Area draining to the BMP | 28,211 | sq. ft. |
| 2 | Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2) | 0.51 | |
| 3 | 85th percentile 24-hour rainfall depth | 0.5 | inches |
| 4 | Design capture volume [Line 1 x Line 2 x (Line 3/12)] | 599 | cu. ft. |
| | **BMP Parameters** | | |
| 5 | Surface ponding [6 inch minimum, 12 inch maximum] | 12 | inches |
| 6 | Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations | 18 | inches |
| 7 | Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area | 15 | inches |
| 8 | Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area | 3 | inches |
| 9 | Freely drained pore storage of the media | 0.2 | in/in |
| 10 | Porosity of aggregate storage | 0.4 | in/in |
| 11 | Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.) | 0.1 | in/hr. |
| | **Baseline Calculations** | | |
| 12 | Allowable routing time for sizing | 6 | hours |
| 13 | Depth filtered during storm [ Line 11 x Line 12] | 0.6 | inches |
| 14 | Depth of Detention Storage<br>[Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)] | 22.8 | inches |
| 15 | Total Depth Treated [Line 13 + Line 14] | 23.4 | inches |
| | **Option 1 – Biofilter 1.5 times the DCV** | | |
| 16 | Required biofiltered volume [1.5 x Line 4] | 899 | cu. ft. |
| 17 | Required Footprint [Line 16/ Line 15] x 12 | 461 | sq. ft. |
| | **Option 2 - Store 0.75 of remaining DCV in pores and ponding** | | |
| 18 | Required Storage (surface + pores) Volume [0.75 x Line 4] | 450 | cu. ft. |
| 19 | Required Footprint [Line 18/ Line 14] x 12 | 237 | sq. ft. |
| | **Footprint of the BMP** | | |
| 20 | BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4) | 0 | |
| 21 | Minimum BMP Footprint [Line 1 x Line 2 x Line 20] | 432 | sq. ft. |
| 22 | Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21) | 432 | sq. ft. |
| 23 | Provided BMP Footprint | 1815 | sq. ft. |
| 24 | Is Line 23 ≥ Line 22? | **Yes, Performance Standard is Met** | |

The City of SAN DIEGO

| | | | |
|---|---|---|---|
| | **Project Name** | Campus Point - Entitlements | |
| | **BMP ID** | Biofiltration Basin 2 (DMA-7) | |
| **Sizing Method for Pollutant Removal Criteria** | | **Worksheet B.5-1** | |
| 1 | Area draining to the BMP | 44,682 | sq. ft. |
| 2 | Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2) | 0.78 | |
| 3 | 85th percentile 24-hour rainfall depth | 0.5 | inches |
| 4 | Design capture volume [Line 1 x Line 2 x (Line 3/12)] | 1452 | cu. ft. |
| **BMP Parameters** | | | |
| 5 | Surface ponding [6 inch minimum, 12 inch maximum] | 12 | inches |
| 6 | Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations | 18 | inches |
| 7 | Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area | 15 | inches |
| 8 | Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area | 3 | inches |
| 9 | Freely drained pore storage of the media | 0.2 | in/in |
| 10 | Porosity of aggregate storage | 0.4 | in/in |
| 11 | Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.) | 0.1 | in/hr. |
| **Baseline Calculations** | | | |
| 12 | Allowable routing time for sizing | 6 | hours |
| 13 | Depth filtered during storm [ Line 11 x Line 12] | 0.6 | inches |
| 14 | Depth of Detention Storage<br>[Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)] | 22.8 | inches |
| 15 | Total Depth Treated [Line 13 + Line 14] | 23.4 | inches |
| **Option 1 – Biofilter 1.5 times the DCV** | | | |
| 16 | Required biofiltered volume [1.5 x Line 4] | 2178 | cu. ft. |
| 17 | Required Footprint [Line 16/ Line 15] x 12 | 1117 | sq. ft. |
| **Option 2 - Store 0.75 of remaining DCV in pores and ponding** | | | |
| 18 | Required Storage (surface + pores) Volume [0.75 x Line 4] | 1089 | cu. ft. |
| 19 | Required Footprint [Line 18/ Line 14] x 12 | 573 | sq. ft. |
| **Footprint of the BMP** | | | |
| 20 | BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4) | 0 | |
| 21 | Minimum BMP Footprint [Line 1 x Line 2 x Line 20] | 1046 | sq. ft. |
| 22 | Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21) | 1046 | sq. ft. |
| 23 | Provided BMP Footprint | 2465 | sq. ft. |
| 24 | Is Line 23 ≥ Line 22? | **Yes, Performance Standard is Met** | |

| | | | |
|---|---|---|---|
| The City of SAN DIEGO | **Project Name** | Campus Point - Entitlements | |
| | **BMP ID** | Biofiltration Basin 3 (DMA-8) | |
| **Sizing Method for Pollutant Removal Criteria** | | **Worksheet B.5-1** | |
| 1 | Area draining to the BMP | 11,624 | sq. ft. |
| 2 | Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2) | 0.64 | |
| 3 | 85th percentile 24-hour rainfall depth | 0.5 | inches |
| 4 | Design capture volume [Line 1 x Line 2 x (Line 3/12)] | 310 | cu. ft. |
| **BMP Parameters** | | | |
| 5 | Surface ponding [6 inch minimum, 12 inch maximum] | 12 | inches |
| 6 | Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations | 18 | inches |
| 7 | Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area | 15 | inches |
| 8 | Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area | 3 | inches |
| 9 | Freely drained pore storage of the media | 0.2 | in/in |
| 10 | Porosity of aggregate storage | 0.4 | in/in |
| 11 | Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.) | 0.1 | in/hr. |
| **Baseline Calculations** | | | |
| 12 | Allowable routing time for sizing | 6 | hours |
| 13 | Depth filtered during storm [ Line 11 x Line 12] | 0.6 | inches |
| 14 | Depth of Detention Storage<br>[Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)] | 22.8 | inches |
| 15 | Total Depth Treated [Line 13 + Line 14] | 23.4 | inches |
| **Option 1 – Biofilter 1.5 times the DCV** | | | |
| 16 | Required biofiltered volume [1.5 x Line 4] | 465 | cu. ft. |
| 17 | Required Footprint [Line 16/ Line 15] x 12 | 238 | sq. ft. |
| **Option 2 - Store 0.75 of remaining DCV in pores and ponding** | | | |
| 18 | Required Storage (surface + pores) Volume [0.75 x Line 4] | 232 | cu. ft. |
| 19 | Required Footprint [Line 18/ Line 14] x 12 | 122 | sq. ft. |
| **Footprint of the BMP** | | | |
| 20 | BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4) | 0 | |
| 21 | Minimum BMP Footprint [Line 1 x Line 2 x Line 20] | 223 | sq. ft. |
| 22 | Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21) | 223 | sq. ft. |
| 23 | Provided BMP Footprint | 626 | sq. ft. |
| 24 | Is Line 23 ≥ Line 22? | **Yes, Performance Standard is Met** | |

The City of SAN DIEGO

| | | | |
|---|---|---|---|
| | **Project Name** | Campus Point - Entitlements | |
| | **BMP ID** | Biofiltration Basin 4 (DMA-9) | |
| **Sizing Method for Pollutant Removal Criteria** | | **Worksheet B.5-1** | |
| 1 | Area draining to the BMP | 64,009 | sq. ft. |
| 2 | Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2) | 0.78 | |
| 3 | 85th percentile 24-hour rainfall depth | 0.5 | inches |
| 4 | Design capture volume [Line 1 x Line 2 x (Line 3/12)] | 2080 | cu. ft. |
| **BMP Parameters** | | | |
| 5 | Surface ponding [6 inch minimum, 12 inch maximum] | 12 | inches |
| 6 | Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations | 18 | inches |
| 7 | Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area | 15 | inches |
| 8 | Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area | 3 | inches |
| 9 | Freely drained pore storage of the media | 0.2 | in/in |
| 10 | Porosity of aggregate storage | 0.4 | in/in |
| 11 | Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.) | 0.1 | in/hr. |
| **Baseline Calculations** | | | |
| 12 | Allowable routing time for sizing | 6 | hours |
| 13 | Depth filtered during storm [ Line 11 x Line 12] | 0.6 | inches |
| 14 | Depth of Detention Storage<br>[Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)] | 22.8 | inches |
| 15 | Total Depth Treated [Line 13 + Line 14] | 23.4 | inches |
| **Option 1 – Biofilter 1.5 times the DCV** | | | |
| 16 | Required biofiltered volume [1.5 x Line 4] | 3120 | cu. ft. |
| 17 | Required Footprint [Line 16/ Line 15] x 12 | 1600 | sq. ft. |
| **Option 2 - Store 0.75 of remaining DCV in pores and ponding** | | | |
| 18 | Required Storage (surface + pores) Volume [0.75 x Line 4] | 1560 | cu. ft. |
| 19 | Required Footprint [Line 18/ Line 14] x 12 | 821 | sq. ft. |
| **Footprint of the BMP** | | | |
| 20 | BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4) | 0 | |
| 21 | Minimum BMP Footprint [Line 1 x Line 2 x Line 20] | 1498 | sq. ft. |
| 22 | Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21) | 1498 | sq. ft. |
| 23 | Provided BMP Footprint | 3,668 | sq. ft. |
| 24 | Is Line 23 ≥ Line 22? | **Yes, Performance Standard is Met** | |

The City of SAN DIEGO

| | | | |
|---|---|---|---|
| **Project Name** | Campus Point - Entitlements | | |
| **BMP ID** | Biofiltration Basin 5 (DMA-13) | | |
| **Sizing Method for Pollutant Removal Criteria** | **Worksheet B.5-1** | | |
| 1 | Area draining to the BMP | 47,250 | sq. ft. |
| 2 | Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2) | 0.65 | |
| 3 | 85th percentile 24-hour rainfall depth | 0.5 | inches |
| 4 | Design capture volume [Line 1 x Line 2 x (Line 3/12)] | 1280 | cu. ft. |
| **BMP Parameters** | | | |
| 5 | Surface ponding [6 inch minimum, 12 inch maximum] | 12 | inches |
| 6 | Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations | 18 | inches |
| 7 | Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area | 15 | inches |
| 8 | Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area | 3 | inches |
| 9 | Freely drained pore storage of the media | 0.2 | in/in |
| 10 | Porosity of aggregate storage | 0.4 | in/in |
| 11 | Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.) | 0.1 | in/hr. |
| **Baseline Calculations** | | | |
| 12 | Allowable routing time for sizing | 6 | hours |
| 13 | Depth filtered during storm [ Line 11 x Line 12] | 0.6 | inches |
| 14 | Depth of Detention Storage<br>[Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)] | 22.8 | inches |
| 15 | Total Depth Treated [Line 13 + Line 14] | 23.4 | inches |
| **Option 1 – Biofilter 1.5 times the DCV** | | | |
| 16 | Required biofiltered volume [1.5 x Line 4] | 1920 | cu. ft. |
| 17 | Required Footprint [Line 16/ Line 15] x 12 | 984 | sq. ft. |
| **Option 2 - Store 0.75 of remaining DCV in pores and ponding** | | | |
| 18 | Required Storage (surface + pores) Volume [0.75 x Line 4] | 960 | cu. ft. |
| 19 | Required Footprint [Line 18/ Line 14] x 12 | 505 | sq. ft. |
| **Footprint of the BMP** | | | |
| 20 | BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4) | 0 | |
| 21 | Minimum BMP Footprint [Line 1 x Line 2 x Line 20] | 921 | sq. ft. |
| 22 | Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21) | 921 | sq. ft. |
| 23 | Provided BMP Footprint | 1,946 | sq. ft. |
| 24 | Is Line 23 ≥ Line 22? | **Yes, Performance Standard is Met** | |

# DMA 1 - MWS-1

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 1.93 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.82 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.475 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.577 | cfs |

# DMA 2 - MWS-2

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 3.96 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.64 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.760 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.924* | cfs |
| | *This is the sum of two compact biofiltration BMPs in series | | | |

# DMA 3 - MWS-3

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 0.98 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.81 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.238 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.346 | cfs |

# DMA 4 - MWS-4

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 0.58 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.97 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.169 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.175 | cfs |

# DMA 5 - MWS-5

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 1.29 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.85 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.329 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.346 | cfs |

# DMA 10 - MWS-6

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 2.12 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.91 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.579 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity* | Q= | 0.693 | cfs |

# DMA 11 - MWS-7

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 1.92 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.87 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.501 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.577 | cfs |

# DMA 12 - MWS-8

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 1.85 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.82 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.455 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.462 | cfs |

# DMA 14 - MWS-9

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 3.86 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.89 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 1.031 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 1.154* | cfs |
| | *This is the sum of two compact biofiltration BMPs in series | | | |

# DMA 15 - MWS-10

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 2.43 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.91 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.663 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.693 | cfs |

# DMA 16 - MWS-11

| Flow-Based Sizing for Compact Biofiltration | | | | |
|---|---|---|---|---|
| 1 | Area tributary to BMP (s) | A= | 0.28 | acres |
| 2 | Area-weighted runoff factor (estimate using Appendix B.2) | C= | 0.49 | unitless |
| 3 | Design rainfall intensity | i= | 0.2 | in/hr |
| 4 | Calculate Flow Rate = 1.5 x (C x i x A) | Q= | 0.041 | cfs |
| 5 | Proprietary biofiltration flow rate treatment capacity | Q= | 0.052 | cfs |

# SPECIFICATIONS

## FLOW-BASED DESIGNS

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

| MODEL # | DIMENSIONS | WETLANDMEDIA SURFACE AREA (sq. ft.) | TREATMENT FLOW RATE (cfs) |
|---|---|---|---|
| MWS-L-4-4 | 4' x 4'<br>MWS-11 | 23 | 0.052 |
| MWS-L-4-6 | 4' x 6' | 32 | 0.073 |
| MWS-L-4-8 | 4' x 8' | 50 | 0.115 |
| MWS-L-4-13 | 4' x 13' | 63 | 0.144 |
| MWS-L-4-15 | 4' x 15'<br>MWS-4 | 76 | 0.175 |
| MWS-L-4-17 | 4' x 17' | 90 | 0.206 |
| MWS-L-4-19 | 4' x 19' | 103 | 0.237 |
| MWS-L-4-21 | 4' x 21'<br>MWS-3 | 117 | 0.268 |
| MWS-L-6-8 | 7' x 9' | 64 | 0.147 |
| MWS-L-8-8 | 8' x 8' | 100 | 0.230 |
| MWS-L-8-12 | 8' x 12'<br>MWS-5 | 151 | 0.346 |
| MWS-L-8-16 | 8' x 16'<br>MWS-2 (x 2) & 8 | 201<br>MWS-9 (x 2) | 0.462 |
| MWS-L-8-20 | 9' x 21'<br>MWS-1 & 7 | 252 | 0.577 |
| MWS-L-8-24 | 9' x 25'<br>MWS-6 & 10 | 302 | 0.693 |
| MWS-L-10-20 | 10' x 20' | 302 | 0.693 |

# Compact (high rate) Biofiltration BMP Checklist

**Form I-10**

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

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

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

## Section 1: Biofiltration Criteria Checklist (Appendix F)

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

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

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

**Provide basis for Criteria 1 and 3:**

**Feasibility Analysis:**

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

**If Partial Infiltration Condition:**

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

**If No Infiltration Condition:**

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

Worksheets B.5-2 and B.5-6 have been provided.

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

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

**Provide basis for Criteria 2:**

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

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

**Provide basis for Criteria 4:**

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

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

**Provide basis for Criteria 5:**

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

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

**Provide basis for Criteria 6:**

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

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

**Provide basis for Criteria 7:**

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

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

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

## July 2017

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

## For the

## MWS-Linear Modular Wetland

**Ecology's Decision:**

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

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

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

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

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

**<u>Ecology's Conditions of Use:</u>**

Applicants shall comply with the following conditions:

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

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

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

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

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

|  |  |
|---|---|
| Applicant: | Modular Wetland Systems, Inc. |
| Applicant's Address: | *PO. Box 869*<br>*Oceanside, CA 92054* |

**Application Documents:**

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

**Applicant's Use Level Request:**

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

**Applicant's Performance Claims:**

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

**Ecology Recommendations:**

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

**Findings of Fact:**

Laboratory Testing

The MWS-Linear Modular wetland has the:

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

Field Testing

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

**Issues to be addressed by the Company:**

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

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

**Contact Information**:

| | |
|---|---|
| Applicant: | Zach Kent<br>BioClean A Forterra Company.<br>398 Vi9a El Centro<br>Oceanside, CA 92058<br>*zach.kent@forterrabp.com* |

Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

**Revision History**

| **Date** | **Revision** |
|---|---|
| June 2011 | Original use-level-designation document |
| September 2012 | Revised dates for TER and expiration |
| January 2013 | Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard |
| December 2013 | Updated name of Applicant |
| April 2014 | Approved GULD designation for Basic, Phosphorus, and Enhanced treatment |
| December 2015 | Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants |
| July 2017 | Revised Manufacturer Contact Information (name, address, and email) |

BIO CLEAN
ENVIRONMENTAL SERVICES, INC.

April 20th, 2016

**Project:** All Related

**Subject:** MWS Linear BMP Classification Per San Diego Manual

To Whom It May Concern:

It is the intention of this document to use the MWS Linear as a biofiltration BMP. Based upon definitions of Biofiltration as found in Section 2.2.1 and Appendix F of the manual the MWS Linear meets the criteria to be classified as biofiltration and therefore is not flow through treatment and thus does not trigger the need for alternative compliance. The MWS Linear has GULD approval for basic, phosphorus and enhanced treatment under the TAPE approval. The system is certified under the TAPE approval at a loading rate of 1 gpm/sq ft for all three pollutant categories. This is consistent with the performance criteria related to the performance of Appendix F.

Let us first address the comment regarding the MWS (referring to the Modular Wetland System Linear) being flow through treatment. To do so let us look at the definition of biofiltration as provided by the Design Manual which states:

> *"For situations where onsite retention of the 85th percentile storm volume is not feasible, biofiltration must be provided to satisfy specific "biofiltration standards" i.e. a set of selection, sizing, design and operation and maintenance (O&M) criteria that must be met for a BMP to be considered a "biofiltration BMP" – see Section 2.2.1 and Appendix F."*

If we look at section 2.2.2 Storm Water Pollutant Control Performance Standard it states:

> *"(i) If it is not technically feasible to implement retention BMPs for the full DCV onsite for a PDP, then the PDP shall utilize biofiltration BMPs for the remaining volume not reliably retained. Biofiltration BMPs must be designed as described in Appendix F 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, and must be sized to:*
>
> > *[a]. Treat 1.5 times the DCV not reliably retained onsite, OR*
> >
> > *[b]. Treat the DCV not reliably retained onsite with a flow-thru design that has a total volume, including pore spaces and pre-filter detention volume, sized to hold at least 0.75 times the portion of the DCV not reliably retained onsite."*

As the manual states Biofiltration BMPs must be designed as described in Appendix F which states:

> *"A project applicant must be able to affirmatively demonstrate that a given BMP is designed and sized in a manner consistent with this definition to be considered as a "biofiltration BMP" as part of a compliant storm water management plan."*
>
> *"This appendix contains a checklist of the key underlying criteria that must be met for a BMP to be considered a biofiltration BMP. The purpose of this checklist is to facilitate consistent review and approval of biofiltration BMPs that meet the "biofiltration standard" defined by the MS4 Permit."*
>
> *"This checklist includes specific design criteria that are essential to defining a system as a biofiltration BMP; however it does not present a complete design basis. This checklist was used to develop BMP Fact Sheets for PR-1 biofiltration with partial retention and BF-1 biofiltration, which do present a complete design basis. Therefore, biofiltration BMPs that substantially meet all aspects of the Fact sheets PR-1 or BF-1 should be able to complete this checklist without additional documentation beyond what would already be required for a project submittal."*
>
> *"Other biofiltration BMP designs (including both non-proprietary and proprietary designs) may also meet the underlying MS4 Permit requirements to be considered biofiltration BMPs. These BMPs may be classified as biofiltration BMPs if they (1) meet the minimum design criteria listed in this appendix, including the pollutant treatment performance standard in Appendix F.1, (2) are designed and maintained in a manner consistent with their performance certifications (See explanation in Appendix F.2), if applicable, and (3) are acceptable at the discretion of the [City Engineer]. The applicant may be required to provide additional studies and/or required to meet additional design criteria beyond the scope of this document in order to demonstrate that these criteria are met."*

As stated the Biofiltration BMP must meet three objectives. The following outlines how the Modular Wetland System Linear meets these criteria.

**Minimum Design Criteria**

1. Biofiltration BMPs shall be allowed only as described in the BMP selection process in this manual (i.e., retention feasibility hierarchy).
    a. The Modular Wetland System Linear (MWS Linear) is only being proposed on plans when retention via infiltration or reuse is proven infeasible. Conditions such as soils with little to no infiltration rate or sites in which insufficient landscaping warrant to successful implementation of reuse systems.

2. Biofiltration BMPs must be sized using acceptable sizing methods described in this manual.

    a. Section B.5.2 Basis for Minimum Sizing Factor for Biofiltration BMPs states:

       *"The MS4 Permit describes conceptual performance goals for biofiltration BMPs and specifies numeric criteria for sizing biofiltration BMPs (See Section 2.2.1 of this Manual). However, the MS4 Permit does not define a specific footprint sizing factor or design profile that must be provided for the BMP to be considered "biofiltration."*

       *"Additionally, it does not apply to alternative biofiltration designs that utilize the checklist in Appendix F (Biofiltration Standard and Checklist). Acceptable alternative designs (such as proprietary systems meeting Appendix F criteria) typically include design features intended to allow acceptable performance with a smaller footprint and have undergone field scale testing to evaluate performance and required O&M frequency."*

       As stated in the Manual alternative biofiltration designs are allowed. The MWS Linear therefore qualifies as a biofiltration BMP under this definition as it has both undergone field scale testing (TAPE tested and approved with a GULD) and provides requirements on O&M frequency. In addition, the MWS Linear can be sized to treat either 1.5 times the DCV not reliably retained onsite OR 1.0 times the portion of the DCV not reliably retained onsite; and additionally check that the system has a total static (i.e. non-routed) storage volume, including pore spaces and pre-filter detention volume to at least 0.75 times the portion of the DCV not reliably retained onsite.

3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.

    a. The MWS Linear is utilized and placed in the same manner as other types of biofiltration systems. As with other biofiltration systems the MWS Linear includes and underdrain for the remaining portion of the DCV that is not retained via incidental infiltration (as biofiltration if infiltration is not feasible due to poor soils) and evapotranspiration. The MWS Linear can be designed with an open bottom to maximize this incidental infiltration. The only exception to this, as with other biofiltration BMPs, is when the geotechnical consultant recommends an impervious liner be used due to specific soil conditions such as expansive clays. Additionally, the MWS Linear utilizes an amended media that is much more porous than the standard prescribed biofiltration media which is a mix of sand and compost. 100% of the media used in the MWS Linear has interparticle voids of 48% plus and 24% internal void space for each media particle. This is much greater than the sand which has interparticle voids of 35% and internal voids of 0%. As such, the MWS Linear retains greater moisture which allows for greater volume retention and ultimately evapotranspiration via respiration of the contained vegetation.

4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control/sequestration processes, and minimize potential for pollutant washout.

    a. The manual states:

    *"Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the City 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."*

    The MWS Linear has been tested under the Washington State TAPE protocol which is full scale field testing and has received General Use Level Designation under that protocol. Table F.1-1, as shown below, requires a biofiltration BMP to have Basic Treatment, Phosphorus Treatment, and Enhanced Treatment under this protocol. The MWS Linear has GULD approval for all three and therefore meets this minimum requirement 4. A copy of the TAPE approval has been attached to this document.

**Table F.1-1: Required Technology Acceptance Protocol-Ecology Certifications for Pollutants of Concern for Biofiltration Performance Standard**

| Project Pollutant of Concern | Required Technology Acceptance Protocol-Ecology Certification for Biofiltration Performance Standard |
|---|---|
| Trash | Basic Treatment, Phosphorus Treatment, Enhanced Treatment |
| Sediments | Basic Treatment, Phosphorus Treatment, Enhanced Treatment |
| Oil and Grease | Basic Treatment, Phosphorus Treatment, Enhanced Treatment |
| Nutrients | Phosphorus Treatment[1] |
| Metals | Enhanced Treatment |
| Pesticides | Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment |
| Organics | Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment |
| Bacteria and Viruses | Basic Treatment (including bacteria removal processes)[3] , Phosphorus Treatment, Enhanced Treatment |
| Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment | Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment |

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

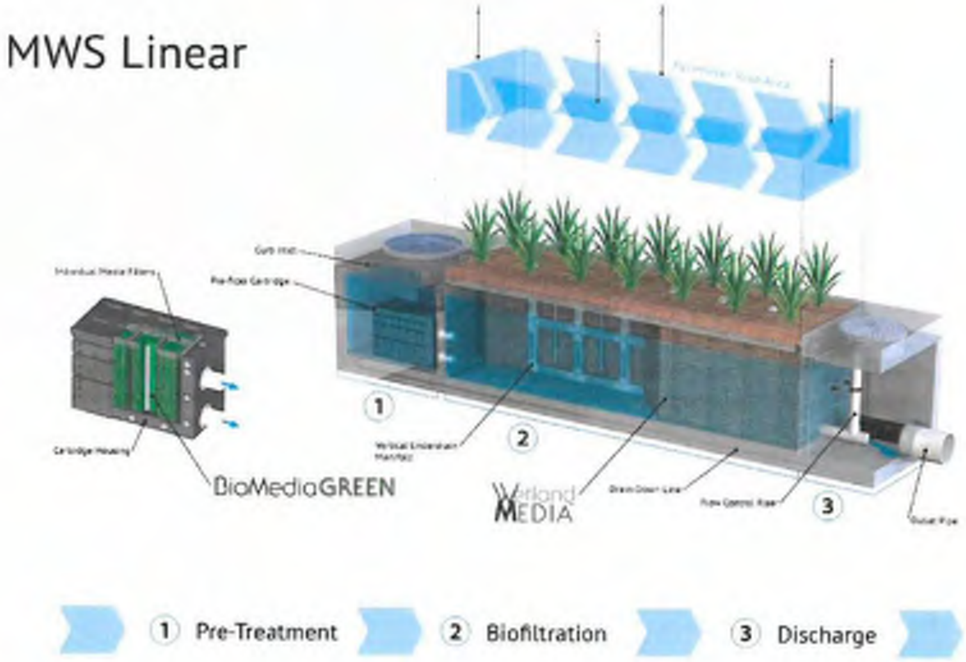
    a. The MWS Linear an advanced vegetated biofiltration promotes biological processes found in both upland bioretention systems and wetlands. The system utilizes an advanced horizontal flow design to ensure maximum contact with the vegetation root mass. Bacterial growth, supported by the root system in the wetland chamber, performs a number of treatment processes. These vary as a function of moisture, temperature, pH, salinity, and pollutant concentrations. Biologically available forms of nitrogen, phosphorus, and carbon are actively taken into the cells of vegetation and bacteria, and used for metabolic processes (i.e., energy production and growth). Nitrogen and phosphorus are actively taken up as nutrients that are vital for a number of cell functions, growth, and energy production. These processes remove metabolites from the media during and between storm events, making the media available to capture more nutrients from subsequent storms.

    b. Soil organisms in the wetland chamber can break down a wide array of organic compounds into less toxic forms or completely break them down into carbon dioxide and water (Means and Hinchee 1994). Bacteria can also cause metals to precipitate out as salts, bind them within organic material, and accumulate metals in nodules within the cells. Finally, plant growth may metabolize many pollutants, sequester them or rendering them less toxic (Reeves and Baker 2000).

    c. Following are pictures from the plants pulled from a MWS Linear after only 14 months of growth. The media used in the system is designed to maximize biological activity:

6. Biofiltration BMPs must be designed to prevent erosion, scour, and channeling within the BMP.

    a. The MWS Linear is a self-contained system with a pre-treatment chamber. Unlike other biofiltration BMPs erosion, scour, and channeling with in the BMP is not an issue. Following is a diagram of the BMP. The system pre-treatment chamber prevent any erosion or scour. The system downstream orifice control prevents channeling of the media:



7. Biofiltration BMP must include operations and maintenance design features and planning considerations to provide for continued effectiveness of pollutant and flow control functions.

    a. The MWS Linear provides activation along with the first year of maintenance and inspection free on all installation in the county of San Diego. Unlike other biofiltration BMPs the City and Co-permitees can be assured the system is being properly installed and maintained. The first year of inspections is used to gauge the amount of loading in the system and this information is used to set appropriate maintenance interval for subsequent years. Attached is a copy of the maintenance manual for the MWS Linear.

**Designed & Maintained Consistent with their Performance Certifications**

We are in agreement that all BMPs should be designed in a manner consistent with the TAPE certification. The MWS Linear is sized in accordance with the TAPE GULD approval which provides certification at a loading rate of 1 gpm/sq ft (100 in/hr) for Basic, Phosphorus and Enhanced treatment. In addition, as stated previously, Modular Wetland System, Inc. provide activation of all system installed in San Diego County along with the first year of inspections and maintenance to ensure appropriate function. As previously stated, a copy of the TAPE GULD approval is attached to support this claim.

Additionally, it should be noted that the manual allows for biofiltration BMPs to be sized in either volume based (DCV) or flow based design. The manual states in section F.2.2 Sizing of Flow-Based Biofiltration *BMPs:*

> *"This sizing method is only available when the BMP meets the pollutant treatment performance standard in Appendix F.1."*
>
> *"Proprietary biofiltration BMPs are typically designed as a flow-based BMPs (i.e., a constant treatment capacity with negligible storage volume). Additionally, proprietary biofiltration is only acceptable if no infiltration is feasible and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible. The applicable sizing method for biofiltration is therefore reduced to: Treat 1.5 times the DCV."*
>
> *"The following steps should be followed to demonstrate that the system is sized to treat 1.5 times the DCV."*
>
> > *1. Calculate the flow rate required to meet the pollutant treatment performance standard without scaling for the 1.5 factor. Options include either:*
> >
> > - *Calculate the runoff flow rate from a 0.2 inch per hour uniform intensity precipitation event (See methodology Appendix B.6.3), or*
> >
> > - *Conduct a continuous simulation analysis to compute the size required to capture and treat 80 percent of average annual runoff; for small catchments, 5-minute precipitation data should be used to account for short time of concentration. Nearest rain gage with 5-minute precipitation data is allowed for this analysis.*

*2. Multiply the flow rate from Step 1 by 1.5 to compute the design flow rate for the biofiltration system.*

*3. Based on the conditions of certification/verification (discussed above), establish the design capacity, as a flow rate, of a given sized unit.*

*4. Demonstrates that an appropriate unit size and number of units is provided to provide a flow rate that meets the required flow rate from Step 2.*

In conclusion, we have closely followed the process and protocol for showing the MWS Linear meets all the criteria to be accepted as Biofiltration as found in Appendix F.

If you have any questions please feel free to contact us directly.

Sincerely,

Zachariha J. Kent

Director of Engineering

Bio Clean Environmental Services, Inc.

# TAPE PERFORMANCE SUMMARY

# MWS-LINEAR 2.0

**Application:** Stand Alone Stormwater Treatment Best Management Practice
**Type of Treatment:** High Flow Rate Media Filtration and Biofiltration (dual-stage)

## DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.

## TAPE PERFORMANCE

Modular Wetland System Linear 2.0 (MWS-L 2.0) completed its TAPE field testing in the spring of 2013. The Washington DOE has approved the system under the TAPE protocol. The MWS-Linear has met the performance benchmarks for the three major pollutant categories as defined by TAPE: Basic Treatment (TSS), Phosphorus and Enhanced (dissolved zinc and copper). It is the first system tested under the protocol to meet the benchmarks for all three categories.

| Pollutant | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|
| Total Suspended Solids | 75.0 | 15.7 | 85% | Summary of all data meeting TAPE parameters pertaining to this pollutant. Mean of 8 microns. |
| Total Phosphorus | 0.227 | 0.074 | 64% | Summary of all data meeting TAPE parameters pertaining to this pollutant. |
| Ortho Phosphorus | 0.093 | 0.031 | 67% | Summary of all data meeting TAPE parameters for total phosphorus. |
| Nitrogen | 1.40 | 0.77 | 45% | Utilizing the Kjeldahl method (Total Kjeldahl nitrogen). Summary of all data during testing. |
| Dissolved Zinc | 0.062 | 0.024 | 66% | Summary of all data meeting TAPE parameters pertaining to this pollutant. |
| Dissolved Copper | 0.0086 | 0.0059 | 38% | Summary of all data meeting TAPE parameters pertaining to this pollutant. |
| Total Zinc | 0.120 | 0.038 | 69% | Summary of all data during testing. |
| Total Copper | 0.017 | 0.009 | 50% | Summary of all data during testing. |
| Motor Oil | 24.157 | 1.133 | 95% | Summary of all data during testing. |

NOTES:
1. The MWS-Linear was proven effective at infiltration rates of up to 121 in/hr.
2. A minimum of 10 aliquots were collected for each event.
3. Sampling was targeted to capture at least 75 percent of the hydrograph.

**Modular Wetland System, Inc.**
**2972 San Luis Rey Rd**
**Oceanside, CA 92058**

Nature & Technology Working Together In Perfect Harmony™

**www.modularwetlands.com**
**P 760-433-7640**
**F 760-433-3179**

# PERFORMANCE SUMMARY

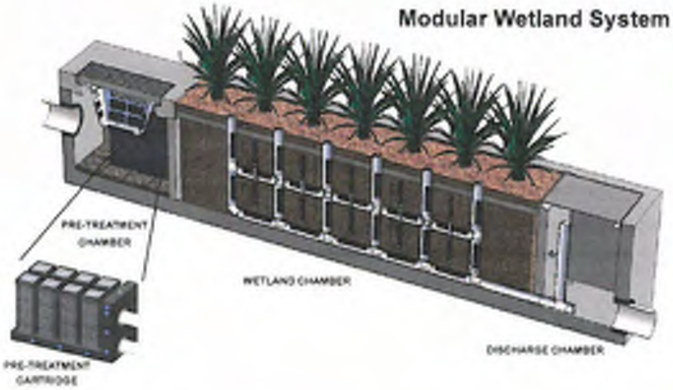
# MWS-LINEAR 2.0

**Application:** Stand Alone Stormwater Treatment Best Management Practice
**Type of Treatment:** High Flow Rate Media Filtration and Biofiltration (dual-stage)

## DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.



**Modular Wetland System Linear 2.0 (MWS-L 2.0) has been independently tested in laboratory and field conditions since 2008.**


Oceanside Test Site


Portland Test Site

## HEAVY METALS: Copper / Zinc

| Description | Type | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| Waves Environmental - 1/4 Scale Lab Testing - 2007 | Lab | .76 / .95 | .06 / .19 | 92% / 80% | Majority Dissolved Fraction |
| City of Oceanside Boat Wash / Waves Environmental - 2008 | Field | .04 / .24 | < .02 / < .05 | >50% / >79% | Effluent Concentrations Below Detectable Limits |
| Recycling Facility, Kileen, TX / CERL - 2011-2012 | Field | .058 / .425 | .032 / .061 | 44% / 86% | Test Unit 2 |
| TAPE Field Testing / Portland, OR 2011/2012 | Field | .017/ .120 | .009 / .038 | 50% / 69% | Total Metals |

## TOTAL SUSPENDED SOLIDS:

| Description | Type | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| Waves Environmental - 1/4 Scale Lab Testing - 2007 | Lab | 270 | 3 | 99% | Sil-co-sil 106 - 20 micron mean particle size |
| City of Oceanside Boat Wash / Waves Environmental - 2008 | Field | 45.67 | 8.24 | 82% | Mean Particle Size by Count < 8 Microns |
| Recycling Facility, Kileen, TX / CERL - 2011-2012 | Field | 676 | 39 | 94% | Test Unit 2 |
| TAPE Field Testing / Portland, OR 2011/2012 | Field | 75.0 | 15.7 | 85% | Means particle size of 8 microns |

MODULAR WETLANDS
Nature & Technology Working Together In Perfect Harmony™

**Modular Wetland System, Inc.**
**2972 San Luis Rey Rd**
**Oceanside, CA 92058**

**www.modularwetlands.com**
**P 760-433-7640**
**F 760-433-3179**

# PERFORMANCE SUMMARY
# MWS-LINEAR 2.0

## PHOSPHORUS:

| Description | Type | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| TAPE Field Testing / Portland, OR 2011/2012 | Field | .227 | .074 | 64% | TOTAL P |
| TAPE Field Testing / Portland, OR 2011/2012 | Field | .093 | .031 | 67% | ORTHO P |

## BACTERIA:

| Description | Type | Avg. Influent (MPN) | Avg. Effluent (MPN) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| Waves Environmental - 1/4 Scale Lab Testing - 2007 | Lab | 1600 / 1600 | 535 / 637 | 67% / 60% | Fecal / E. Coli |
| City of Oceanside Boat Wash / Waves Environmental - 2008 | Field | 31666 / 6280 | 8667 / 1058 | 73% / 83% | Fecal / E. Coli |

## LEAD:

| Description | Type | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| Waves Environmental - 1/4 Scale Lab Testing - 2007 | Lab | .54 | .10 | 82% | Total |
| Recycling Facility, Kileen, TX / CERL - 2011-2012 | Field | .01 / .043 | .004 / .014 | 60% / 68% | Both Test Units |
| TAPE Field Testing / Portland, OR 2011/2012 | Field | .011 | .003 | 70% | Total |

## NITROGEN:

| Description | Type | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| City of Oceanside Boat Wash / Waves Environmental - 2008 | Field | .85 | .21 | 75% | NITRATE |
| TAPE Field Testing / Portland, OR 2011/2012 | Field | 1.40 | 0.77 | 45% | TKN |

## HYDROCARBONS:

| Description | Type | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| Waves Environmental - 1/4 Scale Lab Testing - 2007 | Lab | 10 | 1.625 | 84% | Oils & Grease |
| City of Oceanside Boat Wash / Waves Environmental - 2008 | Field | .83 | 0 | 100% | TPH Motor Oil |
| TAPE Field Testing / Portland, OR 2011/2012 | Field | 24.157 | 1.133 | 95% | Motor Oil |

## TURBIDITY:

| Description | Type | Avg. Influent (NTU) | Avg. Effluent (NTU) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| Waves Environmental - 1/4 Scale Lab Testing - 2007 | Lab | 21 | 1.575 | 93% | Field Measurement |
| City of Oceanside Boat Wash / Waves Environmental - 2008 | Field | 21 | 6 | 71% | Field Measurement |

## COD:

| Description | Type | Avg. Influent (mg/L) | Avg. Effluent (mg/L) | Removal Efficiency | Notes |
|---|---|---|---|---|---|
| Recycling Facility, Kileen, TX / CERL - 2011-2012 | Field | 516 / 1450 | 90 / 356 | 83% / 75% | Both Test Units |

All removal efficiencies and concentrations rounded up for easy viewing. Please call us for more information, including full copies of the reports reference above.

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# 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.

Project Name: Campus Point NDP Entitlements

**Indicate which Items are Included:**

| Attachment Sequence | Contents | Checklist |
|---|---|---|
| **Attachment 2a** | Hydromodification Management Exhibit (Required) | ☑ Included<br>See Hydromodification Management Exhibit Checklist. |
| **Attachment 2b** | Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional)<br>See Section 6.2 of the BMP Design Manual. | ☑ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required)<br>Optional analyses for Critical Coarse Sediment Yield Area Determination<br>☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite<br>☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment<br>☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite |
| **Attachment 2c** | Geomorphic Assessment of Receiving Channels (Optional)<br>See Section 6.3.4 of the BMP Design Manual. | ☑ Not Performed<br>☐ Included<br>☐ Submitted as separate stand-alone document |
| **Attachment 2d** | Flow Control Facility Design and Structural BMP Drawdown Calculations (Required)<br>Overflow Design Summary for each structural BMP<br>See Chapter 6 and Appendix G of the BMP Design Manual | ☑ Included<br>☐ Submitted as separate stand-alone document |

**Project Name:** Campus Point NDP Entitlements

**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 OR provide a separate map showing that the project site is outside of any critical coarse sediment yield areas
☑ 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).

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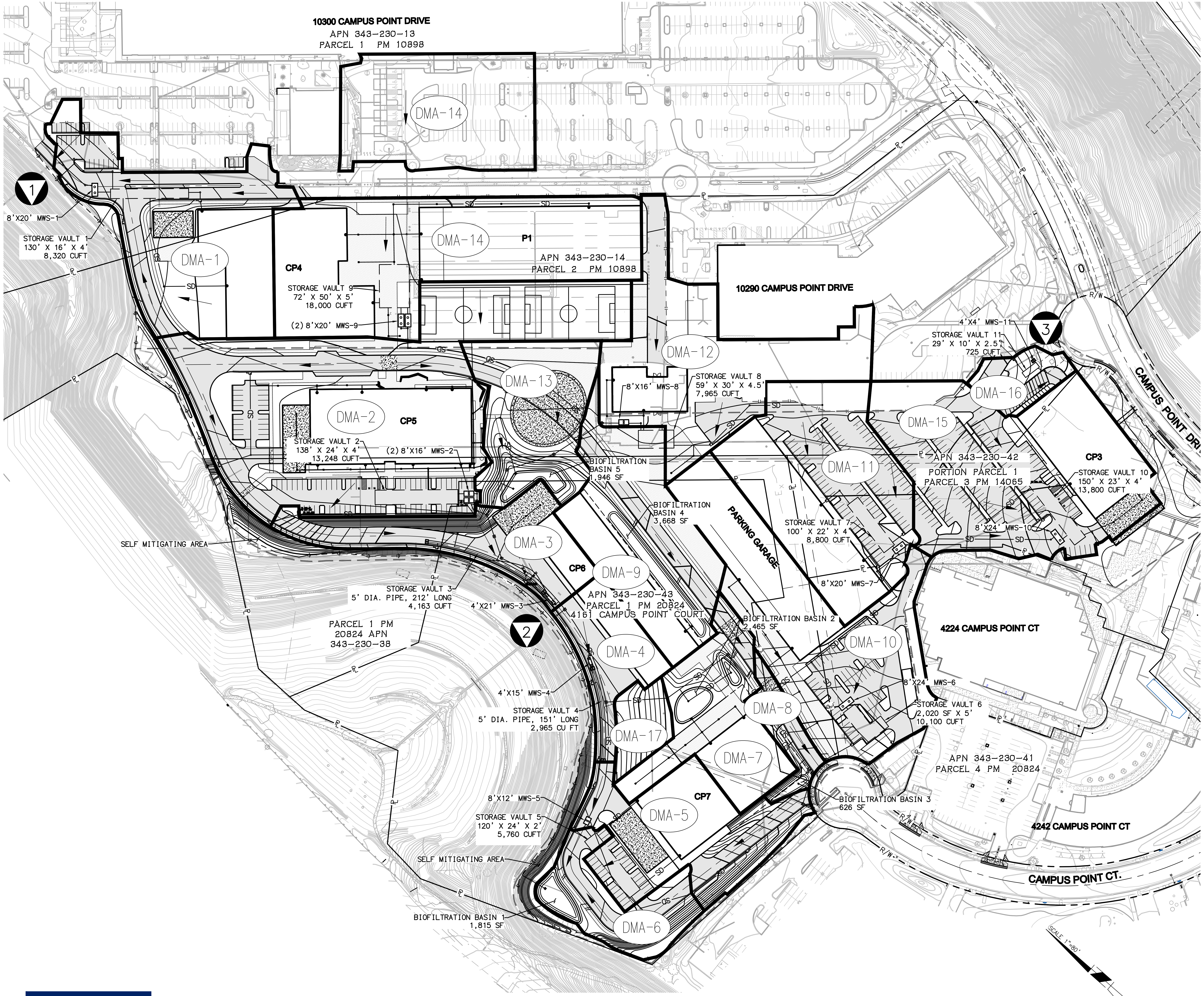

## LEGEND

| | |
|---|---|
| OVERALL BASIN LIMIT | ━━ |
| BASIN ID NUMBER | DMA-X |
| FLOW DIRECTION | → |
| DISCHARGE POINT | ▼ 1 |
| MODULAR WETLAND SYSTEM | ○○ |
| STORAGE VAULT | [ — ] |

NOTES

NO NATURAL HYDROLOGIC FEATURES CURRENTLY EXIST ON SITE
ALL SOILS URBAN LANDS SOIL TYPE "D"

GROUNDWATER DEPTH EXCEEDS 20 FEET

NO CRITICAL COARSE SEDIMENT YIELD AREAS EXIST ON SITE. REFER TO ATTACHMENT 2b

REFER TO ATTACHMENT 1B FOR DMA SUMMARY

SOURCE CONTROL BMPS
1. PREVENTION OF ILLICIT DISCHARGES INTO MS4 (4.2.1)
2. STORM DRAIN STENCILING OR SIGNAGE (4.2.2)
3. PROTECT TRASH STORAGE AREAS (4.2.5)

SITE DESIGN BMPS
1. CONSERVE NATURAL AREAS (4.3.2)
2. MINIMIZE IMPERVIOUS AREAS (4.3.3)
3. MINIMIZE SOIL COMPACTION (4.3.4)
4. IMPERVIOUS AREA DISPERSION (4.3.5)
5. LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES (4.3.7)

**SELF MITIGATING AREA**

DMS 8 AND 9 ARE SELF-MITIGATING DMAS AS THEY MEETS ALL THE FOLLOWING CRITERIA AS SET BY THE CITY OF SAN DIEGO:
- VEGETATION IN NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA (3.5%).
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

80 40 0 80 160 240
SCALE: 1"=80'

# CAMPUS POINT NDP
## HMP Proposed

**Michael Baker**
**INTERNATIONAL**
9755 Clairemont Mesa Boulevard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

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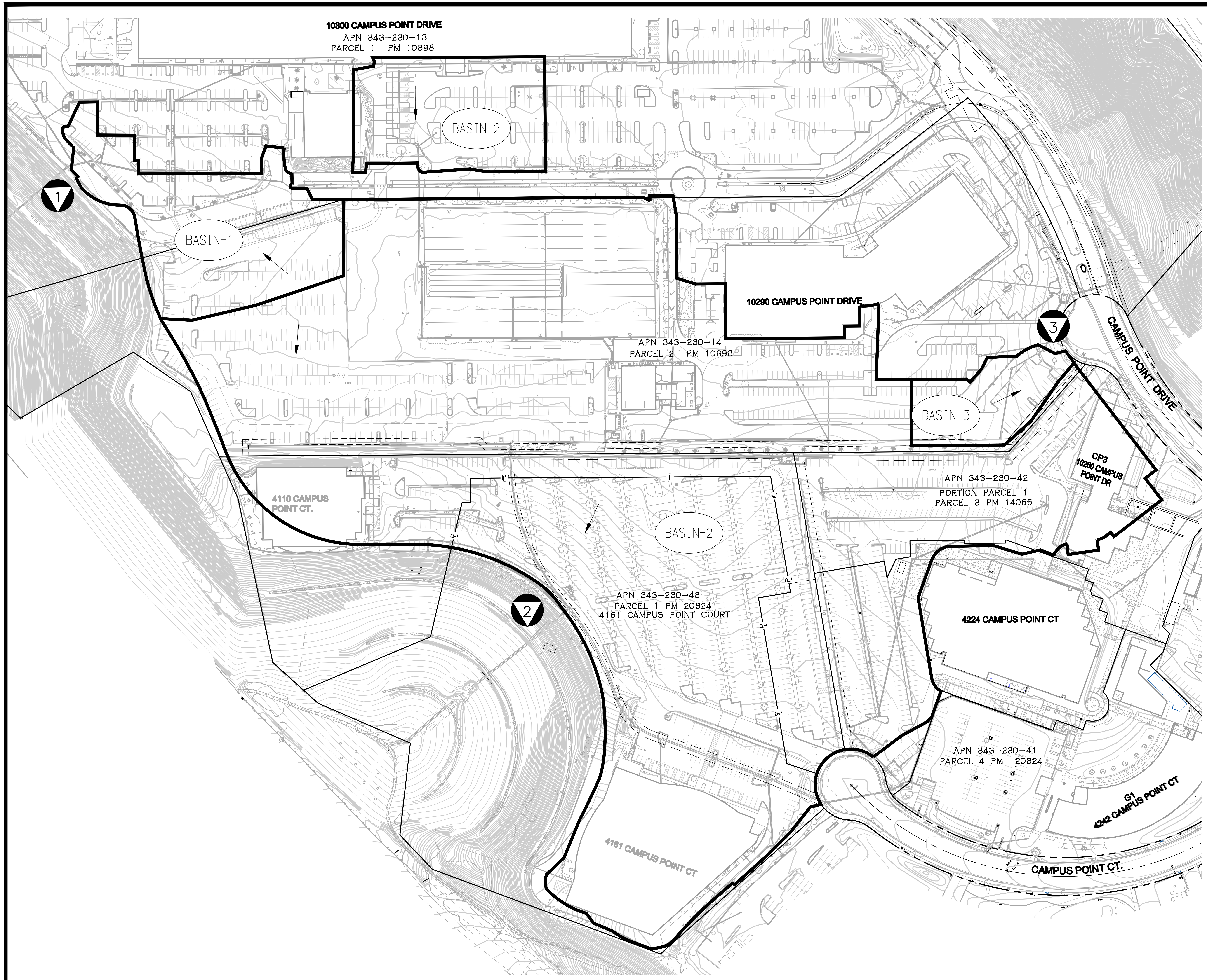
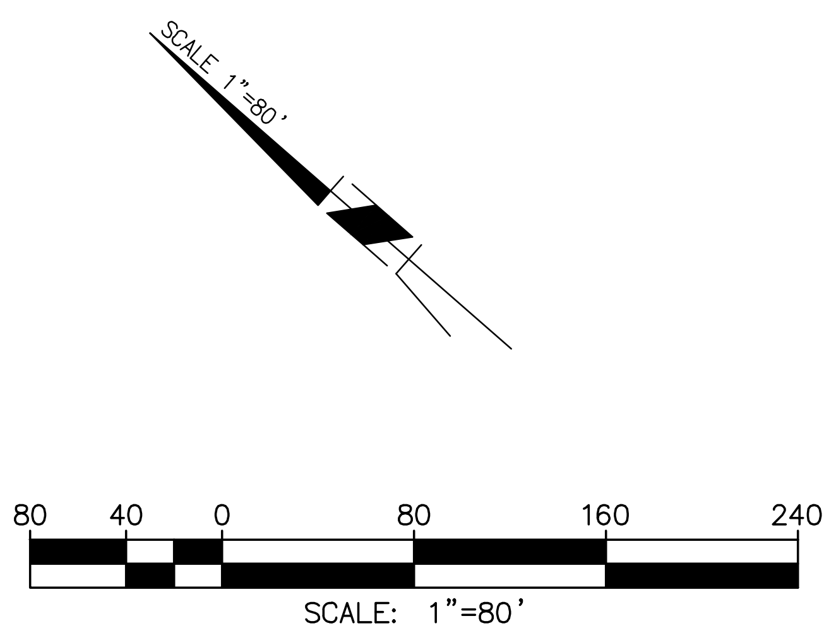


## LEGEND

| | |
|---|---|
| OVERALL BASIN LIMIT | ━━━ |
| BASIN ID NUMBER | BASIN-X |
| FLOW DIRECTION | → |
| EXISTING STORM DRAIN | ═══ |
| DISCHARGE POINT | ▽1 |

## HYDROMODIFICATION

PER APPENDIX G.2.5 OF THE CITY OF SAN DIEGO'S STORMWATER MANUAL (2019) SIZING FACTORS HAVE BEEN PREPARED TO DETERMINE MINIMUM REQUIREMENTS FOR HYDROMODIFICATION BMPS. THESE FACTORS HAVE BEEN USED TO SIZE THE PROPOSED STORAGE VAULTS. SEE WORKSHEETS ON FOLLOWING PAGES FOR DETAILED CALCULATIONS.



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**Michael Baker**
**INTERNATIONAL**
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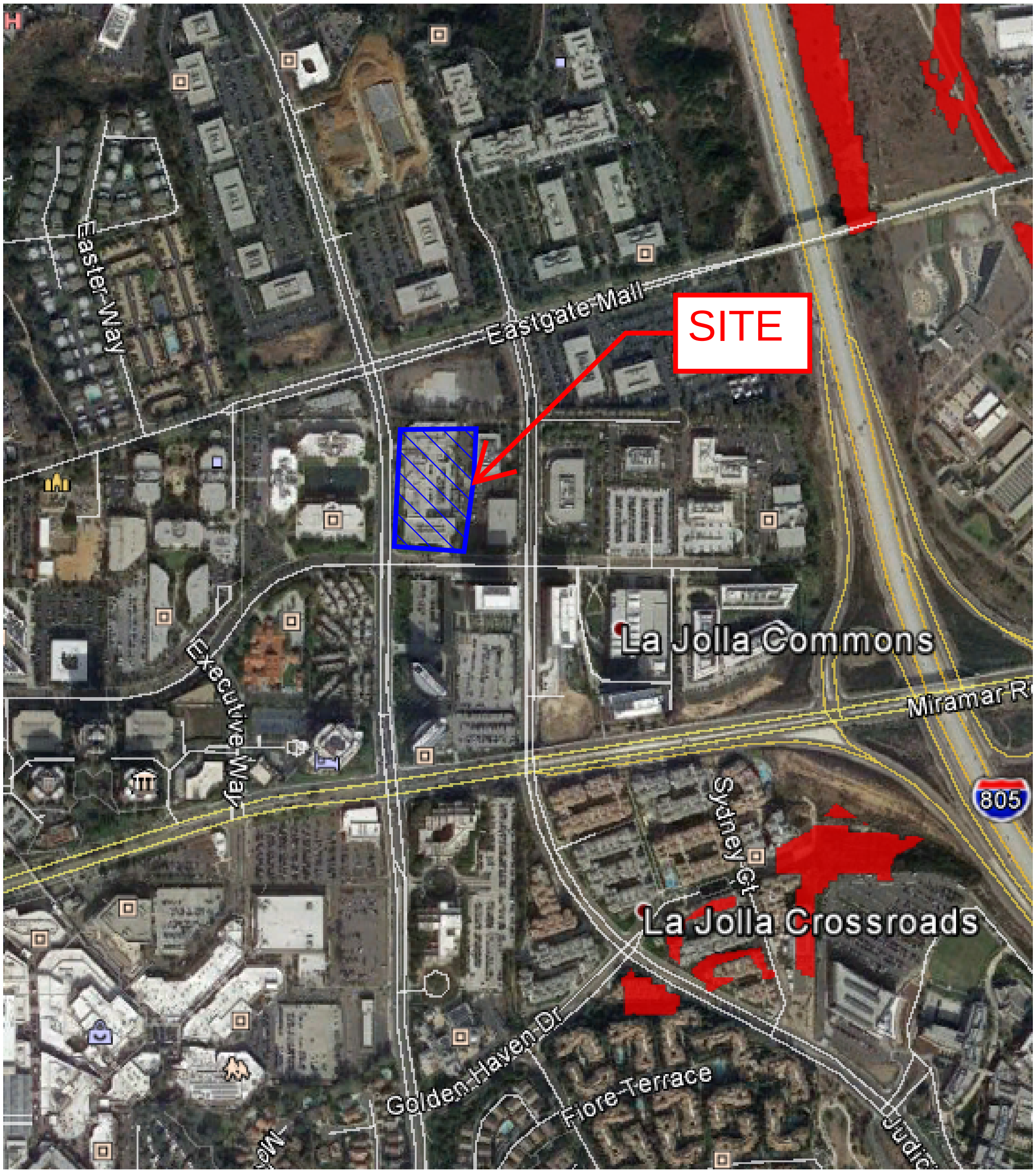
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

CAMPUS POINT NDP
HMP Existing

# ATTACHMENT 2b
# Critical Coarse Sediment Yield Areas



## Legend

| | |
|---|---|
| Areas of CCSY | 🟥 |
| Project Boundary | ― |

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San Diego, CA 92124
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BMP Sizing Spreadsheet V3.1

| | |
|---|---|
| Project Name: | Campus Point - Entitlements |
| Project Applicant: | MBI |
| Jurisdiction: | City of SD |
| Parcel (APN): | 345-200-04, 345-200-05 |
| Hydrologic Unit: | Penasquitos |
| Rain Gauge: | Oceanside |
| Total Project Area (sf): | 872,071 |
| Channel Susceptibility: | High |

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 1 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-1 | 84,229 | D | Flat | Mixed | 0.82 | 0.12 | 8288 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
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| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 84,229 | | | | | Minimum BMP Size | 8288 |
| | | | | | | Proposed BMP Size* | 8320 |

* Assumes standard configuration

| | | |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Minimum Required Cistern Footprint) | 2368 | CF |

Notes:

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

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

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

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

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 1 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area (in$^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-1 | Oceanside | D | Flat | 0.571 | 1.934 | 0.110 | **1.63** |
| | | | | | | | |
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| **3.50** | **0.110** | **1.63** | **1.44** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area (in$^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.104** | **1.54** | **1.400** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area (in$^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 2 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-2 | 172,475 | D | Flat | Mixed | 0.64 | 0.12 | 13246 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
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| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 172,475 | | | | | Minimum BMP Size | 13246 |
| | | | | | | Proposed BMP Size* | 13248 |

* Assumes standard configuration

| | | |
|---|---|---|
| | | |
| | | |
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| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 4.0 | ft |
| Minimum Required Cistern Footprint) | 3312 | CF |

Notes:

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

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

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

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

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 2 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-2 | Oceanside | D | Flat | 0.571 | 3.959 | 0.226 | **3.12** |
| | | | | | | | |
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| **4.00** | **0.226** | **3.12** | **1.99** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.205** | **2.84** | **1.900** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| | |
|---|---|
| Drawdown (Hrs) | Provide Hand Calculation |

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 3 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-3 | 42,810 | D | Flat | Mixed | 0.81 | 0.12 | 4161 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
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| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 42,810 | | | | | Minimum BMP Size | 4161 |
| | | | | | | Proposed BMP Size* | 4163 |

* Assumes standard configuration

| | | |
|---|---|---|
| | | |
| | | |
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| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 4.0 | ft |
| Minimum Required Cistern Footprint) | 1040 | CF |

Notes:

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

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

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

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

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 3 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-3 | Oceanside | D | Flat | 0.571 | 0.983 | 0.056 | **0.77** |
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| **4.00** | **0.056** | **0.77** | **0.99** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.046** | **0.64** | **0.900** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 4 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-4 | 25,425 | D | Flat | Mixed | 0.97 | 0.12 | 2959 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 25,425 | | | | | Minimum BMP Size | 2959 |
| | | | | | | Proposed BMP Size* | 2965 |

* Assumes standard configuration

| | | |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 6.0 | ft |
| Minimum Required Cistern Footprint) | 493 | CF |

Notes:

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

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

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

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

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 4 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area (in$^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-4 | Oceanside | D | Flat | 0.571 | 0.584 | 0.033 | **0.38** |
| | | | | | | | |
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| **6.00** | **0.033** | **0.38** | **0.69** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area (in$^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.025** | **0.28** | **0.600** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area (in$^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 5 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-5 | 56,346 | D | Flat | Mixed | 0.85 | 0.12 | 5747 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
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| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 56,346 | | | | | Minimum BMP Size | 5747 |
| | | | | | | Proposed BMP Size* | 5760 |

* Assumes standard configuration

| | | |
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| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 6.0 | ft |
| Minimum Required Cistern Footprint) | 958 | CF |

Notes:

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

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

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 5 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-5 | Oceanside | D | Flat | 0.571 | 1.294 | 0.074 | **0.83** |
| | | | | | | | |
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| **6.00** | **0.074** | **0.83** | **1.03** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.070** | **0.79** | **1.000** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

BMP Sizing Spreadsheet V3.1

| | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | BIOFILTRATION BASIN 1 | BMP Type: | Biofiltration |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | N/A |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Surface Area | Surface Area (SF) |
| DMA-6 | 28,211 | D | Flat | Mixed | 0.51 | 0.07 | 1007 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 28,211 | | | | | Minimum BMP Size | 1007 |
| | | | | | | Proposed BMP Size* | 1815 |

* Assumes standard configuration

| | | |
|---|---|---|
| Surface Ponding Depth | 12.00 | in |
| Bioretention Soil Media Depth | 18.00 | in |
| Filter Coarse | 6.00 | in |
| Gravel Storage Layer Depth | 12 | in |
| Underdrain Offset | 3.0 | in |
| | | |
| | | |

Notes:

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

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | BIOFILTRATION BASIN 1 | BMP Type: | Biofiltration |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-6 | Oceanside | D | Flat | 0.571 | 0.648 | 0.037 | **0.53** |
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| **3.75** | **0.037** | **0.53** | **0.82** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **0.033** | **0.035** | **0.50** | **0.800** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | 15.4 |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | BIOFILTRATION BASIN 3 | BMP Type: | Biofiltration |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | N/A |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Surface Area | Surface Area (SF) |
| DMA-7 | 44,682 | D | Flat | Mixed | 0.78 | 0.07 | 2440 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 44,682 | | | | | Minimum BMP Size | 2440 |
| | | | | | | Proposed BMP Size* | 2440 |

* Assumes standard configuration

| | | |
|---|---|---|
| Surface Ponding Depth | 12.00 | in |
| Bioretention Soil Media Depth | 18.00 | in |
| Filter Coarse | 6.00 | in |
| Gravel Storage Layer Depth | 12 | in |
| Underdrain Offset | 3.0 | in |
| | | |
| | | |

Notes:

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

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

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| | | | |
|---|---|---|---|
| BMP Sizing Spreadsheet V3.1 | | | |
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | BIOFILTRATION BASIN 3 | BMP Type: | Biofiltration |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-7 | Oceanside | D | Flat | 0.571 | 1.026 | 0.059 | **0.83** |
| | | | | | | | |
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| **3.75** | **0.059** | **0.83** | **1.03** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **0.051** | **0.055** | **0.79** | **1.000** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| | |
|---|---|
| Drawdown (Hrs) | 13.2 |

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | BIOFILTRATION BASIN 2 | BMP Type: | Biofiltration |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | N/A |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Surface Area | Surface Area (SF) |
| DMA-8 | 11,624 | D | Flat | Mixed | 0.64 | 0.07 | 521 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 11,624 | | | | | Minimum BMP Size | 521 |
| | | | | | | Proposed BMP Size* | 626 |

* Assumes standard configuration

| | | |
|---|---|---|
| Surface Ponding Depth | 12.00 | in |
| Bioretention Soil Media Depth | 18.00 | in |
| Filter Coarse | 6.00 | in |
| Gravel Storage Layer Depth | 12 | in |
| Underdrain Offset | 3.0 | in |
| | | |
| | | |

Notes:

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | BIOFILTRATION BASIN 2 | BMP Type: | Biofiltration |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - $\%Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-8 | Oceanside | D | Flat | 0.571 | 0.267 | 0.015 | **0.22** |
| | | | | | | | |
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| **3.75** | **0.015** | **0.22** | **0.53** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **0.013** | **0.014** | **0.20** | **0.500** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | 13.6 |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | BIOFILTRATION BASIN 9 | BMP Type: | Biofiltration |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | N/A |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Surface Area | Surface Area (SF) |
| DMA-9 | 64,009 | D | Flat | Mixed | 0.78 | 0.07 | 3495 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 64,009 | | | | | Minimum BMP Size | 3495 |
| | | | | | | Proposed BMP Size* | 3668 |

* Assumes standard configuration

| | | |
|---|---|---|
| Surface Ponding Depth | 12.00 | in |
| Bioretention Soil Media Depth | 18.00 | in |
| Filter Coarse | 6.00 | in |
| Gravel Storage Layer Depth | 12 | in |
| Underdrain Offset | 3.0 | in |
| | | |
| | | |

Notes:

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | BIOFILTRATION BASIN 9 | BMP Type: | Biofiltration |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-9 | Oceanside | D | Flat | 0.571 | 1.469 | 0.084 | **1.20** |
| | | | | | | | |
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| **3.75** | **0.084** | **1.20** | **1.23** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **0.074** | **0.079** | **1.13** | **1.200** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | 13.8 |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 6 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-10 | 92,256 | D | Flat | Mixed | 0.91 | 0.12 | 10074 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 92,256 | | | | | Minimum BMP Size | 10074 |
| | | | | | | Proposed BMP Size* | 10100 |

* Assumes standard configuration

| | | |
|---|---|---|
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| | | |
| | | |
| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 5.0 | ft |
| Minimum Required Cistern Footprint) | 2015 | CF |

Notes:

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

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

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Designated Staff have final review and approval authority over the project design.

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 6 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-10 | Oceanside | D | Flat | 0.571 | 2.118 | 0.121 | **1.49** |
| | | | | | | | |
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| **5.00** | **0.121** | **1.49** | **1.38** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.108** | **1.33** | **1.300** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 7 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-11 | 83,623 | D | Flat | Mixed | 0.87 | 0.12 | 8730 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 83,623 | | | | | Minimum BMP Size | 8730 |
| | | | | | | Proposed BMP Size* | 8800 |

* Assumes standard configuration

| | | |
|---|---|---|
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| | | |
| | | |
| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Minimum Required Cistern Footprint) | 2494 | CF |

Notes:

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

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 7 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-11 | Oceanside | D | Flat | 0.571 | 1.920 | 0.110 | **1.62** |
| | | | | | | | |
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| **3.50** | **0.110** | **1.62** | **1.44** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.030** | **0.44** | **0.750** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

BMP Sizing Spreadsheet V3.1

| | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 8 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-12 | 80,600 | D | Flat | Mixed | 0.82 | 0.12 | 7931 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 80,600 | | | | | Minimum BMP Size | 7931 |
| | | | | | | Proposed BMP Size* | 7965 |

* Assumes standard configuration

| | | |
|---|---|---|
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| | | |
| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 4.0 | ft |
| Minimum Required Cistern Footprint) | 1983 | CF |

Notes:

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 8 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-12 | Oceanside | D | Flat | 0.571 | 1.850 | 0.106 | **1.46** |
| | | | | | | | |
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| **4.00** | **0.106** | **1.46** | **1.36** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.036** | **0.50** | **0.800** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | BIOFILTRATION BASIN 5 | BMP Type: | Biofiltration |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | N/A |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Surface Area | Surface Area (SF) |
| DMA-13 | 47,250 | D | Flat | Mixed | 0.56 | 0.07 | 1852 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 47,250 | | | | | Minimum BMP Size | 1852 |
| | | | | | | Proposed BMP Size* | 1946 |

* Assumes standard configuration

| | | |
|---|---|---|
| Surface Ponding Depth | 12.00 | in |
| Bioretention Soil Media Depth | 18.00 | in |
| Filter Coarse | 6.00 | in |
| Gravel Storage Layer Depth | 12 | in |
| Underdrain Offset | 3.0 | in |
| | | |
| | | |

Notes:

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | BIOFILTRATION BASIN 5 | BMP Type: | Biofiltration |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-13 | Oceanside | D | Flat | 0.571 | 1.085 | 0.062 | **0.88** |
| | | | | | | | |
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| **3.75** | **0.062** | **0.88** | **1.06** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **0.074** | **0.079** | **1.13** | **1.200** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | 7.3 |
|---|---|

BMP Sizing Spreadsheet V3.1

| | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 9 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-14 | 168,148 | D | Flat | Mixed | 0.89 | 0.12 | 17958 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 168,148 | | | | | Minimum BMP Size | 17958 |
| | | | | | | Proposed BMP Size* | 18000 |

* Assumes standard configuration

| | | |
|---|---|---|
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| | | |
| | | |
| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Minimum Required Cistern Footprint) | 5131 | CF |

Notes:

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

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| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 9 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-14 | Oceanside | D | Flat | 0.571 | 3.860 | 0.220 | **3.25** |
| | | | | | | | |
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| **3.50** | **0.220** | **3.25** | **2.03** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.213** | **3.14** | **2.000** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 10 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)[1] | Volume | Volume (CF) |
| DMA-15 | 105,833 | D | Flat | Mixed | 0.91 | 0.12 | 11557 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 105,833 | | | | | Minimum BMP Size | 11557 |
| | | | | | | Proposed BMP Size* | 11592 |

* Assumes standard configuration

| | | |
|---|---|---|
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| | | |
| | | |
| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 4.0 | ft |
| Minimum Required Cistern Footprint) | 2889 | CF |

Notes:

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

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Designated Staff have final review and approval authority over the project design.

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

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 10 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area ($in^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-15 | Oceanside | D | Flat | 0.571 | 2.430 | 0.139 | **1.91** |
| | | | | | | | |
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| **4.00** | **0.139** | **1.91** | **1.56** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area ($in^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.128** | **1.77** | **1.500** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area ($in^2$) | Selected Orifice Diameter (in) |

| Drawdown (Hrs) | Provide Hand Calculation |
|---|---|

| BMP Sizing Spreadsheet V3.1 | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name: | STORAGE VAULT 11 | BMP Type: | Cistern |
| BMP Native Soil Type: | N/A - Impervious Liner | BMP Infiltration Rate (in/hr): | NA |

| Areas Draining to BMP | | | | | | HMP Sizing Factors | Minimum BMP Size |
|---|---|---|---|---|---|---|---|
| DMA Name | Area (sf) | Pre Project Soil Type | Pre-Project Slope | Post Project Surface Type | Area Weighted Runoff Factor (Table G.2-1)$^1$ | Volume | Volume (CF) |
| DMA-16 | 12,270 | D | Flat | Mixed | 0.49 | 0.12 | 721 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
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| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| | | | | | | 0 | 0 |
| BMP Tributary Area | 12,270 | | | | | Minimum BMP Size | 721 |
| | | | | | | Proposed BMP Size* | 725 |

* Assumes standard configuration

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| | | |
| Standard Cistern Depth (Overflow Elevation) | 3.5 | ft |
| Provided Cistern Depth (Overflow Elevation) | 5.0 | ft |
| Minimum Required Cistern Footprint) | 144 | CF |

Notes:

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

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

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

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

BMP Sizing Spreadsheet V3.1

| | | | |
|---|---|---|---|
| Project Name: | Campus Point - Entitlements | Hydrologic Unit: | Penasquitos |
| Project Applicant: | MBI | Rain Gauge: | Oceanside |
| Jurisdiction: | City of SD | Total Project Area: | 872,071 |
| Parcel (APN): | 345-200-04, 345-200-05 | Low Flow Threshold: | 0.1Q2 |
| BMP Name | STORAGE VAULT 11 | BMP Type: | Cistern |

| DMA Name | Rain Gauge | Pre-developed Condition | | Unit Runoff Ratio (cfs/ac) | DMA Area (ac) | Orifice Flow - %$Q_2$ (cfs) | Orifice Area (in$^2$) |
|---|---|---|---|---|---|---|---|
| | | Soil Type | Slope | | | | |
| DMA-16 | Oceanside | D | Flat | 0.571 | 0.282 | 0.016 | **0.20** |
| | | | | | | | |
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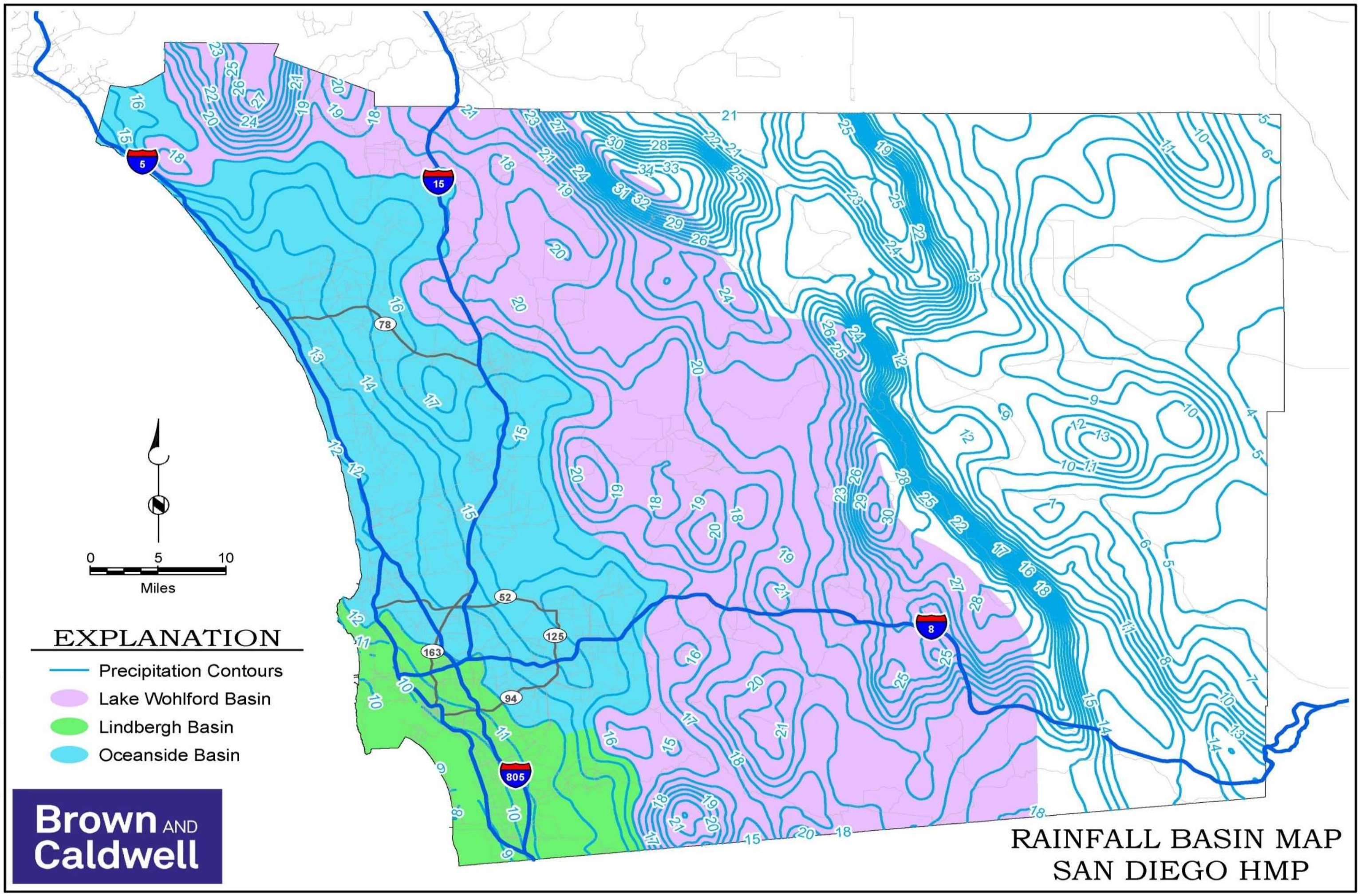
| **5.00** | **0.016** | **0.20** | **0.50** |
|---|---|---|---|
| **Max Orifice Head (feet)** | **Max Tot. Allowable Orifice Flow (cfs)** | **Max Tot. Allowable Orifice Area (in$^2$)** | **Max Orifice Diameter (in)** |

| **Provide Hand Calc.** | **0.016** | **0.20** | **0.500** |
|---|---|---|---|
| Average outflow during surface drawdown (cfs) | Max Orifice Outflow (cfs) | Actual Orifice Area (in$^2$) | Selected Orifice Diameter (in) |

| | |
|---|---|
| Drawdown (Hrs) | Provide Hand Calculation |

File Name: P:\Projects\San Diego County\139942 - HMP Implementation Assistance\GIS\HMF GIS\Basins.mxd



## EXPLANATION

- Precipitation Contours
- 🟪 Lake Wohlford Basin
- 🟩 Lindbergh Basin
- 🟦 Oceanside Basin

Brown AND Caldwell

## RAINFALL BASIN MAP
## SAN DIEGO HMP

## Table G.2-3: Sizing Factors for Hydromodification Flow Control Infiltration BMPs Designed Using Sizing Factor Method

| Lower Flow Threshold | Soil Group | Slope | Rain Gauge | A |
|---|---|---|---|---|
| **0.1Q2** | A | Flat | Lindbergh | 0.055 |
| **0.1Q2** | A | Moderate | Lindbergh | 0.055 |
| **0.1Q2** | A | Steep | Lindbergh | 0.055 |
| **0.1Q2** | B | Flat | Lindbergh | 0.045 |
| **0.1Q2** | B | Moderate | Lindbergh | 0.045 |
| **0.1Q2** | B | Steep | Lindbergh | 0.045 |
| **0.1Q2** | C | Flat | Lindbergh | 0.035 |
| **0.1Q2** | C | Moderate | Lindbergh | 0.035 |
| **0.1Q2** | C | Steep | Lindbergh | 0.035 |
| **0.1Q2** | D | Flat | Lindbergh | 0.03 |
| **0.1Q2** | D | Moderate | Lindbergh | 0.03 |
| **0.1Q2** | D | Steep | Lindbergh | 0.03 |
| **0.1Q2** | A | Flat | Oceanside | 0.06 |
| **0.1Q2** | A | Moderate | Oceanside | 0.06 |
| **0.1Q2** | A | Steep | Oceanside | 0.06 |
| **0.1Q2** | B | Flat | Oceanside | 0.05 |
| **0.1Q2** | B | Moderate | Oceanside | 0.05 |
| **0.1Q2** | B | Steep | Oceanside | 0.05 |
| **0.1Q2** | C | Flat | Oceanside | 0.05 |
| **0.1Q2** | C | Moderate | Oceanside | 0.05 |
| **0.1Q2** | C | Steep | Oceanside | 0.045 |
| **0.1Q2** | D | Flat | Oceanside | 0.035 |
| **0.1Q2** | D | Moderate | Oceanside | 0.035 |
| **0.1Q2** | D | Steep | Oceanside | 0.035 |
| **0.1Q2** | A | Flat | Lake Wohlford | 0.085 |
| **0.1Q2** | A | Moderate | Lake Wohlford | 0.085 |
| **0.1Q2** | A | Steep | Lake Wohlford | 0.085 |
| **0.1Q2** | B | Flat | Lake Wohlford | 0.07 |
| **0.1Q2** | B | Moderate | Lake Wohlford | 0.07 |
| **0.1Q2** | B | Steep | Lake Wohlford | 0.07 |
| **0.1Q2** | C | Flat | Lake Wohlford | 0.055 |
| **0.1Q2** | C | Moderate | Lake Wohlford | 0.055 |
| **0.1Q2** | C | Steep | Lake Wohlford | 0.055 |
| **0.1Q2** | D | Flat | Lake Wohlford | 0.04 |
| **0.1Q2** | D | Moderate | Lake Wohlford | 0.04 |
| **0.1Q2** | D | Steep | Lake Wohlford | 0.04 |

## Table G.2-4: Sizing Factors for Hydromodification Flow Control Biofiltration with Partial Retention Designed Using Sizing Factor Method

| Lower Flow Threshold | Soil Group | Slope | below low orifice inv | Rain Gauge | A |
|---|---|---|---|---|---|
| **0.1Q**$_2$ | A | Flat | 18 | Lindbergh | 0.08 |
| **0.1Q**$_2$ | A | Moderate | 18 | Lindbergh | 0.08 |
| **0.1Q**$_2$ | A | Steep | 18 | Lindbergh | 0.08 |
| **0.1Q**$_2$ | B | Flat | 18 | Lindbergh | 0.065 |
| **0.1Q**$_2$ | B | Moderate | 18 | Lindbergh | 0.065 |
| **0.1Q**$_2$ | B | Steep | 18 | Lindbergh | 0.06 |
| **0.1Q**$_2$ | C | Flat | 6 | Lindbergh | 0.05 |
| **0.1Q**$_2$ | C | Moderate | 6 | Lindbergh | 0.05 |
| **0.1Q**$_2$ | C | Steep | 6 | Lindbergh | 0.05 |
| **0.1Q**$_2$ | D | Flat | 3 | Lindbergh | 0.05 |
| **0.1Q**$_2$ | D | Moderate | 3 | Lindbergh | 0.05 |
| **0.1Q**$_2$ | D | Steep | 3 | Lindbergh | 0.05 |
| **0.1Q**$_2$ | A | Flat | 18 | Oceanside | 0.08 |
| **0.1Q**$_2$ | A | Moderate | 18 | Oceanside | 0.075 |
| **0.1Q**$_2$ | A | Steep | 18 | Oceanside | 0.075 |
| **0.1Q**$_2$ | B | Flat | 18 | Oceanside | 0.07 |
| **0.1Q**$_2$ | B | Moderate | 18 | Oceanside | 0.07 |
| **0.1Q**$_2$ | B | Steep | 18 | Oceanside | 0.07 |
| **0.1Q**$_2$ | C | Flat | 6 | Oceanside | 0.07 |
| **0.1Q**$_2$ | C | Moderate | 6 | Oceanside | 0.07 |
| **0.1Q**$_2$ | C | Steep | 6 | Oceanside | 0.07 |
| **0.1Q**$_2$ | D | Flat | 3 | Oceanside | 0.07 |
| **0.1Q**$_2$ | D | Moderate | 3 | Oceanside | 0.07 |
| **0.1Q**$_2$ | D | Steep | 3 | Oceanside | 0.07 |
| **0.1Q**$_2$ | A | Flat | 18 | Lake Wohlford | 0.11 |
| **0.1Q**$_2$ | A | Moderate | 18 | Lake Wohlford | 0.11 |
| **0.1Q**$_2$ | A | Steep | 18 | Lake Wohlford | 0.105 |
| **0.1Q**$_2$ | B | Flat | 18 | Lake Wohlford | 0.09 |
| **0.1Q**$_2$ | B | Moderate | 18 | Lake Wohlford | 0.085 |
| **0.1Q**$_2$ | B | Steep | 18 | Lake Wohlford | 0.085 |
| **0.1Q**$_2$ | C | Flat | 6 | Lake Wohlford | 0.065 |
| **0.1Q**$_2$ | C | Moderate | 6 | Lake Wohlford | 0.065 |
| **0.1Q**$_2$ | C | Steep | 6 | Lake Wohlford | 0.065 |
| **0.1Q**$_2$ | D | Flat | 3 | Lake Wohlford | 0.06 |
| **0.1Q**$_2$ | D | Moderate | 3 | Lake Wohlford | 0.06 |
| **0.1Q**$_2$ | D | Steep | 3 | Lake Wohlford | 0.06 |

## Table G.2-5: Sizing Factors for Hydromodification Flow Control Biofiltration BMPs Designed Using Sizing Factor Method

| Lower Flow Threshold | Soil Group | Slope | Rain Gauge | A |
|---|---|---|---|---|
| **0.1Q2** | A | Flat | Lindbergh | 0.32 |
| **0.1Q2** | A | Moderate | Lindbergh | 0.3 |
| **0.1Q2** | A | Steep | Lindbergh | 0.285 |
| **0.1Q2** | B | Flat | Lindbergh | 0.105 |

| | | | | |
|---|---|---|---|---|
| **0.1Q2** | B | Moderate | Lindbergh | 0.1 |
| **0.1Q2** | B | Steep | Lindbergh | 0.095 |
| **0.1Q2** | C | Flat | Lindbergh | 0.055 |
| **0.1Q2** | C | Moderate | Lindbergh | 0.05 |
| **0.1Q2** | C | Steep | Lindbergh | 0.05 |
| **0.1Q2** | D | Flat | Lindbergh | 0.05 |
| **0.1Q2** | D | Moderate | Lindbergh | 0.05 |
| **0.1Q2** | D | Steep | Lindbergh | 0.05 |
| **0.1Q2** | A | Flat | Oceanside | 0.15 |
| **0.1Q2** | A | Moderate | Oceanside | 0.14 |
| **0.1Q2** | A | Steep | Oceanside | 0.135 |

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

| Table G.2-6: Sizing Factors for Hydromodification Flow Control Cistern Facilities Designed Using Sizing Factor Method | | | | |
|---|---|---|---|---|
| **Lower Flow Threshold** | **Soil Group** | **Slope** | **Rain Gauge** | **V** |
| **0.1Q2** | A | Flat | Lindbergh | 0.54 |
| **0.1Q2** | A | Moderate | Lindbergh | 0.51 |
| **0.1Q2** | A | Steep | Lindbergh | 0.49 |
| **0.1Q2** | B | Flat | Lindbergh | 0.19 |
| **0.1Q2** | B | Moderate | Lindbergh | 0.18 |
| **0.1Q2** | B | Steep | Lindbergh | 0.18 |
| **0.1Q2** | C | Flat | Lindbergh | 0.11 |
| **0.1Q2** | C | Moderate | Lindbergh | 0.11 |
| **0.1Q2** | C | Steep | Lindbergh | 0.11 |
| **0.1Q2** | D | Flat | Lindbergh | 0.09 |
| **0.1Q2** | D | Moderate | Lindbergh | 0.09 |
| **0.1Q2** | D | Steep | Lindbergh | 0.09 |
| **0.1Q2** | A | Flat | Oceanside | 0.26 |
| **0.1Q2** | A | Moderate | Oceanside | 0.25 |
| **0.1Q2** | A | Steep | Oceanside | 0.25 |
| **0.1Q2** | B | Flat | Oceanside | 0.16 |
| **0.1Q2** | B | Moderate | Oceanside | 0.16 |
| **0.1Q2** | B | Steep | Oceanside | 0.16 |
| **0.1Q2** | C | Flat | Oceanside | 0.14 |
| **0.1Q2** | C | Moderate | Oceanside | 0.14 |
| **0.1Q2** | C | Steep | Oceanside | 0.14 |
| **0.1Q2** | D | Flat | Oceanside | 0.12 |
| **0.1Q2** | D | Moderate | Oceanside | 0.12 |
| **0.1Q2** | D | Steep | Oceanside | 0.12 |
| **0.1Q2** | A | Flat | Lake Wohlford | 0.53 |
| **0.1Q2** | A | Moderate | Lake Wohlford | 0.49 |
| **0.1Q2** | A | Steep | Lake Wohlford | 0.49 |
| **0.1Q2** | B | Flat | Lake Wohlford | 0.28 |
| **0.1Q2** | B | Moderate | Lake Wohlford | 0.28 |
| **0.1Q2** | B | Steep | Lake Wohlford | 0.28 |
| **0.1Q2** | C | Flat | Lake Wohlford | 0.14 |
| **0.1Q2** | C | Moderate | Lake Wohlford | 0.14 |
| **0.1Q2** | C | Steep | Lake Wohlford | 0.14 |
| **0.1Q2** | D | Flat | Lake Wohlford | 0.12 |
| **0.1Q2** | D | Moderate | Lake Wohlford | 0.12 |
| **0.1Q2** | D | Steep | Lake Wohlford | 0.12 |

Drawdown Times

**Vault 1 - 0.8" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 3,081 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.03 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=3.5' |
| Drawdown Time | 25.12 | hours | |

---

**Vault 2 - 1.4" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 9,238 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.11 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=4' |
| Drawdown Time | 23.01 | hours | |

---

**Vault 3 - 1.4" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 10,444 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.11 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=4' |
| Drawdown Time | 26.01 | hours | |

---

**Vault 4 - 0.8" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 3,042 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.04 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=6' |
| Drawdown Time | 18.95 | hours | |

---

**Vault 5 - 1.25" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 8,156 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.11 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=6' |
| Drawdown Time | 20.81 | hours | |

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**Vault 6 - 1.0" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 5,863 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.06 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=4' |
| Drawdown Time | 28.62 | hours | |

---

**Vault 7 - 1.5" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 14,376 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.14 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=5' |
| Drawdown Time | 27.90 | hours | |

---

**Vault 8 - 0.8" dia. orifice**

| | | | |
|---|---|---|---|
| Volume at Riser Head | 3,563 | cubic feet | Orifice Flow Equation |
| Max orifice outflow | 0.04 | cfs | Q=Cd x A x (2gH)^0.5 |
| | | | where Cd =0.65 , g=32.2ft/s^2 , H=4' |
| Drawdown Time | 27.18 | hours | |

---

| | Ao | | | |
|---|---|---|---|---|
| | Dia (in) | Hieght (ft) | in^2 | ft^2 |
| 1 | 0.8 | 3.5 | 0.5027 | 0.0035 |
| 2 | 1.4 | 4 | 1.5394 | 0.0107 |
| 3 | 1.4 | 4 | 1.5394 | 0.0107 |
| 4 | 0.8 | 6 | 0.5027 | 0.0035 |
| 5 | 1.3 | 6 | 1.2272 | 0.0085 |
| 6 | 1.0 | 4 | 0.7854 | 0.0055 |
| 7 | 1.5 | 5 | 1.7671 | 0.0123 |
| 8 | 0.8 | 4 | 0.5027 | 0.0035 |

# Attachment 3
# Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

*Maintenance agreement will be created and approved during final engineering

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**Project Name:** Campus Point NDP Entitlements

**Indicate which Items are Included:**

| Attachment Sequence | Contents | Checklist |
|---|---|---|
| **Attachment 3** | Maintenance Agreement (Form DS-3247) (when applicable) | ☐ Included<br>☐ Not applicable |

*Maintenance agreement will be created and approved during final engineering

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

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

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

# Attachment 4
# Copy of Plan Sheets Showing Permanent Storm Water BMPs

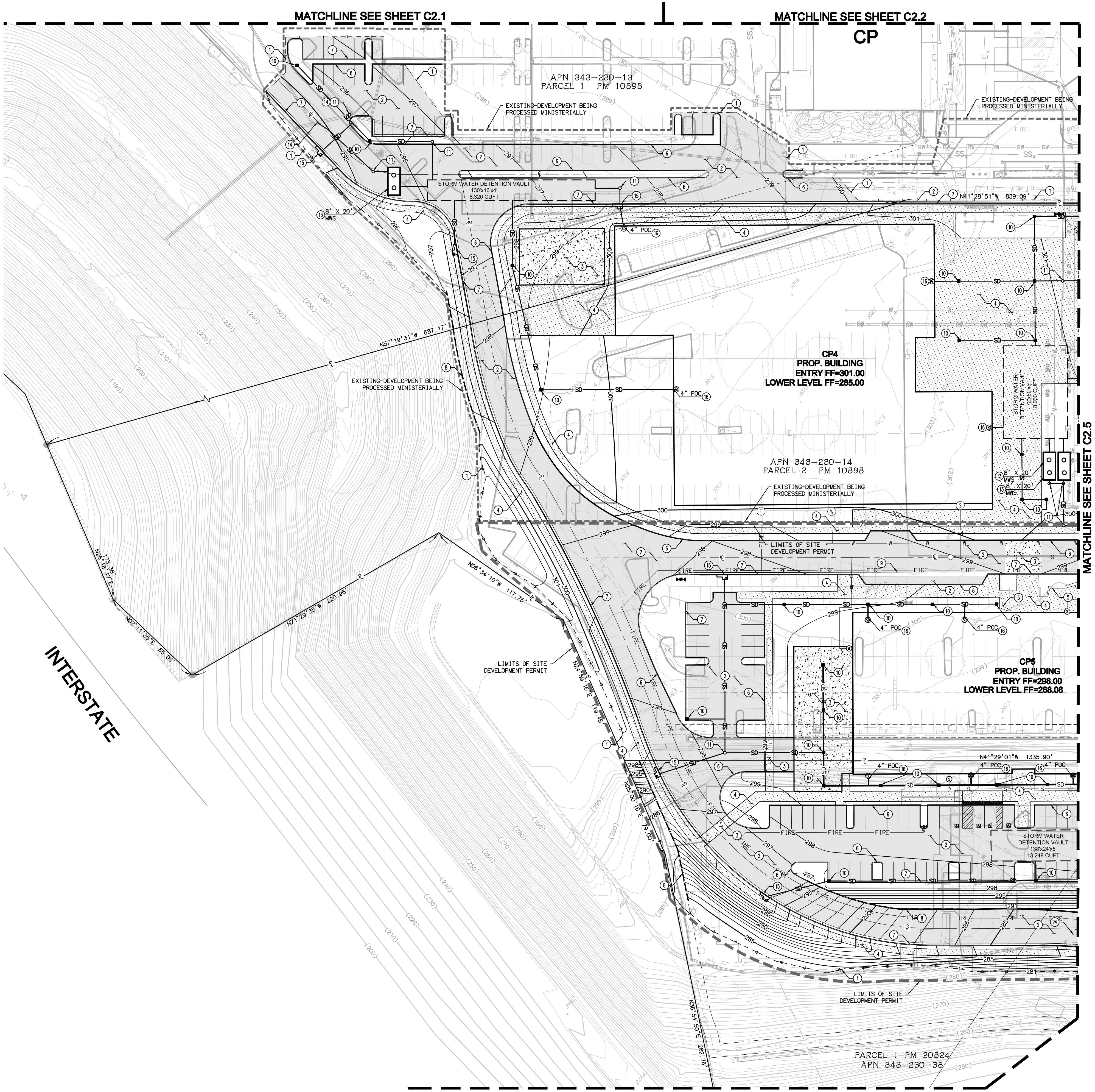
This is the cover sheet for Attachment 4.

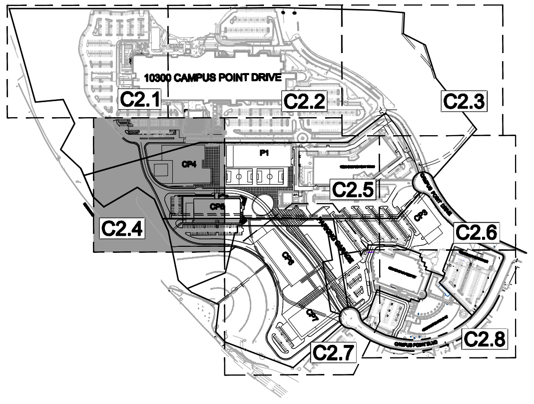
Project Name: Campus Point NDP Entitlements

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

The plans must identify:

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





KEYMAP

NTS

## CONSTRUCTION NOTES

- ① LIMIT OF GRADING/ LIMIT OF WORK/ SAWCUT LINE
- ② AC PAVEMENT
- ③ VEHICULAR CONCRETE PAVEMENT
- ④ CONCRETE SIDEWALK
- ⑤ SEAT WALL
- ⑥ 6" CURB
- ⑦ 6" CURB & GUTTER
- ⑧ RETAINING WALL
- ⑨ RIBBON GUTTER
- ⑩ CATCH BASIN
- ⑪ STORM DRAIN CLEANOUT
- ⑬ MODULAR WETLAND UNIT
- ⑭ CONNECT TO EXIST. STORM DRAIN
- ⑮ CURB INLET
- ⑯ ROOF DRAIN POC
- ㉔ TYPE A-6 CLEANOUT

## STORM DRAIN NOTES

1. ALL ONSITE STORM DRAIN TO BE PRIVATE EXCEPT WHERE NOTED.
2. PRIVATE STORM DRAIN TO BE MAINTAINED BY OWNER.
3. PUBLIC STORM DRAIN TO BE MAINTAINED BY THE CITY OF SAN DIEGO.

## NOTES

FOR ADDITIONAL EASEMENT INFORMATION SEE SHEETS C4.0 & C4.1

## STORM DRAIN MAINTENANCE NOTES

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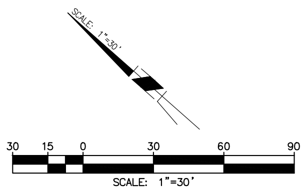

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Brian Oliver 05/01/20
BRIAN K. OLIVER, R.C.E. 45045 DATE
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| Date Published | 05.01.2020 |
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GRADING PLAN

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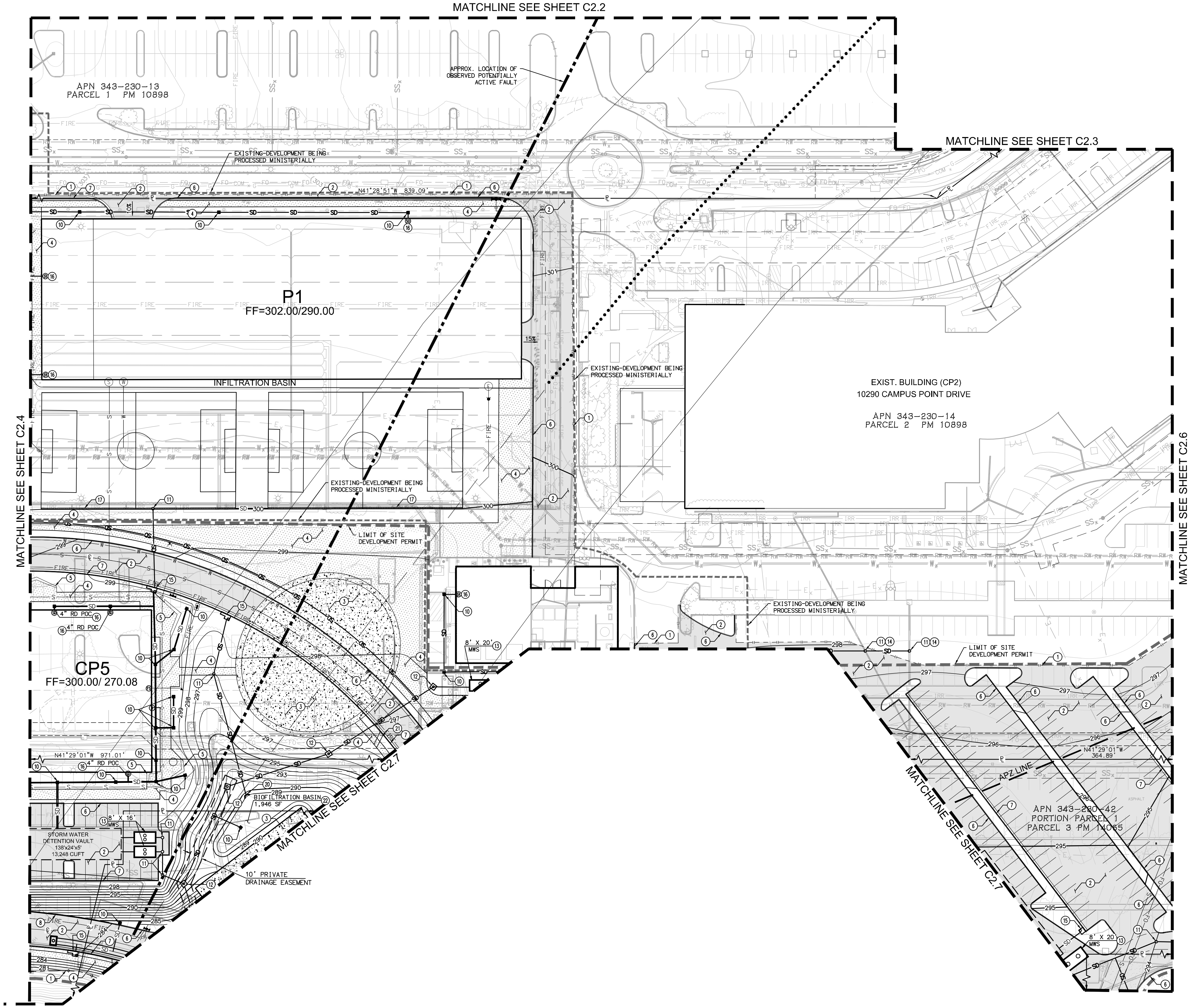

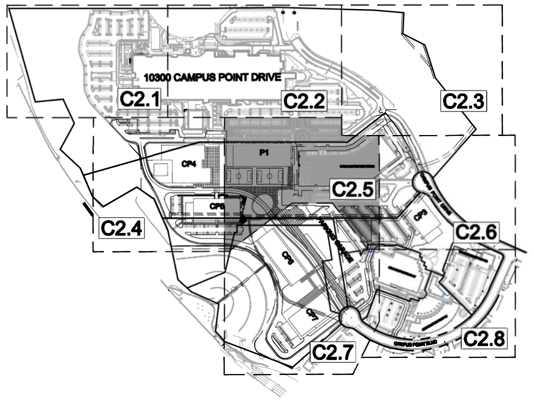

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- ⑯ ROOF DRAIN POC
- ⑰ TRENCH DRAIN
- ⑳ WING TYPE HEADWALL
- ㉑ MODIFIED REVERSE CURB OUTLET
- ㉒ BIOFILTRATION BASIN. SEE DETAIL 1, TYPICAL BASIN SECTION ON SHEET C2.7

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30 15 0 30 60 90

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GRADING PLAN

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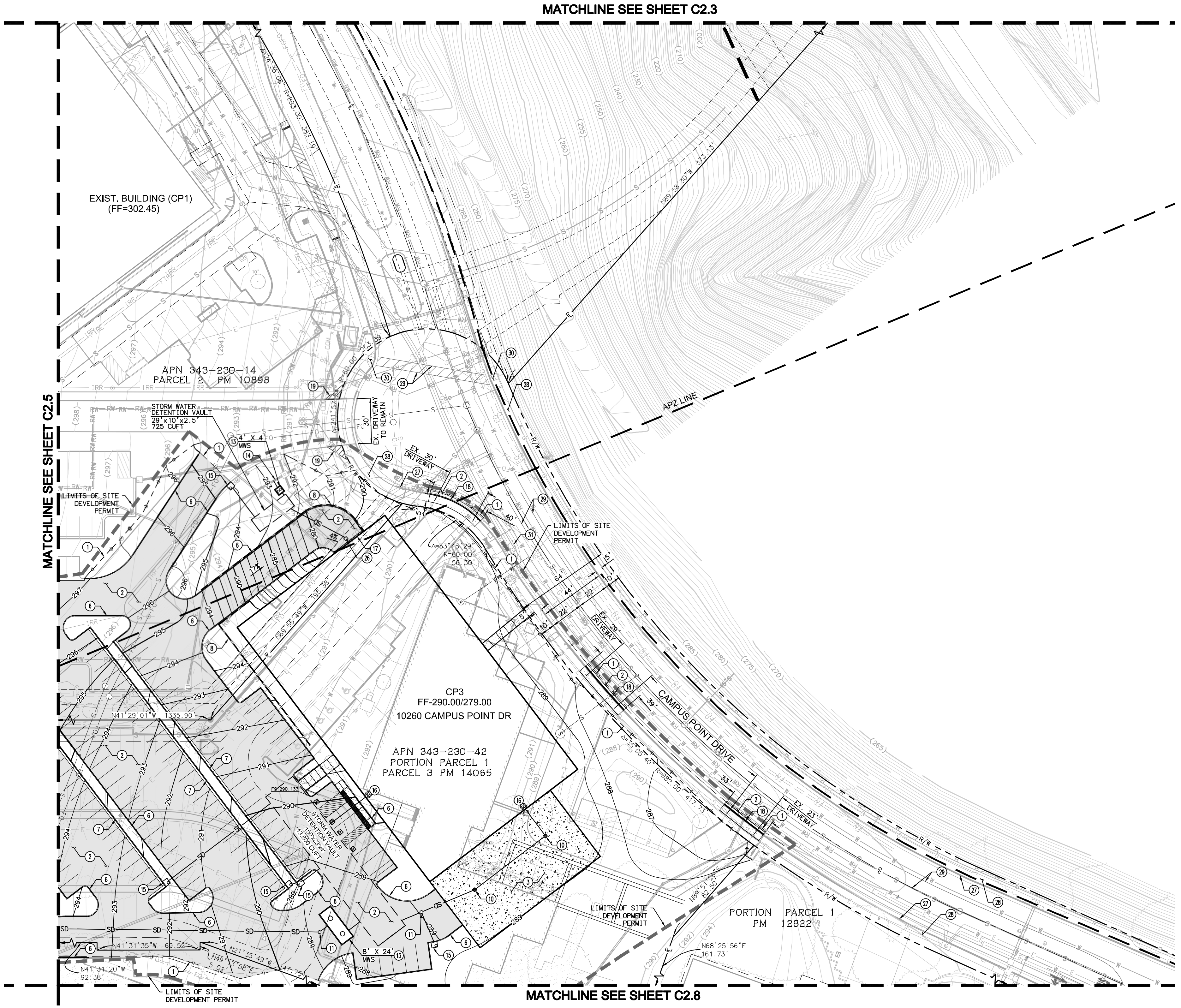

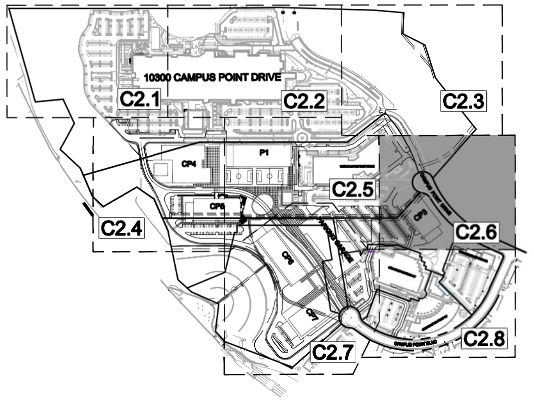

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⑮ CURB INLET
⑯ ROOF DRAIN POC
⑰ TRENCH DRAIN
⑱ EXISTING DRIVEWAY TO BE REMOVED AND REPLACED WITH CURB, GUTTER, & SIDEWALK
⑲ VISIBILITY TRIANGLE. NO OBSTRUCTION INCLUDING LANDSCAPING OR SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 36 INCHES IN HEIGHT PER SDMC SECTION 142.0409(B)(2). PLANT MATERIAL, OTHER THAN TREES, LOCATED WITHIN THE VISIBILITY AREAS OR ADJACENT TO PUBLIC RIGHT-OF-WAY, SHALL NOT EXCEED 36" IN HEIGHT, MEASURED FROM LOWEST GRADE ABUTTING THE PLANT MATERIAL TO THE TOP OF PLANT MATERIAL.
㉖ SUMP PUMP
㉗ EX. CURB & GUTTER
㉘ EX. SIDEWALK
㉙ EX. STREET STRIPING
㉚ EX. CURB RAMP
㉛ EX. STREET LIGHT

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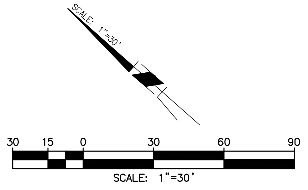

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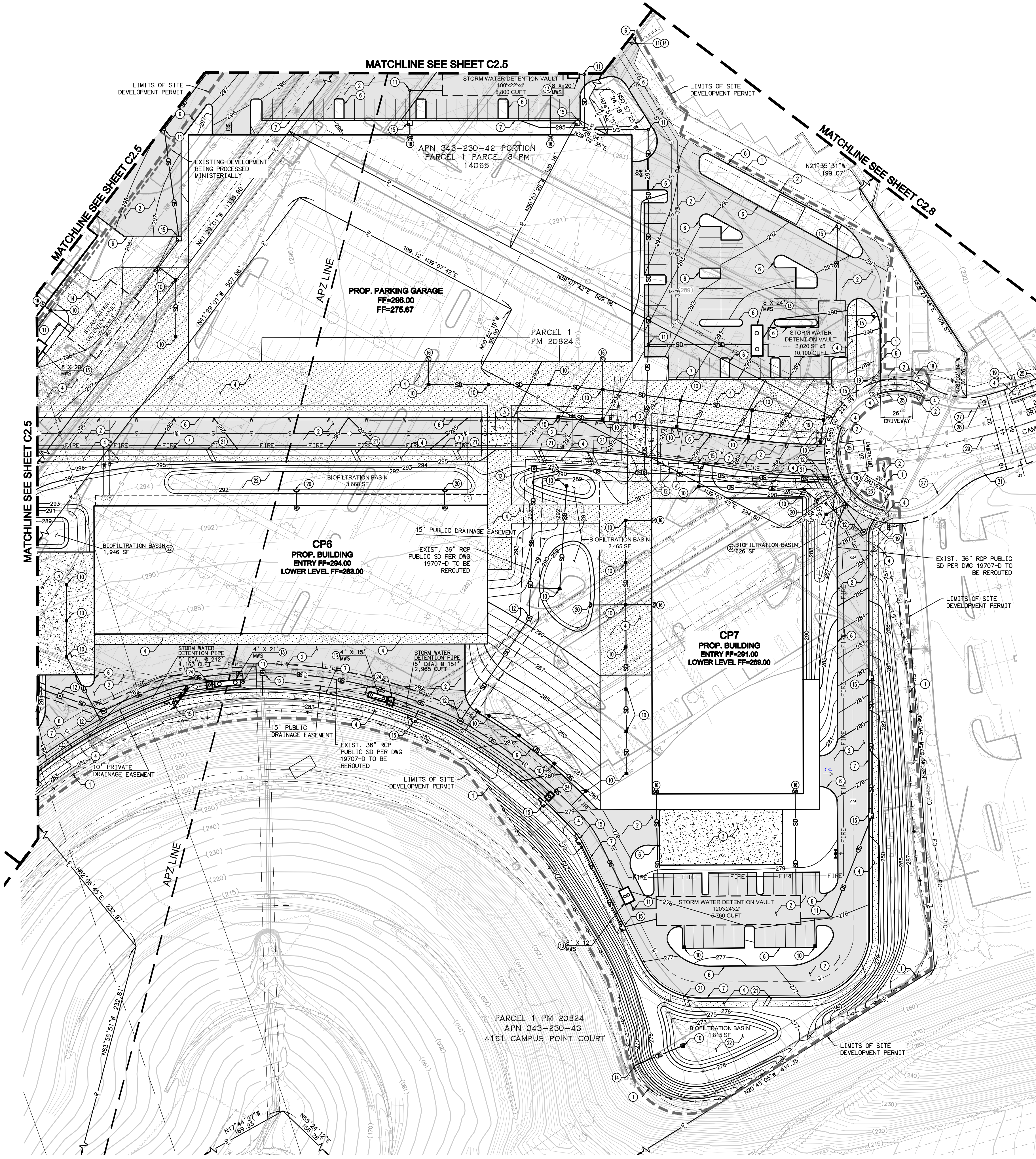

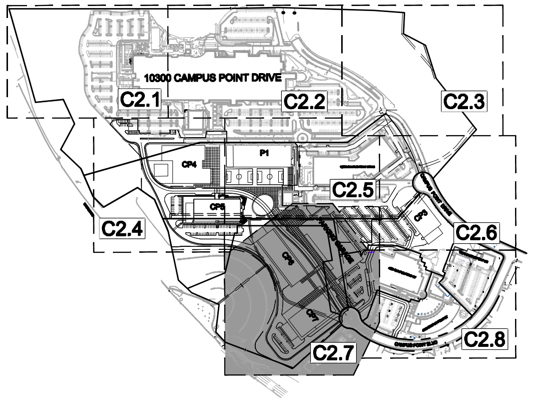

## KEYMAP

NTS

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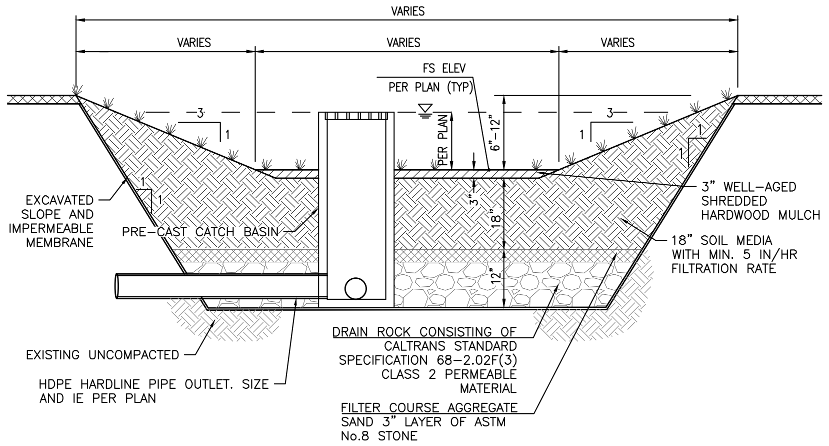
㉓ CONCRETE DRIVEWAY
㉔ TYPE A-6 CLEANOUT
㉕ REPLACE EXISTING DRIVEWAY
㉗ EX. CURB & GUTTER
㉘ EX. SIDEWALK
㉙ EX. STREET STRIPING
㉛ EX. STREET LIGHT



NOTE:

1. COVER PLANTER SURFACE WITH 3" THICK LAYER OF MULCH.
2. PROVIDE 2"x2" CLUSTERED FIELD SEDGE AND COBBES. PLANT AT 6" ON CENTER IN AREAS INDICATED ON PLANS.
3. PLANTER SOIL MIX TO CONSIST OF 20% COMPOST, 60% SAND, 20% TOP SOIL (NO CLAY).
4. PROVIDE 6" DIA. SUBDRAIN PER SDR-35 WITH 3/8" DIA. PERFORATIONS WITH 4 HOLES PER ROW. PERFORATION ROWS SPACED 6" ON CENTER, ALONG LENGTH OF PIPE.
5. CAP SUBDRAIN OUTLET AT THE UPSTREAM END.
6. PROVIDE TEMPORARY IRRIGATION MEASURES UNTIL VEGETATION IS ESTABLISHED.

## ① TYPICAL BASIN SECTION

N.T.S.

## STORM DRAIN NOTES

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# Attachment 5
# Drainage Report

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

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# Preliminary Drainage Study for
## Campus Point NDP
PTS 657935

**Prepared For:**

Alexandria Estate Equities, Inc.
San Diego, CA 92121
(858) 638-2800

**Project Location:**

10290 Campus Point Drive
San Diego, CA 92121
APN No. 343-230-38, 42 ,43 14 in the
City of San Diego, County of San Diego, CA

**Prepared By:**

Michael Baker
INTERNATIONAL
9755 Clairemont Mesa Blvd
San Diego, CA 92124
(858) 614-5000
Christopher Leary, PE

**Michael Baker JN:**
174310

**Prepared:**
April 30, 2020

# Table of Contents

# List of Tables

# List of Appendices

# Section 1 Project Information

## 1.1 Project Data

| | |
|---|---|
| Project Owner: | ARE-SD Region No. 57, LLC<br>10996 Torreyana Rd, Suite 250 |
| Project Site Address: | Campus Point Court, San Diego, CA 92121 |
| APN Number(s): | 343-230-38, 42 ,43 14 |
| Parcel Area: | 19.43-acres |
| Project Disturbed Area: | 19.43-acres |

## 1.2 Scope of Report

This report includes analyses of 100-year project-site peak flow under existing and proposed conditions. This report documents the hydrologic impact of the proposed improvements, as compared to the existing condition; and includes preliminary sizing for attenuation measures required to mitigate peak flow.

This report does not address temporary Best Management Practices (BMPs) required during construction, refer to the project Storm Water Pollution Prevention Plan (SWPPP). Post Construction BMPs are addressed in the project Storm Water Quality Management Plan (SWQMP).

## 1.3 Project Description

Proposed improvements include the demolition of two existing structures and the surrounding parking lot. A total of seven new structures are proposed along with accompanying parking area and hardscape. Total project-site impervious area will be slightly increased as a result of the proposed improvements; however, peak flow will not be diverted and will be mitigated to existing rates through proposed sub-terranean detention vaults.

Based on the Natural Resources Conservation Service's (NRCS) Websoil Survey, the project site is comprised of approximately 26.6-percent Chesterton fine sandy loam (CfB), with slopes ranging from 5 to 9 percent (hydrologic soil type D); and approximately 73.4-percent Altamont Clay (AtF) (hydrologic soil type C).

During surface exploration Geocon Inc. encountered man-made fill material across the project site. Due to this material it is recommended that the site be considered Hydrologic Soil Type D.

The Federal Emergency Management Agency (FEMA) has not mapped a Special Flood Hazard Area (SFHA) within the project site vicinity. The entire project site lies within un-shaded Zone X, which correlates with areas determined to be outside the 500-year floodplain. An exhibit is provided in Appendix A of this report.

## 1.4 Existing Conditions

The project site is entirely built out in the existing condition and has been hydrologically analyzed as three drainage basins.

Basin 1 is approximately 2.25-acres and includes a portion of the parking lot on the northern edge of the site. Runoff is collected by curb inlets and conveyed north. Runoff ultimately exits the project area through a 24” PVC pipe, which discharges into the canyon just west of the site.

Basin 2 is approximately 14.50-acres and includes both existing structures with a majority of the existing parking lot. Runoff is collected via area drains and is conveyed west. Runoff ultimately exits the project area through a 36” RCP, which discharges into the canyon just west of the site.

Basin 3 is approximately 2.68-acres and includes existing parking area. Runoff is collected by drains and is routed to an existing partial infiltration basin constructed by PTS# 526897, 39001-D.

Impervious area is comprised of the concrete walkways, parking stalls, drive isles and roofing. Pervious area is comprised of landscape located within parking islands and adjacent to the existing building. Refer to Appendix B for an exhibit detailing the existing condition.

## 1.5 Proposed Conditions

The proposed structures will be located close to the property lines on all sides of the project site. Roof leaders, area drains, and new on-site private storm drain will direct project site runoff to proposed storage vaults, described in more detail below. The project site is entirely built out in the proposed condition and has been hydrologically analyzed as 17 drainage basins.

Basin 1 is approximately 0.83-acres and includes a portion of the northern parking lot, CP4 and access road. Runoff is collected via curb inlets and routed to a concrete storage vault (Storage Vault 1). The vault has a volume of 8,320 cubic feet at the weir height, with a weir 3.5’ above the vault bottom and a 1.4” orifice.

Basin 2 is approximately 3.96-acres and includes some parking lot, and CP5. Runoff is collected via inlets and routed to a concrete storage vault (Storage Vault 2). The vault has a volume of 13,246 cubic feet at the weir height, with a weir 4’ above the vault bottom and a 1.9” orifice.

Basin 3 is approximately 0.98-acres and includes a portion of the southwest access road as well as part of the roof of CP6. Runoff is collected via inlets and routed to a concrete storage vault (Storage Vault 3). The vault has a volume of 4,163 cubic feet at the weir height, with a weir 4’ above the vault bottom and a 0.9” orifice.

Basin 4 is approximately 0.58-acres and includes a portion of the southwest access road as well as a portion of the roof of CP6. Runoff is collected via inlets and routed to a concrete storage vault (Storage Vault 4). The vault has a volume of 2,965 cubic feet at the weir height, with a weir 6’ above the vault bottom and a 0.6” orifice.

Basin 5 is approximately 1.29-acres and includes the southern portion of the access road as well as the roof of CP7. Runoff is collected via roof leaders and area drains and routed to a concrete storage vault (Storage Vault 5) located within the subterranean parking structure. The vault has a volume of 5,760 cubic feet at the weir height, with a weir 6' above the vault bottom and a 1" orifice.

Basin 6 is approximately 0.65-acres and includes the parts of the southern access road and associated parking lot. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 1). The basin has a footprint of 1,816 square feet and a 0.8" orifice

Basin 7 is approximately 1.03-acres and includes the portion of the access road in the middle of the site and a portion of CP7. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 2). The basin has a footprint of 2,440 square feet and a 1" orifice

Basin 8 is approximately 0.27-acres and includes the main access road onto Campus Point. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 3). The basin has a footprint 6,520 square feet and a 1.0" orifice.

Basin 9 is approximately 1.47-acres and includes the portion of the access road in the middle of the site and portions of the roof of CP6. Runoff is collected via inlets and routed to a Biofiltration basin (Biofiltration Basin 4). The basin has a footprint of 3,668 square feet and a 1.2" orifice.

Basin 10 is approximately 2.12-acres and includes the parking structure located on the eastern side of the site. Runoff is collected via inlets and routed to a separate concrete storage vault (Storage Vault 6). The vault has a volume of 10,100 cubic feet at the weir height, with a weir 4' above the vault bottom and a 1.3" orifice.

Basin 11 is approximately 1.92-acres and includes the parking structure located on the eastern side of the site. Runoff is collected via inlets and routed to a separate concrete storage vault (Storage Vault 7). The vault has a volume of 8,800 cubic feet and a 0.75" orifice.

Basin 12 is approximately 1.85-acres and located in the north easterly portion of the site. Runoff is collected via inlets and routed to a separate concrete storage vault (Storage Vault 8). The vault has a volume of 7,965 cubic feet at the weir height, with a weir 4" above the vault bottom and a 0.8" orifice.

Basin 13 is approximately 1.08-acres and includes portions of the plaza. Runoff is collected via inlets and routed to a biofiltration basin (Biofiltration Basin 5). The basin has a footprint of 1,946 square feet and a 1" orifice

Basin 14 is approximately 3.86-acres and includes the northern portion of the site and part of CP4 and the soccer fields. Runoff is collected via inlets and routed to a storage vault (Storage Vault 9). The vault has a volume of 7,965 cubic feet and a 2" orifice.

Basin 15 is approximately 2.43-acres and includes the eastern portion of the site and all of CP3. Runoff is collected via inlets and routed to a vault (Storage Vault 10). The basin has a volume of 7,965 cubic feet and a 1.5" orifice

Basin 16 is approximately 0.28-acres and includes the access road on the eastern portion of the site. Runoff is collected via inlets and routed to a vault (Storage Vault 11). The basin has a volume of 7,965 cubic feet and a 0.5” orifice

Basin 17 is approximately 0.26-acres and includes a landscaped slope adjacent to CP7. Runoff is collected via a brow ditch and conveyed to the discharge location.

Refer to Appendix C for an exhibit detailing the proposed condition.

# Section 2 Study Objectives

The specific objectives of this study are as follows:

- Quantify 100-year peak flow rates under existing and proposed conditions to all discharge points;
- Develop measures to mitigate any increase in peak flow associated with proposed improvements;
- Demonstrate the proposed improvements will not increase the potential for erosion on the project site or downstream area.
- Demonstrate that the tributary area for the existing infiltration basin is reduced by the proposed improvements.

# Section 3 Methodology

## 3.1 Hydrology

The Rational Method has been utilized to perform the hydrologic analyses. The following formula conforms to the hydrologic methodologies outlined in the City of San Diego Drainage Design Manual (January 2017).

$$Q = C * I * A$$

Where, **Q** = Peak Discharge - *(cfs)*

**C** = Runoff Coefficient

**I** = Average Rainfall Intensity - *(in/hr)*

**A** = Drainage Area - *(acres)*

A weighted runoff coefficient has been calculated for the existing and proposed conditions per Section A.1.2 of the City of San Diego Drainage Design Manual. The tabulated impervious area chosen for the project site is 80% (commercial use) for existing condition and 90% (industrial use) for the proposed condition. In this preliminary study the assumption of 90% impervious cover in the proposed condition is a conservative estimate as the land-use will remain commercial. Final engineering will revise this percentage to more accurately the impervious areas on-site.

Intensity has been calculated per the IDF Curve in Figure A-1 of the City of San Diego Drainage Design Manual. A time in concentration of 5 minutes has been assumed for the project area under existing and proposed conditions.

## 3.2 Hydraulics

The Hydraflow Hydrographs Extension within AutoCAD has been used to model peak flows from the project as they are mitigated by the proposed detention vaults. Hydrographs generated by Rick Engineering Company's RatHydro software have been routed through storage vaults modeled in Hydraflow Hydrographs. Refer to Appendix C for the modelling input and output.

# Section 4 Results

## 4.1 Hydrologic Results

The table below summarizes the hydrologic results under existing and proposed conditions. Calculations are included in Appendices B (existing) and C (proposed).

**Table 4-1 - Hydrologic Summary**

| Discharge Point | **Basin ID** | **C** | **I*** | **A** | **$Q_{100}$** |
|---|---|---|---|---|---|
| | | **-** | **(in/hr)** | **(ac)** | **(cfs)** |
| **Existing Condition** | | | | | |
| 1 | Basin 1 | 0.85 | 4.5 | 2.02 | 7.7 |
| 2 | Basin 2 | 0.85 | 4.5 | 23.26 | 89 |
| 3 | Basin 3 | 0.85 | 4.5 | 0.69 | 2.6 |
| **Proposed Condition (Unmitigated)** | | | | | |
| 1 | Basin 1 | 0.83 | 4.5 | 1.93 | 7.2 |
| **Total** | | | | **1.93** | **7.2** |
| 2 | Basin 2 | 0.71 | 4.5 | 3.96 | 12.7 |
| | Basin 3 | 0.82 | 4.5 | 0.98 | 3.6 |
| | Basin 4 | 0.93 | 4.5 | 0.58 | 2.4 |
| | Basin 5 | 0.85 | 4.5 | 1.29 | 4.9 |
| | Basin 6 | 0.63 | 4.5 | 0.65 | 1.8 |
| | Basin 7 | 0.80 | 4.5 | 1.03 | 3.7 |
| | Basin 8 | 0.71 | 4.5 | 0.27 | 0.9 |
| | Basin 9 | 0.80 | 4.5 | 1.47 | 5.3 |
| | Basin 10 | 0.89 | 4.5 | 2.12 | 8.5 |
| | Basin 11 | 0.87 | 4.5 | 1.92 | 7.5 |
| | Basin 12 | 0.83 | 4.5 | 1.85 | 6.9 |
| | Basin 13 | 0.66 | 4.5 | 1.08 | 3.2 |
| | Basin 14 | 0.88 | 4.5 | 3.86 | 15.3 |
| | Basin 17 | 0.35 | 4.5 | 0.26 | 0.4 |
| **Total** | | | | **21.32** | **77.1** |
| 3 | Basin 15 | 0.89 | 4.5 | 2.43 | 9.7 |
| | Basin 16 | 0.61 | 4.5 | 0.28 | 0.8 |
| **Total** | | | | **2.71** | **10.5** |
| **Proposed Condition Discharge Point 3 (Mitigated)** | | | | | |
| 3 | Basin 15 | 0.89 | 4.5 | 2.43 | 1.4 |
| | Basin 16 | 0.61 | 4.5 | 0.28 | 0.8 |
| **Total** | | | | **2.71** | **2.2** |
| *A time in concentration of 5 minutes has been assumed for each basin. Per Figure A-1 of the Drainage Design Manual this will result in a similar intensity for all basins. Refer to Appendices B and C for hydrologic calculations. | | | | | |

## 4.2 Hydraulic Results

**Discharge Point 1** - The peak flow rate at discharge location 1 is reduced by diverting a portion of the drainage area to discharge 2 as well a reduction in impervious area. No additional peak flow attenuation is required.

**Discharge Point 2** - The peak flow rate at discharge location 1 is reduced by diverting a portion of the drainage area to discharge 2 and a reduction in impervious area. No additional peak flow attenuation is required.

**Discharge Point 3** – The peak flow rate at this location increase due to an increase in impervious area along with additional flow that has been diverted from the other discharge locations. The table below summarizes the hydraulic performance of the proposed storage vault for Basin 15 used for mitigating the peak flow rate. Calculations are included in Appendix C.

**Table 4-2 – Hydraulic Summary Storage Vault 10**

| Vault ID | Volume at weir elevation | Weir Height | Q100 (in) | Q100 (out) |
|---|---|---|---|---|
| | (ft^3) | (ft) | (cfs) | (cfs) |
| Vault 10 | 12,075 | 3.5 | 9.7 | 1.4 |

* 1-foot ponding depth above surface of the biofiltration basin and a standard sub-base section.

# Section 5 Conclusions

Proposed improvements will not result in an increase to 100-year peak flow discharge from the site, as compared to the existing condition. The increases in peak flow at discharge point 3 is associated with an increase in impervious area and additional flow from the other two basins that has been diverted to it. This increase has been mitigated below existing conditions using the storage vault10 located at Basin 15. This vault BMP also provide hydromodification mitigation which is discussed in more detail within the SWQMP.

This project will not discharge, dredge, or fill material into any Water of The United States, thus the project is not required to obtain a Section 401 certification or Section 404 permit from the State or U.S. Army Corps of Engineers.

## Section 6 Declaration of Responsible Charge

I, hereby declare that I am the Civil Engineer of work for this project, 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 current design.

I understand that the check of project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for the project design.

Christopher Leary RCE 87309

Date

# Section 7 Bibliography

City of San Diego. (January 2017). *Drainage Design Manual.* San Diego.

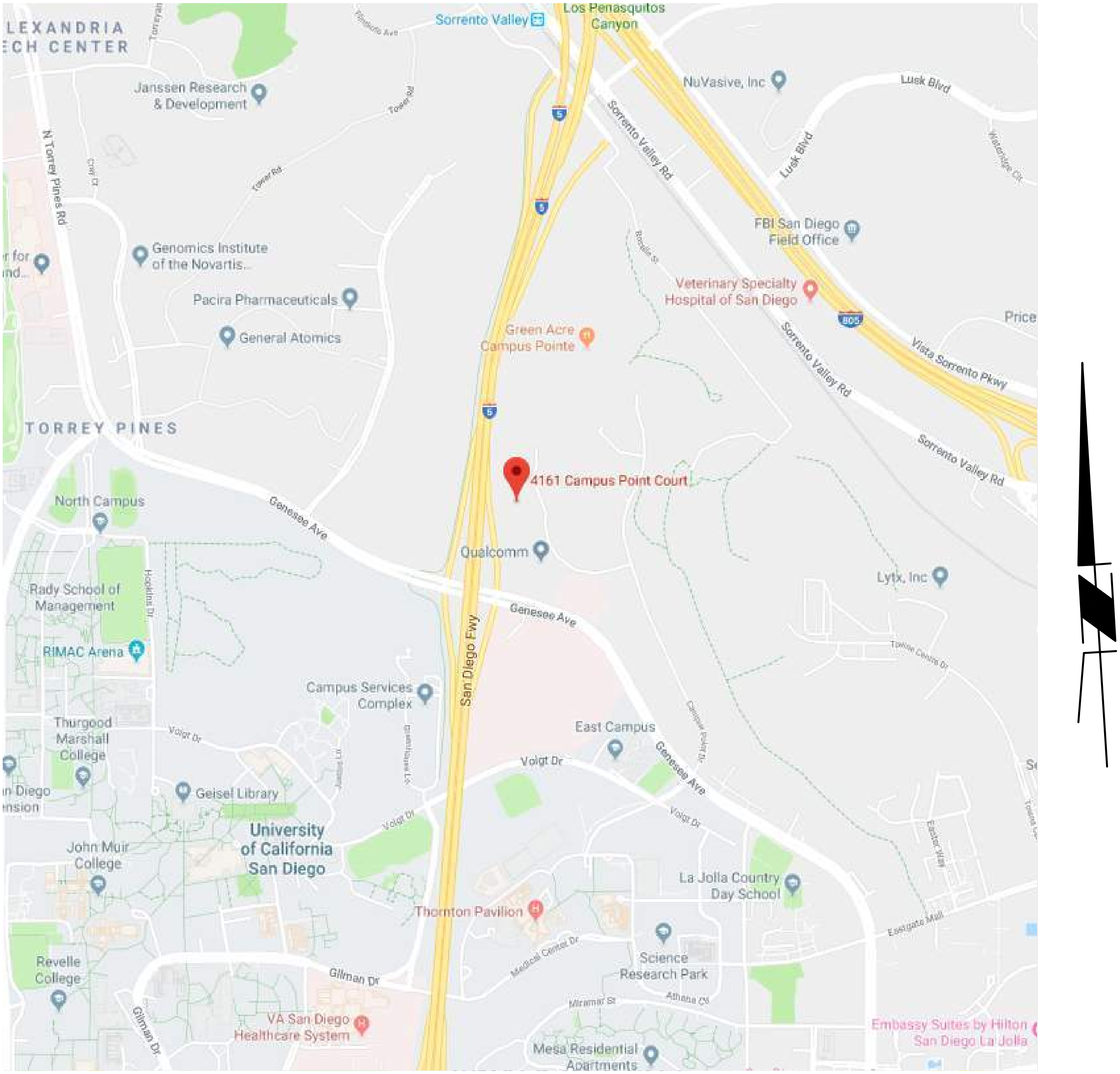
City of San Diego. (January 2018). *Storm Water Standards.* San Diego.

FEMA. (1997). *Flood Insurance Rate Map.* San Diego.

Soil Survey Staff, N. R. (2018, September 24). *Web Soil Survey.* Retrieved from Web Soil Survey: https://websoilsurvey.sc.egov.usda.gov/

# Appendix A – Site Information

*Vicinity Map*
*Rainfall Isopluvials*
*FEMA FIRM*
*NRCS WebSoil Survey*
*Stormwater Standards Appendix B.1.1 from City DDM (Jan. 2017)*



## VICINITY MAP

NO SCALE

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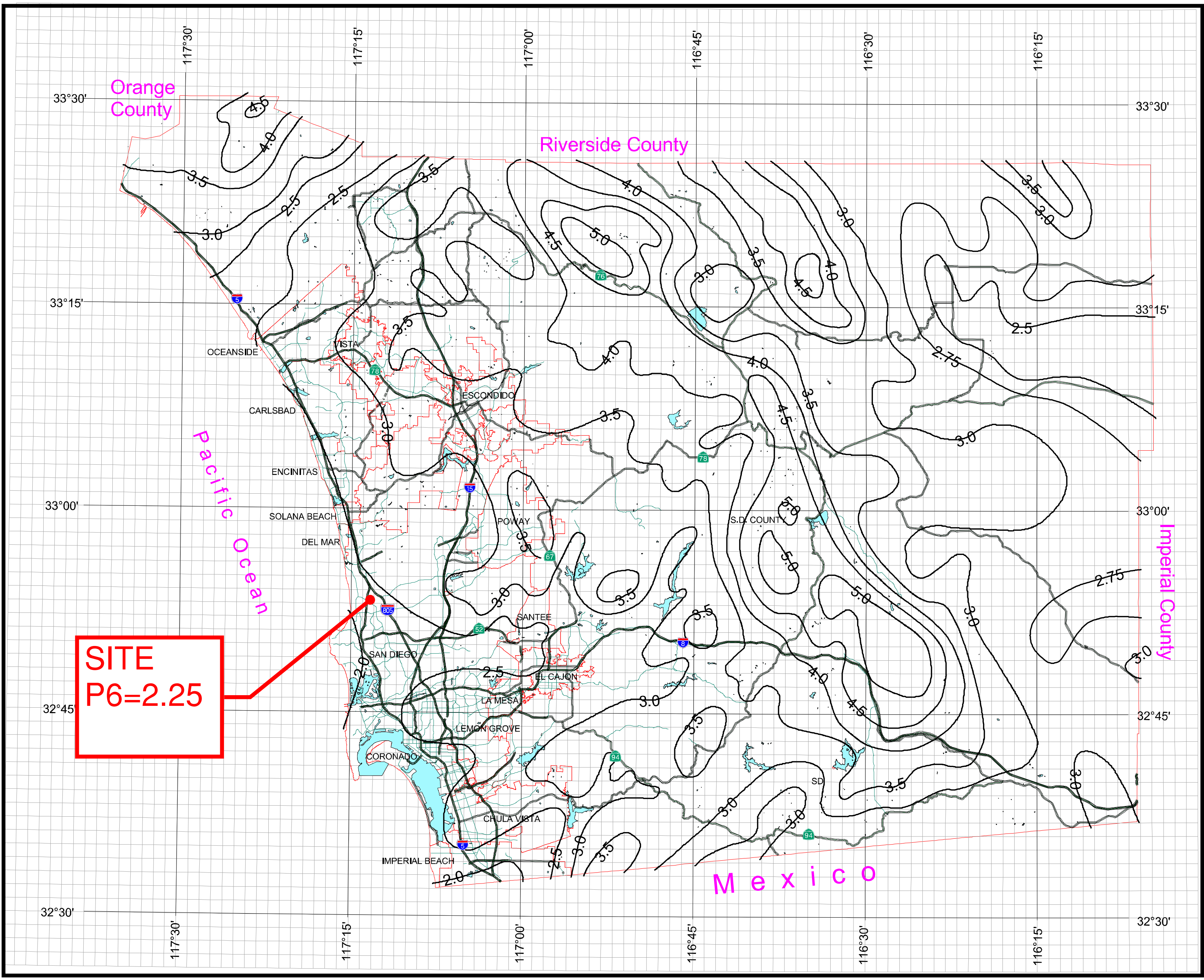


# County of San Diego Hydrology Manual

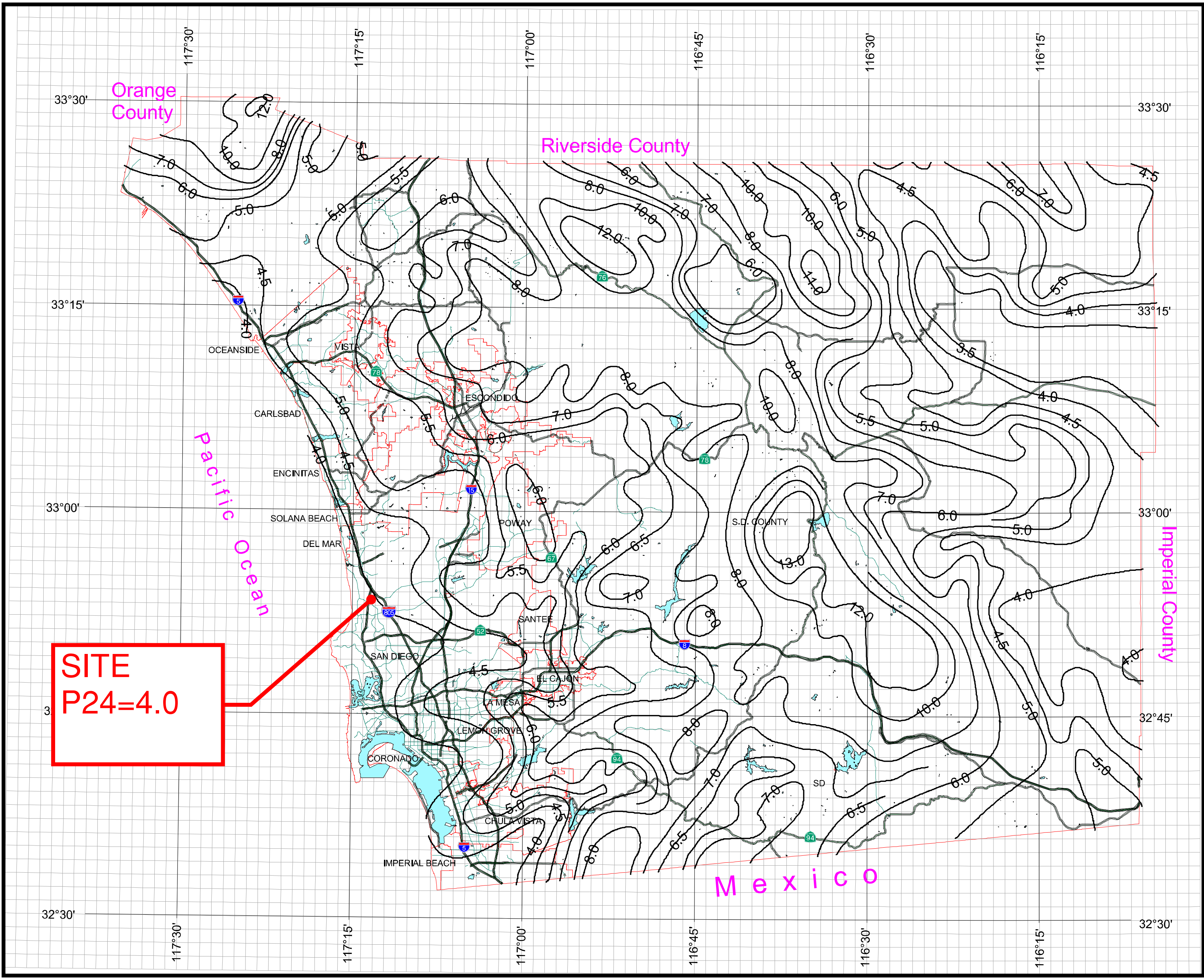
*Rainfall Isopluvials*

**100 Year Rainfall Event - 6 Hours**

— Isopluvial (inches)

N S W E

3 0 3 Miles



# County of San Diego Hydrology Manual

*Rainfall Isopluvials*

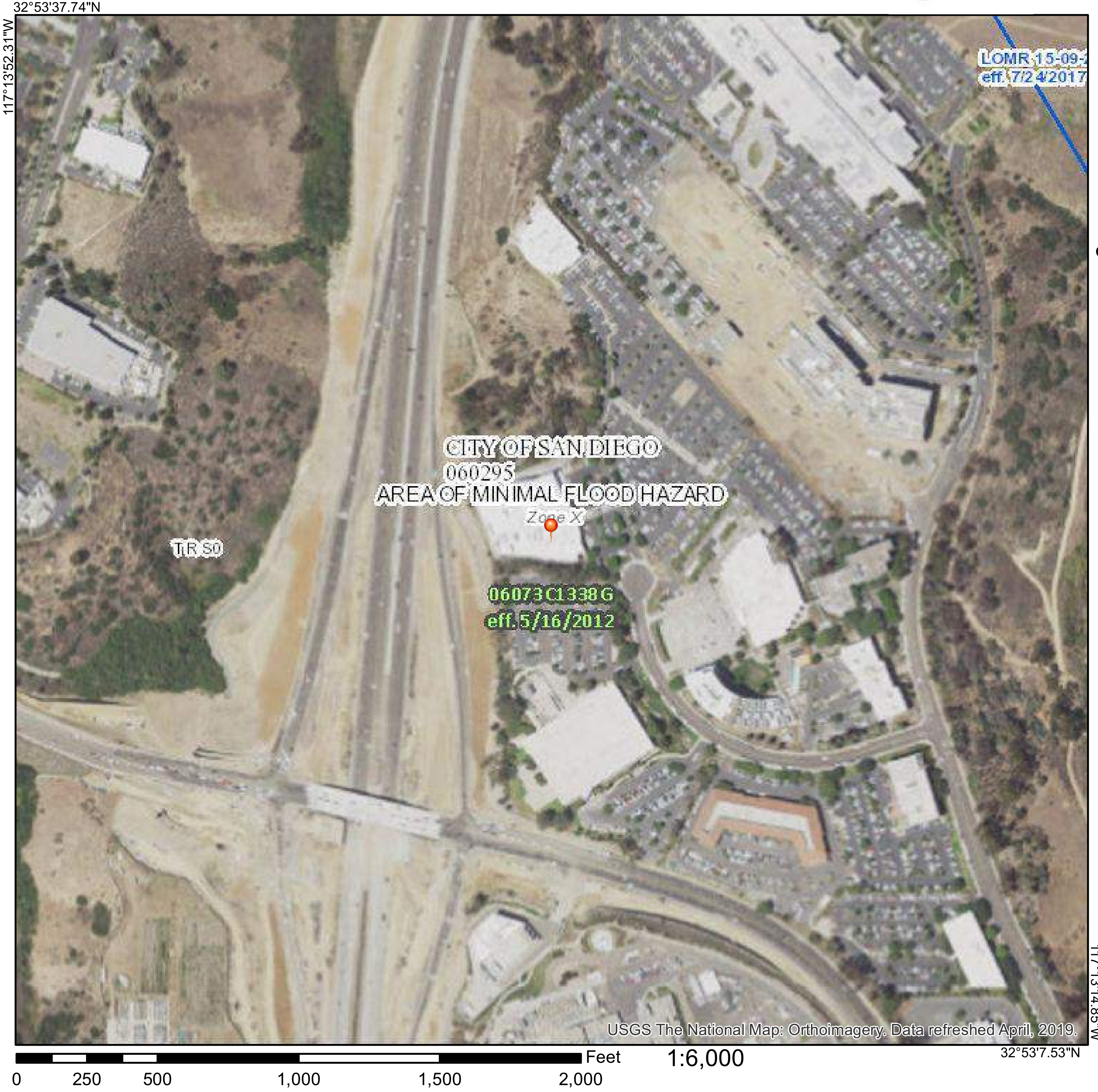
**100 Year Rainfall Event - 24 Hours**

| | |
|---|---|
| — | Isopluvial (inches) |

N
W E
S

3 0 3 Miles

# National Flood Hazard Layer FIRMette



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

| | | |
|---|---|---|
| SPECIAL FLOOD HAZARD AREAS | 🟦 | Without Base Flood Elevation (BFE) *Zone A, V, A99* |
| | | With BFE or Depth *Zone AE, AO, AH, VE, AR* |
| | ▨ | Regulatory Floodway |
| OTHER AREAS OF FLOOD HAZARD | 🟧 | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* |
| | ▨ | Future Conditions 1% Annual Chance Flood Hazard *Zone X* |
| | ▨ | Area with Reduced Flood Risk due to Levee. See Notes. *Zone X* |
| | ▨ | Area with Flood Risk due to Levee *Zone D* |
| OTHER AREAS | NO SCREEN | Area of Minimal Flood Hazard *Zone X* |
| | ▭ | Effective LOMRs |
| | ▭ | Area of Undetermined Flood Hazard *Zone D* |
| GENERAL STRUCTURES | – – – | Channel, Culvert, or Storm Sewer |
| | ıııııı | Levee, Dike, or Floodwall |
| OTHER FEATURES | (B) 20.2 17.5 | Cross Sections with 1% Annual Chance Water Surface Elevation |
| | (8) – – – | Coastal Transect |
| | ~~~ 513 ~~~ | Base Flood Elevation Line (BFE) |
| | ― | Limit of Study |
| | ― | Jurisdiction Boundary |
| | -- -- | Coastal Transect Baseline |
| | - ― | Profile Baseline |
| | ― | Hydrographic Feature |
| MAP PANELS | ☐ | Digital Data Available |
| | ☐ | No Digital Data Available |
| | ☒ | Unmapped |

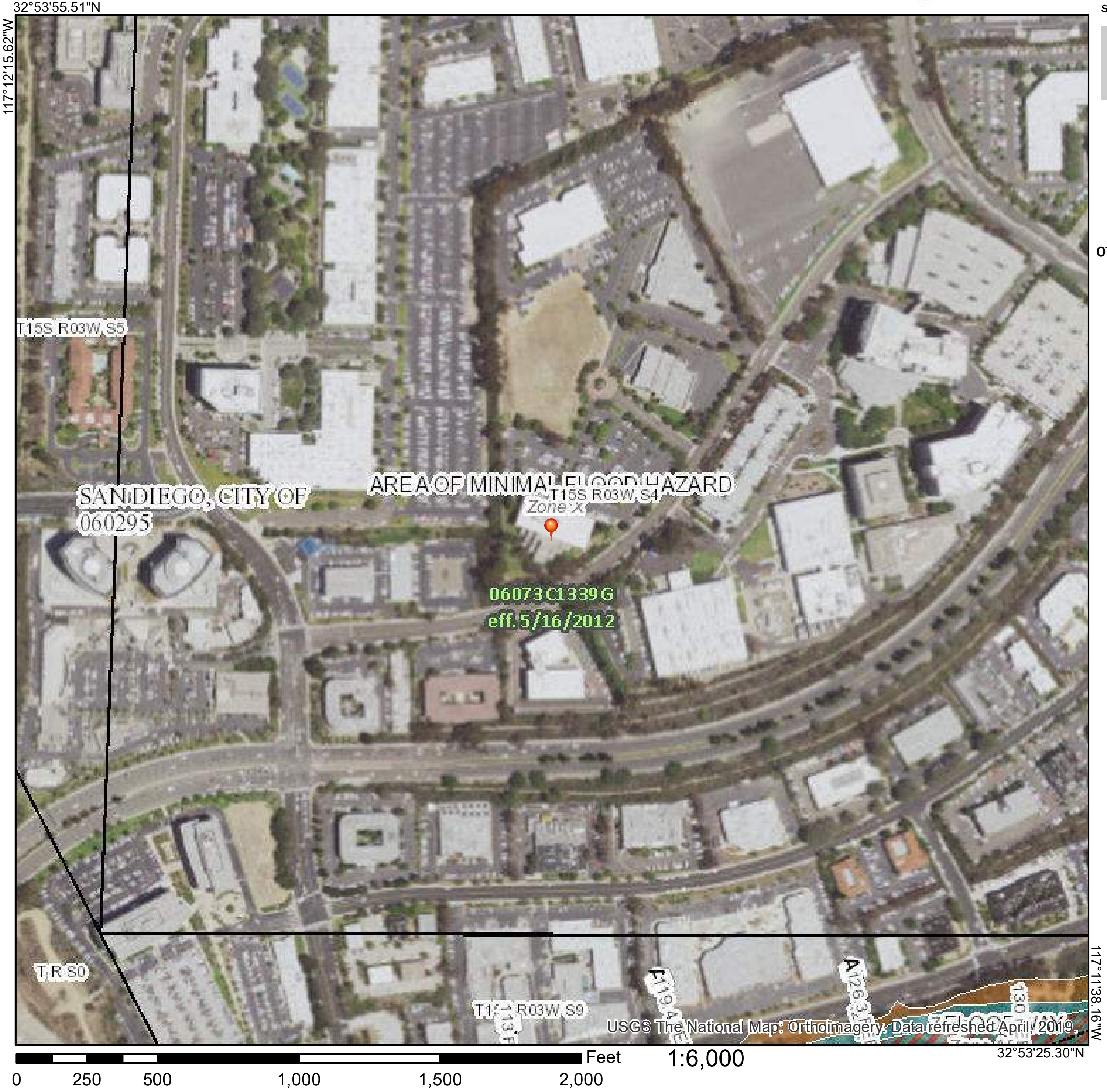
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/18/2019 at 7:08:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# National Flood Hazard Layer FIRMette



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

| | | |
|---|---|---|
| SPECIAL FLOOD HAZARD AREAS | 🟦 | Without Base Flood Elevation (BFE) *Zone A, V, A99* |
| | | With BFE or Depth *Zone AE, AO, AH, VE, AR* |
| | ▨ | Regulatory Floodway |
| OTHER AREAS OF FLOOD HAZARD | 🟧 | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* |
| | ▨ | Future Conditions 1% Annual Chance Flood Hazard *Zone X* |
| | ▨ | Area with Reduced Flood Risk due to Levee. See Notes. *Zone X* |
| | ▨ | Area with Flood Risk due to Levee *Zone D* |
| OTHER AREAS | NO SCREEN | Area of Minimal Flood Hazard *Zone X* |
| | ▭ | Effective LOMRs |
| | 🟧 | Area of Undetermined Flood Hazard *Zone D* |
| GENERAL STRUCTURES | — — — | Channel, Culvert, or Storm Sewer |
| | ııııııı | Levee, Dike, or Floodwall |
| OTHER FEATURES | B 20.2<br>17.5 | Cross Sections with 1% Annual Chance Water Surface Elevation |
| | 8 — — | Coastal Transect |
| | ~~~ 513 ~~~ | Base Flood Elevation Line (BFE) |
| | — | Limit of Study |
| | — | Jurisdiction Boundary |
| | --- --- | Coastal Transect Baseline |
| | — | Profile Baseline |
| | — | Hydrographic Feature |
| MAP PANELS | ☐ | Digital Data Available |
| | ☐ | No Digital Data Available |
| | ☒ | Unmapped |

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

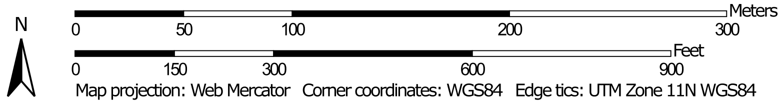
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/12/2020 at 5:19:39 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# Hydrologic Soil Group—San Diego County Area, California

Map Scale: 1:3,480 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

- ▭ Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

**Soil Rating Lines**

- ～ A
- ～ A/D
- ～ B
- ～ B/D
- ～ C
- ～ C/D
- ～ D
- ～ Not rated or not available

**Soil Rating Points**

- ▣ A
- ▣ A/D
- ▣ B
- ▣ B/D
- ▣ C
- ▣ C/D
- ▣ D
- ▣ Not rated or not available

**Water Features**

- ～ Streams and Canals

**Transportation**

- ┼┼┼ Rails
- ～ Interstate Highways
- ～ US Routes
- ～ Major Roads
- ～ Local Roads

**Background**

- ■ Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 13, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 3, 2010—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| AtF | Altamont clay, 30 to 50 percent slopes, warm MAAT, MLRA 20 | C | 19.3 | 66.2% |
| CfC | Chesterton fine sandy loam, 5 to 9 percent slopes | D | 9.9 | 33.8% |
| **Totals for Area of Interest** | | | **29.2** | **100.0%** |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

## B.1.1 Runoff Factor

Estimate the area weighted runoff factor for the tributary area to the BMP using runoff factor (from Table B.1-1) and area of each surface type in the tributary area and Equation B.1-2.

**Equation B.1-2: Estimating Runoff Factor for Area**

$$C = \frac{\sum C_x A_x}{\sum A_x}$$

where:

$C_x$ = Runoff factor for area X

$A_x$ = Tributary area X (acres)

These runoff factors apply to areas receiving direct rainfall only. For conditions in which runoff is routed onto a surface from an adjacent surface, see Section B.2 for determining composite runoff factors for these areas.

**Table B.1-1: Runoff factors for surfaces draining to BMPs – Pollutant Control BMPs**

| Surface | Runoff Factor |
|---|---|
| Roofs[1] | 0.90 |
| Concrete or Asphalt[1] | 0.90 |
| Unit Pavers (grouted)[1] | 0.90 |
| Decomposed Granite | 0.30 |
| Cobbles or Crushed Aggregate | 0.30 |
| Amended, Mulched Soils or Landscape[2] | 0.10 |
| Compacted Soil (e.g., unpaved parking) | 0.30 |
| Natural (A Soil) | 0.10 |
| Natural (B Soil) | 0.14 |
| Natural (C Soil) | 0.23 |
| Natural (D Soil) | 0.30 |

[1] Surface is considered impervious and could benefit from use of Site Design BMPs and adjustment of the runoff factor per Section B.2.1.

[2] Surface shall be designed in accordance with SD-F (Amended soils) fact sheet in Appendix E

# Appendix B –Existing Hydrology

*On-Site Hydrologic Work Map*
*Figure A-1 from the City DDM (Jan. 2017)*

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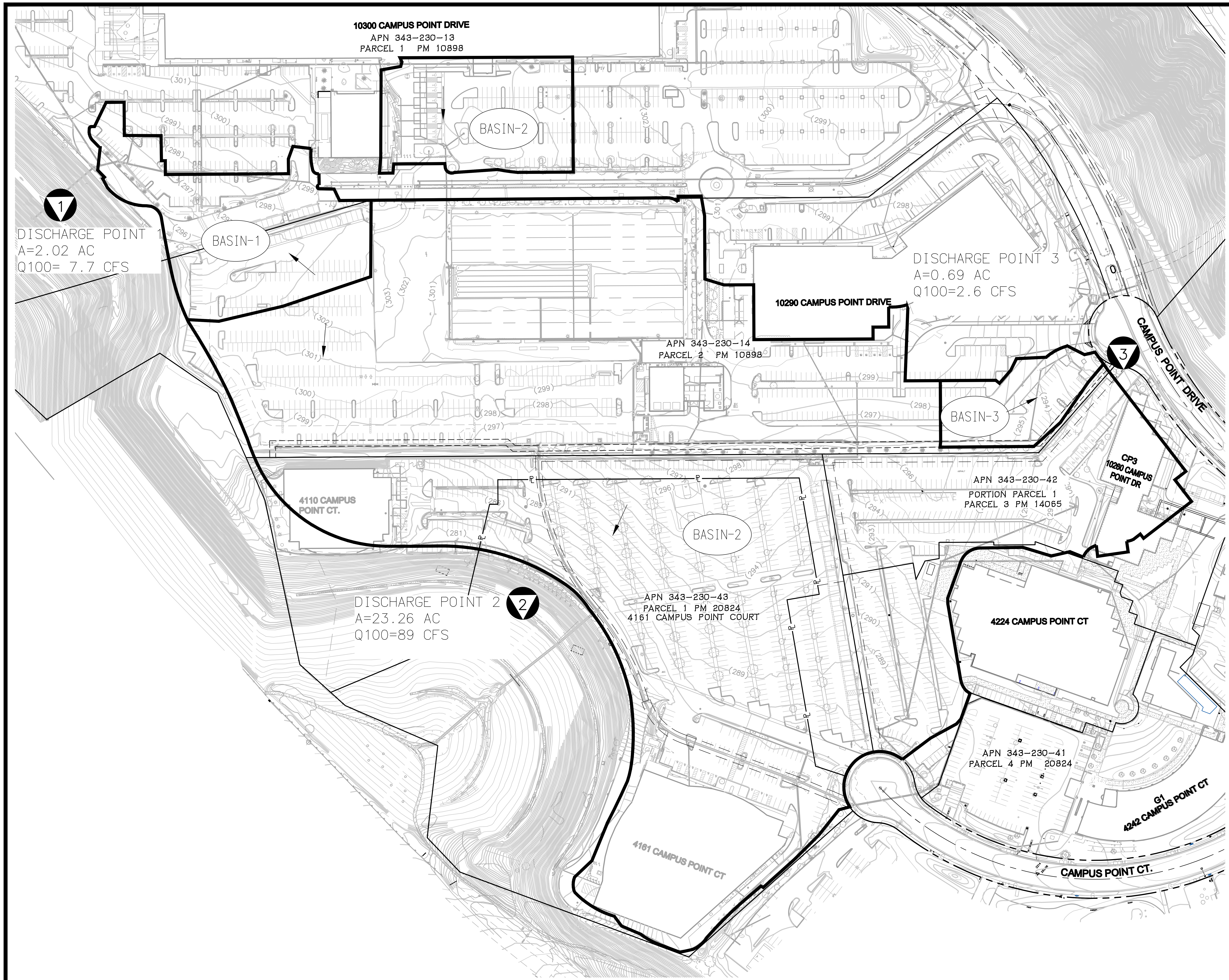


# LEGEND

| | |
|---|---|
| OVERALL BASIN LIMIT | ▬ |
| BASIN ID NUMBER | BASIN-X |
| FLOW DIRECTION | → |
| EXISTING STORM DRAIN | ═ ═ ═ |
| DISCHARGE POINT | ▼ 1 |

SCALE 1"=80'

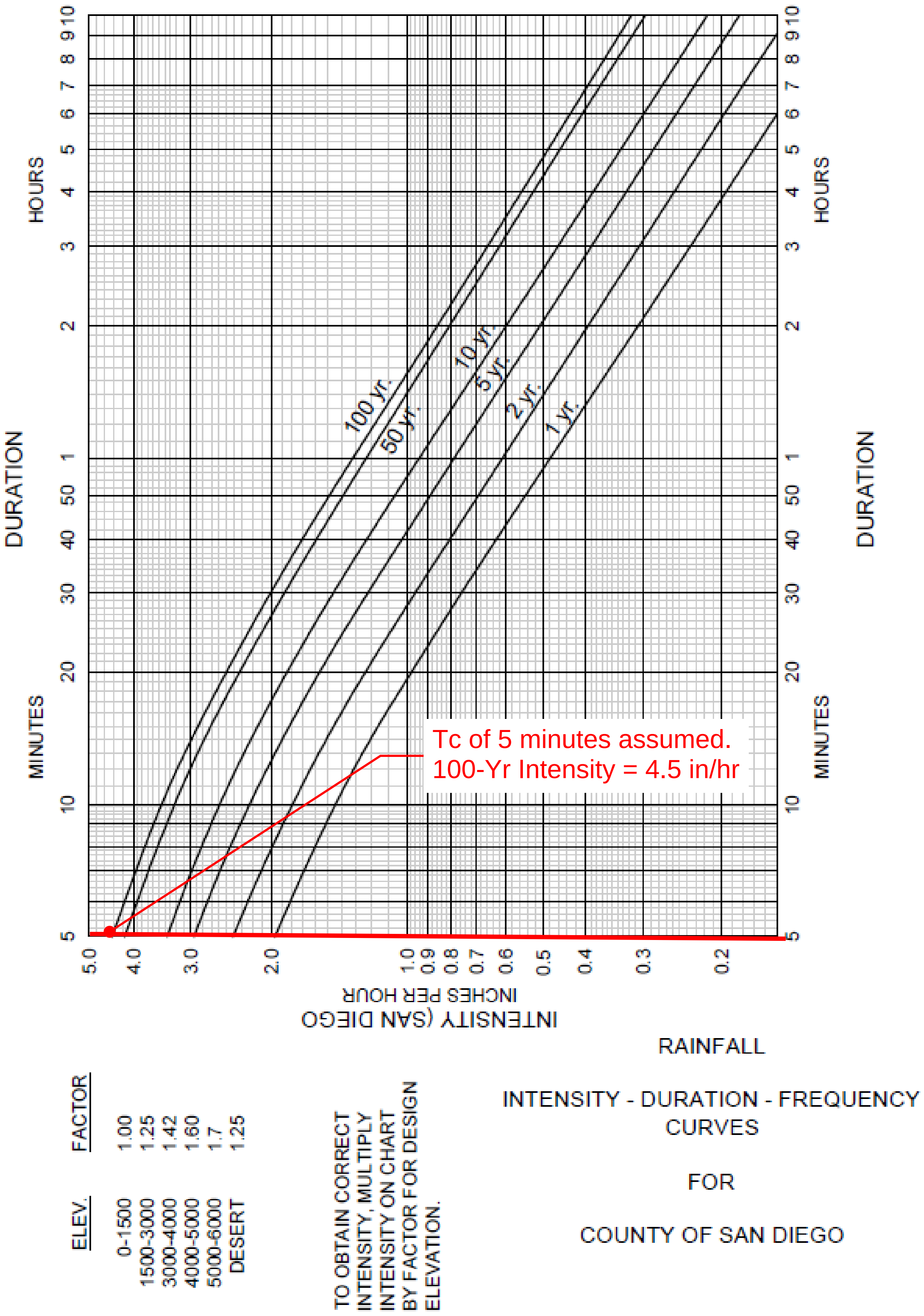
80 40 0 80 160 240

SCALE: 1"=80'

**Michael Baker**
**INTERNATIONAL**
9755 Clairemont Mesa Boulevard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

CAMPUS POINT NDP
On-Site Hydrologic Work Map Existing

\\SANDCA1FS1.BKR.MBAKERCORP.COM\HROOT\PDATA\174310 - CAMPUS PT NDP\CADD\STORMWATER\EXISTING CONDITION.DWG LEARY, CHRISTOPHER L 4/30/2020 6:48 PM



Tc of 5 minutes assumed.
100-Yr Intensity = 4.5 in/hr

| ELEV. | FACTOR |
|---|---|
| 0-1500 | 1.00 |
| 1500-3000 | 1.25 |
| 3000-4000 | 1.42 |
| 4000-5000 | 1.60 |
| 5000-6000 | 1.7 |
| DESERT | 1.25 |

TO OBTAIN CORRECT INTENSITY, MULTIPLY INTENSITY ON CHART BY FACTOR FOR DESIGN ELEVATION.

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

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Basin 1 Existing

| | | | | |
|---|---|---|---|---|
| Impervious Area | 74,792 | SF | 1.72 | ac |
| Pervious Area | 13,199 | SF | 0.30 | ac |
| Total | 87,991 | SF | 2.02 | ac |

C Value
Per City of San Diego DDM Section A.1.2

C= 0.85

Peak Flow Calculation
Q=CIA
Intensity determined using Figure A.1 of the DDM

$Q_{100} = C*I*A$

$Q_{100} =$ 7.7

Basin 2 Existing

|  |  |  |  |  |
|---|---|---|---|---|
| Impervious Area | 861,224 | SF | 19.77 | ac |
| Pervious Area | 151,981 | SF | 3.49 | ac |
| Total | 1,013,205 | SF | 23.26 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.85

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

$Q_{100}$ = C*I*A

$Q_{100}$ = 89.0

Basin 3 Existing

| | | | | |
|---|---|---|---|---|
| Impervious Area | 25,548 | SF | 0.59 | ac |
| Pervious Area | 4,508 | SF | 0.10 | ac |
| Total | 30056 | SF | 0.69 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.85

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 2.6

# Appendix C – Proposed Hydrology

*On-Site Hydrologic Work Map*
*Figure A-1 from the City DDM (Jan. 2017)*
*Hydraulic Routing Input and Output*

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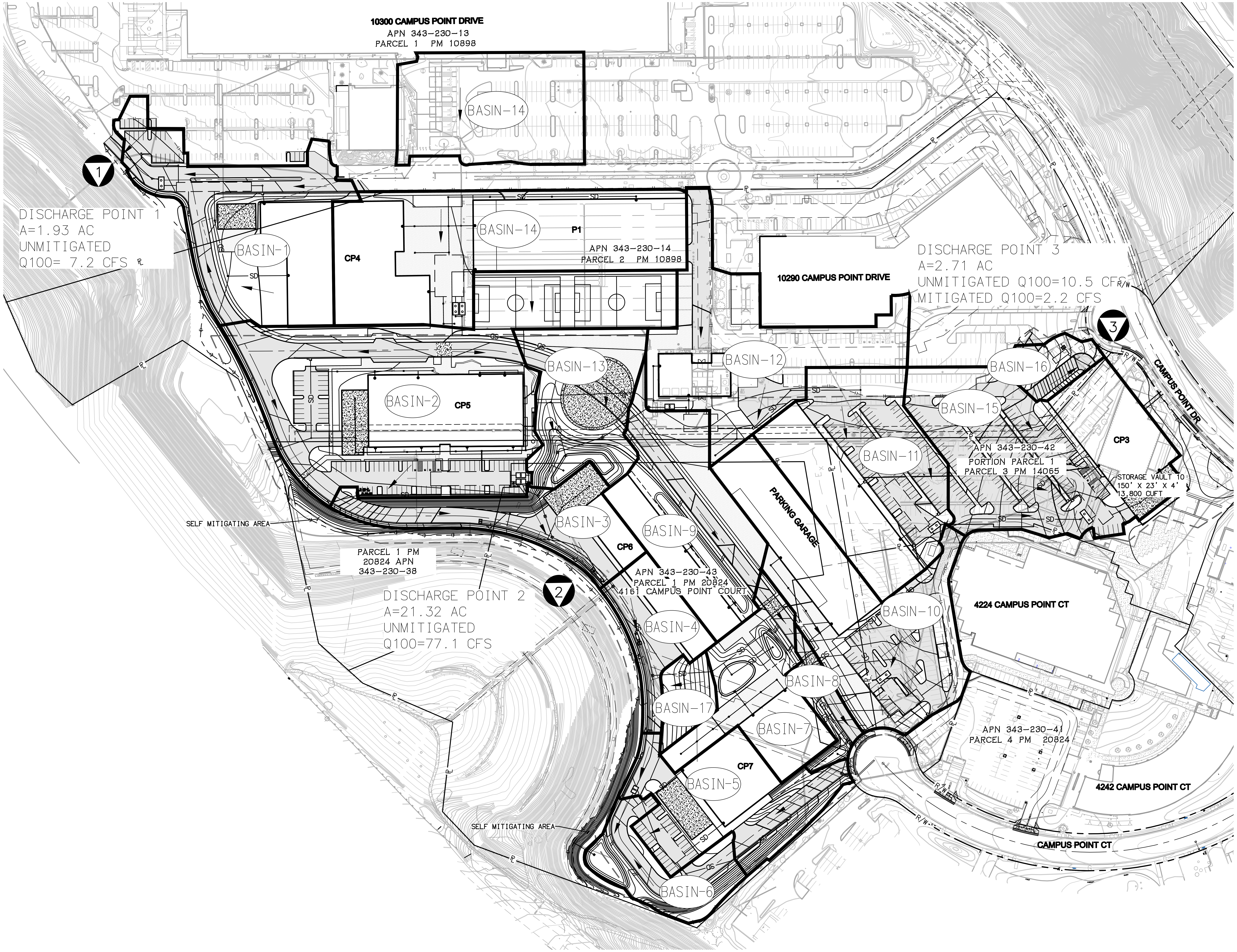

## LEGEND

| | |
|---|---|
| OVERALL BASIN LIMIT | ▬ |
| BASIN ID NUMBER | BASIN-X |
| FLOW DIRECTION | → |
| EXISTING STORM DRAIN | ═══ |
| DISCHARGE POINT | ▼1 |

\\SANDCA1FS1.BKR.MBAKERCORP.COM\HROOT\PDATA\174310 - CAMPUS PT NDP\CADD\STORMWATER\PROPOSED CONDITION V2.DWG LEARY, CHRISTOPHER L 4/30/2020 6:30 PM

**Michael Baker**
**INTERNATIONAL**
9755 Clairemont Mesa Boulevard
San Diego, CA 92124
Phone: (858) 614-5000 · MBAKERINTL.COM

CAMPUS POINT NDP
On-Site Hydrologic Work Map Proposed

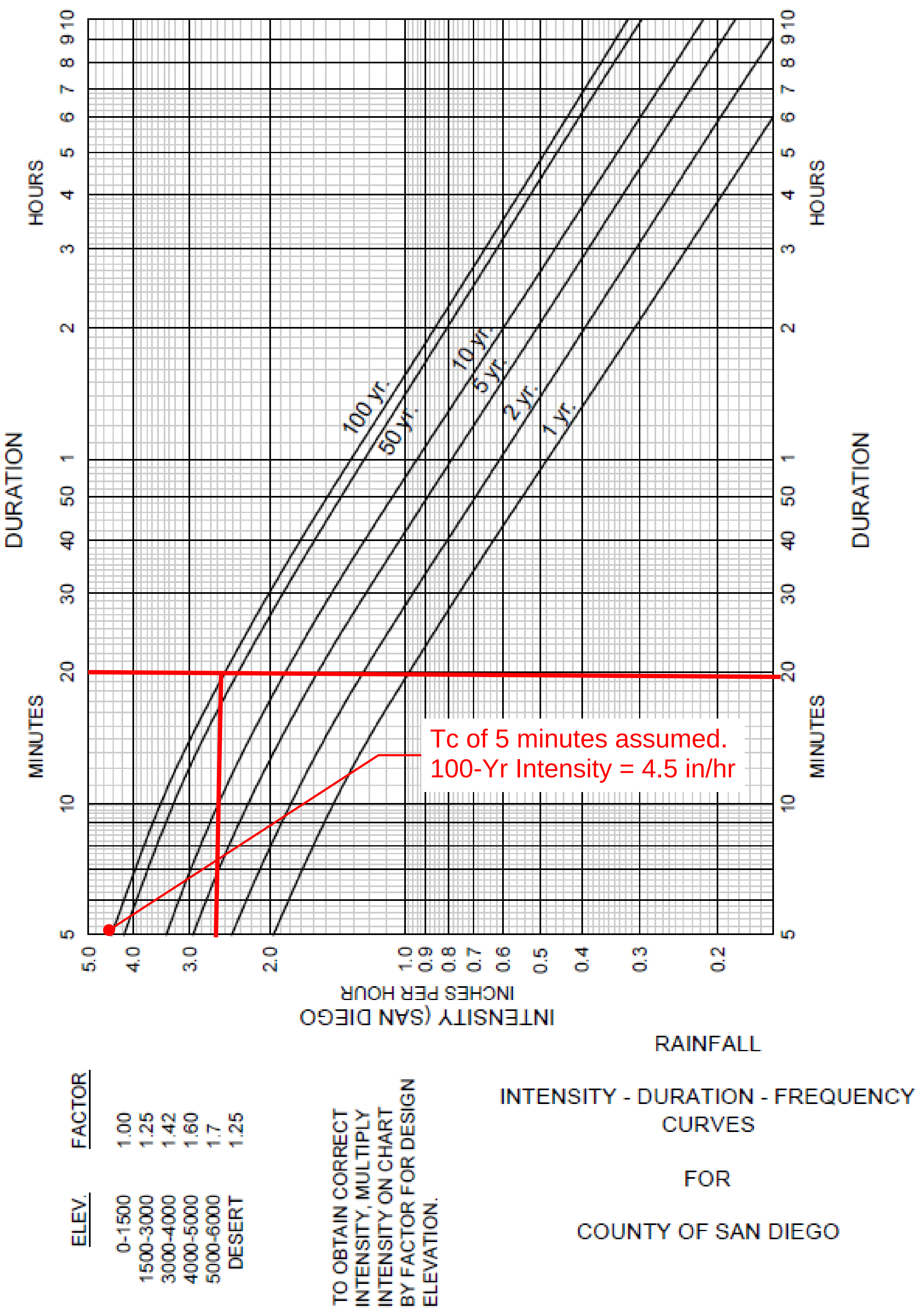

**Figure A-1. Intensity-Duration-Frequency Design Chart**

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Basin 1 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 67,383 | SF | 1.55 | ac |
| Pervious Area | 16,846 | SF | 0.39 | ac |
| Total | 84,229 | SF | 1.93 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.83

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 7.2

Basin 2 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 103,485 | SF | 2.38 | ac |
| Pervious Area | 68,990 | SF | 1.58 | ac |
| Total | 172,475 | SF | 3.96 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.71

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 12.7

Basin 3 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 33,820 | SF | 0.78 | ac |
| Pervious Area | 8,990 | SF | 0.21 | ac |
| Total | 42,810 | SF | 0.98 | ac |

C Value
Per City of San Diego DDM Section A.1.2

C= 0.82

Peak Flow Calculation
$Q_{100}$ = C*I*A
Intensity determined using Figure A.1 of the DDM

Q = C*I*A
$Q_{100}$ = 3.6

Basin 4 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 24,662 | SF | 0.57 | ac |
| Pervious Area | 763 | SF | 0.02 | ac |
| Total | 25,425 | SF | 0.58 | ac |

C Value
Per City of San Diego DDM Section A.1.2

C= 0.93

Peak Flow Calculation
$Q_{100}$ = C*I*A
Intensity determined using Figure A.1 of the DDM

Q = C*I*A
$Q_{100}$ = 2.4

Basin 5 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 46,767 | SF | 1.07 | ac |
| Pervious Area | 9,579 | SF | 0.22 | ac |
| Total | 56,346 | SF | 1.29 | ac |

C Value

Per City of San Diego DDM Section A.1.2

$C= 0.85$

Peak Flow Calculation

$Q=CIA$

Intensity determined using Figure A.1 of the DDM

$Q_{100} = C*I*A$

$Q_{100} = 4.9$

Basin 6 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 12,977 | SF | 0.30 | ac |
| Pervious Area | 15,234 | SF | 0.35 | ac |
| Total | 28,211 | SF | 0.65 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.63

*90% impervious is considered to be a conservative estimate for the site and may be revised during final

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

$Q_{100}$ = C*I*A

$Q_{100}$ = 1.8

Basin 7 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 33,512 | SF | 0.77 | ac |
| Pervious Area | 11,171 | SF | 0.26 | ac |
| Total | 44,683 | SF | 1.03 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.80

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 3.7

Basin 8 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 6,974 | SF | 0.16 | ac |
| Pervious Area | 4,650 | SF | 0.11 | ac |
| Total | 11,624 | SF | 0.27 | ac |

C Value

DMA is entirely natural land cover Type D

C= 0.71

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 0.9

Basin 9 Proposed

|  |  |  |  |  |
|---|---|---|---|---|
| Impervious Area | 48,007 | SF | 1.10 | ac |
| Pervious Area | 16,002 | SF | 0.37 | ac |
| Total | 64,009 | SF | 1.47 | ac |

C Value

DMA is entirely natural land cover Type D

C= 0.80

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 5.3

Basin 10 Proposed

|  |  |  |  |  |
|---|---|---|---|---|
| Impervious Area | 83,030 | SF | 1.91 | ac |
| Pervious Area | 9,226 | SF | 0.21 | ac |
| Total | 92,256 | SF | 2.12 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.89

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 8.5

Basin 11 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 71,916 | SF | 1.65 | ac |
| Pervious Area | 11,707 | SF | 0.27 | ac |
| Total | 83,623 | SF | 1.92 | ac |

C Value

DMA is entirely natural land cover Type D

$C= 0.87$

Peak Flow Calculation

$Q_{100} = C*I*A$

Intensity determined using Figure A.1 of the DDM

$Q = C*I*A$

$Q_{100} = 7.5$

Basin 12 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 64,480 | SF | 1.48 | ac |
| Pervious Area | 16,120 | SF | 0.37 | ac |
| Total | 80,600 | SF | 1.85 | ac |

C Value

DMA is entirely natural land cover Type D

C= 0.83

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

$Q_{100} = C*I*A$

$Q_{100} = 6.9$

Basin 13 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 24,098 | SF | 0.55 | ac |
| Pervious Area | 23,153 | SF | 0.53 | ac |
| Total | 47,251 | SF | 1.08 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.66

Peak Flow Calculation

Q=CIA

Intensity determined using Figure A.1 of the DDM

$Q_{100}$ = C*I*A

$Q_{100}$ = 3.2

Basin 14 Proposed

|  |  |  |  |  |
|---|---|---|---|---|
| Impervious Area | 147,970 | SF | 3.40 | ac |
| Pervious Area | 20,178 | SF | 0.46 | ac |
| Total | 168,148 | SF | 3.86 | ac |

C Value

DMA is entirely natural land cover Type D

C= 0.88

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 15.3

Basin 15 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 95,250 | SF | 2.19 | ac |
| Pervious Area | 10,583 | SF | 0.24 | ac |
| Total | 105,833 | SF | 2.43 | ac |

C Value

DMA is entirely natural land cover Type D

C= 0.89

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 9.7

Basin 16 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 5,276 | SF | 0.12 | ac |
| Pervious Area | 6,994 | SF | 0.16 | ac |
| Total | 12,270 | SF | 0.28 | ac |

C Value

Per City of San Diego DDM Section A.1.2

C= 0.61

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 0.8

Basin 17 Proposed

| | | | | |
|---|---|---|---|---|
| Impervious Area | 0 | SF | 0.00 | ac |
| Pervious Area | 11,434 | SF | 0.26 | ac |
| Total | 11,434 | SF | 0.26 | ac |

C Value

DMA is entirely natural land cover Type D

C= 0.35

Peak Flow Calculation

$Q_{100}$ = C*I*A

Intensity determined using Figure A.1 of the DDM

Q = C*I*A

$Q_{100}$ = 0.4

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Manual | 9.700 | 5 | 245 | 19,290 | ------ | ------ | ------ | Basin 15 - Q100 PR. Un-Mitigated |
| 2 | Reservoir | 1.366 | 5 | 260 | 19,285 | 1 | 4.55 | 12,228 | Discharge Location 3 |

# Hydrograph Report

## Hyd. No. 2

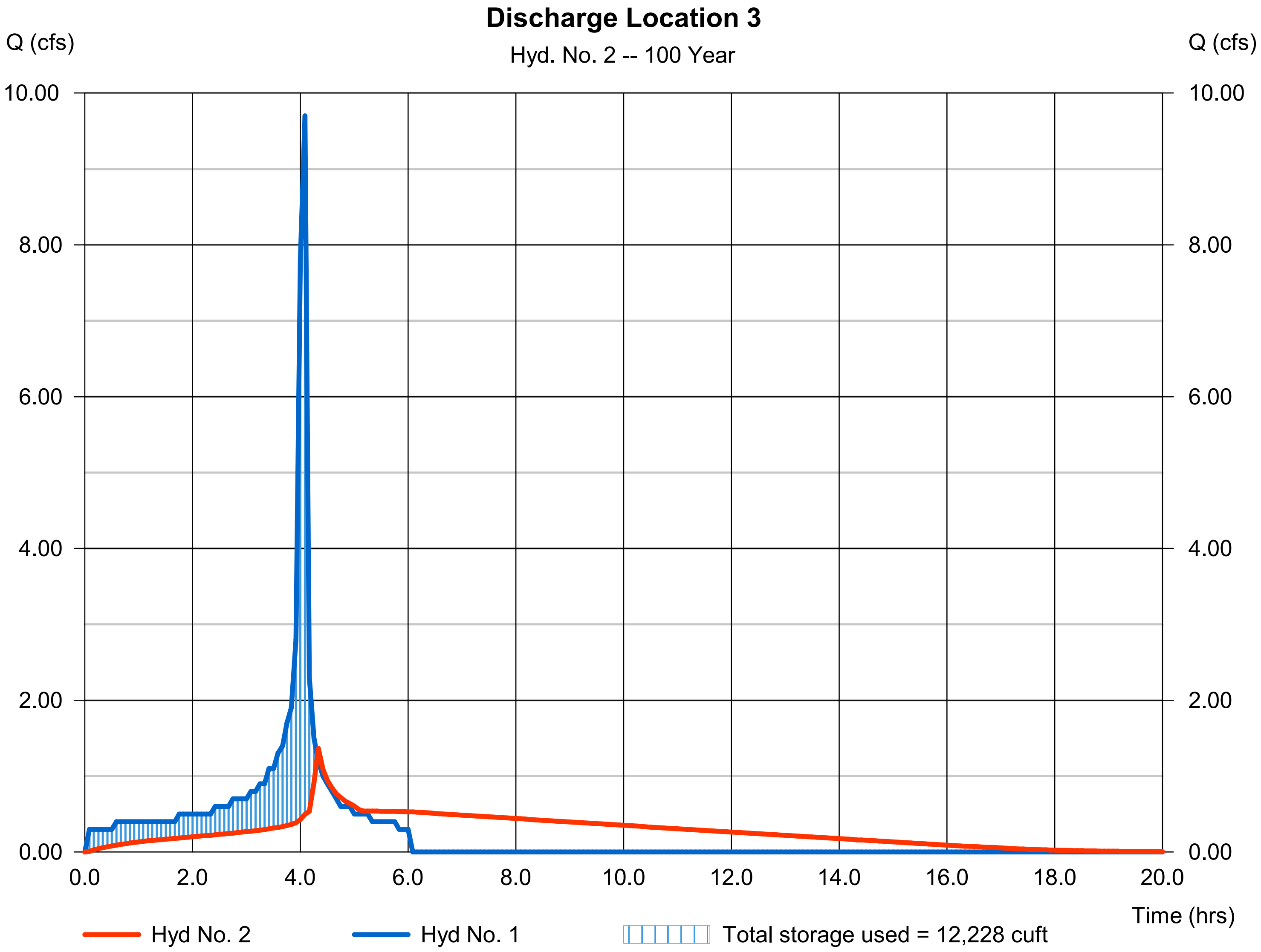
Discharge Location 3

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 5 min
Inflow hyd. No. = 1 - Basin 15 - Q100 PR. Un-Mitigated
Reservoir name = Storage Vaullt 10

Peak discharge = 1.366 cfs
Time to peak = 4.33 hrs
Hyd. volume = 19,285 cuft
Max. Elevation = 4.55 ft
Max. Storage = 12,228 cuft

---

Storage Indication method used.



# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 04 / 30 / 2020

## Pond No. 1 - Storage Vaullt 10

### Pond Data

**UG Chambers -**Invert elev. = 1.00 ft, Rise x Span = 4.00 x 23.00 ft, Barrel Len = 150.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 1.00 | n/a | 0 | 0 |
| 0.40 | 1.40 | n/a | 1,380 | 1,380 |
| 0.80 | 1.80 | n/a | 1,380 | 2,761 |
| 1.20 | 2.20 | n/a | 1,380 | 4,141 |
| 1.60 | 2.60 | n/a | 1,380 | 5,521 |
| 2.00 | 3.00 | n/a | 1,380 | 6,901 |
| 2.40 | 3.40 | n/a | 1,380 | 8,282 |
| 2.80 | 3.80 | n/a | 1,380 | 9,662 |
| 3.20 | 4.20 | n/a | 1,380 | 11,042 |
| 3.60 | 4.60 | n/a | 1,380 | 12,422 |
| 4.00 | 5.00 | n/a | 1,380 | 13,803 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 24.00 | 1.50 | 0.00 | 0.00 |
| **Span (in)** | = 24.00 | 1.50 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 1 | 0 | 0 |
| **Invert El. (ft)** | = 1.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 0.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 0.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | Yes | No | No |

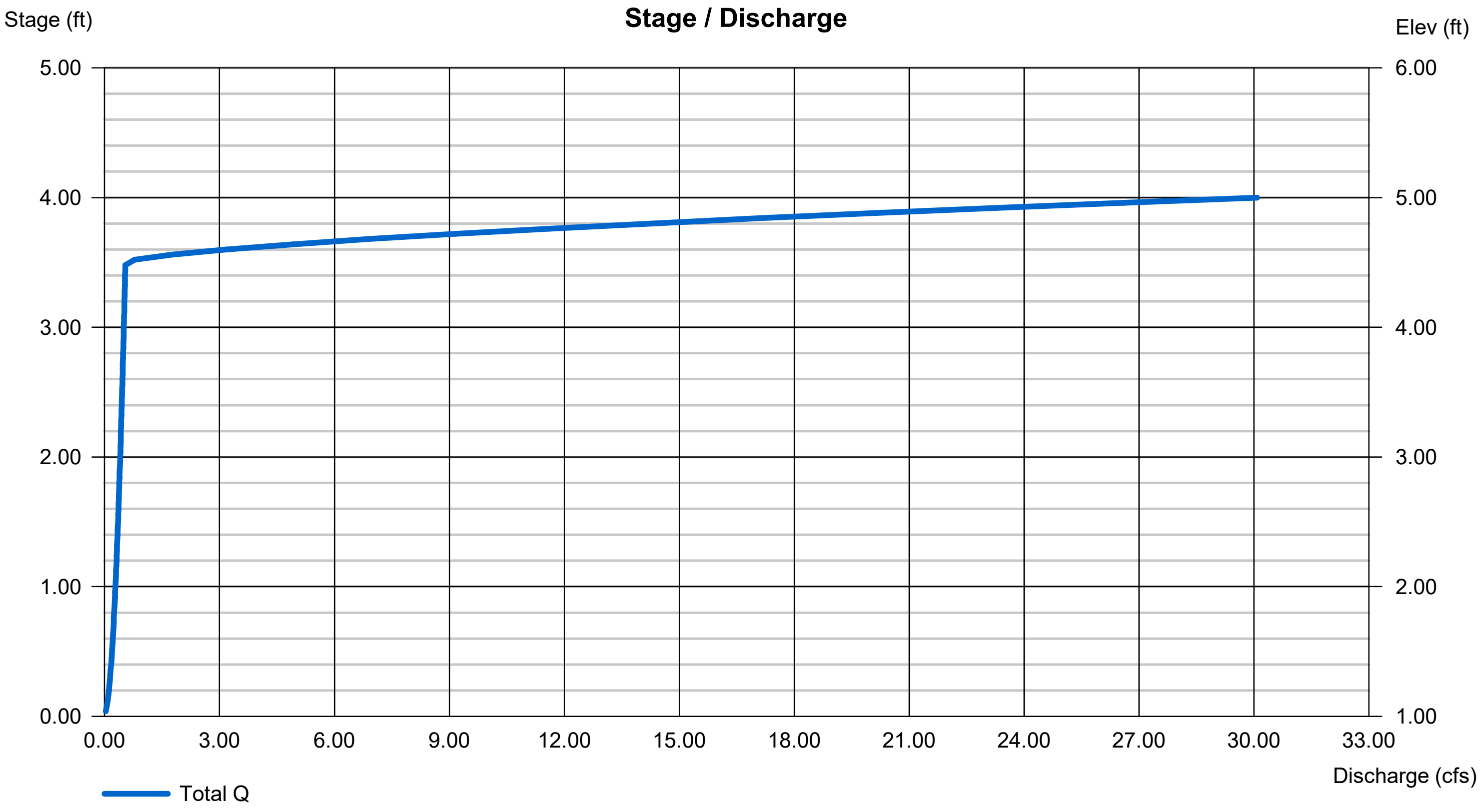
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 6.28 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 4.50 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = Rect | --- | --- | --- |
| **Multi-Stage** | = Yes | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Wet area)

**TW Elev. (ft)** = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



# Attachment 6
# Geotechnical and Groundwater Investigation Report

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

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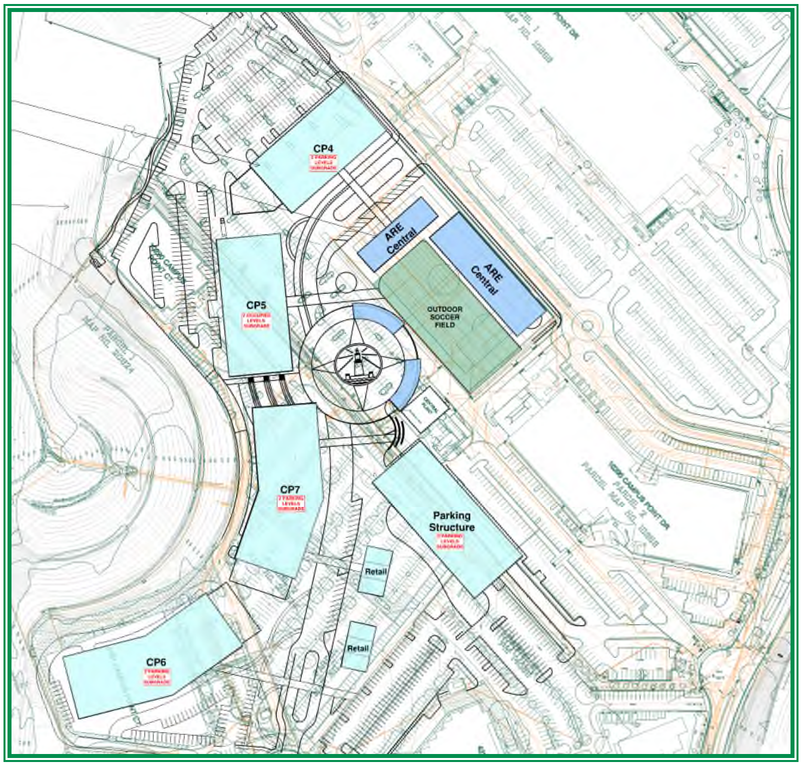
# GEOTECHNICAL INVESTIGATION



## CAMPUS POINTE COMPLEX
## 4110 & 4161 CAMPUS POINT COURT
## 10260 & 10290 CAMPUS POINT DRIVE
## SAN DIEGO, CALIFORNIA

**PREPARED FOR**

ALEXANDRIA®
**SAN DIEGO, CALIFORNIA**

**SEPTEMBER 19, 2019**
**PROJECT NO. G2415-52-01**

GEOCON

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2415-52-01
September 19, 2019

Alexandria Real Estate Equities, Inc.
10996 Torreyana Road, Suite 250
San Diego, California 92121

Attention: Mr. Christopher Clement

Subject: GEOTECHNICAL INVESTIGATION
CAMPUS POINTE COMPLEX
4110 AND 4161 CAMPUS POINT COURT
10260 AND 1290 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA

Dear Mr. Clement:

In accordance with your request and authorization of our Proposal No. LG-19212 dated June 5, 2019, we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards, and to assist in the design of the proposed building and associated improvements.

The accompanying report presents the results of our study and conclusions and recommendations pertaining to geotechnical aspects of the proposed project. The site is suitable for the proposed buildings and improvements provided the recommendations of this report are incorporated into the design and construction of the planned project.

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

Very truly yours,

GEOCON INCORPORATED

Matthew R. Love
RCE 84154

Shawn Foy Weedon
GE 2714

Michael C. Ertwine
CEG 2659

MATTHEW R. LOVE
C84154
CIVIL

SHAWN WEEDON
No. 2714
GEOTECHNICAL

MICHAEL C. ERTWINE
No. 2659
CERTIFIED ENGINEERING GEOLOGIST

MRL:SFW:MCE:kcd

(e-mail) Addressee

# TABLE OF CONTENTS

## TABLE OF CONTENTS (Concluded)

# GEOTECHNICAL INVESTIGATION

## 1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for a new commercial development located within the Campus Point business park in the City of San Diego, California (see Vicinity Map, Figure 1). The purpose of the geotechnical investigation is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may affect development of the property including faulting, liquefaction and seismic shaking based on the 2016 CBC seismic design criteria. In addition, we provided recommendations for remedial grading, shallow and deep foundations, concrete slabs-on-grade, concrete flatwork, pavement and retaining walls. We reviewed the following plans and geotechnical documents in preparation of this report:

1. *Preliminary Grading Plan, Campus Pointe, San Diego, California*, prepared by Michael Baker International, undated.

2. *Geotechnical Investigation, 10260 Campus Point Drive, San Diego, California*, prepared by Geocon Incorporated, dated February 15, 2019 (Project No. G2345-52-02).

3. *Preliminary Geotechnical Investigation, 10290 Campus Pointe Drive, San Diego, California*, prepared by Geocon Incorporated, dated June 11, 2015 (Project No. 07850-42-15).

4. *2nd Addendum to Geotechnical Investigation, 10290 Campus Pointe Drive, San Diego, California*, prepared by Geocon Incorporated, dated March 15, 2016 (Project No. 07850-42-15).

5. *Preliminary Fault Study, 10290 Campus Pointe Drive, San Diego, California*, prepared by Geocon Incorporated, dated May 27, 2015 (Project No. 7850-42-15).

6. *Report of Preliminary Geotechnical Investigation, Qualcomm Office Building, Eli Lillie Property, Campus Point Drive, San Diego, California*, prepared by Southern California Soil & Testing, Inc., dated October 13, 1995 (Project No. 9511205).

7. *Report of Fault Investigation, Qualcomm Office Building, Eli Lillie Property, Campus Point Drive, San Diego, California*, prepared by Southern California Soil & Testing, Inc., dated December 1, 1995 (Project No. 9511205).

8. *Final Report of Engineering Observation of Grading and Testing of Compacted Fill, Campus Point Lots 2 and 3, San Diego, California, TM 78-337. W.O. No. 70918*, prepared by Woodward-Clyde Consultants, dated March 7, 1980.

The scope of this investigation included reviewing readily available published and unpublished geologic literature (see List of References), performing engineering analyses, and preparing this report. We also advanced 16 exploratory borings to a maximum depth of about 85 feet, performed percolation/infiltration testing, obtained soil samples and performed laboratory testing. Appendix A presents the exploratory boring logs and details of the field investigation. The details of the laboratory tests and a summary of the test results are shown in Appendix B and on the boring logs in Appendix A. Appendix C presents previous exploratory excavation and laboratory data from Geocon and others. Appendix D presents a summary of our storm water management investigation.

## 2. SITE AND PROJECT DESCRIPTION

The subject property is located west of Campus Point Drive, north of the Campus Point Court terminus and east of Interstate 5 in San Diego, California (see Vicinity Map, Figure 1). The subject property is part of the existing Campus Point business park and includes the buildings addressed 4110 Campus Point Court, 4161 Campus Point Court, 10260 Campus Point Drive and 10290 Campus Point Drive (APN 343-230-3800, -4300, -4200, and -1400, respectively). The subject property currently possesses the two commercial buildings of 2- and 7-stories along with a central plant, soccer field, paved surface parking and drive areas and other associated improvements as shown on the Existing Site Plan.

Existing Site Plan

The majority of the site is generally flat to slightly sloping with elevations ranging from 265 feet Mean Sea Level (MSL) in the southwestern portion of the site to 305 feet MSL in the northeastern portion of the site. The western portion of the property includes a descending 2:1 (horizontal to vertical) slope with maximum height of approximately 150 feet. Additionally, a soil nail wall with maximum height of 40 feet was recently constructed by Caltrans to the west of 4161 Campus Point Court. Access to the site is from Campus Point Court to the south or Campus Point Drive to the east.

Based on a preliminary site plan prepared by LPA Design Studio, we understand the Campus Pointe complex will be improved to include the structures presented in Table 2.1 and shown on the Geologic Map, Figure 2. The existing structures addressed as 4110 and 4161 Campus Point Court will be demolished to develop the proposed structures. The structures addresses as 10260 and 10290 Campus Point Drive will remain in-use.

TABLE 2.1
PROPOSED BUILDING SUMMARY

| Building Designation | Location on Property | Building Summary |
|---|---|---|
| CP4 | North | 4 Story Office Building over 2 Levels Subterranean Parking |
| CP5 (Leidos) | North | 5 Story Office Building with 2 Levels Subterranean |
| CP6 | West | 4 Story Office Building over 2 Levels Subterranean Parking |
| CP7 | West-Central | 4 Story Office Building over 2 Levels Subterranean Parking |
| Alexandria Central (x2) | Northeast | 1 Story Office At-Grade |
| Retail (x2) | Southeast | 1 Story Retail At-Grade |
| Parking Structure | East | 6-Level Parking Garage with 2 Levels Subterranean |

The locations, site descriptions and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, and discussions with project personnel. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

## 3. PREVIOUS GRADING

Woodward-Clyde Consultants (WCC) performed a geotechnical investigation for the Campus Point development site in 1978. The development originally consisted of steep hillside topography with a prominent north trending ridge line sloping away to canyon drainages to the east and west. Elevations ranged from a high of about 350 feet above Mean Sea Level (MSL) on the southern portion of the development near Genesee Avenue to a low of 130 feet MSL in the bottom of canyon on the west side of the ridge. The general geologic conditions consisted of surficial soil composed of undocumented fill, topsoil, landslide debris and alluvium overlying formational materials of the Very Old Paralic

Deposits (previously called the Lindavista Formation), Scripps Formation and Ardath Shale. The 1978 report identified that faulting was present within the development. The faulting was not considered active and would not impact site development. A landslide was identified within the limits of grading to the southeast with relatively shallow features. The landslide was likely removed and replaced with properly compacted fill. The existing slopes were determined to be stable in their current and graded configuration. Groundwater and seepage conditions were not observed during their field investigation.

Grading of the development occurred in 1979 which created large, sheet-graded pads with maximum cuts from natural grade of approximately 50 feet and fill of about 120 feet deep on the western portion of the overall development adjacent to Interstate 5. The scope of the grading also included the undercutting of highly expansive soil, removal of landslide debris, removal of undocumented fill along Genesee Avenue and the proper burial and compaction of oversize rock at least 20 feet below finish grades. WCC provided the testing and observation services during grading operations consisting of performing laboratory and compaction testing. The field density test results indicated that the fill soil was placed at a dry density of at least 90 percent of the laboratory maximum dry density.

Subsequent to the mass grading observed by WCC, Geocon Incorporated performed a supplemental geotechnical investigation in November 1980 to evaluate if landslide debris was present on the development after completion of mass grading operations. The scope of work included the excavation of 14 exploratory trenches and one large-diameter boring. The report indicated that landsliding was likely present to the east of Campus Point Drive, but it would likely not affect development of original Lots 2 and 3 (10260 Campus Point Drive). Geocon’s Boring B-1 (1980), just south of the existing building, encountered approximately 20 feet of fill that was likely placed during removal and replacement of previous surficial materials or a shallow landslide on the site.

## 4. GEOLOGIC SETTING

The project site is located within the Peninsular Ranges Geomorphic Province. The region is characterized by northwest-trending structural blocks and intervening fault zones. The rock types in the Peninsular Ranges include igneous intrusive rocks associated with the Cretaceous-age Southern California Batholith, intruded into older metavolcanic and/or metasedimentary units in western and central San Diego County. In the western part of the county and along the coastal areas, the basement rocks are overlain by a thick sequence of Cretaceous to Tertiary-age marine and non-marine sedimentary formations, which are the result of transgressive and regressive cycles of the sea. These deposits in turn are partially covered by several Quaternary-age terrace deposits that are geologically younger to the west.

## 5. SOIL AND GEOLOGIC CONDITIONS

We encountered two surficial soil units (consisting of previously placed fill and topsoil) and two formational units (consisting of Scripps Formation and Ardath Shale). The occurrence, distribution, and description of each unit encountered is shown on the Geologic Map, Figure 2 and on the boring logs in Appendix A. The Geologic Cross-Sections, Figure 3, show the approximate subsurface relationship between the geologic units. The surficial soil and geologic units are described herein in order of increasing age.

### 5.1 Previously Placed Fill (Qpf)

Previously placed fill is located across a majority of the property and we encountered the fill in our current geotechnical borings B-1 through B-9, B-11, B-13 and B-14. We expect the fill was placed during mass grading in 1979 to 1980 under the observation and compaction testing of Woodward-Clyde Consultants (WCC). We encountered the fill with a thickness of 90 feet; however, we expect a maximum thickness of about 110 feet. The Geologic Map, Figure 2, provides the approximate fill thickness contours for the site. We expect most of the long-term fill settlement has likely occurred since the fill was placed roughly 40 years ago. The fill was placed over the Scripps Formation and Ardath Shale, which has provided suitable support for the existing fill soil.

The fill consists of medium dense to dense, damp to moist, silty to clayey, fine to medium sand and sandy silt. Based on our laboratory tests the fill has a “very low” to “medium” expansion potential (expansion index [EI] of 90 or less). The upper portion of the previously placed fill is not considered suitable for the proposed improvements and remedial grading will be required.

### 5.2 Topsoil (Qt – Unmapped)

We encountered topsoil in Boring B-8 below the fill and above the Ardath Shale. The topsoil is about 5 feet thick and consists of dark gray to black, sandy to silty clay. The topsoil was likely left in place during the original grading operations and is very limited in area. We do not expect we will encounter topsoil during the construction operations.

### 5.3 Scripps Formation (Tsc)

Tertiary-age Scripps Formation exists below the fill in Borings B-1, B-2, B-5 through B-7 and B-11 through B-16. The Scripps Formation is generally brown, yellowish brown to light gray, silty to clayey sandstone and sandy siltstone/claystone with layers of strongly cemented material. Our laboratory tests and experience indicate the Scripps Formation possesses a “very low” to “medium” expansion potential (expansion index of 90 or less). The Scripps Formation is generally considered suitable for support of properly compacted structural fill and improvements.

### 5.4 Ardath Shale (Ta)

We encountered the Tertiary-age Ardath Formation below the fill in Borings B-8 through B-10 and below the Scripps Formation in Boring B-11. The Tertiary-age formation typically consists of olive-gray and yellowish brown, sandy to clayey siltstone. The upper portion may contain thin beds of medium-grained sandstone similar to the overlying Scripps Formation (Kennedy and Tan, 2008). The Ardath Shale possesses areas of highly cemented concretionary beds. The Ardath Shale is generally considered suitable for support of properly compacted structural fill and improvements.

## 6. GROUNDWATER

We did not encounter groundwater during our site investigation. However, we did encounter minor seepage within the fill materials in Boring B-15. It is not uncommon for shallow seepage conditions to develop where none previously existed when sites are irrigated or infiltration is implemented. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. During the rainy season, seepage conditions may develop that would require special consideration. Proper surface drainage will be important to future performance of the project. We expect groundwater is deeper than about 200 feet below existing grade. We do not expect groundwater to be encountered during construction of the proposed development or adversely impact future construction and performance of the existing building.

## 7. GEOLOGIC HAZARDS

### 7.1 Geologic Hazard Category

The City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 34 defines the site as a Hazard Category 52: *Other Level Areas, gently sloping to steep terrain, favorable geologic structure, Low Risk* and Hazard Category 25*: Ardath - Neutral or favorable geologic structure.* Two east-west trending faults are mapped to cross the southern and central portion of the subject site and are mapped within an area defined as Hazard Category 12: *Fault Zones – Potentially Active, Inactive, Presumed Inactive, or Activity Unknown.* Figure 4 presents the San Diego Seismic Safety Study map for the site.

### 7.2 Faulting

The site is not located within a State of California Earthquake Special Study Zone; however, based on published geologic literature (Kennedy and Tan, 2008) and the City of San Diego Seismic Safety Study (City of San Diego, 2008), the east-west trending, Salk Fault crosses the property. The Salk Fault is described as a down-to-the-south, normal fault juxtaposing the Tertiary-age Scripps Formation against the older Ardath Formation leaving the overlying Pleistocene-age Very Old Paralic Deposits un-deformed and is categorized as potentially active, inactive, presumed inactive, or activity unknown

(City of San Diego, 2008). The Regional Geologic Map, Figure 5, shows the mapped limits of the geologic units at the site.

The Pleistocene-age Very Old Paralic Deposits Unit 10, which correlates to the Tecolote Geologic Terrace, deposited roughly 800,000 years ago. Therefore, these faults are not considered active (indicating fault movement in the last 11,000 years) but rather classified as Potentially Active (movement of at least 11,000 years old but younger than 2 million years) and have not shown movement for at least 800,000 years.

Based on our review of previous fault studies performed on the property and the project plans, potentially active faults may traverse the proposed eastern ARE Central Building and Building CP5.

We performed the referenced Preliminary Fault Study (Geocon, 2015) for a site to the north (10290 Campus Point Drive) of the subject site that included review of previous fault studies and additional fault trenching. Our investigation concluded that previous grading at the site had removed the Quaternary deposits from the site making a direct determination of fault activity difficult; however, the east-west orientation of the observed faults indicates they are not part of the current tectonic setting. The minor displacements and poorly developed to non-existent fault gouge observed are indicative of low-risk fault rupture hazard.

Therefore, we opine, from a geotechnical standpoint, active faults do not cross the subject property and that the faulting identified at the site is at most potentially active and does not pose a risk of fault rupture hazard to the project. We opine setback zones are not required to mitigate fault rupture hazard.

## 7.3 Seismicity

According to the computer program *EZ-FRISK* (Version 7.65), 10 known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the nearest known active fault is the Newport-Inglewood Fault system, located approximately 3 miles southwest of the site, and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood Fault or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.48g, respectively. Table 7.3.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS 2008 and Chiou-Youngs (2007) NGA USGS2008 acceleration-attenuation relationships.

## TABLE 7.3.1
## DETERMINISTIC SPECTRA SITE PARAMETERS

| Fault Name | Distance from Site (miles) | Maximum Earthquake Magnitude (Mw) | Peak Ground Acceleration | | |
|---|---|---|---|---|---|
| | | | Boore-Atkinson 2008 (g) | Campbell-Bozorgnia 2008 (g) | Chiou-Youngs 2007 (g) |
| Newport-Inglewood | 3 | 7.50 | 0.38 | 0.39 | 0.48 |
| Rose Canyon | 3 | 6.90 | 0.33 | 0.38 | 0.42 |
| Coronado Bank | 17 | 7.40 | 0.17 | 0.13 | 0.16 |
| Palos Verdes Connected | 17 | 7.70 | 0.20 | 0.15 | 0.19 |
| Elsinore | 34 | 7.85 | 0.13 | 0.09 | 0.11 |
| Earthquake Valley | 42 | 6.80 | 0.06 | 0.05 | 0.04 |
| Palos Verdes | 48 | 7.30 | 0.07 | 0.05 | 0.05 |

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008 and Chiou-Youngs (2007) NGA USGS2008 in the analysis. Table 7.3.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

## TABLE 7.3.2
## PROBABILISTIC SEISMIC HAZARD PARAMETERS

| Probability of Exceedence | Peak Ground Acceleration | | |
|---|---|---|---|
| | Boore-Atkinson, 2008 (g) | Campbell-Bozorgnia, 2008 (g) | Chiou-Youngs, 2007 (g) |
| 2% in a 50 Year Period | 0.47 | 0.50 | 0.56 |
| 5% in a 50 Year Period | 0.31 | 0.32 | 0.35 |
| 10% in a 50 Year Period | 0.22 | 0.22 | 0.23 |

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

## 7.4 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects the ground surface. The potential for ground rupture is considered to be very low due to the absence of active faults at the subject site.

## 7.5 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface and soil densities are less than about 70 percent of the maximum dry densities. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. Due to the lack of a permanent, near-surface groundwater table and the very dense nature of the underlying fill and formational materials, liquefaction potential for the site is considered very low.

## 7.6 Storm Surge, Tsunamis, and Seiches

Storm surges are large ocean waves that sweep across coastal areas when storms make landfall. Storm surges can cause inundation, severe erosion and backwater flooding along the water front. The site is located approximately 1½ miles from the Pacific Ocean and is at an elevation of about 265 feet or greater above Mean Sea Level (MSL). Therefore, the potential of storm surges affecting the site is considered low.

A tsunami is a series of long period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The County of San Diego Hazard Mitigation Plan (2010) maps zones of possible tsunami inundation for coastal areas throughout the county. The site is not included within one of these high-risk hazard areas, and the site is at a minimum elevation of 190 above feet MSL and is about 1½ miles from the Pacific Ocean. Therefore, the potential for the site to be affected by a tsunami is negligible.

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. The site is not located in the vicinity of or downstream from such bodies of water. Therefore, the risk of seiches affecting the site is negligible.

## 7.7 Landslides

We did not observe evidence of previous or incipient slope instability on the hillside during our reconnaissance. The City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 34 have mapped a landslide area approximately 300 feet southeast of the property on the descending slope on the east side of Campus Point Drive. Map Sheet 34 defines the area as Hazard Category 21: *Landslides, confirmed, known, or highly suspected*. We do not consider the potential for a landslide to be a significant hazard to this project. Lateral movement associated with slope creep could occur to structures and improvements located adjacent to slopes.

## 7.8 Slope Stability

Slope stability analyses for the existing fill slopes with inclinations as steep as 2:1 (horizontal to vertical) indicate a calculated factor of safety of at least 1.5 under static conditions for both deep-seated and surficial failure. Appendix E presents the results of the slope stability analyses.

We performed the slope stability analyses based on the interpretation of geologic conditions encountered during our field investigation. Additional analyses may be required during the grading operations if the geologic conditions vary significantly. We performed the slope stability analyses using the two-dimensional computer program *GeoStudio2014* created by Geo-Slope International Ltd. The existing and proposed slopes should be stable from shallow sloughing conditions provided the recommendations for grading and drainage are incorporated into the design and construction of the proposed slopes.

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

# 8. CONCLUSIONS AND RECOMMENDATIONS

## 8.1 General

8.1.1 We did not encounter soil or geologic conditions during our exploration that would preclude the proposed development, provided the preliminary recommendations presented herein are followed and implemented during design and construction. We will provide supplemental recommendations if we observe variable or undesirable conditions during construction, or if the proposed construction will differ from that anticipated herein.

8.1.2 With the exception of possible moderate to strong seismic shaking, we did not observe or know of significant geologic hazards to exist on the site that would adversely affect the proposed project.

8.1.3 Based on our review of previous fault studies performed on the property, faults are present at the subject site and cross adjacent the proposed eastern ARE Central Building and Buildings CP5 and CP6. We opine the faults crossing the property are potentially active and do not pose a risk of fault rupture hazard to the project. Structural setback zones are not required to mitigate fault rupture hazard.

8.1.4 Our field investigation indicates the site is underlain by previously placed fill, Tertiary-age Scripps Formation and Tertiary-age Ardath Formation. The previously placed fill ranges up to 100 feet below existing grades, where present, and possesses a potential for future settlement on the range of about ½ inch to 2 inches. The design team will need to evaluate the tolerances of the proposed buildings to the settlement estimates provided herein and determine if a deep foundation extending through the fill is needed.

8.1.5 We did not encounter groundwater during our subsurface exploration and we do not expect it to be a constraint to project development. However, we did encounter seepage within the fill materials in Boring B-15 at a depth of about 59 feet, Seepage within surficial soils and rock materials may be encountered during the grading operations, especially during the rainy seasons.

8.1.6 Excavation of the existing fill, Scripps Formation and Ardath Shale should generally be possible with moderate to heavy effort using conventional, heavy-duty equipment during grading and trenching operations. We expect the Scripps Formation and Ardath Shale may be difficult to excavate and could generate oversize material that may require special handling.

8.1.7 Proper drainage should be maintained in order to preserve the engineering properties of the fill in both the building pads and slope areas. Recommendations for site drainage are provided herein.

8.1.8 We performed a storm water management investigation to help evaluate the potential for infiltration on the property. Based on the results of our field infiltration testing and laboratory testing, we opine full or partial infiltration on the property should be considered infeasible as discussed in Appendix D.

8.1.9 Based on our review of the project plans, we opine the planned development can be constructed in accordance with our recommendations provided herein. We do not expect the planned development will destabilize or result in settlement of adjacent properties.

8.1.10 Surface settlement monuments and canyon subdrains will not be required on this project.

## 8.2 Excavation and Soil Characteristics

8.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavation of the formational materials will require very heavy effort and may generate oversized material using conventional heavy-duty equipment during the grading operations. Oversized rock (rocks greater than 12-inches in dimension) may be generated with the formational materials that can be incorporated into landscape use or deep compacted fill areas, if available.

8.2.2 The soil encountered in the field investigation is considered to be “expansive” (expansion index [EI] of greater than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 8.2.1 presents soil classifications based on the expansion index. We expect a majority of the soil encountered possess a “very low” to “medium” expansion potential (EI of 90 or less) in accordance with ASTM D 4829.

### TABLE 8.2.1
### EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

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

8.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the locations tested possess "S0" sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. However, some areas of the Scripps Formation possess "S1" to "S3" water-soluble sulfate contents and additional concrete design recommendations may be encountered during construction. Table 8.2.2 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration. We should perform additional laboratory water-soluble sulfate testing during grading operations to evaluate the sulfate exposure at finish grade elevations of the proposed structure.

**TABLE 8.2.2**
**REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS**

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

*Maximum water to cement ratio limits do not apply to lightweight concrete

8.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements susceptible to corrosion are planned.

## 8.3 Grading

8.3.1 Grading should be performed in accordance with the recommendations provided in this report, the Recommended Grading Specifications contained in Appendix F and the City of San Diego Land Development Manual. Geocon Incorporated should observe the grading operations on a full-time basis and provide testing during the fill placement.

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

8.3.3 Site preparation should begin with the removal of deleterious material, debris, and vegetation. The depth of vegetation removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site. Asphalt and concrete should not be mixed with the fill soil unless approved by the Geotechnical Engineer.

8.3.4 Abandoned foundations and buried utilities (if encountered) should be removed and the resultant depressions and/or trenches should be backfilled with properly compacted material as part of the remedial grading.

8.3.5 The upper 3 feet of materials within the building pad areas should be removed and replaced with properly compacted fill. Additionally, the removals should be extended for buildings where formational materials are near or at grade such that at least 2 feet of fill will be below the bottom of the footings. These deepened removals (i.e. 2-foot below footing) could be required within the fill areas based on the conditions observed during grading. The bottom of the excavations should be sloped 1 percent to the adjacent street or deepest fill. The removals should extend at least 5 feet outside the perimeter of the proposed building and/or footings, where possible. The upper 1 to 2 feet of the existing materials outside the building pad and within the parking lot and driveways should be removed and replaced with properly compacted fill. Prior to any fill soil being placed, the existing ground surface should be scarified, moisture conditioned as necessary, and compacted to a depth of at least 12 inches. Deeper removals may be required if saturated or loose fill soil is encountered. A representative of Geocon should be on-site during removals to evaluate the limits of the remedial grading. Table 8.3.1 provides a summary of the grading recommendations.

8.3.6 We understand that storm water management basins are being considered for the northeastern portion of the property. These basins should not be undercut and the formational materials should be exposed at the base of the basins if infiltration is planned. The surrounding slopes for the basins should be included in the remedial grading to expose competent materials and replaced with compacted fill.

## TABLE 8.3.1
## SUMMARY OF GRADING RECOMMENDATIONS

| Area | Removal Requirements |
|---|---|
| Building Pads | Removal of Upper 3 Feet of Existing Materials |
| Building Pads (Formation Near Grade)* | Undercut 2 Feet Below Bottom of Footing |
| Building Pads (Removal Limits) | 5 Feet Outside of Building Pad/Footing Area |
| Site Development | Removal of Upper 1 to 2 Feet of Existing Materials |
| Storm Water Basins (Unlined) | Remove to Formational Materials |
| Exposed Bottoms of Remedial Grading | Scarify Upper 12 Inches |

*Removal below footings could be required for fill areas based on conditions observed during grading.

8.3.7 Some areas of overly wet and saturated soil could be encountered due to the existing landscape and pavement areas. The saturated soil would require additional effort prior to placement of compacted fill or additional improvements. Stabilization of the soil would include scarifying and air-drying, removing and replacement with drier soil, use of stabilization fabric (e.g. Tensar TX7 or other approved fabric), or chemical treating (i.e. cement or lime treatment).

8.3.8 The contractor should be careful during the remedial grading operations to avoid a “pumping” condition at the base of the removals. Where recompaction of the excavated bottom will result in a “pumping” condition, the bottom of the excavation should be tracked with low ground pressure earthmoving equipment prior to placing fill. If needed to improve the stability of the excavation bottoms, reinforcing fabric or 2- to 3-inch crushed rock can be placed prior to placement of compacted fill.

8.3.9 The site should then be brought to final subgrade elevations with fill compacted in layers. In general, soil native to the site is suitable for use from a geotechnical engineering standpoint as fill if relatively free from vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM Test Procedure D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations.

8.3.10 Import fill (if necessary) should consist of the characteristics presented in Table 8.3.2. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

TABLE 8.3.2
SUMMARY OF IMPORT FILL RECOMMENDATIONS

| Soil Characteristic | Values |
|---|---|
| Expansion Potential | "Very Low" to Medium (Expansion Index of 90 or less) |
| Particle Size | Maximum Dimension Less Than 3 Inches |
| | Generally Free of Debris |

## 8.4 Subdrains

8.4.1 With the exception of retaining wall drains, we do not expect the installation of other subdrains.

## 8.5 Excavation Slopes, Shoring and Tiebacks

8.5.1 The recommendations included herein are provided for stable excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

8.5.2 Temporary excavations should be made in conformance with OSHA requirements and as directed by the assigned competent person in the field (contractor). In general, special shoring requirements may not be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be sloped back at an appropriate inclination. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

8.5.3 The design of temporary shoring is governed by soil and groundwater conditions, and by the depth and width of the excavated area. Continuous support of the excavation face can be provided by a system of soldier piles and wood lagging or sheet piles. Excavations exceeding 15 feet may require soil nails, tieback anchors or internal bracing to provide additional wall restraint.

8.5.4 The condition of existing buildings, streets, sidewalks, and other structures/improvements around the perimeter of the planned excavation should be documented prior to the start of shoring and excavation work. Special attention should be given to documenting existing cracks or other indications of differential settlement within these adjacent structures, pavements and other improvements. Underground utilities sensitive to settlement should be videotaped prior to construction to check the integrity of pipes. In addition, monitoring points should be established indicating location and elevation around the excavation and upon existing buildings. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter. Inclinometers should be installed and monitored behind any shoring sections that will be advanced deeper than 30 feet below the existing ground surface.

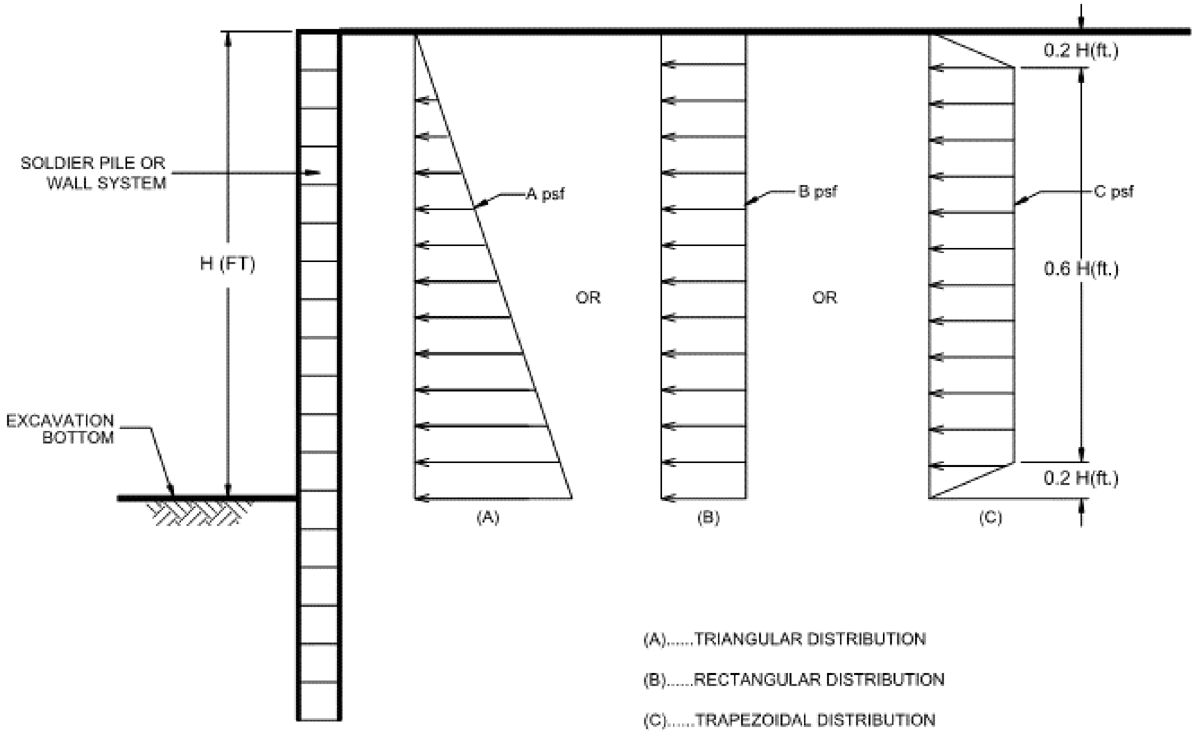
8.5.5 In general, ground conditions are moderately suited for soldier pile and tieback anchor wall construction techniques. However, gravel, cobble, and oversized material may be encountered in the existing materials that could be difficult to drill. Additionally, if cohesionless sands are encountered, some raveling may result along the unsupported portions of excavations. Cemented zones may be encountered within the formational units and could cause difficult excavations.

8.5.6 Temporary shoring with a level backfill should be designed using a lateral pressure envelope acting on the back of the shoring as presented in Table 8.5.1 assuming a level backfill. The distributions are shown on the Active Pressures for Temporary Shoring. Triangular distribution should be used for cantilevered shoring and, the trapezoidal and rectangular distribution should be used for multi-braced systems such as tieback anchors and rakers. The project shoring engineer should determine the applicable soil distribution for the design of the temporary shoring system. Additional lateral earth pressure due to the surcharging effects from construction equipment, sloping backfill, planned stockpiles, adjacent structures and/or traffic loads should be considered, where appropriate, during design of the shoring system.

### TABLE 8.5.1
### SUMMARY OF TEMPORARY SHORING WALL RECOMMENDATIONS

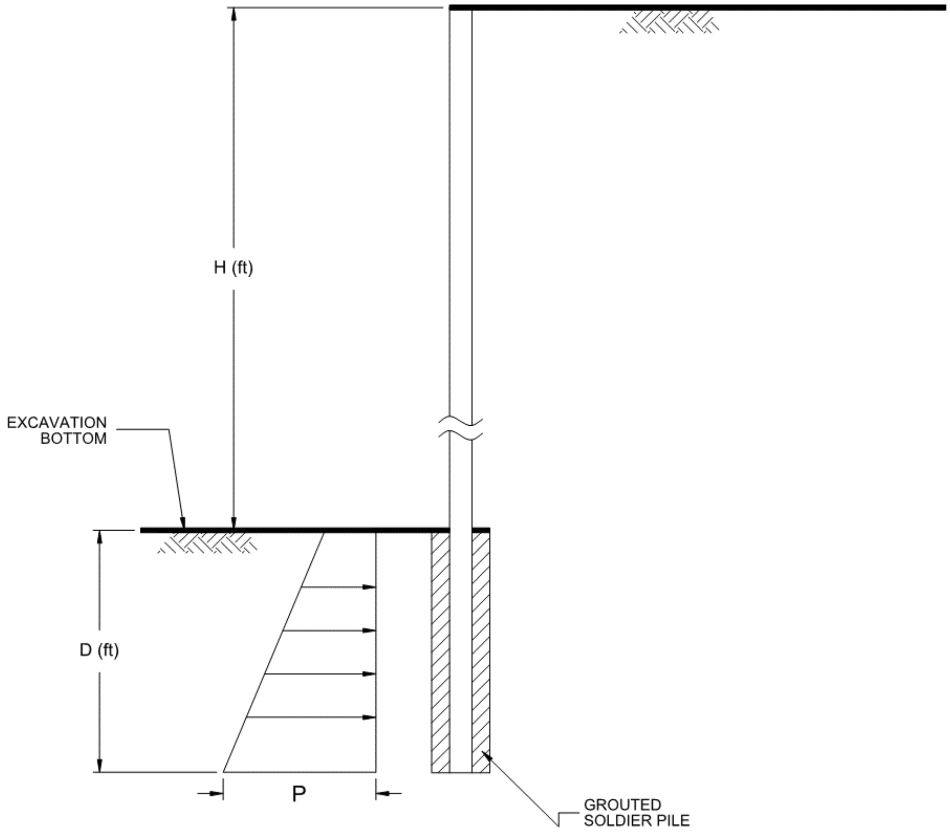
| Parameter | Value |
|---|---|
| Triangular Distribution, A | 34H psf |
| Rectangular Distribution, B | 22H psf |
| Trapezoidal Distribution, C | 27H psf |
| Passive Pressure, P | 350D + 500 psf |
| Effective Zone Angle, E | 28 degrees |
| Maximum Design Lateral Movement | 1 Inch |
| Maximum Design Vertical Movement | ½ Inch |
| Maximum Design Retained Height, H | 40 Feet |

*H equals the height of the retaining portion of the wall in feet
*D equals the embedment depth of the retaining wall in feet



Active Pressures on Temporary Shoring

8.5.7 The passive resistance can be assumed to act over a width of three pile diameters. Typically, soldier piles are embedded a minimum of 0.5 times the maximum height of the excavation (this depth is to include footing excavations) if tieback anchors are not employed. The project structural engineer should determine the actual embedment depth.



Passive Pressures on Temporary Shoring

8.5.8 Lateral movement of shoring is associated with vertical ground settlement outside of the excavation. Therefore, it is essential that the soldier pile and tieback system allow very limited amounts of lateral displacement. Earth pressures acting on a lagging wall can cause movement of the shoring toward the excavation and result in ground subsidence outside of the excavation. Consequently, horizontal movements of the shoring wall should be accurately monitored and recorded during excavation and anchor construction.

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

8.5.10 The project civil engineer should provide the approximate location, depth, and pipe type of the underground utilities to the shoring engineer to help select the shoring type and shoring design. The shoring system should be designed to limit horizontal soldier pile movement to a maximum of 1 inch. The amount of horizontal deflection can be assumed to be essentially zero along the Active Zone and Effective Zone boundary, as shown in the Active Zone Detail herein. The magnitude of movement for intermediate depths and distances from the shoring wall can be linearly interpolated. We understand the City of San Diego may require the developer to prepare a hold harmless agreement for the planned construction operations and development regarding the existing utilities and improvements.

8.5.11 We should observe the drilled shafts for the soldier piles prior to the placement of steel reinforcement to check that the exposed soil conditions are similar to those expected and that footing excavations have been extended to the appropriate bearing strata and design depths. If unexpected soil conditions are encountered, foundation modifications may be required.

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

8.5.13 Anchor capacity is a function of construction method, depth of anchor, batter, diameter of the bonded section and the length of the bonded section. Anchor capacity should be evaluated using the strength parameters shown in Table 8.5.2.

### TABLE 8.5.2
### SOIL STRENGTH PARAMETERS FOR TEMPORARY SHORING

| Description | Cohesion (psf) | Friction Angle (Degrees) |
|---|---|---|
| Compacted Fill (Qpf & Qcf) | 300 | 28 |
| Scripps Formation/Ardath Shale | 300 | 32 |

8.5.14 Grout should only be placed in the tieback anchor’s bonded section prior to testing. Tieback anchors should be proof-tested to at least 130 percent of the anchor’s design working load. Following a successful proof test, the tieback anchors should be locked off at 80 percent of the allowable working load. Tieback anchor test failure criteria should be established in project plans and specifications. The tieback anchor test failure criteria should be based upon a maximum allowable displacement at 130 percent of the anchor’s working load (anchor creep) and a maximum residual displacement within the anchor following stressing.

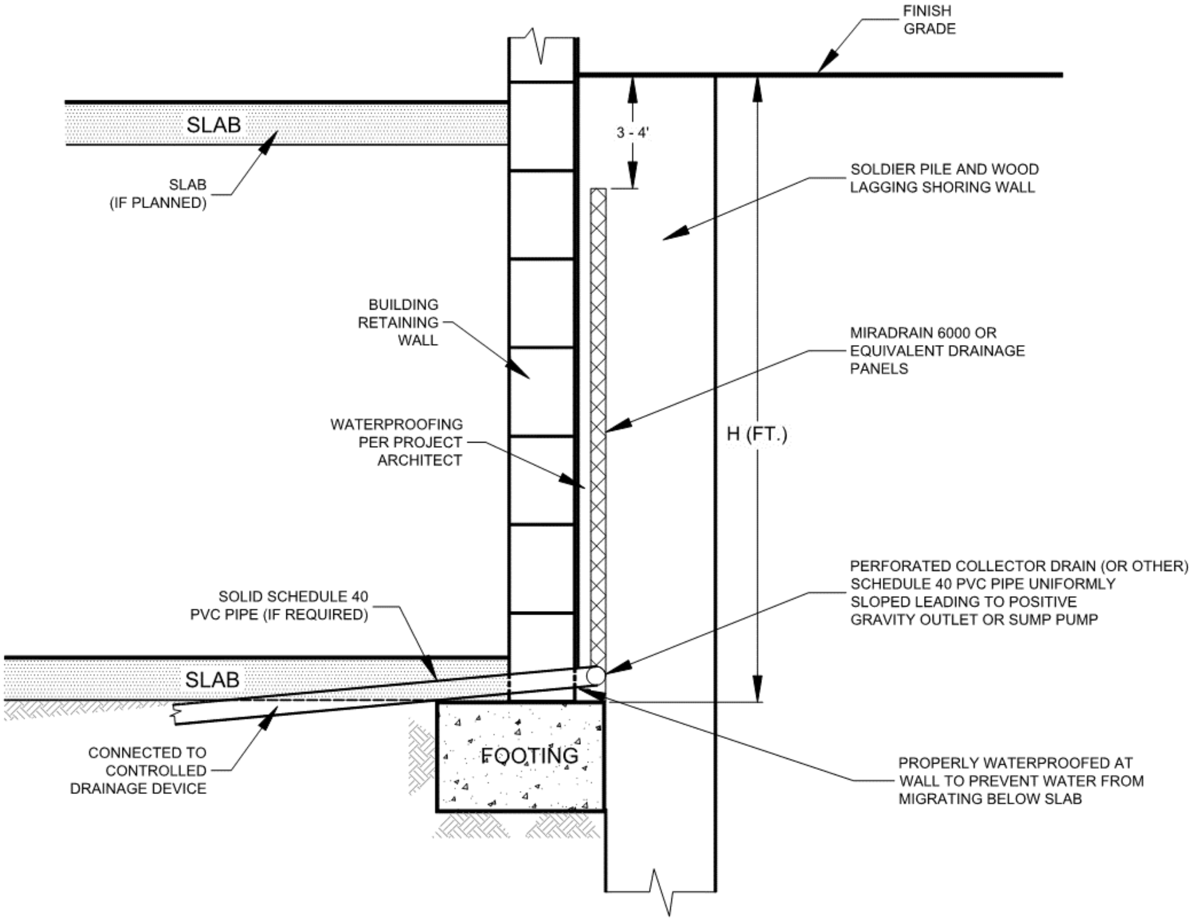
Tieback anchor stressing should only be conducted after sufficient hydration has occurred within the grout. Tieback anchors that fail to meet project specified test criteria should be replaced or additional anchors should be constructed.

8.5.15 Lagging should keep pace with excavation. The excavation should not be advanced deeper than three feet below the bottom of lagging at any time. These unlagged gaps of up to three feet should only be allowed to stand for short periods of time in order to decrease the probability of soil instability and should never be unsupported overnight. Backfilling should be conducted when necessary between the back of lagging and excavation sidewalls to reduce sloughing in this zone and all voids should be filled by the end of each day. Further, the excavation should not be advanced further than four feet below a row of tiebacks prior to those tiebacks being proof tested and locked off unless otherwise specific by the shoring engineer.

8.5.16 If tieback anchors are employed, an accurate survey of existing utilities and other underground structures adjacent to the shoring wall should be conducted. The survey should include both locations and depths of existing utilities. Locations of anchors should be adjusted as necessary during the design and construction process to accommodate the existing and proposed utilities.

8.5.17 Tieback anchors within the City of San Diego right-of-way should be properly detentioned and removed where steel does not exist within the upper 20 feet from the existing grade. The Notice – Land Development Review/Shoring in City Right-Of-Way, prepared by the City of San Diego, dated July 1, 2003 should be reviewed and incorporated into the design of the tieback anchors. Procedures for removal of tieback anchors include unscrewing tendons using special couplings, use of explosives, or heat induction. Geocon Incorporated should be consulted if other methods of removal are planned.

8.5.18 The shoring system should incorporate a drainage system for the proposed retaining wall as shown herein.



**Soldier Pile Wall Drainage Detail**

## 8.6 Soil Nail Wall

8.6.1 As an alternative to temporary shoring followed by construction of a permanent basement wall, a soil nail wall can be used. Soil nail walls consist of installing closely spaced steel bars (nails) into a slope or excavation in a top-down construction sequence. Following installation of a horizontal row of nails, drains, waterproofing and wall reinforcing steel are placed and shotcrete applied to create a final wall. The wall should be designed by an engineer familiar with the design of soil nail walls.

8.6.2 Temporary soil nail walls should not be considered a permanent design to support the seismic lateral loads and soil pressures on a building wall. Therefore, the proposed building should be designed to support the expected lateral loads.

8.6.3 In general, ground conditions are moderately suited to soil nail wall construction techniques. However, localized gravel, cobble and oversized material could be encountered in the existing materials that could be difficult to drill. Additionally, relatively clean sands may be encountered within the existing soil that may result in some raveling of the unsupported excavation. Casing or specialized drilling techniques should be planned where raveling exists.

8.6.4 Testing of the soil nails should be performed in accordance with the guidelines of the Federal Highway Administration or similar guidelines. At least two verification tests should be performed to confirm design assumptions for each soil/rock type encountered. Verification tests nails should be sacrificial and should not be used to support the proposed wall. The bond length should be adjusted to allow for pullout testing of the verification nails to evaluate the ultimate bond stress. A minimum of 5 percent of the production nails should also be proof tested and a minimum of 4 sacrificial nails should be tested at the discretion of Geocon Incorporated. Consideration should be given to testing sacrificial nails with an adjusted bond length rather than testing production nails. Geocon Incorporated should observe the nail installation and perform the nail testing.

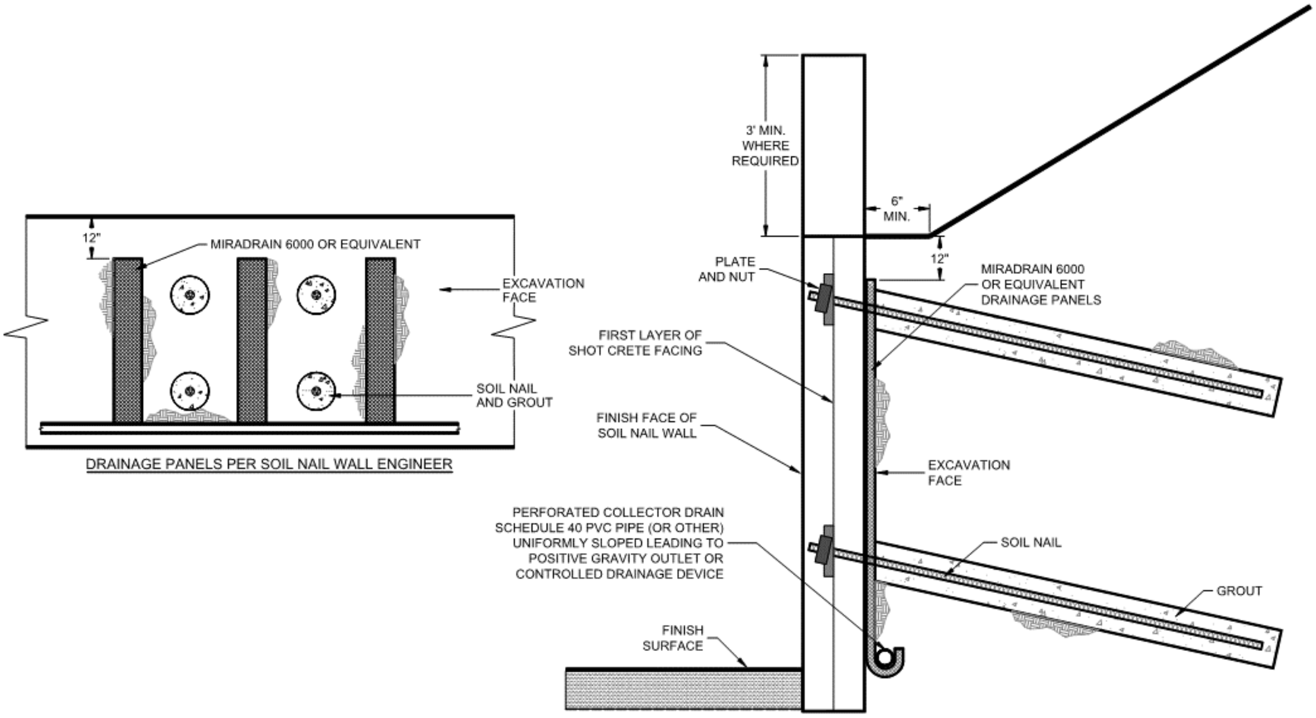
8.6.5 The soil strength parameters listed in Table 8.6 can be used in design of the soil nails. The bond stress is dependent on drilling method, diameter, and construction method. Therefore, the designer should evaluate the bond stress based on the existing soil conditions and the construction method.

### TABLE 8.6
### SOIL STRENGTH PARAMETERS FOR SOIL NAIL WALLS

| Description | Cohesion (psf) | Friction Angle (degrees) | Estimated Ultimate Bond Stress (psi)* |
|---|---|---|---|
| Previously Placed Fill | 300 | 28 | 10 |
| Scripps Formation/Ardath Shale | 300 | 32 | 20 |

*Assuming gravity fed, open hole drilling techniques.

8.6.6 A wall drain system should be incorporated into the design of the soil nail wall as shown herein. Corrosion protection should be provided for the nails if the wall will be a permanent structure.



**Soil Nail Wall Drainage Detail**

## 8.7 Seismic Design Criteria

8.7.1 We used the computer program *Seismic Design Maps*, provided by Structural Engineers Association of California and based on guidelines provided by the California Building Code. Table 8.7.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The buildings and improvements should be designed using a Site Class C where the fill thickness is 20 feet or less and/or when deep foundations are used, or a Site Class D where the fill is thicker than 20 feet. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 8.7.1 are for the risk-targeted maximum considered earthquake ($MCE_R$).

## TABLE 8.7.1
## 2016 CBC SEISMIC DESIGN PARAMETERS

| Parameter | Value | | 2016 CBC Reference |
|---|---|---|---|
| Site Class | C | D | Section 1613.3.2 |
| Fill Thickness, T (feet) | T<20 | T≥20 | -- |
| MCE$_R$ Ground Motion Spectral Response Acceleration – Class B (short), $S_S$ | 1.135g | 1.135g | Figure 1613.3.1(1) |
| MCE$_R$ Ground Motion Spectral Response Acceleration – Class B (1 sec), $S_1$ | 0.438g | 0.438g | Figure 1613.3.1(2) |
| Site Coefficient, $F_A$ | 1.000 | 1.046 | Table 1613.3.3(1) |
| Site Coefficient, $F_V$ | 1.362 | 1.562 | Table 1613.3.3(2) |
| Site Class Modified MCE$_R$ Spectral Response Acceleration (short), $S_{MS}$ | 1.135g | 1.187g | Section 1613.3.3 (Eqn 16-37) |
| Site Class Modified MCE$_R$ Spectral Response Acceleration (1 sec), $S_{M1}$ | 0.597g | 0.685g | Section 1613.3.3 (Eqn 16-38) |
| 5% Damped Design Spectral Response Acceleration (short), $S_{DS}$ | 0.757g | 0.792g | Section 1613.3.4 (Eqn 16-39) |
| 5% Damped Design Spectral Response Acceleration (1 sec), $S_{D1}$ | 0.398g | 0.456g | Section 1613.3.4 (Eqn 16-40) |

8.7.2 Table 8.7.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE$_G$).

## TABLE 8.7.2
## 2016 CBC SITE ACCELERATION DESIGN PARAMETERS

| Parameter | Value | | ASCE 7-10 |
|---|---|---|---|
| Site Class | C | D | -- |
| Fill Thickness, T (Feet) | T≤20 | T>20 | -- |
| Mapped MCE$_G$ Peak Ground Acceleration, PGA | 0.485g | 0.485g | Figure 22-7 |
| Site Coefficient, $F_{PGA}$ | 1.000 | 1.046 | Table 11.8-1 |
| Site Class Modified MCE$_G$ Peak Ground Acceleration, $PGA_M$ | 0.485g | 0.492g | Section 11.8.3 (Eqn 11.8-1) |

8.7.3 Conformance to the criteria in Tables 8.7.1 and 8.7.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

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

## 8.8 Settlement Due to Fill Loads

8.8.1 Fill soil, even if properly compacted, will experience settlement over the lifetime of the improvements that it supports. The ultimate settlement potential of the fill is a function of the soil classification, placement relative compaction, and subsequent increases in the soil moisture content.

8.8.2 The proposed buildings will be underlain by a maximum thickness of compacted fill on the order of 100 feet. The settlement of compacted fill is expected to continue over a relatively extended time period resulting from both gravity loading and hydrocompression upon wetting from rainfall and/or landscape irrigation. The previously placed fill has existed for approximately 20 years; therefore, a majority of the expected settlement has likely occurred.

8.8.3 Due to the variable fill thickness, a potential for differential settlement across the proposed buildings exist and special foundation design consideration as discussed herein will be necessary. Based on measured settlement of similar fill depths on other sites and the time period since the fill was placed, we estimate that maximum settlement of the compacted fill will be approximately 0.15 percent for the compacted fills based on the existing fill thickness. Figure 2 provides the approximate thickness of fill and estimated maximum fill settlement in the area of the proposed buildings and improvements.

8.8.4 Table 8.8 presents the estimated total and differential fill thickness and settlements of the building pads using an estimated settlement of 0.15 percent for the existing fill soils. We understand some of the proposed buildings may include subterranean garages and/or offices 2-levels below grade and we reduced the fill thicknesses and settlements for these buildings assuming a pad elevation of 25 feet to 30 below existing grades in Table 8.8. Thickness of proposed fill was not incorporated into the settlement calculations. These settlement magnitudes should be considered in design of the foundation system and adjacent flatwork that connects to the proposed buildings.

TABLE 8.8
EXPECTED DIFFERENTIAL SETTLEMENT OF FILL SOIL

| Building No. | Maximum Depth of Fill Beneath Structure (Feet) | Maximum Fill Differential (Feet) | Estimated Maximum Settlement (Inches) | Estimated Differential Settlement (Inches) | Estimated Maximum Angular Distortion |
|---|---|---|---|---|---|
| CP4 | 5 | 5 | 0.1 | 0.1 | 1/4800 |
| CP4 (Subterranean[A]) | 0 | 0 | --- | --- | --- |
| CP5 | 35 | 35 | 0.6 | 0.6 | 1/800 |
| CP5 (Subterranean[A]) | 10 | 10 | 0.2 | 0.2 | 1/2400 |
| CP6 | 100 | 80 | 1.8 | 1.4 | 1/350 |
| CP6 (Subterranean[A]) | 75 | 55 | 1.4 | 1.0 | 1/480 |
| CP7[B] | 70 | 50 | 1.3 | 0.9 | 1/500 |
| CP7[B] (Subterranean[A]) | 45 | 25 | 0.8 | 0.5 | 1/960 |
| Alexandria Central Buildings | 0 | 0 | --- | --- | --- |
| Retail Buildings | 80 | 20 | 1.4 | 0.4 | 1/200 |
| Parking Structure | 60 | 45 | 1.1 | 0.8 | 1/600 |
| Parking Structure (Subterranean) | 35 | 20 | 0.6 | 0.4 | 1/1200 |

[A] Assuming 25 foot excavation for CP4, CP6, CP7 and Parking Structure, and 30 foot excavation for CP5.
[B] Existing ~20 foot tall retaining wall present within footprint of CP7.

8.8.5 Deep foundations such as driven piles or drilled piers are the most effective means of reducing the ultimate settlement potential of the proposed structures to a negligible amount. Alternatively, highly reinforced shallow foundation systems and slabs-on-grade may be used for support of the buildings; however, the shallow foundation systems would not eliminate the potential for cosmetic distress related to differential settlement of the underlying fill. Some cosmetic distress should be expected over the life of the structure as a result of long-term differential settlement. The owner, tenants, and future owners should be made aware that cosmetic distress, including separation of caulking at wall joints, small non-structural wall panel cracks, and separation of concrete flatwork is likely to occur. Recommendations for deep foundations can be provided to evaluate the comparative risks and costs upon request.

## 8.9 Shallow Foundations

8.9.1 The proposed structures can be supported on a shallow foundation system founded in the compacted fill and/or formational materials. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope. Table 8.9.1 provides a summary of the foundation design recommendations.

### TABLE 8.9.1
### SUMMARY OF FOUNDATION RECOMMENDATIONS (AT-GRADE)

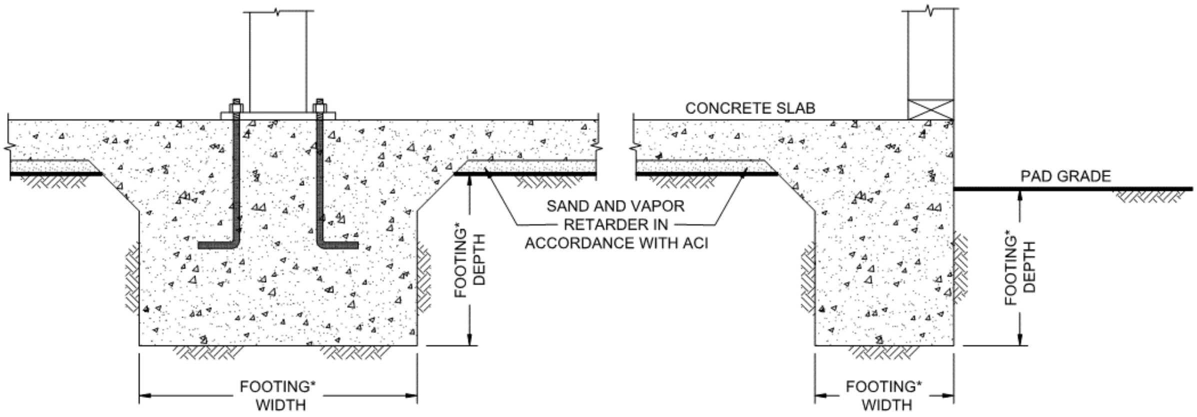
| Parameter | Value |
|---|---|
| Bearing Material | Formation |
| Minimum Continuous Foundation Width | 12 inches |
| Minimum Isolated Foundation Width | 24 inches |
| Minimum Foundation Depth | 24 Inches Below Lowest Adjacent Grade |
| Minimum Steel Reinforcement | 4 No. 5 Bars, 2 at the Top and 2 at the Bottom |
| Bearing Capacity – Fill | 2,500 psf |
| Bearing Capacity – Formation | 6,000 psf |
| Bearing Capacity Increase | 500 psf per Foot of Depth |
| | 500 psf per Foot of Width |
| Maximum Bearing Capacity – Fill | 4,000 psf |
| Maximum Bearing Capacity – Formation | 8,000 psf |
| Estimated Total Settlement | 1 Inch |
| Estimated Differential Settlement | ½ Inch in 40 Feet |
| Footing Size Used for Settlement | 9-Foot Square |
| Design Expansion Index | 90 or less |

8.9.2 We understand that several of the buildings are proposed to be supported at 2-levels below grade. We assume that at least 25 feet of fill will be removed to achieve pad grades. Table 8.9.2 provides a summary of the foundation design recommendations for subterranean levels.

## TABLE 8.9.2
## SUMMARY OF FOUNDATION RECOMMENDATIONS WITH SUBTERRANEAN LEVELS

| Parameter | Value |
|---|---|
| Minimum Continuous Foundation Width | 12 inches |
| Minimum Isolated Foundation Width | 24 inches |
| Minimum Foundation Depth | 24 Inches Below Lowest Adjacent Grade |
| Minimum Steel Reinforcement | 4 No. 5 Bars, 2 at the Top and 2 at the Bottom |
| Bearing Capacity – Fill | 4,000 psf |
| Bearing Capacity – Formation | 9,000 psf |
| Bearing Capacity Increase | 500 psf per Foot of Depth |
| | 500 psf per Foot of Width |
| Maximum Bearing Capacity - Fill | 6,000 psf |
| Maximum Bearing Capacity - Formation | 11,000 psf |
| Estimated Total Settlement | 1 Inch |
| Estimated Differential Settlement | ½ Inch in 40 Feet |
| Footing Size Used for Settlement | 9-Foot Square |
| Design Expansion Index | 90 or less |

8.9.3 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope (unless designed with a post-tensioned foundation system as discussed herein).



Wall/Column Footing Dimension Detail

8.9.4 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

8.9.5 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations. The isolated footings should be connected to the building foundation system with grade beams when located beyond the perimeter of the building and supporting structural elements connected to the building.

8.9.6 Overexcavation of the footings and replacement with slurry can be performed in areas where formational materials are not encountered at the bottom of the footing where the foundations are planned in the formational materials. Minimum two-sack slurry can be placed in the excavations for the conventional foundations to the bottom of proposed footing elevation.

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

- For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

8.9.8 We should observe the foundation excavations prior to the placement of reinforcing steel and concrete to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.

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

## 8.10 Mat Foundation

8.10.1 We understand the proposed retail buildings may be supported on a mat foundation. A mat foundation consists of a thick, rigid concrete mat that allows the entire footprint of the structure to carry building loads. In addition, the mat can tolerate significantly greater differential movements such as those associated with expansive soils or differential settlement. In this case, the mat foundation may be used to accommodate the relatively large differential settlements and associated angular distortion due to the potential fill settlement. Table 8.10 provides a summary of the foundation design recommendations.

### TABLE 8.10
### SUMMARY OF MAT FOUNDATION RECOMMENDATIONS

| Parameter | Value |
|---|---|
| Minimum Foundation Depth | 24 Inches Below Lowest Adjacent Grade |
| Minimum Steel Reinforcement | Per Structural Engineer |
| Bearing Capacity | 800 psf |
| Estimated Total Settlement | 1 Inch |
| Estimated Differential Settlement | ½ Inch in 40 Feet |
| Foundation Size Used for Settlement Estimate | 60-Foot-Square Mat Foundation |
| Modulus of Subgrade Reaction | 100 to 150 pci |
| Design Expansion Index | 90 or less |

8.10.2 The modulus of subgrade reaction values should be modified as necessary using standard equations for mat size as required by the structural engineer. This value is a unit value for use with a 1-foot square footing. The modulus should be reduced in accordance with the following equation when used with larger foundations:

$$K_R = K\left|\frac{\quad}{\quad}\right|$$

Where: $K_R$ = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

8.10.3 A mat foundation system will allow the structure to settle with the ground and should have sufficient rigidity to allow the structure to move as a single unit. Re-leveling of the mat foundation could be necessary through the use of mud jacking, compaction grouting or other similar techniques if differential settlement occurs

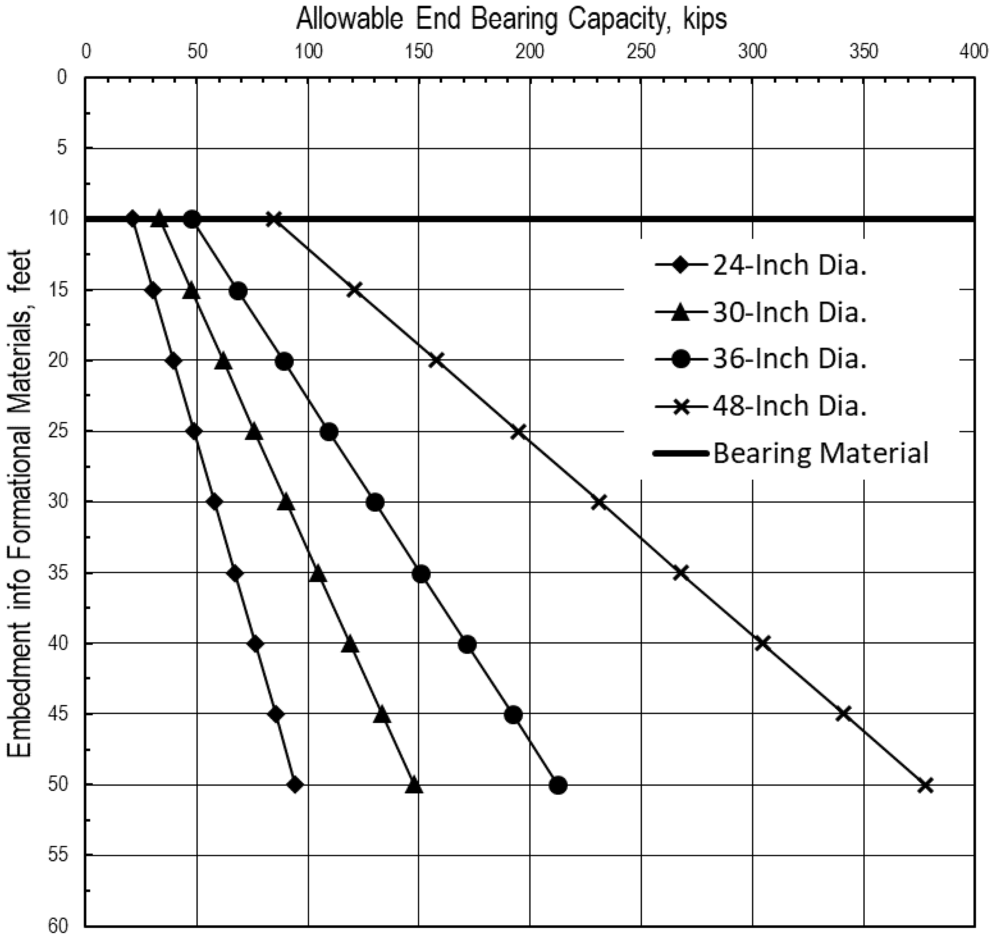
8.10.4 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

8.10.5 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

## 8.11 Drilled Pier Recommendations

8.11.1 We understand that drilled piers may be used for foundation support. The foundation recommendations herein assume that the piers will extend through fill into the Scripps Formation or Ardath Shale materials. The piers should be embedded at least 10 feet within the formational materials.

8.11.2 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and portions of the fill soil. An allowable skin friction resistance of 200 psf and 500 psf can be used for that portion of the drilled pier embedded in fill soil and formational materials, respectively. The end bearing capacity can be determined by the End Bearing Capacity Chart. These allowable values possess a factor of safety of at least 2 and 3 for skin friction and end bearing, respectively.



End Bearing Capacity Chart

8.11.3 The diameter of the piers should be a minimum of 24 inches. The design length of the drilled piers should be determined by the designer based on the elevation of the pile cap or grade beam and the elevation of the top of the formational materials obtained from the Geologic Map and Geologic Cross-Sections presented herein. It is difficult to evaluate the exact length of the proposed drilled piers due to the variable thickness of the existing fill; therefore, some variation should be expected during drilling operations.

8.11.4 If pier spacing is at least three times the maximum dimension of the pier, no reduction in axial capacity for group effects is considered necessary. If piles are spaced between 2 and 3 pile diameters (center to center), the single pile axial capacity should be reduced by 25 percent. Geocon Incorporated should be contacted to provide single-pile capacity if piers are spaced closer than 2 diameters.

8.11.5 The allowable downward capacity may be increased by one-third when considering transient wind or seismic loads.

8.11.6 The formational materials may contain gravel and cobble and may possess very dense zones; therefore, the drilling contractor should expect difficult drilling conditions during excavations for the piers. Because a significant portion of the piers capacity will be developed by end bearing, the bottom of the borehole should be cleaned of loose cuttings prior to the placement of steel and concrete. Experience indicates that backspinning the auger does not remove loose material and a flat cleanout plate is necessary. Concrete should be placed within the excavation as soon as possible after the auger/cleanout plate is withdrawn to reduce the potential for discontinuities or caving

8.11.7 Pile settlement of production piers is expected to be on the order of ½ to 1 inch if the piers are loaded to their allowable capacities. Geocon should provide updated settlement estimates once the foundation plans are available. Settlements should be essentially complete shortly after completion of the building superstructure.

8.11.8 We can provide a lateral pile capacity analysis using the *LPILE* computer program once the pile type, size, and approximate length has been provided. The total capacity of pile groups should be considered less than the sum of the induvial pile capacities for pile spacing of less than 8D (where D is pile diameter) for lateral loads parallel to the pile group and 3D for loads perpendicular to the pile group. The reduction in capacity is based on pile spacing and positioning and can result in group efficiency on the order of 50 percent of the sum of single-pile capacities. We can evaluate the lateral capacity of pile groups using the *GROUP* computer program, if requested.

## 8.12 Concrete Slabs-On-Grade

8.12.1 Concrete slabs-on-grade for the structures should be constructed in accordance with Table 8.12.

### TABLE 8.12
### MINIMUM CONCRETE SLAB-ON-GRADE RECOMMENDATIONS

| Parameter | Value |
|---|---|
| Minimum Concrete Slab Thickness | 5 inches |
| Minimum Steel Reinforcement | No. 4 Bars 18 Inches on Center, Both Directions |
| Typical Slab Underlayment | 3 to 4 Inches of Sand/Gravel/Base |
| Design Expansion Index | 90 or less |

8.12.2 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

8.12.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common to have 3 to 4 inches of sand for 5-inch and 4-inch thick slabs, respectively, in the southern California region. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

8.12.4 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Crack-control joints should be spaced at intervals no greater than 12 feet. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

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

8.12.6 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting expected loads.

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

## 8.13 Exterior Concrete Flatwork

8.13.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in Table 8.13. The recommended steel reinforcement would help reduce the potential for cracking.

TABLE 8.13
MINIMUM CONCRETE FLATWORK RECOMMENDATIONS

| Expansion Index, EI | Minimum Steel Reinforcement* Options | Minimum Thickness |
|---|---|---|
| EI ≤ 90 | 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh | 4 Inches |
| | No. 3 Bars 18 inches on center, Both Directions | |
| EI ≤ 130 | 4x4-W4.0/W4.0 (4x4-4/4) welded wire mesh | |
| | No. 4 Bars 12 inches on center, Both Directions | |

*In excess of 8 feet square.

8.13.2 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade. The steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

8.13.3 Concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.

8.13.4 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

8.13.5 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

## 8.14 Retaining Walls

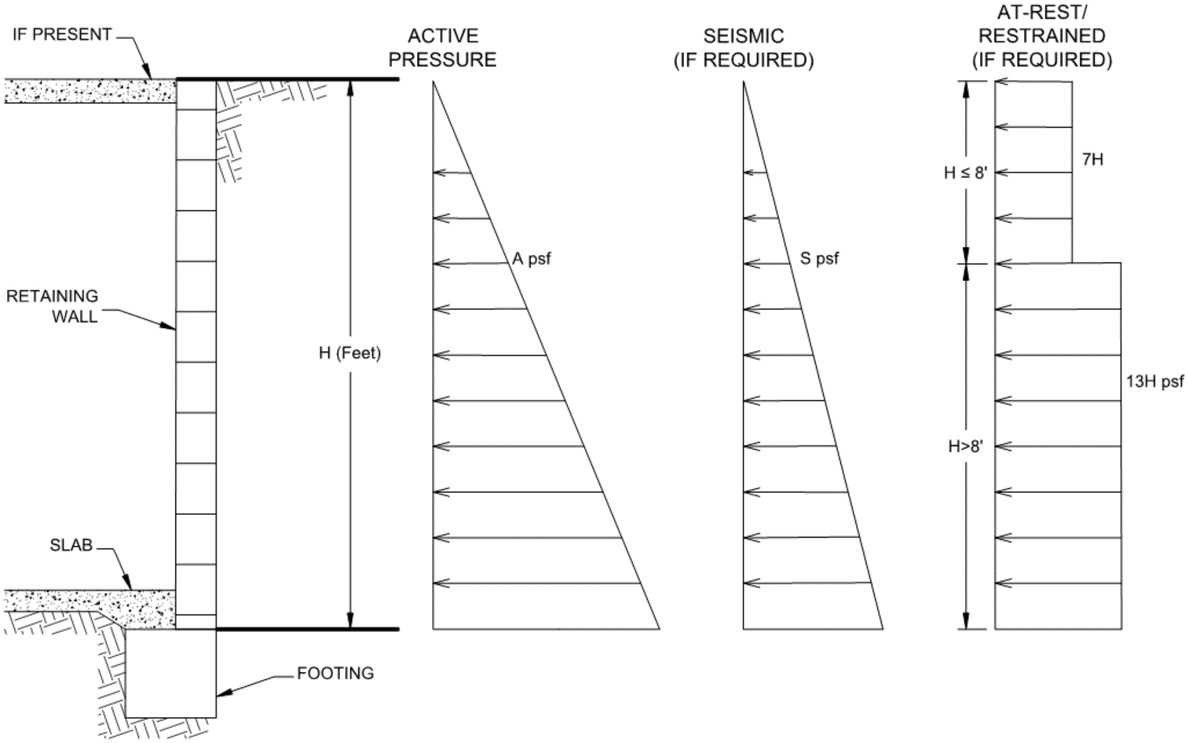
8.14.1 Retaining walls should be designed using the values presented in Table 8.14.1. Soil with an expansion index (EI) of greater than 90 should not be used as backfill material behind retaining walls.

### TABLE 8.14.1
### RETAINING WALL DESIGN RECOMMENDATIONS

| **Parameter** | **Value** | |
|---|---|---|
| | **EI≤50** | **EI≤90** |
| Active Soil Pressure, A (Fluid Density, Level Backfill) | 35 pcf | 40 pcf |
| Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill) | 45 psf | 55 pcf |
| Seismic Pressure, S | 15H psf | |
| At-Rest/Restrained Walls Additional Uniform Pressure (0 to 8 Feet High) | 7H psf | |
| At-Rest/Restrained Walls Additional Uniform Pressure (8+ Feet High) | 13H psf | |
| Expected Expansion Index for the Subject Property | EI≤90 | |

*H equals the height of the retaining portion of the wall

8.14.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.



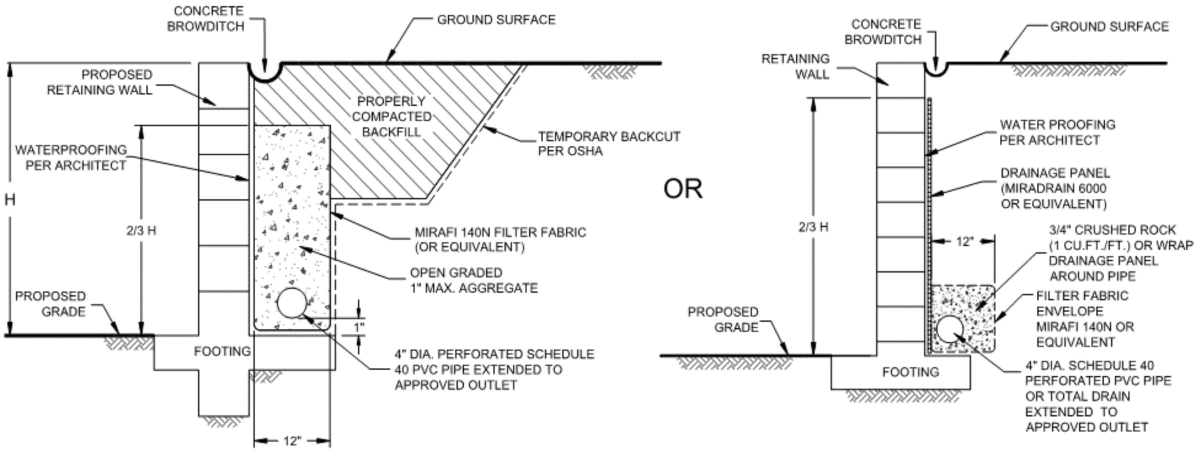
Retaining Wall Loading Diagram

8.14.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be added to the active soil pressure. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

8.14.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2016 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.

8.14.5 Retaining walls should be designed to ensure stability against overturning sliding, and excessive foundation pressure. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

8.14.6 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

8.14.7 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer. Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.

8.14.8 In general, wall foundations having should be designed in accordance with Table 8.14.2. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

## TABLE 8.14.2
## SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

| Parameter | Value |
|---|---|
| Minimum Retaining Wall Foundation Width | 12 inches |
| Minimum Retaining Wall Foundation Depth | 12 Inches |
| Minimum Steel Reinforcement | Per Structural Engineer |
| Bearing Capacity | 2,500 psf |
| Bearing Capacity Increase | 300 psf per Foot of Depth |
| | 300 psf per Foot of Width |
| Maximum Bearing Capacity | 3,500 psf |
| Estimated Total Settlement | 1 Inch |
| Estimated Differential Settlement | ½ Inch in 40 Feet |

8.14.9 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. In the event that other types of walls (such as mechanically stabilized earth [MSE] walls, soil nail walls, or soldier pile walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

8.14.10 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

8.14.11 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

## 8.15 Lateral Loading

8.15.1 Table 8.15 should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

### TABLE 8.15
### SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

| Parameter | Value |
|---|---|
| Passive Pressure Fluid Density | 350 pcf |
| Coefficient of Friction (Concrete and Soil) | 0.40 |
| Coefficient of Friction (Along Vapor Barrier) | 0.2 to 0.25* |

*Per manufacturer's recommendations.

8.15.2 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

## 8.16 Preliminary Pavement Recommendations

8.16.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck traffic areas, respectively. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections for the parking lot should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have assumed an R-Value of 10 and 20 for subgrade soil. We assume the base materials will possess an R-Value of 78. Table 8.16.1 presents the preliminary flexible pavement sections.

### TABLE 8.16.1
### PRELIMINARY FLEXIBLE PAVEMENT SECTION

| Location | Assumed Traffic Index | Assumed Subgrade R-Value | Asphalt Concrete (inches) | Class 2 Aggregate Base (inches) |
|---|---|---|---|---|
| Parking stalls for automobiles and light-duty vehicles | 5.0 | 10 | 3 | 9 |
| | | 20 | 3 | 7 |
| Driveways for automobiles and light-duty vehicles | 5.5 | 10 | 3 | 11 |
| | | 20 | 3 | 9 |
| Medium truck traffic areas | 6.0 | 10 | 3.5 | 12 |
| | | 20 | 3.5 | 10 |
| Driveways for heavy truck traffic | 7.0 | 10 | 4 | 14 |
| | | 20 | 4 | 12 |

8.16.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

8.16.3 A rigid Portland cement concrete (PCC) pavement section should be placed in roadway aprons and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 Guide for Design and Construction of Concrete Parking Lots using the parameters presented in Table 8.16.2.

### TABLE 8.16.2
### RIGID PAVEMENT DESIGN PARAMETERS

| Design Parameter | Design Value |
|---|---|
| Modulus of subgrade reaction, k | 50 pci |
| Modulus of rupture for concrete, $M_R$ | 500 psi |
| Traffic Category, TC | A and C |
| Average daily truck traffic, ADTT | 10 and 100 |

8.16.4 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 8.16.3.

### TABLE 8.16.3
### RIGID VEHICULAR PAVEMENT RECOMMENDATIONS

| Location | Portland Cement Concrete (inches) |
|---|---|
| Automobile Parking Stalls (TC=A) | 6.0 |
| Driveways (TC=C) | 7.5 |

8.16.5 The PCC vehicular pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch).

8.16.6 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., 6-inch and 7.5-inch-thick slabs would have an 8- and 9.5-inch-thick edge, respectively). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

8.16.7 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 12 feet for 5.5-inch-thick and 15 feet for the 6.0-inch and thicker slabs and should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report. The depth of the crack-control joints should be at least ¼ of the slab thickness when using a conventional saw, or at least 1 inch when using early-entry saws on slabs 9 inches or less in thickness, as determined by the referenced ACI report discussed in the pavement section herein. Cuts at least ¼ inch wide are required for sealed joints, and a ⅜ inch wide cut is commonly recommended. A narrow joint width of $^{1}/_{10}$- to $^{1}/_{8}$-inch wide is common for unsealed joints.

8.16.8 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed at the as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

8.16.9 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters that receives vehicular should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, or cross-gutters so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

## 8.17 Site Drainage and Moisture Protection

8.17.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

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

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

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

## 8.18 Grading and Foundation Plan Review

8.18.1 Geocon Incorporated should review the grading and building foundation plans for the project prior to final design submittal to evaluate if additional analyses and/or recommendations are required.

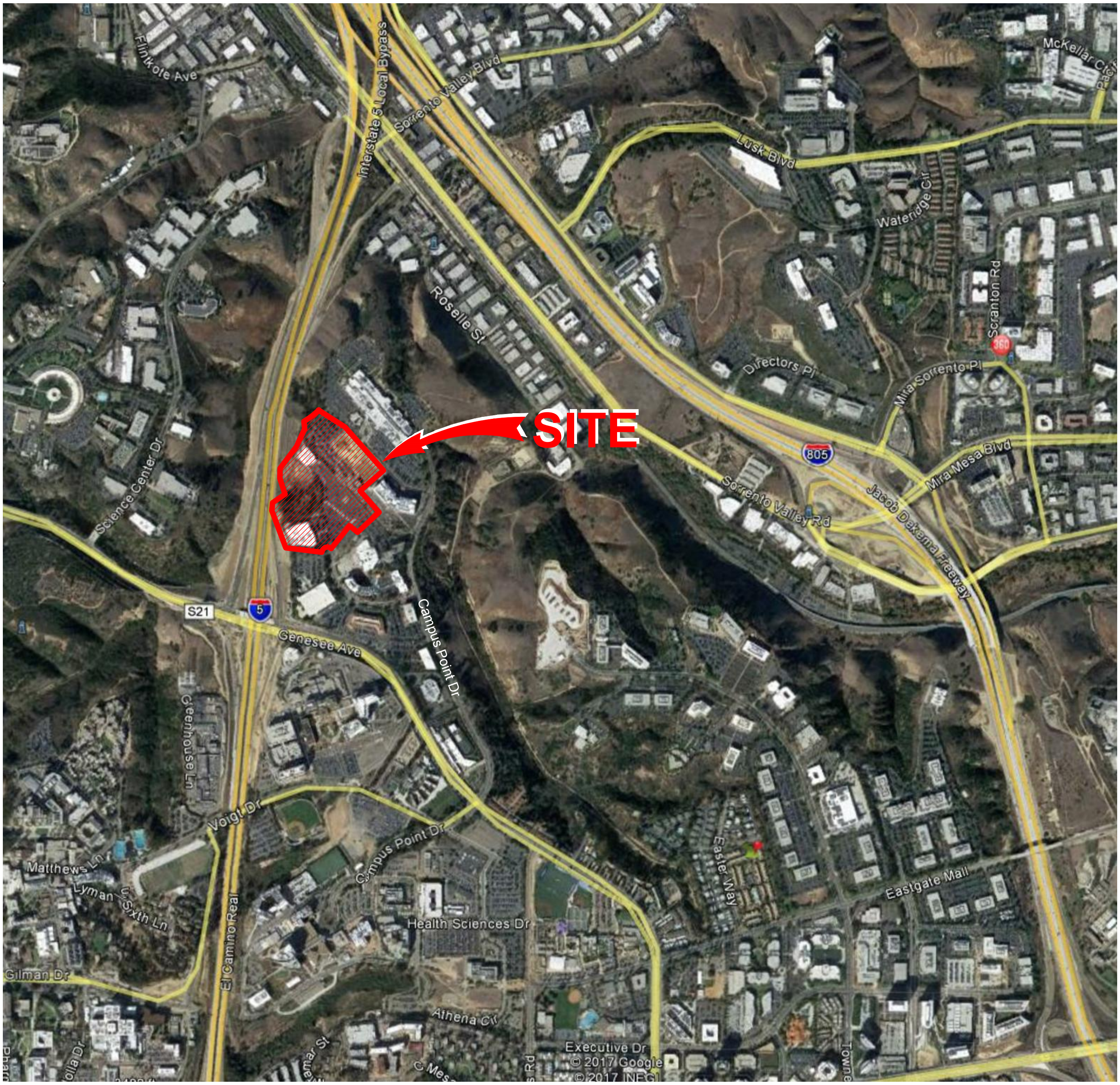
# LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



N

NO SCALE

# VICINITY MAP

**GEOCON**
INCORPORATED

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

CAMPUS POINTE
SAN DIEGO, CALIFORNIA

| | | | | | |
|---|---|---|---|---|---|
| ML / RA | | DSK/GTYPD | DATE 09 - 19 - 2019 | PROJECT NO. G2415 - 52 - 01 | FIG. 1 |

Plotted:09/18/2019 2:10PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2415-52-01 Campus Point\DETAILS\G2415-52-01 VicinityMap.dwg

GEOCON LEGEND

- **Qpf** ........PREVIOUSLY PLACED FILL
- **Qudf** ........UNDOCUMENTED FILL
- **Tsc** ........SCRIPPS FORMATION (Dotted Where Buried)
- **Ta** ........ARDATH SHALE (Dotted Where Buried)
- B-12 ........APPROX. LOCATION OF BORING (This Study)
- B-5 ........APPROX. LOCATION OF BORING (Geocon, January 2019)
- B-16 ........APPROX. LOCATION OF BORING (Geocon, 2015/2016)
- B-16 ........APPROX. LOCATION OF BORING (SCS&T, 1995)
- FT-1 .........APPROX. LOCATION OF FAULT TRENCH (Geocon, 2015)
- C C' ........APPROX. LOCATION OF FAULT TRENCH (SCS&T, 1995)
- T-12 ........APPROX. LOCATION OF TRENCH (Geocon, 1980)
- B-1 ........APPROX. LOCATION OF BORING (Geocon, 1980)
- ?........APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried; Queried Where Uncertain)
- 80 ........APPROX. THICKNESS OF FILL (From Existing Grade, In Feet)
- 1.2 ........APPROX. ESTIMATED SETTLEMENT (In Inches)
- ........APPROX. CITY OF SAN DIEGO FAULT STUDY ZONE
- ........CITY OF SAN DIEGO MAPPED FAULT LOCATION (Dotted Where Buried)
- 3 3' ........APPROX. LOCATION OF GEOLOGIC CROSS-SECTION
- ........APPROX. LOCATION OF OBSERVED POTENTIALLY ACTIVE FAULT
- (90)........APPROX. DEPTH TO FORMATION (In Feet)

# GEOLOGIC MAP

CAMPUS POINTE
SAN DIEGO, CALIFORNIA

GEOCON
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6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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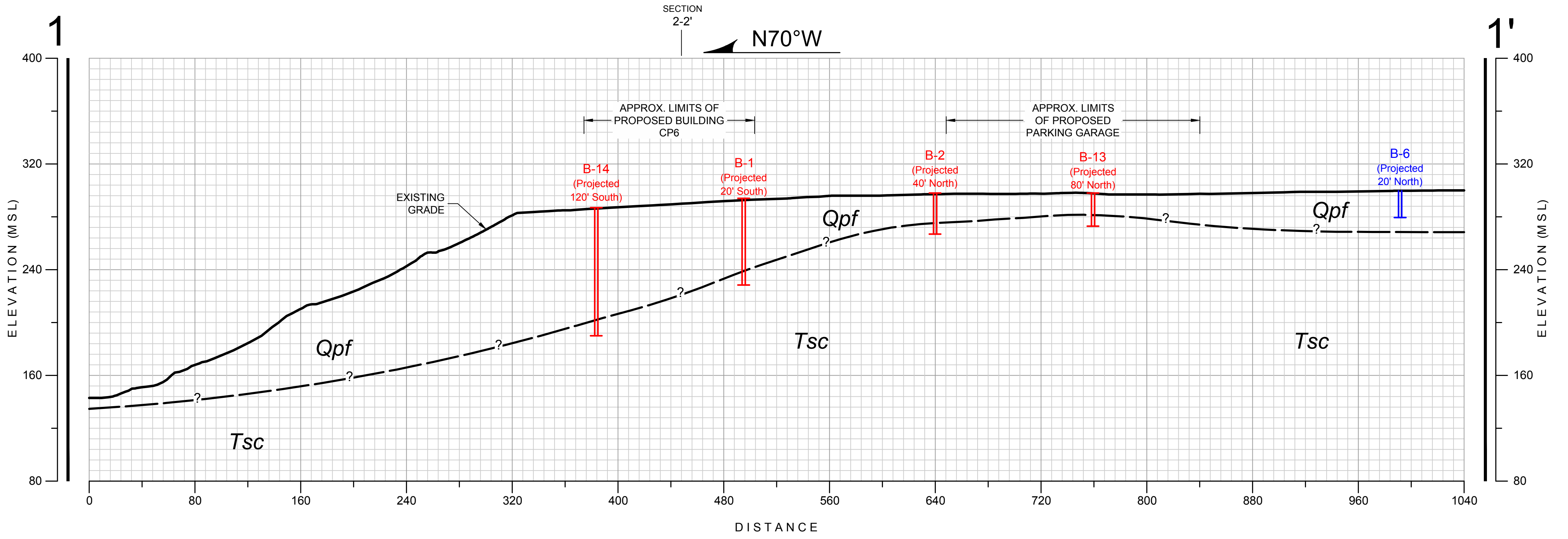
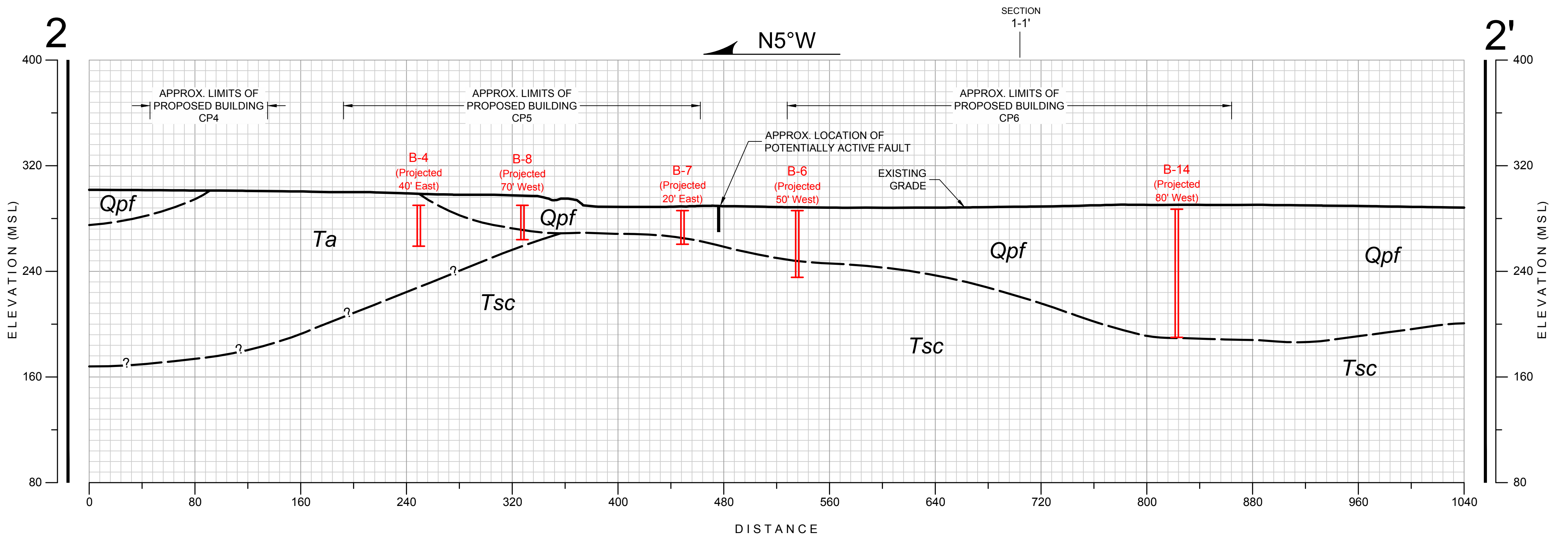
SCALE 1" = 80'
DATE 09 - 19 - 2019
PROJECT NO. G2415 - 52 - 01
FIGURE 2
SHEET 1 OF 1

Plotted:09/18/2019 2:19PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2415-52-01 Campus Point\SHEETS\G2415-52-01 GeoMap.dwg



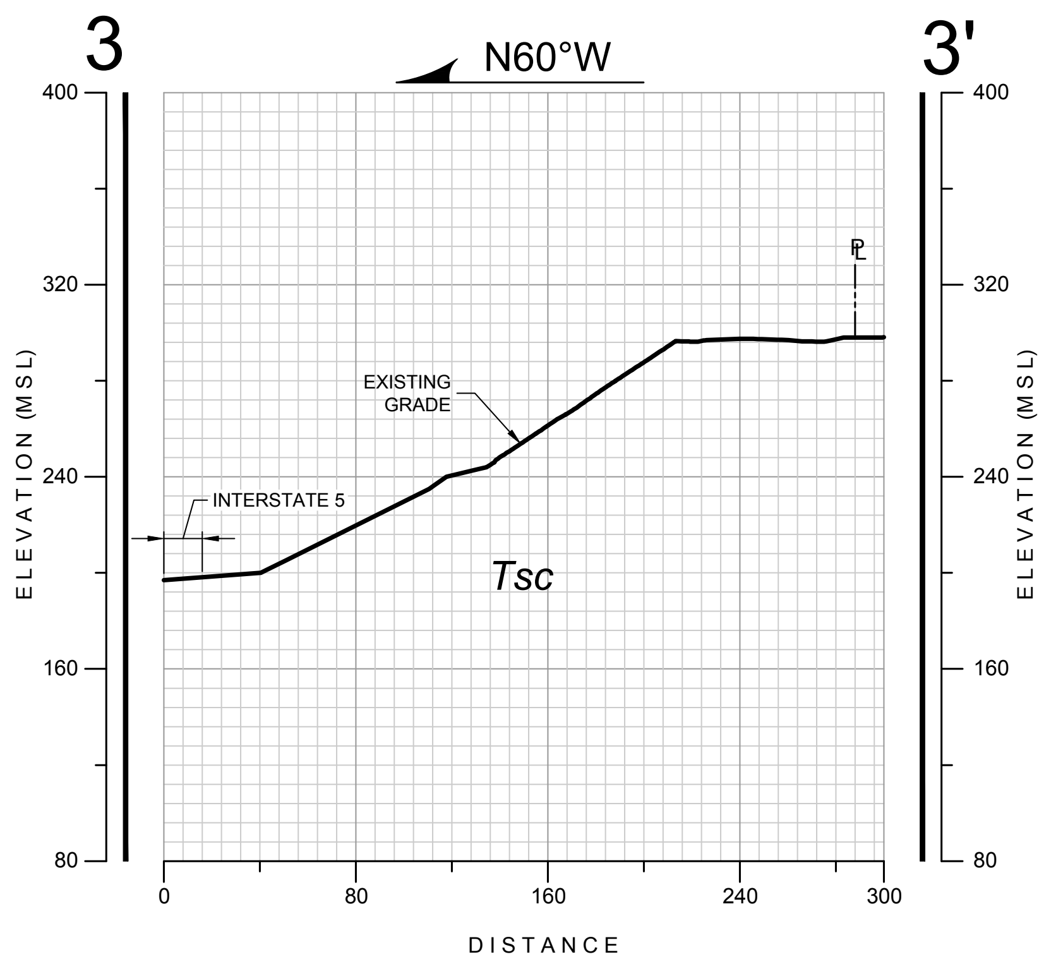
GEOLOGIC CROSS-SECTION 1-1'

SCALE: 1" = 80' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION 2-2'

SCALE: 1" = 80' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION 3-3'

SCALE: 1" = 80' (Vert. = Horiz.)

*Qpf*........PREVIOUSLY PLACED FILL
*Tsc*........SCRIPPS FORMATION
*Ta*........ARDATH SHALE
~?~........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
B-13........APPROX. LOCATION OF BORING (This Study)
B-6........APPROX. LOCATION OF BORING (Geocon, 2016; See Appendix A)

# GEOLOGIC CROSS SECTION

CAMPUS POINTE
SAN DIEGO, CALIFORNIA

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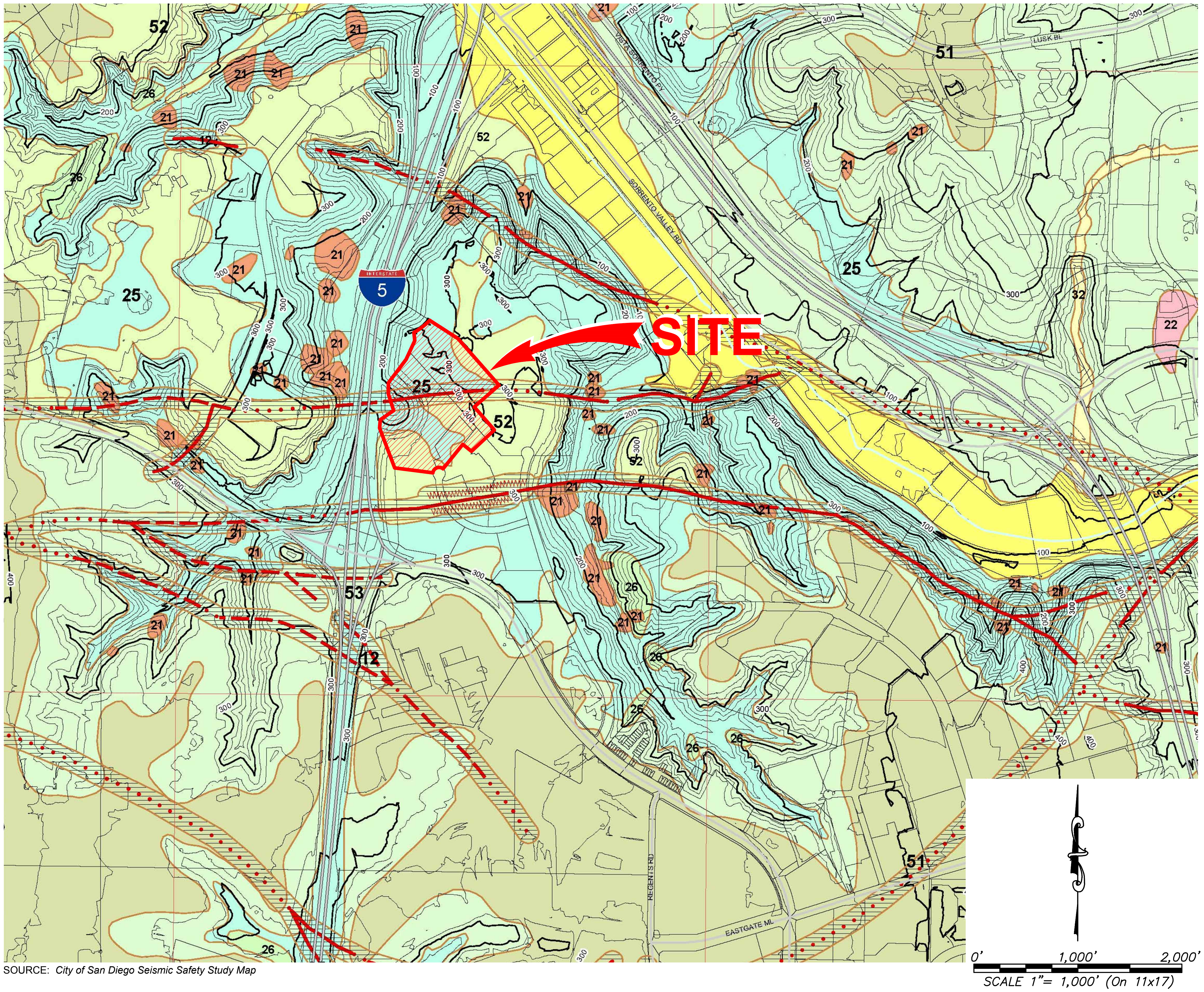
| | | |
|---|---|---|
| SCALE 1" = 80' | DATE 09 - 19 2019 | |
| PROJECT NO. G2415 - 52 - 01 | | FIGURE 3 |
| SHEET 1 OF 1 | | |

Plotted:09/18/2019 2:22PM \| By:ALVIN LADRILLONO \| File Location:Y:\PROJECTS\G2415-52-01 Campus Point\SHEETS\G2415-52-01 XSections.dwg



SOURCE: *City of San Diego Seismic Safety Study Map*

## *Geologic Hazard Categories*

**FAULT ZONES**

▨ 11 Active, Alquist-Priolo Earthquake Fault Zone

▤ 12 Potentially Active,
Inactive, Presumed Inactive, or Activity Unknown

■ 13 Downtown special fault zone

**LANDSLIDES**

■ 21 Confirmed, known, or highly suspected

■ 22 Possible or conjectured

**SLIDE-PRONE FORMATIONS**

■ 23 Friars: neutral or favorable geologic structure

■ 24 Friars: unfavorable geologic structure

■ 25 Ardath: neutral or favorable geologic structure

■ 26 Ardath: unfavorable geologic structure

■ 27 Otay, Sweetwater, and others

**LIQUEFACTION**

■ 31 High Potential -- shallow groundwater
major drainages, hydraulic fills

■ 32 Low Potential -- fluctuating groundwater
minor drainages

**COASTAL BLUFFS**

■ 41 Generally unstable
Numerous landslides, high steep bluffs,
severe erosion, unfavorable geologic structure

■ 42 Generally unstable
Unfavorable bedding plains, high erosion

■ 43 Generally unstable
Unfavorable jointing, local high erosion

■ 44 Moderately stable
Mostly stable formations, local high erosion

■ 45 Moderately stable
Some minor landslides, minor erosion

■ 46 Moderately stable
Some unfavorable geologic structure, minor or no erosion

■ 47 Generally stable
Favorable geologic structure, minor or no erosion,
no landslides

■ 48 Generally stable
Broad beach areas, developed harbor

**OTHER TERRAIN**

■ 51 Level mesas -- underlain by terrace deposits and bedrock
nominal risk

■ 52 Other level areas, gently sloping to steep terrain,
favorable geologic structure, Low risk

■ 53 Level or sloping terrain, unfavorable geologic structure,
Low to moderate risk

■ 54 Steeply sloping terrain, unfavorable or fault controlled
geologic structure, Moderate risk

■ 55 Modified terrain (graded sites)
Nominal risk

**Water (Bays and Lakes)**

■

**FAULTS**

Fault

Inferred Fault

Concealed Fault

Shear Zone

# SAN DIEGO SEISMIC SAFETY MAP

## CAMPUS POINTE
## SAN DIEGO, CALIFORNIA

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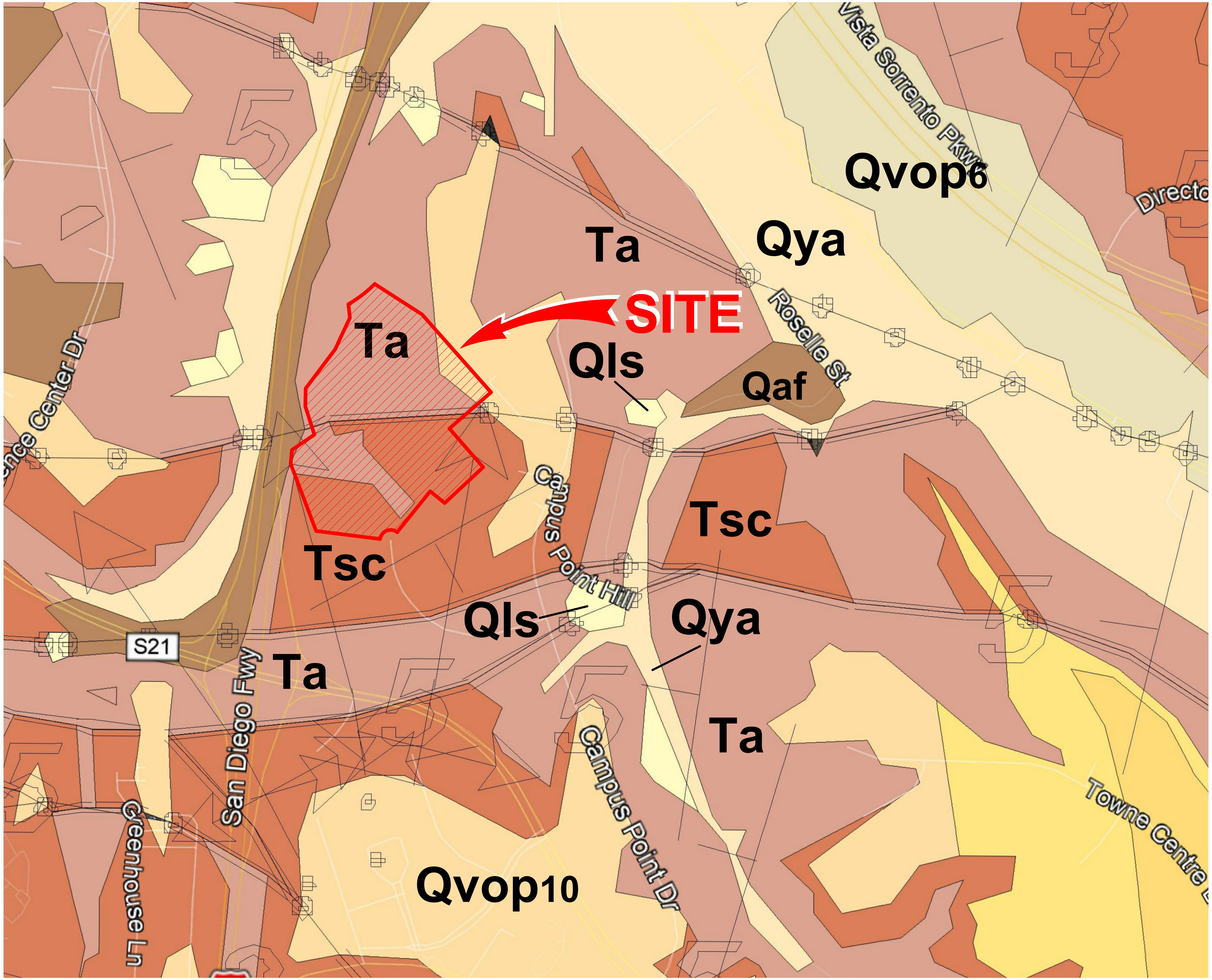
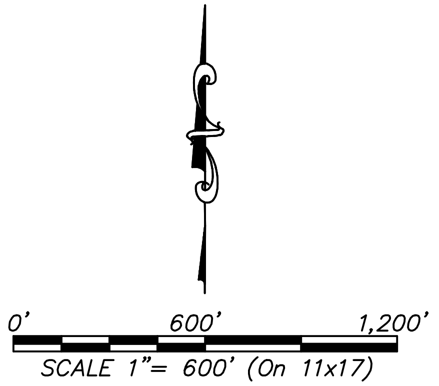
SCALE 1" = 1,000'
DATE 09 - 19 - 2019
PROJECT NO. G2415 - 52 - 01
SHEET 1 OF 1
FIGURE 4

Plotted:09/18/2019 2:26PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2415-52-01 Campus Point\SHEETS\G2415-52-01 SeismicSafetyHazardMap.dwg



SOURCE: Kennedy P. Michael and Tan S. Siang, 2005, *Geologic Map of San Diego 30'x60' Quadrangle, California*
*U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside*



**GEOCON LEGEND**

***Qaf*** ........ARTIFICIAL FILL
***Qls*** ........LANDSLIDE DEPOSITS UNDIVIDED
***Qya*** ........YOUNG ALLUVIAL FLOOD PLAIN DEPOSITS
***Qvop10*** ........VERY OLD PARALIC DEPOSITS, UNIT 10
***Qvop6*** ........VERY OLD PARALIC DEPOSITS, UNIT 6
***Tsc*** ........SCRIPPS FORMATION
***Ta*** ........ARDATH SHALE

# REGIONAL GEOLOGIC MAP
CAMPUS POINTE
SAN DIEGO, CALIFORNIA

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

SCALE 1" = 600'
DATE 09 - 19 - 2019
PROJECT NO. G2415 - 52 - 01
FIGURE 5
SHEET 1 OF 1

# APPENDIX A

# APPENDIX A

# FIELD INVESTIGATION

# FOR

# CAMPUS POINTE
# SAN DIEGO, CALIFORNIA

# PROJECT NO. G2415-52-01

# APPENDIX A

# FIELD INVESTIGATION

We performed the drilling operations on July 15 through 20, 2019. Borings extended to maximum depth of approximately 97 feet. The locations of the current exploratory borings are shown on the Geologic Map, Figure 2. The boring logs are presented in this Appendix. We located the borings in the field using a measuring tape and existing reference points; therefore, actual boring locations may deviate slightly.

The geotechnical borings were drilled by Baja Drilling to depths ranging from approximately 6 to 97 feet below existing grade using a CME 95 drill rig equipped with hollow-stem augers. The infiltration-test borings were drilled to depths of approximately 6 to 11 feet.

We obtained samples during our subsurface exploration in the borings using either a California sampler or a Standard Penetration Test (SPT) sampler. Both samplers are composed of steel and are driven to obtain ring samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 3 inches. Up to 18 rings are placed inside the sampler that is 2.4 inches in diameter and 1 inch in height. The SPT sampler has an inside diameter of 1.5 inches and an outside diameter of 2 inches. We obtained ring samples at appropriate intervals, placed them in moisture-tight containers, and transported them to the laboratory for testing. The type of sample is noted on the exploratory boring logs.

The California sampler and SPT sampler were driven 12 and 18 inches, respectively. The sampler is connected to A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler. If the sampler was not driven for 12 inches, an approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values as adjustments have not been applied. We estimated elevations shown on the boring logs either from a topographic map or by using a benchmark. Each excavation was backfilled as noted on the boring logs.

We visually examined, classified, and logged the soil encountered in the borings in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained.

PROJECT NO. G2415-52-01

# BORING B 1

ELEV. (MSL.) **294'** DATE COMPLETED **07-15-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2" **ASPHALT CONCRETE** over 3" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, light reddish brown mottled with dark gray, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B1-1 | ■ | | | | 43 | 100.0 | 21.3 |
| 6 | B1-2 | ⊠ | | | | | | |
| 8 | | | | | | | | |
| 10 | B1-3 | ■ | | | -Becomes yellowish brown | 23 | 100.7 | 23.9 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B1-4 | ■ | | | | 29 | 100.5 | 23.2 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B1-5 | ■ | | | -Trace gravel | 30 | 101.6 | 24.0 |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-1,**
**Log of Boring B 1, Page 1 of 3**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 1

ELEV. (MSL.) **294'** DATE COMPLETED **07-15-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B1-6 | | | SM | | 33 | 101.1 | 24.2 |
| 32 | | | | | | | | |
| 34 | | | | | | | | |
| 36 | | | | | | | | |
| 38 | | | | | | | | |
| 40 | B1-7 | | | | -Becomes dense | 53 | 109.8 | 16.0 |
| 42 | | | | | | | | |
| 44 | | | | | | | | |
| 46 | | | | | | | | |
| 48 | | | | | | | | |
| 50 | B1-8 | | | | -Becomes medium dense, fine-grained | 49 | 107.7 | 11.0 |
| 52 | | | | | | | | |
| 54 | | | | | | | | |
| 56 | | | | | | | | |
| 58 | | | | | | | | |

**Figure A-1,**
**Log of Boring B 1, Page 2 of 3**

SAMPLE SYMBOLS

- ▢ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2415-52-01

## BORING B 1

ELEV. (MSL.) **294'** DATE COMPLETED **07-15-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 60 | B1-9 | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, yellowish brown-gray, fine-grained SANDSTONE; oxide staining | 50/2" | 101.6 | 15.2 |
| 62 | | | | | | | | |
| 64 | | | | | | | | |
| | B1-10 | | | | | 50/5" | | 9.3 |
| | | | | | BORING TERMINATED AT 65.5 FEET<br>No groundwater encountered | | | |

**Figure A-1,**
**Log of Boring B 1, Page 3 of 3**

G2415-52-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 2

ELEV. (MSL.) 298'  DATE COMPLETED 07-15-2019

EQUIPMENT CME 95  BY: A. REKANI

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3" **ASPHALT CONCRETE** over 4" **BASE** | | | |
| | | | | SM/SC | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense to dense, moist, mottled light reddish brown and olive gray, Silty/Clayey SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | ■ B2-1 | | | | | 32 | 101.8 | 21.5 |
| 6 | ▨ B2-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | ■ B2-3 | | | | | 31 | 107.8 | 16.8 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | ■ B2-4 | | | | | 28 | 107.2 | 20.2 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | ■ B2-5 | | | | | 51 | 108.6 | 16.2 |
| | | | | | -Becomes dense; trace gravels | | | |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | ■ B2-6 | | | | | 51 | 116.2 | 15.4 |
| 26 | | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Dense, moist, gray to brown gray, Silty, fine- to medium-grained SANDSTONE | | | |
| 28 | | | | | | | | |

**Figure A-2,**
**Log of Boring B 2, Page 1 of 2**

G2415-52-01.GPJ

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ▨ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 2

ELEV. (MSL.) **298'** DATE COMPLETED **07-15-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | | | |
| | B2-7 ■ | ▨ | | SM | | 88/10" | 104.3 | 6.3 |
| | | | | | BORING TERMINATED AT 31 FEET<br>No groundwater encountered | | | |

**Figure A-2,**
**Log of Boring B 2, Page 2 of 2**

G2415-52-01.GPJ

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ▢ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ⊠ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 3

ELEV. (MSL.) 294' DATE COMPLETED 07-15-2019

EQUIPMENT CME 95 BY: A. REKANI

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2" **ASPHALT CONCRETE** over 5" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, mottled light reddish brown and grayish brown, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B3-1 | | | | | 30 | 103.0 | 21.5 |
| 6 | B3-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | B3-3 | | | | | 33 | 100.8 | 22.7 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B3-4 | | | | | 31 | 106.4 | 19.7 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B3-5 | | | | -Becomes reddish to yellowish brown | 36 | 111.3 | 16.1 |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | B3-6 | | | | | 36 | 108.0 | 16.2 |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-3,**
**Log of Boring B 3, Page 1 of 2**

G2415-52-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 3

ELEV. (MSL.) **294'** DATE COMPLETED **07-15-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B3-7 ■ | ▨ | | SM | | 63 | 111.7 | 15.8 |
| | | | | | BORING TERMINATED AT 31 FEET<br>No groundwater encountered | | | |

**Figure A-3,**
**Log of Boring B 3, Page 2 of 2**

G2415-52-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 4

ELEV. (MSL.) 290' DATE COMPLETED 07-15-2019

EQUIPMENT CME 95 BY: A. REKANI

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2" **ASPHALT CONCRETE** over 8" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, mottled light reddish brown and grayish brown, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B4-1 | | | | | 34 | 110.6 | 17.0 |
| 6 | B4-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | B4-3 | | | | | 38 | 108.1 | 18.8 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B4-4 | | | | | 23 | 106.3 | 22.7 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B4-5 | | | | -Tough drilling, trace gravels | 48 | 105.0 | 19.9 |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | | | | | -No recovery at 25 feet due to rock in tip | | | |
| 26 | B4-6 | | | | | 22 | 103.4 | 17.4 |
| 28 | | | | | | | | |

**Figure A-4,**
**Log of Boring B 4, Page 1 of 2**

G2415-52-01.GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 4

ELEV. (MSL.) **290'** DATE COMPLETED **07-15-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B4-7 ■ | ▨ | | SM | | 61 | 111.1 | 16.4 |
| | | | | | BORING TERMINATED AT 31 FEET<br>No groundwater encountered | | | |

**Figure A-4,**
**Log of Boring B 4, Page 2 of 2**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ☒ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 5

ELEV. (MSL.) **295'** DATE COMPLETED **07-16-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3" **ASPHALT CONCRETE** over 4" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, light reddish brown to yellowish brown, mottled with grayish brown, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B5-1 | | | | | 34 | 105.0 | 21.0 |
| 6 | B5-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | B5-3 | | | | | 35 | 107.2 | 10.7 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B5-4 | | | | | 31 | 108.3 | 15.5 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B5-5 | | | | | 48 | 107.5 | 17.8 |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | B5-6 | | | | -Becomes dense, yellowish brown | 50 | 105.6 | 18.9 |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-5,**
**Log of Boring B 5, Page 1 of 3**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ▨ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

## BORING B 5

ELEV. (MSL.) **295'** DATE COMPLETED **07-16-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | | | | SM | | | | |
| | B5-7 ■ | | | | | 49 | 109.4 | 18.6 |
| 32 | | | | | | | | |
| 34 | | | | | | | | |
| 36 | | | | | | | | |
| 38 | | | | | | | | |
| 40 | B5-8 ■ | | | | -Becomes very dense, trace gravels | 80/11" | 114.5 | 13.9 |
| 42 | | | | | | | | |
| 44 | | | | | | | | |
| 46 | | | | | | | | |
| 48 | | | | | | | | |
| 50 | B5-9 ■ | | | | -Becomes dense | 60 | 109.0 | 20.5 |
| 52 | | | | | | | | |
| 54 | | | | | | | | |
| 56 | | | | | | | | |
| 58 | | | | | | | | |

**Figure A-5,**
**Log of Boring B 5, Page 2 of 3**

G2415-52-01.GPJ

SAMPLE SYMBOLS

▢ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 5

ELEV. (MSL.) **295'** DATE COMPLETED **07-16-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 60 | B5-10 ■ | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, yellowish brown, Silty, fine- to medium-grained SANDSTONE | 50/5" | 108.4 | 11.9 |
| 62 | | | | | | | | |
| 64 | | | | | | | | |
| 66 | | | | | | | | |
| 68 | | | | | | | | |
| 70 | B5-11 ■ | | | | -Poor recovery | 50/5" | | 7.9 |

BORING TERMINATED AT 70.5 FEET
No groundwater encountered

**Figure A-5,**
**Log of Boring B 5, Page 3 of 3**

G2415-52-01.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 6

ELEV. (MSL.) 286' DATE COMPLETED 07-16-2019

EQUIPMENT CME 95 BY: A. REKANI

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2" **ASPHALT CONCRETE** over 8" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, light reddish brown, yellowish brown mottled with gray, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B6-1 ■ | | | | | 35 | 105.3 | 20.9 |
| 6 | B6-2 ⊠ | | | | | | | |
| 8 | | | | | | | | |
| 10 | B6-3 ■ | | | | | 29 | 101.7 | 21.5 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B6-4 ■ | | | | | 21 | 100.8 | 22.7 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | | | | | -No recovery at 20 feet; drilled to 21 feet, no recovery<br>-Gravel and cobble sized rock fragments from 20'-22' | | | |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-6,**
**Log of Boring B 6, Page 1 of 2**

G2415-52-01.GPJ

SAMPLE SYMBOLS

▢ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 6

ELEV. (MSL.) 286' DATE COMPLETED 07-16-2019

EQUIPMENT CME 95 BY: A. REKANI

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | | | | SM | | | | |
| | B6-5 ■ | | | | | 36 | 104.1 | 21.3 |
| 32 | | | | | | | | |
| 34 | | | | | | | | |
| 36 | | | | | | | | |
| 38 | | | | | | | | |
| 40 | B6-6 ■ | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, light yellowish brown to grayish brown, Silty, fine- to medium-grained SANDSTONE | 50/6" | 100.0 | 9.3 |
| 42 | | | | | | | | |
| 44 | | | | | | | | |
| 46 | | | | | | | | |
| 48 | | | | | | | | |
| 50 | B6-7 ■ | | | | | 50/6" | 101.9 | 7.8 |
| | | | | | BORING TERMINATED AT 50.5 FEET<br>No groundwater encountered | | | |

**Figure A-6,**
**Log of Boring B 6, Page 2 of 2**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ☒ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 7

ELEV. (MSL.) 286' DATE COMPLETED 07-16-2019

EQUIPMENT CME 95 BY: A. REKANI

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3" **ASPHALT CONCRETE** over 8" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, light yellowish to reddish brown mottled with gray, Silty, fine to medium SAND | | | |
| | B7-1 | | | | | 35 | 104.5 | 21.5 |
| | B7-2 | | | | | | | |
| | B7-3 | | | | | 30 | 105.4 | 21.0 |
| | | | | | -No recovery at 15 feet<br>-Becomes very dense, gravel and cobble encountered | 50/2" | | |
| | | | | | -No recovery | 50/2" | | |
| 20 | B7-4 | | | | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, light yellowish brown to grayish brown, Silty, fine- to medium-grained SANDSTONE | 92/9" | | 12.4 |
| | | | | | -No recovery | 50/5" | | |
| | | | | | BORING TERMINATED AT 25.5 FEET<br>No groundwater encountered | | | |

**Figure A-7,**
**Log of Boring B 7, Page 1 of 1**

G2415-52-01.GPJ

SAMPLE SYMBOLS

| | | | |
|---|---|---|---|
| ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 8

ELEV. (MSL.) **290'** DATE COMPLETED **07-16-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2" **ASPHALT CONCRETE** over 8" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, reddish brown, Silty, fine SAND with trace gravel | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B8-1 | | | | | 32 | 97.9 | 23.2 |
| 6 | B8-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | B8-3 | | | | | 28 | 103.0 | 21.6 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B8-4 | | | CL | **TOPSOIL (Qt)**<br>Firm, moist, dark gray to black, Silty, Sandy CLAY; trace rootlets, wood; organic smell | 13 | 91.3 | 23.2 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B8-5 | | | ML | **ARDATH SHALE (Ta)**<br>Hard, damp, yellowish brown to reddish brown mottled with grayish brown, Sandy SILTSTONE | 92/9" | 122.3 | 17.4 |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | B8-6 | | | | | 97 | 109.7 | 20.1 |
| 26 | | | | | BORING TERMINATED AT 26 FEET<br>No groundwater encountered | | | |

**Figure A-8,**
**Log of Boring B 8, Page 1 of 1**

G2415-52-01.GPJ

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ☒ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 9

ELEV. (MSL.) 302' DATE COMPLETED 07-17-2019

EQUIPMENT CME 95 BY: A. REKANI

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | B9-1 | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, light yellowish to reddish brown, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | B9-2 | | | ML | **ARDATH SHALE (Ta)**<br>Hard, damp, mottled reddish to grayish brown, fine Sandy SILTSTONE; trace gravel; laminated | | | |
| | B9-3 | | | | | 95/8" | 110.1 | 18.4 |
| 6 | | | | | | | | |
| 8 | | | | | | | | |
| 10 | B9-4 | | | | | 77/11" | | |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B9-5 | | | | -Driller reports difficult drilling | 86/10" | | |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-9,**
**Log of Boring B 9, Page 1 of 2**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ▒ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ▩ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 9

ELEV. (MSL.) **302'** DATE COMPLETED **07-17-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B9-6 ■ | ▥ | | ML | | 50/6" | | |
| | | | | | BORING TERMINATED AT 31 FEET<br>No groundwater encountered | | | |

**Figure A-9,**
**Log of Boring B 9, Page 2 of 2**

G2415-52-01.GPJ

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ☒ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 10

ELEV. (MSL.) **301'** DATE COMPLETED **07-17-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SM | **PREVIOUSLY PLACED FILL (Qpf))**<br>Loose, damp, yellowish brown, Silty, fine SAND with trace gravel | | | |
| | B10-1 ⊠ | | | ML | **ARDATH SHALE (Ta)**<br>Very stiff, damp to moist, mottled yellowish to grayish brown, Clayey SILTSTONE | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B10-2 ■ | | | 109.1 | -Becomes hard | 78/11" | 18.4 | |
| 6 | | | | | BORING TERMINATED AT 6 FEET<br>No groundwater encountered | | | |

**Figure A-10,**
**Log of Boring B 10, Page 1 of 1**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 11

ELEV. (MSL.) **300'** DATE COMPLETED **07-17-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0<br>2 | B11-1 | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, damp to moist, light yellowish brown, Silty, fine SAND; trace gravel | | | |
| 4<br>6<br>8 | B11-2 | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, light yellowish gray, Silty, fine- to medium-grained SANDSTONE; weakly cemented; friable | 82/11" | 107.0 | 8.0 |
| 10 | B11-3 | | | ML | **ARDATH SHALE (Ta)**<br>Hard, damp to moist, mottled yellowish to grayish brown, Sandy SILTSTONE | 90/8" | 112.1 | 15.9 |
| | | | | | BORING TERMINATED AT 11 FEET<br>No groundwater encountered | | | |

**Figure A-11,**
**Log of Boring B 11, Page 1 of 1**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ▨ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 12

ELEV. (MSL.) **300'** DATE COMPLETED **07-17-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2" **ASPHALT CONCRETE** over 6" **BASE** | | | |
| | | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, light reddish brown to yellowish gray, Silty, fine- to medium-grained SANDSTONE; weakly cemented; friable | | | |
| 2 | B12-1 | | | | | | | |
| 4 | | | | | | | | |
| | B12-2 | | | | | 98/9" | 111.5 | 9.4 |
| 6 | | | | | | | | |
| 8 | | | | | | | | |
| 10 | B12-3 | | | | | 50/2" | 112.7 | 8.7 |

BORING TERMINATED AT 11 FEET
No groundwater encountered

**Figure A-12,**
**Log of Boring B 12, Page 1 of 1**

G2415-52-01.GPJ

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 13

ELEV. (MSL.) **298'** DATE COMPLETED **07-17-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|
| 0 | | | 3" **ASPHALT CONCRETE** over 12" **BASE** | | | |
| | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, yellowish to reddish brown, Silty, fine SAND with trace gravel | | | |
| 2 | | | | | | |
| 4 | | | | | | |
| | B13-1 | | | 39 | 105.6 | 19.8 |
| 6 | B13-2 | | | | | |
| | | | -Becomes very dense | | | |
| 8 | | | | | | |
| 10 | B13-3 | | | 22 | 105.0 | 9.3 |
| 12 | | | | | | |
| 14 | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, yellowish to grayish brown, Silty, fine-grained SANDSTONE; strongly cemented | | | |
| | | | | 50/2" | | |
| 16 | | | | | | |
| | B13-4 | | | 50/5" | 102.9 | 21.6 |
| 18 | | | | | | |
| 20 | | | | | | |
| 22 | | | | | | |
| | | | -Driller reports difficult drilling | | | |
| 24 | | | | | | |
| | | | -No recovery | 50/1" | | |

BORING TERMINATED AT 25 FEET
No groundwater encountered

**Figure A-13,**
**Log of Boring B 13, Page 1 of 1**

G2415-52-01.GPJ

SAMPLE SYMBOLS

| | |
|---|---|
| ▢ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST |
| ■ ... DRIVE SAMPLE (UNDISTURBED) | ▩ ... DISTURBED OR BAG SAMPLE |
| ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 14

ELEV. (MSL.) **287'** DATE COMPLETED **07-18-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3" **ASPHALT CONCRETE** over 7" **BASE** | | | |
| | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, mottled yellowish brown and grayish brown, Silty, fine to medium SAND with trace gravel | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B14-1 | | | | | 46 | 116.0 | 11.9 |
| 6 | B14-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | B14-3 | | | SC | Medium dense, moist, mottled yellowish to reddish brown and grayish brown, Clayey SAND with trace gravel sized rock fragments | 24 | 102.6 | 23.1 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B14-4 | | | ML | Very stiff, moist, mottled yellowish brown to grayish brown, Sandy SILT | 46 | 109.7 | 20.0 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B14-5 | | | SM | Medium dense, moist, mottled yellowish to reddish brown and grayish brown, Silty, fine SAND | 42 | 110.2 | 19.6 |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | B14-6 | | | | | 35 | 106.9 | 20.9 |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-14,**
**Log of Boring B 14, Page 1 of 4**

G2415-52-01.GPJ

SAMPLE SYMBOLS

- ▢ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ☒ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 14

ELEV. (MSL.) **287'** DATE COMPLETED **07-18-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | ▨ | | | SM | -No recovery; rock in tip | 72 | | |
| 32 | | | | | | | | |
| 34 | | | | | | | | |
| | B14-7 ■ | | | | -Becomes dense, yellowish brown | 63 | 108.3 | 17.9 |
| 36 | | | | | | | | |
| 38 | | | | | | | | |
| 40 | B14-8 ■ | | | | | 67 | 100.5 | 22.7 |
| 42 | | | | | | | | |
| 44 | | | | | | | | |
| 46 | | | | | | | | |
| 48 | | | | | | | | |
| 50 | B14-9 ■ | | | SC | -Auger chattering/bouncing<br>Medium dense, moist, mottled yellowish-reddish brown gray brown, Clayey, fine SAND with few gravel | 25 | 107.1 | 22.7 |
| 52 | | | | | | | | |
| 54 | | | | | | | | |
| 56 | | | | | | | | |
| 58 | | | | | | | | |

## Figure A-14,
## Log of Boring B 14, Page 2 of 4

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ▨ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ☒ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2415-52-01

## BORING B 14

ELEV. (MSL.) **287'** DATE COMPLETED **07-18-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 60 | B14-10 | | | SC | Dense, moist, mottled dark brown, black and grayish brown, Clayey, fine to medium SAND with trace gravel; trace visible organics; trace charcoal | 50 | 114.5 | 18.0 |
| | B14-11 | | | | | | | |
| 62 | | | | | | | | |
| 64 | | | | | | | | |
| 66 | | | | | | | | |
| 68 | | | | | | | | |
| 70 | B14-12 | | | | -Increase in silt and gravel | 55 | 109.1 | 20.6 |
| 72 | | | | | | | | |
| 74 | | | | | | | | |
| 76 | | | | | | | | |
| 78 | | | | | | | | |
| 80 | B14-13 | | | | -Becomes very dense | 85/11" | 115.1 | 11.6 |
| | B14-15 | | | | | | | |
| 82 | | | | | | | | |
| 84 | | | | | | | | |
| 86 | | | | | | | | |
| 88 | | | | | | | | |

**Figure A-14,**
**Log of Boring B 14, Page 3 of 4**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ▢ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 14

ELEV. (MSL.) **287'** DATE COMPLETED **07-18-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 90 | B14-14 | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, yellowish to grayish brown, Silty, fine-grained SANDSTONE; weakly cemented; friable | 50/3" | | 6.4 |
| 92 | | | | | | | | |
| | | | | | -Gravel from 93-97 feet | | | |
| 94 | | | | | | | | |
| 96 | | | | | | 50/1" | | |
| | | | | | -No recovery | | | |

BORING TERMINATED AT 97 FEET
DUE TO REFUSAL ON ROCK
No groundwater encountered

**Figure A-14,**
**Log of Boring B 14, Page 4 of 4**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ☒ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

## BORING B 15

ELEV. (MSL.) **286'** DATE COMPLETED **07-20-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3" **ASPHALT CONCRETE** over 10" **BASE** | | | |
| 2 | | | | SM | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, yellowish to grayish brown, Silty, fine to medium SAND | | | |
| | B15-1 ■ | | | | | 36 | 109.9 | 16.0 |
| 6 | B15-2 ▨ | | | | | | | |
| 10 | B15-3 ■ | | | | -Becomes dense, trace gravel | 53 | 102.3 | 18.9 |
| | B15-4 ■ | | | ML | Stiff, moist, mottled reddish brown and olive brown, Sandy SILT | 24 | 105.6 | 20.3 |
| 20 | ▢ | | | SM | Medium dense, moist, yellowish to reddish brown, Silty, fine to medium SAND with trace gravel | 43 | | |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-15,**
**Log of Boring B 15, Page 1 of 3**

SAMPLE SYMBOLS

▢ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2415-52-01

## BORING B 15

ELEV. (MSL.) **286'** DATE COMPLETED **07-20-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | ▒ | | | SM | -No recovery; rock in tip | 56 | | |
| 32 | ■ B15-5 | | | ML | Stiff, moist, yellowish to reddish brown, Sandy SILT | 33 | 108.3 | 20.3 |
| 34 | | | | | | | | |
| 36 | | | | | | | | |
| 38 | | | | | | | | |
| 40 | ■ B15-6 | | | | | 50 | 109.2 | 19.5 |
| | | | | | -Becomes very stiff | | | |
| 42 | | | | | | | | |
| 44 | | | | | | | | |
| | ⊠ B15-7 | | | | | | | |
| 46 | | | | | | | | |
| 48 | | | | | | | | |
| 50 | ■ B15-8 | | | | | 24 | 103.4 | 22.9 |
| | | | | CL | Firm, moist to wet, dark brown to black, highly plastic CLAY with trace organics (observed in tip) | | | |
| 52 | | | | | | | | |
| 54 | | | | ML | Stiff, moist, mottled yellowish-reddish brown, fine Sandy SILT | | | |
| 56 | | | | | | | | |
| 58 | | | | | | | | |
| | | | ▽ | | -Seepage encountered at 59' | | | |

### Figure A-15,
### Log of Boring B 15, Page 2 of 3

SAMPLE SYMBOLS

- ▒ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

# BORING B 15

ELEV. (MSL.) **286'** DATE COMPLETED **07-20-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 60 | B15-9 | | | SM | | 40 | 108.4 | 21.2 |
| 62 | | | | | | | | |
| 64 | | | | | | | | |
| 66 | | | | | | | | |
| 68 | | | | | | | | |
| 70 | B15-10 | | | | | 66/2" | 112.5 | 19.1 |
| | | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist to wet, yellowish to grayish brown, Silty, fine-grained SANDSTONE; laminated; friable (contact in tip) | | | |
| 72 | | | | | | | | |
| 74 | | | | | | | | |
| 76 | | | | | | | | |
| 78 | | | | | | | | |
| 80 | | | | | | 50/3" | | |
| | | | | | -No recovery; strongly cemented | | | |
| 82 | | | | | | | | |
| 84 | | | | | -No recovery; very dense, moist, reddish brown | 50/2" | | |

PRACTICAL REFUSAL AT 85 FEET
Groundwater encountered at ~60'

**Figure A-15,**
**Log of Boring B 15, Page 3 of 3**

G2415-52-01.GPJ

SAMPLE SYMBOLS

- ▢ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 16

ELEV. (MSL.) **286'** DATE COMPLETED **07-20-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 4" **ASPHALT CONCRETE** over 10" **BASE** | | | |
| 2 | | | | ML | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, moist, mottled yellowish to reddish brown and grayish brown, Sandy SILT | | | |
| 4 | | | | | | | | |
| 6 | B16-1 | | | | | 34 | 107.1 | 16.1 |
| 8 | | | | | | | | |
| 10 | B16-2 | | | | | 30 | 103.4 | 21.7 |
| | B16-3 | | | | | | | |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B16-4 | | | | | 35 | 105.9 | 20.7 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B16-5 | | | CL | Firm, moist to wet, mottled dark gray and yellowish to reddish brown, Silty CLAY with trace gravel | 13 | 98.2 | 26.8 |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | B16-6 | | | ML | Medium dense, moist, mottled yellowish to reddish brown and grayish brown, Sandy SILT | 37 | 107.7 | 21.4 |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-16,**
**Log of Boring B 16, Page 1 of 2**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ☒ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2415-52-01

## BORING B 16

ELEV. (MSL.) **286'** DATE COMPLETED **07-20-2019**

EQUIPMENT **CME 95** BY: **A. REKANI**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B16-7 ■ | ▨ | | SC | **SCRIPPS FORMATION (Tsc)**<br>Very dense, damp to moist, yellowish to reddish brown, Silty, fine-grained SANDSTONE with gravel | 50/2" | | |
| 32 | | | | | BORING TERMINATED AT 32 FEET<br>DUE TO REFUSAL ON GRAVEL<br>No groundwater encountered | | | |

**Figure A-16,**
**Log of Boring B 16, Page 2 of 2**

G2415-52-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ☒ ... DISTURBED OR BAG SAMPLE | ◩ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

# APPENDIX B

# APPENDIX B

# LABORATORY TESTING

FOR

CAMPUS POINTE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2415-52-01

# APPENDIX B

## LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for in-place dry density/moisture content, maximum density/optimum moisture content, shear strength, expansion index, water-soluble sulfate, R-Value, consolidation and gradation characteristics. The results of the laboratory tests are in Tables B-I through B-IX and on Figures B-1 through B-25. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

### TABLE B-I
### SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
### ASTM D 1557

| Sample No. | Description | Maximum Dry Density (pcf) | Optimum Moisture Content (% dry wt.) |
|---|---|---|---|
| B3-2 | Reddish- to grayish-brown, Silty, fine to medium SAND (Qpf) | 126.6 | 10.4 |
| B11-1 | Light yellowish-brown, Silty, fine SAND (Qpf) | 127.8 | 10.4 |
| B13-2 | Yellowish- to reddish-brown, Silty, fine SAND (Qpf) | 127.6 | 10.0 |
| B14-15 | Dark brown, Clayey, fine to medium SAND (Qpf) | 125.8 | 11.2 |

### TABLE B-II
### SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
### ASTM D 3080

| Sample No. | Depth (feet) | Geologic Unit | Dry Density (pcf) | Moisture Content (%) | | Unit Peak [Ultimate[1]] Cohesion (psf) | Angle of Peak [Ultimate[1]] Shear Resistance (degrees) |
|---|---|---|---|---|---|---|---|
| | | | | Initial | Final | | |
| B1-6 | 30 | Qpf | 101.1 | 24.2 | 25.9 | 1300 [1200] | 27 [27] |
| B2-7 | 30 | Tsc | 100.9 | 6.6 | 21.7 | 550 [500] | 30 [30] |
| B5-7 | 30 | Qpf | 109.4 | 18.6 | 19.4 | 500 [400] | 37 [36] |
| B8-5 | 20 | Ta | 122.3 | 17.4 | 21.2 | 1000 [900] | 31 [31] |
| B14-9 | 50 | Qpf | 100.4 | 22.0 | 25.6 | 1600 [1500] | 32 [32] |
| B15-9 | 60 | Qpf | 108.4 | 21.2 | 22.7 | 1400 [1100] | 29 [29] |
| B1-3[A] | 10 | Tsc | 106.9 | 17.7 | 21.8 | 600 [600] | 44 [36] |
| B5-2[A] | 5 | Qpf | 102.2 | 9.3 | 21.4 | 300 [50] | 40 [38] |
| B4-3[B] | 10 | Ta | 109.7 | 16.6 | 18.8 | 1,300 [1,000] | 32 [32] |

[A] Results from previous investigation at 10260 Campus Point Drive (G2345-52-02).
[B] Results from previous investigation at 10290 Campus Point Drive (07850-42-15).

## TABLE B-III
## SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
## ASTM D 4829

| Sample No. | Moisture Content (%) | | Dry Density (pcf) | Expansion Index | 2016 CBC Expansion Classification | ASTM Soil Expansion Classification |
|---|---|---|---|---|---|---|
| | Before Test | After Test | | | | |
| B2-2 | 10.8 | 21.9 | 106.9 | 65 | Expansive | Medium |
| B8-2 | 10.3 | 21.6 | 107.7 | 67 | Expansive | Medium |
| B14-15 | 10.2 | 19.9 | 109.6 | 52 | Expansive | Medium |
| B15-7 | 10.2 | 21.5 | 108.3 | 77 | Expansive | Medium |

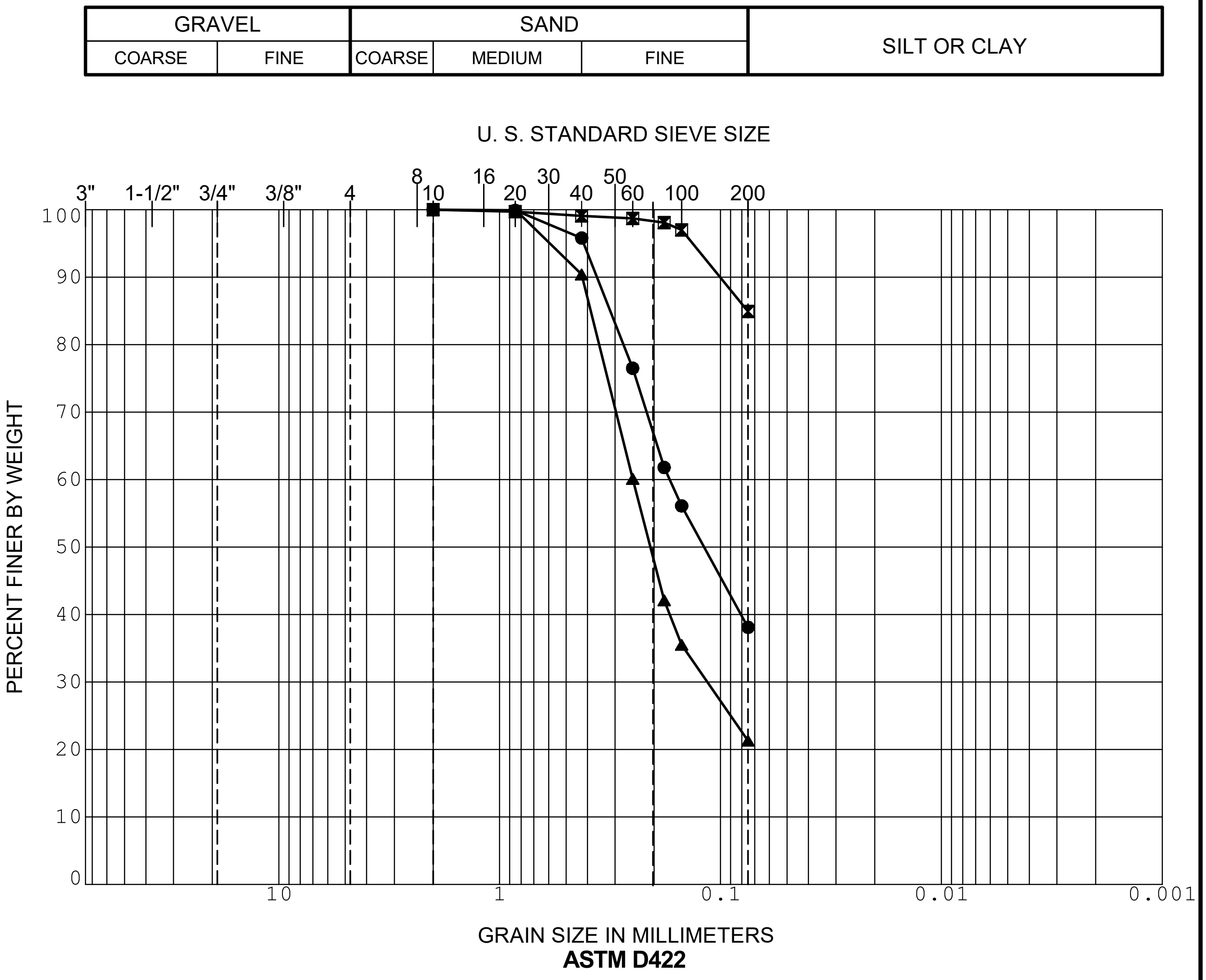
## TABLE B-IV
## SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
## CALIFORNIA TEST NO. 417

| Sample No. | Depth (Feet) | Geologic Unit | Water-Soluble Sulfate (%) | ACI 318 Sulfate Exposure |
|---|---|---|---|---|
| B3-2 | 6 | Qpf | 0.012 | S0 |
| B11-1 | 0 | Qpf | 0.004 | S0 |
| B13-2 | 6 | Qpf | 0.031 | S0 |
| B14-15 | 80 | Qpf | 0.029 | S0 |
| B15-7 | 45 | Qpf | 0.057 | S0 |

## TABLE B-VII
## SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
## ASTM D 2844

| Sample No. | Depth (Feet) | Description (Geologic Unit) | R-Value |
|---|---|---|---|
| B3-2 | 6 | Reddish- to grayish-brown, Silty, fine to medium SAND (Qpf) | 9 |
| B11-1 | 0 | Light yellowish-brown, Silty, fine SAND (Qpf) | 26 |
| B13-2 | 6 | Yellowish- to reddish-brown, Silty, fine SAND (Qpf) | 13 |

PROJECT NO. G2415-52-01



| | SAMPLE | DEPTH (ft) | CLASSIFICATION | NAT WC | LL | PL | PI |
|---|---|---|---|---|---|---|---|
| ● | B5-8 | 40.0 | SM - Silty SAND | | | | |
| ☒ | B10-2 | 5.0 | ML - Sandy SILT | | | | |
| ▲ | B12-3 | 10.0 | SM - Silty SAND | | | | |

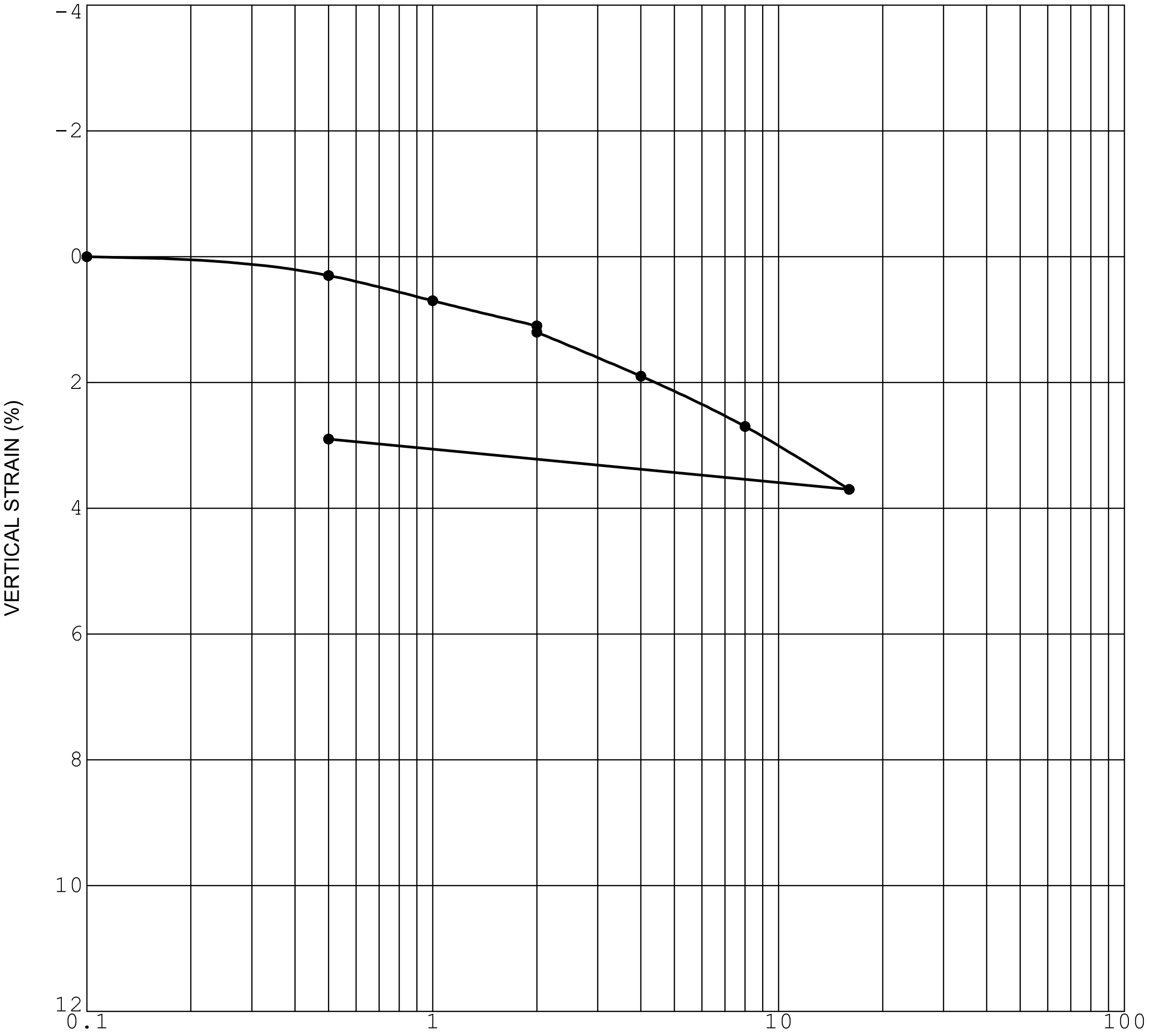
# GRADATION CURVE

CAMPUS POINTE

SAN DIEGO, CALIFORNIA

PROJECT NO. G2415-52-01

SAMPLE NO. B1-8



**ASTM D2435**

| | |
|---|---|
| **Initial Dry Density (pcf)** | 107.2 |
| **Initial Water Content (%)** | 11.0 |

| | |
|---|---|
| **Initial Saturation (%)** | 53.5 |
| **Sample Saturated at (ksf)** | 2.0 |

# CONSOLIDATION CURVE

CAMPUS POINTE

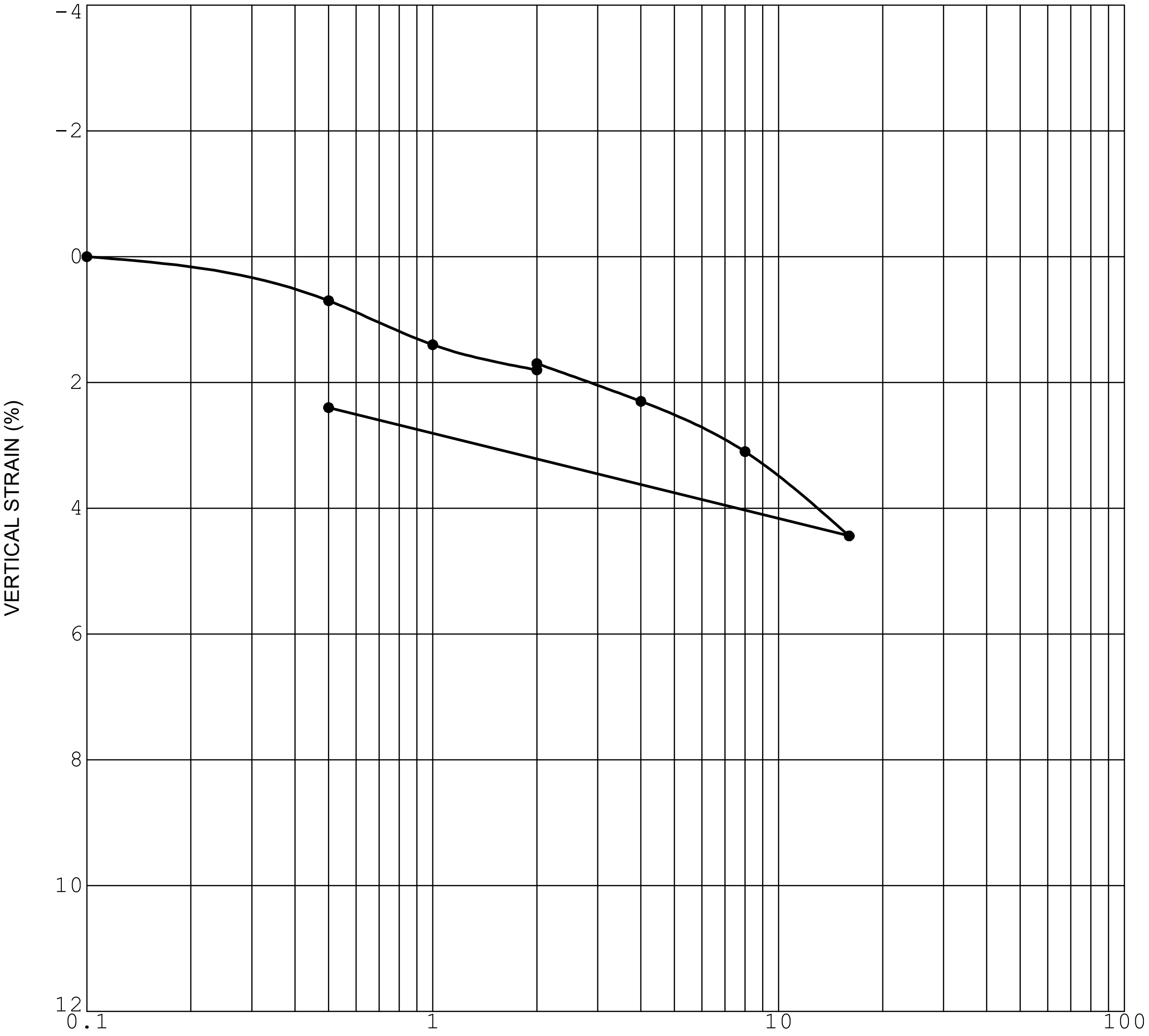
SAN DIEGO, CALIFORNIA

G2415-52-01.GPJ

Figure B-2

GEOCON

SAMPLE NO. B5-9



**ASTM D2435**

| | |
|---|---|
| **Initial Dry Density (pcf)** | 109.0 |
| **Initial Water Content (%)** | 20.5 |

| | |
|---|---|
| **Initial Saturation (%)** | 100 |
| **Sample Saturated at (ksf)** | 2.0 |

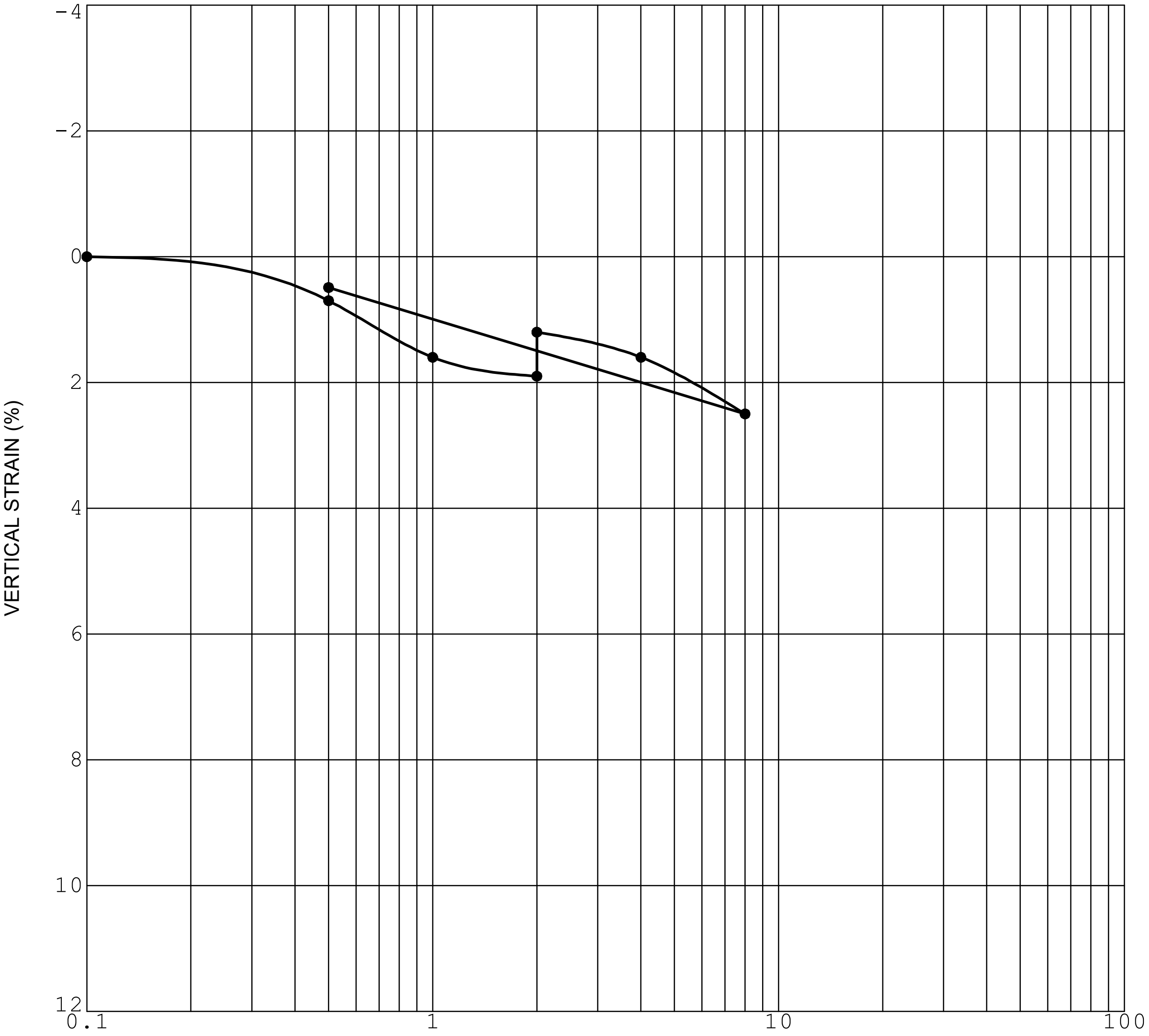
# CONSOLIDATION CURVE

CAMPUS POINTE

SAN DIEGO, CALIFORNIA

Figure B-3

SAMPLE NO. B8-6



APPLIED PRESSURE (ksf)

**ASTM D2435**

| | | | |
|---|---|---|---|
| **Initial Dry Density (pcf)** | 109.7 | **Initial Saturation (%)** | 100 |
| **Initial Water Content (%)** | 20.1 | **Sample Saturated at (ksf)** | 2.0 |

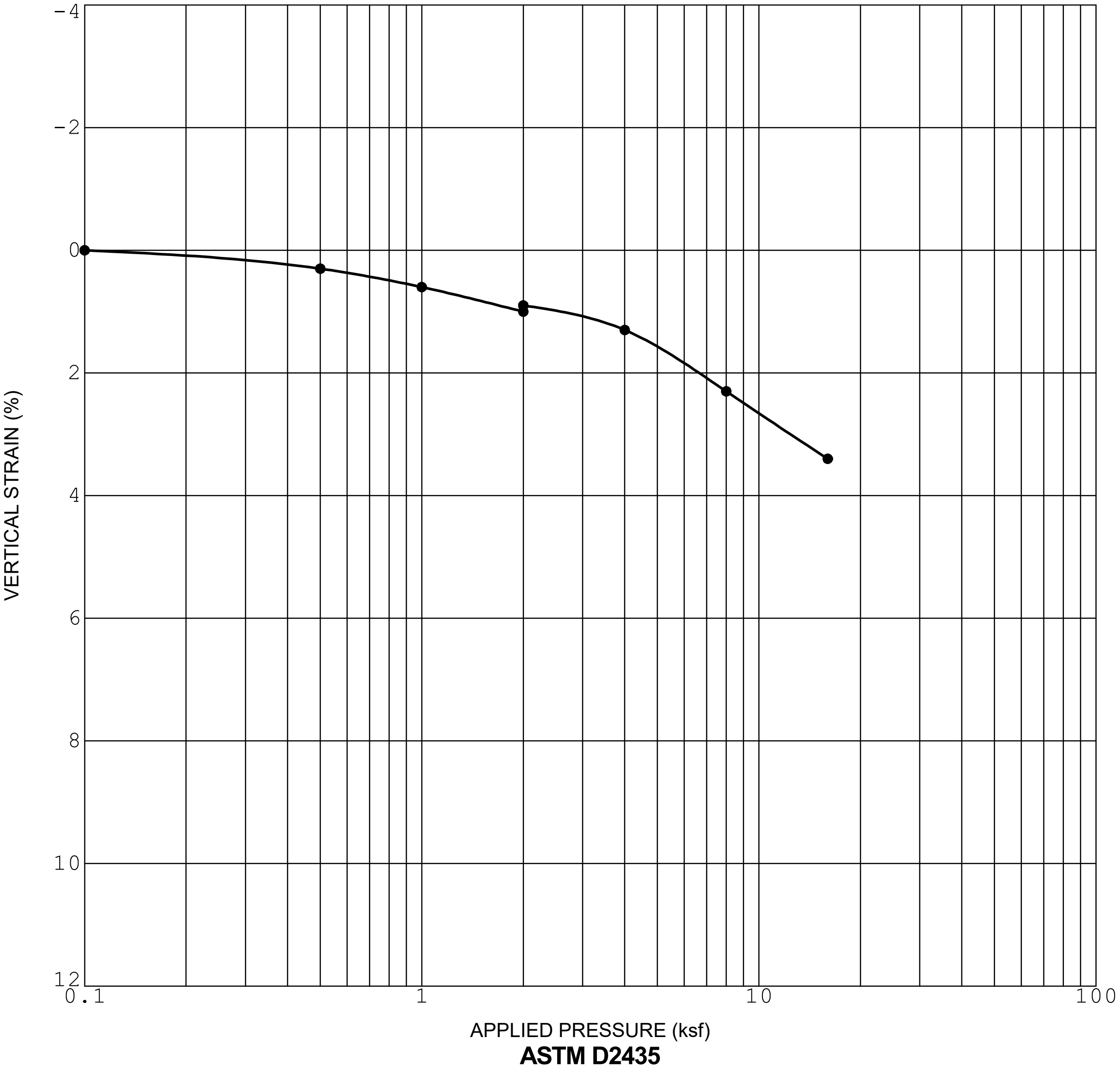
# CONSOLIDATION CURVE

CAMPUS POINTE

SAN DIEGO, CALIFORNIA

PROJECT NO. G2415-52-01

SAMPLE NO. B14-9



**ASTM D2435**

| | |
|---|---|
| **Initial Dry Density (pcf)** | 107.1 |
| **Initial Water Content (%)** | 22.7 |

| | |
|---|---|
| **Initial Saturation (%)** | 100 |
| **Sample Saturated at (ksf)** | 2.0 |

# CONSOLIDATION CURVE

CAMPUS POINTE

SAN DIEGO, CALIFORNIA

G2415-52-01.GPJ

Figure B-5

GEOCON

PROJECT NO. G2415-52-01

SAMPLE NO. B15-8

APPLIED PRESSURE (ksf)

**ASTM D2435**

| | |
|---|---|
| **Initial Dry Density (pcf)** | 103.4 |
| **Initial Water Content (%)** | 22.9 |

| | |
|---|---|
| **Initial Saturation (%)** | 100 |
| **Sample Saturated at (ksf)** | 2.0 |

# CONSOLIDATION CURVE

CAMPUS POINTE

SAN DIEGO, CALIFORNIA

Figure B-6

# APPENDIX C

# APPENDIX C

## BORING, TRENCH LOGS & LABORATORY TESTING FROM:

GEOCON INCORPORATED (2019) – 10260 CAMPUS POINT DRIVE,
GEOCON INCORPORATED (2015) – 10290 CAMPUS POINT DRIVE
SOUTHERN CALIFORNIA SOILS & TESTING (1995) – 10290 CAMPUS POINT DRIVE
GEOCON INCORPORATED (1980) – CAMPUS POINT, PHASE II

FOR

## CAMPUS POINTE
## SAN DIEGO, CALIFORNIA

## PROJECT NO. G2415-52-01

PROJECT NO. G2345-52-02

## BORING B 1

ELEV. (MSL.) 290' DATE COMPLETED 01-30-2019

EQUIPMENT UNIMOG W/ 6" HSA BY: K. JAMES

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | **4-INCH ASPHALT CONCRETE** | | | |
| | B1-1 | | | SM | **UNDOCUMENTED FILL (Qudf)**<br>Medium dense, damp, brown, Silty fine to medium SAND | | | |
| 2 | | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Dense, damp, light gray to yellowish brown, Silty, fine SANDSTONE<br>-Strongly cemented layer encountered from approximate 16 to 24 inches below ground surface | | | |
| 4 | | | | | | | | |
| | B1-2 | | | | | 66 | 106.5 | 11.5 |
| 6 | | | | | | | | |
| 8 | | | | | -Becomes very dense | | | |
| 10 | B1-3 | | | | | 38/11" | 106.8 | 20.1 |
| | | | | | -Becomes light gray and yellowish brown mottled | | | |
| 12 | | | | | | | | |
| 14 | | | | SP | Very dense, damp, gray and red-brown mottled, fine to medium SANDSTONE | | | |
| | B1-4 | | | | | 81 | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B1-5 | | | | | 78 | | |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | B1-6 | | | | | 71/11" | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |
| | | | | SM | Very dense, damp, brown, Silty, fine to medium SANDSTONE | | | |

**Figure A-1,**
**Log of Boring B 1, Page 1 of 2**

G2345-52-02.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ■ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◩ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2345-52-02

## BORING B 1

ELEV. (MSL.) 290' DATE COMPLETED 01-30-2019

EQUIPMENT UNIMOG W/ 6" HSA BY: K. JAMES

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B1-7<br>B1-8 | | | SM | | 50/5.5" | 99.0 | 15.8 |
| 32 | | | | | | | | |
| 34 | | | | SP | Very dense, damp, brown, Silty, fine to medium SANDSTONE | | | |
| | B1-9 | | | | | 50/5" | 96.7 | 9.8 |
| 36 | | | | | | | | |
| 38 | | | | | | | | |
| 40 | B1-10 | | | | -Becomes wet | 81/11" | | |
| | | | | | BORING TERMINATED AT 40 FEET 11 INCHES<br>Boring backfilled with approximate 8 cu. ft. bentonite<br>No groundwater encountered | | | |

**Figure A-1,**
**Log of Boring B 1, Page 2 of 2**

G2345-52-02.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ▒ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ▩ ... DISTURBED OR BAG SAMPLE | ◩ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2345-52-02

## BORING B 2

ELEV. (MSL.) **291'** DATE COMPLETED **01-30-2019**

EQUIPMENT **UNIMOG W/ 6" HSA** BY: **K. JAMES**

| DEPTH IN FEET | SAMPLE NO. | | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | ■ | | | **4-INCH ASPHALT CONCRETE** | | | |
| | B2-1 | ⊠ | ⁘ | | SM | **UNDOCUMENTED FILL (Qudf)**<br>Medium dense, damp, brown, Silty, fine to medium SAND | | | |
| 2 | | ⊠ | ⁘ | | SM | **SCRIPPS FORMATION (Tsc)**<br>Very dense, damp, light yellowish brown, Silty fine to medium SANDSTONE | | | |
| 4 | B2-2 | ■ | ⁘ | | | | 74/10" | 109.4 | 8.5 |

BORING TERMINATED AT 5 FEET
Backfilled with soil cuttings
No groundwater encountered

**Figure A-2,**
**Log of Boring B 2, Page 1 of 1**

G2345-52-02.GPJ

SAMPLE SYMBOLS
- ■ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◩ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2345-52-02

## BORING B 3

ELEV. (MSL.) **293'** DATE COMPLETED **01-30-2019**

EQUIPMENT **UNIMOG W/ 6" HSA** BY: **K. JAMES**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | **5-INCH ASPHALT CONCRETE** | | | |
| | | | | SM | **UNDOCUMENTED FILL (Qudf)**<br>Loose, damp, brown to yellowish brown, Silty fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B3-1 | | | | | 16 | 96.9 | 10.6 |
| 6 | | | | SM | **SCRIPPS FORMATION (Tsc)**<br>Dense, damp, light brown and yellowish brown, Silty, fine to medium SAND | | | |
| 8 | | | | | | | | |
| 10 | | | | | | | | |
| | B3-2 | | | | | 46 | | |

BORING TERMINATED AT 11.5 FEET
Backfilled with soil cuttings
No groundwater encountered

**Figure A-3,**
**Log of Boring B 3, Page 1 of 1**

G2345-52-02.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ■ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

## BORING B 4

ELEV. (MSL.) **294'** DATE COMPLETED **01-30-2019**

EQUIPMENT **UNIMOG W/ 6" HSA** BY: **K. JAMES**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | **4-INCH ASPHALT CONCRETE** | | | |
| | B4-1 | | | SC | **PREVIOUSLY PLACED FILL**<br>Medium dense, moist, brown to yellowish brown, Clayey, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B4-2 | | | | | 22 | 97.3 | 13.7 |
| 6 | | | | | BORING TERMINATED AT 6 FEET<br>Backfilled with soil cuttings<br>No groundwater encountered | | | |

**Figure A-4,**
**Log of Boring B 4, Page 1 of 1**

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ▒ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2345-52-02

## BORING B 5

ELEV. (MSL.) **295'** DATE COMPLETED **01-30-2019**

EQUIPMENT **UNIMOG W/ 6" HSA** BY: **K. JAMES**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | **4-INCH ASPHALT CONCRETE** | | | |
| | B5-1 | | | SC | **PREVIOUSLY PLACED FILL (Qpf)**<br>Medium dense, damp, brown to yellowish brown, Clayey, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B5-2 | | | | | | | |
| 6 | | | | SP | Dense, damp, light brown, fine to medium SAND | 51 | | |
| 8 | | | | | | | | |
| | | | | SC | **SCRIPPS FORMATION (Tsc)**<br>Very dense, brown to yellowish brown, Clayey, fine to medium SAND | | | |
| 10 | B5-3 | | | | | 57/6.5" | 101.7 | 17.1 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B5-4 | | | SM | Very dense, strongly cemented, moist, light gray, Silty fine to medium SANDSTONE | 72/11" | 98.3 | 9.6 |
| 16 | | | | | -Difficult drilling | | | |
| 18 | | | | | | | | |
| 20 | B5-5 | | | | -strongly cemented | 50/0.2" | | |
| 22 | | | | | -Very difficult drilling | | | |
| 24 | | | | | -Becomes weakly cemented; brown to yellowish brown | | | |
| | B5-6 | | | | | 76/10" | 96.5 | 12.3 |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-5,**
**Log of Boring B 5, Page 1 of 2**

SAMPLE SYMBOLS

| | |
|---|---|
| ■ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST |
| ■ ... DRIVE SAMPLE (UNDISTURBED) | ▩ ... DISTURBED OR BAG SAMPLE |
| ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

## BORING B 5

ELEV. (MSL.) **295'** DATE COMPLETED **01-30-2019**

EQUIPMENT **UNIMOG W/ 6" HSA** BY: **K. JAMES**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B5-7 | | | SM | | 50/6" | | |
| 32 | | | | | | | | |
| 34 | | | | | | | | |
| | B5-8 | | | | -Becomes light brown | 50/5" | | |
| 36 | | | | | | | | |
| 38 | | | | SP | Very dense, damp, light brown, fine to medium SANDSTONE<br>-Difficult drilling | | | |
| 40 | B5-9 | | | | | 60 | | |
| 42 | | | | | | | | |
| | | | | SM | Very dense, damp, light grayish brown, Silty, fine to medium SANDSTONE | | | |
| 44 | | | | | | | | |
| | B5-10 | | | | | 85 | 108.7 | 13.8 |
| 46 | | | | | BORING TERMINATED AT 46 FEET<br>Backfilled with approximately 9 cu. ft. bentonite<br>No groundwater encountered | | | |

**Figure A-5,**
**Log of Boring B 5, Page 2 of 2**

G2345-52-02.GPJ

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ■ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ▩ ... DISTURBED OR BAG SAMPLE | ◩ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2345-52-02

## TEST PIT P 1

ELEV. (MSL.) 290' DATE COMPLETED 01-30-2019

EQUIPMENT UNIMOG W/ 6" HSA BY: K. JAMES

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | **4-INCH ASPHALT CONCRETE** | | | |
| | | | | SC | **UNDOCUMENTED FILL (Qudf)**<br>Medium dense, moist, brown, Clayey, fine to medium SAND | | | |
| 2 | | | | ML | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, yellowish brown, Sandy SILTSTONE | | | |
| 4 | | | | | | | | |
| | P1-1 ■ | | | | | 52 | | |
| 6 | | | | | BORING TERMINATED AT 6 FEET<br>Backfilled with soil cuttings<br>No groundwater encountered | | | |

**Figure A-6,**
**Log of Test Pit P 1, Page 1 of 1**

G2345-52-02.GPJ

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ■ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2345-52-02

## TEST PIT P 2

ELEV. (MSL.) **290'** DATE COMPLETED **01-30-2019**

EQUIPMENT **UNIMOG W/ 6" HSA** BY: **K. JAMES**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | **4-INCH ASPHALT CONCRETE** | | | |
| | | | | SC | **UNDOCUMENTED FILL (Qudf)**<br>Medium dense, moist, brown, Clayey, fine to medium SAND | | | |
| 2 | | | | ML | **SCRIPPS FORMATION (Tsc)**<br>Very dense, moist, yellowish brown, Sandy SILTSTONE | | | |
| 4 | | | | | | | | |
| 6 | | | | | BORING TERMINATED AT 6 FEET<br>Backfilled with soil cuttings<br>No groundwater encountered | | | |

**Figure A-7,**
**Log of Test Pit P 2, Page 1 of 1**

G2345-52-02.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ■ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◪ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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# APPENDIX B

# LABORATORY TESTING

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. We tested selected soil samples for in-place dry density and moisture content, maximum density and optimum moisture content, direct shear strength, expansion index, water soluble sulfate, R-Value, unconfined compressive strength, gradation characteristics and consolidation characteristics. Tables B-I through B-VI and Figures B-1 and B-2 present the results of our laboratory tests. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

### TABLE B-I
### SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
### (ASTM D 1557)

| Sample No. | Description (Geologic Unit) | Maximum Dry Density (pcf) | Optimum Moisture Content (% dry wt.) |
|---|---|---|---|
| B2-1 | Light Yellowish Brown, Silty, fine to medium SAND (Tsc) | 131.6 | 8.7 |
| B5-1 | Brown to yellowish brown, Clayey, fine to medium SAND (Qudf) | 130.4 | 9.4 |

### TABLE B-II
### SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
### ASTM D 3080

| Sample No. | Dry Density (pcf) | Moisture Content (%) | | Peak [Ultimate[1]] Cohesion (psf) | Peak [Ultimate[1]] Angle of Shear Resistance (degrees) |
|---|---|---|---|---|---|
| | | Initial | Final | | |
| B1-3 | 106.9 | 17.7 | 21.8 | 600 [600] | 44 [36] |
| B5-2[2] | 102.2 | 9.3 | 21.4 | 300 [50] | 40 [38] |

[1] Ultimate at end of test at 0.2-inch deflection.
[2] Remolded to a dry density of about 90 percent of the laboratory maximum dry density.

## TABLE B-III
## SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
## ASTM D 4829

| Sample No. | Geologic Unit | Moisture Content (%) | | Dry Density (pcf) | Expansion Index | 2016 CBC Expansion Classification | ASTM Soil Expansion Classification |
|---|---|---|---|---|---|---|---|
| | | Before Test | After Test | | | | |
| B1-8 | Tsc | 9.7 | 17.1 | 111.7 | 19 | Non-Expansive | Very Low |
| B5-1 | Qpf | 9.8 | 19.4 | 110.7 | 55 | Expansive | Medium |

## TABLE B-IV
## SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
## CALIFORNIA TEST NO. 417

| Sample No. | Depth (feet) | Geologic Unit | Water-Soluble Sulfate (%) | ACI 318 Sulfate Exposure |
|---|---|---|---|---|
| B1-8 | 30-35 | Tsc | 0.007 | S0 |
| B2-1 | 0.5-4 | Tsc | 0.006 | S0 |
| B5-1 | 0.5-5 | Qpf | 0.042 | S0 |

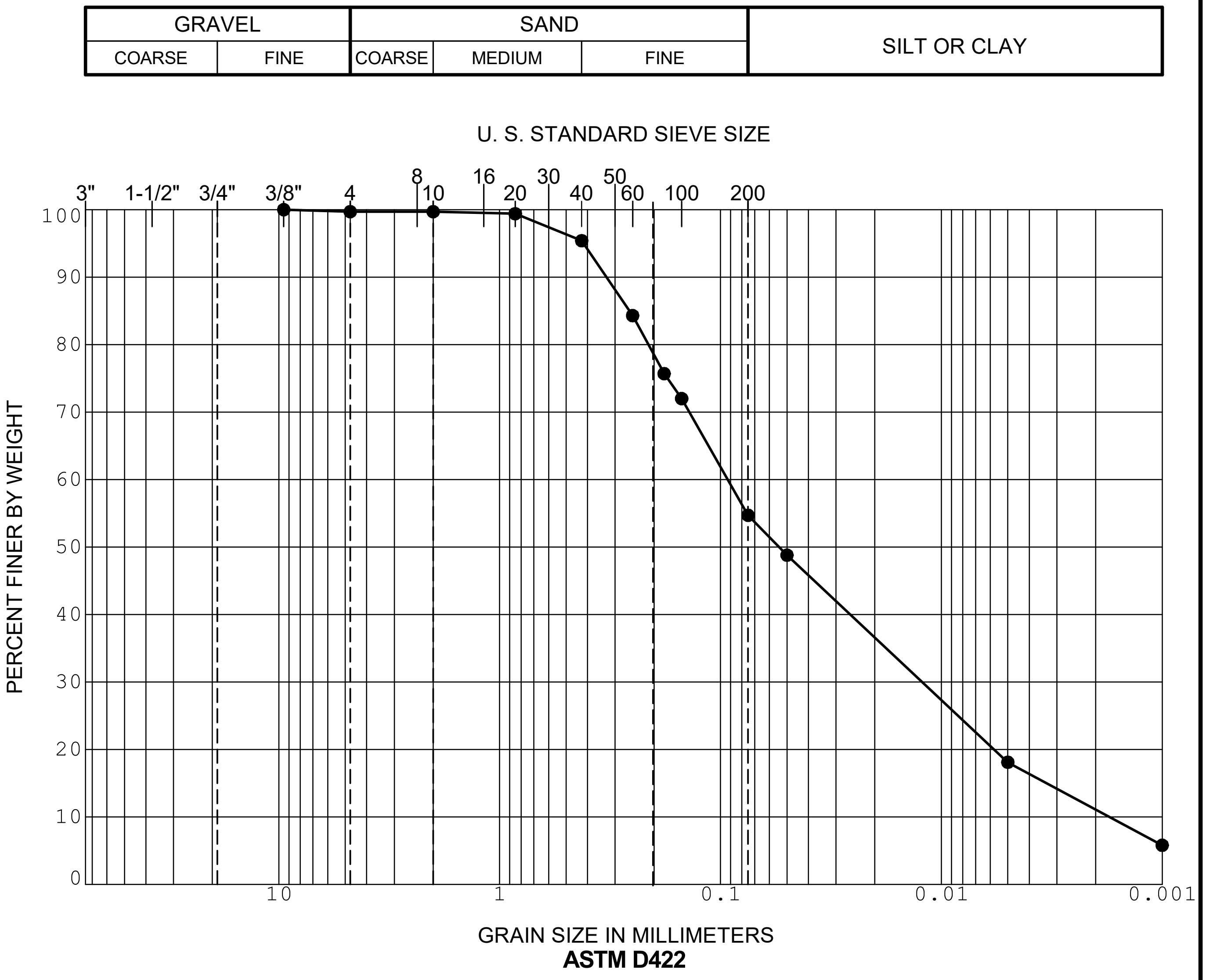
## TABLE B-V
## SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS
## ASTM D 2844

| Sample No. | R-Value |
|---|---|
| B4-1 | 20 |

## TABLE B-VI
## SUMMARY OF LABORATORY UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS
## ASTM D 1558

| Sample No. | Depth (feet) | Geologic Unit | Hand Penetrometer Reading, Unconfined Compression Strength (tsf) | Undrained Shear Strength (ksf) |
|---|---|---|---|---|
| B1-2 | 5 | Tsc | 4.5 | 4.5 |
| B1-7 | 30 | Tsc | 4.5 | 4.5 |
| B2-2 | 4 | Tsc | 4.0 | 4.0 |
| B3-1 | 5 | Qudf | 2.5 | 2.5 |
| B4-2 | 5 | Qpf | 4.0 | 4.0 |
| B5-3 | 10 | Tsc | 3.5 | 3.5 |
| B5-10 | 45 | Tsc | 4.5 | 4.5 |

PROJECT NO. G2345-52-02



| | SAMPLE | DEPTH (ft) | CLASSIFICATION | NAT WC | LL | PL | PI |
|---|---|---|---|---|---|---|---|
| ● | P1-1 | 4.5 | ML - Sandy SILT | | | | |
| ⊠ | | | | | | | |
| ▲ | | | | | | | |

## GRADATION CURVE

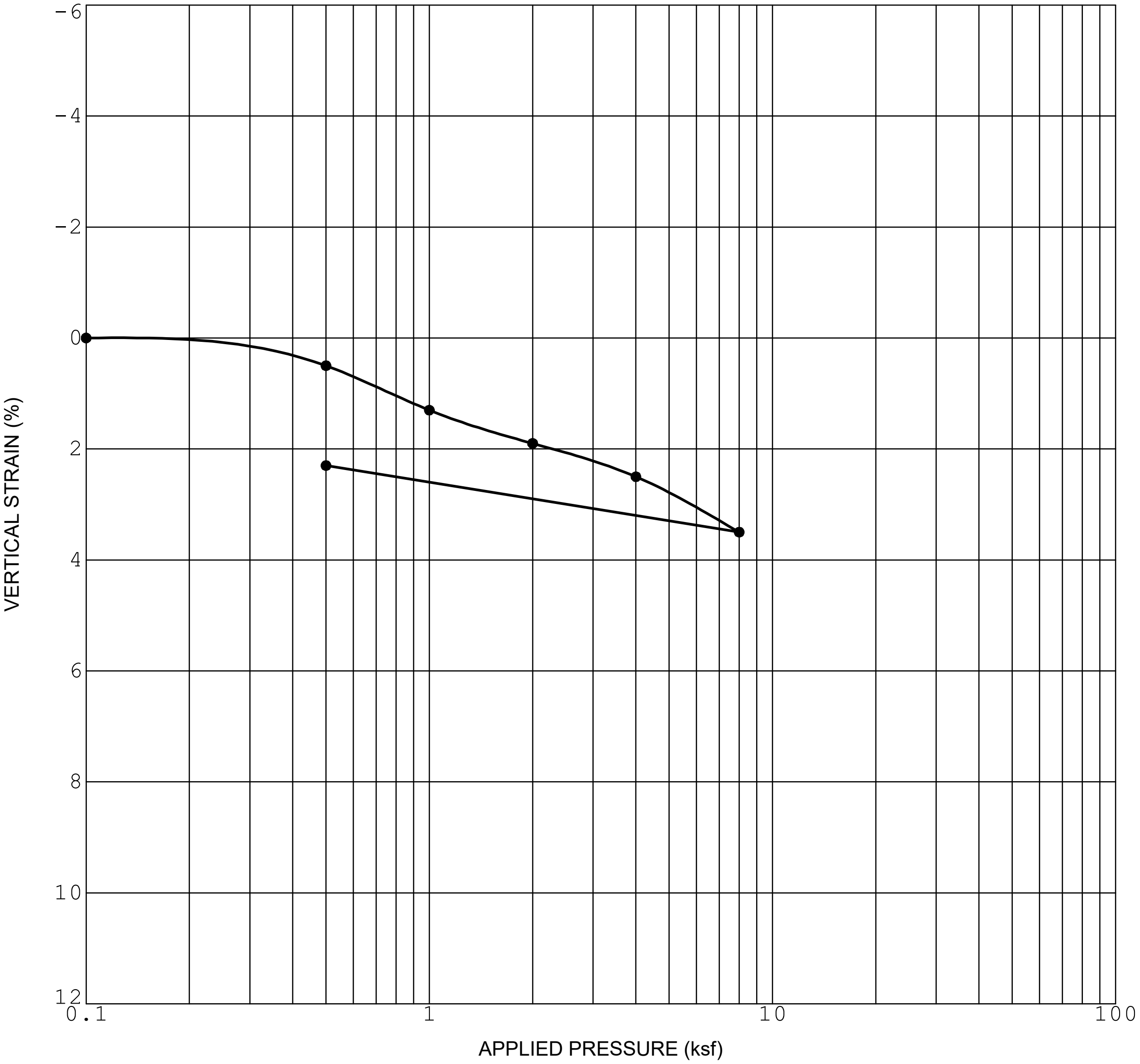
10260 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

Figure B-1

PROJECT NO.  G2345-52-02

SAMPLE NO.  B4-2



**ASTM D2435**

| | | | |
|---|---|---|---|
| **Initial Dry Density (pcf)** | 106.8 | **Initial Saturation (%)** | 96.5 |
| **Initial Water Content (%)** | 20.1 | **Sample Saturated at (ksf)** | 2.0 |

# CONSOLIDATION CURVE

10260 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

G2345-52-02.GPJ

Figure B-2

GEOCON

PROJECT NO. 07850-42-15

## BORING B 1

ELEV. (MSL.) 300' DATE COMPLETED 05-26-2015

EQUIPMENT CME 75 BY: N. BORJA

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3/4" **ASPHALT CONCRETE** Over 6" **BASE** | | | |
| | B1-1 | | | SM | **PREVIOUSLY PLACED FILL**<br>Medium dense, moist, yellowish brown, Silty, fine to medium SAND; few clay | | | |
| 2 | | | | | | | | |
| | | | | ML | Stiff, moist, yellowish brown to brown, Sandy SILT; few clay | | | |
| 4 | | | | | | | | |
| | B1-2 | | | | | 22 | 105.8 | 20.5 |
| 6 | | | | | | | | |
| 8 | | | | SM | Medium dense, moist, mottled yellowish brown and gray, Silty, fine to medium SAND; trace clay | | | |
| 10 | | | | | | | | |
| | B1-3 | | | | | 21 | 104.2 | 21.3 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B1-4 | | | | | 21 | 100.1 | 24.6 |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| | B1-5 | | | | | 25 | 102.8 | 22.6 |
| | | | | SM/ML | **ARDATH SHALE**<br>Dense, moist, mottled yellowish brown, gray, and reddish brown, Silty, fine to medium SAND and Sandy SILT | | | |

BORING TERMINATED AT 19.5 FEET
No groundwater encountered
Boring finished on 05/26/2015

**Figure A-1,**
**Log of Boring B 1, Page 1 of 1**

07850-42-15 (UPDATED).GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ▩ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 2

ELEV. (MSL.) **300'** DATE COMPLETED **05-26-2015**

EQUIPMENT **CME 75** BY: **N. BORJA**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 3" **ASPHALT CONCRETE** Over 5.5" **BASE** | | | |
| | B2-1 | | | SM | **ARDATH FORMATION**<br>Very dense, damp, mottled yellowish brown and gray, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B2-2 | | | | | 50/3" | | |
| 6 | | | | | | | | |
| | | | | | -Becomes tan brown; encountered hard cemented zone; different drilling between 7' to 9' | | | |
| 8 | | | | | | | | |
| 10 | B2-3 | | | | | 69/11" | | |
| | B2-4 | | | | | | | |
| 12 | | | | | | | | |
| | | | | SM | Very dense, damp, mottled brown and yellowish brown to reddish brown, Silty, fine to medium SAND; moderately cemented | | | |
| 14 | | | | | | | | |
| | B2-5 | | | | | 50/5" | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| | B2-6 | | | | -Hard cemented zone or rock encountered; very difficult drilling below 18'; poor recovery at 18.5' sample | 50/2" | | |
| | | | | | BORING TERMINATED AT 19.5 FEET<br>No groundwater encountered<br>Boring finished on 05/26/2015 | | | |

**Figure A-2,**
**Log of Boring B 2, Page 1 of 1**

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 3

ELEV. (MSL.) **303'** DATE COMPLETED **05-26-2015**

EQUIPMENT **CME 75** BY: **N. BORJA**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 4" **ASPHALT CONCRETE** Over 7" **BASE** | | | |
| | | | | SM | **ARDATH FORMATION**<br>Dense to very dense damp light grayish brown, Silty, fine to medium SAND | | | |
| 2 | | | | | | | | |
| | | | | | -Becomes damp to moist light yellowish brown | | | |
| 4 | | | | | | | | |
| | B3-1 | | | | | 71/10" | | |
| 6 | B3-2 | | | | | | | |
| 8 | | | | | | | | |
| | | | | SM | Medium dense, damp, light brown, Silty, fine to medium SAND | | | |
| 10 | B3-3 | | | | | 30 | | |
| | | | | ML | Stiff, damp, light gray, Sandy SILT | | | |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | | | | SM | Very dense, damp, yellowish brown, Silty, fine to medium SAND | | | |
| | B3-4 | | | | | 82/10" | | |
| 16 | | | | | | | | |
| 18 | | | | | -Becomes dense | | | |
| | B3-5 | | | | | 71 | | |

BORING TERMINATED T 19.5 FEET
No groundwater encountered
Boring finished on 05/26/2015

**Figure A-3,**
**Log of Boring B 3, Page 1 of 1**

07850-42-15 (UPDATED).GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ☒ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 4

ELEV. (MSL.) 300' DATE COMPLETED 05-26-2015

EQUIPMENT CME 75 BY: N. BORJA

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 2.5" **ASPHALT CONCRETE** Over 4" **RECYCLED BASE** | | | |
| | | | | ML/SM | **ARDATH FORMATION**<br>Hard, damp, mottled, yellowish brown to tan and gray, Sandy SILT to Silty, fine-grained SAND | | | |
| 2 | | | | SM/SP-SM | Dense, damp, light gray, fine to medium SAND; weakly cemented | | | |
| 4 | | | | SM | Dense to very dense, damp, mottled tan brown and gray, Silty, fine to medium grained SAND; weakly cemented; massive | | | |
| 6 | B4-1 | | | | | 71/11" | | |
| | B4-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | B4-3 | | | | | 77/10" | 109.7 | 16.6 |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| 16 | B4-4 | | | | -Excavates with few gypsum | 79/11" | | |
| 18 | | | | | -Poor recovery | | | |
| | B4-5 | | | | | 50/2" | | |

BORING TERMINATED AT 19.5 FEET
No groundwater encountered
Boring finished on 05/26/2015

**Figure A-4,**
**Log of Boring B 4, Page 1 of 1**

07850-42-15 (UPDATED).GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ▩ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 5

ELEV. (MSL.) **298'** DATE COMPLETED **05-26-2015**

EQUIPMENT **CME 75** BY: **N. BORJA**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 4" **ASPHALT CONCRETE** Over 4" **RECYCLED BASE** | | | |
| 2 | | | | SM/ML | **PREVIOUSLY PLACED FILL**<br>Medium dense, damp to moist, mottled tan and gray, Silty, fine to medium SAND to Sandy SILT | | | |
| 4 | | | | SM | **SCRIPPS FORMATION**<br>Dense, moist, mottled light brown and brown, Silty, fine-grained SAND | | | |
| 6 | B5-1 | | | | -Excavates with reddish brown and yellowish brown staining | 57/11" | | |
| 8 | | | | | | | | |
| 10 | B5-2 | | | | | 76/10" | | |
| 12 | | | | | | | | |
| 14 | | | | | -Becomes brown to light brown; excavates with black specs | | | |
| 16 | B5-3 | | | | | 77/9" | | |
| 18 | | | | | -Becomes light grayish brown to light brown | | | |
| | B5-4 | | | | BORING TERMINATED AT 19.5 FEET<br>No groundwater encountered<br>Boring finished on 05/26/2015 | 77/8" | | |

**Figure A-5,**
**Log of Boring B 5, Page 1 of 1**

SAMPLE SYMBOLS

| | | |
|---|---|---|
| ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ⊠ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

PROJECT NO. 07850-42-15

# BORING B 6

ELEV. (MSL.) **302'** DATE COMPLETED **05-26-2015**

EQUIPMENT **CME 75** BY: **N. BORJA**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | 4" **ASPHALT CONCRETE** Over 8.5" **BASE** | | | |
| 2 | B6-1 ▨ | | | SM | **PREVIOUSLY PLACED FILL**<br>Medium dense, moist, yellowish brown to brown, Silty, fine to medium SAND, trace gravel; trace concrete | | | |
| 4 | | | | | | | | |
| | B6-2 ■ | | | | | 24 | 105.2 | 21.0 |
| 6 | | | | ML | Stiff, moist, mottled yellowish brown to brown and gray, Sandy SILT | | | |
| | | | | | -Encountered cemented zone from 7' to 8'; hard drilling due to rock | | | |
| 8 | | | | | | | | |
| 10 | B6-3 ■ | | | | -Becomes very stiff | 49 | 112.8 | 17.5 |
| 12 | | | | SM | Medium dense to dense, moist, tan brown to yellowish brown, Silty, fine to medium SAND; few clay; trace gravel | | | |
| 14 | | | | CL | Stiff, moist, mottled dark brown, dark gray, and gray, Sandy CLAY; trace gravel, trace organics, slight organic odor; sample chunk of formation in shoe | | | |
| | B6-4 ■ | | | | | 25 | 109.7 | 14.8 |
| 16 | | | | SM | Medium dense, damp, mottled brown and gray, Silty, fine to medium SAND; little chunks of siltstone | | | |
| 18 | | | | | | | | |
| | B6-5 ■ | | | | | 32 | 104.6 | 10.0 |

BORING TERMINATED AT 19.5 FEET
No groundwater encountered
Boring finished on 05/26/2015

**Figure A-6,**
**Log of Boring B 6, Page 1 of 1**

07850-42-15 (UPDATED).GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ▨ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

## BORING B 7

ELEV. (MSL.) **300'** DATE COMPLETED **02-29-2016**

EQUIPMENT **CME 95** BY: **G. CANNON**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SC | **SCRIPPS FORMATION**<br>Very dense, moist, light olive, Clayey, fine SAND | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B7-1 ■ | | | | | 70/11" | | |
| 6 | | | | | | | | |
| 8 | | | | CL | Hard, moist, light olive, fine Sandy CLAY | | | |
| 10 | | | | | | | | |
| | B7-2 ■ | | | | | 83/9" | | |
| 12 | | | | | | | | |
| | | | | SP | Very dense, moist, light gray, fine SAND | | | |
| 14 | | | | | | | | |
| | B7-3 ■ | | | | | 75/10" | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | | | | | | | | |
| | B7-4 ■ | | | | | 93/10" | | |
| 22 | | | | | | | | |
| 24 | | | | | | | | |
| | B7-5 ■ | | | | | 91/10" | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-7,**
**Log of Boring B 7, Page 1 of 2**

07850-42-15 (UPDATED).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◣ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 7

ELEV. (MSL.) **300'** DATE COMPLETED **02-29-2016**

EQUIPMENT **CME 95** BY: **G. CANNON**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | | | | | -Refusal of sampler on concretion | | | |
| 32 | B7-6 | | | | -No sample, rock in shoe | 50/4" | | |
| | | | | SM | Very dense, light reddish gray, Silty fine SAND | | | |
| 34 | | | | | | | | |
| | B7-7 | | | | | 50/6" | | |
| 36 | | | | | BORING TERMINATED AT 36 FEET<br>No groundwater encountered<br>Backfilled with cuttings | | | |

**Figure A-7,**
**Log of Boring B 7, Page 2 of 2**

07850-42-15 (UPDATED).GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ▨ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 8

ELEV. (MSL.) **300'** DATE COMPLETED **02-29-2016**

EQUIPMENT **CME 95** BY: **G. CANNON**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | ML | **ARDATH FORMATION**<br>Hard, moist, olive, fine Sandy, Clayey SILT | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B8-1 | | | | | 75 | | |
| 6 | B8-2 | | | | | | | |
| 8 | | | | | | | | |
| 10 | B8-3 | | | | | 82/11" | | |
| 12 | | | | | | | | |
| 14 | | | | | | | | |
| | B8-4 | | | | -Sample disturbed, rock in sampler | 50/3" | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B8-5 | | | | | 70/11" | | |
| 22 | | | | | | | | |
| | | | | CL | Hard, moist, olive brown, fine Sandy, Silty CLAY | | | |
| 24 | | | | | | | | |
| | B8-6 | | | | | 50/4" | | |
| 26 | | | | | | | | |
| 28 | | | | | | | | |

**Figure A-8,**
**Log of Boring B 8, Page 1 of 2**

07850-42-15 (UPDATED).GPJ

| SAMPLE SYMBOLS | | |
|---|---|---|
| ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| ▨ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

## BORING B 8

ELEV. (MSL.) **300'** DATE COMPLETED **02-29-2016**

EQUIPMENT **CME 95** BY: **G. CANNON**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 30 | B8-7 ■ | ▨ | | | | 87/10" | | |
| 32 | | ▨ | | | | | | |
| 34 | | ▨ | | | | | | |
| 36 | B8-8 ■ | ▨ | | | | 95/10" | | |
| | | | | | BORING TERMINATED AT 36 FEET<br>No groundwater encountered<br>Backfilled with cuttings | | | |

**Figure A-8,**
**Log of Boring B 8, Page 2 of 2**

07850-42-15 (UPDATED).GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ☐ ... SAMPLING UNSUCCESSFUL | ◧ ... STANDARD PENETRATION TEST | ■ ... DRIVE SAMPLE (UNDISTURBED) |
| | ⊠ ... DISTURBED OR BAG SAMPLE | ◣ ... CHUNK SAMPLE | ▼ ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07850-42-15

# BORING B 9

ELEV. (MSL.) **303'** DATE COMPLETED **02-29-2016**

EQUIPMENT **CME 95** BY: **G. CANNON**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | B9-1 | | | SM | **PREVIOUSLY PLACED FILL**<br>Medium dense, moist, yellowish brown, Silty SAND | | | |
| 2 | | | | | | | | |
| | | | | SM | **ARDATH FORMATION**<br>Medium dense, moist, light olive, Silty fine SAND | | | |
| 4 | | | | | | | | |
| | B9-2 | | | | | 21 | 100.3 | 12.6 |
| 6 | | | | | | | | |
| 8 | | | | CL | Hard, moist, gray, Silty CLAY | | | |
| 10 | B9-3 | | | | | 75/10" | 114.5 | 15.1 |
| 12 | | | | CL | Hard, moist, olive brown, Silty, fine Sandy CLAY | | | |
| 14 | B9-4 | | | | | 84/10" | | |
| 16 | | | | | | | | |
| | | | | ML | Hard, moist, olive brown, fine Sandy SILT | | | |
| 18 | | | | | | | | |
| 20 | B9-5 | | | | | 74/10" | | |
| | | | | | BORING TERMINATED AT 21 FEET<br>No groundwater encountered<br>Backfilled with cuttings | | | |

**Figure A-9,**
**Log of Boring B 9, Page 1 of 1**

07850-42-15 (UPDATED).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

▨ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 10

ELEV. (MSL.) **303'** DATE COMPLETED **02-29-2016**

EQUIPMENT **CME 95** BY: **G. CANNON**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | B10-1 ▨ | | | SM | **PREVIOUSLY PLACED FILL**<br>Medium dense, moist, yellowish brown, Silty SAND | | | |
| 2 | | | | ML | **ARDATH FORMATION**<br>Hard, moist, light olive, fine Sandy SILT | | | |
| 4 | | | | | | | | |
| | B10-2 ■ | | | | | 87/9" | | |
| 6 | | | | | | | | |
| 8 | | | | | | | | |
| 10 | B10-3 ■ | | | | | 77/9" | 109.3 | 19.3 |
| 12 | | | | | | | | |
| | | | | CL | Hard, moist, gray, Silty CLAY | | | |
| 14 | | | | | | | | |
| | B10-4 ■ | | | | | 50/6" | 110.2 | 17.4 |
| 16 | | | | | | | | |
| 18 | | | | ML | Hard, moist, red brown, Clayey SILT | | | |
| 20 | B10-5 ■ | | | | | 100/10" | | |

BORING TERMINATED AT 21 FEET
No groundwater encountered
Backfilled with cuttings

## Figure A-10,
## Log of Boring B 10, Page 1 of 1

07850-42-15 (UPDATED).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 11

ELEV. (MSL.) 298' DATE COMPLETED 03-01-2016

EQUIPMENT CME 95 BY: G. CANNON

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | B11-1 | ▨ |  | CL-CL | **FILL**<br>Stiff, moist, olive brown, fine Sandy SILT with clay |  |  |  |
| 2 |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |
|  |  |  |  | CL | **TOPSOIL**<br>Hard, moist, dark brown, CLAY | 24 |  |  |
| 6 | B11-2 | ■ |  | ML | **ARDATH FORMATION**<br>Hard, moist, olive brown, Clayey SILT | 35 |  |  |
| 8 |  |  |  | CL | Very stiff, moist, olive brown, Silty CLAY |  |  |  |
| 10 | B11-3 | ■ |  |  |  | 39 |  |  |
| 12 |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |
|  | B11-4 | ■ |  |  | -Becomes hard | 60 |  |  |
| 16 |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |
|  |  |  |  |  | Hard, moist, olive, Silty CLAY |  |  |  |
| 20 | B11-5 | ■ |  |  |  | 44 |  |  |

BORING TERMINATED AT 21 FEET
No groundwater encountered
Backfilled with cuttings

**Figure A-11,**
**Log of Boring B 11, Page 1 of 1**

07850-42-15 (UPDATED).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. 07850-42-15

## BORING B 12

ELEV. (MSL.) 301' DATE COMPLETED 03-01-2016

EQUIPMENT CME 95 BY: G. CANNON

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | ▨ | | CL | **ARDATH FORMATION**<br>Hard, moist, olive brown, Silty CLAY | | | |
| | B12-1 ⊠ | | | | | | | |
| 2 | | | | | | | | |
| 4 | | | | | | | | |
| | B12-2 ■ | | | | | 70 | 109.0 | 13.5 |
| 6 | | | | | | | | |
| 8 | | ░ | | ML | Hard, moist, olive brown, fine Sandy SILT | | | |
| 10 | B12-3 ■ | | | | | 77/10" | | |
| 12 | | | | | | | | |
| | | ▨ | | CL | Hard, moist, grayish brown, Silty CLAY | | | |
| 14 | | | | | | | | |
| | B12-4 ■ | | | | | 77/11" | | |
| 16 | | | | | | | | |
| 18 | | | | | | | | |
| 20 | B12-5 ■ | | | | | 67 | | |
| | | | | | BORING TERMINATED AT 21 FEET<br>No groundwater encountered<br>Backfilled with cuttings | | | |

## Figure A-12,
## Log of Boring B 12, Page 1 of 1

07850-42-15 (UPDATED).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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# APPENDIX B

# LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their: in-place moisture density; expansion index (EI); shear strength; water-soluble sulfate; gradation; and consolidation characteristics. The results of our laboratory tests are presented on the following tables and figures.

## TABLE B-I
## SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
## ASTM D 4829

| Sample No. | Moisture Content (%) | | Dry Density (pcf) | Expansion Index | Expansion Classification |
|---|---|---|---|---|---|
| | Before Test | After Test | | | |
| B1-1 | 10.8 | 25.1 | 106.8 | 67 | Medium |
| B4-2 | 11.1 | 20.3 | 106.7 | 28 | Low |
| B8-7 | 12.0 | 26.2 | 102.6 | 68 | Medium |
| B10-1 | 9.5 | 20.3 | 110.7 | 57 | Medium |
| B11-3 | 14.6 | 29.0 | 95.1 | 67 | Medium |

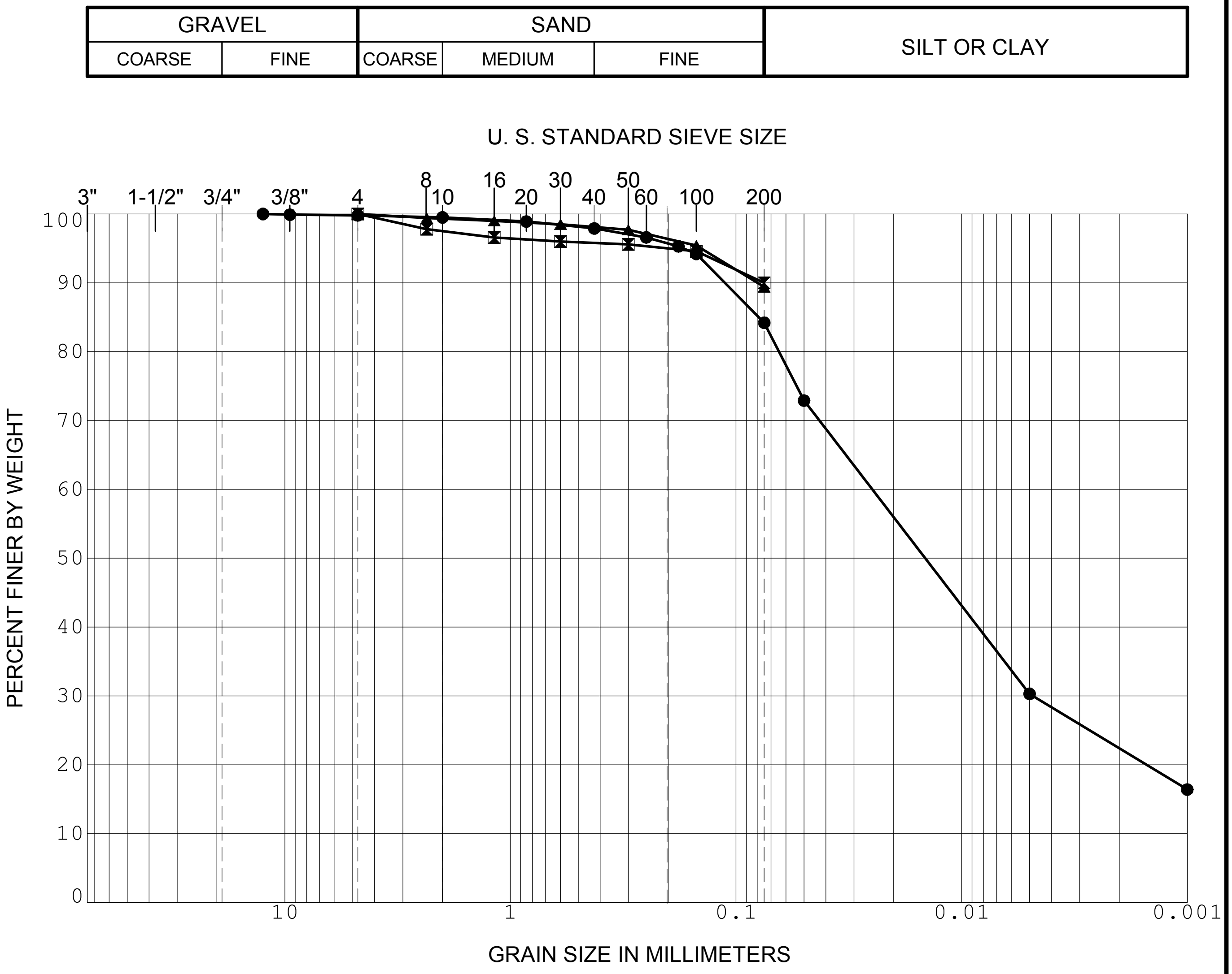
## TABLE B-II
## SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
## ASTM D 3080

| Sample No. | Dry Density (pcf) | Moisture Content (%) | | Unit Cohesion (psf) | Angle of Shear Resistance (degrees) |
|---|---|---|---|---|---|
| | | Initial | Final | | |
| B4-3 | 109.7 | 16.6 | 18.8 | 1330 | 32 |
| B10-3 | 109.3 | 19.3 | 21.2 | 800 | 17 |
| B12-2 | 109.0 | 13.5 | 18.8 | 1000 | 14 |

## TABLE B-III
## SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
## CALIFORNIA TEST NO. 417

| Sample No. | Water-Soluble Sulfate (%) | Classification |
|---|---|---|
| B1-1 | 0.015 | Not Applicable (S0) |
| B4-2 | 0.025 | Not Applicable (S0) |
| B8-7 | 1.010 | Severe (S2) |
| B10-1 | 0.073 | Not Applicable (S0) |
| B11-3 | 1.051 | Severe (S2) |

PROJECT NO. 07850-42-15



|  | SAMPLE | DEPTH (ft) | CLASSIFICATION | NAT WC | LL | PL | PI |
|---|---|---|---|---|---|---|---|
| ● | B2-1 | 1.0 | ML - SILT with Sand |  |  |  |  |
| ⧗ | B10-3 | 10.0 | (ML) Yellowish brown SILT |  |  |  |  |
| ▲ | B11-3 | 10.0 | (CL) Yellowish brown Lean CLAY |  |  |  |  |

# GRADATION CURVE

10290 CAMPUS POINT DRIVE

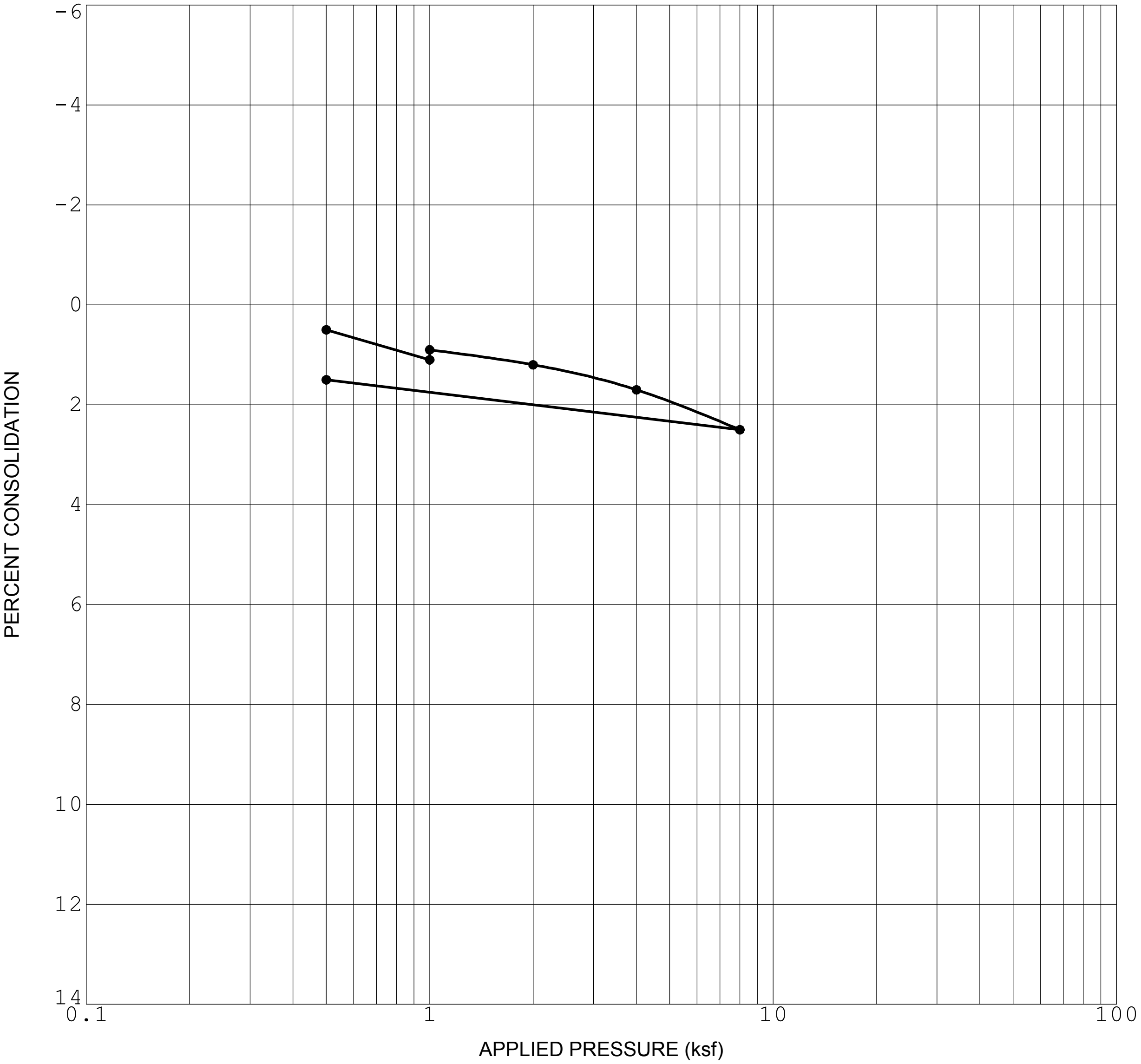
SAN DIEGO, CALIFORNIA

Figure B-1

GEOCON

PROJECT NO. 07850-42-15

SAMPLE NO. B1-2



| | | | | |
|---|---|---|---|---|
| **Initial Dry Density (pcf)** | 105.8 | | **Initial Saturation (%)** | 95.6 |
| **Initial Water Content (%)** | 20.5 | | **Sample Saturated at (ksf)** | 1.0 |

## CONSOLIDATION CURVE

10290 CAMPUS POINT DRIVE

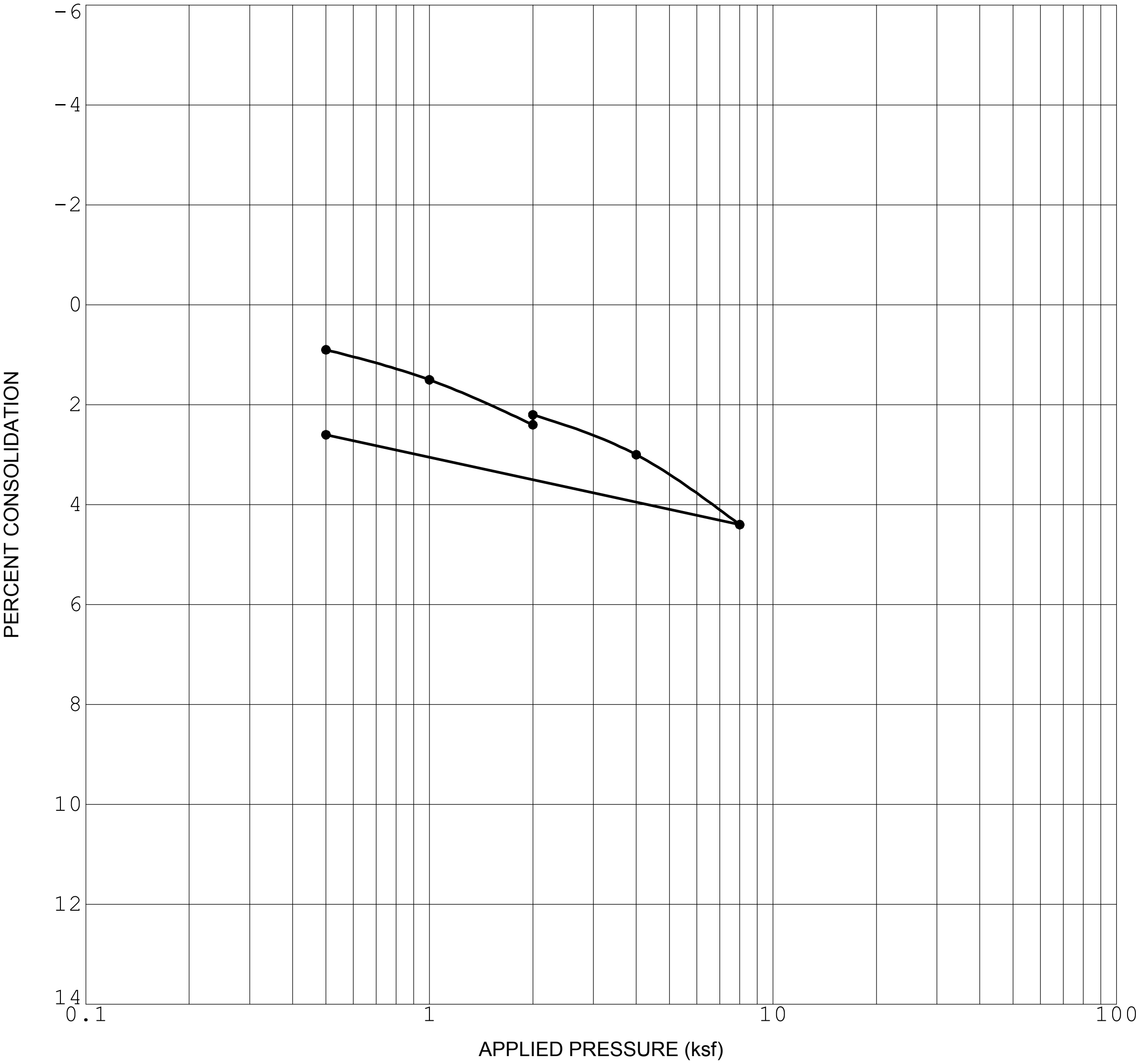
SAN DIEGO, CALIFORNIA

07850-42-15 (UPDATED).GPJ

Figure B-2

GEOCON

SAMPLE NO. B1-4



| | | | | |
|---|---|---|---|---|
| **Initial Dry Density (pcf)** | 100.1 | | **Initial Saturation (%)** | 99.5 |
| **Initial Water Content (%)** | 24.6 | | **Sample Saturated at (ksf)** | 2.0 |

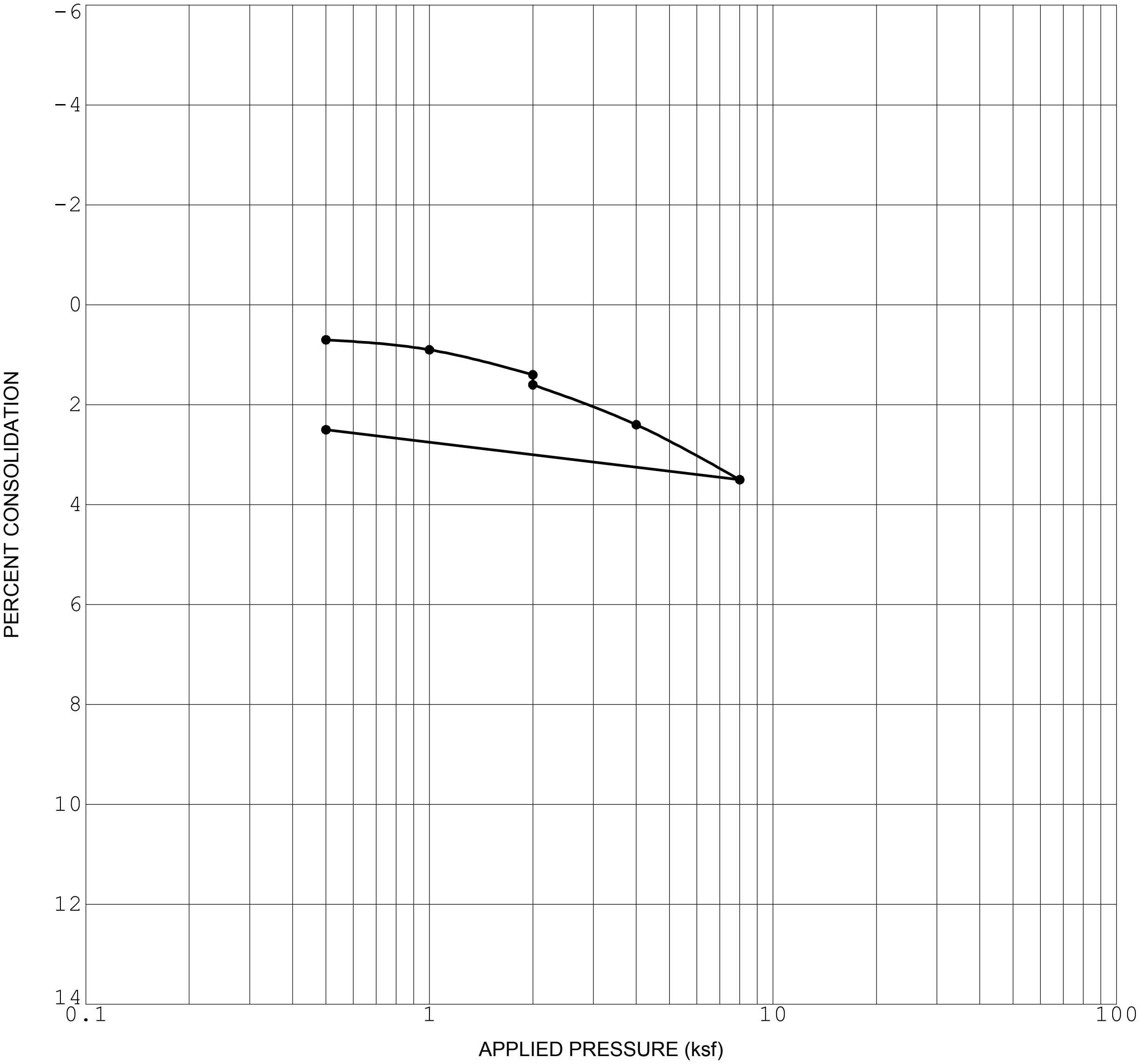
# CONSOLIDATION CURVE

10290 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

PROJECT NO. 07850-42-15

SAMPLE NO. B6-4



| | |
|---|---|
| **Initial Dry Density (pcf)** | 109.7 |
| **Initial Water Content (%)** | 14.8 |

| | |
|---|---|
| **Initial Saturation (%)** | 76.6 |
| **Sample Saturated at (ksf)** | 2.0 |

# CONSOLIDATION CURVE

10290 CAMPUS POINT DRIVE

SAN DIEGO, CALIFORNIA

07850-42-15 (UPDATED).GPJ

Figure B-4

GEOCON

# SUBSURFACE EXPLORATION LEGEND

## UNIFIED SOIL CLASSIFICATION CHART

| SOIL DESCRIPTION | | GROUP SYMBOL | TYPICAL NAMES |
|---|---|---|---|
| I. COARSE GRAINED, more than half of material is larger than No. 200 sieve size. | | | |
| GRAVELS<br>More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3". | CLEAN GRAVELS | GW | Well graded gravels, gravel-sand mixtures, little or no fines. |
| | | GP | Poorly graded gravels, gravel sand mixtures, little or no fines. |
| | GRAVELS WITH FINES (Appreciable amount of fines) | GM | Silty gravels, poorly graded gravel-sand-silt mixtures. |
| | | GC | Clayey gravels, poorly graded gravel-sand, clay mixtures. |
| SANDS<br>More than half of coarse fraction is smaller than No. 4 sieve size. | CLEAN SANDS | SW | Well graded sand, gravelly sands, little or no fines. |
| | | SP | Poorly graded sands, gravelly sands, little or no fines. |
| | SANDS WITH FINES (Appreciable amount of fines) | SM | Silty sands, poorly graded sand and silty mixtures. |
| | | SC | Clayey sands, poorly graded sand and clay mixtures. |
| II. FINE GRAINED, more than half of material is smaller than No. 200 sieve size. | SILTS AND CLAYS | ML | Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity. |
| | Liquid Limit less than 50 | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. |
| | | OL | Organic silts and organic silty clays or low plasticity. |
| | SILTS AND CLAYS | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts. |
| | Liquid Limit greater than 50 | CH | Inorganic clays of high plasticity, fat clays. |
| | | OH | Organic clays of medium to high plasticity. |
| | HIGHLY ORGANIC SOILS | PT | Peat and other highly organic soils. |

▼ — Water level at time of excavation or as indicated

US — Undisturbed, driven ring sample or tube sample

CK — Undisturbed chunk sample

BG — Bulk sample

SP — Standard penetration sample

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

QUALCOMM/IVAC

BY: CHC

DATE: 10-10-95

JOB NUMBER: 9511205

Plate No. 2

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | BORING NUMBER 1<br>ELEVATION<br>DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | SM | FILL, Tan to Light Brown, SILTY SAND | Humid | Loose | | | | |
| 2 | | | | Moist | Dense | | | | |
| | US | | | | | 47 | 108.8 | 10.1 | |
| 4 | BAG | | | | | | | | |
| 6 | US | ML | Yellow-Green Tan and Medium Grey, SLIGHTLY CLAYEY, VERY SANDY SILT | Moist | Stiff | 38 | 104.9 | 19.8 | |
| 8 | BAG | | | | | | | | |
| 10 | US | ML | | Moist | Stiff | 30 | 100.3 | 23.1 | |
| 12 | | | | | | | | | |
| 14 | | | | | | | | | |
| 16 | US | SM | Tan to Reddish Tan, SILTY SAND | Moist | Dense | 35 | 106.1 | 17.9 | |
| 18 | | SM | REWORKED ALLUVIUM, Grey to Dark Brown, SLIGHTLY CLAYEY SILTY SAND with Roots and Organic Odor, Topsoil and Subsoil | Moist | Medium Dense | | | | |
| 20 | US | | | | | 46 | 105.7<br>118.5 | 12.3<br>12.0 | |
| 22 | | SM-SC | SCRIPPS FORMATION, Light Reddish Tan, CLAYEY SILTY SAND | Moist | Dense | | | | |
| 24 | | SM | Tan, SILTY SAND | Moist | Very Dense | | | | |
| 26 | US | | | | | 50/5" | 96.8 | 9.0 | |
| 28 | | | Light Grey | | | | | | |
| 30 | US | | Bottom at 30.5 Feet | | | 50/5" | | | |

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

**SUBSURFACE EXPLORATION LOG**

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 3

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | BORING NUMBER 2<br>ELEVATION<br>DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | SM | SCRIPPS FORMATION, Light Tan to Yellow Tan, SILTY SAND | Humid | Loose | | | | |
| 2 | BAG | | | Moist | Dense | | | | |
| 4 | US | SM-ML | VERY SILTY SAND | Moist | Dense/Hard | 44 | 101.3 | 8.0 | |
| 6 | US | SM | Tan to Light Brown, SILTY SAND | Moist | Dense | 68 | 101.7 | 7.8 | |
| 8 | | | | | | | | | |
| 10 | US | SM | Tan, SILTY SAND | Moist | Dense | 50/5" | 103.7 | 7.9 | |
| 12 | | | | | | | | | |
| 14 | | | | | | | | | |
| 16 | US | ML | Yellow Tan, SANDY SILT | Moist | Hard | 86 | 109.8 | 18.2 | |
| | | | Bottom at 16 Feet | | | | | | |

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

**SUBSURFACE EXPLORATION LOG**

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 4

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | BORING NUMBER 3<br>ELEVATION<br>DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | ML-CL | SCRIPPS FORMATION, Medium Grey to Yellow Tan, SANDY SILT TO SILTY CLAY | Humid | Soft | | | | |
| 2 | US | | | Moist | Hard | 67 | 108.5 | 17.6 | |
| 4 | | | | | | | | | |
| | US | ML-SM | Yellow Tan to Light Grey, VERY SANDY SILT | Moist | Very Dense | 50/6" | 102.9 | 8.8 | |
| 6 | | | | | | | | | |
| 8 | | | | | | | | | |
| 10 | US | SM | Light Grey, SILTY SAND | Moist | Very Dense | 50/5" | 96.9 | 6.9 | |
| 12 | | | Refusal at 12 Feet on Highly Cemented Concretion | | | | | | |

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

**SUBSURFACE EXPLORATION LOG**

| | |
|---|---|
| LOGGED BY: JRH | DATE LOGGED: 09-28-95 |
| JOB NUMBER: 9511205 | Plate No. 5 |

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | **BORING NUMBER 4**<br>ELEVATION<br>DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | SM | FILL, Tan to Light Brown, SILTY SAND with Rock | Humid | Loose | | | | |
| 2 | US<br>BAG | | | Moist | Dense | 50 | | | |
| 4 | | | | | | | | | |
| 6 | US | | | | | 30 | 103.1 | 9.9 | |
| 8 | BAG | SM-ML | SCRIPPS FORMATION, Light Tan to Tan, SILTY SAND/SANDY SILT | Moist | Very | | | | |
| 10 | US | | | | | 50/5" | 97.2 | 8.7 | |
| 12 | | SM | SILTY SAND | | | | | | |
| 14 | | | | | | | | | |
| | US | SM | SILTY SAND | Moist | Very Dense | 50/5" | 93.2 | 8.1 | |
| 16 | | | | | | | | | |
| 18 | | | | | | | | | |
| 20 | | | Bottom at 20 Feet | | | | | | |

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

**SUBSURFACE EXPLORATION LOG**

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 6

## BORING NUMBER 5

ELEVATION

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | BAG | SM | FILL OR WEATHERED FORMATIONAL, Yellow Tan, SILTY SAND | Humid<br>Moist | Loose<br>Dense | | | | |
| 2 | | | | | | | | | |
| 4 | | SM | SCRIPPS FORMATION, Light Grey with Yellow Tan, SILTY SAND | Moist | Very Dense | | | | |
| | US | | | | | 50/5" | 98.9 | 6.4 | |
| 6 | | | | | | | | | |
| 8 | BAG | | | | | | | | |
| 10 | US | | | | | 50/4" | | | |
| 12 | | | | | | | | | |
| 14 | | | | | | | | | |
| | US | SM | SILTY SAND | Moist | Very Dense | 50/4" | 96.3 | 6.3 | |
| 16 | | | Bottom at 15.5 Feet | | | | | | |

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

**SUBSURFACE EXPLORATION LOG**

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 7

# BORING NUMBER 6

ELEVATION

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 |  | SM | SCRIPPS FORMATION, Yellow Tan, SILTY SAND | Humid | Loose |  |  |  |  |
| 2 | US |  |  | Moist | Dense |  |  |  |  |
| 4 |  |  |  |  |  | 50/4" | 105.0 | 7.3 |  |
| 6 | US | SM |  |  |  | 50/6" | 96.6 | 10.3 |  |
| 8 |  |  |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |
|  | US | SM | Light Grey and Yellow Tan, SILTY SAND | Moist | Very Dense | 50/2" | 97.8 | 8.4 |  |
| 12 | BAG |  |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |
|  |  |  | Bottom at 15 Feet |  |  |  |  |  |  |

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

**SUBSURFACE EXPLORATION LOG**

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 8

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | **BORING NUMBER 7**<br>ELEVATION<br>DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | SM | WEATHERED SCRIPPS FORMATION, TAN, SILTY SAND | Humid | Loose | | | | |
| 2 | | SM | SCRIPPS FORMATION, Yellow Tan to Tan, SILTY SAND | Moist | Dense | | | | |
| 4 | | | | | | | | | |
| 6 | | | Bottom at 5 Feet | | | | | | |
| | | | **BORING NUMBER 8** | | | | | | |
| 0 | | SM | SCRIPPS FORMATION, Light Tan to Yellow Tan, SILTY SAND | Humid | Loose | | | | |
| 2 | | | | Moist | Dense | | | | |
| 4 | | | | | | | | | |
| 6 | | | Bottom at 5 Feet | | | | | | |
| | | | **BORING NUMBER 9** | | | | | | |
| 0 | | SM | FILL, Tan to Yellow Tan, SILTY SAND | Humid | Loose | | | | |
| 2 | | | | Moist | Dense | | | | |
| 4 | | SM | SCRIPPS FORMATION, Yellow Tan, SILTY SAND | Moist | Very Dense | | | | |
| 6 | | | Bottom at 5 Feet | | | | | | |

**SOUTHERN CALIFORNIA**
**SOIL & TESTING, INC.**

**SUBSURFACE EXPLORATION LOG**

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 9

| DEPTH (ft.) | SAMPLE TYPE | SOIL CLASSIFICATION | BORING NUMBER 10<br>ELEVATION<br>DESCRIPTION | APPARENT MOISTURE | APPARENT CONSISTENCY OR DENSITY | PENETRATION RESISTANCE (blows/ft. of drive) | DRY DENSITY (pcf) | MOISTURE CONTENT (%) | RELATIVE COMPACTION (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | SM | FILL, Tan to Yellow Tan, SILTY SAND | Humid | Loose | | | | |
| 2 | | | | Moist | Dense | | | | |
| 4 | | | | | | | | | |
| 6 | | ML | SCRIPPS FORMATION, Yellow Tan, SANDY SILT | Moist | Hard | | | | |
| 8 | | | Bottom at 7 Feet | | | | | | |

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

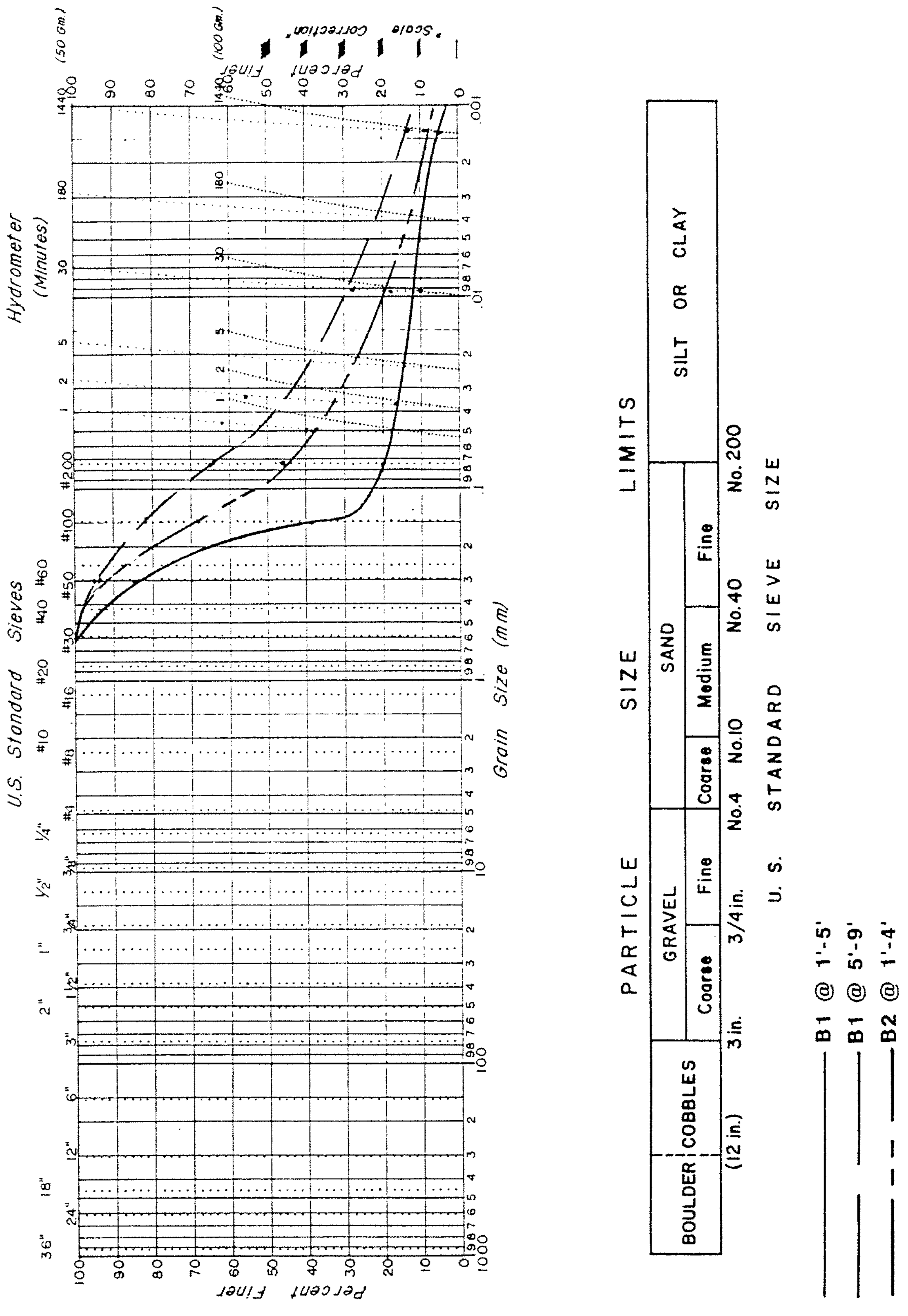
**SUBSURFACE EXPLORATION LOG**

LOGGED BY: JRH

DATE LOGGED: 09-28-95

JOB NUMBER: 9511205

Plate No. 10

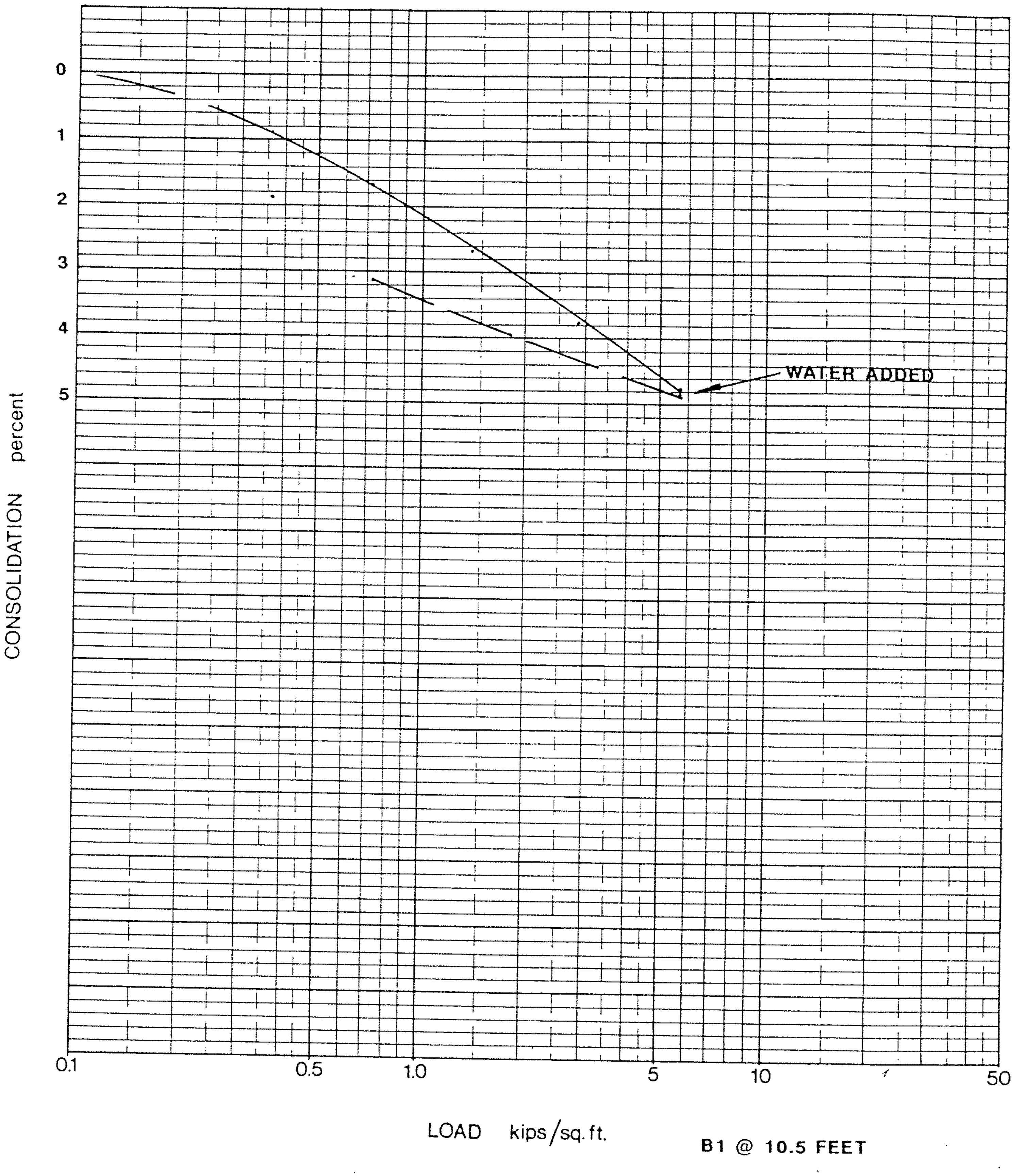


**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

QUALCOMM/IVAC

GRAIN SIZE DISTRIBUTION

| | |
|---|---|
| BY CHC | DATE 10-13-95 |
| JOB NO. 9511205 | Plate No. 11 |



**B1 @ 10.5 FEET**

**SOUTHERN CALIFORNIA**
**SOIL & TESTING LAB, INC.**
6280 RIVERDALE STREET
SAN DIEGO, CALIFORNIA 92120

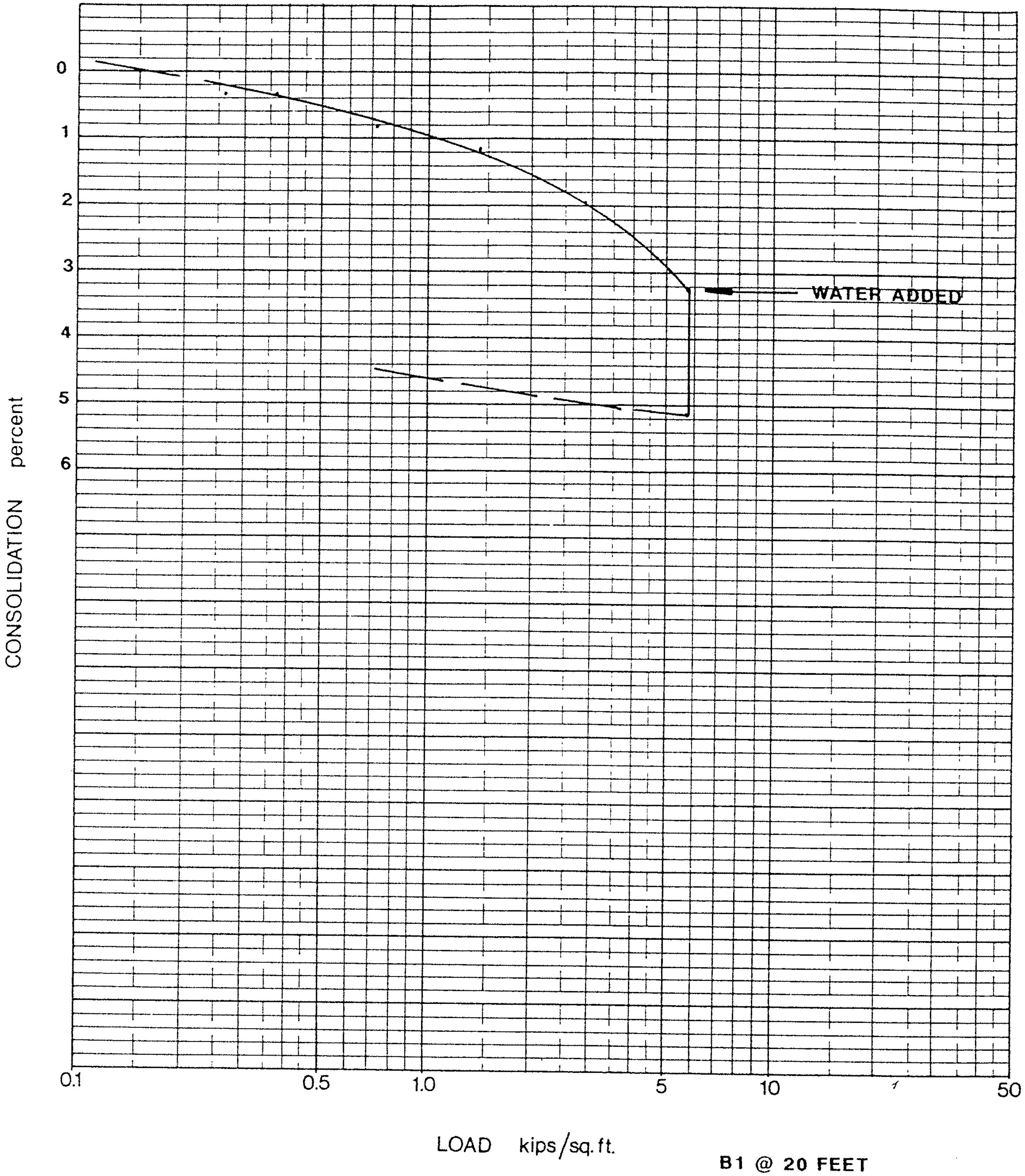
QUALCOMM/IVAC

BY CHC

DATE 10-13-95

JOB NO. 9511205

Plate No. 12



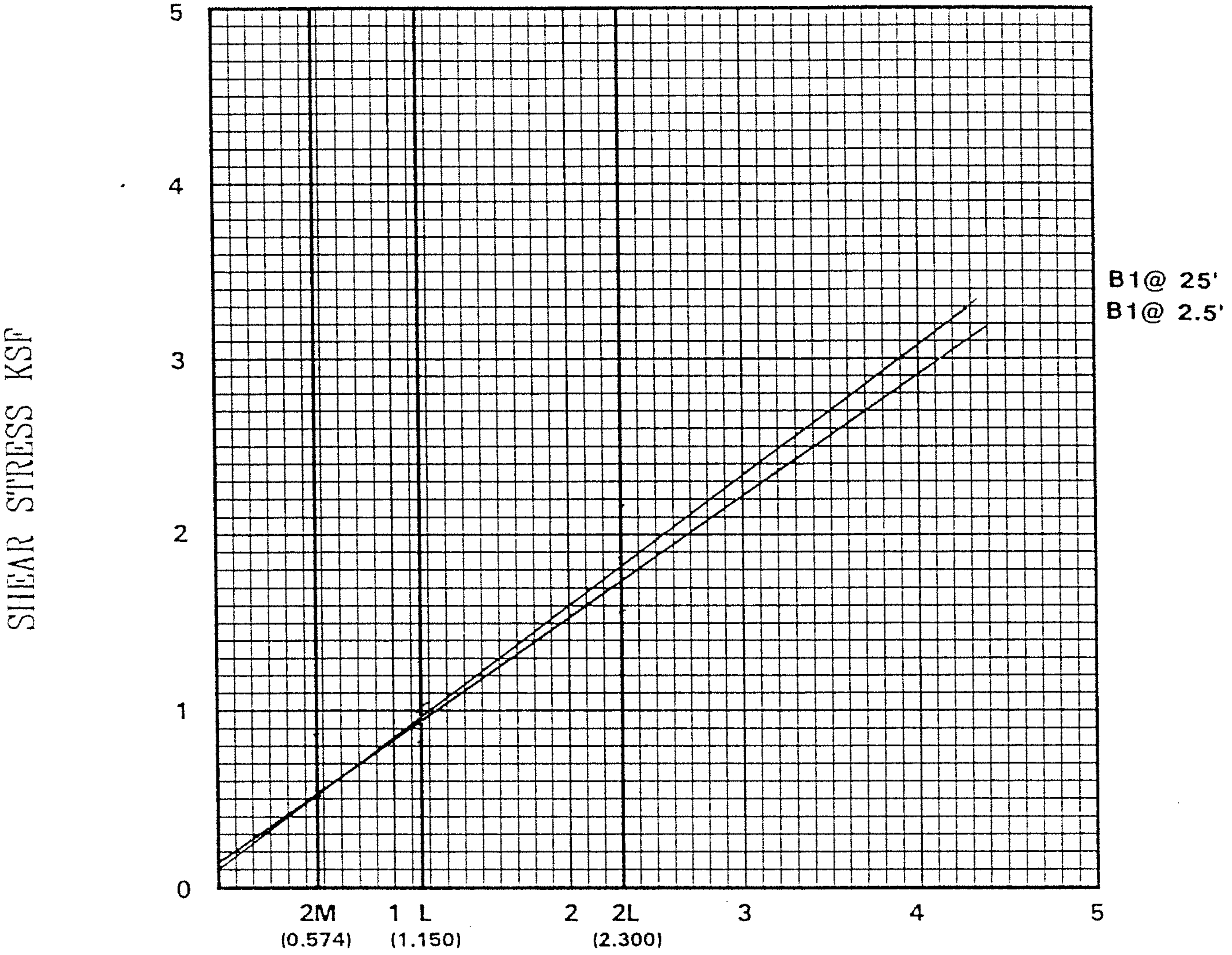
**B1 @ 20 FEET**

**SOUTHERN CALIFORNIA**
**SOIL & TESTING LAB, INC.**
6280 RIVERDALE STREET
SAN DIEGO, CALIFORNIA 92120

QUALCOMM/IVAC

| | |
|---|---|
| BY CHC | DATE 10-13-95 |
| JOB NO. 9511205 | Plate No. 13 |

# DIRECT SHEAR SUMMARY



NORMAL STRESS, KSF (2 ⅜" SAMPLE)

| SAMPLE | DESCRIPTION | ANGLE OF INTERNAL FRICTION | COHESION INTERCEPT (PSF) |
|---|---|---|---|
| B1 @ 2.5' | Undisturbed | 35 Degrees | 150 psf |
| B1 @ 25' | Undisturbed | 37 Degrees | 100 psf |

PROVING RING No. ____________

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

QUALCOMM/IVAC

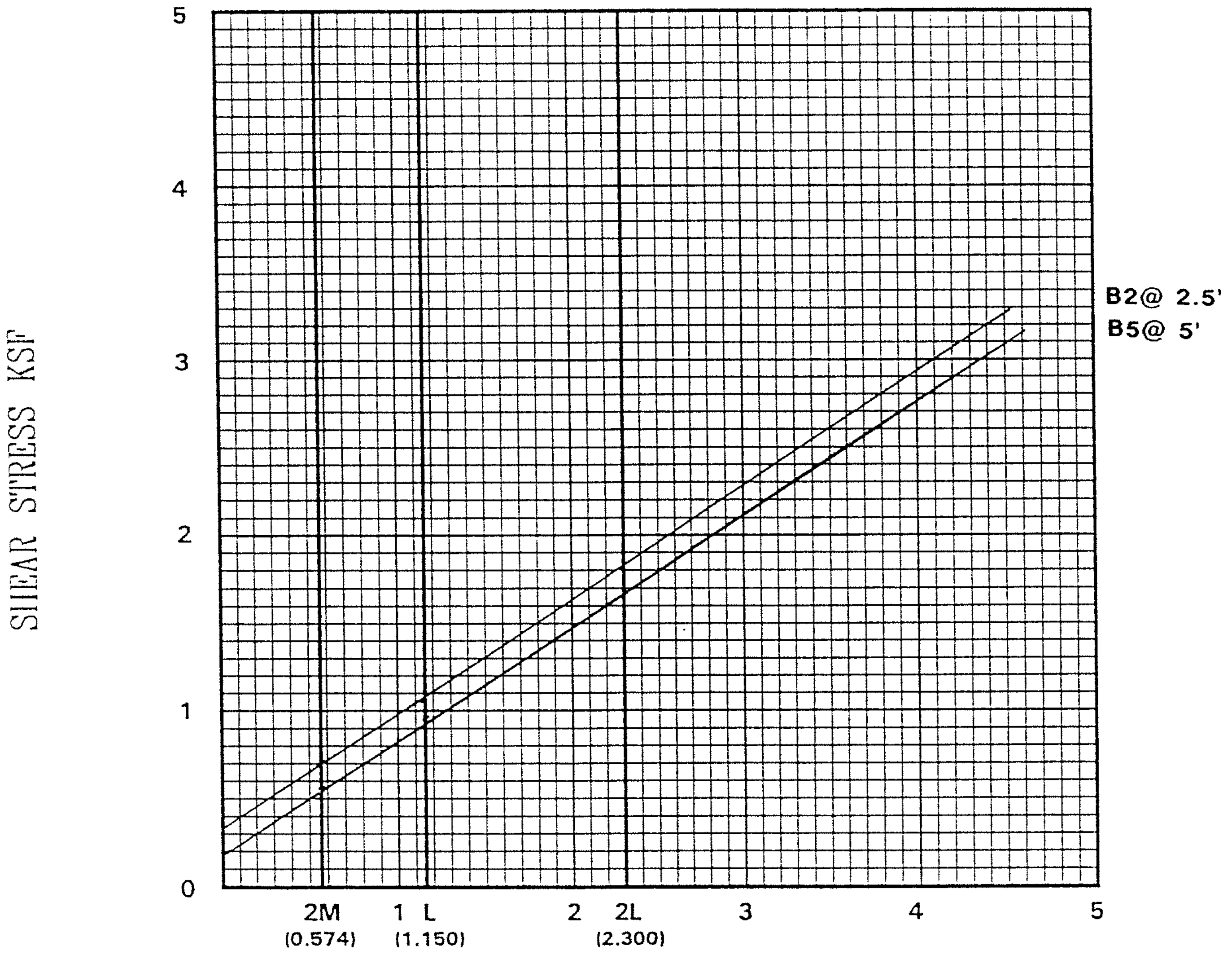
BY: CHC

DATE: 10-13-95

JOB NUMBER: 9511205

PLATE No.: 14

# DIRECT SHEAR SUMMARY



NORMAL STRESS, KSF (2 ⅜" SAMPLE)

| SAMPLE | DESCRIPTION | ANGLE OF INTERNAL FRICTION | COHESION INTERCEPT (PSF) |
|---|---|---|---|
| B2 @ 2.5' | Undisturbed | 33 Degrees | 350 psf |
| B5 @ 5' | Undisturbed | 33 Degrees | 175 psf |

PROVING RING No. ____________

**SOUTHERN CALIFORNIA SOIL & TESTING, INC.**

QUALCOMM/IVAC

**BY:** CHC

**DATE:** 10-13-95

**JOB NUMBER:** 9511205

**PLATE No.:** 15

File No. D-2379-M01
November 10, 1980

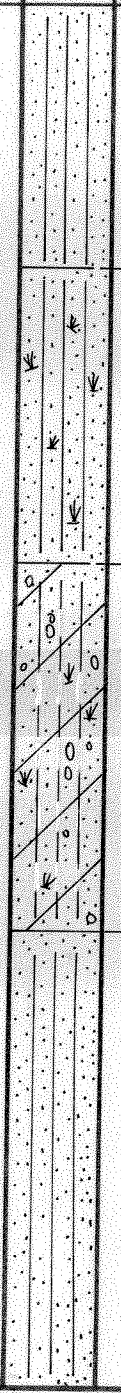
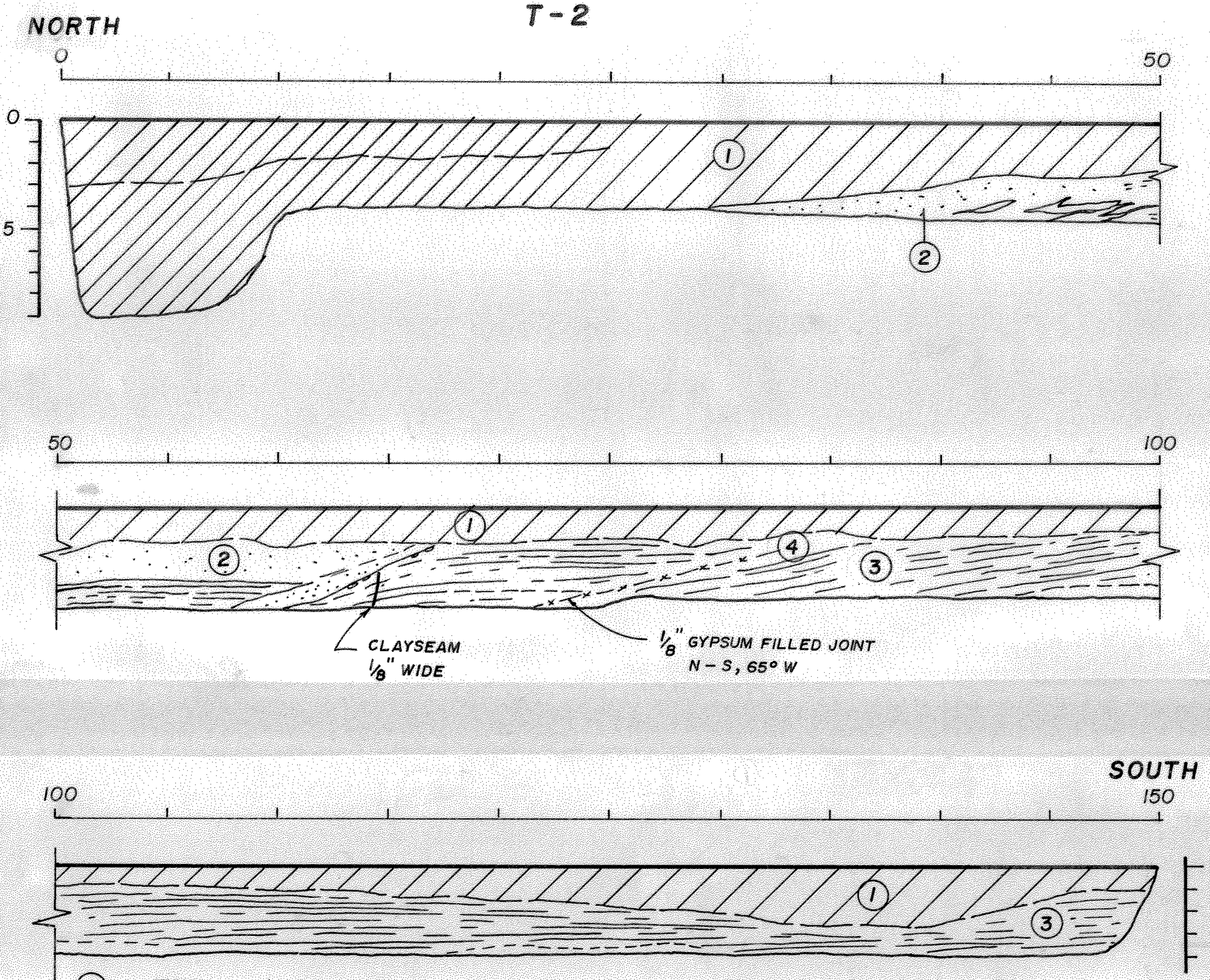
| DEPTH IN FEET | SAMPLE NUMBER | LOG & LOCATION OF SAMPLE | Penetration Resistance Blows/ft | DESCRIPTION | IN-PLACE | |
|---|---|---|---|---|---|---|
| | | | | | DRY DENSITY p.c.f | MOISTURE CONTENT % dry wt |
| | | | | BORING NO. 1 | | |
| 0 | |  | | FILL<br>Medium dense, dry, angular SILTSTONE fragments in a Sandy matrix | | |
| 6 | | | | Loose to medium dense, damp, tan-brown, SAND with angular gray SILTSTONE, topsoil layers/fragments, organics | | |
| 12 | | | | Loose, dary, Sandy GRAVEL layer 1' thick, soft, moist, dark brown, Silty CLAY with angular SILTSTONE fragments and organics (grass, rocks) frequent cobbles | | |
| 20 | | | | SCRIPPS FORMATION<br>Very dense, damp, interbedded (beds thickness within 1") reddish-brown, very fine SANDSTONE and light gray Sandy SILTSTONE, very well cemented Gravel attitude N10°W/9°W | | |
| 30 | | | | BORING TERMINATED AT 30.0 FEET | | |

Figure 18, Log of Test Boring 1



① FILL, dry to moist, medium dense to loose, Silty fine SAND (CLAY)

② Dense, massive bedded, reddish-brown, Silty SANDSTONE with shale rip-up clasts

③ Very dense, light gray SILTSTONE

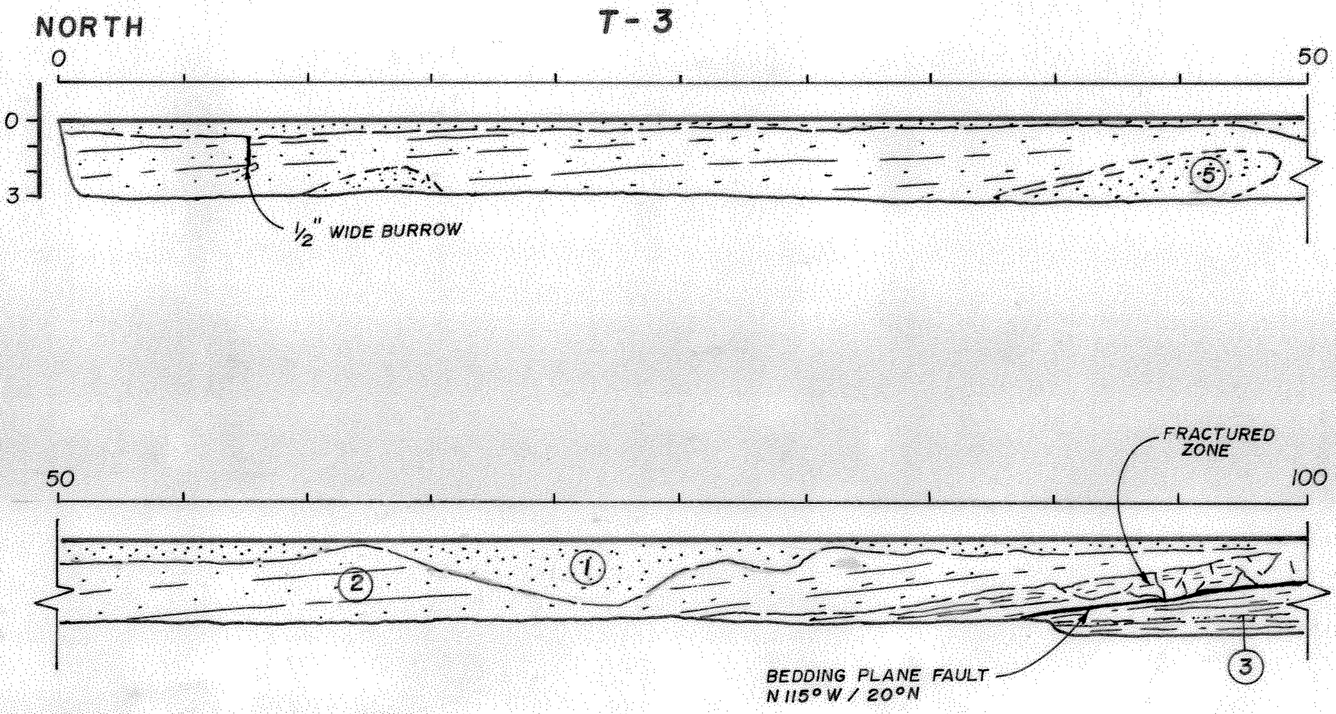
④ Gypsum bed

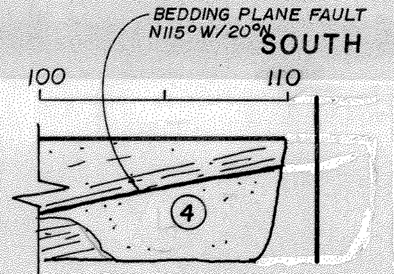
LOG OF TRENCH NO. 2

CAMPUS POINT, PHASE II
San Diego, California

FIGURE 4

**GEOCON, INCORPORATED**





① Light brown, very dense, massive SANDSTONE with siltstone clasts

② Light gray, dense, damp, medium cemented SANDSTONE

③ Stiff, damp, dark gray, very well cemented, Silty CLAYSTONE

④ Dense, well cemented SANDSTONE

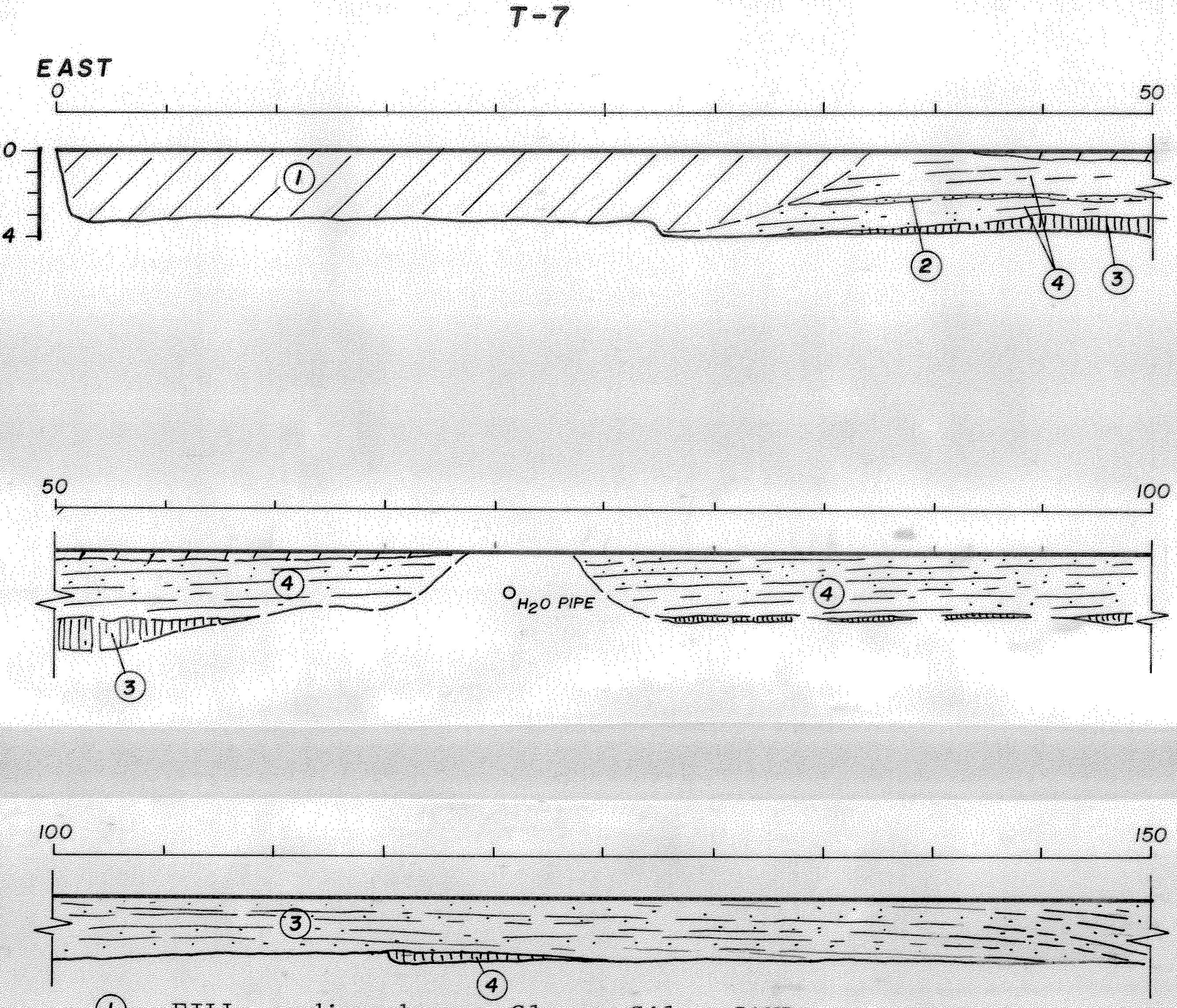
⑤ Hard, very well cemented, concretion with laminated Silty fine SAND, reddish-brown stain

LOG OF TRENCH NO. 3

CAMPUS POINT, PHASE II
San Diego, California

FIGURE 5

**GEOCON, INCORPORATED**



① FILL, medium dense, Clayey Silty SAND

② Loose Sandy layer

③ Very dense, massive, light brown-tan, well cemented Silty SANDSTONE

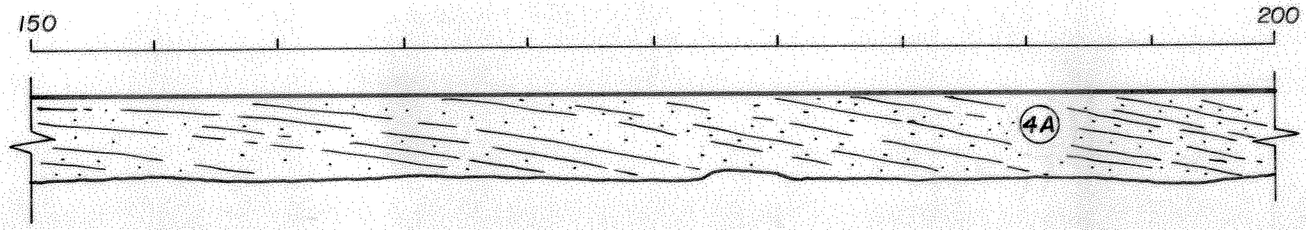
④ Very dense, damp, gray to tan, massive, very fine Sandy Clayey SILTSTONE/SANDSTONE

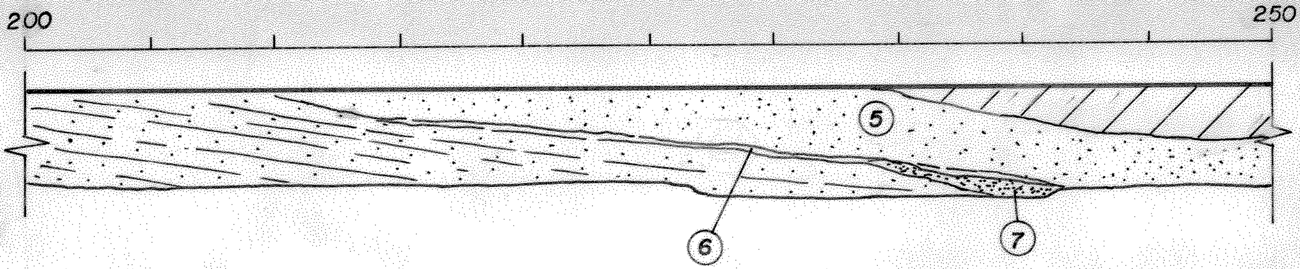
LOG OF TRENCH NO. 7

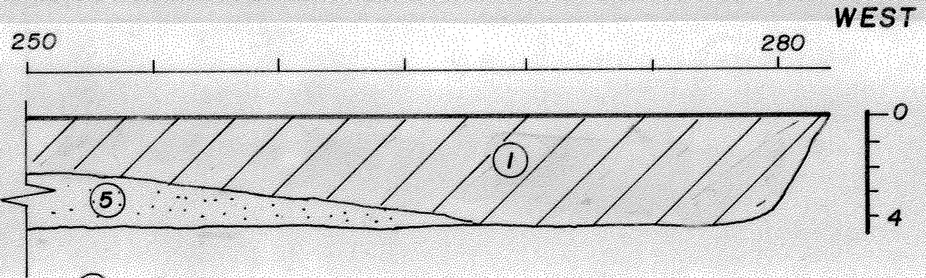
CAMPUS POINT, PHASE II
San Diego, California

Continued next page

## T-7 CONTINUED



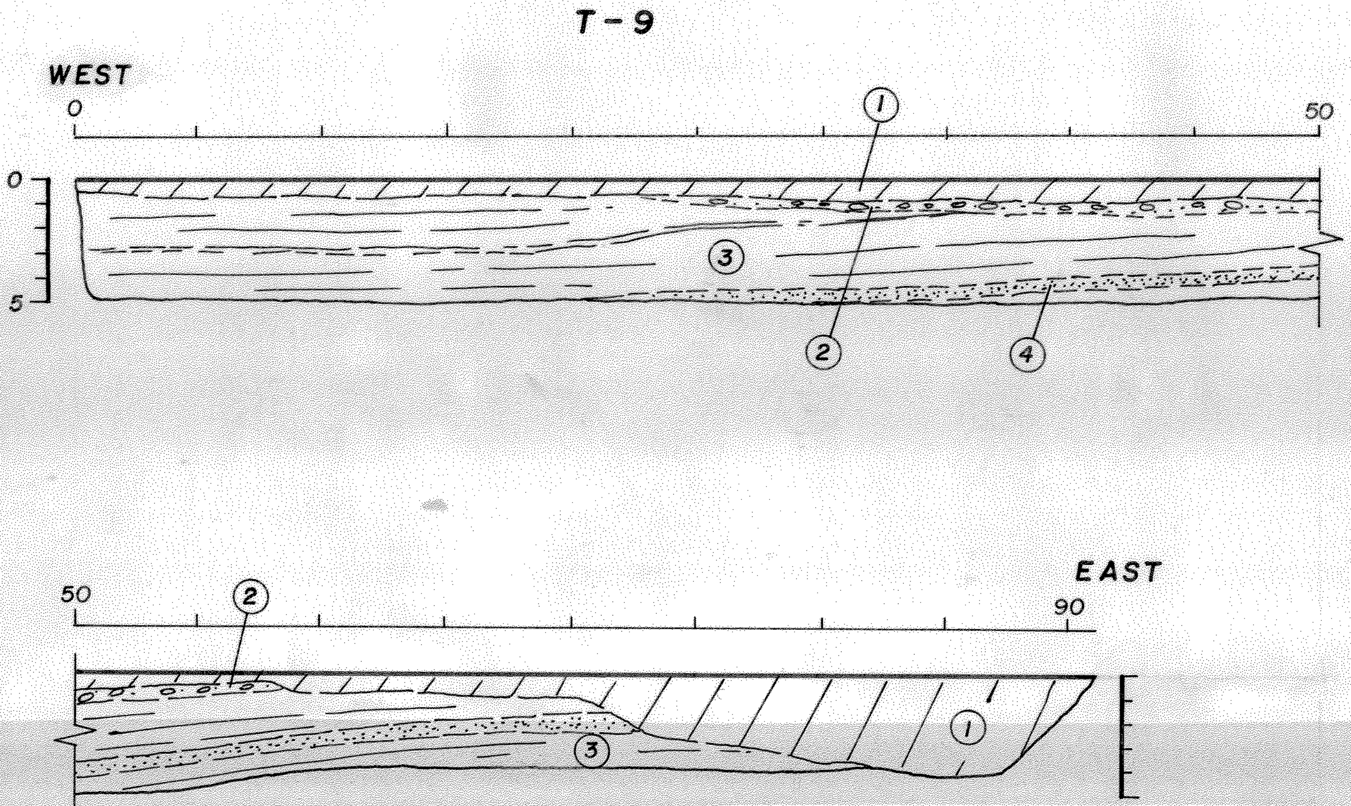




| | |
|---|---|
| Ⓐ 4A | Very stiff, damp, dark gray, Sandy Clayey SILTSTONE |
| ⑤ | Light gray, medium cemented, dense, dry, fine to medium SAND |
| ⑥ | Highly fractured & sheared zone, thickness 1/2"-1/2', dark brown, reddish-gray, Silty CLAYSTONE, dipping NW ≈ 15°, possible bedding plane fault |
| ⑦ | Hard, cemented concretion |

### LOG OF TRENCH NO. 7 CONTINUED

CAMPUS POINT, PHASE II
San Diego, California



① FILL

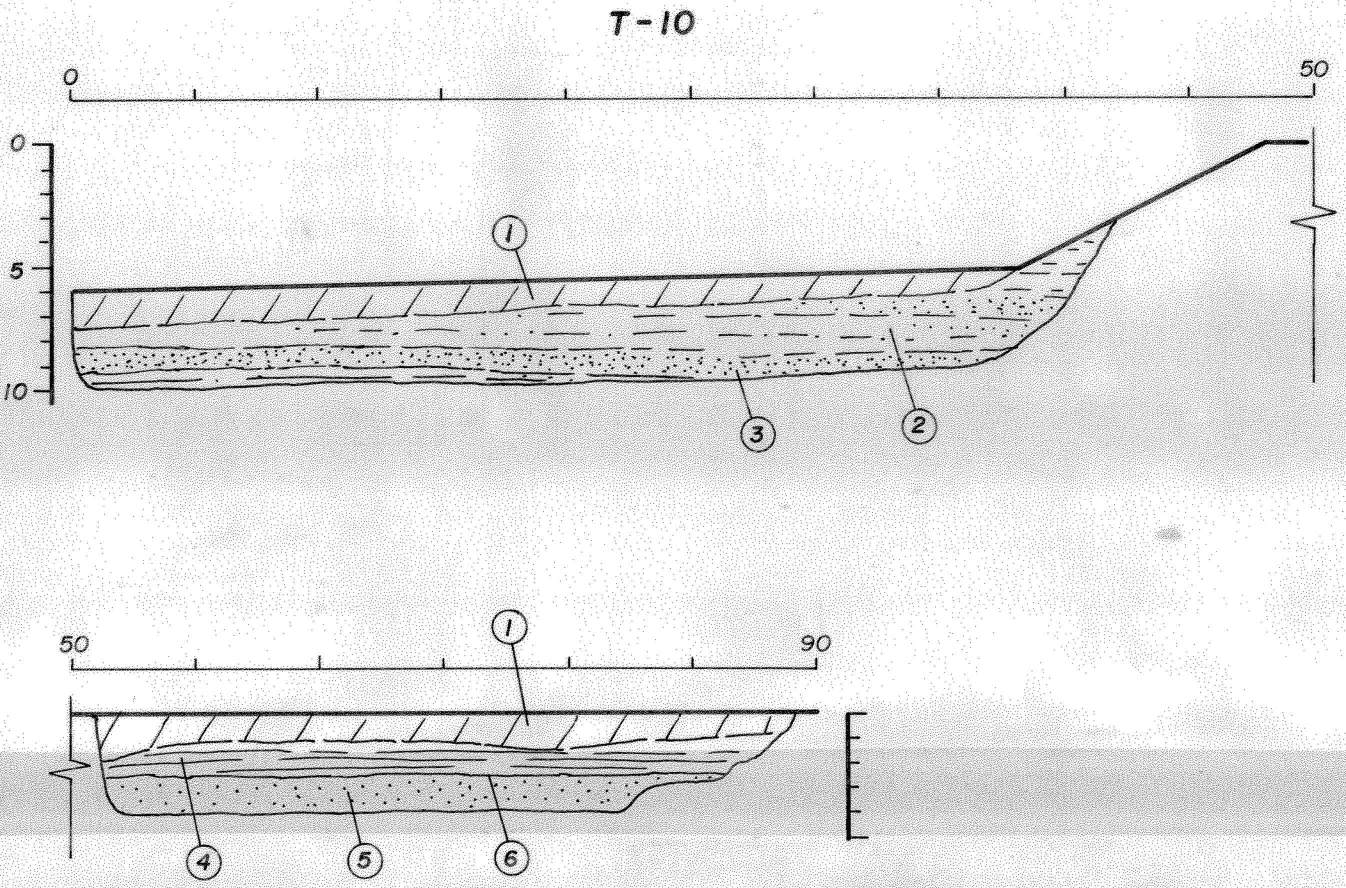
② Red-brown, Sandy pebble CONGLOMERATE

③ Very dense, moist, gray, reddish stained Clayey SILTSTONE, very well cemented, fissile, horizontally bedded

④ Red-brown, Silty SANDSTONE

LOG OF TRENCH NO. 9

CAMPUS POINT, PHASE II
San Diego, California



① FILL, loose Silty SAND

② Very dense, moist, gray, fine Sandy SILTSTONE

③ Red-brown, Silty STANDSTONE layer 8" thick

④ Very dense, gray SILTSTONE with red stains

⑤ Gray fine SAND

⑥ Red stain

## LOG OF TRENCH NO. 10

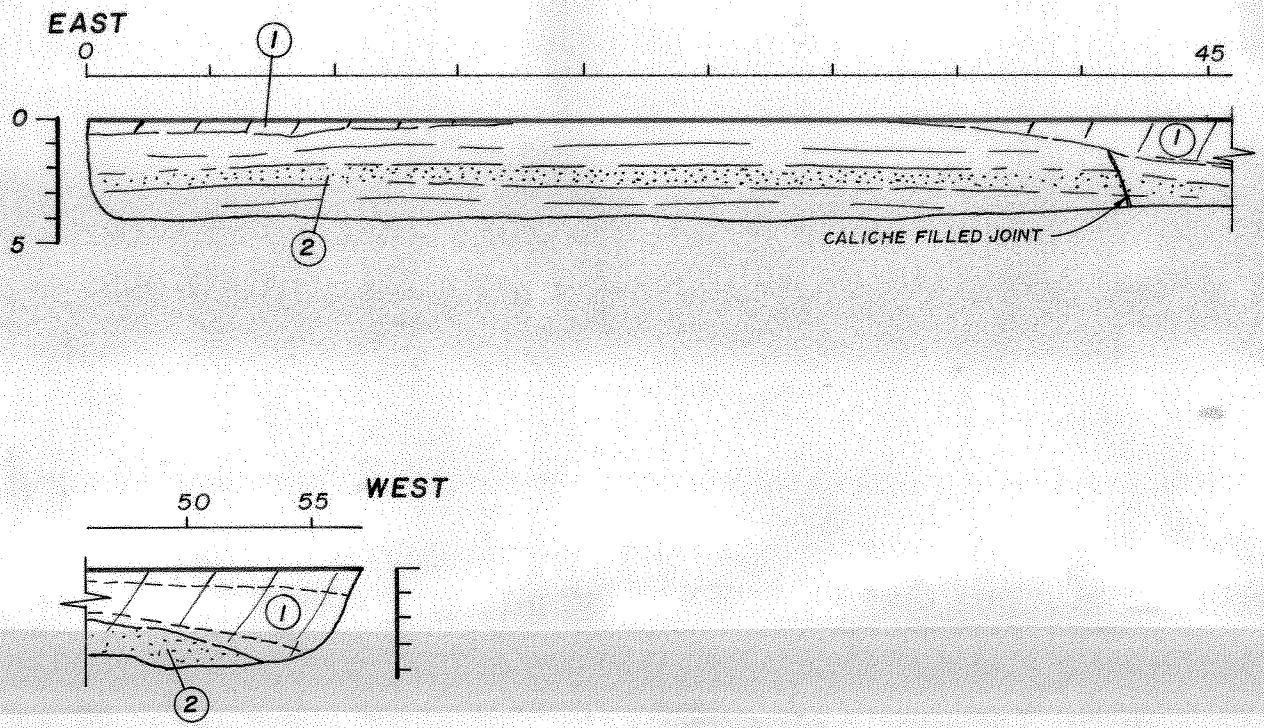
CAMPUS POINT, PHASE II
San Diego, California

FIGURE 13

**GEOCON, INCORPORATED**

File No. D-2379-M01
November 10, 1980

T-12



① FILL, loose to medium dense, dry to moist, Silty SAND/ Silty CLAY (TOPSOIL)

② Massive bedded, dense, gray, Silty medium SANDSTONE

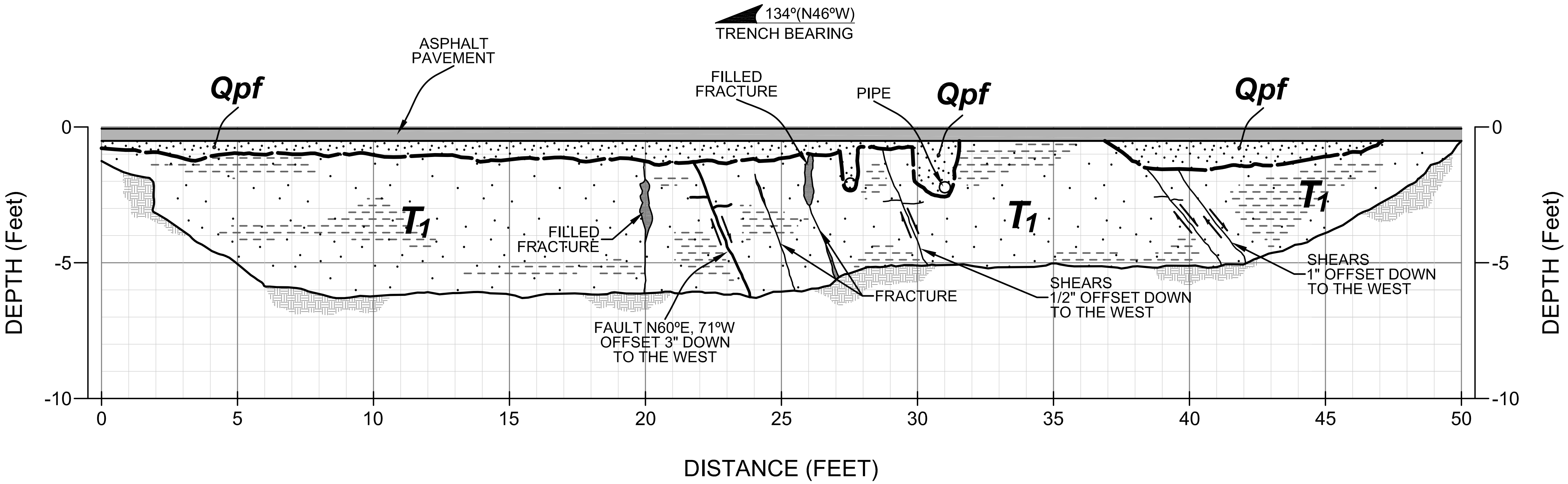
LOG OF TRENCH NO. 12

CAMPUS POINT, PHASE II
San Diego, California

FIGURE 15

**GEOCON, INCORPORATED**

CAMPUS POINTE MASTER PLAN
10300 CAMPUS POINT DRIVE
SAN DIEGO, CALIFORNIA



# FAULT TRENCH FT-1

SCALE: 1" = 5' (Vert. = Horiz.)

**GEOCON LEGEND**

**Qpf** ........PREVIOUSLY PLACED FILL

**$T_1$**........TERTIARY-AGE SCRIPPS FORMATION
Horizontally bedded, light gray and red brown banded,
Clayey SANDSTONE

⌒ ........APPROX. LOCATION OF GEOLOGIC CONTACT

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

FAULT TRENCH FT-1
PROJECT NO. 07850 - 42 - 11
FIGURE 4
DATE 02 - 03 - 2014

Plotted:02/03/2014 3:00PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\07850-42-11 Campus Pointe Master Plan\SHEETS\07850-42-11 FaultTrench.dwg

## SCS&T LEGEND

55 FRACTURES

55 FAULTS

★ JUMBLED FAULTS

△ FAULTS WITH CLAY GOUGE

□ OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES

⊕ ANNEALED FAULTS

* ASSUMED FAULTS WHICH HAVE BECOME ANNEALED

\+ FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED

SOUTHERN CALIFORNIA
SOIL & TESTING, INC.

QUALCOMM

| | |
|---|---|
| BY: CHC/JRH/SD | DATE: 11-16-95 |
| JOB No.: 9511205 | PLATE No.: 1A |

DATA TABLE

| NO. | BRNG/DELTA | RADIUS | LENGTH |
|---|---|---|---|
| C1 | 231°57'08" | 60.00' | 242.90' |
|  | (231°58'55" | 60.00' | 242.93') |
| C2 | 140°35'42" | 60.00' | 147.23' |
|  | (140°41'10" | 60.00' | 147.33' P.M. 10898) |
| C3 | 91°21'27" | 60.00' | 95.67' |
|  | (91°17'45" | 60.00' | 95.60' P.M. 10898) |
| C4 | 00°40'10" | 682.00' | 7.97' |
|  | (00°38'31" | 682.00' | 7.64' P.M. 10898) |
| C5 | N50°09'46"E | — | 28.44' |
|  | (N50°11'40"E | — | 28.42') |
| C6 | 05°43'16" | 618.00' | 61.71' |
|  | (05°41'17" | 618.00' | 61.35') |

**SCS&T LEGEND**

- 55 FRACTURES
- 55 FAULTS
- ★ JUMBLED FAULTS
- △ FAULTS WITH CLAY GOUGE
- ☐ OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES
- ⊕ ANNEALED FAULTS
- * ASSUMED FAULTS WHICH HAVE BECOME ANNEALED
- \+ FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED
- ●●●●●●● EASTERLY END OF FAULT ZONE

0 20 40 80
SCALE 1" = 40'

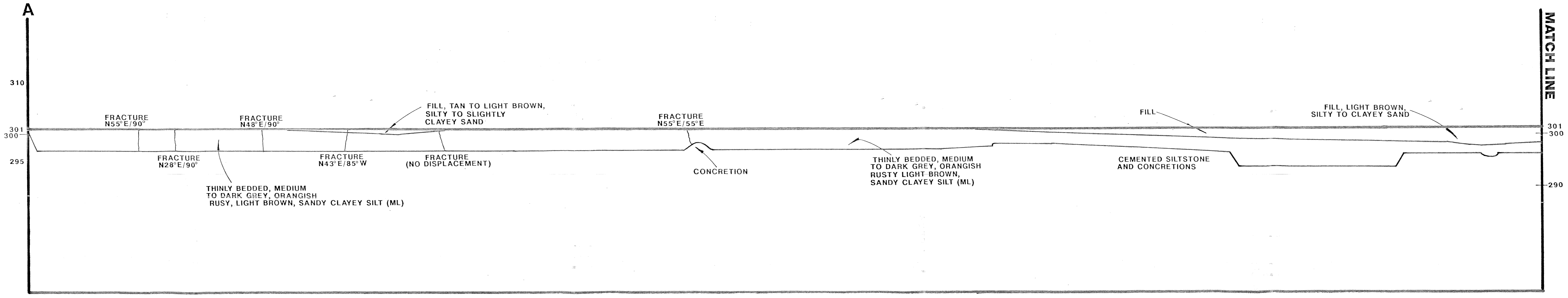
SOUTHERN CALIFORNIA
SOIL & TESTING, INC.

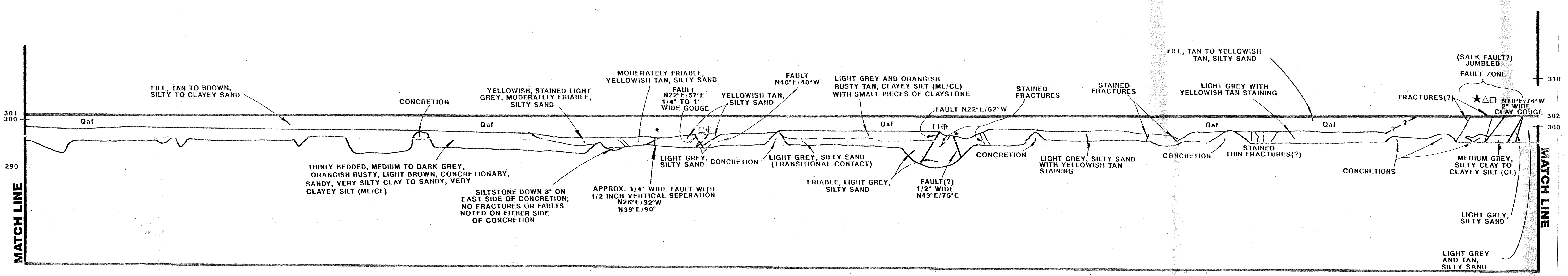
**QUALCOMM**

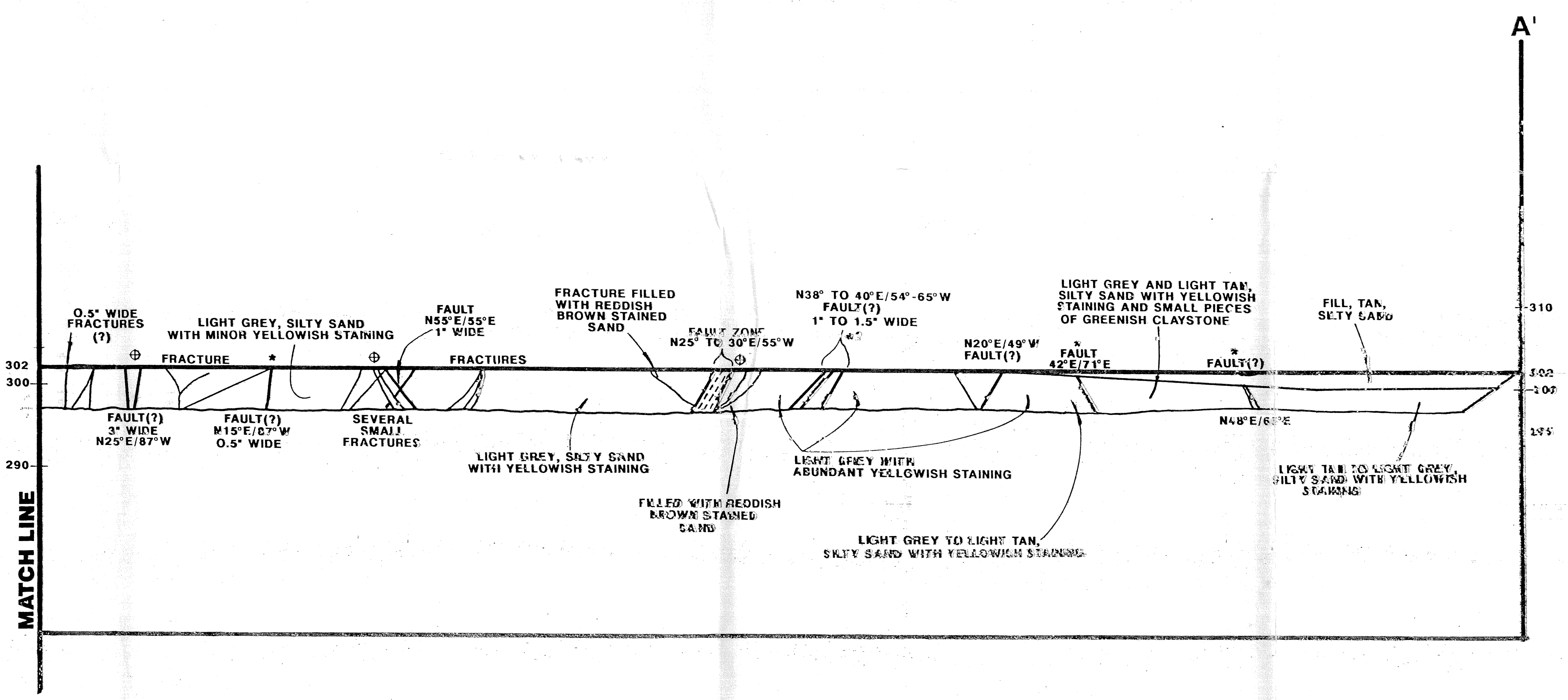
BY: CHC/JRH/SD
DATE: 11-16-95
JOB No.: 9511205
PLATE No.: 1B

# CROSS SECTION A - A'

SCALE: 1" = 10'

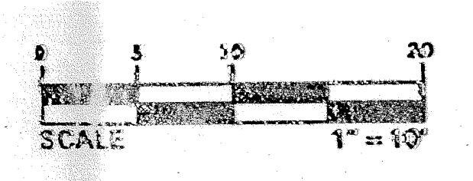






## SCS&T LEGEND

| | |
|---|---|
| ★ | JUMBLED FAULTS |
| △ | FAULTS WITH CLAY GOUGE |
| □ | OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES |
| ⊕ | ANNEALED FAULTS |
| * | ASSUMED FAULTS WHICH HAVE BECOME ANNEALED |
| + | FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED |



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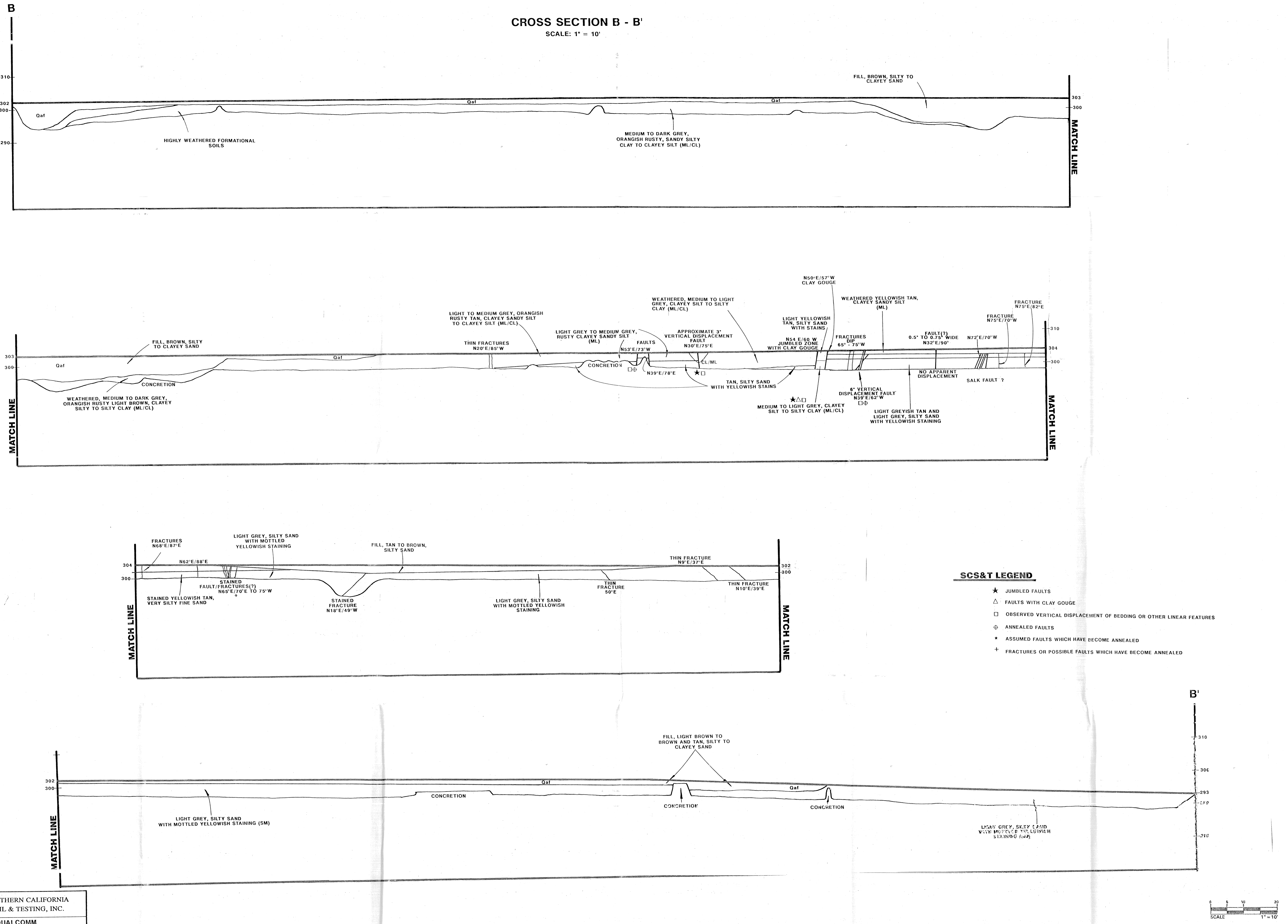
| BY: CHC/JRH/SD | DATE: 11-16-95 |
| JOB No.: 9511205- | PLATE No.: 2 |

# CROSS SECTION B - B'

SCALE: 1" = 10'



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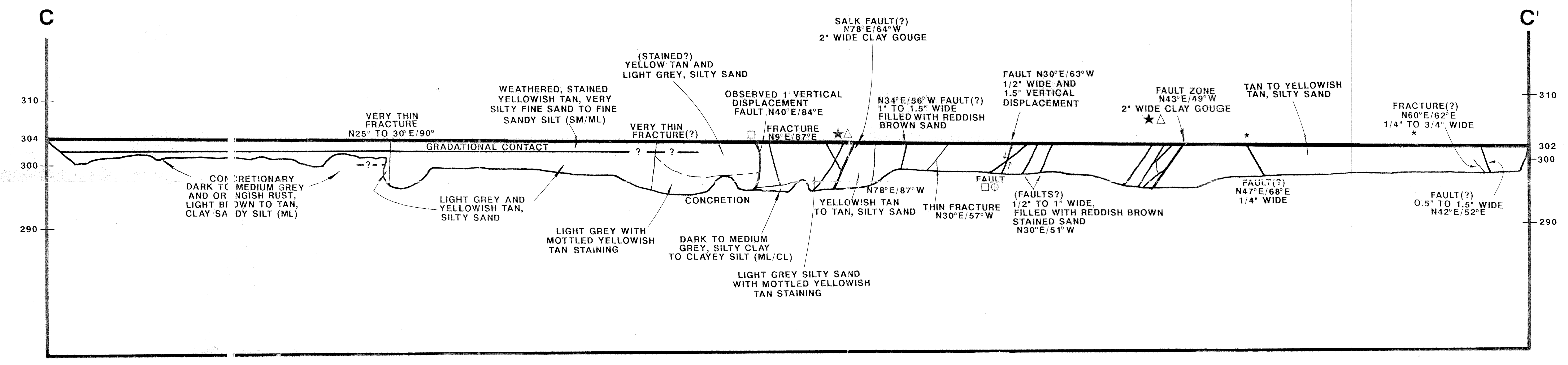
| | |
|---|---|
| BY: CHC/JRH/SD | DATE: 11-16-95 |
| JOB No.: 9511205- | PLATE No.: 3 |

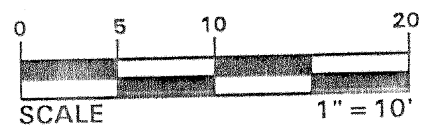
# CROSS SECTION C - C'

SCALE: 1" = 10'



**SCS&T LEGEND**

| | |
|---|---|
| ★ | JUMBLED FAULTS |
| △ | FAULTS WITH CLAY GOUGE |
| □ | OBSERVED VERTICAL DISPLACEMENT OF BEDDING OR OTHER LINEAR FEATURES |
| ⊕ | ANNEALED FAULTS |
| * | ASSUMED FAULTS WHICH HAVE BECOME ANNEALED |
| + | FRACTURES OR POSSIBLE FAULTS WHICH HAVE BECOME ANNEALED |



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| | |
|---|---|
| BY: CHC/JRH/SD | DATE: 11-16-95 |
| JOB No.: 9511205- | PLATE No.: 4 |

# APPENDIX D

# APPENDIX D

# STORM WATER MANAGEMENT INVESTIGATION

FOR

CAMPUS POINTE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2415-52-01

# APPENDIX D

## STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the *2018 City of San Diego Storm Water Standards* (SWS). If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

### Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table D-I presents the descriptions of the hydrologic soil groups. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

TABLE D-I
HYDROLOGIC SOIL GROUP DEFINITIONS

| Soil Group | Soil Group Definition |
|---|---|
| A | Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission. |
| B | Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission. |
| C | Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission. |
| D | Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission. |

The property is underlain by man-made previously placed fill and should be classified as Soil Group D. The Hydrologic Soil Group Map presents output from the USDA website showing the limits of the soil units.

Hydrologic Soil Group Map

Table D-II presents the information from the USDA website for the subject property.

TABLE D-II
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP*

| Map Unit Name | Map Unit Symbol | Approximate Percentage of Property | Hydrologic Soil Group | $k_{SAT}$ of Most Limiting Layer (Inches/ Hour) |
|---|---|---|---|---|
| Altamont Clay, 30 to 50 percent Slopes, Warm MAAT, MLRA 20 | AtF | 73.4 | C | 0.06 – 0.57 |
| Chesterton Fine Sandy Loam, 5 to 9 percent Slopes | CfC | 26.6 | D | 0.00 – 0.06 |

*The property should be considered to possess a Hydrologic Soil Group D due to the existing fill materials.

## In Situ Testing

We performed four constant-head infiltration tests at the locations shown on the Geologic Map, Figure 2. Table D-III presents the results of the infiltration tests. The field data sheets are attached herein. We applied a feasibility factor of safety of 2.0 to our estimated infiltration rates to provide input on Worksheet C.4-1. Soil infiltration rates from in-situ tests can vary significantly from one location to another due to the heterogeneous characteristics inherent to most soil.

### TABLE D-III
### INFILTRATION TEST RESULTS

| Test No. | Geologic Unit | Test Elevation (feet, MSL) | Field-Saturated Hydraulic Conductivity/Infiltration Rate, $k_{sat}$ (inch/hour) | Worksheet Infiltration Rate[1] (inch/hour) |
|---|---|---|---|---|
| P-1 (B-9) | Ta | 297 | 0.003 | 0.002 |
| P-2 (B-10) | Ta | 298 | 0.015 | 0.008 |
| P-3 (B-11) | Tsc | 295 | 0.091 | 0.046 |
| P-4 (B-12) | Tsc | 298 | 0.071 | 0.036 |
| Average | | | 0.045 | 0.023 |

*Using a Factor of Safety of 2.

Infiltration categories include full infiltration, partial infiltration and no infiltration. Table D-IV presents the commonly accepted definitions of the potential infiltration categories based on the infiltration rates.

### TABLE D-IV
### INFILTRATION CATEGORIES

| Infiltration Category | Field Infiltration Rate, I (Inches/Hour) | Factored Infiltration Rate*, I (Inches/Hour) |
|---|---|---|
| Full Infiltration | $I > 1.0$ | $I > 0.5$ |
| Partial Infiltration | $0.10 < I \leq 1.0$ | $0.05 < I \leq 0.5$ |
| No Infiltration (Infeasible) | $I < 0.10$ | $I < 0.05$ |

*Using a Factor of Safety of 2.

Based on our observations and test results, the infiltration rates for the formational materials onsite (Scripps Formation and Ardath Shale) are less than 0.05 inches per hour. Therefore, full and partial infiltration on the property should be considered infeasible based on the calculated infiltrations rates. Vertical cutoff walls or liners should be installed on the sides and bottom of the infiltration basin and a drain should be installed at the base of the basin.

# GEOTECHNICAL CONSIDERATIONS

## Groundwater Elevations

We did not encounter groundwater or seepage during our site investigation. We expect groundwater is deeper than about 200 feet below existing grade.

## New or Existing Utilities

Utilities are located on and adjacent to the property within the existing parking area and roadways. Therefore, full and partial infiltration within the areas near these utilities should be considered infeasible. Setbacks for infiltration should be incorporated. The setback for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility.

## Existing or Planned Structures

Structures are present along the northern, eastern and southern boundaries of the property, and several structures are proposed on-site as described herein. Water should not be allowed to infiltrate in areas where it could affect the neighboring properties and adjacent structures. Mitigation for existing structures consists of not allowing water infiltration within 10 feet of the existing foundations.

## Slopes

A descending slope with a height of approximately 150 feet exists on the western portion of the property. Infiltration should not be allowed within a distance of 50 feet or a distance of 1.5H from a slope where H is the height of the slope (about 225 feet from the top of the existing slope).

## Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

# CONCLUSIONS AND RECOMMENDATIONS

## Storm Water Evaluation Narrative

The majority of the site is underlain by varying depths of fill overlying the Scripps Formation and Ardath Shale (see Geologic Map, Figure 2). Infiltration is not allowed in areas with 5 feet and thicker of fill. Descending slopes exist west of the property along Campus Point Drive with a height up to approximately 150 feet. Infiltration should not be allowed within 50 feet or 1.5 times the height of existing slopes (225 feet).

We performed two infiltration tests within the Scripps Formation and two within the Ardath Shale in the northeastern portion of the site where formational materials are present near existing and proposed grade. We located our infiltration tests within the area of the site with adequate setbacks from slopes and fills of less than 5 feet. The results indicate an average rate of less than 0.05 inches per hour (with an applied factor of safety of 2).

## Storm Water Evaluation Conclusion

Infiltration should be considered infeasible within the existing fill soils on the southern and western portions of the property. Full and partial infiltration should be considered infeasible at the site because the average infiltration rate is less than 0.05 inches per hour within formational materials. Mitigation measures do not exist that allow an increase to the infiltration rates.

## Storm Water Management Devices

Liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

## Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. Worksheet C.4-1 presents the completed information for the submittal process and is attached herein.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table D-IV describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

## TABLE D-V
## SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

| Consideration | High Concern – 3 Points | Medium Concern – 2 Points | Low Concern – 1 Point |
|---|---|---|---|
| Assessment Methods | Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods | Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., Infiltrometer). Moderate spatial resolution | Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods. |
| Predominant Soil Texture | Silty and clayey soils with significant fines | Loamy soils | Granular to slightly loamy soils |
| Site Soil Variability | Highly variable soils indicated from site assessment or unknown variability | Soil boring/test pits indicate moderately homogenous soils | Soil boring/test pits indicate relatively homogenous soils |
| Depth to Groundwater/ Impervious Layer | <5 feet below facility bottom | 5-15 feet below facility bottom | >15 feet below facility bottom |

Based on our geotechnical investigation and the previous table, Table D-V presents the estimated factor values for the evaluation of the factor of safety. This table only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

## TABLE D-VI
## FACTOR OF SAFETY WORKSHEET DESIGN VALUES – PART A1

| Suitability Assessment Factor Category | Assigned Weight (w) | Factor Value (v) | Product (p = w x v) |
|---|---|---|---|
| Assessment Methods | 0.25 | 2 | 0.50 |
| Predominant Soil Texture | 0.25 | 3 | 0.75 |
| Site Soil Variability | 0.25 | 2 | 0.50 |
| Depth to Groundwater/ Impervious Layer | 0.25 | 1 | 0.25 |
| Suitability Assessment Safety Factor, $S_A = \sum p$ | | | 2.00 |

*The project civil engineer should complete Worksheet D.5-1 or Form I-9 using the data on this table. Additional information is required to evaluate the design factor of safety.

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

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

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

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

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

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

The majority of the site is underlain by varying depths of fill overlying the Scripps Formation and Ardath Shale (see Geologic Map, Figure 2). Infiltration is not allowed in areas with 5 feet and thicker of fill. Descending slopes exist west of the property along Campus Point Drive with a height up to approximately 150 feet. Infiltration should not be allowed within 50 feet or 1.5 times the height of existing slopes (225 feet).

We performed two infiltration tests within the Scripps Formation and two within the Ardath Shale in the northeastern portion of the site. The results indicate an average rate of less than 0.05 inches per hour (with an applied factor of safety of 2). Therefore, infiltration is considered infeasible within the formational Scripps Formation and infeasible at the site.

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

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

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

| Part 1 Result – Full Infiltration Geotechnical Screening [12] | Result |
|---|---|
| If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only.<br>If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required. | ☐ Full infiltration Condition<br>☒ Complete Part 2 |

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

## Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions

## Worksheet C.4-1: Form I-8A[10]

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

| **DMA(s) Being Analyzed:** | **Project Phase:** |
|---|---|
| Campus Pointe | Design |

### Criteria 3: Infiltration Rate Screening

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

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

The majority of the site is underlain by varying depths of fill overlying the Scripps Formation and Ardath Shale (see Geologic Map, Figure 2). Infiltration is not allowed in areas with 5 feet and thicker of fill. Descending slopes exist west of the property along Campus Point Drive with a height up to approximately 150 feet. Infiltration should not be allowed within 50 feet or 1.5 times the height of existing slopes (225 feet).

We performed two infiltration tests within the Scripps Formation and two within the Ardath Shale in the northeastern portion of the site. The results indicate an average rate of less than 0.05 inches per hour (with an applied factor of safety of 2). Therefore, infiltration is considered infeasible within the formational Scripps Formation and infeasible at the site.

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

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

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions</th><th colspan="2">Worksheet C.4-1: Form I- 8A[10]</th></tr>
<tr><td>Criteria 4 Result</td><td>Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?</td><td>☐ Yes</td><td>☐ No</td></tr>
<tr><td colspan="4">Summarize findings and basis; provide references to related reports or exhibits.</td></tr>
</table>

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

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

## Aardvark Permeameter Data Analysis

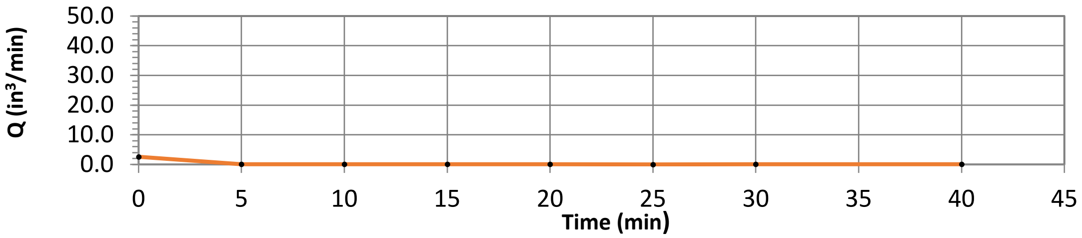
Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-1

Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 302.0
Bottom EL (feet, MSL): 297.0

Borehole Diameter, d (in.): 8.00
Borehole Depth, **H** (in): 60.00
Distance Between Reservoir & Top of Borehole (in.): 29.00
Estimated Depth to Water Table, **S** (feet): 200.00
Height APM Raised from Bottom (in.): 2.00
Pressure Reducer Used: No

Distance Between Resevoir and APM Float, **D** (in.): 79.75
Head Height Calculated, **h** (in.): 5.77
Head Height Measured, **h** (in.): 5.00
Distance Between Constant Head and Water Table, **L** (in.): 2345.00

| Reading | Time Elapsed (min) | Water Weight Consummed (lbs) | Water Volume Consummed ($in^3$) | Q ($in^3$/min) |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 5.00 | 0.465 | 12.88 | 2.575 |
| 3 | 5.00 | 0.005 | 0.14 | 0.028 |
| 4 | 5.00 | 0.010 | 0.28 | 0.055 |
| 5 | 5.00 | 0.010 | 0.28 | 0.055 |
| 6 | 5.00 | 0.005 | 0.14 | 0.028 |
| 7 | 5.00 | 0.000 | 0.00 | 0.000 |
| 8 | 10.00 | 0.010 | 0.28 | 0.028 |
| 9 | 5.00 | 0.005 | 0.14 | 0.028 |
| | | | Steady Flow Rate, Q ($in^3$/min): | 0.018 |



**Soil Matric Flux Potential, $\Phi_m$**

**$\Phi_m$=** 0.0001 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

***$K_{sat}$* =** 5.39E-05 in/min 0.003 in/hr

GEOCON

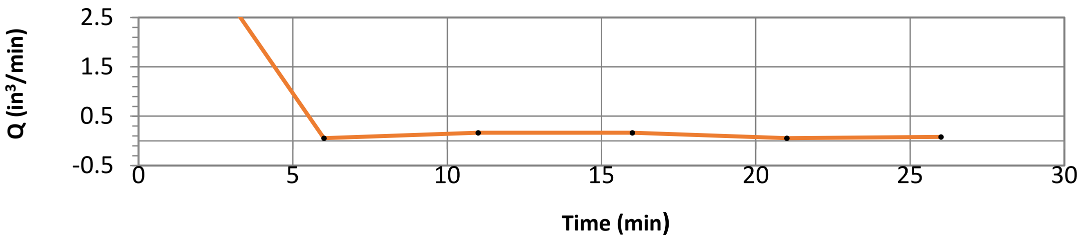
## Aardvark Permeameter Data Analysis

Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-2
Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 301.0
Bottom EL (feet, MSL): 296.7

Borehole Diameter, d (in.): 8.00
Borehole Depth, **H** (in): 52.00
Distance Between Reservoir & Top of Borehole (in.): 29.00
Estimated Depth to Water Table, **S** (feet): 200.00
Height APM Raised from Bottom (in.): 1.00
Pressure Reducer Used: No

Distance Between Resevoir and APM Float, **D** (in.): 72.75
Head Height Calculated, **h** (in.): 4.74
Head Height Measured, **h** (in.): 4.00
Distance Between Constant Head and Water Table, **L** (in.): 2352.00

| **Reading** | **Time Elapsed (min)** | **Water Weight Consummed (lbs)** | **Water Volume Consummed ($in^3$)** | **Q ($in^3$/min)** |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 6.00 | 0.800 | 22.15 | 3.692 |
| 3 | 5.00 | 0.990 | 27.42 | 5.483 |
| 4 | 5.00 | 0.010 | 0.28 | 0.055 |
| 5 | 5.00 | 0.030 | 0.83 | 0.166 |
| 6 | 5.00 | 0.030 | 0.83 | 0.166 |
| 7 | 5.00 | 0.010 | 0.28 | 0.055 |
| 8 | 5.00 | 0.015 | 0.42 | 0.083 |
|  |  |  | Steady Flow Rate, Q ($in^3$/min): | 0.069 |



**Soil Matric Flux Potential, $\Phi_m$**

**$\Phi_m$=** 0.0003 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

***$K_{sat}$* =** 2.48E-04 in/min 0.015 in/hr

GEOCON

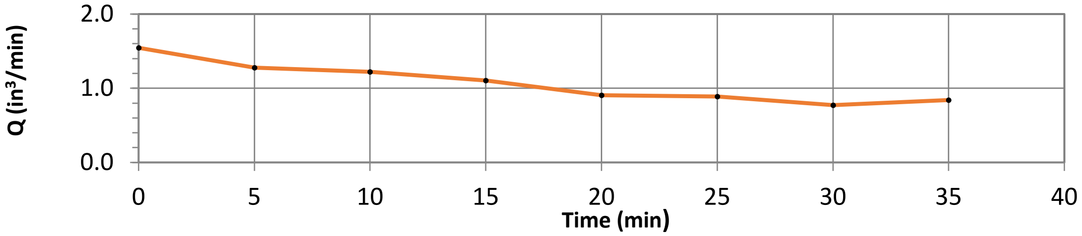
## Aardvark Permeameter Data Analysis

Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-3
Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 300.0
Bottom EL (feet, MSL): 294.7

Borehole Diameter, d (in.): 8.00
Borehole Depth, **H** (in): 64.00
Distance Between Reservoir & Top of Borehole (in.): 27.00
Estimated Depth to Water Table, **S** (feet): 200.00
Height APM Raised from Bottom (in.): 4.00
Pressure Reducer Used: No

Distance Between Resevoir and APM Float, **D** (in.): 79.75
Head Height Calculated, **h** (in.): 7.77
Head Height Measured, **h** (in.): 8.00
Distance Between Constant Head and Water Table, **L** (in.): 2344.00

| Reading | Time Elapsed (min) | Water Weight Consummed (lbs) | Water Volume Consummed ($in^3$) | Q ($in^3$/min) |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 5.00 | 0.108 | 2.99 | 0.598 |
| 3 | 5.00 | 0.279 | 7.73 | 1.545 |
| 4 | 5.00 | 0.231 | 6.40 | 1.279 |
| 5 | 5.00 | 0.220 | 6.11 | 1.221 |
| 6 | 5.00 | 0.200 | 5.52 | 1.105 |
| 7 | 5.00 | 0.164 | 4.53 | 0.906 |
| 8 | 5.00 | 0.161 | 4.44 | 0.889 |
| 9 | 5.00 | 0.140 | 3.86 | 0.773 |
| 10 | 5.00 | 0.152 | 4.20 | 0.839 |
|  |  |  | Steady Flow Rate, Q ($in^3$/min): | 0.834 |



**Soil Matric Flux Potential, $\Phi_m$**

$\Phi_m$= 0.0017 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

$K_{sat}$ = 1.51E-03 in/min 0.091 in/hr

GEOCON

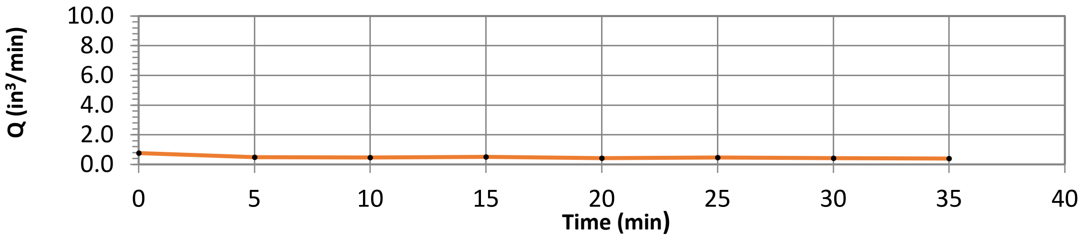
## Aardvark Permeameter Data Analysis

Project Name: Campus Pointe
Project Number: G2415-52-01
Test Number: P-4
Date: 7/17/2019
By: MRL
Ref. EL (feet, MSL): 300.0
Bottom EL (feet, MSL): 298.0

| | |
|---|---|
| Borehole Diameter, d (in.): | 8.00 |
| Borehole Depth, **H** (in): | 24.00 |
| Distance Between Reservoir & Top of Borehole (in.): | 28.00 |
| Estimated Depth to Water Table, **S** (feet): | 200.00 |
| Height APM Raised from Bottom (in.): | 2.00 |
| Pressure Reducer Used: | No |

| | |
|---|---|
| Distance Between Resevoir and APM Float, **D** (in.): | 42.75 |
| Head Height Calculated, **h** (in.): | 5.64 |
| Head Height Measured, **h** (in.): | 5.00 |
| Distance Between Constant Head and Water Table, **L** (in.): | 2381.00 |

| Reading | Time Elapsed (min) | Water Weight Consummed (lbs) | Water Volume Consummed ($in^3$) | Q ($in^3$/min) |
|---|---|---|---|---|
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 5.00 | 0.138 | 3.82 | 0.764 |
| 3 | 5.00 | 0.089 | 2.48 | 0.495 |
| 4 | 5.00 | 0.083 | 2.29 | 0.459 |
| 5 | 5.00 | 0.092 | 2.54 | 0.508 |
| 6 | 5.00 | 0.077 | 2.14 | 0.429 |
| 7 | 5.00 | 0.083 | 2.31 | 0.462 |
| 8 | 5.00 | 0.075 | 2.08 | 0.415 |
| 9 | 5.00 | 0.071 | 1.98 | 0.395 |
| | | | Steady Flow Rate, Q ($in^3$/min): | 0.405 |



**Soil Matric Flux Potential, $\Phi_m$**

$\Phi_m$= 0.0013 $in^2$/min

**Field-Saturated Hydraulic Conductivity (Infiltration Rate)**

$K_{sat}$ = 1.18E-03 in/min 0.071 in/hr

# APPENDIX E

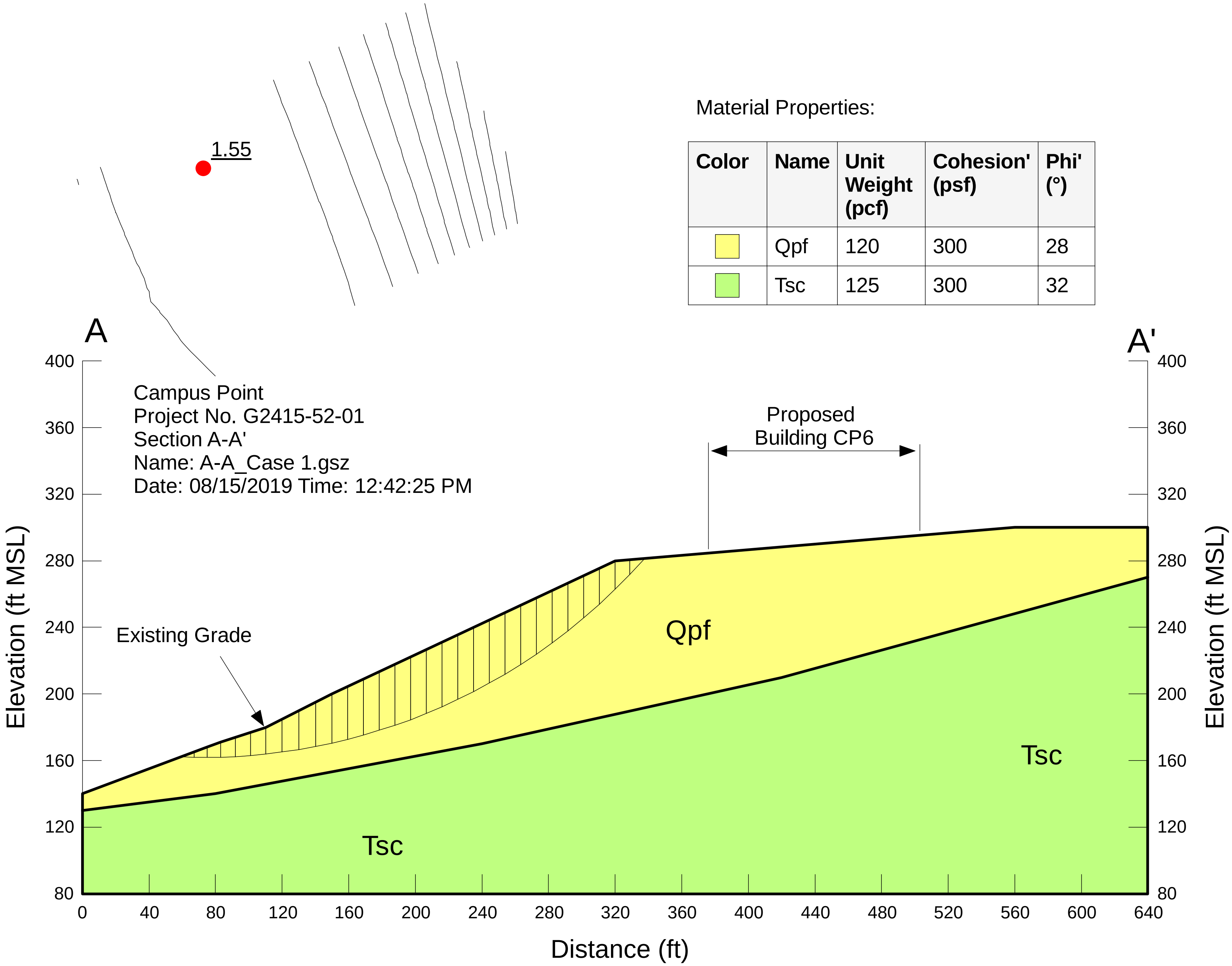
# APPENDIX E

# SLOPE STABILITY ANALYSIS

FOR

CAMPUS POINTE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2415-52-01



Campus Point
Project No. G2415-52-01
Section A-A'
Name: A-A_Case 1.gsz
Date: 08/15/2019 Time: 12:42:25 PM

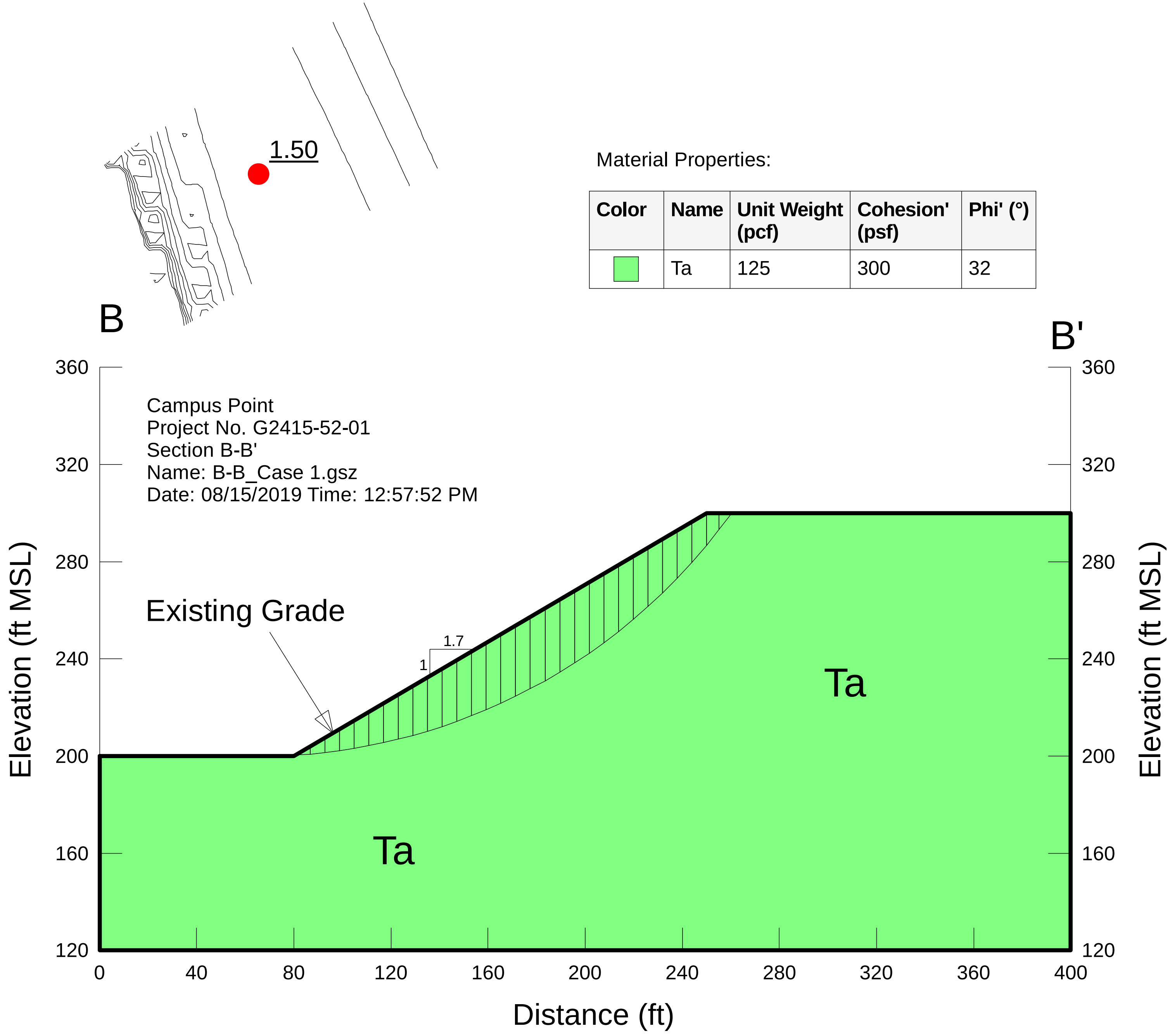
Material Properties:

| **Color** | **Name** | **Unit Weight (pcf)** | **Cohesion' (psf)** | **Phi' (°)** |
|---|---|---|---|---|
| 🟨 | Qpf | 120 | 300 | 28 |
| 🟩 | Tsc | 125 | 300 | 32 |

Directory: X:\Engineering and Geology\ENGINEER PROGRAMS, GUIDES, ETC\EngrgPrg\GEO-SLOPE2018\G2415-52-01 Campus Point\

Material Properties:

| Color | Name | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) |
|---|---|---|---|---|
| 🟩 | Ta | 125 | 300 | 32 |



Campus Point
Project No. G2415-52-01
Section B-B'
Name: B-B_Case 1.gsz
Date: 08/15/2019 Time: 12:57:52 PM

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# APPENDIX F

# APPENDIX F

# RECOMMENDED GRADING SPECIFICATIONS

FOR

CAMPUS POINTE
SAN DIEGO, CALIFORNIA

PROJECT NO. G2415-52-01

# RECOMMENDED GRADING SPECIFICATIONS

## 1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

## 2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

## 3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

## 4. CLEARING AND PREPARING AREAS TO BE FILLED

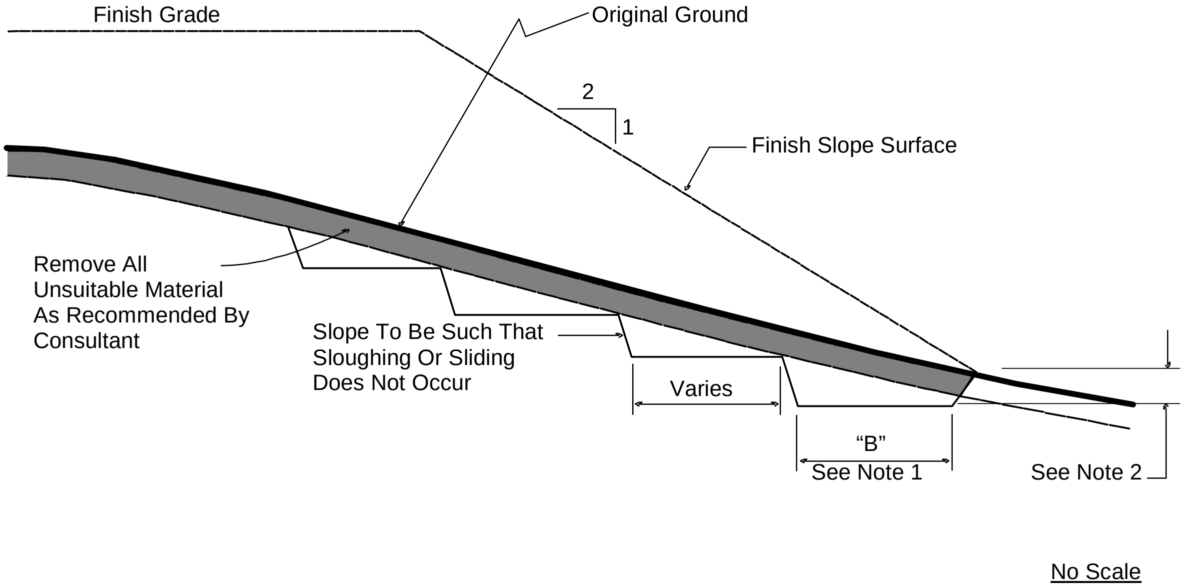
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

## 5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

## 6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

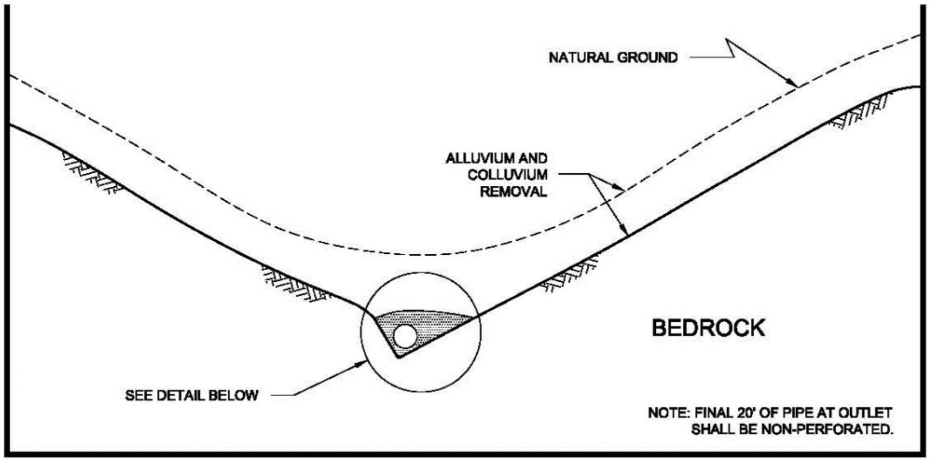
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

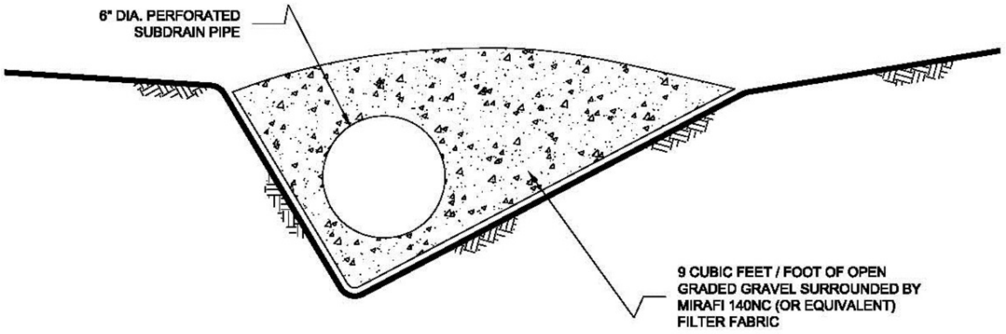
## 7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

## TYPICAL CANYON DRAIN DETAIL



NOTE: FINAL 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED.



**NOTES:**

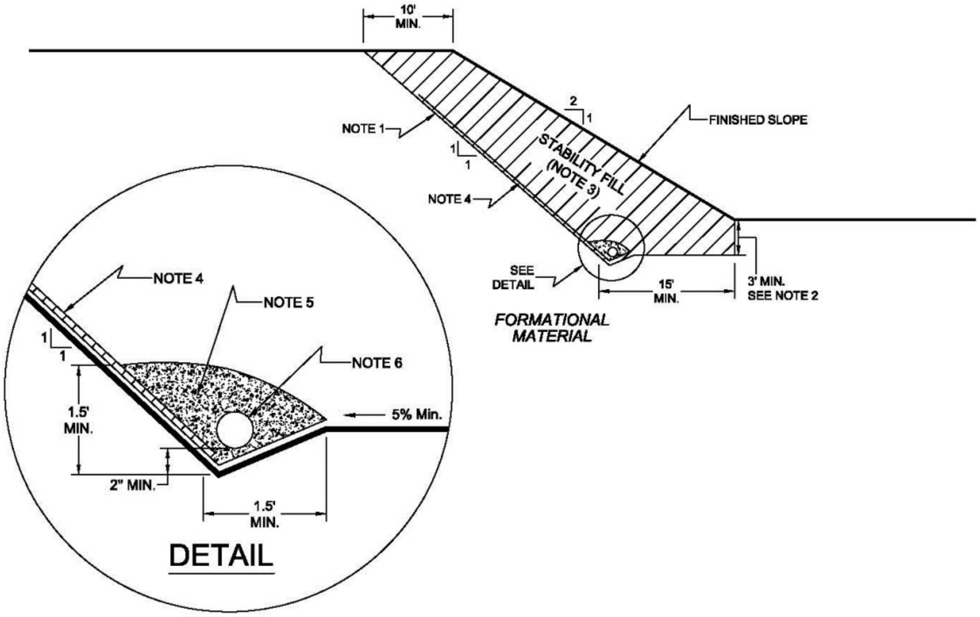
1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

**NO SCALE**

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

## TYPICAL STABILITY FILL DETAIL



**NOTES:**

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

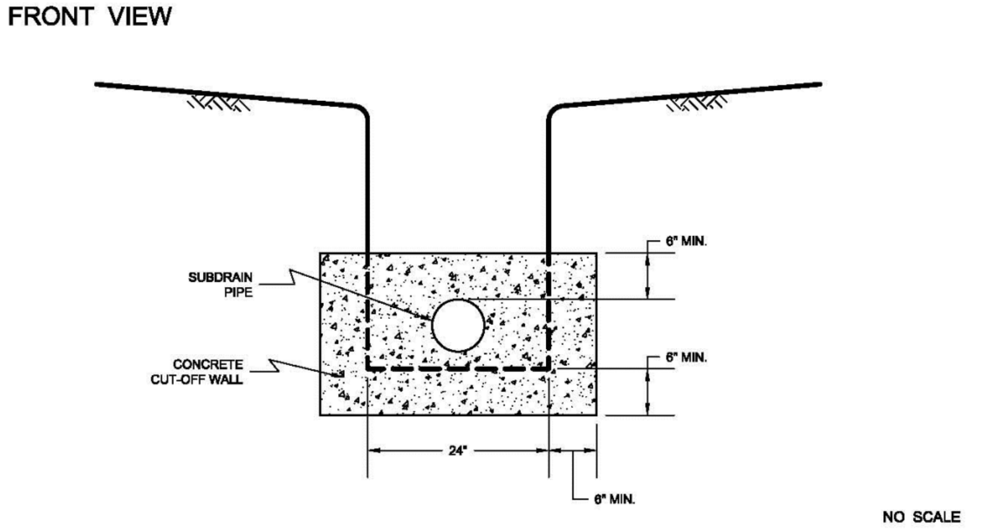
**NO SCALE**

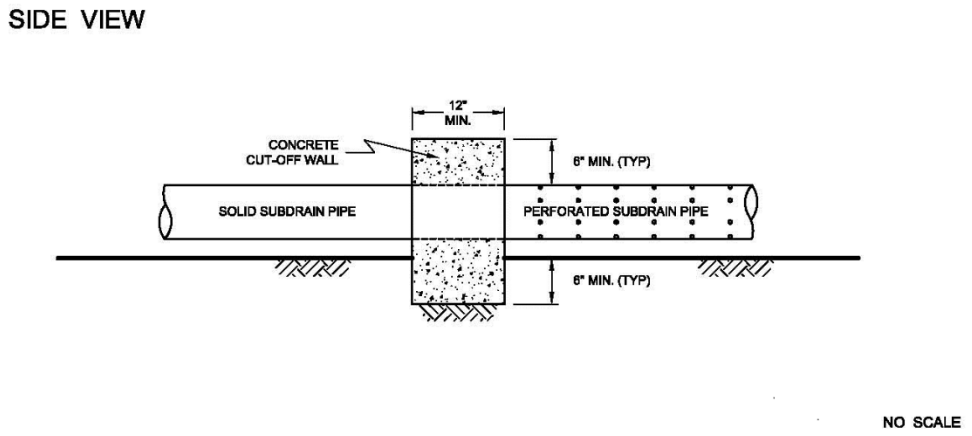
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

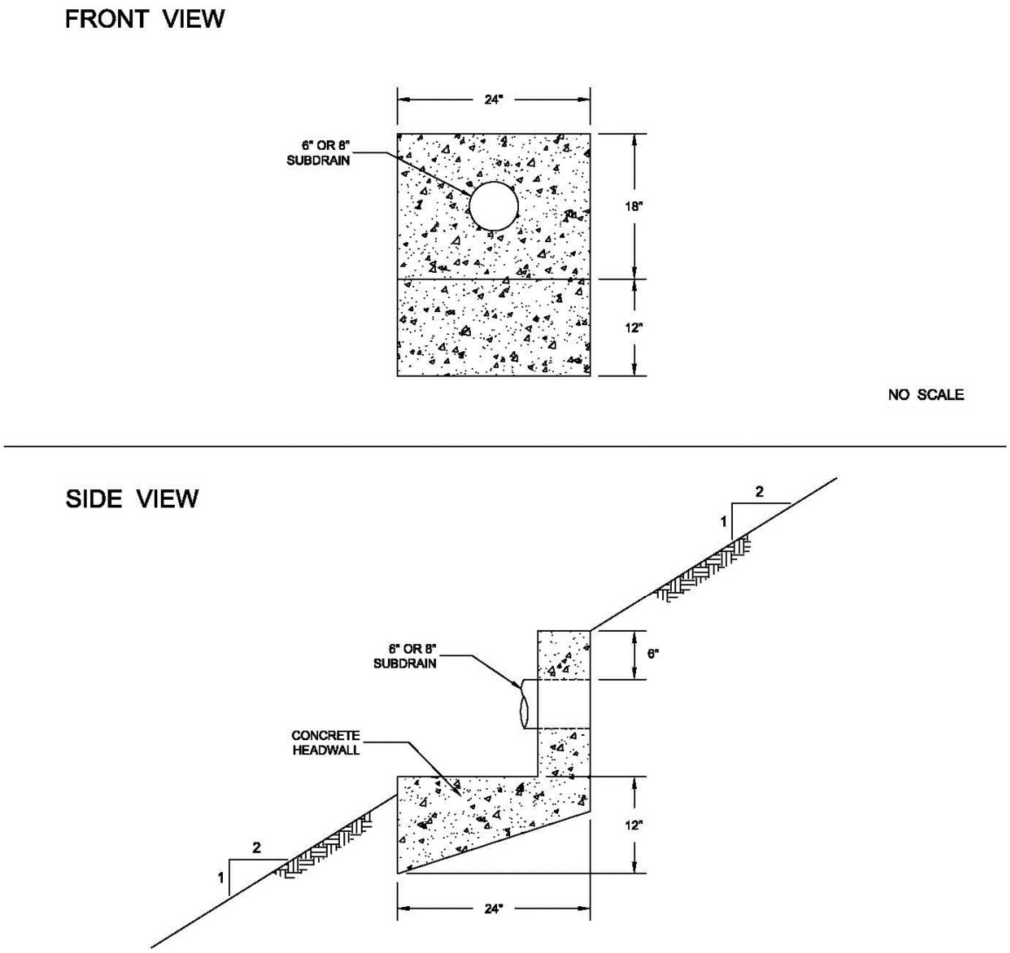
## TYPICAL CUT OFF WALL DETAIL





7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

## TYPICAL HEADWALL DETAIL


FRONT VIEW

SIDE VIEW

NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

## 8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner’s representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

### 8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

## 9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

## 10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

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