Appendix J

Priority Development Project Storm Water Quality Management Plan

County of San Diego
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

OTAY 250, TM FOR TRACT 5607
PDS 2015 – SPA-15-001

9300 Otay Mesa Road
Otay, CA

ASSESSOR'S PARCEL NUMBER(S):
646-080-26 TO 29, 646-080-31 TO 33, 646-240-30, 646-310-17

ENGINEER OF WORK:

REGISTERED PROFESSIONAL ENGINEER
BRYAN T. HILL
C 69339
EXP 6/30/18
CIVIL
STATE OF CALIFORNIA

12/12/16

BRYAN T. HILL, RCE 69339

PREPARED FOR:

Sunroad Otay Partners, LP
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San Diego, CA 92121
858-362-8500

PDP SWQMP PREPARED BY:

STEVENS CRESTO ENGINEERING, INC.
9665 CHESAPEAKE DR.
SAN DIEGO, CA 92123
858-694-5660

DATE OF SWQMP:
December 12, 2016

PLANS PREPARED BY:
STEVENS CRESTO ENGINEERING, INC.
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858-694-5660

SWQMP APPROVED BY:

APPROVAL DATE:

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Acronyms

ACP	Alternative Compliance Project
APN	Assessor's Parcel Number
BMP	Best Management Practice
BMP DM	Best Management Practice Design Manual
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDCI	Private Development Construction Inspection Section
PDP	Priority Development Project
PDS	Planning and Development Services
PE	Professional Engineer
RPO	Resource Protection Ordinance
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWQMP	Storm Water Quality Management Plan
WMAA	Watershed Management Area Analysis
WPO	Watershed Protection Ordinance
WQIP	Water Quality Improvement Plan

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PDP SWQMP Preparer's Certification Page

Project Name: OTAY 250, TM FOR TRACT 5607
Permit Application Number: PDS 2015 – SPA-15-001

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100) requirements for storm water management.

I have read and understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by County staff 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.

NOTE: The current CEQA level PDP SWQMP is in conformance with the MS4 permit. Prior to approval of Final Improvement/Grading plans, an updated PDP SWQMP will be provided that has final engineering level calculations which meet the MS4 permit requirements to the satisfaction of the County of San Diego. Due to the limitations with the BMP Sizing Spreadsheet tool and its applicability for portions of this project, the BMP Sizing Spreadsheet calculations included in this PDP SWQMP are intended to demonstrate feasibility for CEQA Level only and are not to be used for final BMP design and therefore Continuous Simulation Modeling is to be provided at final engineering.

RCE 69339, EXP 6/30/18
Engineer of Work's Signature, PE Number & Expiration Date

Bryan T. Hill
Print Name

Stevens Cresto Engineering, Inc.
Company

12/12/16
Date

Engineer's Seal: REGISTERED PROFESSIONAL ENGINEER — BRYAN T. HILL — C 69339 — EXP 6/30/18 — CIVIL — STATE OF CALIFORNIA

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Submittal Record

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

Preliminary Design / Planning / CEQA

Submittal Number	Date	Summary of Changes
1	07/16/15 (SWMP)	Initial Submittal
2	01/20/16 (SWMP)	Revision
3	04/08/16 (SWQMP)	Revision
4	08/23/16 (SWQMP) 12/12/16 (SWQMP)	Revision Revision

Final Design

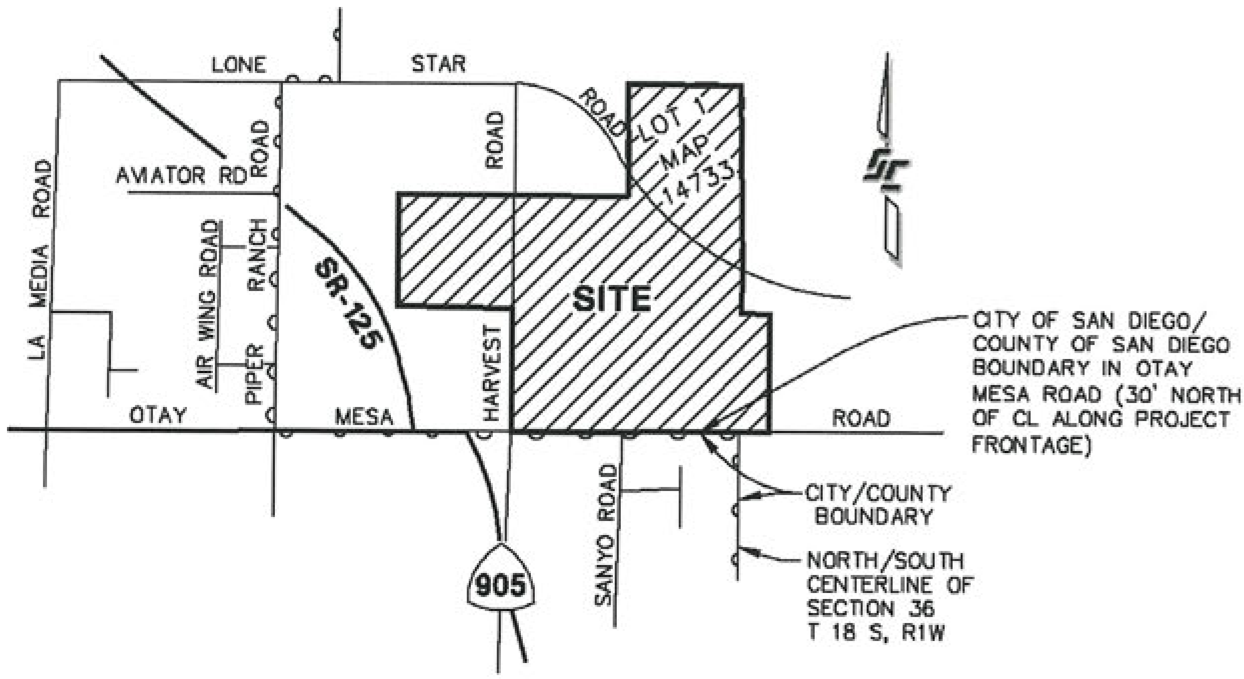
Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

Plan Changes

Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

Project Vicinity Map

Project Name: Otay 250
Record ID: PDS 2015 – SPA-15-001



VICINITY MAP
NO SCALE

Step 1: Project type determination (Standard or Priority Development Project)

Is the project part of another Priority Development Project (PDP)? If so, a PDP SWQMP is required. Go to Step 2.			(☐ Yes ☒ No
The project is (select one): ☒ New Development ☐ Redevelopment[1]			
The total proposed newly created or replaced impervious area is:			1,215,341 ft^2
The total existing (pre-project) impervious area is:			0 ft^2
The total area disturbed by the project is:			8,799,120 ft^2
If the total area disturbed by the project is 1 acre (43,560 sq. ft.) or more OR the project is part of a larger common plan of development disturbing 1 acre or more, a Waste Discharger Identification (WDID) number must be obtained from the State Water Resources Control Board. WDID: TO BE PROVIDED AT FINAL ENGINEERING			
Is the project in any of the following categories, (a) through (f)?[2]			
Yes ☒	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces [3](collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

[1] Redevelopment is defined as: The creation and/or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include routine maintenance activities, such as trenching and resurfacing associated with utility work; pavement grinding; resurfacing existing roadways; new sidewalks construction; pedestrian ramps; or bike lanes on existing roads; and routine replacement of damaged pavement, such as pothole repair.

[2] Applicants should note that any development project that will create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site) is considered a new development.

[3] For solar energy farm projects, the area of the solar panels does not count toward the total impervious area of the site.

Project type determination (continued)

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

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

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

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

Further guidance may be found in Chapter 1 and Table 1-2 of the BMP Design Manual.

The following is for **redevelopment PDPs only**:

The area of existing (pre-project) impervious area at the project site is: N/A ft² (A)
The total proposed newly created or replaced impervious area is N/A ft² (B)
Percent impervious surface created or replaced (B/A)*100: N/A %
The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – **only newly created or replaced impervious areas are considered a PDP and subject to stormwater requirements**

OR

☐ greater than fifty percent (50%) – **the entire project site is considered a PDP and subject to stormwater requirements**

Step 1.1: Storm Water Quality Management Plan requirements

Step	Answer	Progression
Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions?	☐ Standard Project	Standard Project requirements apply, including Standard Project SWQMP. **Complete Standard Project SWQMP.**
To answer this item, complete Step 1 Project Type Determination Checklist on Pages 1 and 2, and see PDP exemption information below. For further guidance, see Section 1.4 of the BMP Design Manual *in its entirety*.	☒ PDP ☐ PDP with ACP	Standard and PDP requirements apply, including PDP SWQMP. **Complete PDP SWQMP.** If participating in offsite alternative compliance, **complete Step 6.3 and an ACP SWQMP.**
	☐ PDP Exemption	**Go to Step 1.2 below.**

Step 1.2: Exemption to PDP definitions

Is the project exempt from PDP definitions based on either of the following:	If so:
☐ Projects that are only new or retrofit paved sidewalks, bicycle lanes, or trails that meet the following criteria: (i) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR (ii) Designed and constructed to be hydraulically disconnected from paved streets or roads [i.e., runoff from the new improvement does not drain directly onto paved streets or roads]; OR (iii) Designed and constructed with permeable pavements or surfaces in accordance with County of San Diego Guidance on Green Infrastructure;	Standard Project requirements apply, AND any additional requirements specific to the type of project. County concurrence with the exemption is required. *Provide discussion and list any additional requirements below in this form.* **Complete Standard Project SWQMP**
☐ Projects that are only retrofitting or redeveloping existing paved alleys, streets or roads that are designed and constructed in accordance with the County of San Diego Guidance on Green Infrastructure.	**Complete Green Streets PDP Exempt SWQMP.**
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable: N/A	

Step 2: Construction Storm Water BMP Checklist

Minimum Required Standard Construction Storm Water BMPs		
If you answer "Yes" to any of the questions below, your project is subject to Table 1 on the following page (Minimum Required Standard Construction Stormwater BMPs). As noted in Table 1, please select at least the minimum number of required BMPs, or as many as are feasible for your project. If no BMP is selected, an explanation must be given in the box provided. The following questions are intended to aid in determining construction BMP requirements for your project. **Note: All selected BMPs below must be included on the BMP plan incorporated into the construction plan sets.**		
1. Will there be soil disturbing activities that will result in exposed soil areas? (This includes minor grading and trenching.) **Reference Table 1 Items A, B, D, and E** Note: Soil disturbances NOT considered significant include, but are not limited to, change in use, mechanical/electrical/plumbing activities, signs, temporary trailers, interior remodeling, and minor tenant improvement.	☒Yes	☐No
2. Will there be asphalt paving, including patching? **Reference Table 1 Items D and F**	☒Yes	☐No
3. Will there be slurries from mortar mixing, coring, or concrete saw cutting? **Reference Table 1 Items D and F**	☒Yes	☐No
4. Will there be solid wastes from concrete demolition and removal, wall construction, or form work? **Reference Table 1 Items D and F**	☒Yes	☐No
5. Will there be stockpiling (soil, compost, asphalt, concrete, solid waste) for over 24 hours? **Reference Table 1 Items D and F**	☒Yes	☐No
6. Will there be dewatering operations? **Reference Table 1 Items C and D**	☐Yes	☒No
7. Will there be temporary on-site storage of construction materials, including mortar mix, raw landscaping and soil stabilization materials, treated lumber, rebar, and plated metal fencing materials? **Reference Table 1 Items E and F**	☒Yes	☐No
8. Will trash or solid waste product be generated from this project? **Reference Table 1 Item F**	☒Yes	☐No
9. Will construction equipment be stored on site (e.g.: fuels, oils, trucks, etc.?) **Reference Table 1 Item F**	☒Yes	☐No
10. Will Portable Sanitary Services ("Porta-potty") be used on the site? **Reference Table 1 Item F**	☒Yes	☐No

Table 1. Construction Storm Water BMP Checklist

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook[4] Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
A. Select Erosion Control Method for Disturbed Slopes (choose at least one for the appropriate season)			
Vegetation Stabilization Planting[5] (Summer)	SS-2, SS-4	☒	N/A for Tentative Map, will be included on construction drawings.
Hydraulic Stabilization Hydroseeding[2] (Summer)	SS-4	☐	
Bonded Fiber Matrix or Stabilized Fiber Matrix[6] (Winter)	SS-3	☐	
Physical Stabilization Erosion Control Blanket[3] (Winter)	SS-7	☐	
B. Select erosion control method for disturbed flat areas (slope < 5%) (choose at least one)			
County Standard Lot Perimeter Protection Detail	PDS 659[7], SC-2	☐	N/A for Tentative Map, will be included on construction drawings.
Will use erosion control measures from Item A on flat areas also	SS-3, 4, 7	☒	
County Standard Desilting Basin (must treat all site runoff)	PDS 660[8], SC-2	☐	
Mulch, straw, wood chips, soil application	SS-6, SS-8	☐	

4 State of California Department of Transportation (Caltrans). 2003. Storm Water Quality Handbooks, Construction Site Best Management Practices (BMPs) Manual. March. Available online at: http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm.

5 If Vegetation Stabilization (Planting or Hydroseeding) is proposed for erosion control it may be installed between May 1st and August 15th. Slope irrigation is in place and needs to be operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. The owner must implement a contingency physical BMP by August 15th if vegetation establishment does not occur by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.

6 All slopes over three feet must have established vegetative cover prior to final permit approval.

7 County of San Diego, Planning & Development Services. 2012. Standard Lot Perimeter Protection Design System. Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds659.pdf.

8 County of San Diego, Planning & Development Services. 2012. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds660.pdf.

Table 1. Construction Storm Water BMP Checklist (continued)

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
C. If runoff or dewatering operation is concentrated, velocity must be controlled using an energy dissipater			
Energy Dissipater Outlet Protection[9]	SS-10	☒	N/A for Tentative Map, will be included on construction drawings.
D. Select sediment control method for all disturbed areas (choose at least one)			
Silt Fence	SC-1	☒	N/A for Tentative Map, will be included on construction drawings.
Fiber Rolls (Straw Wattles)	SC-5	☒	
Gravel & Sand Bags	SC-6 & 8	☒	
Dewatering Filtration	NS-2	☐	
Storm Drain Inlet Protection	SC-10	☒	
Engineered Desilting Basin (sized for 10-year flow)	SC-2	☐	
E. Select method for preventing offsite tracking of sediment (choose at least one)			
Stabilized Construction Entrance	TC-1	☒	N/A for Tentative Map, will be included on construction drawings.
Construction Road Stabilization	TC-2	☐	
Entrance/Exit Tire Wash	TC-3	☐	
Entrance/Exit Inspection & Cleaning Facility	TC-1	☐	
Street Sweeping and Vacuuming	SC-7	☒	
F. Select the general site management BMPs			
F.1 Materials Management			
Material Delivery & Storage	WM-1	☒	N/A for Tentative Map, will be included on construction drawings.
Spill Prevention and Control	WM-4	☒	
F.2 Waste Management[10]			
Waste Management Concrete Waste Management	WM-8	☒	N/A for Tentative Map, will be included on construction drawings.
Solid Waste Management	WM-5	☒	
Sanitary Waste Management	WM-9	☒	
Hazardous Waste Management	WM-6	☐	

Note: The Construction General Permit (Order No. 2009-0009-DWQ) also requires all projects not subject to the BMP Design Manual to comply with runoff reduction requirements through the implementation of post-construction BMPs as described in Section XIII of the order.

9 Regional Standard Drawing D-40 – Rip Rap Energy Dissipater is also acceptable for velocity reduction.
10 Not all projects will have every waste identified. The applicant is responsible for identifying wastes that will be onsite and applying the appropriate BMP. For example, if concrete will be used, BMP WM-8 must be selected.

Step 3: County of San Diego PDP SWQMP Site Information Checklist

Step 3.1: Description of Existing Site Condition

Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Tijuana 911, Water Tanks 911.12

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

- ☐ Existing development
- ☐ Previously graded but not built out
- ☐ Demolition completed without new construction
- ☐ Agricultural or other non-impervious use
- ☒ Vacant, undeveloped/natural

Description / Additional Information:

Existing Land Cover Includes (select all that apply and provide each area on site):

- ☒ Vegetative Cover 202 Acres (8,799,120 Square Feet)
- ☐ Non-Vegetated Pervious Areas 0 Acres (0 Square Feet)
- ☐ Impervious Areas 0 Acres (0 Square Feet)

Description / Additional Information:
An additional lot, containing approximately 51 acres, was dedicated as open space with Map No. 14733.

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

- ☐ NRCS Type A
- ☐ NRCS Type B
- ☐ NRCS Type C
- ☒ NRCS Type D

Approximate Depth to Groundwater (GW) (or N/A if no infiltration is used):

- ☐ GW Depth < 5 feet
- ☐ 5 feet < GW Depth < 10 feet
- ☐ 10 feet < GW Depth < 20 feet
- ☒ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- ☒ Watercourses
- ☐ Seeps
- ☐ Springs
- ☐ Wetlands
- ☐ None
- ☐ Other

Description / Additional Information:

Step 3.2: Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

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

Describe existing site drainage patterns:
The existing site drainage conveyance is natural and is divided into three distinct drainage basins with three distinct outfall points. Two of the three basins are located on the southern half of the project and drain to the south, to storm drain in Otay Mesa Road. The other basin, in the northern half of the project, drains to the northwest and is collected in storm drain on the east side of SR-125. The entire project is within the Tijuana Watershed. Approximately 52.7 acres of the offsite run-on from the east, and approximately 32.6 acres from the north, will be collected within the project storm drain system for conveyance through the site. Run-on will bypass directly through the site and will not be routed to any of the regional detention/biofiltration basins.

Step 3.3: Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:

Otay 250 is a mixed use residential/commercial subdivision containing twenty-nine developable lots, with associated public roads, on approximately 202 acres. An additional lot, containing approximately 51 acres, was dedicated as open space with Map No. 14733. The project is located within the northwest quadrant of the East Otay Mesa Specific Plan area. The project is located north of Otay Mesa Road and adjacent to the east of the SR 125 extension in the Otay Mesa area within the County of San Diego, California. Otay 250, at ultimate build-out, while zoned Technological Business Park with a portion having a Commercial overlay, supports commercial, light industrial, and mixed use residential/retail land uses. The project will be constructed in multiple phases.

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

Proposed roadways

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

Rough graded pads

Does the project include grading and changes to site topography?

☒Yes

☐No

Description / Additional Information:

Insert acreage or square feet for the different land cover types in the table below:

Change in Land Cover Type Summary			
Land Cover Type	Existing (acres or ft^2)	Proposed (acres or ft^2)	Percent Change
Vegetation	253 AC	225 AC	-12%
Pervious (non-vegetated)			
Impervious	0	28 AC	>100%

Step 3.4: Description of Proposed Site Drainage Patterns

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

☒Yes

☐No

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

Describe proposed site drainage patterns:

Each lot will contain at least one storm water collection basin to hold and store pad runoff prior to it entering the storm drain system. The proposed public storm drain system will collect runoff from each collection basin and convey flows to the northwest and south directions off site. The project will generally maintain pre-project drainage basins and discharge points.

Step 3.5: Potential Pollutant Source Areas

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply). Select "Other" if the project is a phased development and provide a description:

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

Description / Additional Information:

Step 3.6: Identification and Narrative of Receiving Water and Pollutants of Concern

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

The entire project is within the Tijuana Watershed and is collected within public storm drain systems for conveyance to the west. Runoff is conveyed in a combination of storm drains, open channels, and natural channels before being discharged to the Tijuana River. The Tijuana River outlets to the Pacific Ocean.

List any 303(d) impaired water bodies[11] within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
Pacific Ocean Shoreline, Tijuana HU	*Enterococcus, Fecal Coliform, Total Coliform*	*Est. TMDL completion: 2019*
Tijuana River Estuary	*Eutrophic, Indicator Bacteria, Lead, Low Dissolved Oxygen, Nickel, Pesticides, Thallium, Trash, Turbidity*	*Est. TMDL completion: 2010, 2019*
Tijuana River	*Eutrophic, Indicator Bacteria, Low Dissolved Oxygen, Pesticides, Phosphorus, Sedimentation/Siltation, Selenium, Solids, Surfactants, Synthetic Organics, Total Nitrogen, Toxicity, Trace Elements, Trash*	*Est. TMDL completion: 2010, 2019, 2021* *WQIP Highest Priority Pollutants: Sedimentation/Siltation and Turbidity*

Identification of Project Site Pollutants*

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

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

[11] The current list of Section 303(d) impaired water bodies can be found at http://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/#impaired

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	☐	☒	☒

Step 3.7: Hydromodification Management Requirements

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

☒Yes, hydromodification management requirements for flow control and preservation of critical coarse sediment yield areas are applicable.

☐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[12] for the watershed in which the project resides.

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

[12] The Watershed Management Area Analysis (WMAA) is an optional element for inclusion in the Water Quality Improvement Plans (WQIPs) described in the 2013 MS4 Permit [Provision B.3.b.(4)]. It is available online at the Project Clean Water website: http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=248

Step 3.7.1: Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**
Projects must satisfy critical coarse sediment yield area (CCSYA) requirements by characterizing the project as one of the scenario-types presented below and satisfying associated criteria. Projects must appropriately satisfy all requirements for identification, avoidance, and bypass, OR may alternatively elect to demonstrate no net impact. ☐ **Scenario 1**: Project is subject to and in compliance with RPO requirements *(without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3) that result in impacts to more than 15% of the project-scale CCSYAs)*. ☐ Identify: Project has identified both <u>onsite and upstream</u> CCSYAs as areas that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,* ☐ Avoid: Project has avoided <u>onsite</u> CCSYAs per existing RPO steep slope encroachment criteria. AND, ☐ Bypass: Project has demonstrated that both <u>onsite and upstream</u> CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR, ☐ No Net Impact: Project does not satisfy all Scenario 1 criteria above and must alternatively demonstrate no net impact to the receiving water. ☒ **Scenario 2**: Project is entirely exempt/not subject to RPO requirements without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3). ☒ Identify: Project has identified <u>upstream</u> CCSYAs that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,* ☒ Avoid: Project is not required to avoid onsite CCSYAs as none were identified in the previous step. AND, ☒ Bypass: Project has demonstrated that <u>upstream</u> CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR, N/A : No CCSYAs Upstream ☐ No Net Impact: Project does not satisfy all Scenario 2 criteria above and must alternatively demonstrate no net impact to the receiving water. *(Skip to next row)*. ☐ **Scenario 3**: Project utilizes exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3) and impacts more than 15% of the project-scale CCSYAs. ☐ No Net Impact: Project is not eligible for traditional methods of identification, avoidance, and bypass. Project must demonstrate no net impact to the receiving water.

Critical Coarse Sediment Yield Areas Continued
Demonstrate No Net Impact
If the project elects to satisfy CCSYA criteria through demonstration of no net impact to the receiving water. Applicants must identify the methods utilized from the list below and provide supporting documentation in Attachment 2c of the SWQMP. Check all that are applicable. ☒ N/A, the project appropriately identifies, avoids, and bypasses CCSYAs. ☐ Project has performed additional analysis to demonstrate that impacts to CCSYAs satisfy the no net impact standard of Ep/Sp≤1.1. ☐ Project has provided alternate mapping of CCSYAs. ☐ Project has implemented additional onsite hydromodification flow control measures. ☐ Project has implemented an offsite stream rehabilitation project to offset impacts. ☐ Project has implemented other applicant-proposed mitigation measures.

Step 3.7.2: Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit. The first Point of Compliance, POC 1, is located on the north side of Otay Mesa Road where project runoff is discharged to an existing culvert approximately 800 ft east of Harvest Road. The second Point of Compliance, POC 2, is located at the intersection of Harvest Road and Otay Mesa Road, where project storm drain discharges to an existing public storm drain system. The third Point of Compliance, POC 3, is located at the northwest corner of the site where runoff is discharged to a graded channel.
Has a geomorphic assessment been performed for the receiving channel(s)? ☐ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is the low flow threshold is 0.1Q2 ☐ Yes, the result is the low flow threshold is 0.3Q2 ☒ Yes, the result is the low flow threshold is 0.5Q2 *If a geomorphic assessment has been performed, provide title, date, and preparer:* *Hydromodification Screening for Otay 250, dated August 15, 2016 by Chang Consultants* *Discussion / Additional Information: (optional)*

Step 3.8: 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.

Step 4: Source Control BMP Checklist

Source Control BMPs			
All development projects must implement source control BMPs 4.2.1 through 4.2.6 where applicable and feasible. See Chapter 4.2 and Appendix E of the County BMP Design Manual for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following: • "Yes" means the project will implement the source control BMP as described in Chapter 4.2 and/or Appendix E of the County 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 must 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:			
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:			

Source Control Requirement	Applied?		
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:			
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below):			
☒ A. On-site storm drain inlets	☒Yes	☐No	☐N/A
☐ B. Interior floor drains and elevator shaft sump pumps	☐Yes	☐No	☒N/A
☐ C. Interior parking garages	☐Yes	☐No	☒N/A
☐ D. Need for future indoor & structural pest control	☐Yes	☐No	☒N/A
☒ E. Landscape/outdoor pesticide use	☒Yes	☐No	☐N/A
☐ F. Pools, spas, ponds, fountains, and other water features	☐Yes	☐No	☒N/A
☐ G. Food service	☐Yes	☐No	☒N/A
☐ H. Refuse areas	☐Yes	☐No	☒N/A
☐ I. Industrial processes	☐Yes	☐No	☒N/A
☐ J. Outdoor storage of equipment or materials	☐Yes	☐No	☒N/A
☐ K. Vehicle and equipment cleaning	☐Yes	☐No	☒N/A
☐ L. Vehicle/equipment repair and maintenance	☐Yes	☐No	☒N/A
☐ M. Fuel dispensing areas	☐Yes	☐No	☒N/A
☐ N. Loading docks	☐Yes	☐No	☒N/A
☐ O. Fire sprinkler test water	☐Yes	☐No	☒N/A
☐ P. Miscellaneous drain or wash water	☐Yes	☐No	☒N/A
☒ Q. Plazas, sidewalks, and parking lots	☒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.			

Note: Show all source control measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 5: Site Design BMP Checklist

Site Design BMPs
All development projects must implement site design BMPs SD-A through SD-H where applicable and feasible. See Chapter 4.3 and Appendix E of the County BMP Design Manual for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following: • "Yes" means the project will implement the site design BMP as described in Chapter 4.3 and/or Appendix E of the County 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 must be provided.

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: The project has dedicated approximately 51.3 acres of open space. This area is north of the future Lone Star Road alignment and will not be disturbed by project construction.			
4.3.2 Conserve Natural Areas, Soils, and Vegetation	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.2 not implemented: The project has dedicated approximately 51.3 acres of open space. This area is north of the future Lone Star Road alignment and will not be disturbed by project construction.			
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: Public roadways have been designed to minimum required widths. Runoff generated by the roadways will be treated in regional bioretention/detention facilities which will provide water quality, hydromodification, and peak flow mitigation.			

Site Design Requirement	Applied?		
4.3.6 Runoff Collection	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.6 not implemented:			
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 Harvesting and Using Precipitation	☐Yes	☒No	☐N/A
Discussion / justification if 4.3.8 not implemented: According to Worksheet B.3-1, in Attachment 1a, full capture and use techniques are not feasible for the project.			

Note: Show all site design measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 6: PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the County at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the County must confirm the maintenance (see Section 7 of the BMP Design Manual).

Use this section 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 (Step 6.2) for each structural BMP within the project (copy the BMP summary information sheet [Step 6.2] as many times as needed to provide summary information for each individual structural BMP).

Step 6.1: Description of structural BMP strategy

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. At the end of this discussion provide a summary of all the structural BMPs within the project including the type and number.

Otay 250 will construct rough graded pads and public roads. Per the 2013 MS4 Permit, selection of BMPs for the project was completed using the feasibility analysis worksheet, B.3-1, from the County BMP Design Manual. After completing Worksheet B.3-1, both infiltration and harvest and use were determined to be infeasible and based on the result of Feasibility Category 5, biofiltration BMPs were selected. The project proposes 7 dual purpose biofiltration/detention basins located throughout the site to provide pollutant control, hydromodification, and 100 year peak mitigation. Some of the pads are considered as self-mitigating DMAs and have storm drains that discharges directly to public storm drains offsite. Most of the proposed pads drain to BMPs that are sized to manage the pad area in a naturalistic state. When the pads are developed, they will include BMPs to manage new impervious areas proposed at that time, and the future improvements will be documented in future PDP SWQMPs.

(Continue on following page as necessary.)

Description of structural BMP strategy continued (Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from previous page)

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BF1 – BF7	
Construction Plan Sheet No.	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	Bryan T. Hill, R.C.E. 69339 Stevens Cresto Engineering, Inc. 9665 Chesapeake Drive, Suite 200 San Diego, CA 92123 (858) 694-5660
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	2

Discussion (as needed): *(Continue on subsequent pages as necessary)*

Step 6.3: Offsite Alternative Compliance Participation Form

PDP INFORMATION	
Record ID:	**N/A**
Assessor's Parcel Number(s) [APN(s)]	
What are your PDP Pollutant Control Debits? *See Attachment 1 of the PDP SWQMP	
What are your PDP HMP Debits? (if applicable) *See Attachment 2 of the PDP SWQMP	
ACP Information	
Record ID:	
Assessor's Parcel Number(s) [APN(s)]	
Project Owner/Address	
What are your ACP Pollutant Control Credits? *See Attachment 1 of the ACP SWQMP	
What are your ACP HMP Debits? (if applicable) *See Attachment 2 of the ACP SWQMP	
Is your ACP in the same watershed as your PDP? ☐ Yes ☐ No	Will your ACP project be completed prior to the completion of the PDP? ☐ Yes ☐ No
Does your ACP account for all Deficits generated by the PDP? ☐ Yes ☐ No (PDP and/or ACP must be redesigned to account for all deficits generated by the PDP.	What is the difference between your PDP debits and ACP Credits? *(ACP Credits -Total PDP Debits = Total Earned Credits)

2

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	Storm Water Pollutant Control Worksheet Calculations -Worksheet B.3-1 (Required) -Worksheet B.1-1 (Required) -Worksheet B.4-1 (if applicable) -Worksheet B.4-2 (if applicable) -Worksheet B.5-1 (if applicable) -Worksheet B.5-2 (if applicable) -Worksheet B.5-3 (if applicable) -Worksheet B.6-1 (if applicable) -Summary Worksheet (optional)	☒ Included
Attachment 1b	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1c	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒ Included
Attachment 1d	Individual Structural BMP DMA Mapbook (Required) -Place each map on 8.5"x11" paper. -Show at a minimum the DMA, Structural BMP, and any existing hydrologic features within the DMA.	☒ Included

Attachment 1a

Storm Water Pollutant Control Worksheet Calculations

- Worksheet B.3-1
- Worksheet B.1-1
- Worksheet B.5-1

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

Category	#	Description	Value	Units
Capture & Use Inputs	0	Design Capture Volume for Entire Project Site	91,085	cubic-feet
	1	Proposed Development Type	Residential	unitless
	2	Number of Residents or Employees at Proposed Development	0	#
	3	Total Planted Area within Development	134,386	sq-ft
	4	Water Use Category for Proposed Planted Areas	Low	unitless
Infiltration Inputs	5	Is Average Site Infiltration Rate Less than 0.5 Inches per Hour?	Yes	yes/no
	6	Is Retention of the Full DCV Anticipated to Produce Negative Impacts?	Yes	yes/no
	7	Is Retention of Any Volume Anticipated to Produce Negative Impacts?	Yes	yes/no
Calculations	8	36-Hour Toilet Use Per Resident or Employee	0.37	cubic-feet
	9	Subtotal: Anticipated 36 Hour Toilet Use	0	cubic-feet
	10	Anticipated 1 Acre Landscape Use Over 36 Hours	52.14	cubic-feet
	11	Subtotal: Anticipated Landscape Use Over 36 Hours	161	cubic-feet
	12	Total Anticipated Use Over 36 Hours	161	cubic-feet
	13	Total Anticipated Use / Design Capture Volume	0.00	cubic-feet
	14	Are Full Capture and Use Techniques Feasible for this Project?	No	unitless
	15	Is Full Retention Feasible for this Project?	No	yes/no
	16	Is Partial Retention Feasible for this Project?	No	yes/no
Result	17	Feasibility Category	5	1, 2, 3, 4, 5

Worksheet B.3-1 General Notes:

A. Applicants may use this optional worksheet to gauge the feasibility of implementing capture and use techniques on their project site. User input should be provided for yellow shaded cells, values for all other cells will be automatically generated. Projects demonstrating feasibility or potential feasibility via this worksheet are encouraged to incorporate capture and use features in their project.

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

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

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

E. Feasibility Category 3: Applicant must implement retention and/or infiltration elements for the entire DCV.

F. Feasibility Category 4: Applicant must implement partial retention BMPs.

G. Feasibility Category 5: Applicant must implement biofiltration BMPs.

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

Automated Worksheet B.1-1: Calculation of Design Capture Volume (V1.1)

Category	#	Description	i	ii	iii	iv	v	vi	vii	viii	ix	x	Units
Standard Drainage Basin Inputs	0	Drainage Basin ID or Name	BF-1	BF-2	BF-3	BF-4	BF-5	BF-6	BF-7				unitless
	1	Basin Drains to the Following BMP Type	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration				unitless
	2	85th Percentile 24-hr Storm Depth	0.60	0.60	0.60	0.60	0.60	0.60	0.60				inches
	3	Impervious Surfaces <u>Not Directed to Dispersion Area</u> (C=0.90)	201,983	80,445	124,435	229,767	377,008	152,441	49,262				sq-ft
	4	Semi-Pervious Surfaces <u>Not Serving as Dispersion Area</u> (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces <u>Not Serving as Dispersion Area</u> (C=0.10)	1,861,023	771,659	363,453	1,077,066	2,019,810	895,142	104,213				sq-ft
	6	Natural Type A Soil <u>Not Serving as Dispersion Area</u> (C=0.10)											sq-ft
	7	Natural Type B Soil <u>Not Serving as Dispersion Area</u> (C=0.14)											sq-ft
	8	Natural Type C Soil <u>Not Serving as Dispersion Area</u> (C=0.23)											sq-ft
	9	Natural Type D Soil <u>Not Serving as Dispersion Area</u> (C=0.30)											sq-ft
Dispersion, Tree Well, & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	No	No	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Final Adjusted Runoff Factor Calculations	22	Total Area Tributary to BMP	2,063,006	852,104	487,888	1,306,833	2,396,818	1,047,583	153,475	0	0	0	sq-ft
	23	Composite Runoff Factor for Standard Drainage Areas	0.18	0.18	0.30	0.24	0.23	0.22	0.36	0.00	0.00	0.00	unitless
	24	Initial Composite Runoff Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	25	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	26	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	27	Dispersed Impervious Area / Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	28	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	29	Final Adjusted Tributary Runoff Factor	0.18	0.18	0.30	0.24	0.23	0.22	0.36	n/a	n/a	n/a	unitless
Volume Reduction Calculations	30	Final Effective Tributary Area	371,341	153,379	146,366	313,640	551,268	230,468	55,251	0	0	0	sq-ft
	31	Initial Design Capture Volume	18,567	7,669	7,318	15,682	27,563	11,523	2,763	0	0	0	cubic-feet
	32	Volume Reduction per Tree Well	0	0	0	0	0	0	0	0	0	0	cubic-feet
	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Result	35	Design Capture Volume Tributary to BMP	18,567	7,669	7,318	15,682	27,563	11,523	2,763	0	0	0	cubic-feet

<u>Worksheet B.1-1 General Notes:</u>

A. Applicants may use this worksheet to calculate design capture volumes for up to 10 drainage areas User input must be provided for yellow shaded cells, values for all other cells will be automatically generated, errors/notifications will be highlighted in red and summarized below. Upon completion of this worksheet, proceed to the appropriate BMP Sizing worksheet(s).

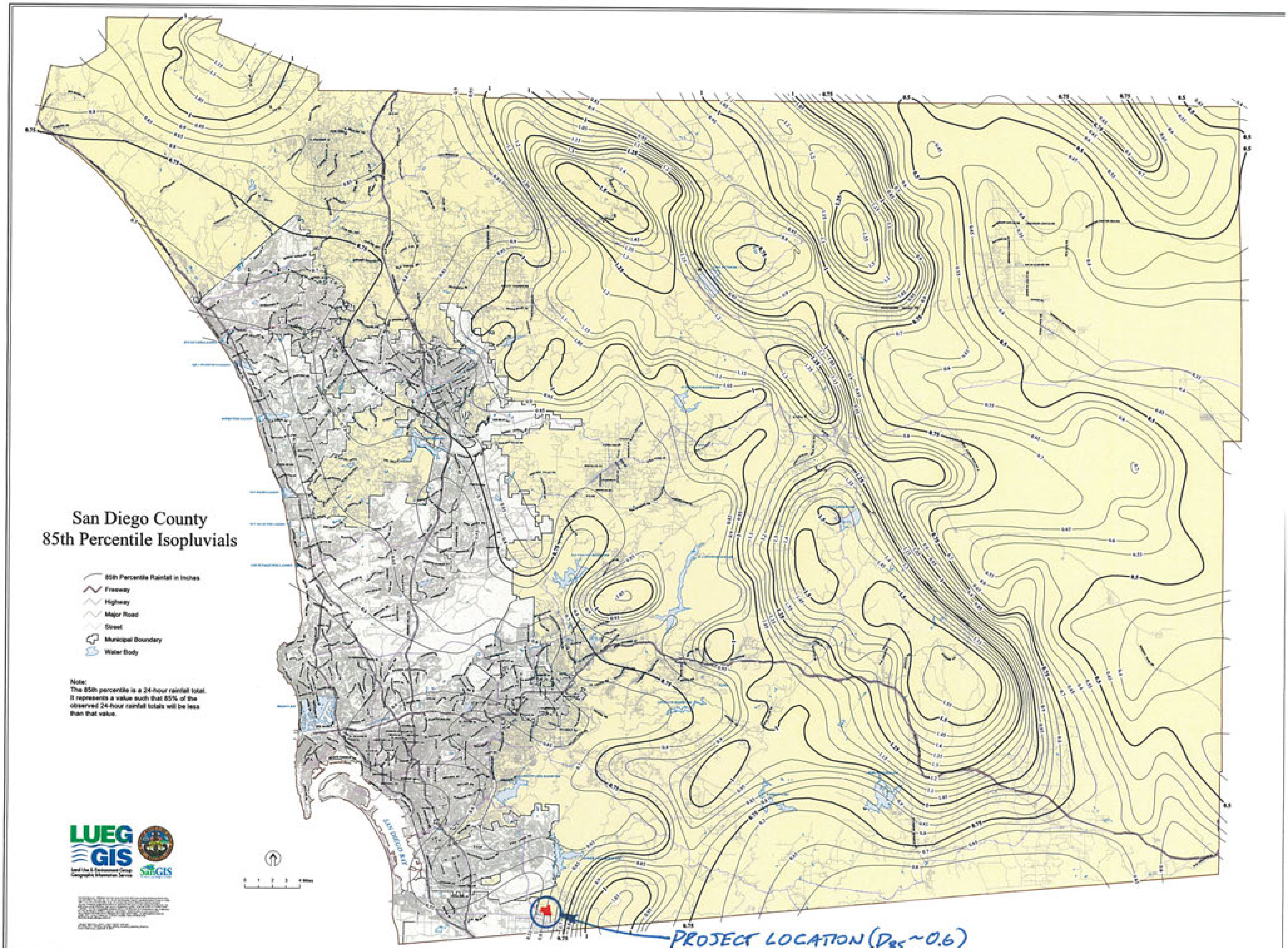
B. Impervious surfaces include roofs, concrete, asphalt, or pervious pavements with an impervious liner. Semi-pervious surfaces include decomposed granite, cobbles, crushed aggregate, or compacted soils such as unpaved parking. Engineered pervious surfaces include pervious pavements providing full retention of the 85th percentile rainfall depth, or areas with soils that have been amended and mulched per Section 86.709 of the Landscape Ordinance. Dispersion areas are pervious or semi-pervious surfaces that receive runoff from impervious surfaces (C=0.90) and reduce stormwater runoff as outlined in Fact Sheet SD-B.

Automated Worksheet B.5-1: Sizing Biofiltration BMPs (V1.1)

Category	#	Description	i	ii	iii	iv	v	vi	vii	viii	ix	x	Units
BMP Inputs	0	Drainage Basin ID or Name	BF-1	BF-2	BF-3	BF-4	BF-5	BF-6	BF-7	-	-	-	unitless
	1	Effective Tributary Area	371,341	153,379	146,366	313,640	551,268	230,468	55,251	-	-	-	sq-ft
	2	Minimum Biofiltration Footprint Sizing Factor	0.030	0.030	0.030	0.030	0.030	0.030	0.030	-	-	-	ratio
	3	Design Capture Volume Tributary to BMP	18,567	7,669	7,318	15,682	27,563	11,523	2,763	-	-	-	cubic-feet
	4	Provided Biofiltration Surface Area	25,000	10,000	13,000	21,000	32,300	13,150	4,800				sq-ft
	5	Provided Surface Ponding Depth	14.4	15	12	15	18	18.2	12				inches
	6	Provided Soil Media Thickness	18	18	18	18	18	18	18				inches
	7	Provided Gravel Storage Thickness	12	12	12	12	12	12	12				inches
	8	Hydromodification Orifice Diameter of Underdrain	6.00	3.80	2.90	4.80	6.00	4.30	1.60				inches
Biofiltration Calculations	9	Max Hydromod Flow Rate through Underdrain	1.756	0.719	0.406	1.140	1.831	0.951	0.125	n/a	n/a	n/a	CFS
	10	Max Soil Filtration Rate Allowed by Underdrain Orifice	3.03	3.10	1.35	2.35	2.45	3.12	1.12	n/a	n/a	n/a	in/hr
	11	Soil Media Filtration Rate	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	12	Soil Media Filtration Rate to be used for Sizing	3.03	3.10	1.35	2.35	2.45	3.12	1.12	5.00	5.00	5.00	in/hr
	13	Depth Biofiltered Over 6 Hour Storm	18.21	18.63	8.09	14.07	14.69	18.75	6.73	0.00	0.00	0.00	inches
	14	Soil Media Pore Space	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	unitless
	15	Gravel Pore Space	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	16	Effective Depth of Biofiltration Storage	24.6	25.2	22.2	25.2	28.2	28.4	22.2	0	0	0	inches
	17	Drawdown Time for Surface Ponding	5	5	9	6	7	6	11	0	0	0	hours
	18	Drawdown Time for Entire Biofiltration Basin	8	8	16	11	12	9	20	0	0	0	hours
	19	Total Depth Biofiltered	42.81	43.83	30.29	39.27	42.89	47.15	28.93	0.00	0.00	0.00	inches
	20	Option 1 - Biofilter 1.50 DCV: Target Volume	27,851	11,504	10,977	23,523	41,345	17,285	4,145	0	0	0	cubic-feet
	21	Option 1 - Provided Biofiltration Volume	27,851	11,504	10,977	23,523	41,345	17,285	4,145	0	0	0	cubic-feet
	22	Option 2 - Store 0.75 DCV: Target Volume	13,925	5,752	5,489	11,762	20,672	8,642	2,072	0	0	0	cubic-feet
	23	Option 2 - Provided Storage Volume	13,925	5,752	5,489	11,762	20,672	8,642	2,072	0	0	0	cubic-feet
	24	Percentage of Performance Requirement Satisfied	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	ratio
Result	25	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**n/a**	**n/a**	**n/a**	cubic-feet

Worksheet B.5-1 General Notes:

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


San Diego County
85th Percentile Isopluvials
85th Percentile Rainfall in Inches
Freeway
Highway
Major Road
Street
Municipal Boundary
Water Body
Note:
The 85th percentile is a 24-hour rainfall total. It represents a value such that 85% of the observed 24-hour rainfall totals will be less than that value.
SAN DIEGO BAY
LUEG GIS
SanGIS
PROJECT LOCATION (D_{85} ~ 0.6)

Attachment 1b

Form I-8, Categorization of Infiltration Feasibility Condition

Categorization of Infiltration Feasibility Condition			Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

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

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

Provide basis:

Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided.

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

Criteria	Screening Question	Yes	No
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.2.		✓

Provide basis:

Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided.

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

Form I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		✓
Provide basis: Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		✓
Provide basis: Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result *	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		

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

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria **Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		✓
Provide basis: Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.2.		✓
Provide basis: Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

Form I-8 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		✓

Provide basis:

Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

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

Provide basis:

Per the project Geotechnical Investigation, see Attachment 7, the site soils are unsuitable for infiltration of stormwater runoff. Additionally, soil conditions like those found at the site are prone to developing a perched groundwater condition, as such, infiltration should be avoided.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

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

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

Attachment 1c

DMA Exhibit

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

The DMA Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐ Critical coarse sediment yield areas to be protected
☒ Existing topography and impervious areas
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed demolition
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☒ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Step 3.5)
☒ Structural BMPs (identify location, structural BMP ID#, type of BMP, and size/detail)

DRAINAGE MANAGEMENT AREAS EXHIBIT
1 OF 2

LEGEND

- PROPOSED LOT NUMBER — (1) THRU (30)
- SUBDIVISION BOUNDARY
- PROPOSED LOT LINE
- PROPOSED RIGHT-OF-WAY
- EXISTING CONTOUR — 630
- PROPOSED CONTOUR — 630
- PROPOSED STORM DRAIN — SD
- PROPOSED STORM DRAIN INLET/ CATCH BASIN
- PROPOSED STORM DRAIN CLEANOUT
- PROPOSED STORM DRAIN HEADWALL/ ENERGY DISSIPATOR
- RUNOFF FLOW DIRECTION
- BIOFILTRATION/STORM WATER DETENTION FACILITY (FACILITIES WILL CONTAIN PLANTS TOLERANT OF SATURATED SOIL CONDITIONS) — BF-1
- DRAINAGE MANAGEMENT AREA BOUNDARY AND LABEL — BF-1 47.36 ACRES
- SELF-MITIGATING AREA

DMA ID	AREA (SF)	TYPE
BF-1	2,063,006	201,983 SF ROADWAY 22,442 SF ROADWAY PERVIOUS AREA 25,000 SF BIOFILTRATION 1,813,581 SF ROUGH GRADED PADS
BF-2	852,104	80,445 SF ROADWAY 8,938 SF ROADWAY PERVIOUS AREA 10,000 SF BIOFILTRATION 752,721 SF ROUGH GRADED PADS
BF-3	487,888	124,435 SF ROADWAY 13,826 SF ROADWAY PERVIOUS AREA 13,000 SF BIOFILTRATION 336,627 SF ROUGH GRADED PADS
BF-4	1,306,833	229,767 SF ROADWAY 25,530 SF ROADWAY PERVIOUS AREA 21,000 SF BIOFILTRATION 1,030,536 SF ROUGH GRADED PADS
BF-5	2,396,818	377,008 SF ROADWAY 41,889 SF ROADWAY PERVIOUS AREA 32,300 SF BIOFILTRATION 1,945,621 SF ROUGH GRADED PADS
BF-6	1,046,933	152,441 SF ROADWAY 16,288 SF ROADWAY PERVIOUS AREA 13,150 SF BIOFILTRATION 865,054 SF ROUGH GRADED PADS
BF-7	163,525	49,262 SF ROADWAY 5,473 SF ROADWAY PERVIOUS AREA 4,800 SF BIOFILTRATION 103,990 SF ROUGH GRADED PADS
SELF-MITIGATING	392,033	392,033 SF ROUGH GRADED PADS
TOTAL	10,930,000	1,215,341 SF ROADWAY 134,386 SF ROADWAY PERVIOUS AREA 119,250 SF BIOFILTRATION 7,240,163 SF ROUGH GRADED PADS 2,221,560 SF OPEN SPACE

S-BMPs - DEVELOPMENT OF THE UNITS:

DEVELOPMENT PROPOSED ON THE ROUGH GRADED PADS WILL BE REQUIRED TO PROVIDE STORM WATER MITIGATION AT THAT TIME, CONSISTENT WITH ALL APPROPRIATE POLICIES AND PERMITS APPLICABLE AT THE TIME OF DEVELOPMENT. TREATMENT STRATEGIES WILL BE DETERMINED DURING THE SITE PLAN REVIEW PERFORMED PRIOR TO THE DEVELOPMENT OF EACH LOT, AS MANDATED BY THE SPECIFIC PLAN.

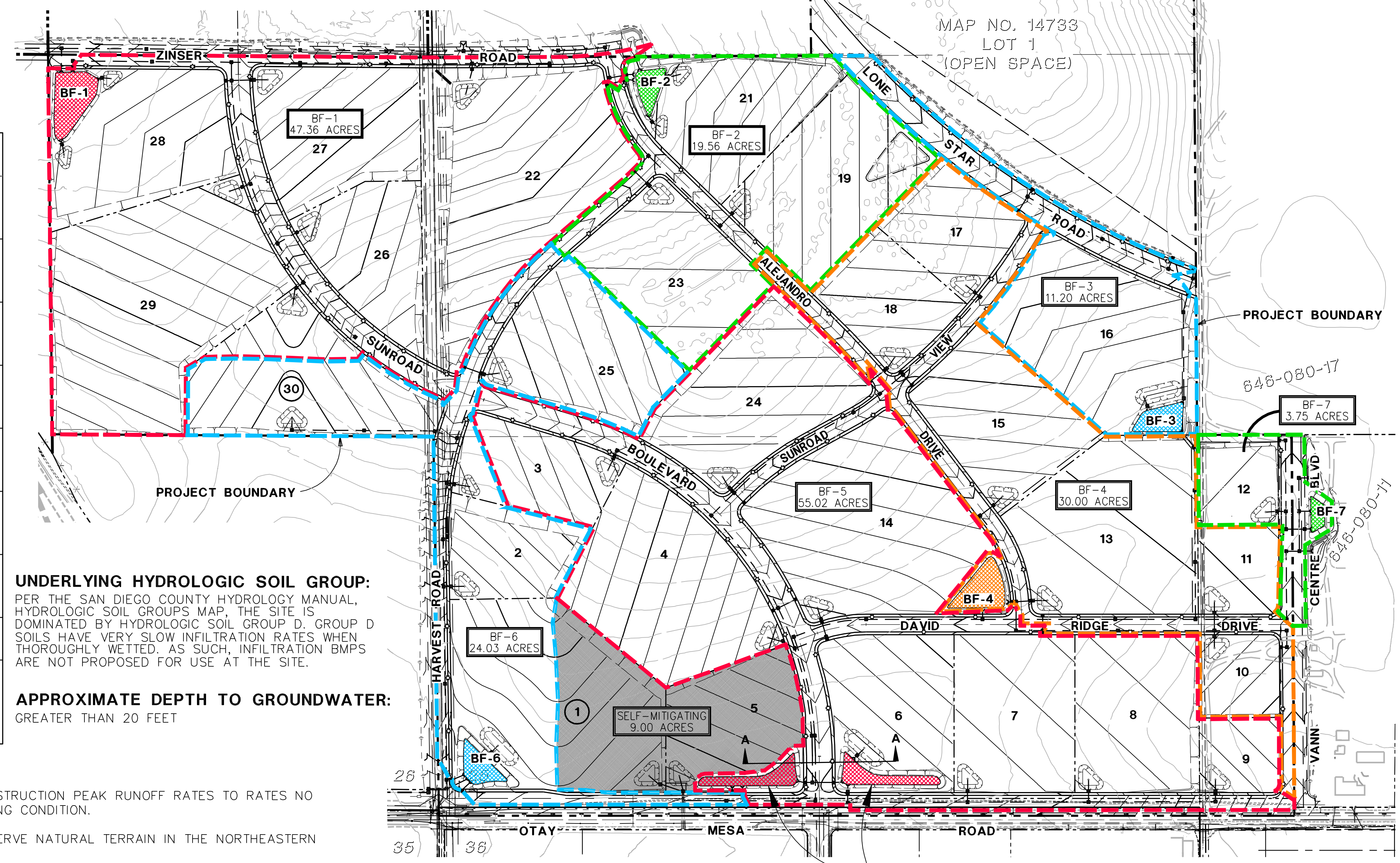
NOTE:

FOR ROUGH GRADED PADS CONSTRUCTED PER THIS PROJECT, CONSTRUCTION GENERAL PERMIT REQUIREMENTS APPLY TO THESE AREAS. INCLUDING BUT NOT LIMITED TO THE INSTALLATION AND ONGOING MAINTENANCE OF CONSTRUCTION BMPS. FUTURE IMPROVEMENTS PER SEPARATE PERMIT AND ASSOCIATED PDP SWQMP.

SELF-MITIGATING DMAS (PER BMP DESIGN MANUAL):

SELF-MITIGATING DMAS CONSIST OF NATURAL OR LANDSCAPED AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM SYSTEM. SELF-MITIGATING DMAS MUST MEET ALL OF THE FOLLOWING TO BE ELIGIBLE FOR EXCLUSION:

- VEGETATION IN THE 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.
- 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.



UNDERLYING HYDROLOGIC SOIL GROUP:

PER THE SAN DIEGO COUNTY HYDROLOGY MANUAL, HYDROLOGIC SOIL GROUPS MAP, THE SITE IS DOMINATED BY HYDROLOGIC SOIL GROUP D. GROUP D SOILS HAVE VERY SLOW INFILTRATION RATES WHEN THOROUGHLY WETTED. AS SUCH, INFILTRATION BMPS ARE NOT PROPOSED FOR USE AT THE SITE.

APPROXIMATE DEPTH TO GROUNDWATER:

GREATER THAN 20 FEET

LID TREATMENT BMPS:

1) BIORETENTION/DETENTION WILL BE UTILIZED TO LIMIT POST-CONSTRUCTION PEAK RUNOFF RATES TO RATES NO GREATER THAN THOSE GENERATED BY THE PROJECT IN THE EXISTING CONDITION.

2) THE PROJECT HAS ESTABLISHED AN OPEN SPACE LOT TO PRESERVE NATURAL TERRAIN IN THE NORTHEASTERN CORNER OF THE SITE.

3) THOUGH THE PROPOSED PROJECT WILL EMPLOY LID SITE DESIGN PRINCIPALS TO THE MAXIMUM EXTENT PRACTICABLE (MEP), LID DESIGN OPTIONS ARE LIMITED AT THIS STAGE IN DEVELOPMENT SINCE THE PROJECT WILL ONLY CONSTRUCT STREETS AND ROUGH GRADED PADS. ULTIMATE LID SITE DESIGN STRATEGIES WILL BE IMPLEMENTED DURING THE DEVELOPMENT OF EACH LOT AND WILL BE DETERMINED DURING THE SITE PLAN REVIEW PERFORMED PRIOR TO THE DEVELOPMENT OF EACH LOT, AS MANDATED BY THE SPECIFIC PLAN.

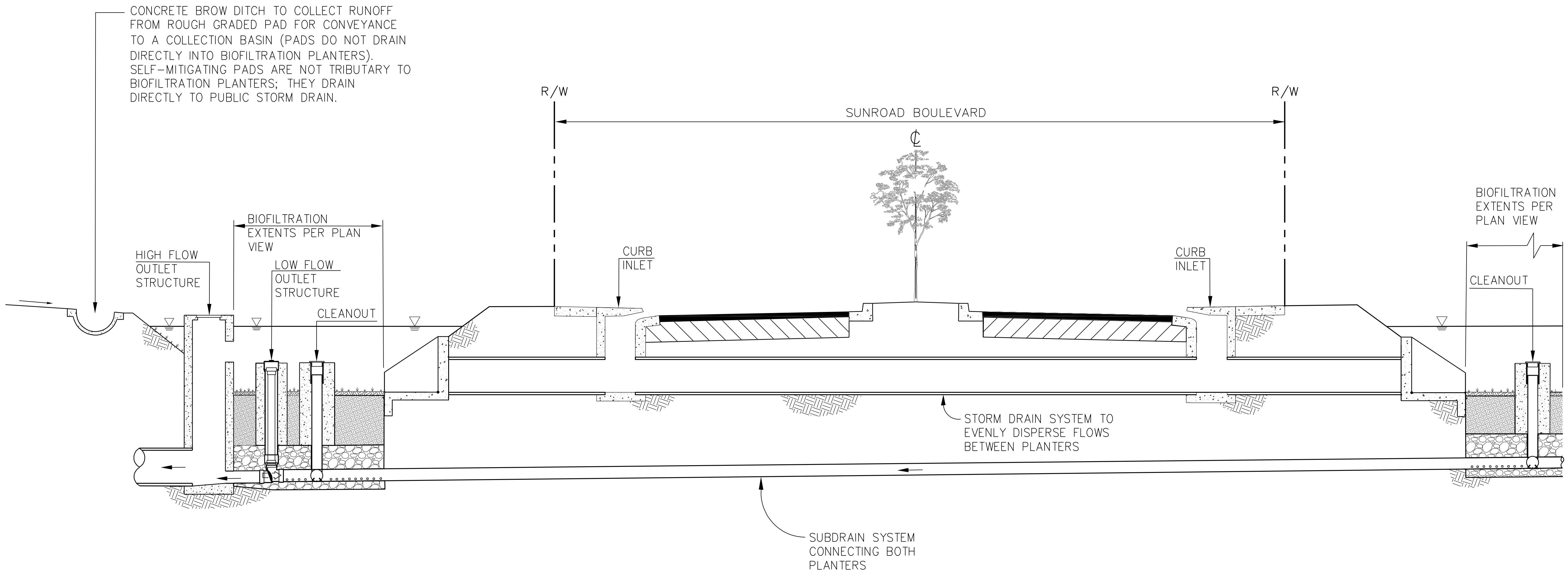
STEVENS-CRESTO ENGINEERING, INC.
CIVIL ENGINEERS - PLANNERS - LAND SURVEYORS
9665 CHESAPEAKE DRIVE, SUITE 320, SAN DIEGO, CA 92123-1352
PHONE: 858.694.5660
FAX: 858.694.5661
www.scengr.com

OTAY 250, TRACT 5607
OTAY MESA, CALIFORNIA

ATTACHMENT 1c
DRAINAGE MANAGEMENT AREAS EXHIBIT

DATE: 12/12/16
SCE NO. 14009.01
SHEET **1c**
1 OF 2 SHEETS

DRAINAGE MANAGEMENT AREAS EXHIBIT
2 OF 2



BIOFILTRATION PLANTER BF-5
SECTION A-A

NO SCALE

NOTE: CONCEPTUAL DESIGN SHOWN, CONSTRUCTION DETAILS TO BE PROVIDED AT FINAL ENGINEERING

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OTAY MESA, CALIFORNIA

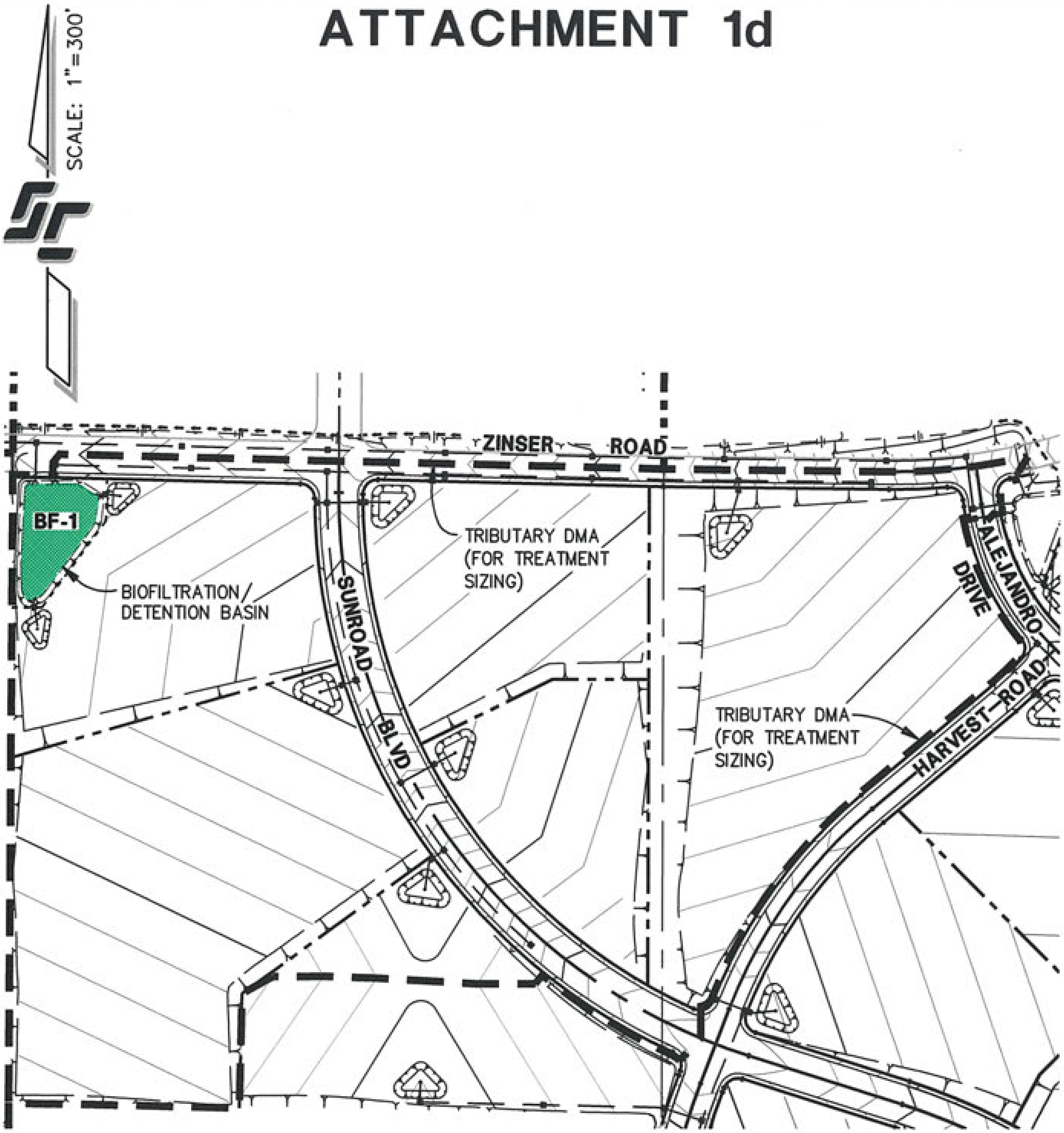
ATTACHMENT 1c
DRAINAGE MANAGEMENT AREAS EXHIBIT

DATE: 12/9/2016
SCE NO. 14009.01
SHEET 1c
2 OF 2 SHEET

Attachment 1d

Individual Structural BMP DMA Mapbook

ATTACHMENT 1d

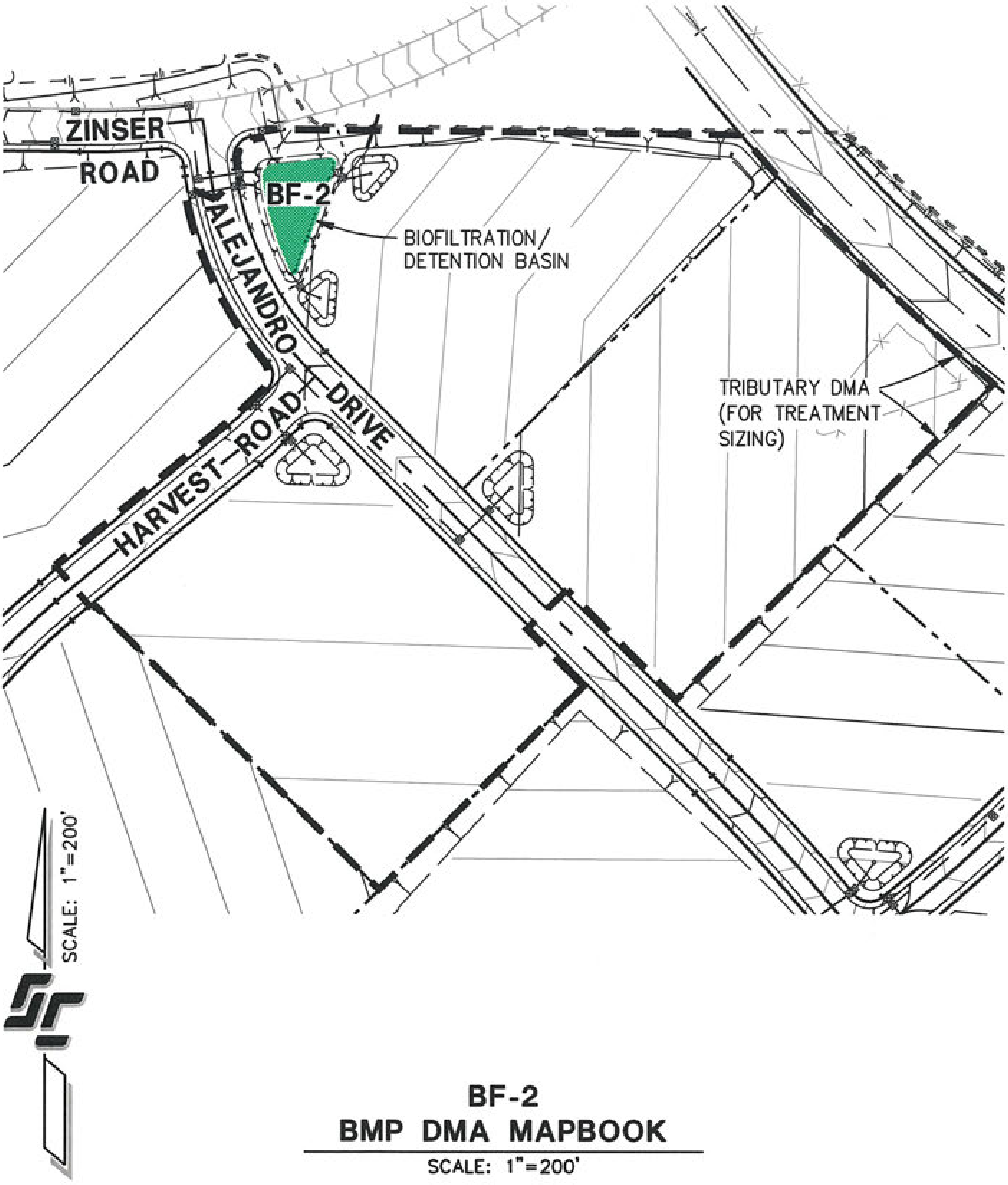


BF-1
BMP DMA MAPBOOK

SCALE: 1"=300'

SHEET 1 OF 7

ATTACHMENT 1d

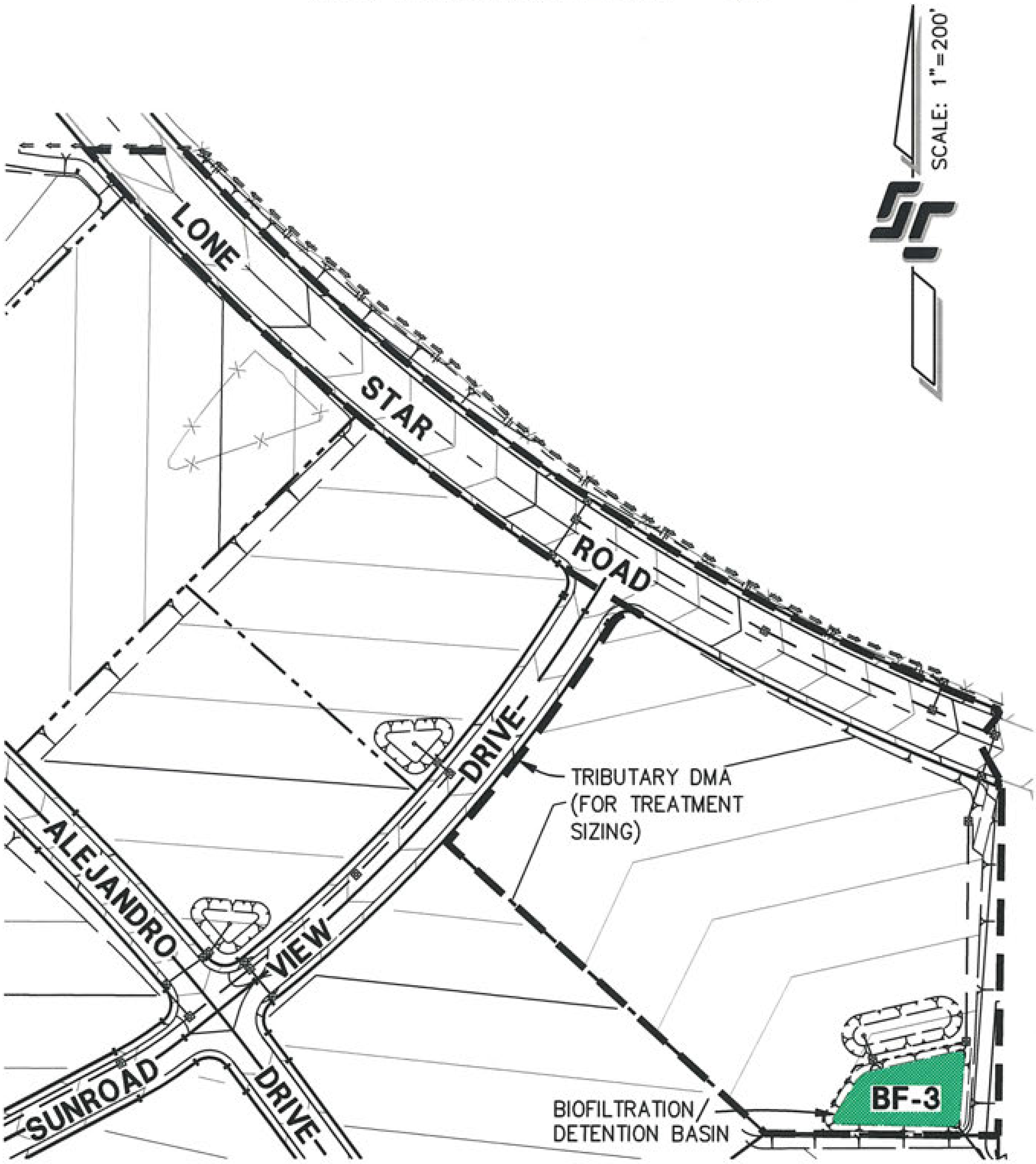


BF-2
BMP DMA MAPBOOK

SCALE: 1"=200'

SHEET 2 OF 7

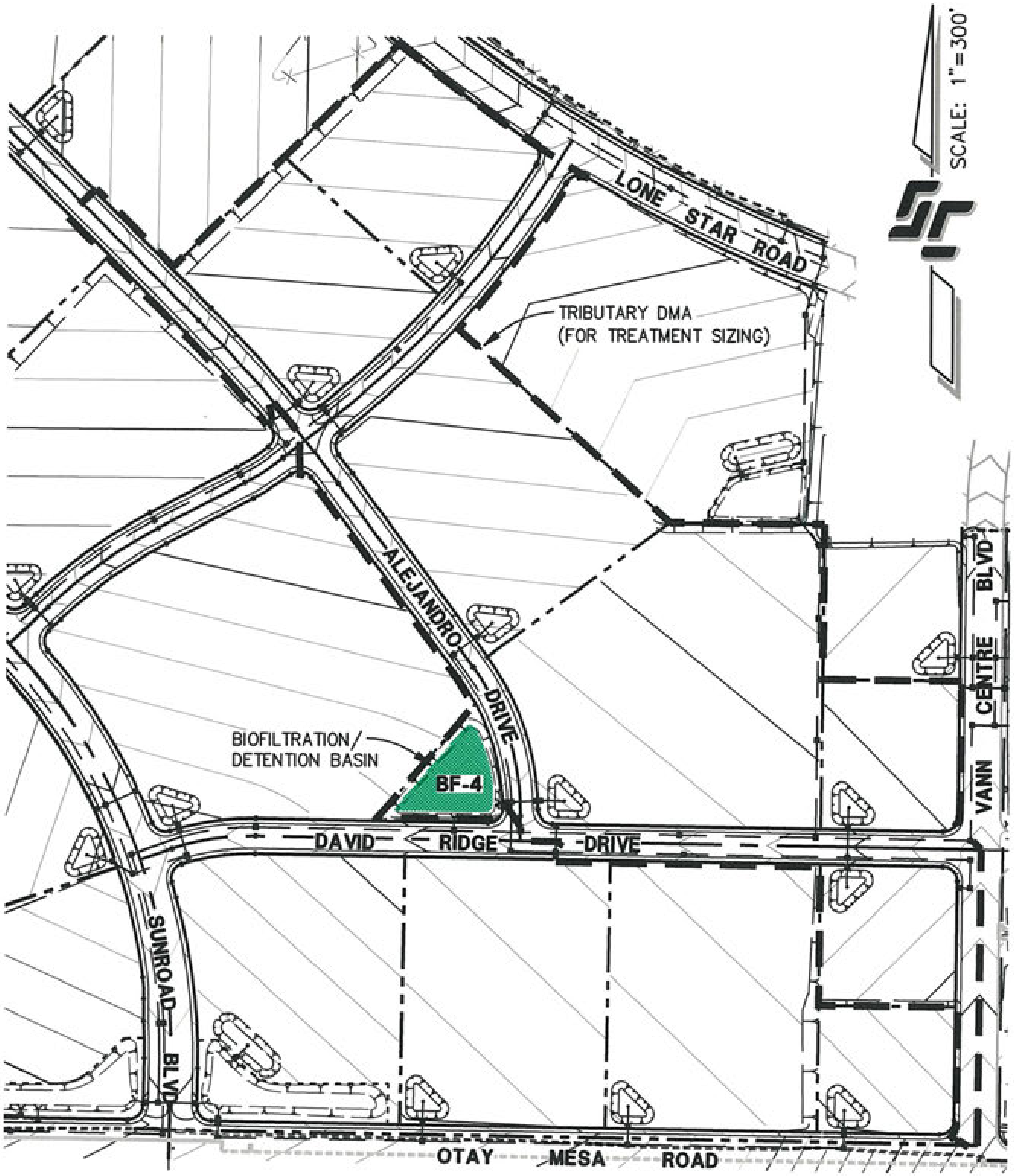
ATTACHMENT 1d



BF-3
BMP DMA MAPBOOK

SCALE: 1"=200'

ATTACHMENT 1d



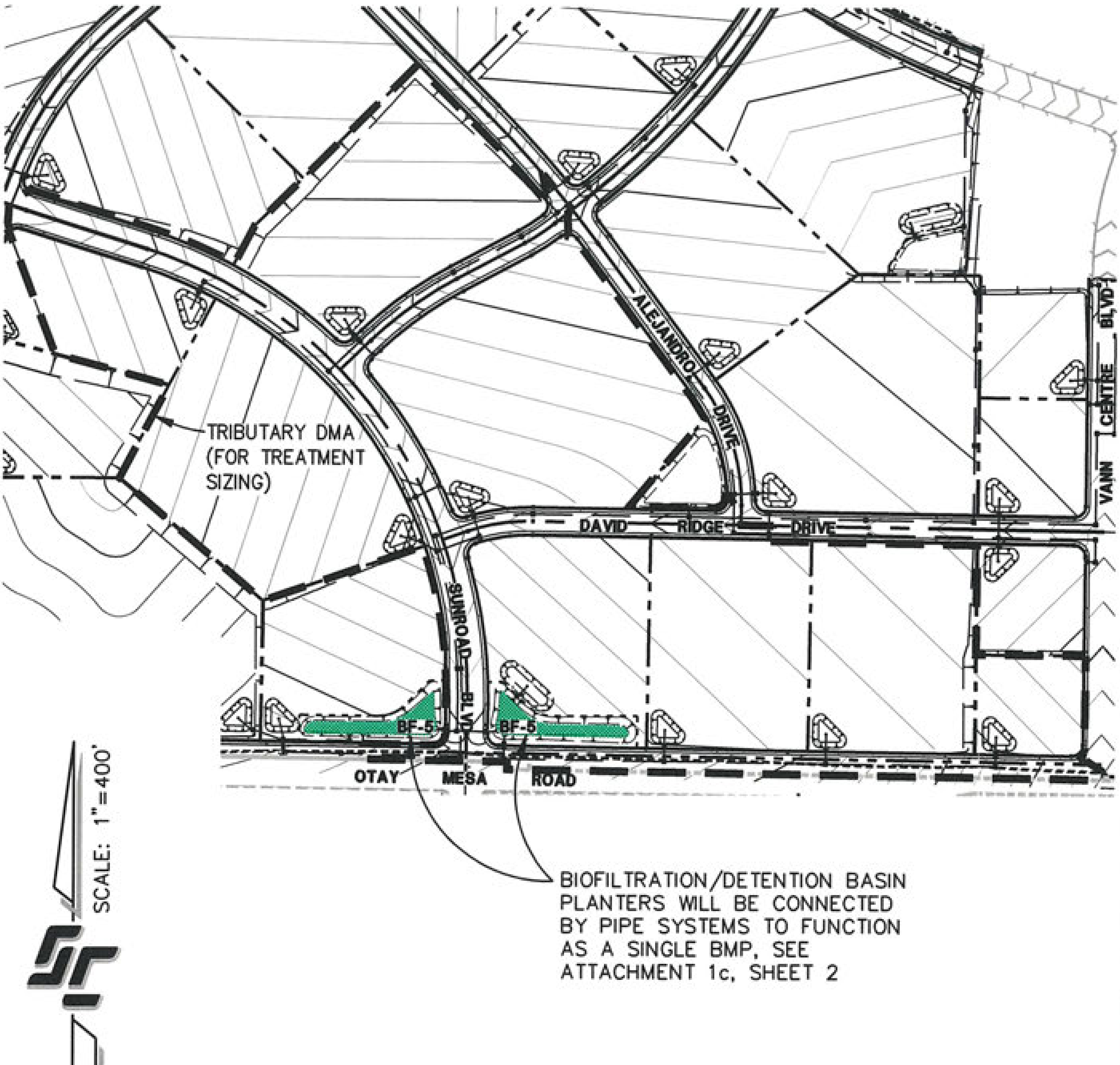
BF-4

BMP DMA MAPBOOK

SCALE: 1"=300'

SHEET 4 OF 7

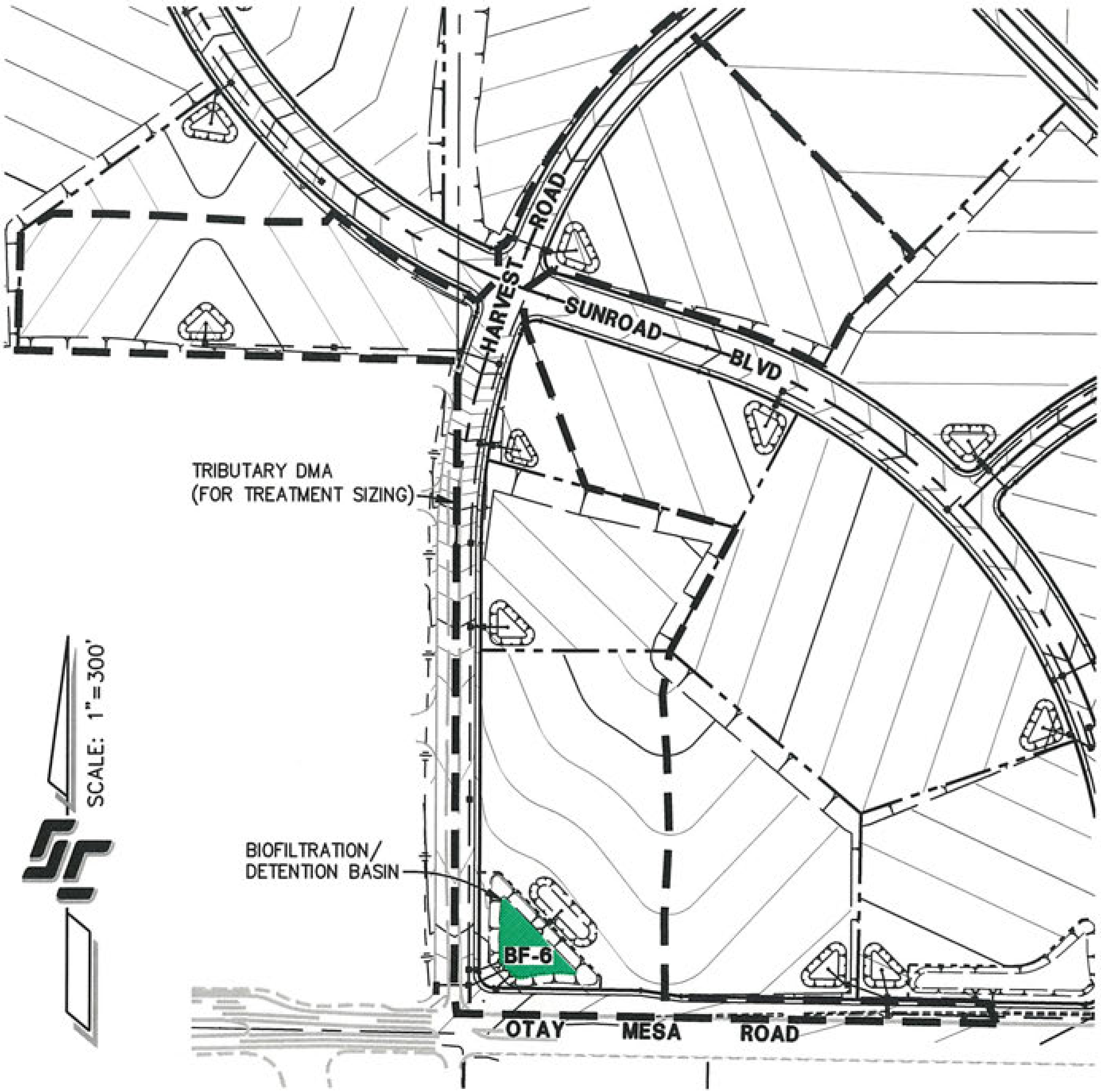
ATTACHMENT 1d



BF-5
BMP DMA MAPBOOK

SCALE: 1"=400'

ATTACHMENT 1d



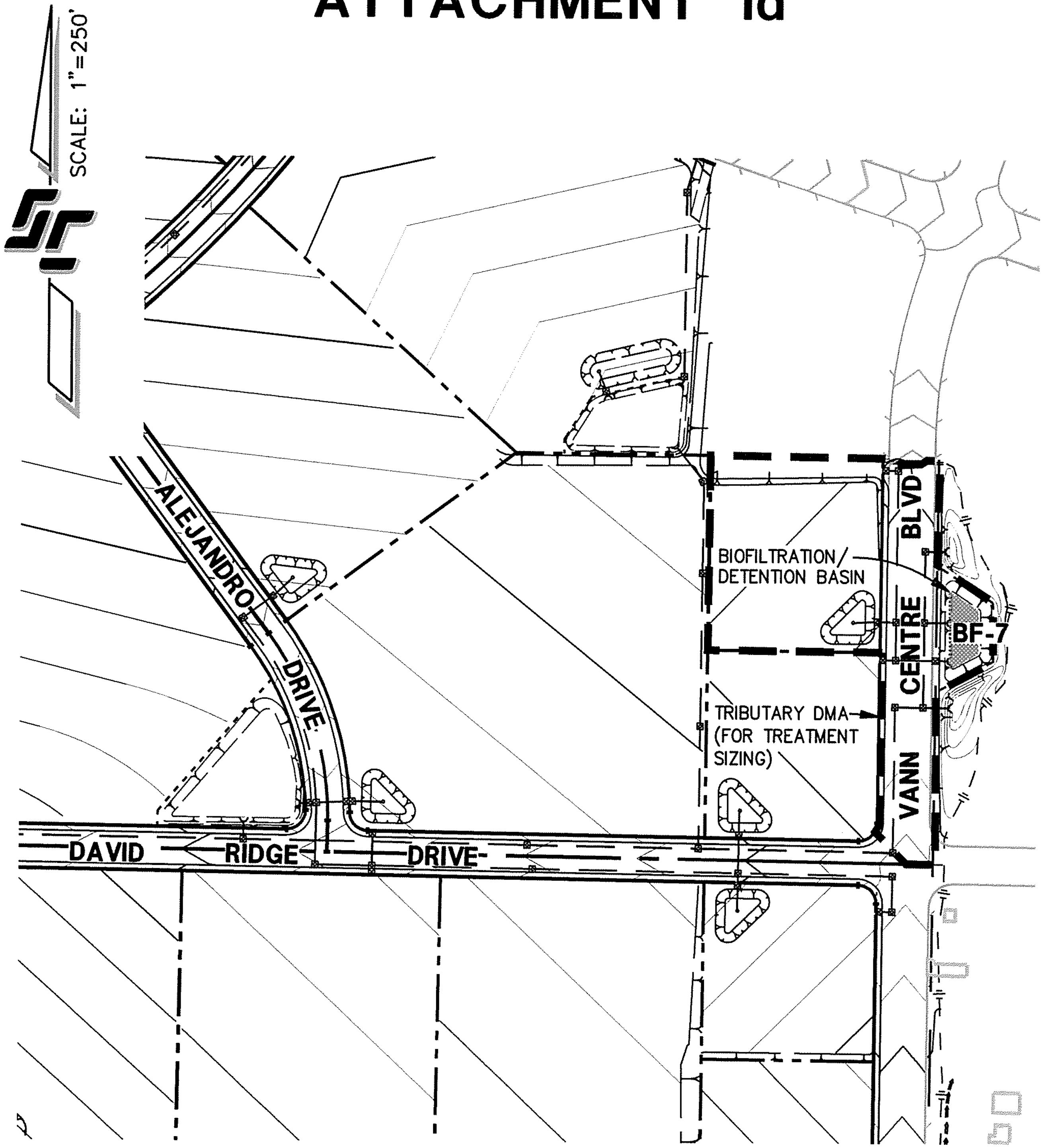
BF-6

BMP DMA MAPBOOK

SCALE: 1"=300'

SHEET 6 OF 7

ATTACHMENT 1d



BF-7

BMP DMA MAPBOOK

SCALE: 1"=250'

3

ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

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

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2b	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2c	Management of Critical Coarse Sediment Yield Areas See Section 6.2 and Appendix H of the BMP Design Manual.	☒ Exhibit depicting onsite and/or upstream sources of critical coarse sediment as mapped by Regional or Jurisdictional approaches outlined in Appendix H.1 AND, ☐ Demonstration that the project effectively avoids and bypasses sources of mapped critical coarse sediment per approaches outlined in Appendix H.2 and H.3. OR, ☐ Demonstration that project does not generate a net impact on the receiving water per approaches outlined in Appendix H.4.
Attachment 2d	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☐ Not performed ☒ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ Not required because BMPs will drain in less than 96 hours

Attachment 2a

Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary

Note: The BMP Sizing Spreadsheet calculations are intended to demonstrate feasibility only and are not to be used for final BMP design: Continuous simulation modeling will be provided at Final Engineering.

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	Stevens Cresto Engineering	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name:	BF 1	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
PER TO IMP	201983	D	Flat	ASPHALT	1.0	0.08	0.0667	0.048	16159	13472	9695
PER TO PER	1836023	D	Flat	LANDSCAPE	0.1	0.08	0.0667	0.048	14688	12246	8813
BF 1	25000	D	Flat	BIOFILTER	0.1	0.08	0.0667	0.048	200	167	120
											Total
Total BMP Area	2063006							Minimum BMP Size	31046.824	25885	18628 44513
								Proposed BMP Size*	25000	30000	15000 45000
								Soil Matrix Depth		18.00	in
								Minimum Ponding Depth		12.42	in
								Maximum Ponding Depth		192.08	in
								Selected Ponding Depth		14.40	in

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

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NOTE: BMP IS ADEQUATELY SIZED TO PROVIDE HYDROMODIFICATION MITIGATION VOLUMES REQUIRED AND PROVIDED AREA IS ADEQUATE FOR POLLUTANT CONTROL (SEE ATTACHMENT 1a). CONTINUOUS SIMULATION MODELING WILL BE UTILIZED AT FINAL ENGINEERING TO REFINE BMP DESIGN AND MINIMIZE PONDING DEPTH.

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	tevens Cresto Engineerir	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name	BF 1	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
PER TO IMP	Lindbergh	D	Scrub	Flat	0.05	4.637	0.116	**2.83**
PER TO PER	Lindbergh	D	Scrub	Flat	0.05	42.149	1.054	**25.73**
BF 1	Lindbergh	D	Scrub	Flat	0.05	0.574	0.014	**0.35**

1.184	**28.91**	**6.07**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

1.158	**28.27**	6.00
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	7.2

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	Stevens Cresto Engineering	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name:	BF 2	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
PER TO IMP	80445	D	Flat	ASPHALT	1.0	0.08	0.0667	0.048	6436	5366	3861
PER TO PER	761659	D	Flat	LANDSCAPE	0.1	0.08	0.0667	0.048	6093	5080	3656
BF 2	10000	D	Flat	BIOFILTER	0.1	0.08	0.0667	0.048	80	67	48
Total BMP Area	852104										
								Minimum BMP Size	12608.872	10513	7565
								Proposed BMP Size*	10000	12500	6000
								Soil Matrix Depth		18.00	in
								Minimum Ponding Depth		12.62	in
								Maximum Ponding Depth		200.29	in
								Selected Ponding Depth		15.00	in

Total
18078
18500

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BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	tevens Cresto Engineerir	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name	BF 2	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
PER TO IMP	Lindbergh	D	Scrub	Flat	0.05	1.847	0.046	**1.13**
PER TO PER	Lindbergh	D	Scrub	Flat	0.05	17.485	0.437	**10.67**
BF 2	Lindbergh	D	Scrub	Flat	0.05	0.230	0.006	**0.14**

0.489	**11.94**	**3.90**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.483	**11.79**	3.88
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	7.2

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	Stevens Cresto Engineering	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name:	BF 3	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
PER TO IMP	124435	D	Flat	ASPHALT	1.0	0.08	0.0667	0.048	9955	8300	5973
PER TO PER	350453	D	Flat	LANDSCAPE	0.1	0.08	0.0667	0.048	2804	2338	1682
BF 3	13000	D	Flat	BIOFILTER	0.1	0.08	0.0667	0.048	104	87	62
Total BMP Area	487888										

Minimum BMP Size	12862.424	10724	7717	Total 18441
Proposed BMP Size*	13000	13000	7800	20800
Soil Matrix Depth		18.00	in	
Minimum Ponding Depth		9.90	in	
Maximum Ponding Depth		84.81	in	
Selected Ponding Depth		12.00	in	

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

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NOTE: BMP IS ADEQUATELY SIZED TO PROVIDE HYDROMODIFICATION MITIGATION VOLUMES REQUIRED AND PROVIDED AREA IS ADEQUATE FOR POLLUTANT CONTROL (SEE ATTACHMENT 1a). CONTINUOUS SIMULATION MODELING WILL BE UTILIZED AT FINAL ENGINEERING TO REFINE BMP DESIGN AND MINIMIZE PONDING DEPTH.

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	tevens Cresto Engineerir	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name	BF 3	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
PER TO IMP	Lindbergh	D	Scrub	Flat	0.05	2.857	0.071	**1.74**
PER TO PER	Lindbergh	D	Scrub	Flat	0.05	8.045	0.201	**4.91**
BF 3	Lindbergh					0.298		

0.273	**6.66**	**2.91**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.266	**6.49**	2.88
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	13.6

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	Stevens Cresto Engineering	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name:	BF 4	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size			
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)	
PER TO IMP	229767	D	Flat	ASPHALT	1.0	0.08	0.0667	0.048	18381	15325	11029	
PER TO PER	1056066	D	Flat	LANDSCAPE	0.1	0.08	0.0667	0.048	8449	7044	5069	
BF 4	21000	D	Flat	BIOFILTER	0.1	0.08	0.0667	0.048	168	140	101	
												Total
Total BMP Area	1306833							Minimum BMP Size	26997.888	22509	16199	3870[illegible]
								Proposed BMP Size*	21000	26250	12600	3885[illegible]
								Soil Matrix Depth		18.00	in	
								Minimum Ponding Depth		12.86	in	
								Maximum Ponding Depth		143.31	in	
								Selected Ponding Depth		15.00	in	

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

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NOTE: BMP IS ADEQUATELY SIZED TO PROVIDE HYDROMODIFICATION MITIGATION VOLUMES REQUIRED AND PROVIDED AREA IS ADEQUATE FOR POLLUTANT CONTROL (SEE ATTACHMENT 1a). CONTINUOUS SIMULATION MODELING WILL BE UTILIZED AT FINAL ENGINEERING TO REFINE BMP DESIGN AND MINIMIZE PONDING DEPTH.

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	tevens Cresto Engineerir	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name	BF 4	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
PER TO IMP	Lindbergh	D	Scrub	Flat	0.05	5.275	0.132	**3.22**
PER TO PER	Lindbergh	D	Scrub	Flat	0.05	24.244	0.606	**14.80**
BF 4	Lindbergh	D	Scrub	Flat	0.05	0.482	0.012	**0.29**

0.750	**18.31**	**4.83**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.726	**17.72**	4.75
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	10.0

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	Stevens Cresto Engineering	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name:	BF 5	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size			
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)	
PER TO IMP	377008	D	Flat	ASPHALT	1.0	0.08	0.0667	0.048	30161	25146	18096	
PER TO PER	1987510	D	Flat	LANDSCAPE	0.1	0.08	0.0667	0.048	15900	13257	9540	
BF 5	32300	D	Flat	BIOFILTER	0.1	0.08	0.0667	0.048	258	215	155	
												Total
Total BMP Area	2396818							Minimum BMP Size	46319.12	38619	27791	66410
								Proposed BMP Size*	32300	48450	19380	67830
								Soil Matrix Depth		18.00	in	
								Minimum Ponding Depth		14.35	in	
								Maximum Ponding Depth		168.10	in	
								Selected Ponding Depth		18.00	in	

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

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BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	tevens Cresto Engineerir	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name	BF 5	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
PER TO IMP	Lindbergh	D	Scrub	Flat	0.05	8.655	0.216	**5.28**
PER TO PER	Lindbergh	D	Scrub	Flat	0.05	45.627	1.141	**27.85**
BF 5	Lindbergh	D	Scrub	Flat	0.05	0.742	0.019	**0.45**

1.376	**33.59**	**6.54**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

1.158	**28.27**	6.00
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	11.6

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	Stevens Cresto Engineering	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name:	BF 6	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
PER TO IMP	152441	D	Flat	ASPHALT	1.0	0.08	0.0667	0.048	12195	10168	7317
PER TO PER	881342	D	Flat	LANDSCAPE	0.1	0.08	0.0667	0.048	7051	5879	4230
BF 6	13150	D	Flat	BIOFILTER	0.1	0.08	0.0667	0.048	105	88	63

Total BMP Area	1046933

				Total
Minimum BMP Size	19351.216	16134	11611	2774
Proposed BMP Size*	13150	19944	7890	2783'
Soil Matrix Depth	18.00	in		
Minimum Ponding Depth	14.72	in		
Maximum Ponding Depth	183.22	in		
Selected Ponding Depth	18.20	in		

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

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BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	tevens Cresto Engineerir	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name	BF 6	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
PER TO IMP	Lindbergh	D	Scrub	Flat	0.05	3.500	0.087	**2.14**
PER TO PER	Lindbergh	D	Scrub	Flat	0.05	20.233	0.506	**12.35**
BF 6	Lindbergh	D	Scrub	Flat	0.05	0.302	0.008	**0.18**

0.601	**14.67**	**4.32**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.581	**14.19**	4.25
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	9.5

BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	Stevens Cresto Engineering	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name:	BF 7	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
PER TO IMP	49262	D	Flat	ASPHALT	1.0	0.08	0.0667	0.048	3941	3286	2365
PER TO PER	109463	D	Flat	LANDSCAPE	0.1	0.08	0.0667	0.048	876	730	525
BF 7	4800	D	Flat	BIOFILTER	0.1	0.08	0.0667	0.048	38	32	23

Total BMP Area	163525

Minimum BMP Size	4855.064	4048	2913
Proposed BMP Size*	4800	4800	2880
Soil Matrix Depth		18.00	in
Minimum Ponding Depth		10.12	in
Maximum Ponding Depth		73.38	in
Selected Ponding Depth		12.00	in

Total
6961
7680

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

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BMP Sizing Spreadsheet V1.04			
Project Name:	Otay 250	Hydrologic Unit:	911 Tijuana Watershed
Project Applicant:	tevens Cresto Engineerir	Rain Gauge:	Lindbergh
Jurisdiction:	County of San Diego	Total Project Area:	253 AC
Parcel (APN):		Low Flow Threshold:	0.5Q2
BMP Name	BF 7	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
PER TO IMP	Lindbergh	D	Scrub	Flat	0.05	1.131	0.028	**0.69**
PER TO PER	Lindbergh	D	Scrub	Flat	0.05	2.513	0.063	**1.53**
BF 7	Lindbergh	D	Scrub	Flat	0.05	0.110	0.003	**0.07**

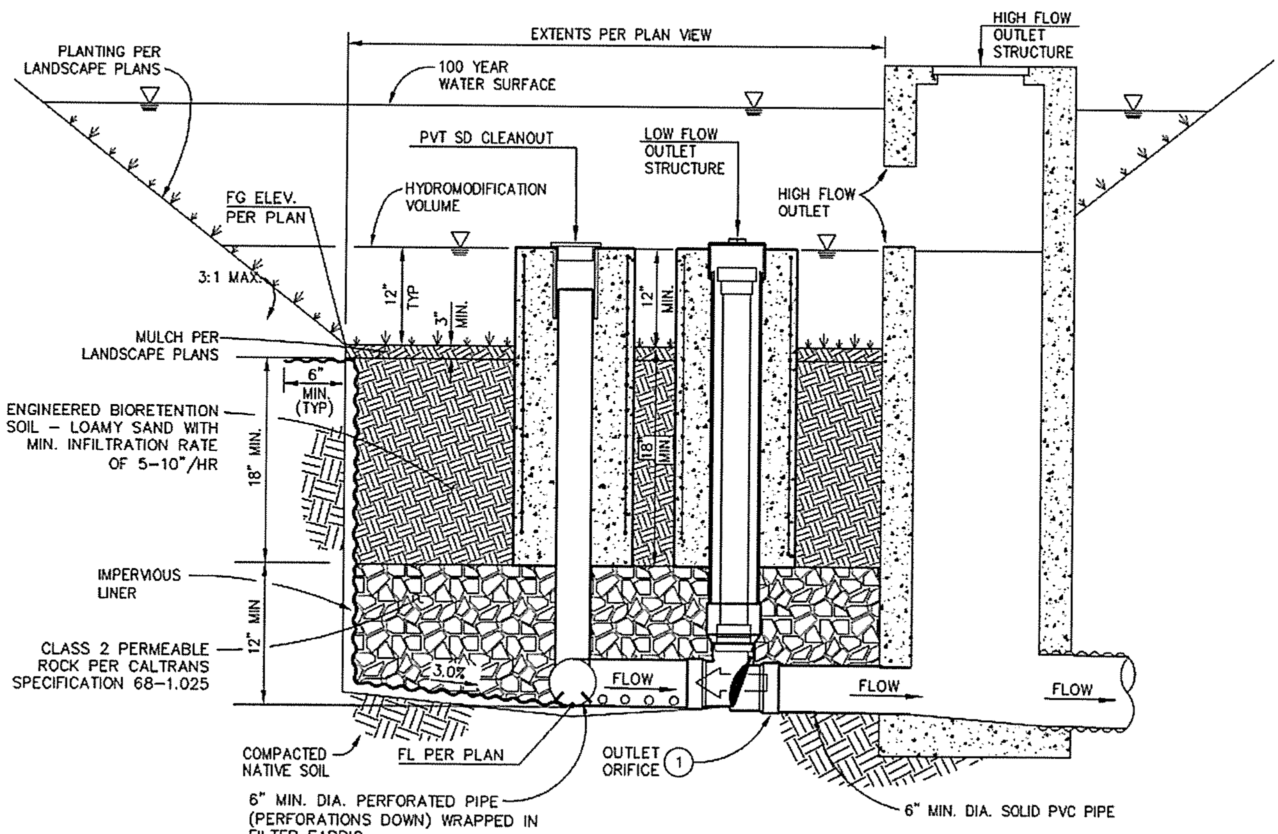
0.094	**2.29**	**1.71**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.085	**2.07**	1.63
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	15.7

Dual Purpose Biofiltration Sizing Confirmation

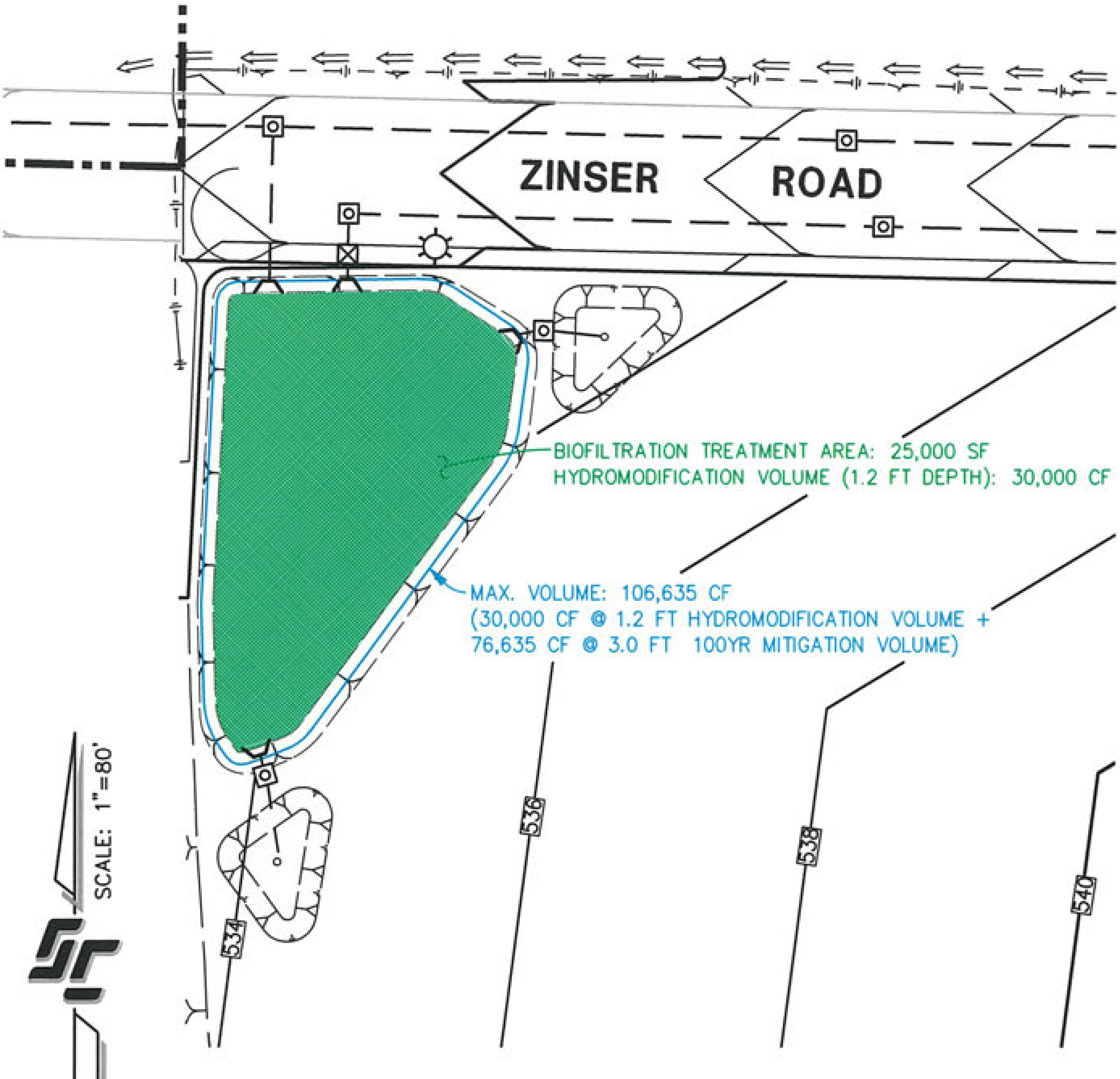
Sunroad Otay 250 proposes to use dual purpose biofiltration/detention basins to provide pollutant control, hydromodification, and 100yr peak mitigation. It is anticipated that the basins will be constructed with a total ponded depth of 3-4 feet. The bottom of the basin will be constructed as a biofiltration planter. The facility will be designed to provide hydromodification storage within the biofiltration media and on the surface. Ponded depth for hydromodification purposes, storms up to a 10 year design storm, will be approximately 12”-18”. A hydromodification control structure (surface maintainable), at the downstream end of the biofiltration underdrain system, will restrict low flows. Flows greater than those generated by a 10 year storm will enter the high flow outlet, a weir set above the hydromodification ponded depth. The high flow outlet will be sized for the peak design storm to ensure that post-project peak discharge rates do not exceed pre-project rates for storms up to a 100 year design storm. See figure below for a typical section of a dual purpose biofiltration facility. The calculations and exhibits within this section demonstrate that the basin sizes shown on the preliminary grading plan conservatively address both hydromodification and peak detention needs. Continuous simulation modeling will be used at final engineering to minimize treatment area and reduce ponded depths.



NOTES

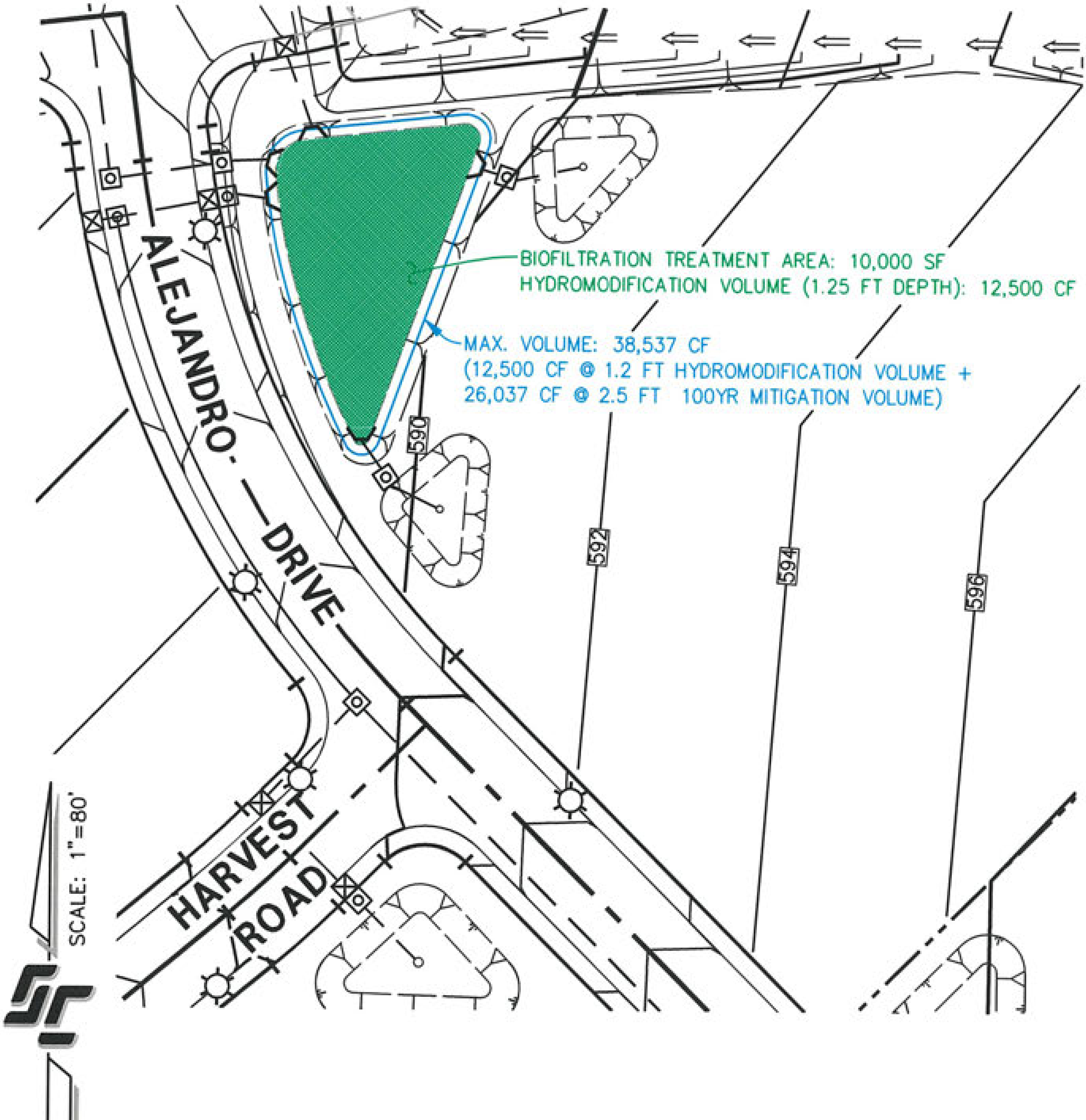
(1) 6" PVC RECTORSEAL CLEAN CHECK EXTENDABLE BACKWATER VALVE, OR EQUIVALENT (HYDROMODIFICATION OUTLET CONTROL STRUCTURE), WITH LOW FLOW ORIFICE.

Typical Section of a Biofiltration/Detention Basin



BF-1
DUAL PURPOSE BIOFILTRATION/DETENTION BASIN

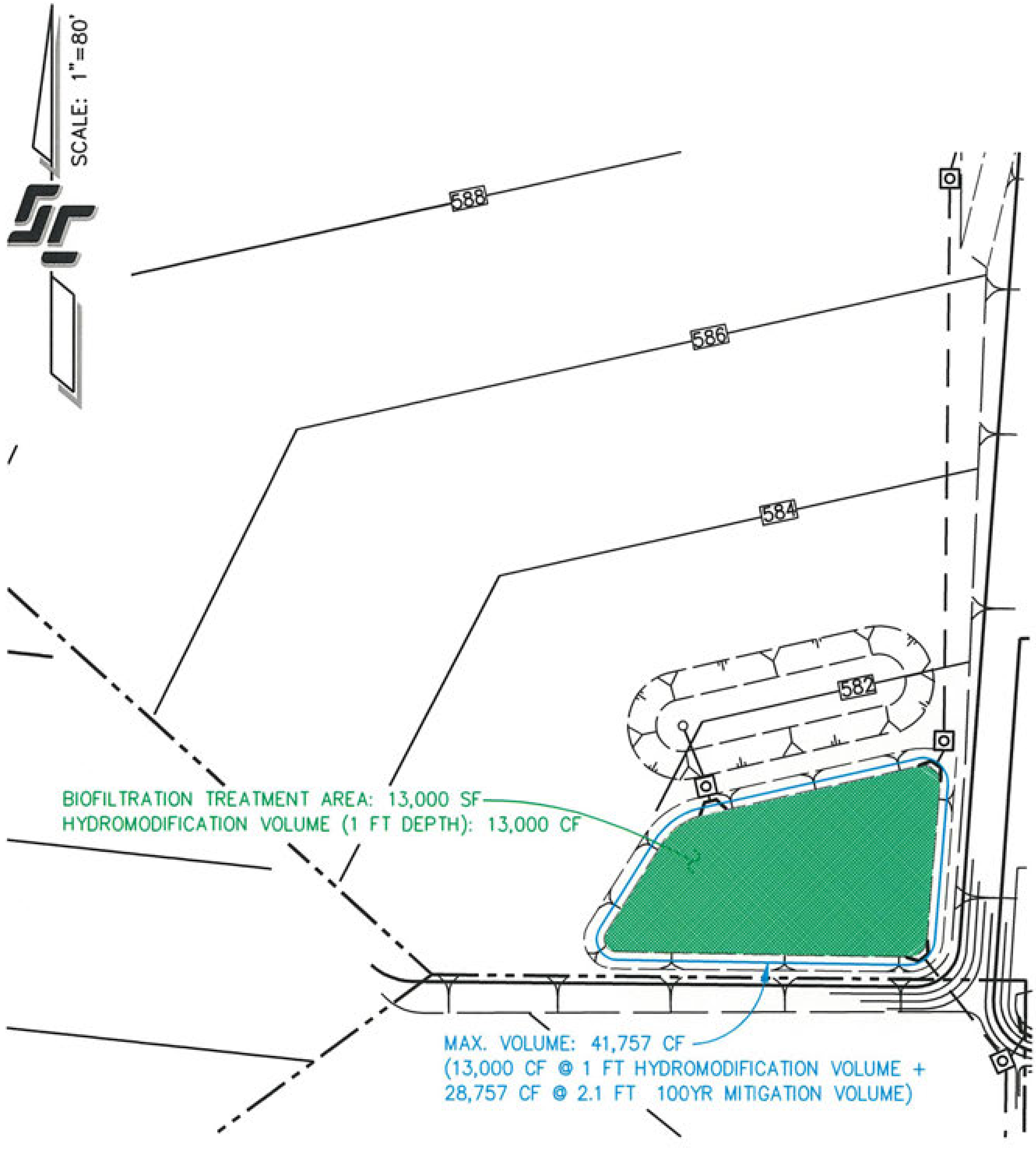
SCALE: 1"=80'



BF-2

DUAL PURPOSE BIOFILTRATION/DETENTION BASIN

SCALE: 1"=80'



BF-3

DUAL PURPOSE BIOFILTRATION/DETENTION BASIN

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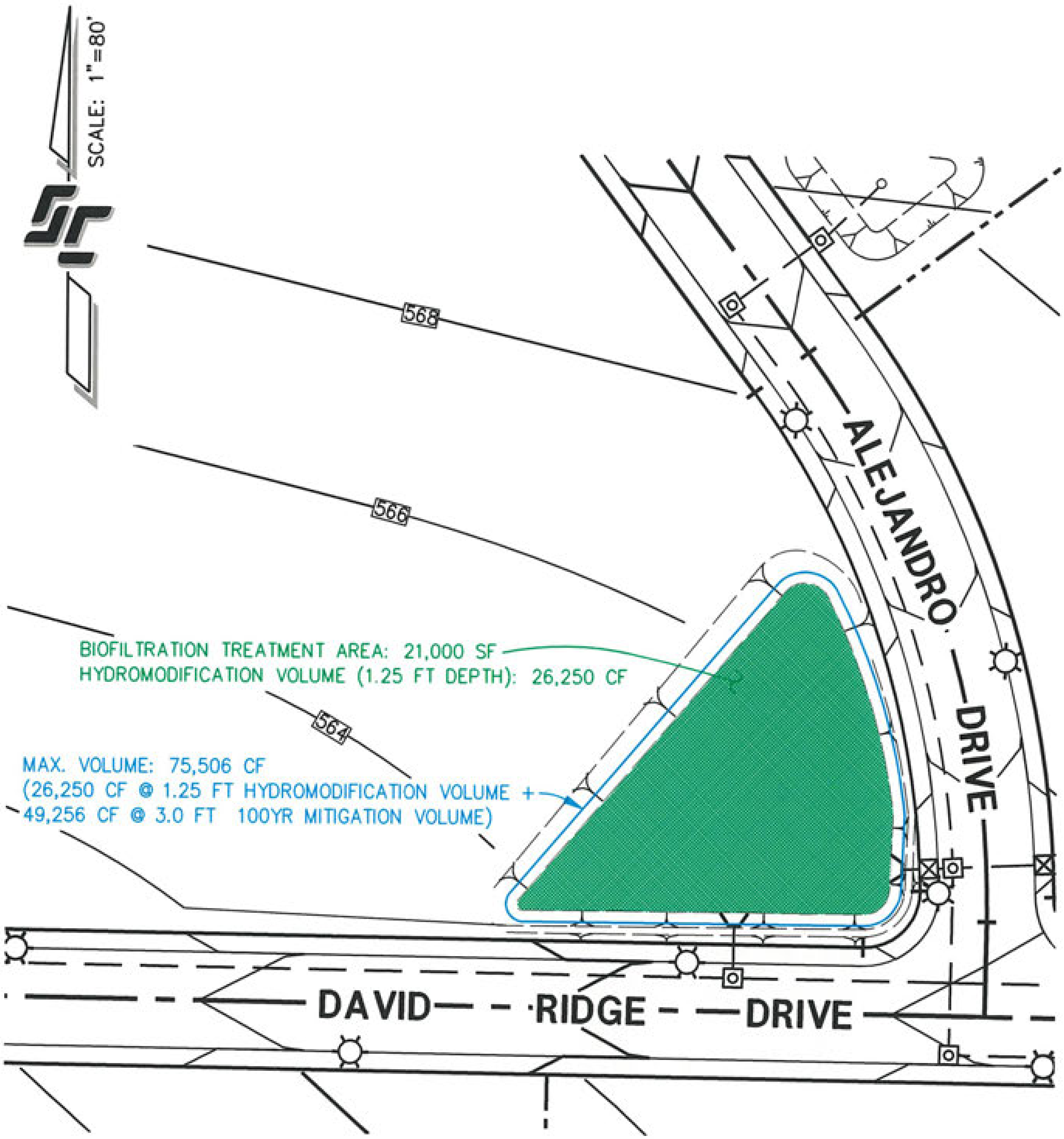

BF-4

DUAL PURPOSE BIOFILTRATION/DETENTION BASIN

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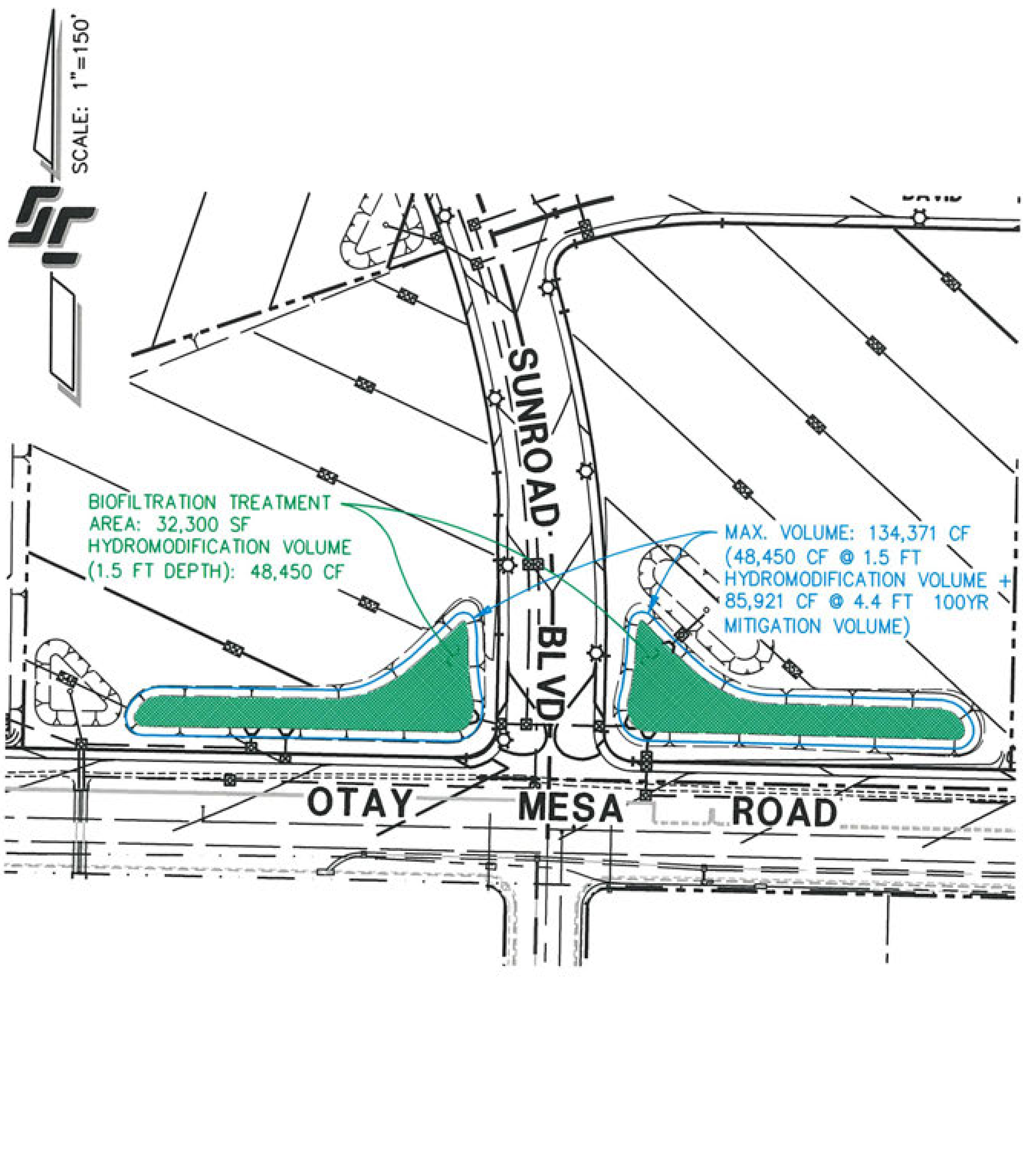

BF-5

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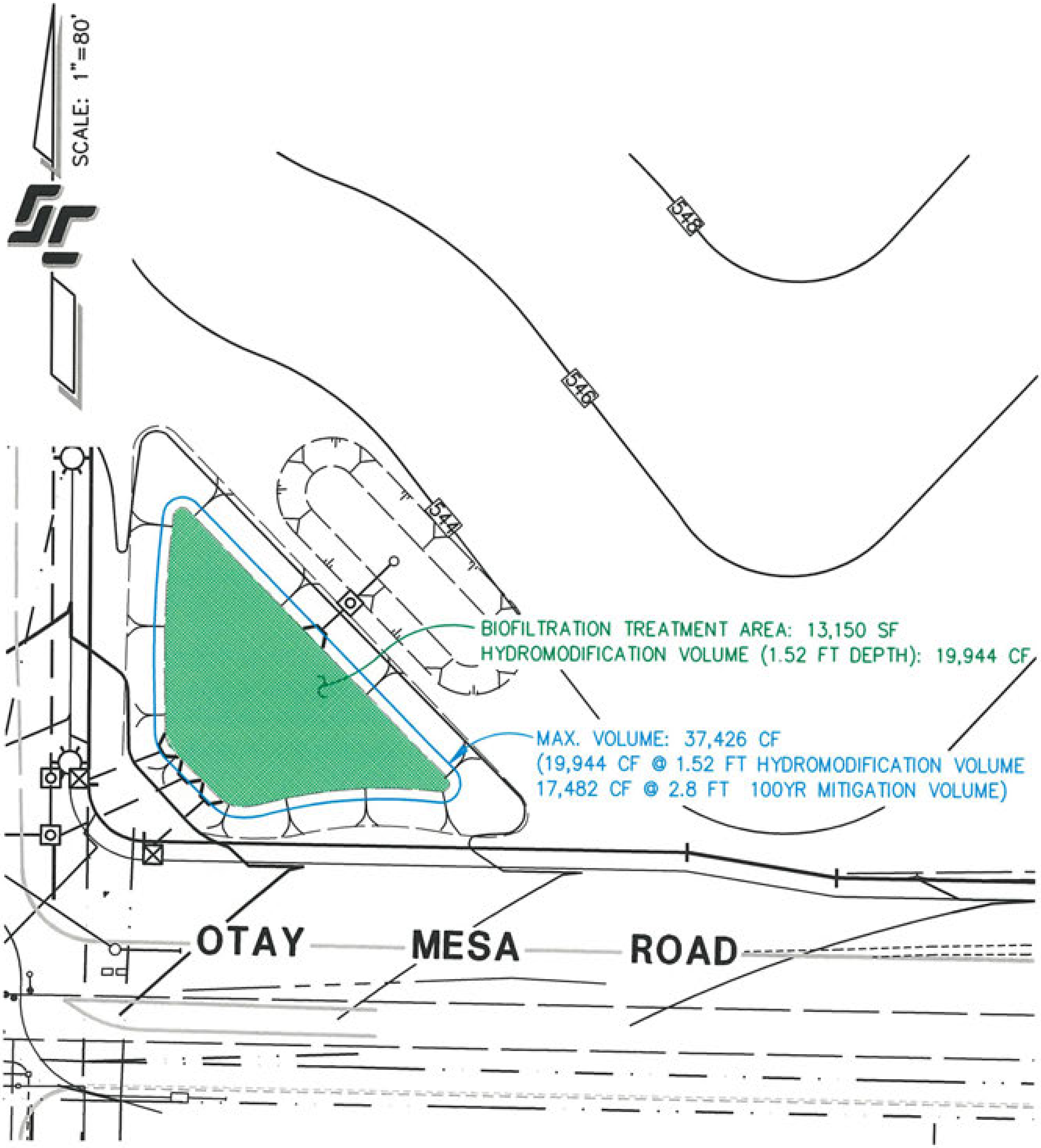
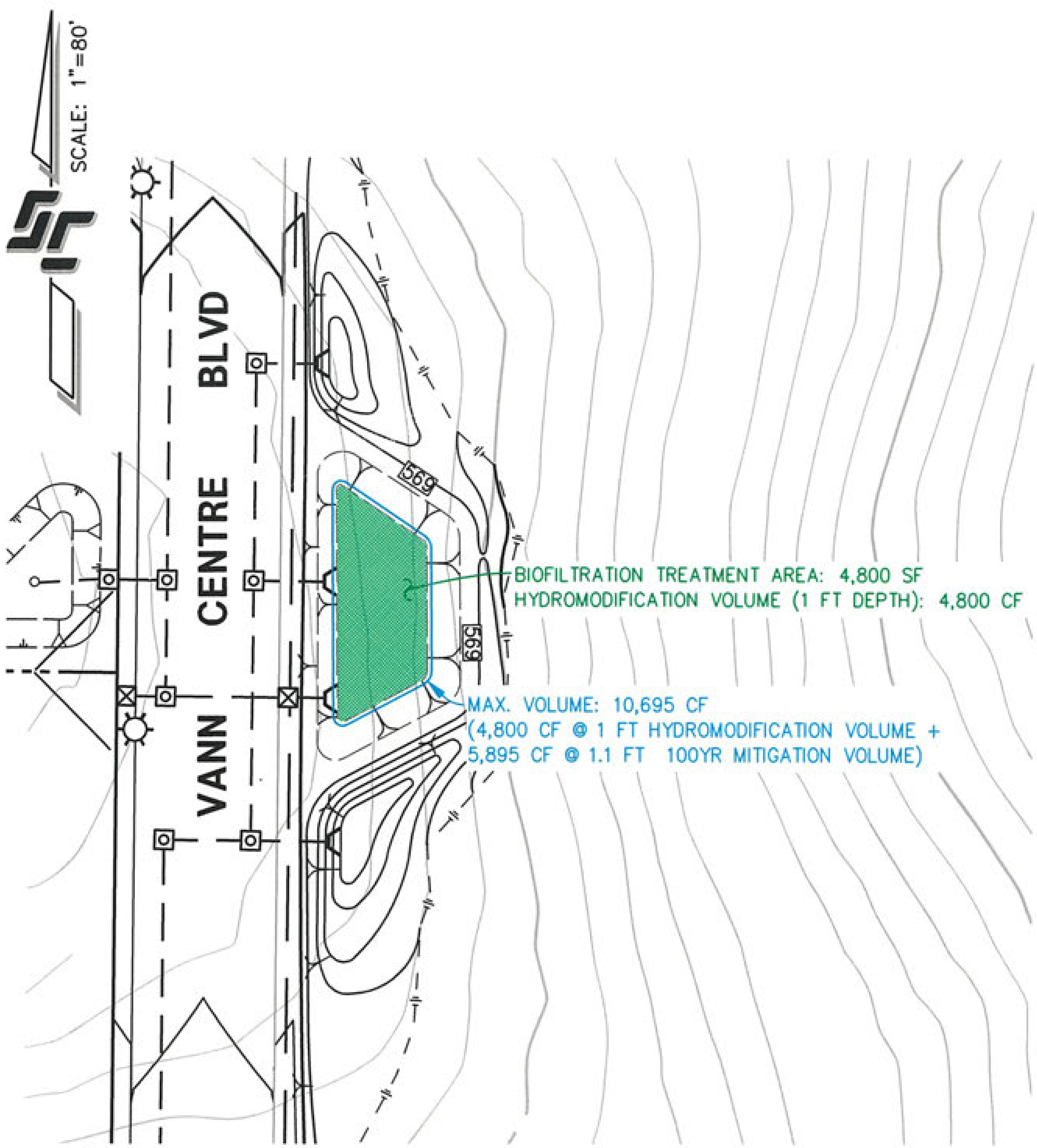


BF-6
DUAL PURPOSE BIOFILTRATION/DETENTION BASIN

SCALE: 1"=80'



BF-7

DUAL PURPOSE BIOFILTRATION/DETENTION BASIN

SCALE: 1"=80'

Attachment 2b

Hydromodification Management Exhibit

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

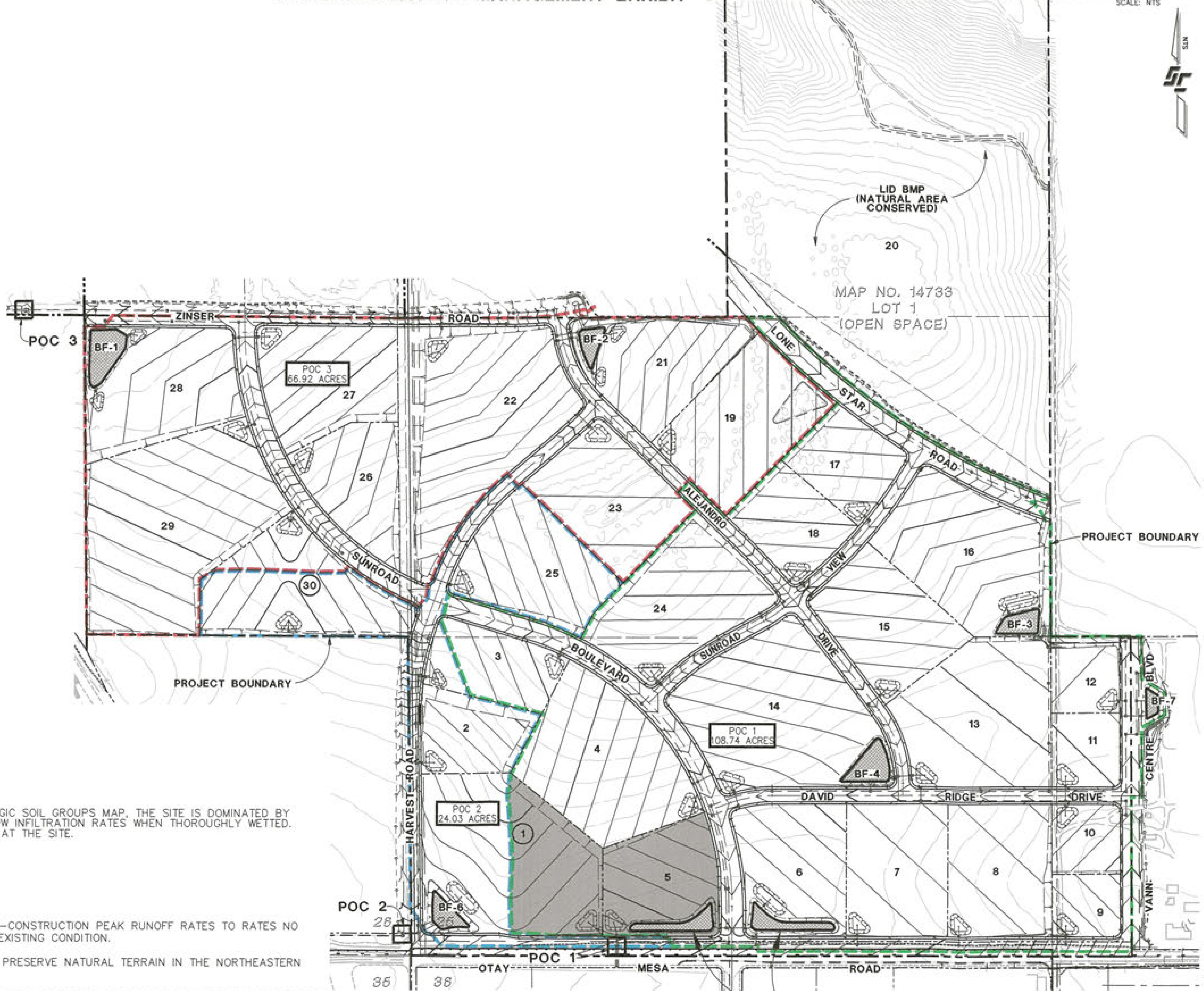
The Hydromodification Management Exhibit must identify:

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

HYDROMODIFICATION MANAGEMENT EXHIBIT

LEGEND

- PROPOSED LOT NUMBER — 1 THRU 30
- SUBDIVISION BOUNDARY
- PROPOSED LOT LINE
- PROPOSED RIGHT–OF–WAY
- EXISTING CONTOUR — 630
- PROPOSED CONTOUR — 630
- PROPOSED STORM DRAIN — SD
- PROPOSED STORM DRAIN INLET/ CATCH BASIN
- PROPOSED STORM DRAIN CLEANOUT
- PROPOSED STORM DRAIN HEADWALL/ ENERGY DISSIPATOR
- RUNOFF FLOW DIRECTION
- BIOFILTRATION/STORM WATER DETENTION FACILITY (FACILITIES WILL CONTAIN PLANTS TOLERANT OF SATURATED SOIL CONDITIONS) — BF-1
- POC BOUNDARY AND LABEL — POC 1 108.74 ACRES
- SELF–MITIGATING AREA



UNDERLYING HYDROLOGIC SOIL GROUP:

PER THE SAN DIEGO COUNTY HYDROLOGY MANUAL, HYDROLOGIC SOIL GROUPS MAP, THE SITE IS DOMINATED BY HYDROLOGIC SOIL GROUP D. GROUP D SOILS HAVE VERY SLOW INFILTRATION RATES WHEN THOROUGHLY WETTED. AS SUCH, INFILTRATION BMPS ARE NOT PROPOSED FOR USE AT THE SITE.

APPROXIMATE DEPTH TO GROUNDWATER:

GREATER THAN 20 FEET

LID TREATMENT BMPS:

1) BIORETENTION/DETENTION WILL BE UTILIZED TO LIMIT POST–CONSTRUCTION PEAK RUNOFF RATES TO RATES NO GREATER THAN THOSE GENERATED BY THE PROJECT IN THE EXISTING CONDITION.

2) THE PROJECT HAS ESTABLISHED AN OPEN SPACE LOT TO PRESERVE NATURAL TERRAIN IN THE NORTHEASTERN CORNER OF THE SITE.

3) THOUGH THE PROPOSED PROJECT WILL EMPLOY LID SITE DESIGN PRINCIPALS TO THE MAXIMUM EXTENT PRACTICABLE (MEP), LID DESIGN OPTIONS ARE LIMITED AT THIS STAGE IN DEVELOPMENT SINCE THE PROJECT WILL ONLY CONSTRUCT STREETS AND ROUGH GRADED PADS. ULTIMATE LID SITE DESIGN STRATEGIES WILL BE IMPLEMENTED DURING THE DEVELOPMENT OF EACH LOT AND WILL BE DETERMINED DURING THE SITE PLAN REVIEW PERFORMED PRIOR TO THE DEVELOPMENT OF EACH LOT, AS MANDATED BY THE SPECIFIC PLAN.

STEVENS–CRESTO ENGINEERING, INC.
CIVIL ENGINEERS – PLANNERS – LAND SURVEYORS
9665 CHESAPEAKE DRIVE SUITE 200 SAN DIEGO, CA 92123-1352
PHONE: 858.694.5660 FAX: 858.694.5661 www.sceinc.com

OTAY 250, TRACT 5607
OTAY MESA, CALIFORNIA

ATTACHMENT 2b
HYDROMODIFICATION MANAGEMENT EXHIBIT

DATE: 12/12/2016
SCE NO. 14009.01
SHEET **2b**
1 OF 1 SHEET

X:\2014\14009\CAD\REPORTS\SWQMP\14009.01 SWQMP 2b_Hydromod DEC 2016.dwg 12/12/2016 10:08:07 AM PDT

Attachment 2c

Management of Critical Coarse Sediment Yield Areas

SCALE: N.T.S.

LEGEND

- PROJECT BOUNDARY
- POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS

STEVENS-CRESTO ENGINEERING, INC.
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REVISIONS

OTAY 250, TRACT 5607
OTAY MESA, CALIFORNIA

ATTACHMENT 2c
POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS MAP

DATE: 04/04/16

SCE NO. 14009.01

SHEET 2c

Attachment 2d

Geomorphic Assessment of Receiving Channels

HYDROMODIFICATION SCREENING

FOR

OTAY 250

(Log No. 98-19-013B)

August 15, 2016

REGISTERED PROFESSIONAL ENGINEER
WAYNE W. CHANG
No. 46548
Exp. 6/30/17
CIVIL
STATE OF CALIFORNIA

Wayne W. Chang, MS, PE 46548

ChangConsultants

Civil Engineering ◦ Hydrology ◦ Hydraulics ◦ Sedimentation

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Rancho Santa Fe, CA 92067
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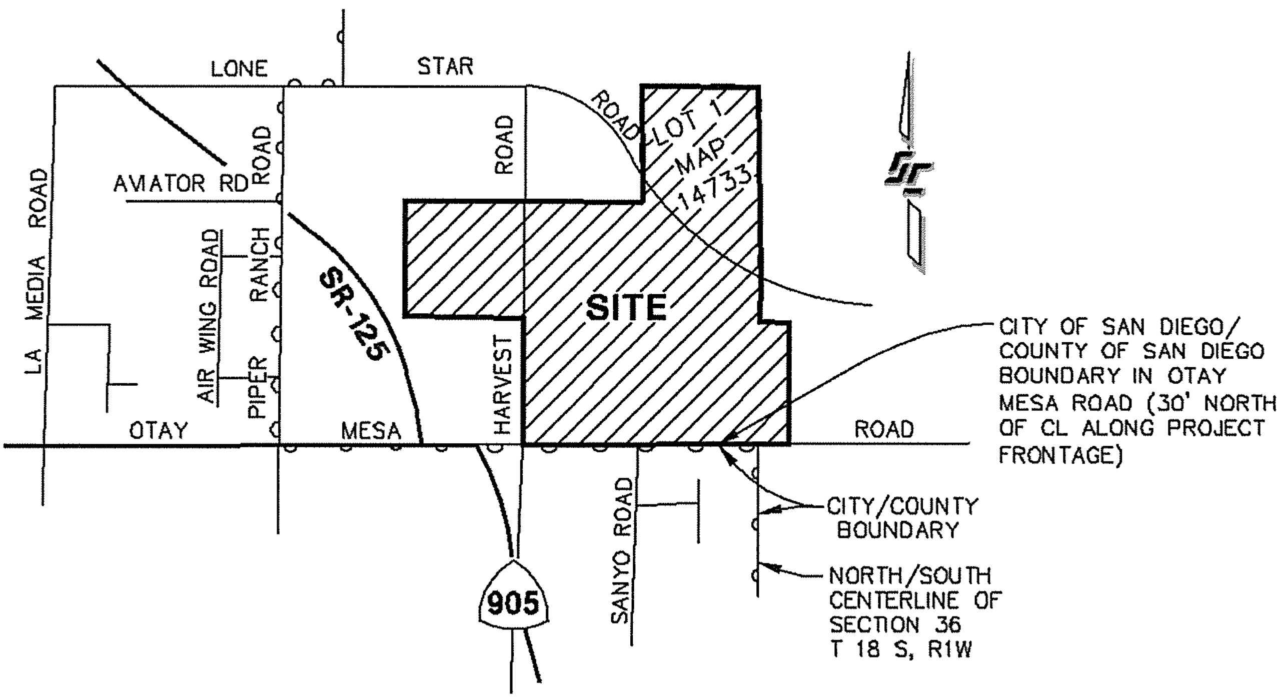
INTRODUCTION

The County of San Diego's March 2011, *Final Hydromodification Management Plan,* and January 8, 2011, *Standard Urban Stormwater Mitigation Plan* (SUSMP) outline low flow thresholds for hydromodification analyses. The thresholds are based on a percentage of the pre-project 2-year flow (Q_2), i.e., $0.1Q_2$ (low flow threshold and high susceptibility to erosion), $0.3Q_2$ (medium flow threshold and medium susceptibility to erosion), or $0.5Q_2$ (high flow threshold and low susceptibility to erosion). A flow threshold of $0.1Q_2$ represents a natural downstream receiving conveyance system with a high susceptibility to bed and/or bank erosion. This is the default value used for hydromodification analyses and will result in the most conservative (largest) on-site facility sizing. A flow threshold of $0.3Q_2$ or $0.5Q_2$ represents downstream receiving conveyance systems with a medium or low susceptibility to erosion, respectively. In order to qualify for a medium or low erosion susceptibility rating, a project must perform a channel screening analysis based on the March 2010, *Hydromodification Screening Tools: Field Manual for Assessing Channel Susceptibility,* developed by the Southern California Coastal Water Research Project (SCCWRP). The SCCWRP results are compared with the critical shear stress calculator results from the County of San Diego's Critical Flow Calculator spreadsheet to establish the appropriate erosion susceptibility threshold of low, medium, or high.



Vicinity Map

This report provides hydromodification screening analyses for Sunroad's Otay 250 project being designed by Stevens-Cresto Engineering, Inc. (Stevens-Cresto). The project is located northeast of the intersection of Otay Mesa Road and State Route 125 (South Bay Expressway) in the county of San Diego (see the Vicinity Map above as well as the Study Area Exhibit in the map pocket). Immediately northeast of the intersection is the proposed California Crossings project. The Otay 250 project surrounds California Crossings on the north and east sides. The Otay 250 site covers approximately 253 acres and is a proposed commercial/light industrial subdivision. The site is gently sloping to the south and southwest. The site is currently undeveloped and primarily supports natural vegetation consisting of grasses, weeds, and small brush. There is some off-site runoff onto the site from the north and east.

Storm runoff from the proposed site and tributary off-site areas generally flows in three separate directions. Runoff from the easterly portion of the site will be conveyed into existing double 60-inch RCPs that cross Otay Mesa Road in a southerly direction. The 60-inch RCPs are approximately 1,720 feet east of the SR 125 on-ramp. The RCPs discharge onto the natural ground surface south of Otay Mesa Road. The flow is then conveyed south over 920 feet south to Caltrans drainage facilities.

Runoff from the southwesterly portion of the site flows in a southwesterly direction. The runoff will be collected by an existing double 6-foot wide by 2-foot high reinforced concrete box culvert on the north side of Otay Mesa Road east of the SR 125 on-ramp. The double box culvert conveys the runoff south across Otay Mesa Road and outlets onto a concrete apron/drop structure and into a stilling basin with concrete banks and a natural bottom. The runoff is conveyed out of the stilling basin in a westerly and then southerly direction by a naturally-lined trapezoidal channel. The trapezoidal channel ultimately flows into Caltrans drainage facilities approximately 850 feet south of Otay Mesa Road.

Runoff from the northerly portion of the site is collected by a proposed storm drain that outlets westerly into a small natural drainage course. The natural drainage course conveys the flow approximately 1,000 feet to an existing Caltrans drainage ditch at the northwest corner of the site. The concrete ditch conveys the flow to a culvert crossing SR 125 approximately 3,500 feet northwest of Otay Mesa Road. The culvert connects to an interconnected system of public storm drain pipes, concrete channels, and concrete culverts that ultimately discharge into a natural channel on the east side of La Media Road approximately 200 feet south of Interstate 905.

The SCCWRP screening tool requires both office and field work to establish the vertical and lateral susceptibility of a downstream receiving channel to erosion. The vertical and lateral assessments are performed independently of each other although the lateral results can be affected by the vertical rating. A screening analysis was performed to assess the low flow threshold for the project's three points of compliance (POC). A POC is the location where the project's runoff enters a natural drainage course. POC 1 is associated with the easterly portion of the site described above, POC 2 is associated with the southwesterly portion of the site, and POC 3 is associated with the northerly portion of the site. POC 2 was assessed by Chang Consultants in the December 9, 2011 report, *Hydromodification Screening for California Crossings* (approved by the County of San Diego).

There is an additional POC within the drainage area tributary to POC 2. The additional POC occurs at the southerly outlet from proposed Lot 30. The additional POC has not been assessed in this report. Therefore, the proposed area draining to the additional POC must be designed for a high susceptibility to erosion, i.e., $0.1Q_2$.

The initial step in performing the SCCWRP screening analysis is to establish the domain of analysis and the study reaches within the domain. This is followed by office and field components of the screening tool along with the associated analyses and results. The following sections cover these procedures in sequence for POC 1 and 3. This is followed by a discussion of the prior results for POC 2 and applicability to the Otay 250 project.

DOMAIN OF ANALYSIS

SCCWRP defines an upstream and downstream domain of analysis, which establish the study limits. The County of San Diego's HMP specifies the downstream domain of analysis based on the SCCWRP criteria. The HMP indicates that the downstream domain is the first point where one of these is reached:

- at least one reach downstream of the first grade control point
- tidal backwater/lentic waterbody
- equal order tributary
- accumulation of 50 percent drainage area for stream systems or 100 percent drainage area for urban conveyance systems (storm drains, hardened channels, etc.)

The upstream limit is defined as:

- proceed upstream for 20 channel top widths or to the first grade control point, whichever comes first. Identify hard points that can check headward migration and evidence of active headcutting.

SCCWRP defines the maximum spatial unit, or reach (a reach is circa 20 channel widths), for assigning a susceptibility rating within the domain of analysis to be 200 meters (656 feet). If the domain of analysis is greater than 200 meters, the study area should be subdivided into smaller reaches of less than 200 meters for analysis. Most of the units in the HMP's SCCWRP analysis are metric. Metric units are used in this report only where given so in the HMP or Caltrans plans. Otherwise English units are used.

Downstream Domain of Analysis
The downstream domain of analysis for POC 1 and POC 3 have been determined by assessing and comparing the four bullet items above. POC 1 is discussed first followed by POC 3. POC 2 was analyzed in prior study, which is discussed later in this report.

As mentioned in the Introduction, storm runoff from the easterly portion of the project will be conveyed to existing double 60-inch RCPs that cross Otay Mesa Road. The RCPs discharge into a natural drainage course on the south side of Otay Mesa Road. The RCP outlets correspond to POC 1. The downstream domain of analysis for the easterly project area is selected below POC 1.

Per the first bullet item, the first permanent grade control below POC 1 was located. The runoff from POC 1 is collected by a Caltrans concrete channel located approximately 1,208 feet downstream of POC 1 (see Figure 6). The concrete channel functions as a grade control because it is a hardened, non-erodible facility that will maintain the upstream drainage course elevations. Since the channel is a Caltrans drainage facility it is considered permanent.

The second bullet item is the tidal backwater or lentic (standing or still water such as ponds, pools, marshes, lakes, etc.) waterbody location. Runoff from POC 1 ultimately flows into Mexico west of La Media Road. A tidal backwater or lentic waterbody does not exist between the project site and Mexico. Therefore, the tidal backwater or lentic waterbody will be further downstream than the downstream domain of analysis established by the permanent grade control criteria.

The final two bullet items are related to the tributary drainage area. The drainage area tributary to POC 1 covers 166.08 acres (see the Study Area Exhibit). The additional area added between POC 1 and the downstream grade control covers 19.42 acres. Therefore, neither an equal order tributary nor a 50 to 100 percent drainage area is accumulated before the grade control.

Based on the above information, the permanent grade control created by Caltrans concrete channel meets the HMP downstream domain of analysis criteria because it is the first point reached from the four bullet items. Per the first bullet item, the downstream domain of analysis should begin one reach below the channel. In this case, the channel connects to a concrete culvert that continues over 3,000 feet west. Consequently, one reach below the grade control will be within the non-erodible culvert, which is not subject to hydromodification impacts. As a result, the downstream domain of analysis location is where the natural drainage course meets the concrete channel.

POC 3 is located at outlet of the proposed storm drain serving the northerly portion of the site (see the Study Area Exhibit).

Per the first bullet item, the first permanent grade control below POC 3 was located. The runoff from POC 3 is collected by a Caltrans concrete drainage ditch located approximately 1,002 feet downstream of POC 3 (see Figure 11) and along the easterly edge of Interstate 905. The concrete drainage ditch functions as a grade control because it is a hardened, non-erodible facility that will maintain the upstream drainage course elevations. Since the ditch is a Caltrans drainage facility it is considered permanent.

In regards to the second bullet item, a tidal backwater or lentic waterbody does not exist between the project site and Mexico. Therefore, the tidal backwater or lentic waterbody will be further downstream than the downstream domain of analysis established by the permanent grade control criteria.

For the third and fourth bullet items, the Study Area Exhibit reveals that there is neither an equal order tributary nor a 50 to 100 percent drainage area is accumulated between POC 3 and the grade control, so these bullet items will not govern over bullet item 1.

Based on the above information, the permanent grade control created by the Caltrans concrete drainage ditch meets the HMP downstream domain of analysis criteria for POC 3 because it is the first point reached from the four bullet items. Per the first bullet item, the downstream domain of analysis should begin one reach below the ditch. In this case, the ditch connects to hardened drainage facilities that continue over 4,000 feet west. Consequently, one reach below the grade control will be within non-erodible facilities, which are not subject to hydromodification impacts. As a result, the downstream domain of analysis location is where the natural drainage course meets Caltrans' concrete drainage ditch.

Upstream Domain of Analysis

The aforementioned RCPs associated with POC 1 and the storm drain outlet associated with POC 3 discharge into the uppermost end of their receiving drainage courses. Since a natural drainage course does not extend upstream of POC 1 or POC 3, the upstream domain of analysis locations will be at POC 1 and POC 3.

Study Reaches within Domain of Analysis

For POC 1, the entire domain of analysis extends along the natural drainage course from the RCP outlets to Caltrans' concrete channel and covers approximately 1,208 feet. The domain of analysis was subdivided into two study reaches with similar characteristics (see the Study Area Exhibit). Reach 1 (upper reach) is 554 feet long and extends below POC 1. Reach 2 (lower reach) is 654 feet long and extends from the downstream end of Reach 1 to the concrete channel. Each reach is within the 656 feet maximum reach length specified by SCCWRP.

For POC 3, the entire domain of analysis extends along the natural drainage course from the northerly area storm drain outlet to Caltrans' concrete ditch and covers approximately 1,002 feet. The domain of analysis was subdivided into two study reaches with similar characteristics (see the Study Area Exhibit). Reach 3 (upper reach) is 366 feet long and extends below POC 3. Reach 4 (lower reach) is 636 feet long and extends from the downstream end of Reach 3 to the concrete ditch. Each reach is within the 656 feet maximum reach length specified by SCCWRP.

INITIAL DESKTOP ANALYSIS

After the domain of analysis is established, SCCWRP requires an "initial desktop analysis" that involves office work. The initial desktop analysis establishes the watershed area, mean annual precipitation, valley slope, and valley width. These terms are defined in Form 1, which is included in Appendix A. SCCWRP recommends the use of National Elevation Data (NED) to determine the watershed area, valley slope, and valley width. The NED data is similar to USGS mapping, so it is not very detailed. For this report, 1-foot contour interval topographic mapping prepared for the project and 2-foot contour interval topographic mapping for the area south of Otay Mesa Road were used for the project and study reaches. A site investigation was performed that confirmed the accuracy of these sources. The mapping does not show Caltrans recent concrete channel (or adjacent freeway work to the south), but the location is available from Google Earth. In addition, Stevens-Cresto provided their most up-to-date engineering drawings for the proposed development.

The required watershed areas were established by Stevens-Cresto's post-project hydrologic analysis as well as the available topographic mapping for the downstream study reaches. Stevens-Cresto delineated a 166.08 acre drainage area tributary to POC 1 from the project and its tributary area. An additional 10.42 acres was delineated below POC 1 tributary to Reach 1, and then another 9.00 acres was delineated tributary to Reach 2. These watershed areas are included on the Study Area Exhibit. Based on the watershed delineations, the drainage areas tributary to the downstream end of Reaches 1 and 2 are 176.50 and 185.50 acres (0.2758 and 0.2898 square miles), respectively.

For POC 3, Stevens-Cresto delineated a 174.61 acre drainage area tributary to the downstream end of Reach 4 as seen on the Study Area Exhibit. This area was used for both Reach 3 and 4. Since the actual area tributary to Reach 3 will be somewhat less, using this area for Reach 3 will yield slightly conservative results (i.e., more potential for erosion).

The mean annual precipitation was obtained from the closest rain gage to the site with extensive historic data. This was the Western Regional Climate Center's Chula Vista gage (see Appendix A). The average rainfall measured at this gage for the period of record from 1918 to 2010 is 9.75 inches.

The valley slope of Reaches 1 and 2 were determined from the 2-foot contour interval topographic mapping, while 1-foot contour interval mapping was available for Reaches 3 and 4. The valley slope is the longitudinal slope of the channel bed along the flow line, so it is determined by dividing the elevation difference within a reach by the flow path. The valley width is the average bottom width of the drainage course between valley slopes. The average valley widths were determined using the topographic mapping to estimate the interface between the bottom and side slopes of the drainage course. The drainage area, valley slope, and valley width within each study reach are summarized in Table 1.

Reach	Tributary Drainage Area, sq. mi.	Valley Slope, m/m	Valley Width, m
1	0.2758	0.0081	13.1
2	0.2898	0.0090	10.4
3	0.2728	0.0126	1.5
4	0.2728	0.0118	1.5

Table 1. Summary of Valley Slope and Valley Width

These values were input to a spreadsheet to calculate the simulated peak flow, screening index, and valley width index outlined in Form 1. The input data and results are tabulated in Appendix A. This completes the initial desktop analysis.

FIELD SCREENING

After the initial desktop analysis is complete, a field assessment must be performed. The field assessment is used to establish a natural channel's vertical and lateral susceptibility to erosion. SCCWRP states that although they are admittedly linked, vertical and lateral susceptibility are assessed separately for several reasons. First, vertical and lateral responses are primarily controlled by different types of resistance, which, when assessed separately, may improve ease of use and lead to increased repeatability compared to an integrated, cross-dimensional assessment. Second, the mechanistic differences between vertical and lateral responses point to different modeling tools and potentially different management strategies. Having separate screening ratings may better direct users and managers to the most appropriate tools for subsequent analyses.

The field screening tool uses combinations of decision trees and checklists. Decision trees are typically used when a question can be answered fairly definitively and/or quantitatively (e.g., d_{50} < 16 mm). Checklists are used where answers are relatively qualitative (e.g., the condition of a grade control). Low, medium, high, and very high ratings are applied separately to the vertical and lateral analyses. When the vertical and lateral analyses return divergent values, the most conservative value shall be selected as the flow threshold for the hydromodification analyses.

Vertical Stability

The purpose of the vertical stability decision tree (Figure 6-4 in the County of San Diego HMP) is to assess the state of the channel bed with a particular focus on the risk of incision (i.e., down cutting). The decision tree is included in Figure 14. The first step is to assess the channel bed resistance. There are three categories defined as follows:

1. Labile Bed – sand-dominated bed, little resistant substrate.

2. Transitional/Intermediate Bed – bed typically characterized by gravel/small cobble, Intermediate level of resistance of the substrate and uncertain potential for armoring.

3. Threshold Bed (Coarse/Armored Bed) – armored with large cobbles or larger bed material or highly-resistant bed substrate (i.e., bedrock).

Figures 7, 8 and 13 show photographs of the bed material within the study reaches. A gravelometer is included in the photographs for reference. Each square on the gravelometer indicates grain size in millimeters (the squares range from 2 mm to 180 mm). Based on the photographs and site investigation, the bed material and resistance is generally within the transitional/intermediate bed category. There was no evidence of a threshold bed condition. However, some bed areas contained smaller grain sizes typically found in a labile bed, while others contains larger gravel-sized particles. A pebble count was performed (see discussion near the end of this section) that determined the median (d_{50}) bed material size to be 8 millimeters (mm) in Reach 1 and 2. A similar size was observed in Reach 3 and 4. Figure 6-4 in the County HMP indicates that a d_{50} less than 16 mm can be within the labile bed category. The figure also identifies that the bed material in a labile bed is "loosely-packed." The Reach 1 through 4 channels do not meet the criteria of containing loosely-packed material. The material was found to be relatively well-compacted during a site investigation. The site investigation revealed no evidence of vertical or lateral erosion.

In addition to the material size and compaction, there are several factors that establish the erodibility of a channel such as the flow rate (i.e., size of the tributary area), grade controls, channel slope, vegetative cover, channel planform, etc. The Introduction of the SCCWRP *Hydromodification Screening Tools: Field Manual* identifies several of these factors. When multiple factors influence erodibility, it is appropriate to perform the more detailed SCCWRP analysis, which is to analyze a channel according to SCCWRP's transitional/intermediate bed procedure. This requires the most rigorous steps and will generate the appropriate results given the range of factors that define erodibility. The transitional/intermediate bed procedure takes into account that bed material may fall within the labile category (the bed material size is used in SCCWRP's Form 3 Figure 4), but other factors may trend towards a less erodible condition. Dr. Eric Stein from SCCWRP, who co-authored the *Hydromodification Screening Tools: Field Manual* in the *Final Hydromodification Management Plan* (HMP), indicated that it would be appropriate to analyze channels with multiple factors that impact erodibility using the transitional/intermediate bed procedure. Consequently, this procedure was used to produce more accurate results.

Transitional/intermediate beds cover a wide susceptibility/potential response range and need to be assessed in greater detail to develop a weight of evidence for the appropriate screening rating. The three primary risk factors used to assess vertical susceptibility for channels with transitional/intermediate bed materials are:

1. Armoring potential – three states (Checklist 1)

2. Grade control – three states (Checklist 2)

3. Proximity to regionally-calibrated incision/braiding threshold (Mobility Index Threshold – Probability Diagram)

These three risk factors are assessed using checklists and a diagram (see Appendix B), and the results of each are combined to provide a final vertical susceptibility rating for the intermediate/transitional bed-material group. Each checklist and diagram contains a Category A, B, or C rating. Category A is the most resistant to vertical changes while Category C is the most susceptible.

Checklist 1 determines armoring potential of the channel bed. The channel bed along each of the four reaches is within Category B, which represents intermediate bed material within unknown armoring potential due to a surface veneer and dense vegetation. Figures 2 through 5 and 12 reveal that all four study reaches contain a relatively uniform cover of grasses, weeds, and bushes. The soil was probed and penetration was relatively difficult through the underlying layer.

Checklist 2 determines grade control characteristics of the channel bed. This is reliant on the spacing of the grade controls. Category A on Checklist 2 is based on a spacing of $2/S_v$ and $4/ S_v$. where S_v is the valley slope. S_v is 0.0081, 0.0090, 0.0126, and 0.0118 for Reach 1, 2, 3, and 4, respectively, from the Form 1 analysis in Appendix A. Based on this, the Reach 1 through 4 values for $2/S_v$ are 808, 727, 522, and 556 feet, respectively, and the values for $4/S_v$ are 1,616, 1,455, 1,044, and 1,113 feet, respectively.

The closest grade control downstream of Reach 1 and 2 is the Caltrans concrete channel. The concrete channel is at most 1,208 feet from the upper end of Reach 1 and 654 feet from the upper end of Reach 2. The grade control is further away than the $2/S_v$ values, but closer than the $4/S_v$ values. Therefore, both reaches are within Category B on Checklist 2. A field walk along the study area did not reveal evidence of headcutting or mass wasting (see figures), so the grade control has been effective.

The closest grade control downstream of Reach 3 and 4 is the Caltrans concrete ditch. The concrete ditch is at most 1,002 feet from the upper end of Reach 3 and 636 feet from the upper end of Reach 4. The grade control is further away than the $2/S_v$ values, but closer than the $4/S_v$ values. Therefore, both reaches are within Category B on Checklist 2. A field walk along the study area did not reveal evidence of headcutting or mass wasting (see Figure 12), so the grade control has been effective.

The Mobility Index Threshold is a probability diagram that depicts the risk of incising or braiding based on the potential stream power of the valley relative to the median particle diameter. The threshold is based on regional data from Dr. Howard Chang of Chang Consultants and others. The probability diagram is based on d_{50} as well as the Screening Index determined in the initial desktop analysis (see Appendix A). d_{50} is derived from a pebble count in which a minimum of 100 particles are obtained along transects at the site. SCCRWP states that if fines less than ½-inch thick are at a sample point, it is appropriate to sample the coarser buried substrate. The d_{50} value is the particle size in which 50 percent of the particles are smaller and 50 percent are larger.

The pebble count results for Reach 1 and 2 are included in Appendix B. The results show a d_{50} of 8 millimeters for each area. The screening index for Reach 1 and 2 are tabulated in Appendix A. Plotting the d_{50} and screening index values on the Mobility Index Threshold diagram shows that both Reach 1 and 2 have a less than 50 percent probability of incising or braiding (even less than 10 percent), which falls within Category A. In fact, the screening index values are so small that the pebble count is irrelevant.

The screening index values for Reach 3 and 4 from Form 1 are 0.0123 and 0.0116, respectively. The Screening Index Threshold diagram shows that the probability of incising or braiding is less than 50 percent regardless of d_{50} for an INDEX value of 0.0150 or less. Since the Reach 3 and 4 Screening Index values are less than the smallest 50 percent value (as are Reach 1 and 2), both reaches are within Category A, so a pebble count is not necessary.

The overall vertical rating is determined from the Checklist 1, Checklist 2, and Mobility Index Threshold results. The scoring is uses the following values for each category:

Category A = 3, Category B = 6, Category C = 9

The vertical rating score is based on these values and the equation:

$$\text{Vertical Rating} = [(\text{armoring} \times \text{grade control})^{1/2} \times \text{screening index score}]^{1/2}$$
$$= [(6 \times 6)^{1/2} \times 3]^{1/2}$$
$$= 4.2$$

Since the vertical rating is less than 4.5 (Reach 1, 2, 3, and 4 have the same values), each reach has a low threshold for vertical susceptibility.

Lateral Stability

The purpose of the lateral decision tree (Figure 6-5 from County of San Diego HMP included in Figure 15) is to assess the state of the channel banks with a focus on the risk of widening. Channels can widen from either bank failure or through fluvial processes such as chute cutoffs, avulsions, and braiding. Widening through fluvial avulsions/active braiding is a relatively straightforward observation. If braiding is not already occurring, the next logical step is to assess the condition of the banks. Banks fail through a variety of mechanisms; however, one of the most important distinctions is whether they fail in mass (as many particles) or by fluvial detachment of individual particles. Although much research is dedicated to the combined effects of weakening, fluvial erosion, and mass failure, SCCWRP found it valuable to segregate bank types based on the inference of the dominant failure mechanism (as the management approach may vary based on the dominant failure mechanism). A decision tree (Form 4 in Appendix B) is used in conducting the lateral susceptibility assessment. Definitions and photographic examples are also provided below for terms used in the lateral susceptibility assessment.

The first step in the decision tree is to determine if lateral adjustments are occurring. The adjustments can take the form of extensive mass wasting (greater than 50 percent of the banks are exhibiting planar, slab, or rotational failures and/or scalloping, undermining, and/or tension cracks). The adjustments can also involve extensive fluvial erosion (significant and frequent bank cuts on over 50 percent of the banks). Neither mass wasting nor extensive fluvial erosion was evident within the four reaches during a field investigation. The gently sloping banks are intact in the photographs included in the figures. The relatively uniform vegetative cover on the banks is evidence of the absence of large lateral adjustments.

The next step in the Form 4 decision tree is to assess the consolidation of the bank material. The banks were moderate to well-consolidated. This determination was made because the banks were difficult to penetrate with a probe. In addition, the banks showed limited evidence of crumbling and were composed of well-packed particles (see figures).

Form 6 (see Appendix B) is used to assess the probability of mass wasting. Form 6 identifies a 10, 50, and 90 percent probability based on the bank angle and bank height. The site visit and topographic mapping reveal that the channel banks are gently sloping and much flatter than 2:1 (26.6 degrees). Form 6 shows that the probability of mass wasting and bank failure has less than 10 percent risk for a 26.6 degree bank angle or less regardless of the bank height.

The final two steps in the Form 4 decision tree are based on the braiding risk determined from the vertical rating as well as the Valley Width Index (VWI) calculated in Appendix A. If the vertical rating is high, the braiding risk is considered to be greater than 50 percent. Excessive braiding can lead to lateral bank failure. For Reach 1 through 4 the vertical rating is low, so the braiding risk is less than 50 percent. Furthermore, a VWI greater than 2 represents channels unconfined by bedrock or hillslope and, hence, subject to lateral migration. The VWI calculations in the spreadsheet in Appendix A show that the VWI for each reach is less than 2.

From the above steps, the lateral susceptibility rating is low (red circles are included on the Form 4: Lateral Susceptibility Field Sheet decision tree in Appendix B showing the decision path).

PRIOR CHANNEL ASSESSMENTS

The above Domain of Analysis, Initial Desktop Analysis, and Field Screening sections were prepared for POC 1 and 3. As mentioned in the Introduction, the project contains a southwesterly watershed area that outlets to POC 2. However, the natural channel downstream of POC 2 was previously analyzed in the December 9, 2011 report, *Hydromodification Screening for California Crossings* (approved by the County of San Diego). This report is contained in Attachment 1. The following outlines the applicability of the report to POC 2 associated with Otay 250 followed by a discussion POC 3.

POC 2 Assessment

POC 2 discharges at the same POC location analyzed in the 2011 California Crossings report. The report is contained in Attachment 1. There are two changes that have occurred since the 2011 report was prepared. The first is that the Otay 250 project will reduce the drainage area tributary to the study reaches. Stevens-Cresto's hydrology mapping shows that the drainage area tributary to the POC will be 77.51 acres (see Study Area Exhibit) while the area in the 2011 report's Study Area Exhibit was over 80 acres. The smaller watershed area will result in less potential for erosion; therefore, the Otay 250 project will not adversely affect the 2011 report results. The other change is that Caltrans has extended and realigned a portion of their engineered channel further downstream to connect to their underground storm drain system. This is related to Reach 2 from the 2011 report. However, the fact that Caltrans has extended their channel will not affect the channel assessment results because the channel is engineered, so it is designed to convey flows without hydromodification impacts. Caltrans requires channels adjacent to freeways to be designed for the 100-year flows. Figures 9 and 10 are current photographs of the study reaches, which were assessed in the 2011 report. Reach 1 in Figure 9 is similar to the 2011 report (see Figure 4 in 2011 report for comparison); however, the vegetation is now somewhat more mature, so is more resistant to hydromodification impacts. Reach 2 in Figure 10 shows the engineered channel. Based on this information, the results from the 2011 report for POC 2 are still applicable, i.e., a low susceptibility to erosion ($0.5Q_2$).

POC 3 Assessment

An assessment has been prepared for POC 3 this report. For reference purposes, the next natural watercourse below the POC 3 study area (along east side of La Media Road south of Interstate 905) was assessed in the May 14, 2012 report, *Hydromodification Screening for Sunroad 80 Project* (approved by the City of San Diego). The 2012 report demonstrated that the watercourse had a low susceptibility to erosion.

CONCLUSION

The SCCWRP channel screening tools were used to assess the downstream channel susceptibility for the Otay 250 project. The project runoff will be collected by proposed on-site drainage facilities and outlet to three separate points of compliance. A downstream channel assessment for POC 1 and POC 3 is included in this report and the results indicate a low threshold for vertical and lateral susceptibilities. Downstream channel assessments were previously prepared for POC 2 and the results are still relevant. Those results also indicate low susceptibilities.

The HMP requires that these results be compared with the critical stress calculator results outlined in the County of San Diego HMP. The critical stress results are included in Appendix B for the two POC 1 study reaches and two POC 3 study reaches using the spreadsheet provided by the County. The channel dimensions were estimated from the topographic mapping and site visit. Based on these values, the critical stress results returned a low threshold consistent with the SCCWRP channel screening results. The critical stress analyses for POC 2 are within the prior reports included in Attachment 1, which also returned a low threshold. Therefore, the SCCWRP analyses and critical stress calculator demonstrate that a low overall threshold is applicable to all three points of compliance (i.e., 0.5Q2).

Figure 1. Double 60-inch RCP Outlets at POC 1

Figure 2. Looking Downstream at Reach 1 from Upper End at POC 1

Figure 3. Looking Upstream at Reach 1 from Lower End

Figure 4. Looking Downstream at Reach 2 from Upper End

Figure 5. Looking Upstream at Reach 2 from Lower End

Figure 6. Caltrans Concrete Channel (Permanent Grade Control) at Lower End of Reach 2

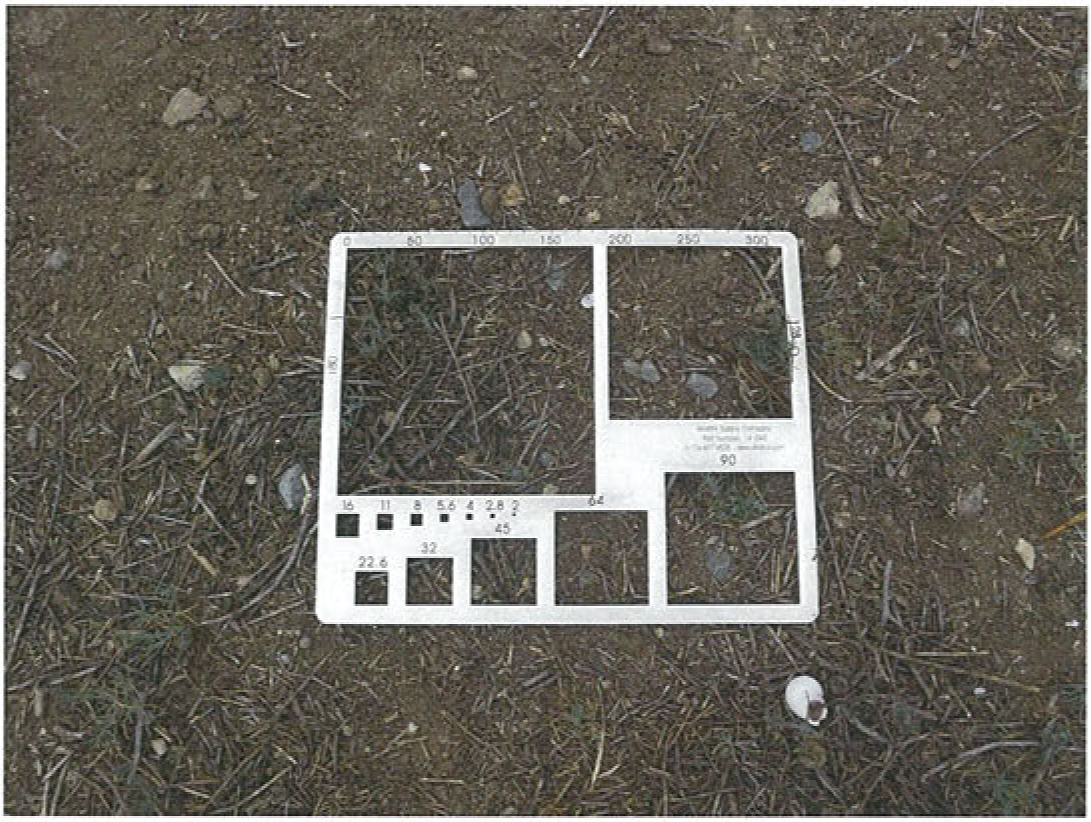


Figure 7. Gravelometer in Reach 1

Figure 8. Gravelometer in Reach 2

Figure 9. Looking Downstream at Reach 1 (POC 2) from 2011 Study

Figure 10. Looking Downstream at Reach 2 from 2011 Study

Figure 11. Caltrans Drainage Ditch below POC 3

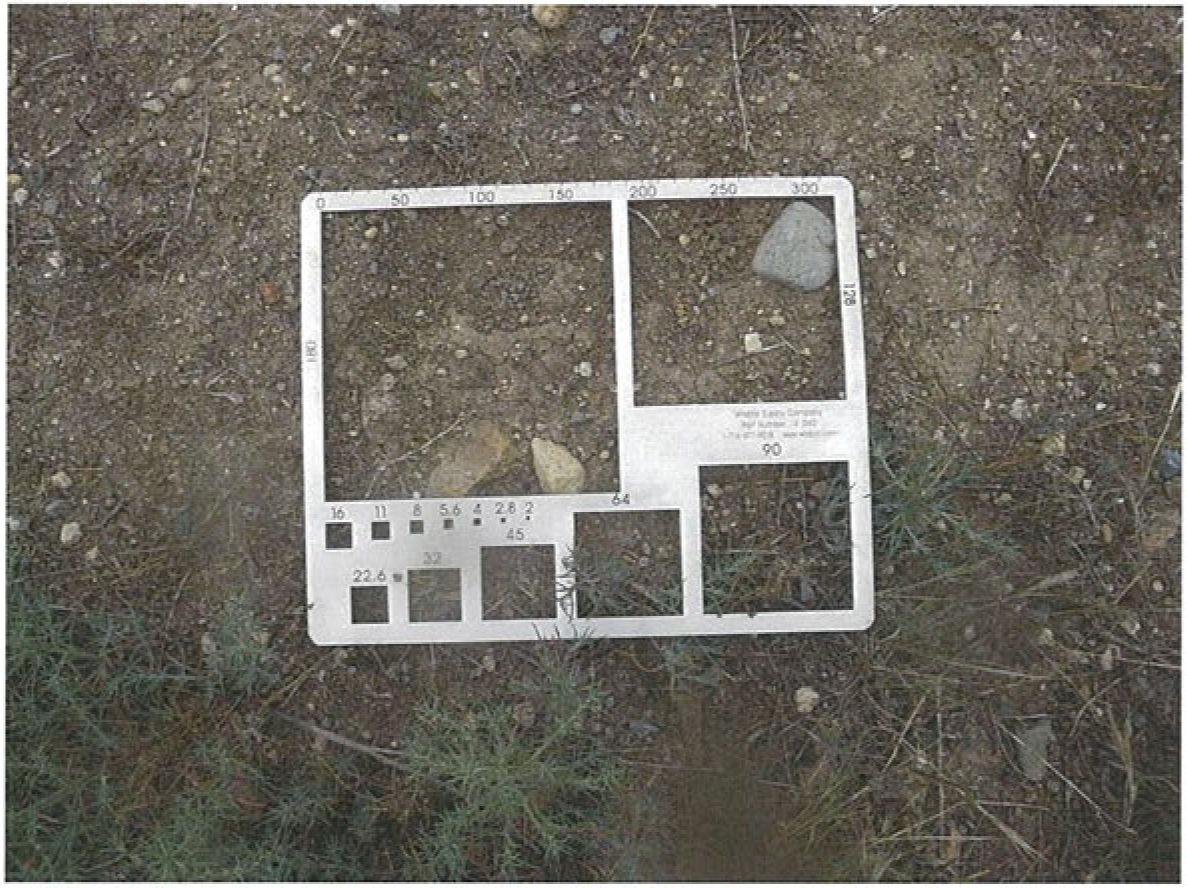


Figure 13. Gravelometer along Reach 3 and 4

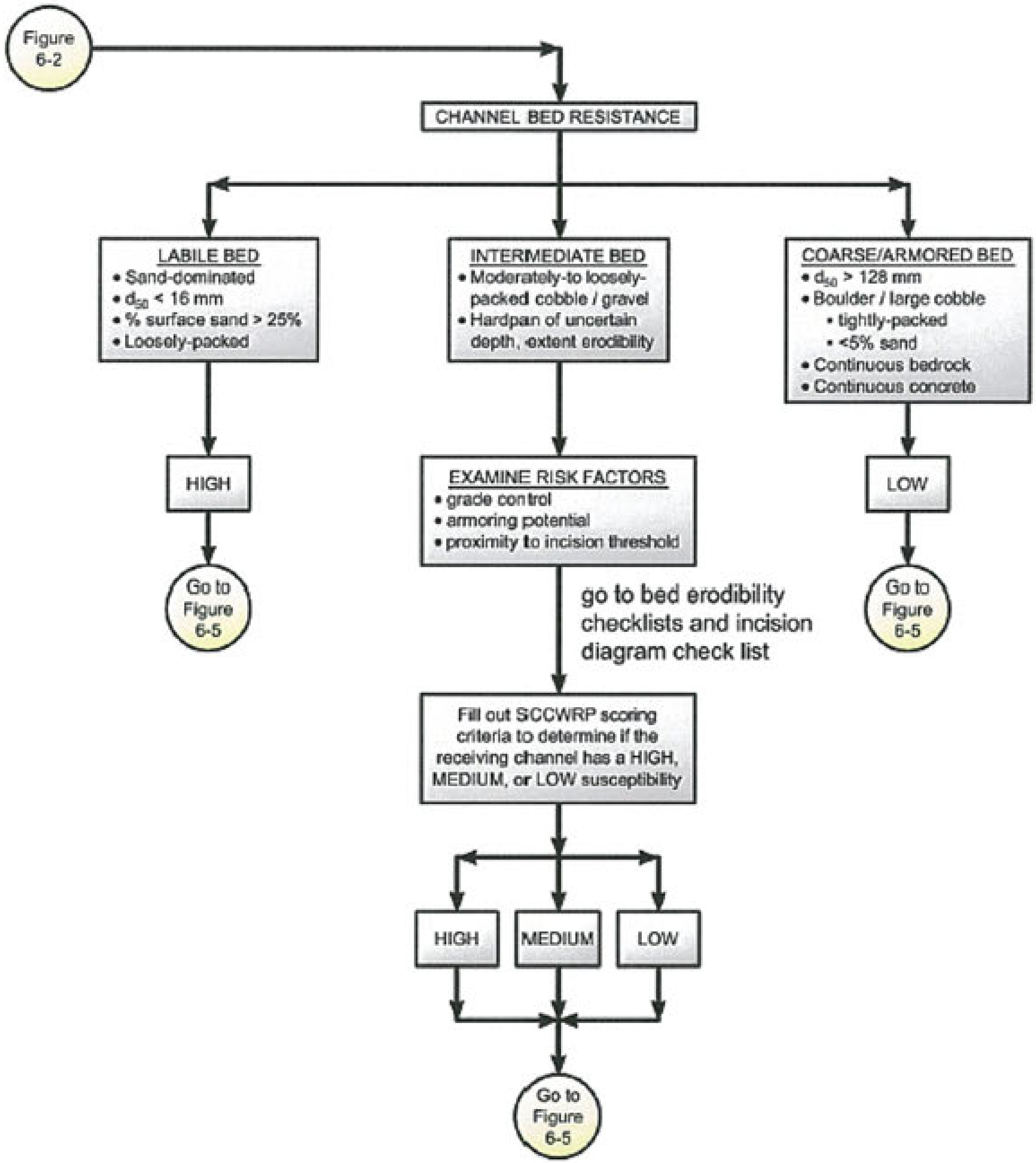


Figure 6-4. SCCWRP Vertical Susceptibility

Figure 14. SCCWRP Vertical Channel Susceptibility Matrix

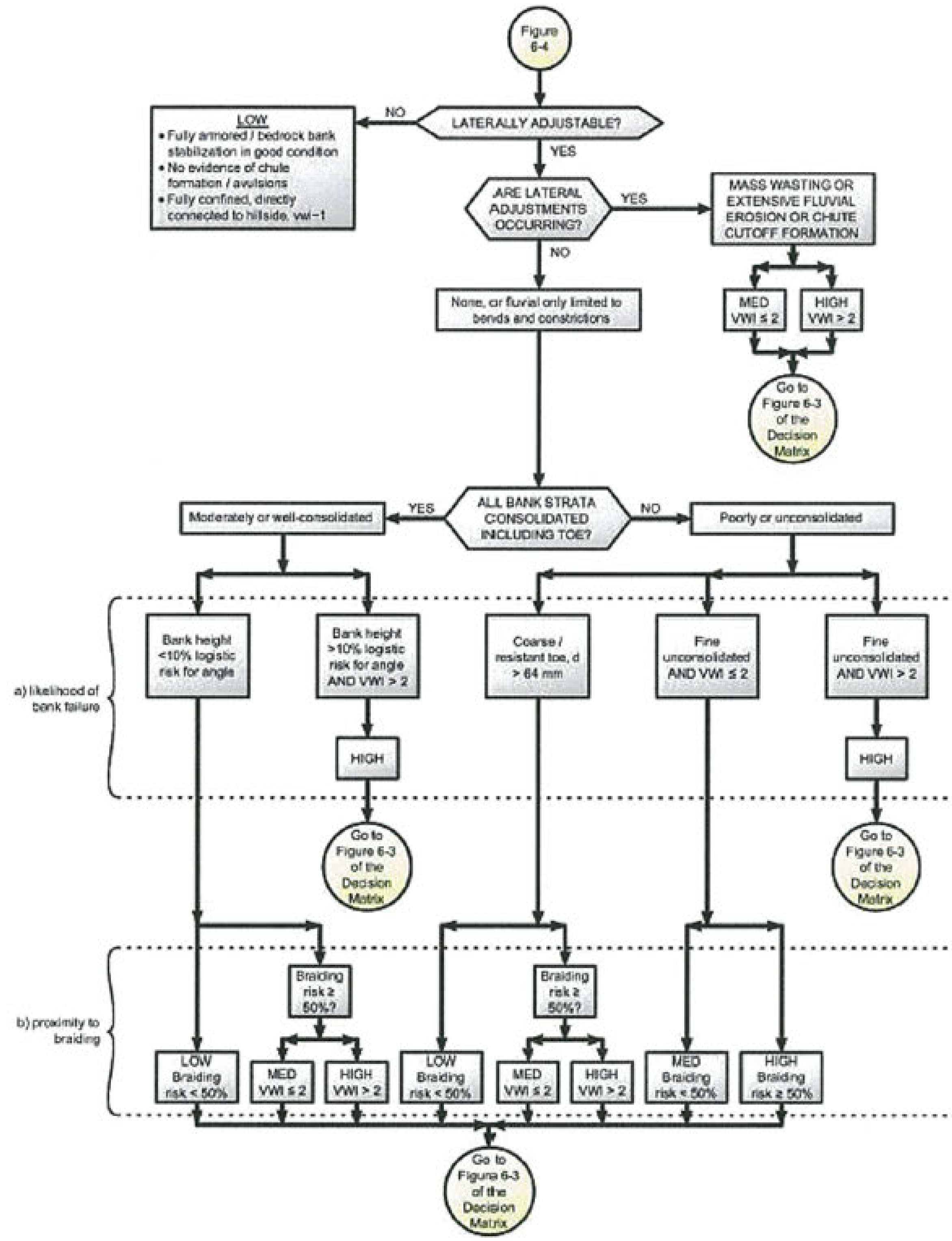


Figure 6-5. Lateral Channel Susceptibility

Figure 15. SCCWRP Lateral Channel Susceptibility Matrix

APPENDIX A

SCCWRP INITIAL DESKTOP ANALYSIS

FORM 1: INITIAL DESKTOP ANALYSIS

Complete all shaded sections.

IF required at multiple locations, circle one of the following site types:

Applicant Site / Upstream Extent / Downstream Extent

Location: Latitude: 32.5693 Longitude: -116.9475

Description (river name, crossing streets, etc.): NE of intersection of Otay Mesa Road and State Route 125 (South Bay Expressway)

GIS Parameters: The International System of Units (SI) is used throughout the assessment as the field standard and for consistency with the broader scientific community. However, as the singular exception, US Customary units are used for contributing drainage area (A) and mean annual precipitation (P) to apply regional flow equations after the USGS. See SCCWRP Technical Report 607 for example measurements and "Screening Tool Data Entry.xls" for automated calculations.

Form 1 Table 1. Initial desktop analysis in GIS.

Symbol		Variable	Description and Source	Value
Watershed properties (English units)	A	Area (mi^2)	Contributing drainage area to screening location via published Hydrologic Unit Codes (HUCs) and/or ≤ 30 m National Elevation Data (NED), USGS seamless server	See attached Form 1 table on next page for calculated values for each reach.
	P	Mean annual precipitation (in)	Area-weighted annual precipitation via USGS delineated polygons using records from 1900 to 1960 (which was more significant in hydrologic models than polygons delineated from shorter record lengths)	
Site properties (SI units)	S_v	Valley slope (m/m)	Valley slope at site via NED, measured over a relatively homogenous valley segment as dictated by hillslope configuration, tributary confluences, etc., over a distance of up to ~500 m or 10% of the main-channel length from site to drainage divide	
	W_v	Valley width (m)	Valley bottom width at site between natural valley walls as dictated by clear breaks in hillslope on NED raster, irrespective of potential armoring from floodplain encroachment, levees, etc. (imprecise measurements have negligible effect on rating in wide valleys where VWI is >> 2, as defined in lateral decision tree)	

Form 1 Table 2. Simplified peak flow, screening index, and valley width index. Values for this table should be calculated in the sequence shown in this table, using values from Form 1 Table 1.

Symbol	Dependent Variable	Equation	Required Units	Value
Q_{10cfs}	10-yr peak flow (ft^3/s)	$Q_{10cfs} = 18.2 * A^{0.87} * P^{0.77}$	A (mi^2) P (in)	See attached Form 1 table on next page for calculated values for each reach.
Q_{10}	10-yr peak flow (m^3/s)	$Q_{10} = 0.0283 * Q_{10cfs}$	Q_{10cfs} (ft^3/s)	
INDEX	10-yr screening index ($m^{1.5}/s^{0.5}$)	$INDEX = S_v * Q_{10}^{0.5}$	Sv (m/m) Q_{10} (m^3/s)	
W_{ref}	Reference width (m)	$W_{ref} = 6.99 * Q_{10}^{0.438}$	Q_{10} (m^3/s)	
VWI	Valley width index (m/m)	$VWI = W_v/W_{ref}$	W_v (m) W_{ref} (m)	

(Sheet 1 of 1)

SCCWRP FORM 1 ANALYSES

Reach	Area A, sq. mi.	Mean Annual Precip. P, inches	Valley Slope Sv, m/m	Valley Width Wv, m	10-Year Flow Q10cfs, cfs	10-Year Flow Q10, cms
1	0.2758	9.75	0.0081	13.1	34	0.97
2	0.2898	9.75	0.0090	10.4	36	1.01
3	0.2728	9.75	0.0126	1.5	34	0.96
4	0.2728	9.75	0.0118	1.5	34	0.96

Reach	10-Year Screening Index INDEX	Reference Width Wref, m	Valley Width Index VWI, m/m
1	0.0080	6.90	1.90
2	0.0091	6.92	1.50
3	0.0123	6.76	0.23
4	0.0116	6.76	0.23

CHULA VISTA, CALIFORNIA (041758)

Period of Record Monthly Climate Summary

Period of Record : 9/ 1/1918 to 12/31/2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	64.1	64.5	64.7	65.9	67.2	68.9	72.5	74.1	74.0	71.7	69.0	65.1	68.5
Average Min. Temperature (F)	43.7	45.7	48.3	51.6	56.0	59.1	63.0	64.2	61.6	55.8	48.5	44.6	53.5
Average Total Precipitation (in.)	1.78	1.92	1.61	0.82	0.21	0.05	0.02	0.06	0.17	0.51	0.95	1.64	9.75
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 93.2% Min. Temp.: 93.1% Precipitation: 98.7% Snowfall: 98.8% Snow Depth: 98.6%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Western US COOP Station Map

APPENDIX B

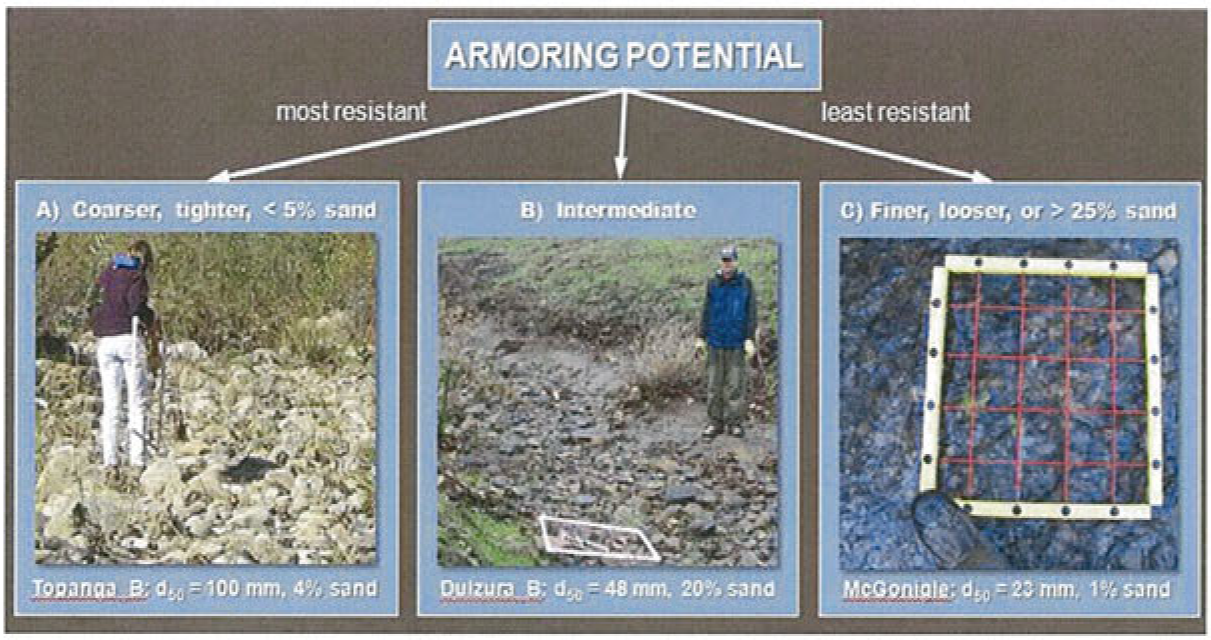
SCCWRP FIELD SCREENING DATA

Form 3 Support Materials

Form 3 Checklists 1 and 2, along with information recording in Form 3 Table 1, are intended to support the decisions pathways illustrated in Form 3 Overall Vertical Rating for Intermediate/Transitional Bed.

Form 3 Checklist 1: Armoring Potential

☐	A	A mix of coarse gravels and cobbles that are tightly packed with <5% surface material of diameter <2 mm
X	B	Intermediate to A and C or hardpan of unknown resistance, spatial extent (longitudinal and depth), or unknown armoring potential due to surface veneer covering gravel or coarser layer encountered with probe
☐	C	Gravels/cobbles that are loosely packed or >25% surface material of diameter <2 mm



Form 3 Figure 2. Armoring potential photographic supplement for assessing intermediate beds ($16 < d_{50} < 128$ mm) to be used **in conjunction with Form 3 Checklist 1.**

(Sheet 2 of 4)

REACH 1 THROUGH 4 RESULTS

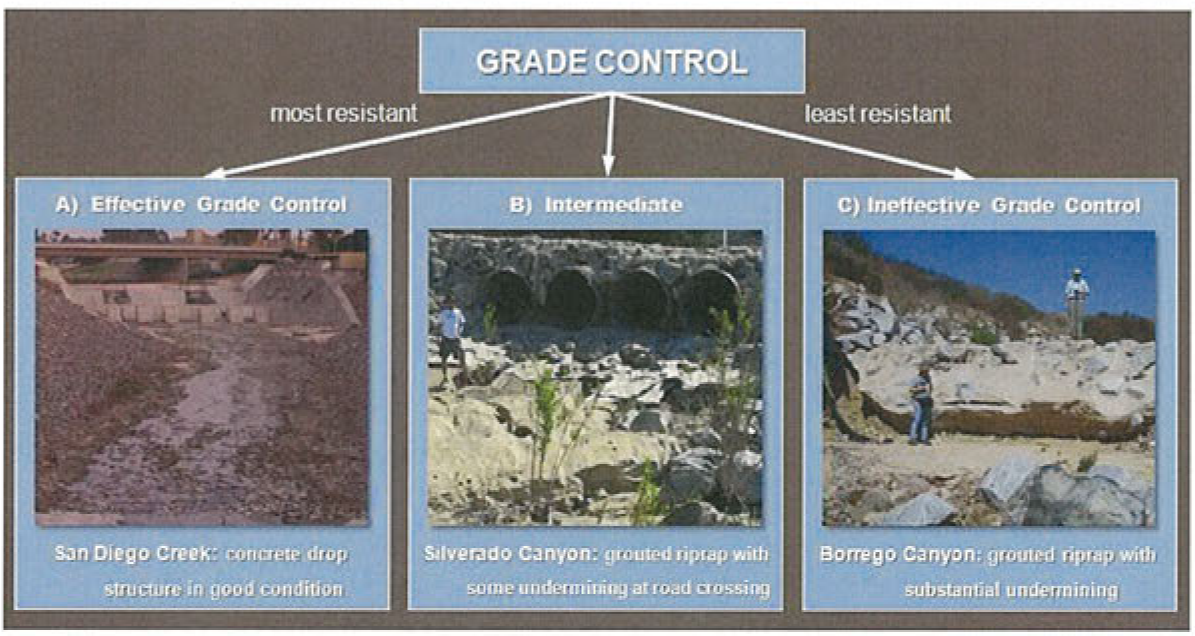
Form 3 Checklist 2: Grade Control

☐ A Grade control is present with spacing <50 m or $2/S_v$ m

- No evidence of failure/ineffectiveness, e.g., no headcutting (>30 cm), no active mass wasting (analyst cannot say grade control sufficient if mass-wasting checklist indicates presence of bank failure), no exposed bridge pilings, no culverts/structures undermined
- Hard points in serviceable condition at decadal time scale, e.g., no apparent undermining, flanking, failing grout
- If geologic grade control, rock should be resistant igneous and/or metamorphic; For sedimentary/hardpan to be classified as 'grade control', it should be of demonstrable strength as indicated by field testing such as hammer test/borings and/or inspected by appropriate stakeholder

☒ B Intermediate to A and C – artificial or geologic grade control present but spaced 2/Sv m to 4/Sv m or potential evidence of failure or hardpan of uncertain resistance

☐ C Grade control absent, spaced >100 m or $>4/S_v$ m, or clear evidence of ineffectiveness



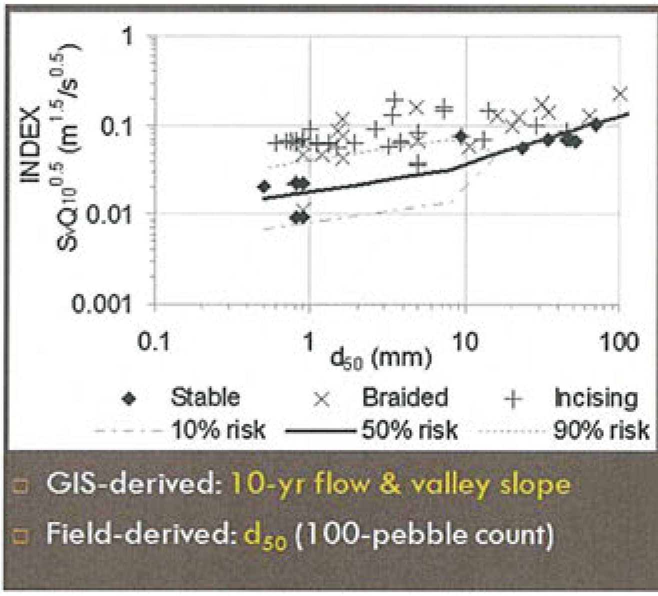
Form 3 Figure 3. Grade-control (condition) photographic supplement for assessing intermediate beds ($16 < d_{50} < 128$ mm) to be used in conjunction with Form 3 Checklist 2.

(Sheet 3 of 4)

REACH 1 THROUGH 4 RESULTS

Regionally-Calibrated Screening Index Threshold for Incising/Braiding

For transitional bed channels (d_{50} between 16 and 128 mm) or labile beds (channel not incised past critical bank height), use Form 3 Figure 3 to determine Screening Index Score and complete Form 3 Table 1.



Model Type	d_{50} (mm)	50% Risk $S_vQ_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$)
Logistic Regression $d_{50} \geq 16$ mm	128	0.145
	96	0.125
	80	0.114
	64	0.101
	48	0.087
	32	0.070
	16	0.049
Logistic Reg. $d_{50} < 16$ mm	8	0.031
	4	0.026
	2	0.022
	1	0.018
	0.5	0.015

Form 3 Figure 4. Probability of incising/braiding based on logistic regression of Screening Index and d_{50} to be used in conjunction with Form 3 Table 1.

Form 3 Table 1. Values for Screening Index Threshold (probability of incising/braiding) to be used in conjunction with Form 3 Figure 4 (above) to complete Form 3 Overall Vertical Rating for Intermediate/Transitional Bed (below).. Screening Index Score: A = <50% probability of incision for current Q_{10}, valley slope, and d_{50}; B = Hardpan/d_{50} indeterminate; and C = ≥50% probability of incising/braiding for current Q_{10}, valley slope, and d_{50}.

d_{50} (mm) *From Form 2*	S_v*$Q_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$) *From Form 1*	S_v*$Q_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$) *50% risk of incising/braiding from table in Form 3 Figure 3 above*	Screening Index Score (A, B, C)

Overall Vertical Rating for Intermediate/Transitional Bed

Calculate the overall Vertical Rating for Transitional Bed channels using the formula below. Numeric values for responses to Form 3 Checklists and Table 1 as follows: A = 3, B = 6, C = 9.

$$Vertical\ Rating = \sqrt{\{(\sqrt{armoring * grade\ control}) * screening\ index\ score\}}$$

6 x 6 x 3 = 4.2

Vertical Susceptibility based on Vertical Rating: <4.5 = LOW; 4.5 to 7 = MEDIUM; and >7 = HIGH.

(Sheet 4 of 4)

REACH 1 THROUGH 4 RESULTS

Pebble Count

#	Reach 1 diameter, mm	Reach 2 diameter, mm
1	2	2
2	2	2
3	2	2
4	2	2
5	2	2
6	2	2
7	2	2
8	2	2
9	2	2
10	2	2
11	2	2
12	2	2
13	2	2
14	2	2
15	2	2
16	2	2
17	2	2
18	2.8	2
19	2.8	2.8
20	2.8	2.8
21	2.8	2.8
22	2.8	2.8
23	2.8	2.8
24	2.8	2.8
25	2.8	2.8
26	2.8	2.8
27	2.8	2.8
28	2.8	2.8
29	2.8	2.8
30	2.8	2.8
31	2.8	2.8
32	4	2.8
33	4	4
34	4	4
35	4	4
36	4	4
37	4	4
38	4	4
39	4	4
40	4	4
41	5.6	5.6

Pebble Count

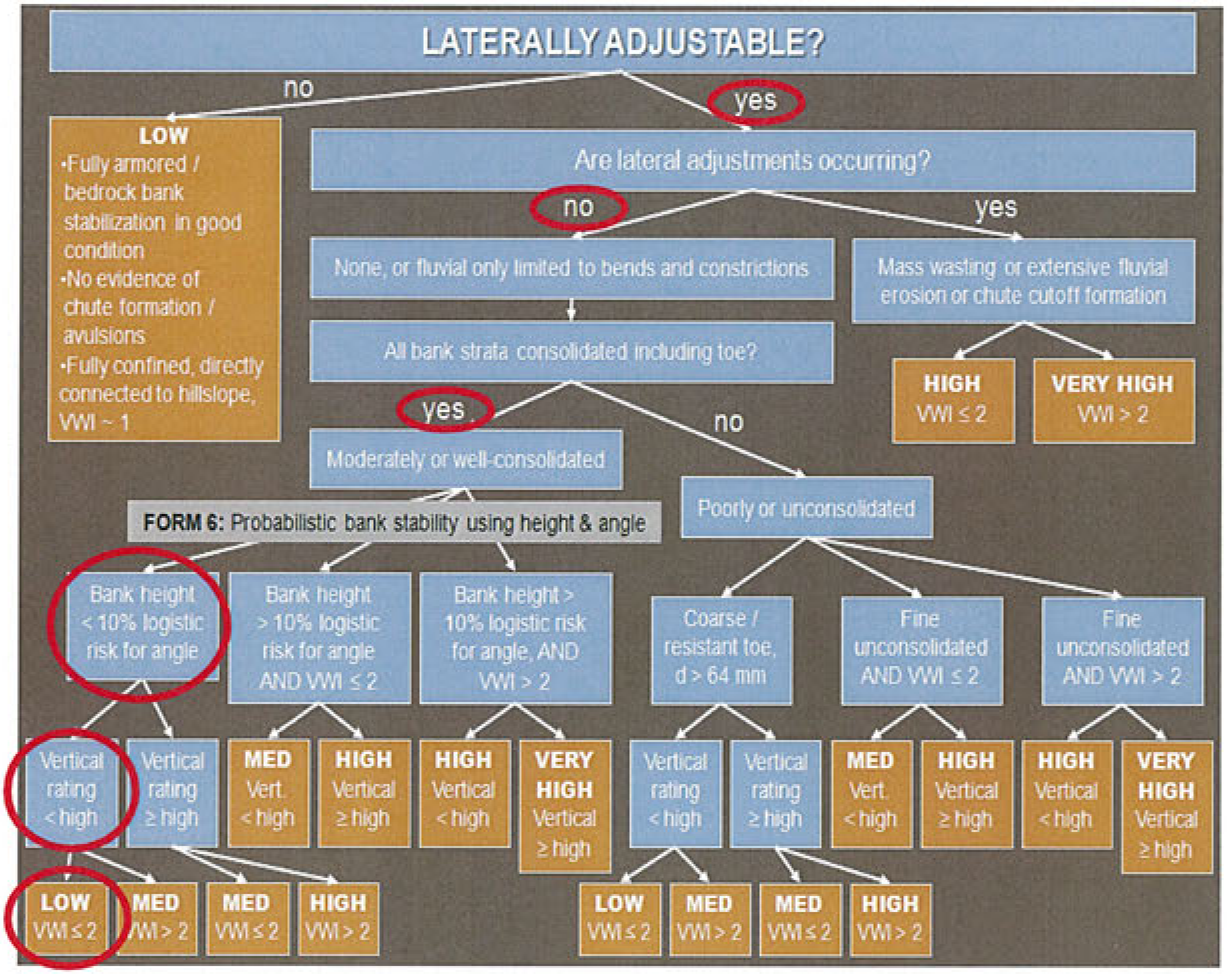
#	Reach 1 diameter, mm	Reach 2 diameter, mm	
42	5.6	5.6	
43	5.6	5.6	
44	5.6	5.6	
45	5.6	5.6	
46	5.6	5.6	
47	5.6	8	
48	8	8	
49	8	8	
50	8	8	D50
51	8	8	
52	8	8	
53	8	8	
54	8	8	
55	8	8	
56	8	8	
57	8	11	
58	8	11	
59	8	11	
60	8	11	
61	11	11	
62	11	11	
63	11	11	
64	11	11	
65	11	11	
66	11	11	
67	11	11	
68	11	11	
69	11	11	
70	11	11	
71	11	16	
72	11	16	
73	16	16	
74	16	16	
75	16	16	
76	16	16	
77	16	16	
78	16	16	
79	16	16	
80	16	16	
81	16	16	
82	16	22.6	

Pebble Count

#	Reach 1 diameter, mm	Reach 2 diameter, mm
83	16	22.6
84	16	22.6
85	22.6	22.6
86	22.6	22.6
87	22.6	22.6
88	22.6	22.6
89	22.6	22.6
90	22.6	22.6
91	32	22.6
92	32	22.6
93	32	32
94	32	32
95	32	32
96	32	32
97	32	32
98	45	32
99	45	45
100	45	45

FORM 4: LATERAL SUSCEPTIBILTY FIELD SHEET

Circle appropriate nodes/pathway for proposed site OR use sequence of questions provided in Form 5.



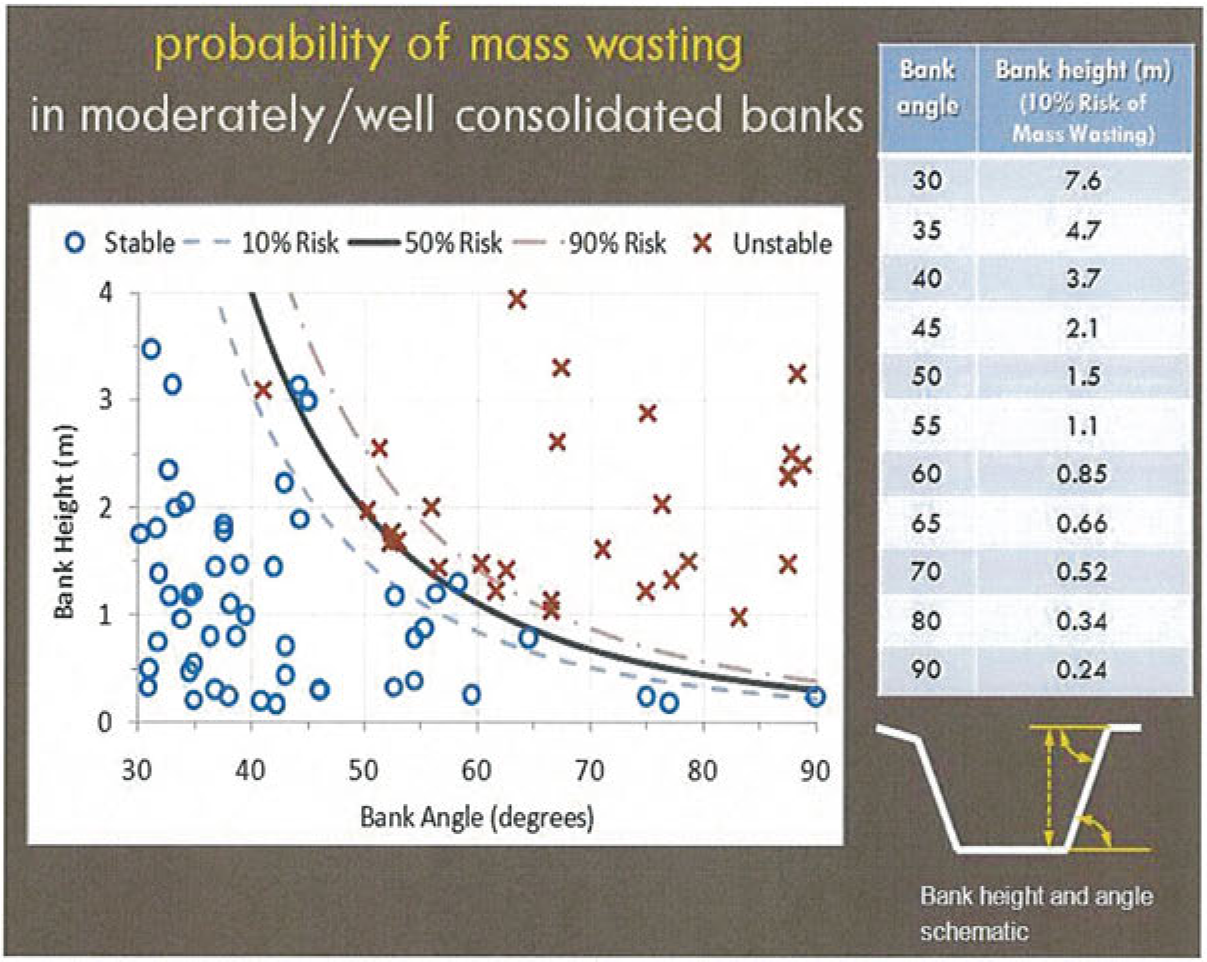
(Sheet 1 of 1)

REACH 1 THROUGH 4 RESULTS

FORM 6: PROBABILITY OF MASS WASTING BANK FAILURE

If mass wasting is not currently extensive and the banks are moderately- to well-consolidated, measure bank height and angle at several locations (i.e., at least three locations that capture the range of conditions present in the study reach) to estimate representative values for the reach. Use Form 6 Figure 1 below to determine if risk of bank failure is >10% and complete Form 6 Table 1. Support your results with photographs that include a protractor/rod/tape/person for scale.

	Bank Angle (degrees) *(from Field)*	**Bank Height (m)** *(from Field)*	**Corresponding Bank Height for 10% Risk of Mass Wasting (m)** *(from Form 6 Figure 1 below)*	**Bank Failure Risk** *(<10% Risk)* *(>10% Risk)*
Left Bank	**<26.6 (2:1)**	**---**	**----**	**<10%**
Right Bank	**<26.6 (2:1)**	**---**	**----**	**<10%**



Bank angle	Bank height (m) (10% Risk of Mass Wasting)
30	7.6
35	4.7
40	3.7
45	2.1
50	1.5
55	1.1
60	0.85
65	0.66
70	0.52
80	0.34
90	0.24

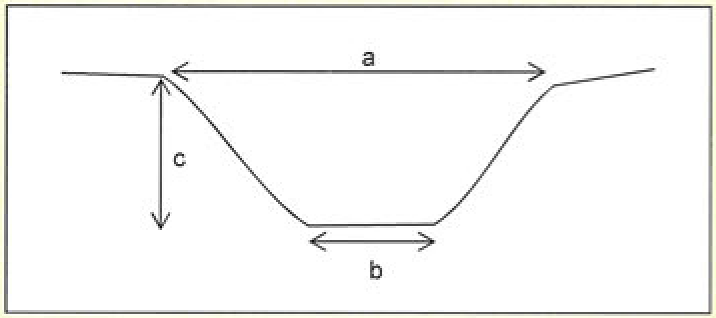
Form 6 Figure 1. Probability Mass Wasting diagram, Bank Angle:Height/% Risk table, and Band Height:Angle schematic.

Critical Flow Calculator

Reach 1 Results

enter all values in green cells
and drop down boxes

Inputs



a) Receiving channel width at top of bank (ft) - see figure on right	160
b) Channel width at bed (ft)	43
c) Bank height at top of bank (ft)	1
Channel gradient (ft/ft)	0.0081
Receiving channel roughness	Sluggish reaches, weedy, deep pools n=0.07

Channel materials (use weakest of bed or banks). If materials are varied use weakest material covering more than 20% of channel.

- unconsolidated sandy loam 0.035 lb/sq ft
- alluvial silt (non coloidal) 0.045 lb/sq ft
- medium gravel 0.12 lb/sq ft
- alluvial silt/clay 0.26 lb/sq ft
- 2.5 inch cobble 1.1 lb/sq ft
- enter own d50 (variable)
- vegetation (bed and banks) 0.6 lb/sq ft

Select method of calculating Q2

- Input own Q2
- Calculate Q2 using USGS regression

Receiving water watershed annual precip (inches)	9.75	Receiving water watershed area at PoC (sq mi)	0.2758
Project watershed annual precipitation (inches)	9.75	Project watershed area draining to PoC (sq mi)	0.2758

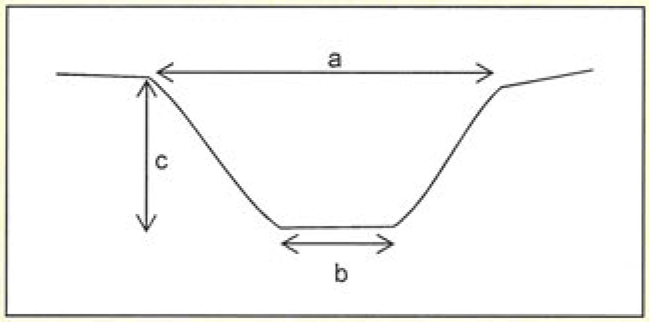
Outputs - Flow control range

Receiving water Q2	2.2	**Point of Compliance low flow rate (cfs)**	**1.1**
Project site Q2	2.2	**Low flow class**	**0.5Q2**
		Channel vulnerability	Low

Critical Flow Calculator

Reach 2 Results

enter all values in green cells
and drop down boxes



Inputs

a) Receiving channel width at top of bank (ft) - see figure on right	300
b) Channel width at bed (ft)	34
c) Bank height at top of bank (ft)	1
Channel gradient (ft/ft)	0.0090
Receiving channel roughness	Sluggish reaches, weedy, deep pools n=0.07

Channel materials (use weakest of bed or banks). If materials are varied use weakest material covering more than 20% of channel.

- unconsolidated sandy loam 0.035 lb/sq ft
- alluvial silt (non coloidal) 0.045 lb/sq ft
- medium gravel 0.12 lb/sq ft
- alluvial silt/clay 0.26 lb/sq ft
- 2.5 inch cobble 1.1 lb/sq ft
- enter own d50 (variable)
- vegetation (bed and banks) 0.6 lb/sq ft

Select method of calculating Q2

- Input own Q2
- Calculate Q2 using USGS regression

Receiving water watershed annual precip (inches)	9.75	Receiving water watershed area at PoC (sq mi)	0.2898
Project watershed annual precipitation (inches)	9.75	Project watershed area draining to PoC (sq mi)	0.2898

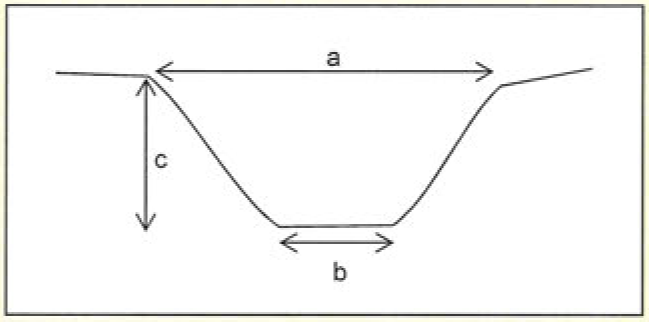
Outputs - Flow control range

Receiving water Q2	2.3	**Point of Compliance low flow rate (cfs)**	**1.1**
Project site Q2	2.3	**Low flow class**	**0.5Q2**
		Channel vulnerability	Low

Critical Flow Calculator

Reach 3 Results

enter all values in green cells
and drop down boxes



Inputs

a) Receiving channel width at top of bank (ft) - see figure on right	21
b) Channel width at bed (ft)	5
c) Bank height at top of bank (ft)	4
Channel gradient (ft/ft)	0.0126
Receiving channel roughness	Same as above, but some weeds and stones n=0.045

Channel materials (use weakest of bed or banks). If materials are varied use weakest material covering more than 20% of channel.

- unconsolidated sandy loam 0.035 lb/sq ft
- alluvial silt (non coloidal) 0.045 lb/sq ft
- medium gravel 0.12 lb/sq ft
- alluvial silt/clay 0.26 lb/sq ft
- 2.5 inch cobble 1.1 lb/sq ft
- enter own d50 (variable)
- vegetation (bed and banks) 0.6 lb/sq ft

Select method of calculating Q2

- Input own Q2
- Calculate Q2 using USGS regression

Receiving water watershed annual precip (inches)	9.75	Receiving water watershed area at PoC (sq mi)	0.2728
Project watershed annual precipitation (inches)	9.75	Project watershed area draining to PoC (sq mi)	0.2728

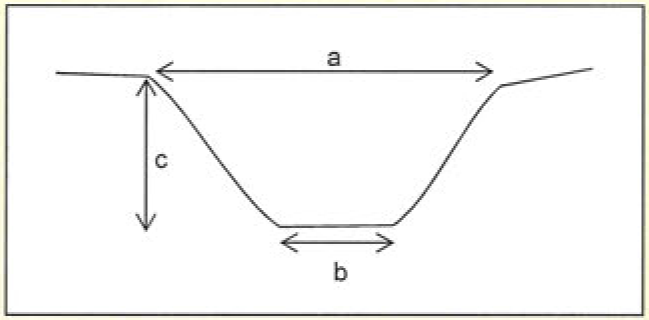
Outputs - Flow control range

Receiving water Q2	2.2	**Point of Compliance low flow rate (cfs)**	**1.1**
Project site Q2	2.2	**Low flow class**	**0.5Q2**
		Channel vulnerability	Low

Critical Flow Calculator

Reach 4 Results

enter all values in green cells
and drop down boxes



Inputs

a) Receiving channel width at top of bank (ft) - see figure on right	60
b) Channel width at bed (ft)	5
c) Bank height at top of bank (ft)	1
Channel gradient (ft/ft)	0.0118
Receiving channel roughness	Same as above, but some weeds and stones n=0.045

Channel materials (use weakest of bed or banks). If materials are varied use weakest material covering more than 20% of channel.

- unconsolidated sandy loam 0.035 lb/sq ft
- alluvial silt (non coloidal) 0.045 lb/sq ft
- medium gravel 0.12 lb/sq ft
- alluvial silt/clay 0.26 lb/sq ft
- 2.5 inch cobble 1.1 lb/sq ft
- enter own d50 (variable)
- vegetation (bed and banks) 0.6 lb/sq ft

Select method of calculating Q2

- Input own Q2
- Calculate Q2 using USGS regression

Receiving water watershed annual precip (inches)	9.75	Receiving water watershed area at PoC (sq mi)	0.2728
Project watershed annual precipitation (inches)	9.75	Project watershed area draining to PoC (sq mi)	0.2728

Outputs - Flow control range

Receiving water Q2	2.2	**Point of Compliance low flow rate (cfs)**	**1.1**
Project site Q2	2.2	**Low flow class**	**0.5Q2**
		Channel vulnerability	Low

STUDY AREA EXHIBIT - OTAY 250

ATTACHMENT 1

Approved December 9, 2011 report
Hydromodification Screening for California Crossings

HYDROMODIFICATION SCREENING

FOR

CALIFORNIA CROSSINGS

(P06-102, TPM 21046, Log No. 93-19-0006AA)

December 9, 2011

REGISTERED PROFESSIONAL ENGINEER
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Exp. 6/30/13
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STATE OF CALIFORNIA

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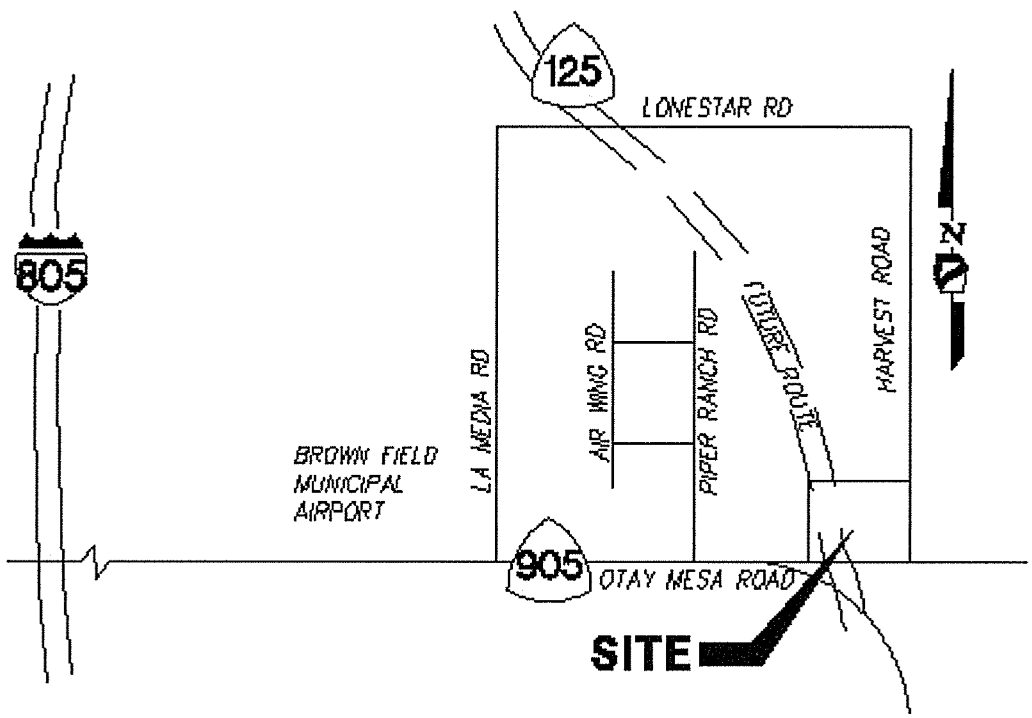
APPENDICES

MAP POCKET

INTRODUCTION

The County of San Diego's March 2011, *Final Hydromodification Management Plan,* and January 8, 2011, *Standard Urban Stormwater Mitigation Plan* (SUSMP) outline low flow thresholds for hydromodification analyses. The thresholds are based on a percentage of the pre-project 2-year flow (Q_2), i.e., $0.1Q_2$ (low), $0.3Q_2$ (medium), or $0.5Q_2$ (high). A threshold of $0.1Q_2$ represents a downstream receiving conveyance system with a high susceptibility to erosion. This is the default value used for hydromodification analyses and will result in the most conservative (greatest) on-site facility sizing. A threshold of $0.3Q_2$ or $0.5Q_2$ represents downstream receiving conveyance systems with a medium or low susceptibility to erosion, respectively. In order to qualify for a medium or low susceptibility rating, a project must perform a channel screening analysis based on a "hydromodification screening tool" procedure developed by the Southern California Coastal Water Research Project (SCCWRP). The SCCWRP results are compared with the critical shear stress calculator results from the County of San Diego's BMP Sizing Calculator to establish the appropriate susceptibility threshold of low, medium, or high.



Vicinity Map

This report provides hydromodification screening analyses for the California Crossings project being designed by Project Design Consultants, which is located immediately northeast of the intersection of Otay Mesa Road and State Route 125 (South Bay Expressway) in the county of San Diego (see the Vicinity Map above as well as the Study Area Exhibit and Site Plan in the map pocket). The site covers over 28 acres and is gently sloping to the south and southwest. The site is currently undeveloped and primarily supports natural vegetation consisting of grasses, weeds, and an isolated area with a stand of cacti. There is some off-site runoff onto the site from the north and east.

Surface runoff from the site and tributary off-site areas generally flows in a southerly to southwesterly direction. The runoff is ultimately collected by a double 6-foot wide by 2-foot high reinforced concrete box culvert at the southwest corner of the site (see the Caltrans plans in the map pocket and Figures 1 and 3). The double box culvert conveys the runoff south across Otay Mesa Road and then outlets onto a concrete apron/drop structure and into a stilling basin with concrete banks and a natural bottom (see Caltrans Plan DD-39 and Figures 1 to 4). A third box culvert also outlets into the stilling basin adjacent to the double box culverts. The runoff is conveyed out of the stilling basin in a westerly direction by a naturally-lined trapezoidal channel (see Figure 4). The channel has a 3 meter (9.8 feet) bottom width, 2 to 1 (horizontal to vertical) side slopes, and 1.2 to 2.2 meter (3.9 to 7.2 foot) height. The trapezoidal channel continues west for over 270 feet, bends towards the south through a 50 meter (164 foot) radius, then continues south for approximately 335 feet. Per the Caltrans plans, the southerly segment of the channel gradually widens from 3 to 15 meters (49 feet) and the height steadily decreases from 1.2 to 0 meters. As runoff exits the south end of the channel it spreads broadly over the natural ground surface.

The SCCWRP screening tool requires both office and field work to establish the vertical and lateral susceptibility of a downstream receiving channel to erosion. The vertical and lateral assessments are performed independently of each other although the lateral results can be affected by the vertical rating. A screening analysis was performed to assess the low flow threshold for the point of compliance, which is at the outlet of the box culverts into the stilling basin.

The initial step in performing the SCCWRP screening analysis is to establish the domain of analysis and the study reaches within the domain. This is followed by office and field components of the screening tool along with the associated analyses and results. The following sections cover these procedures in sequence.

DOMAIN OF ANALYSIS

SCCWRP defines an upstream and downstream domain of analysis, which establish the study limits. The County of San Diego's HMP specifies the downstream domain of analysis based on the SCCWRP criteria. The HMP indicates that the downstream domain is the first point where one of these is reached:

- at least one reach downstream of the first grade control point
- tidal backwater/lentic waterbody
- equal order tributary
- accumulation of 50 percent drainage area for stream systems or 100 percent drainage area for urban conveyance systems (storm drains, hardened channels, etc.)

The upstream limit is defined as:

- proceed upstream for 20 channel top widths or to the first grade control point, whichever comes first. Identify hard points that can check headward migration and evidence of active headcutting.

SCCWRP defines the maximum spatial unit, or reach (a reach is circa 20 channel widths), for assigning a susceptibility rating within the domain of analysis to be 200 meters (656 feet). If the domain of analysis is greater than 200 meters, the study area should be subdivided into smaller reaches of less than 200 meters for analysis. Most of the units in the HMP's SCCWRP analysis are metric. Metric units are used in this report only where given so in the HMP or Caltrans plans. Otherwise English units are used.

Downstream Domain of Analysis
The downstream domain of analysis for the study area has been determined by assessing and comparing the four bullet items above. The project runoff will discharge into a double box culvert that outlets into a stilling basin. The stilling basin is the point of compliance (POC) and seen in Figure 4. The downstream domain of analysis will be selected below this POC.

Per the first bullet item, the first permanent grade control below the box culvert discharge point is a riprap grade control just at the outlet of the stilling basin (see Caltrans Plan DD-39). Sediment has deposited over and buried a portion of the riprap. The downstream domain of analysis based on the first bullet item will be one reach (656 feet) downstream of the riprap grade control.

The second bullet item is the tidal backwater or lentic (standing or still water such as ponds, pools, marshes, lakes, etc.) waterbody location. The outlet of the trapezoidal channel discharges onto a broad ground surface that forms a lentic waterbody. The lentic area is seen in the Study Area Exhibit as the patch of green marshy vegetation surrounded by the brown upland-type areas and graded areas. Ponded water is evident in portions of the green marsh. Figures 10 through 12 also show the lentic waterbody, but the vegetation is brown since the photographs were taken in the fall. The southerly and westerly perimeter of the lentic waterbody is surrounded by an earthen berm and/or fencing, which confines surface flow and maintains the lentic feature of this marsh area.

The final two bullet items are related to the tributary drainage area. The drainage area encompassing the site, its tributary off-site area, and the trapezoidal channel are delineated on the Study Area Exhibit and covers over 85 acres. The trapezoidal channel discharges directly into the lentic waterbody. As a result, a 50 percent or equal order (100 percent) tributary does not apply because the downstream domain of analysis for the 85 acre area will not extend beyond the lentic waterbody, i.e., the downstream domain of analysis stops at the lentic waterbody, which occurs before an equal order tributary is reached.

Based on the above information, the lentic water body just beyond the end of the trapezoidal channel was selected as the downstream domain of analysis point for the POC. The downstream domain of analysis could have been selected as one reach downstream of the riprap grade control located at the stilling basin outlet. However, the lentic waterbody was chosen because it is somewhat more conservative, i.e., a longer study reach is analyzed.

Upstream Domain of Analysis
The aforementioned box culverts outlet into the uppermost end of the receiving trapezoidal channel. Since the channel does not extend upstream of the box culverts, the upstream domain of analysis location will be at the stilling basin. The concrete bank of the stilling basin also satisfies the definition of the upstream domain of analysis location because it is essentially a grade control that checks headward migration of the natural channel.

Study Reaches within Domain of Analysis
The entire domain of analysis extends along the trapezoidal channel from the stilling basin to the lentic waterbody. The total domain of analysis covers approximately 870 feet. The domain of analysis was subdivided into two study reaches with similar characteristics (see the Study Area Exhibit). Reach 1 (upper reach) is just over 620 feet long with a constant bottom width and side slopes, and extends from the POC to where the trapezoidal channel begins to taper out. Reach 2 (lower reach) is nearly 250 feet long and continues from the beginning of the taper to the lentic waterbody. Each reach is within the 656 feet maximum reach length specified by SCCWRP.

INITIAL DESKTOP ANALYSIS

After the domain of analysis is established, SCCWRP requires an "initial desktop analysis" that involves office work. The initial desktop analysis establishes the watershed area, mean annual precipitation, valley slope, and valley width. These terms are defined in Form 1, which is included in Appendix A. SCCWRP recommends the use of National Elevation Data (NED) to determine the watershed area, valley slope, and valley width. The NED data is similar to USGS mapping, so it is not very detailed. For this report, Caltrans' as-built design drawings were used for the trapezoidal channel, while 1-foot contour interval topographic mapping prepared for the project was used for the project and surrounding area. A site investigation was performed that confirmed the accuracy of these sources. In addition, PDC provided their most up-to-date engineering drawings for the proposed development.

The watershed area tributary to the proposed project was established by the post-project hydrologic analysis by PDC. The PDC watershed was delineated using the 1-foot contour interval topographic mapping, their post-project engineering plans, and Caltrans' as-built plans. This watershed area is included on the Study Area Exhibit. The watershed area was extended downstream to include Reaches 1 and 2. The areas extended downstream were also based on the topographic mapping and Caltrans plan. A site investigation was performed to delineate part of the southeasterly portion of the watershed because recent topographic mapping was not available for this area. Based on the watershed delineations, the drainage areas tributary to the downstream end of Reaches 1 and 2 are 85.17 and 85.59 acres (0.1331 and 0.1337 square miles), respectively.

The mean annual precipitation was obtained from the closest rain gage to the site with extensive historic data. This was the Western Regional Climate Center's Chula Vista gage (see Appendix

A). The average rainfall measured at this gage for the period of record from 1918 to 2010 is 9.75 inches.

The valley slope of Reaches 1 and 2 were determined from the Caltrans' as-built drawings for the trapezoidal channel. The valley slope is the longitudinal slope of the channel bed along the flow line, so it is determined by dividing the elevation difference within a reach by the flow path. The valley width is the bottom width of the trapezoidal channel. The valley width within Reach 1 is constant. The valley width with Reach 2 gradually tapers out as the channel extends to the south. The valley slope and valley width within each reach are summarized in Table 1.

Reach	Valley Slope, m/m	Valley Width, m
1	0.0056	3
2	0.0056	3 to 15

Table 1. Summary of Valley Slope and Valley Width

These values were input to a spreadsheet to calculate the simulated peak flow, screening index, and valley width index outlined in Form 1. The input data and results are tabulated in Appendix A. The analysis for Reach 2 was based on the average channel width within the taper which is 9 meters. This completes the initial desktop analysis.

FIELD SCREENING

After the initial desktop analysis is complete, a field assessment must be performed. The field assessment is used to establish a natural channel's vertical and lateral susceptibility to erosion. SCCWRP states that although they are admittedly linked, vertical and lateral susceptibility are assessed separately for several reasons. First, vertical and lateral responses are primarily controlled by different types of resistance, which, when assessed separately, may improve ease of use and lead to increased repeatability compared to an integrated, cross-dimensional assessment. Second, the mechanistic differences between vertical and lateral responses point to different modeling tools and potentially different management strategies. Having separate screening ratings may better direct users and managers to the most appropriate tools for subsequent analyses.

The field screening tool uses combinations of decision trees and checklists. Decision trees are typically used when a question can be answered fairly definitively and/or quantitatively (e.g., d_{50} < 16 mm). Checklists are used where answers are relatively qualitative (e.g., the condition of a grade control). Low, medium, high, and very high ratings are applied separately to the vertical and lateral analyses. When the vertical and lateral analyses return divergent values, the most conservative value shall be selected as the flow threshold for the hydromodification analyses.

Vertical Stability

The purpose of the vertical stability decision tree (Figure 6-4 in the County of San Diego HMP) is to assess the state of the channel bed with a particular focus on the risk of incision (i.e., down cutting). The decision tree is included in Figure 16. The first step is to assess the channel bed resistance. There are three categories defined as follows:

1. Labile Bed – sand-dominated bed, little resistant substrate.

2. Transitional/Intermediate Bed – bed typically characterized by gravel/small cobble, Intermediate level of resistance of the substrate and uncertain potential for armoring.

3. Threshold Bed (Coarse/Armored Bed) – armored with large cobbles or larger bed material or highly-resistant bed substrate (i.e., bedrock).

Figures 13 and 14 show photographs of the bed material within the study reach. A gravelometer is included in the photographs for reference. Each square on the gravelometer indicates grain size in millimeters (the squares range from 2 mm to 180 mm). Based on the photographs and site investigation, the bed material and resistance is generally within the transitional/intermediate bed category. There was no evidence of a threshold bed condition. However, some bed areas contained smaller grain sizes typically found in a labile bed. A pebble count was performed (see discussion near the end of this section) that determined the median (d_{50}) bed material size to be 8 millimeters (mm) in Reach 1 and 2. Figure 6-4 in the County HMP indicates that a d_{50} less than 16 mm is within the labile bed category. The figure also identifies that the bed material in a labile bed is "loosely-packed." Although the Reach 1 and 2 channels have an 8 mm median size, the channels do not meet the criteria of containing loosely-packed material. The channels were engineered and were as-built by Caltrans in 2010 (see attached Caltrans plans). As a result, the channels were designed and compacted in accordance with established engineering and construction standards.

In addition to the material size and compaction, there are several factors that establish the erodibility of a channel such as the flow rate (i.e., size of the tributary area), grade controls, channel slope, vegetative cover, channel planform, etc. The Introduction of the SCCWRP *Hydromodification Screening Tools: Field Manual* identifies several of these factors. When multiple factors influence erodibility, it is appropriate to perform the more detailed SCCWRP analysis, which is to analyze a channel according to SCCWRP's transitional/intermediate bed procedure. This requires the most rigorous steps and will generate the appropriate results given the range of factors that define erodibility. The transitional/intermediate bed procedure takes into account that bed material may fall within the labile category (the bed material size is used in SCCWRP's Form 3 Figure 4), but other factors may trend towards a less erodible condition. Dr. Eric Stein from SCCWRP, who co-authored the *Hydromodification Screening Tools: Field Manual* in the *Final Hydromodification Management Plan* (HMP), indicated that it would be appropriate to analyze channels with multiple factors that impact erodibility using the transitional/intermediate bed procedure. Consequently, this procedure was used to produce more accurate results.

Transitional/intermediate beds cover a wide susceptibility/potential response range and need to be assessed in greater detail to develop a weight of evidence for the appropriate screening rating. The three primary risk factors used to assess vertical susceptibility for channels with transitional/intermediate bed materials are:

1. Armoring potential – three states (Checklist 1)

2. Grade control – three states (Checklist 2)

3. Proximity to regionally-calibrated incision/braiding threshold (Mobility Index Threshold – Probability Diagram)

These three risk factors are assessed using checklists and a diagram (see Appendix B), and the results of each are combined to provide a final vertical susceptibility rating for the intermediate/transitional bed-material group. Each checklist and diagram contains a Category A, B, or C rating. Category A is the most resistant to vertical changes while Category C is the most susceptible.

Checklist 1 determines armoring potential of the channel bed. The channel bed along each of the two reaches is within Category B, which represents intermediate bed material within unknown armoring potential due to a surface veneer and dense vegetation. The soil was probed and penetration was relatively difficult through the underlying layer. This resistant layer is likely because the channel was recently constructed as an engineered channel.

Checklist 2 determines grade control characteristics of the channel bed. This is based on the spacing of the grade controls. Category A on Checklist 2 is based on a spacing of $2/S_v$. S_v is 0.0056 from the Form 1 analysis in Appendix A, so $2/S_v$ is 357 meters or 1,171 feet. There is a riprap grade control at the upper end of Reach 1, but this only prevents scour protection for the upstream stilling basin. The lentic waterbody is considered to be a grade control for Reach 1 and 2 because the ponded water will prevent upstream headcutting. If water ponds up high enough within the lentic waterbody, the release point is through a riprap-lined spillway located near the southeast corner of the lentic waterbody (see the Study Area Exhibit and Figure 15). The riprap-lined spillway is another grade control. The total length of Reaches 1 and 2 are approximately 620 and 250 feet, respectively (870 feet total). The additional distance to the spillway is 300 feet or 1,170 feet total. These lengths are less than $2/S_v$ so both reaches are within Category A on Checklist 2. A field walk along the study area did not reveal evidence of headcutting or mass wasting (see figures), so the grade controls are effective.

The Mobility Index Threshold is a probability diagram that depicts the risk of incising or braiding based on the potential stream power of the valley relative to the median particle diameter. The threshold is based on regional data from Dr. Howard Chang of Chang Consultants and others. The probability diagram is based on d_{50} as well as the Screening Index determined in the initial desktop analysis (see Appendix A). d_{50} is derived from a pebble count in which a minimum of 100 particles are obtained along transects at the site. SCCRWP states that if fines less than ½-inch thick are at a sample point, it is appropriate to sample the coarser buried substrate. The d_{50} value is the particle size in which 50 percent of the particles are smaller and 50 percent are larger. The pebble count results for Reach 1 and 2 are included in Appendix B. The results show a d_{50} of 8 millimeters for each area. The screening index for Reach 1 and 2 are tabulated in Appendix A. Plotting the d_{50} and screening index values on the Mobility Index

Threshold diagram shows that both Reach 1 and 2 have a less than 50 percent probability of incising or braiding (even less than 10 percent), which falls within Category A.

The overall vertical rating is determined from the Checklist 1, Checklist 2, and Mobility Index Threshold results. The scoring is based on the following values:

Category A = 3, Category B = 6, Category C = 9

The vertical rating score is based on these values and the equation:

$$\begin{aligned}\text{Vertical Rating} &= [(\text{armoring} \times \text{grade control})^{1/2} \times \text{screening index score}]^{1/2} \\ &= [(6 \times 3)^{1/2} \times 3]^{1/2} \\ &= 3.6\end{aligned}$$

Since the vertical rating is less than 4.5, each reach has a low threshold for vertical susceptibility.

Lateral Stability

The purpose of the lateral decision tree (Figure 6-5 from County of San Diego HMP included in Figure 17) is to assess the state of the channel banks with a focus on the risk of widening. Channels can widen from either bank failure or through fluvial processes such as chute cutoffs, avulsions, and braiding. Widening through fluvial avulsions/active braiding is a relatively straightforward observation. If braiding is not already occurring, the next logical step is to assess the condition of the banks. Banks fail through a variety of mechanisms; however, one of the most important distinctions is whether they fail in mass (as many particles) or by fluvial detachment of individual particles. Although much research is dedicated to the combined effects of weakening, fluvial erosion, and mass failure, SCCWRP found it valuable to segregate bank types based on the inference of the dominant failure mechanism (as the management approach may vary based on the dominant failure mechanism). A decision tree (Form 4 in Appendix B) is used in conducting the lateral susceptibility assessment. Definitions and photographic examples are also provided below for terms used in the lateral susceptibility assessment.

The first step in the decision tree is to determine if lateral adjustments are occurring. The adjustments can take the form of extensive mass wasting (greater than 50 percent of the banks are exhibiting planar, slab, or rotational failures and/or scalloping, undermining, and/or tension cracks). The adjustments can also involve extensive fluvial erosion (significant and frequent bank cuts on over 50 percent of the banks). Neither mass wasting nor extensive fluvial erosion was evident within any of the reaches during a field investigation. The banks are intact in the photographs included in the figures. The relatively uniform vegetative cover on the banks is evidence of the absence of large lateral adjustments.

The next step in the Form 4 decision tree is to assess the consolidation of the bank material. The banks were moderate to well-consolidated. This determination was made because the banks were difficult to penetrate with a probe. In addition, the banks showed limited evidence of crumbling and were composed of well-packed particles (see figures). This is likely due to the fact that the channel was recently constructed by Caltrans in accordance with engineering standards for compaction and stability.

Form 6 (see Appendix B) is used to assess the probability of mass wasting. Form 6 identifies a 10, 50, and 90 percent probability based on the bank angle and bank height. The Caltrans as-built drawings indicate that the trapezoidal channel was constructed with bank angles having a 2 to 1 (horizontal to vertical) slope or 26.6 degrees. Form 6 shows that the probably of mass wasting and bank failure has less than 10 percent risk for a 26.6 degree bank angle or less regardless of the bank height.

The final two steps in the Form 4 decision tree are based on the braiding risk determined from the vertical rating as well as the Valley Width Index (VWI) calculated in Appendix A. If the vertical rating is high, the braiding risk is considered to be greater than 50 percent. Excessive braiding can lead to lateral bank failure. For the Reaches 1 and 2 the vertical rating is low, so the braiding risk is less than 50 percent. Furthermore, a VWI greater than 2 represents channels unconfined by bedrock or hillslope and, hence, subject to lateral migration. The VWI calculations in the spreadsheet in Appendix A show that the VWI for each reach is less than 2.

From the above steps, the lateral susceptibility rating is low (red circles are included on the Form 4: Lateral Susceptibility Field Sheet decision tree in Appendix B showing the decision path).

CONCLUSION

The SCCWRP channel screening tools were used to assess the downstream channel susceptibility for the California Crossings project. The project runoff will be collected by existing double box culverts at the southwesterly corner of the site. The box culverts cross Otay Mesa Road and discharge into an existing stilling basin. This is the point of compliance. A naturally-lined trapezoidal channel conveys the runoff in a westerly to southerly direction and into a lentic waterbody. The downstream channel assessment for the trapezoidal channel was performed based on office analyses and field work. The results indicate a low threshold for vertical and lateral susceptibilities for the two study reaches.

The HMP requires that these results be compared with the critical stress calculator results incorporated in the County of San Diego's BMP Sizing Calculator. The BMP Sizing Calculator critical stress results are included in Appendix B for Reach 1 and 2. Based on these values, the critical stress results returned a low threshold. Therefore, the SCCWRP analyses and critical stress calculator demonstrate that the project can be designed assuming a low susceptibility to erosion, i.e., $0.5Q_2$.

Figure 1. Box Culvert Outlets into Stilling Basin

Figure 2. Stilling Basin (Box Culverts to Left of Photograph)

Figure 3. Box Culverts and Stilling Basin (Site is Behind Upper Road)

Figure 4. Looking Downstream (West) at Stilling Basin and into Upper End of Reach 1 (Point of Compliance Begins Here)

Figure 5. Looking Upstream (East) Towards Upper End of Reach 1

Figure 6. Looking Downstream (West) Towards East-West Segment of Reach 1

Figure 7. Looking Downstream (West) Towards East-West Segment of Reach 1Approaching Bend

Figure 8. Looking West Towards Beginning of Bend in Reach 1

Figure 9. Looking Upstream (North) Towards North-South Segment of Reach 1

Figure 10. Looking Downstream (South) Towards Reach 2 and Lentic Waterbody

Figure 11. Looking West Towards Lentic Waterbody

Figure 12. Looking South within Lentic Waterbody

Figure 13. Gravelometer on Channel Bed Near Upstream End of Study Area

Figure 14. Gravelometer on Channel Bed Near Downstream End of Study Area

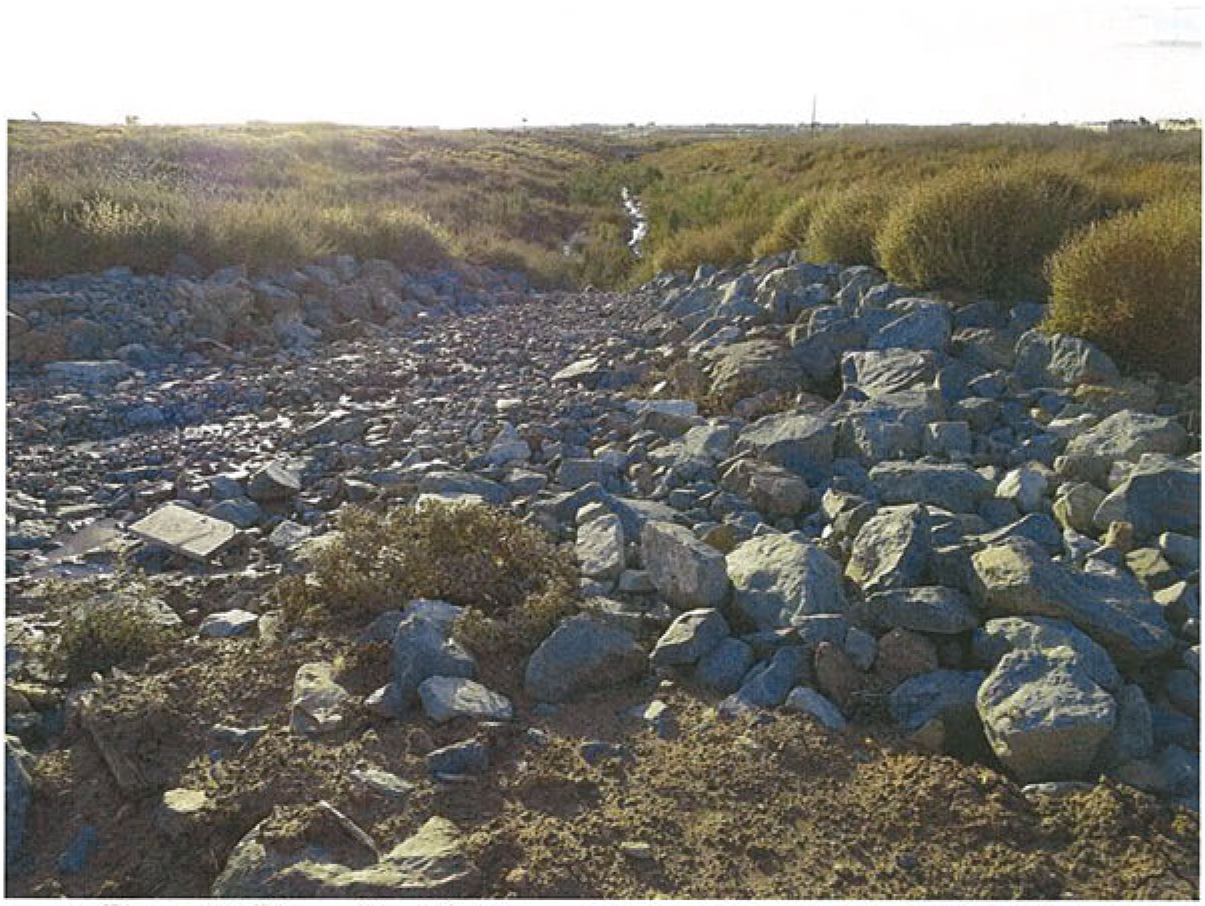


Figure 15. Riprap-Lined Spillway at Southeast corner of Lentic Waterbody

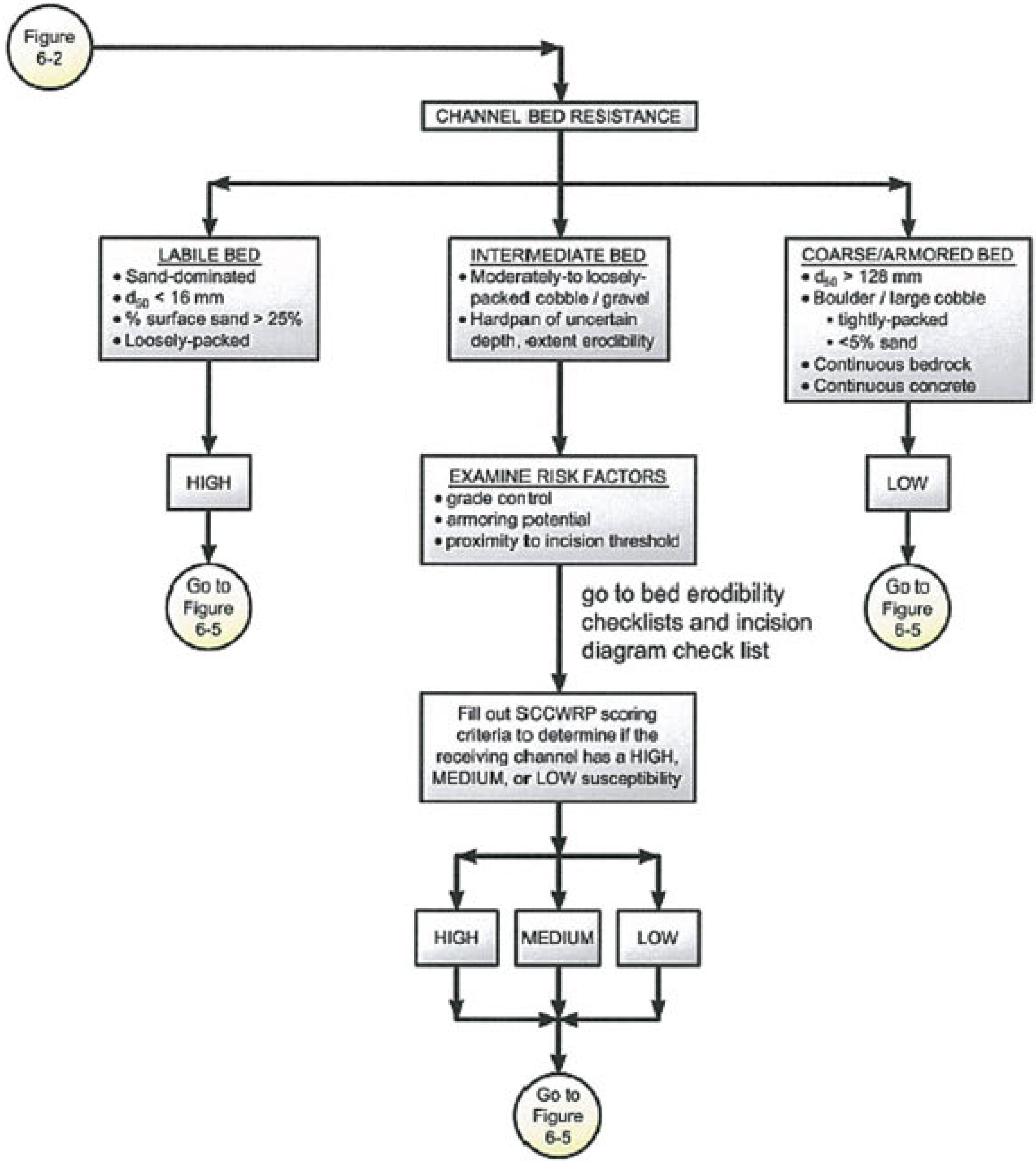


Figure 6-4. SCCWRP Vertical Susceptibility

Figure 16. SCCWRP Vertical Channel Susceptibility Matrix

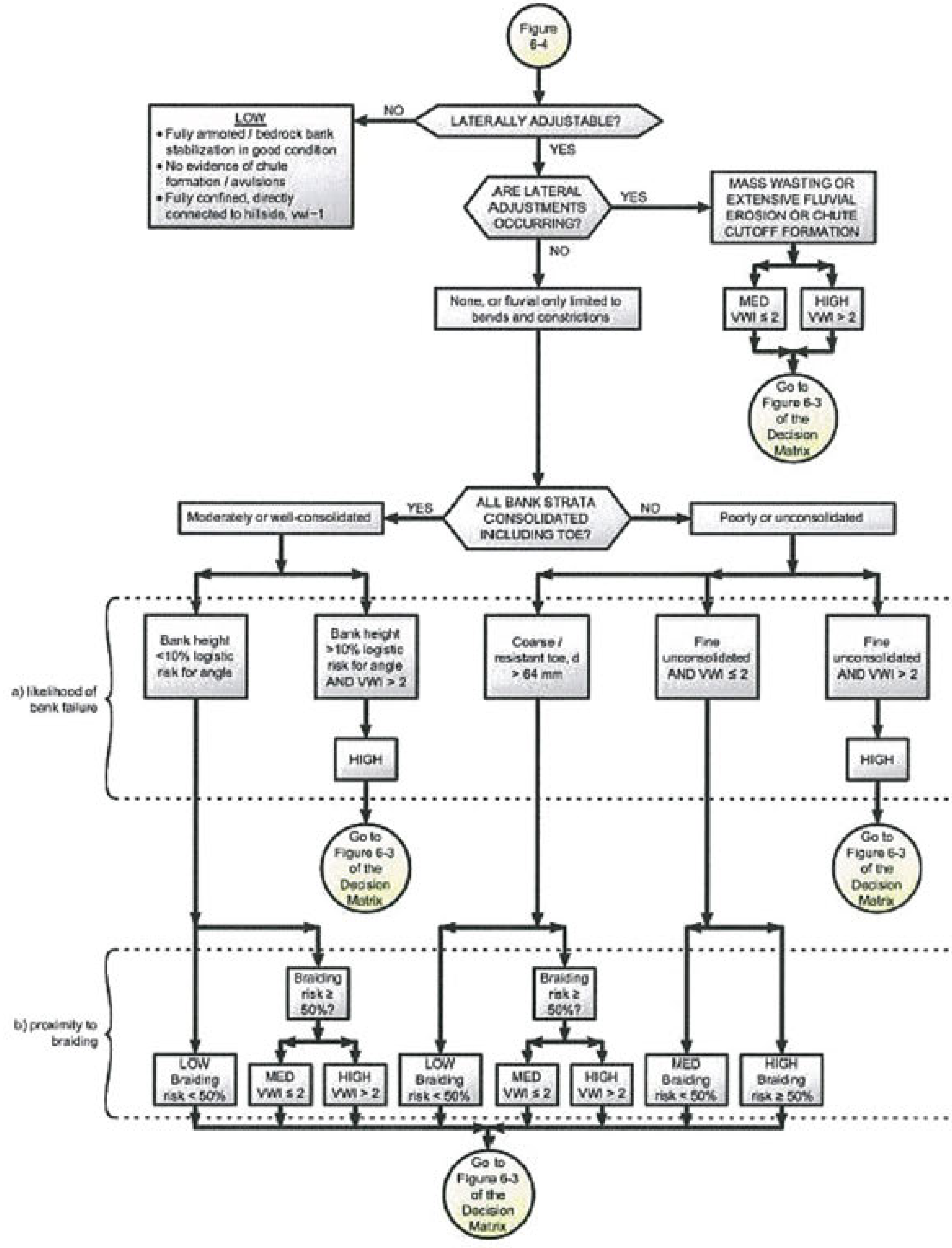


Figure 6-5. Lateral Channel Susceptibility

Figure 17. SCCWRP Lateral Channel Susceptibility Matrix

APPENDIX A

SCCWRP INITIAL DESKTOP ANALYSIS

FORM 1: INITIAL DESKTOP ANALYSIS

Complete all shaded sections.

IF required at multiple locations, circle one of the following site types:

Applicant Site / Upstream Extent / Downstream Extent

Location: Latitude: 32.5693 Longitude: -116.9475

Description (river name, crossing streets, etc.): Near intersection of Otay Mesa Road and State Route 125 (South Bay Expressway)

GIS Parameters: The International System of Units (SI) is used throughout the assessment as the field standard and for consistency with the broader scientific community. However, as the singular exception, US Customary units are used for contributing drainage area (A) and mean annual precipitation (P) to apply regional flow equations after the USGS. See SCCWRP Technical Report 607 for example measurements and "Screening Tool Data Entry.xls" for automated calculations.

Form 1 Table 1. Initial desktop analysis in GIS.

Symbol		Variable	Description and Source	Value
Watershed properties (English units)	A	Area (mi^2)	Contributing drainage area to screening location via published Hydrologic Unit Codes (HUCs) and/or ≤ 30 m National Elevation Data (NED), USGS seamless server	See attached Form 1 table on next page for calculated values for each reach.
	P	Mean annual precipitation (in)	Area-weighted annual precipitation via USGS delineated polygons using records from 1900 to 1960 (which was more significant in hydrologic models than polygons delineated from shorter record lengths)	
Site properties (SI units)	S_v	Valley slope (m/m)	Valley slope at site via NED, measured over a relatively homogenous valley segment as dictated by hillslope configuration, tributary confluences, etc., over a distance of up to ~500 m or 10% of the main-channel length from site to drainage divide	
	W_v	Valley width (m)	Valley bottom width at site between natural valley walls as dictated by clear breaks in hillslope on NED raster, irrespective of potential armoring from floodplain encroachment, levees, etc. (imprecise measurements have negligible effect on rating in wide valleys where VWI is >> 2, as defined in lateral decision tree)	

Form 1 Tabl e 2. Simplif ied peak flo w, screening index, and valley width index. Values for this table should be calculated in the sequence shown in this table, using values from Form 1 Table 1.

Symbol	Dependent Variable	Equation	Required Units	Value
Q_{10cfs}	10-yr peak flow (ft^3/s)	$Q_{10cfs} = 18.2 * A^{0.87} * P^{0.77}$	A (mi^2) P (in)	See attached Form 1 table on next page for calculated values for each reach.
Q_{10}	10-yr peak flow (m^3/s)	$Q_{10} = 0.0283 * Q_{10cfs}$	Q_{10cfs} (ft^3/s)	
INDEX	10-yr screening index ($m^{1.5}/s^{0.5}$)	$INDEX = S_v * Q_{10}^{0.5}$	Sv (m/m) Q_{10} (m^3/s)	
W_{ref}	Reference width (m)	$W_{ref} = 6.99 * Q_{10}^{0.438}$	Q_{10} (m^3/s)	
VWI	Valley width index (m/m)	$VWI = W_v/W_{ref}$	W_v (m) W_{ref} (m)	

(Sheet 1 of 1)

SCCWRP FORM 1 ANALYSES

Reach	Area A, sq. mi.	Mean Annual Precip. P, inches	Valley Slope Sv, m/m	Valley Width Wv, m	10-Year Flow Q10cfs, cfs	10-Year Flow Q10, cms
1	0.13	9.75	0.0056	3	18	0.5
2	0.13	9.75	0.0056	9	18	0.5

Reach	10-Year Screening Index INDEX	Reference Width Wref, m	Valley Width Index VWI, m/m
1	0.0041	5.22	0.57
2	0.0041	5.15	1.75

CHULA VISTA, CALIFORNIA (041758)

Period of Record Monthly Climate Summary

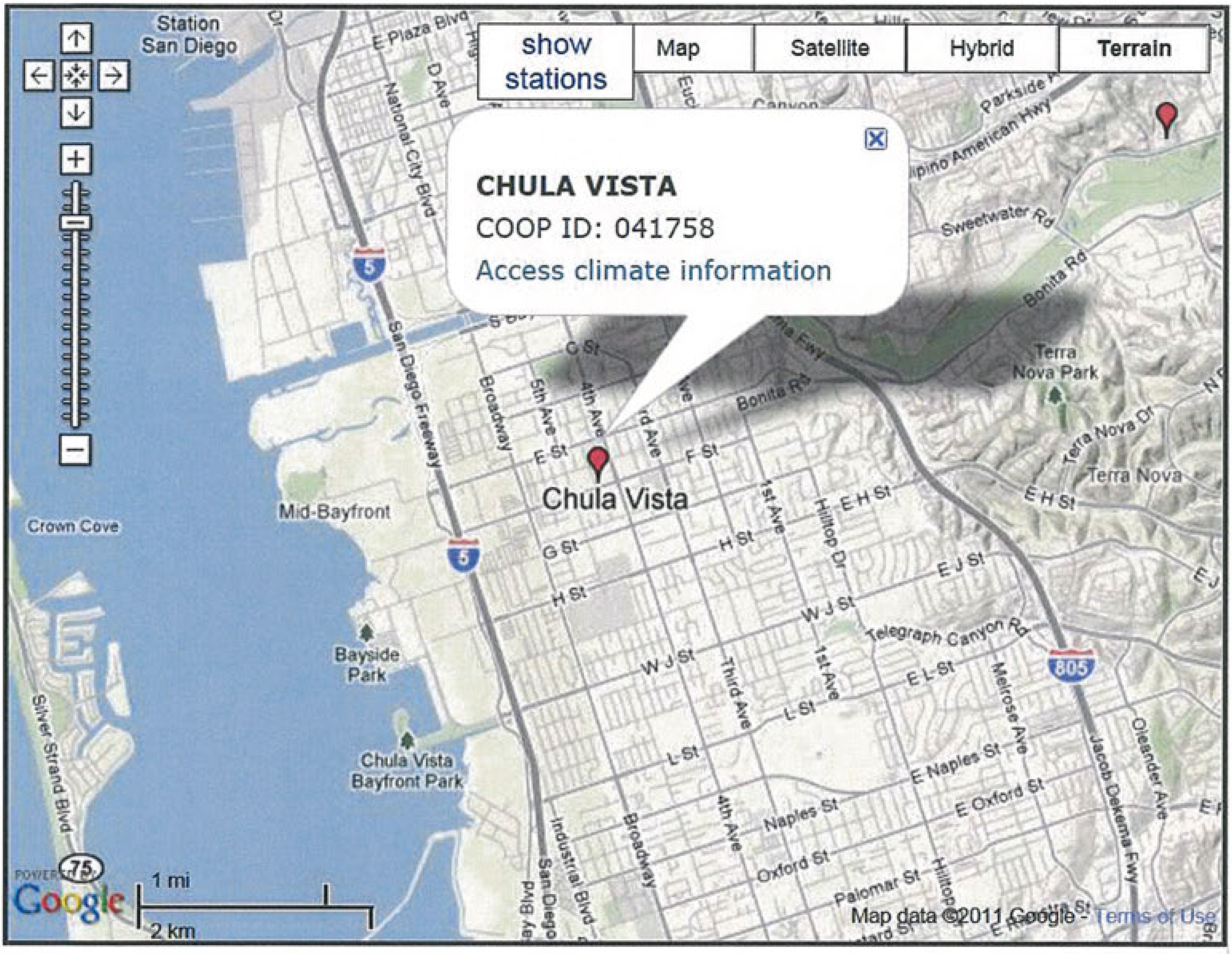
Period of Record : 9/ 1/1918 to 12/31/2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	64.1	64.5	64.7	65.9	67.2	68.9	72.5	74.1	74.0	71.7	69.0	65.1	68.5
Average Min. Temperature (F)	43.7	45.7	48.3	51.6	56.0	59.1	63.0	64.2	61.6	55.8	48.5	44.6	53.5
Average Total Precipitation (in.)	1.78	1.92	1.61	0.82	0.21	0.05	0.02	0.06	0.17	0.51	0.95	1.64	9.75
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 93.2% Min. Temp.: 93.1% Precipitation: 98.7% Snowfall: 98.8% Snow Depth: 98.6%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Western US COOP Station Map



APPENDIX B

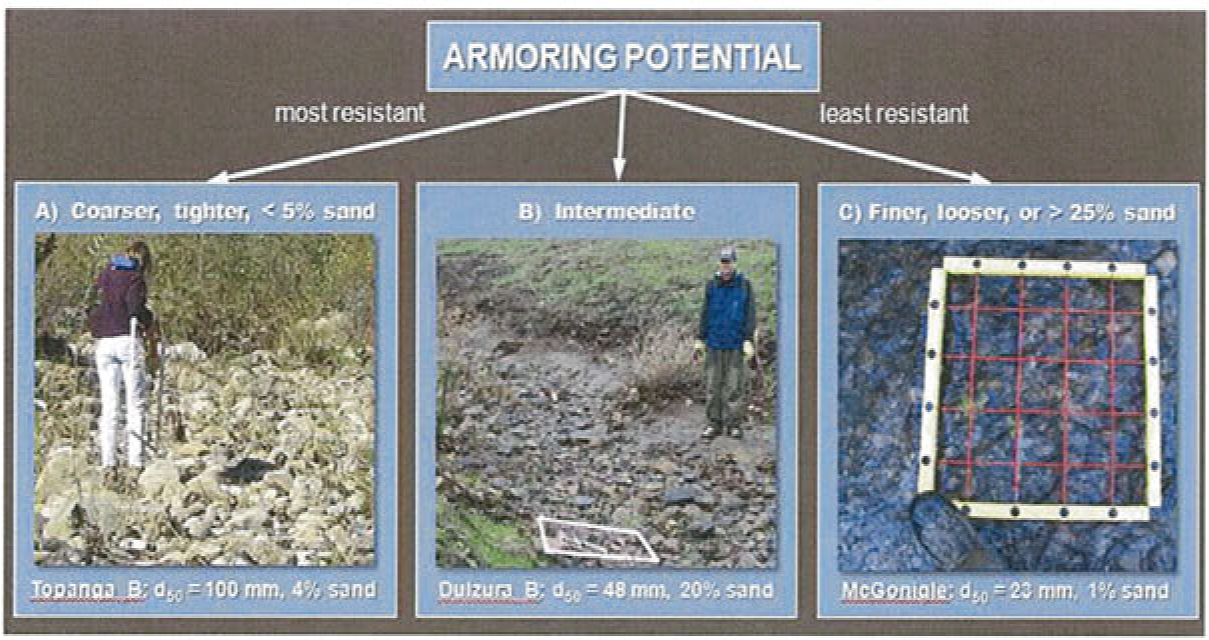
SCCWRP FIELD SCREENING DATA

Form 3 Support Materials

Form 3 Checklists 1 and 2, along with information recording in Form 3 Table 1, are intended to support the decisions pathways illustrated in Form 3 Overall Vertical Rating for Intermediate/Transitional Bed.

Form 3 Checklist 1: Armoring Potential

☐	A	A mix of coarse gravels and cobbles that are tightly packed with <5% surface material of diameter <2 mm
X	B	Intermediate to A and C or hardpan of unknown resistance, spatial extent (longitudinal and depth), or unknown armoring potential due to surface veneer covering gravel or coarser layer encountered with probe
☐	C	Gravels/cobbles that are loosely packed or >25% surface material of diameter <2 mm



Form 3 Figure 2. Armoring potential photographic supplement for assessing intermediate beds ($16 < d_{50} < 128$ mm) to be used **in conjunction with Form 3 Checklist 1.**

(Sheet 2 of 4)

REACH 1 AND 2 RESULTS

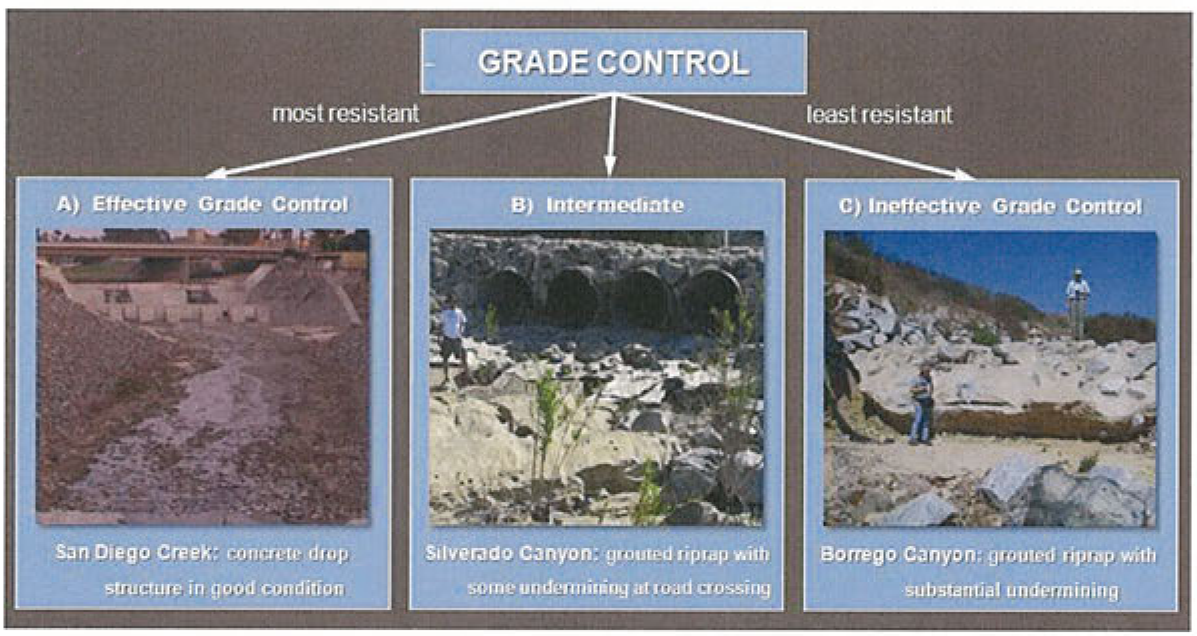
Form 3 Checklist 2: Grade Control

x A Grade control is present with spacing <50 m or $2/S_v$ m

- No evidence of failure/ineffectiveness, e.g., no headcutting (>30 cm), no active mass wasting (analyst cannot say grade control sufficient if mass-wasting checklist indicates presence of bank failure), no exposed bridge pilings, no culverts/structures undermined
- Hard points in serviceable condition at decadal time scale, e.g., no apparent undermining, flanking, failing grout
- If geologic grade control, rock should be resistant igneous and/or metamorphic; For sedimentary/hardpan to be classified as 'grade control', it should be of demonstrable strength as indicated by field testing such as hammer test/borings and/or inspected by appropriate stakeholder

□ B Intermediate to A and C – artificial or geologic grade control present but spaced 2/Sv m to 4/Sv m or potential evidence of failure or hardpan of uncertain resistance

□ C Grade control absent, spaced >100 m or >$4/S_v$ m, or clear evidence of ineffectiveness



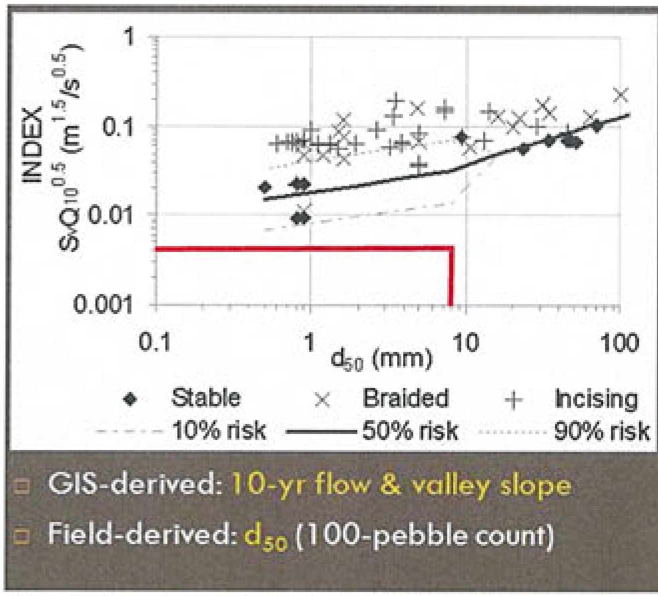
Form 3 Figure 3. Grade-control (condition) photographic supplement for assessing intermediate beds (16 < d_{50} < 128 mm) to be used in conjunction with Form 3 Checklist 2.

(Sheet 3 of 4)

REACH 1 AND 2 RESULTS

Regionally-Calibrated Screening Index Threshold for Incising/Braiding

For transitional bed channels (d_{50} between 16 and 128 mm) or labile beds (channel not incised past critical bank height), use Form 3 Figure 3 to determine Screening Index Score and complete Form 3 Table 1.



Model Type	d_{50} (mm)	50% Risk $S_vQ_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$)
Logistic Regression $d_{50} \geq 16$ mm	128	0.145
	96	0.125
	80	0.114
	64	0.101
	48	0.087
	32	0.070
	16	0.049
Logistic Reg. $d_{50} < 16$ mm	8	0.031
	4	0.026
	2	0.022
	1	0.018
	0.5	0.015

Form 3 Figure 4. Probability of incising/braiding based on logistic regression of Screening Index and d_{50} to be used in conjunction with Form 3 Table 1.

Form 3 Table 1. Values for Screening Index Threshold (probability of incising/braiding) to be used in conjunction with Form 3 Figure 4 (above) to complete Form 3 Overall Vertical Rating for Intermediate/Transitional Bed (below).. Screening Index Score: A = <50% probability of incision for current Q_{10}, valley slope, and d_{50}; B = Hardpan/d_{50} indeterminate; and C = $\geq$50% probability of incising/braiding for current Q_{10}, valley slope, and d_{50}.

d_{50} (mm) *From Form 2*	$S_v{*}Q_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$) *From Form 1*	$S_v{*}Q_{10}^{0.5}$ ($m^{1.5}/s^{0.5}$) *50% risk of incising/braiding from table in Form 3 Figure 3 above*	Screening Index Score (A, B, C)

Overall Vertical Rating for Intermediate/Transitional Bed

Calculate the overall Vertical Rating for Transitional Bed channels using the formula below. Numeric values for responses to Form 3 Checklists and Table 1 as follows: A = 3, B = 6, C = 9.

$$Vertical\ Rating = \sqrt{\{(\sqrt{armoring * grade\ control}) * screening\ index\ score\}}$$

6 x 3 x 3 = 3.6

Vertical Susceptibility based on Vertical Rating: <4.5 = LOW; 4.5 to 7 = MEDIUM; and >7 = HIGH.

(Sheet 4 of 4)

REACH 1 AND 2 RESULTS

Pebble Count

#	Reach 1 diameter, mm	Reach 2 diameter, mm
1	2	2
2	2	2
3	2	2
4	2	2
5	2	2
6	2	2
7	2	2
8	2	2
9	2	2
10	2	2
11	2	2
12	2	2
13	2	2
14	2	2
15	2	2
16	2	2.8
17	2.8	2.8
18	2.8	2.8
19	2.8	2.8
20	2.8	2.8
21	2.8	2.8
22	2.8	2.8
23	2.8	2.8
24	2.8	2.8
25	2.8	2.8
26	2.8	2.8
27	2.8	2.8
28	2.8	2.8
29	2.8	2.8
30	2.8	2.8
31	2.8	2.8
32	2.8	2.8
33	2.8	4
34	2.8	4
35	2.8	4
36	2.8	4
37	4	4
38	4	4
39	4	4
40	4	4
41	4	5.6

Pebble Count

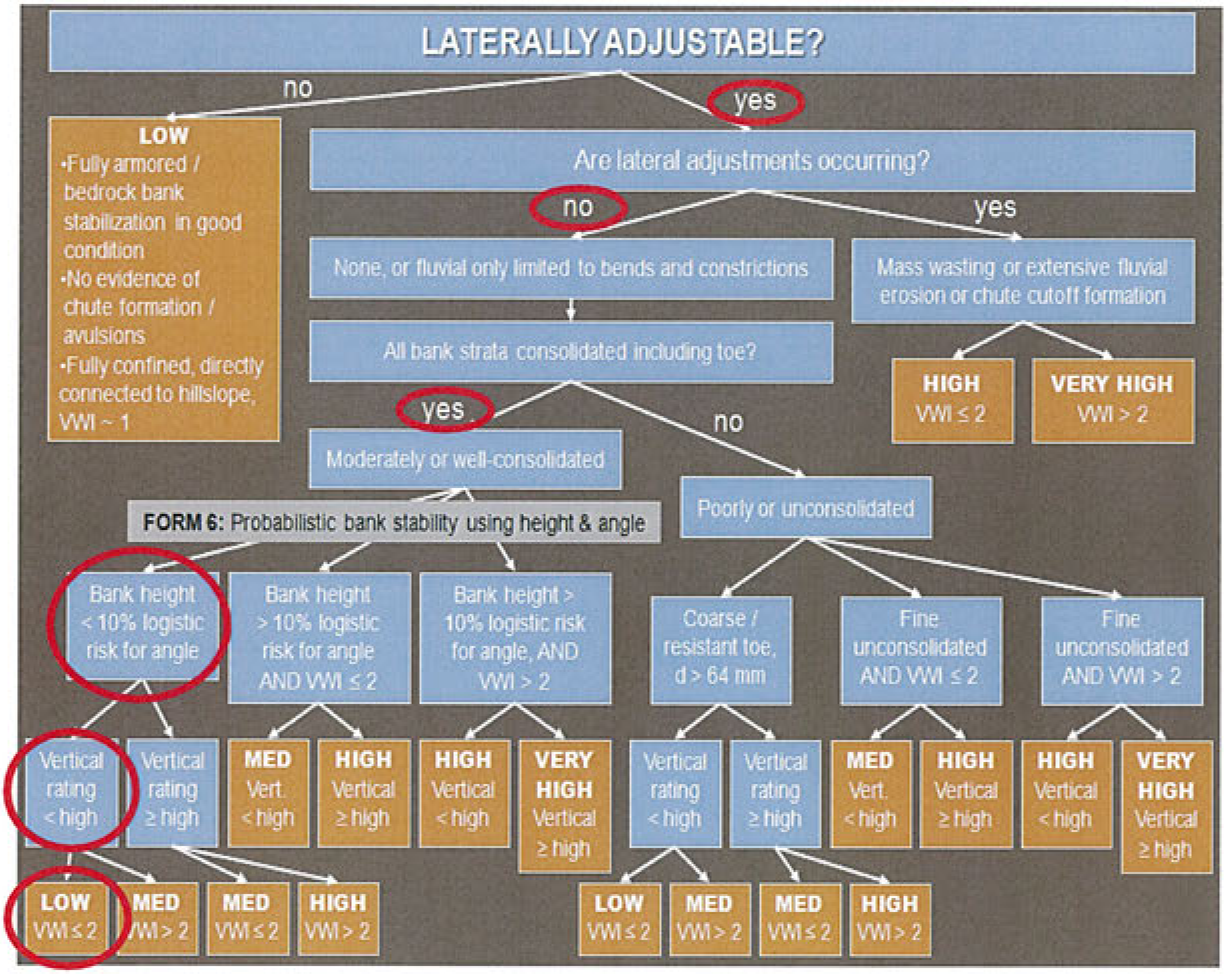
#	Reach 1 diameter, mm	Reach 2 diameter, mm	
42	4	5.6	
43	4	5.6	
44	4	5.6	
45	4	5.6	
46	5.6	5.6	
47	5.6	8	
48	5.6	8	
49	5.6	8	
50	8	8	D50
51	8	8	
52	8	8	
53	8	8	
54	8	8	
55	8	8	
56	8	8	
57	8	11	
58	8	11	
59	8	11	
60	8	11	
61	11	11	
62	11	11	
63	11	11	
64	11	11	
65	11	11	
66	11	11	
67	11	11	
68	11	11	
69	11	16	
70	11	16	
71	16	16	
72	16	16	
73	16	16	
74	16	16	
75	16	16	
76	16	16	
77	16	16	
78	16	16	
79	16	16	
80	16	16	
81	16	16	
82	16	16	

Pebble Count

#	Reach 1 diameter, mm	Reach 2 diameter, mm
83	16	16
84	22.6	22.6
85	22.6	22.6
86	22.6	22.6
87	22.6	22.6
88	22.6	22.6
89	22.6	22.6
90	22.6	22.6
91	22.6	22.6
92	22.6	22.6
93	22.6	22.6
94	22.6	32
95	32	32
96	32	32
97	32	32
98	32	32
99	32	45
100	45	45

FORM 4: LATERAL SUSCEPTIBILTY FIELD SHEET

Circle appropriate nodes/pathway for proposed site
OR use sequence of questions provided in Form 5.



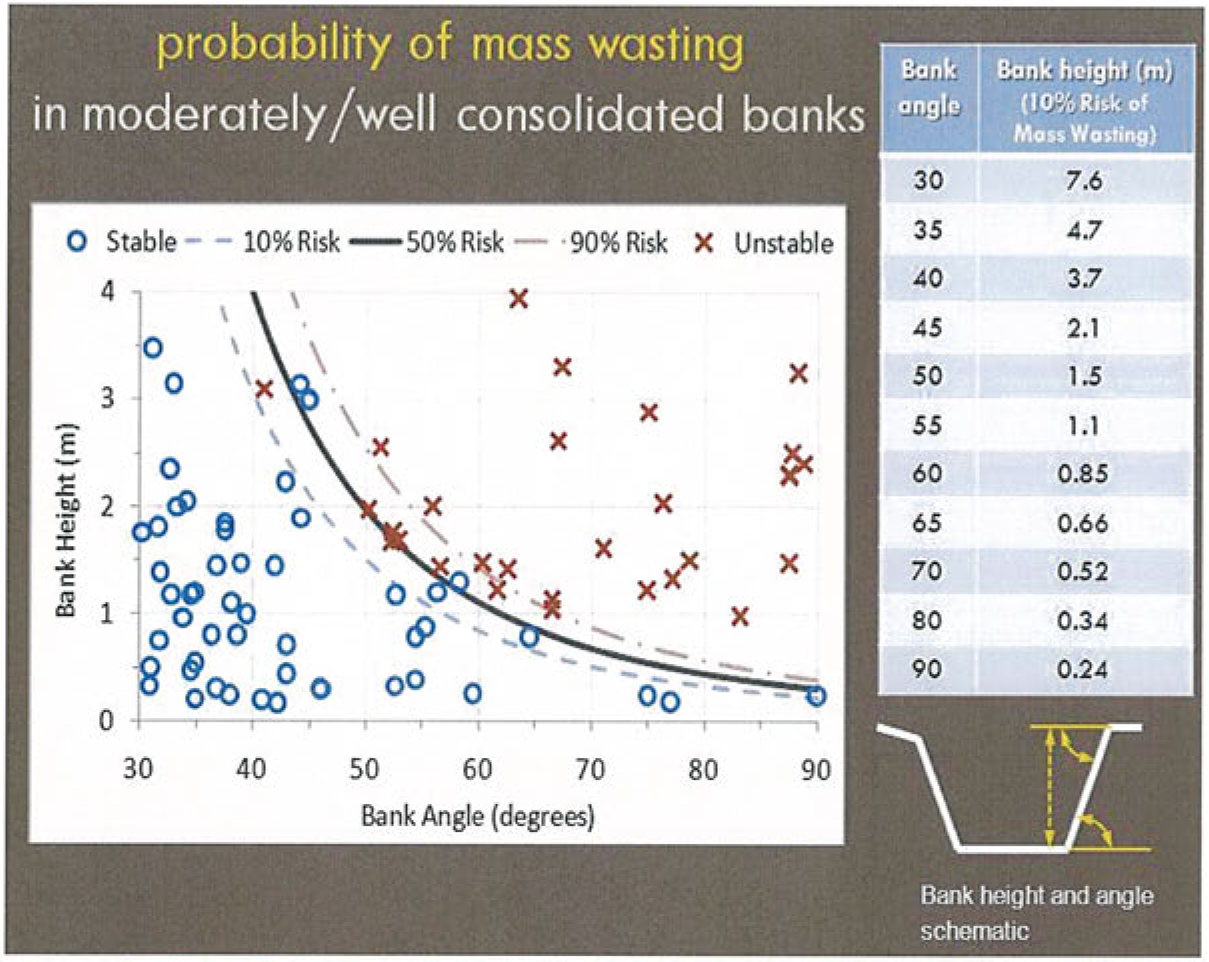
(Sheet 1 of 1)

REACH 1 AND 2 RESULTS

FORM 6: PROBABILITY OF MASS WASTING BANK FAILURE

If mass wasting is not currently extensive and the banks are moderately- to well-consolidated, measure bank height and angle at several locations (i.e., at least three locations that capture the range of conditions present in the study reach) to estimate representative values for the reach. Use Form 6 Figure 1 below to determine if risk of bank failure is >10% and complete Form 6 Table 1. Support your results with photographs that include a protractor/rod/tape/person for scale.

	Bank Angle (degrees) *(from Field)*	**Bank Height (m)** *(from Field)*	**Corresponding Bank Height for 10% Risk of Mass Wasting (m)** *(from Form 6 Figure 1 below)*	**Bank Failure Risk** *(<10% Risk)* *(>10% Risk)*
Left Bank				
Right Bank				



Bank angle	Bank height (m) (10% Risk of Mass Wasting)
30	7.6
35	4.7
40	3.7
45	2.1
50	1.5
55	1.1
60	0.85
65	0.66
70	0.52
80	0.34
90	0.24

Form 6 Figure 1. Probability Mass Wasting diagram, Bank Angle:Height/% Risk table, and Band Height:Angle schematic.

Probability is less than 10% for the existing bank angles (2:1 = 26.6 degrees) in Reach 1 and 2.

(Sheet 1 of 1)

uKnow San Diego BMP Sizing Calculator (v3.0)   Home Contacts Legal   Logout

Find   Map data provided by OpenStreetMap

CRITICAL STRESS CALCULATOR RESULTS - REACH 1

Map Details

Result View

Define Drainage Basins

Basin: Reach 1   Project: California Crossings

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Cancel | Save | Update

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Channel Assessed: Yes

Watershed Area (ac): 85.17

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

Channel Top Width (ft): 33.8

Channel Bottom Width (ft): 9.8

Channel Height (ft): 6.0

Channel Slope: 0.0056

Large View

uKnow San Diego BMP Sizing Calculator (v3.0)   Home Contacts Legal   Logout

Find   Map data provided by OpenStreetMap

CRITICAL STRESS CALCULATOR RESULTS - REACH 2

Map **Details**

Result View

Define Drainage Basins

Basin: Reach 2   Project: California Crossings

Start | Project | Basin | POC | Export

Manage Your Point of Compliance (POC)

Analyze the receiving water at the 'Point of Compliance' by completing this form. Click Edit and enter the appropriate fields, then click the Update button to calculate the critical flow and low-flow threshold condition. Finally, click Save to commit the changes.

Cancel Save Update

Channel Susceptibility: LOW

Low Flow Threshold: 0.5Q2

Channel Assessed: Yes

Watershed Area (ac): 85.59

Vertical Susceptibility: Low (Vertical)

Lateral Susceptibility: Low (Lateral)

Material: Vegetation

Roughness: 0.100

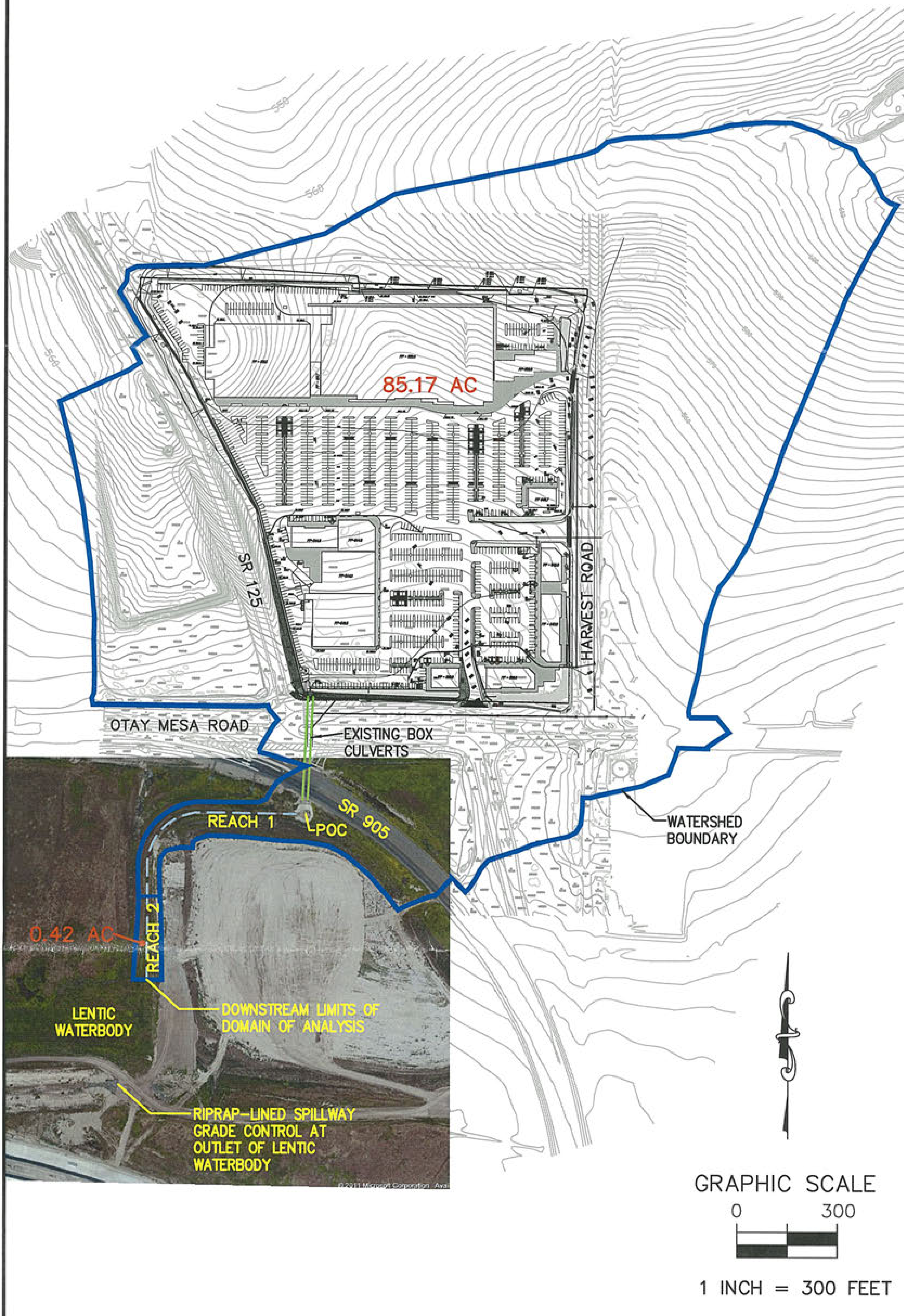
Channel Top Width (ft): 37.4

Channel Bottom Width (ft): 29.4

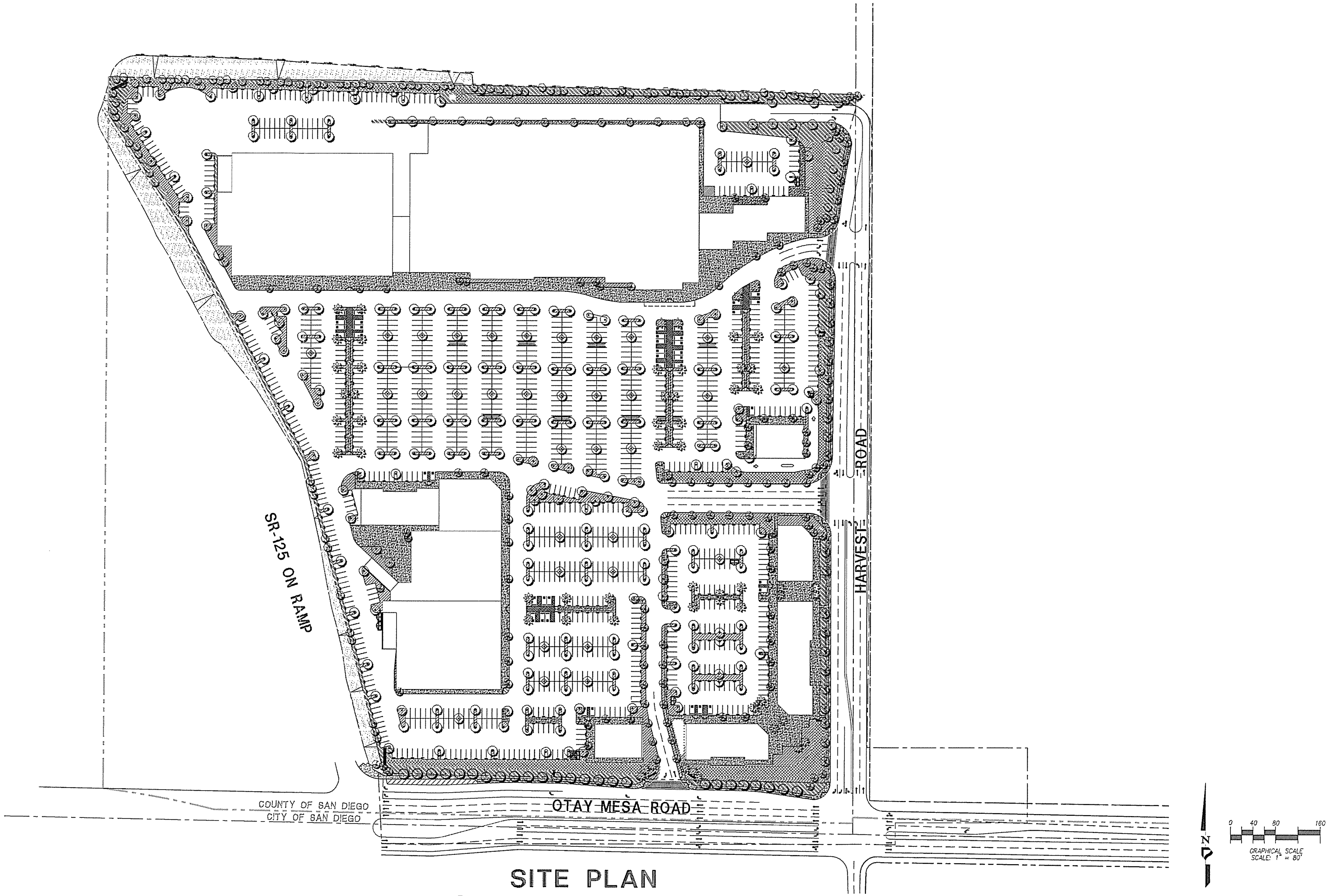
Channel Height (ft): 2.0

Channel Slope: 0.0056

Large View



STUDY AREA EXHIBIT



SITE PLAN

California Crossings

San Diego, California

PROJECT DESIGN CONSULTANTS
Planning | Engineering | Survey
701 B Street, Suite 800 San Diego, CA 92101
619.235.6471 Tel 619.234.0349 Fax

P:\3315\ENGR\EXHIBITS\Site Plan\3315_Site Plan.dwg 11-14-2011

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	125	2.7/8.2		

REGISTERED CIVIL ENGINEER DATE 24JUL07

PLANS APPROVAL DATE

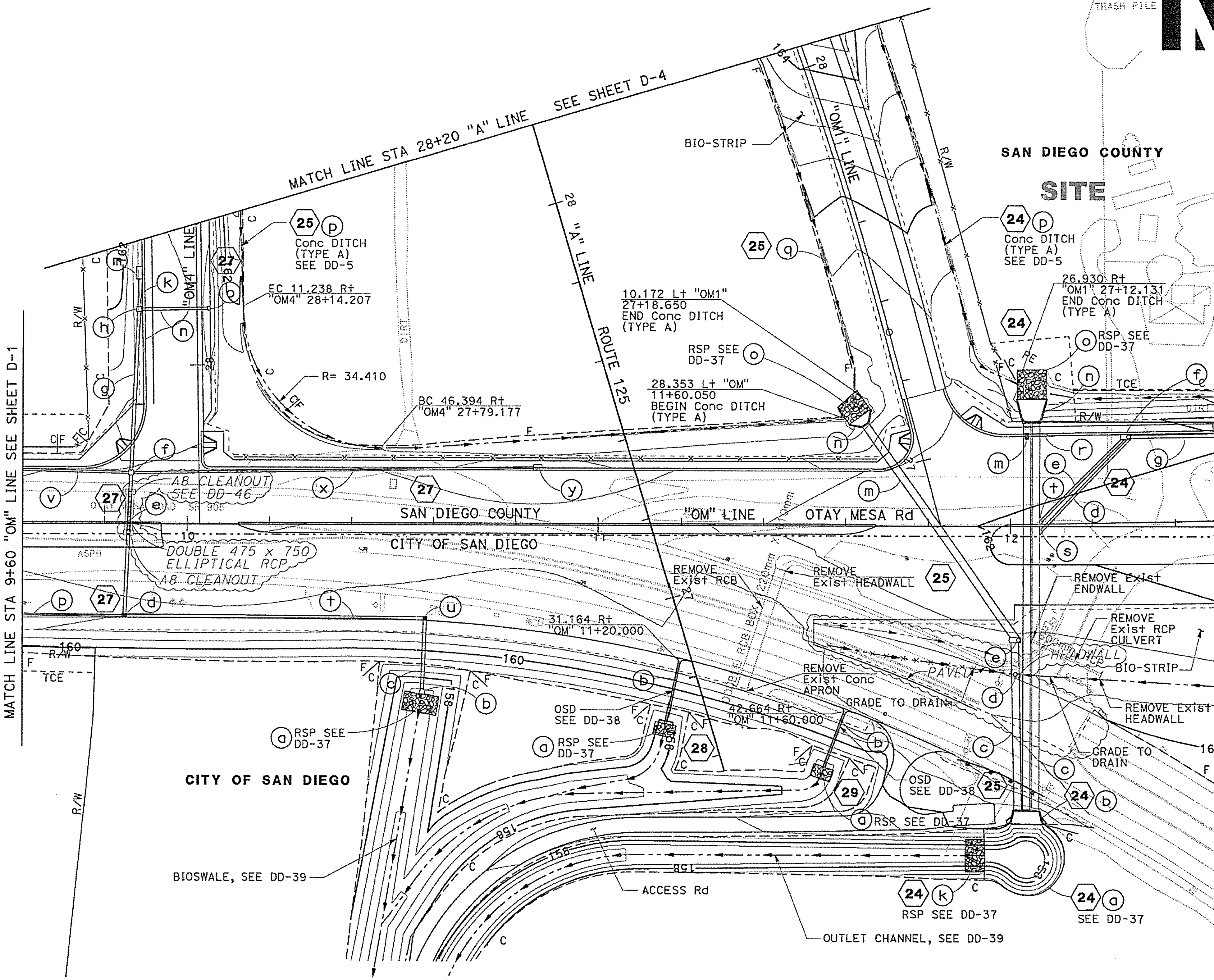
REGISTERED PROFESSIONAL ENGINEER EA CAMERINO No. 58844 Exp. 6-30-09 CIVIL STATE OF CALIFORNIA

California Transportation Ventures, Inc.
880 Kuhn Drive
Chula Vista, CA 91914

Rick Engineering Company
5620 Friars Road
San Diego, CA 92110

Caltrans Metric

AS BUILT
CONTRACT No. 11-232301
C.C.A. DATE 03-04-10
R.E. NAME Melanio Estes, P.E.



24 25 27 28 29

DRAINAGE PLAN

SCALE 1:500

D-2

THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

ISSUE RECORD		
No.	PURPOSE	DATE
0	RELEASED FOR CONSTRUCTION	09SEP05
1	CMT RFR C-031.04.01	24JUL07
	AS BUILT	

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

DESIGN OVERSIGHT RAMON MARTINEZ

CALCULATED/DESIGNED BY | CHECKED BY | DATE | REVISED BY | DATE REVISED

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	125	2.7/8.2		

REGISTERED CIVIL ENGINEER 24JUL07 DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER EA CAMERINO No. 58844 Exp. 6-30-09 CIVIL STATE OF CALIFORNIA

California Transportation Ventures, Inc.
880 Kuhn Drive
Chula Vista, CA 91914

Rick Engineering Company
5620 Friars Road
San Diego, CA 92110

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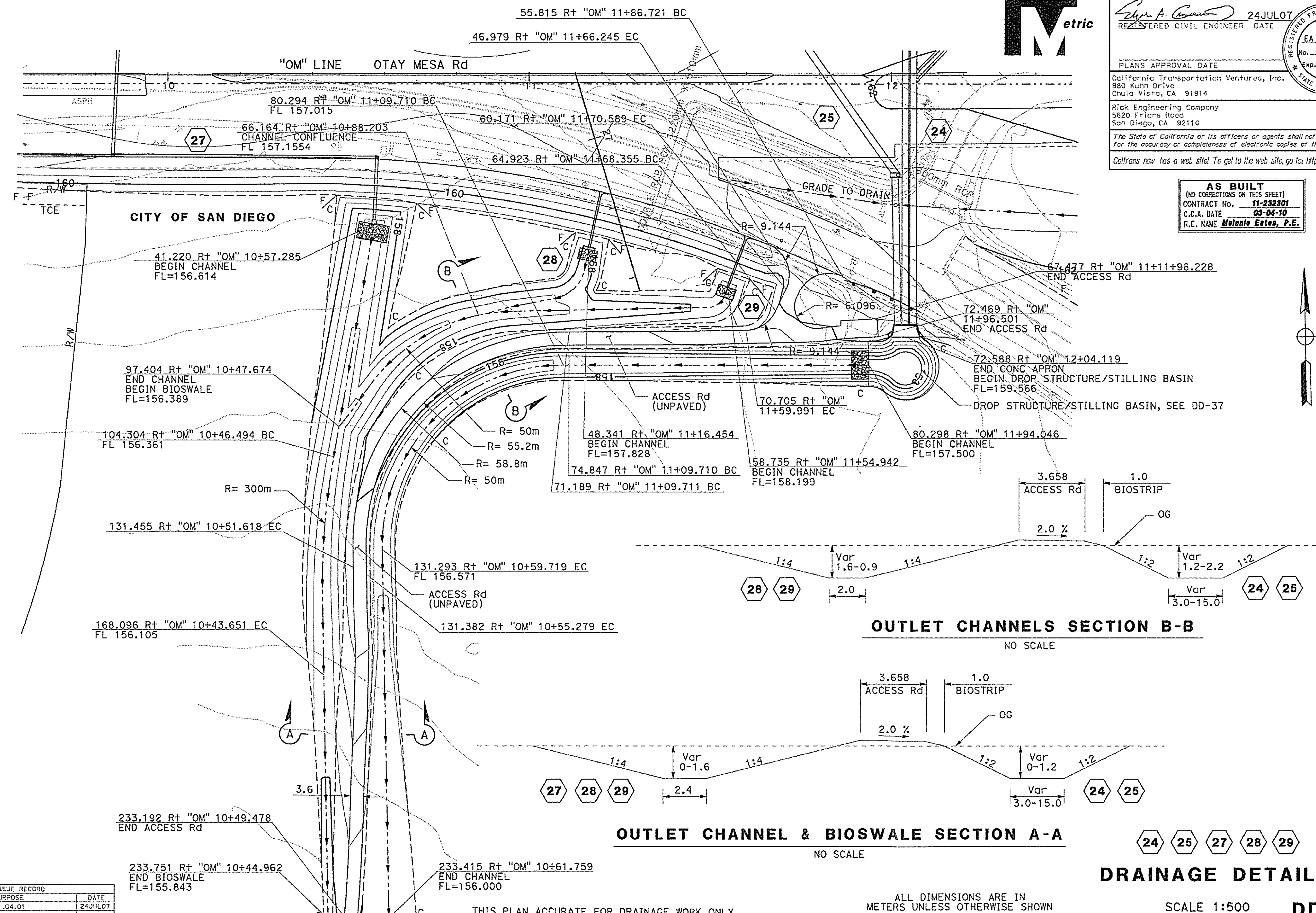
Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

Caltrans Metric

AS BUILT
(NO CORRECTIONS ON THIS SHEET)
CONTRACT No. 11-232301
C.C.A. DATE 03-04-10
R.E. NAME Melanie Eates, P.E.



THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

DRAINAGE DETAILS

SCALE 1:500

DD-39

No.	PURPOSE	DATE
0	CMT RFR C-031.04.01	24JUL07
	AS BUILT	

ISSUE RECORD

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

DESIGN OVERSIGHT RAMON MARTINEZ

CALCULATED/DESIGNED BY — CHECKED BY — DATE — REVISED BY — DATE REVISED

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS 0 20 40 60 80

USERNAME => jreeves
DGN FILE => 1aic39.dgn

CU 11274

EA 232301

SEGMENT 1A

LAST REVISION 07-24-07 DATE PLOTTED => 16-JUN-2009 09:30 TIME PLOTTED => 09:30

4

ATTACHMENT 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

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

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

Attachment 3a must identify:

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

Attachment 3b: For all Structural BMPs, Attachment 3b must include a draft maintenance agreement in the County's standard format depending on the Category (PDP applicant to contact County staff to obtain the current maintenance agreement forms). Refer to Section 7.3 in the BMP Design Manual for a description of the different categories.

Attachment 3a

Structural BMP Maintenance Plan

General maintenance guidelines are provided here per Section 7.7 of the BMP Design Manual; additional construction and maintenance detail will be provided at Final Engineering.

TABLE 7-3. Maintenance Indicators and Actions for Vegetated BMPs

Typical Maintenance Indicator(s) for Vegetated BMPs	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.
Overgrown vegetation	Mow or trim as appropriate, but not less than the design height of the vegetation per original plans when applicable (e.g. a vegetated swale may require a minimum vegetation height).
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, The County must be contacted prior to any additional repairs or reconstruction.
Standing water in vegetated swales	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. If the issue is not corrected by restoring the BMP to the original plan and grade, County staff in the Watershed Protection Program must be contacted prior to any additional repairs or reconstruction.
Standing water in bioretention, biofiltration with partial retention, or biofiltration areas, or flow-through planter boxes for longer than 96 hours following a storm event*	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains (where applicable), or repairing/replacing clogged or compacted soils.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.
*These BMPs typically include a surface ponding layer as part of their function which may take 96 hours to drain following a storm event.	

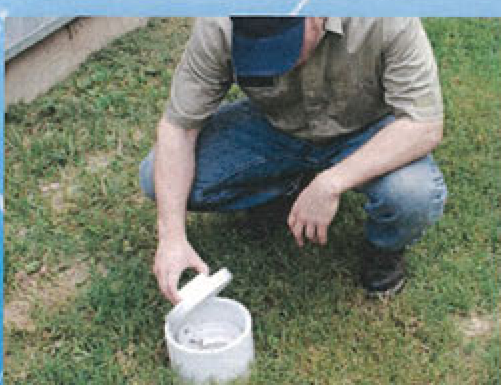
TYPICAL BIOFILTRATION MAINTENANCE INDICATORS

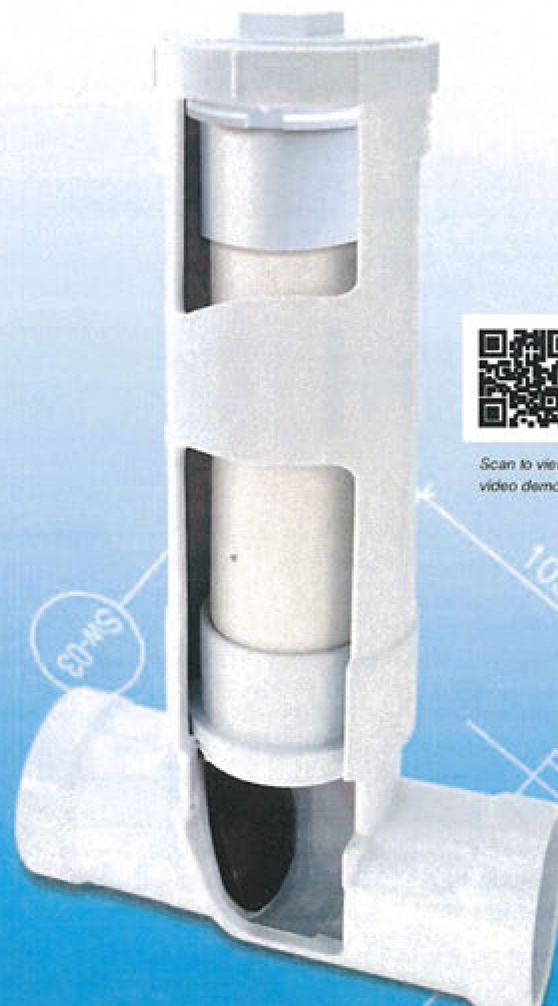
RECTORSEAL

CLEAN® CHECK

A simple but revolutionary extendable backwater valve that eliminates the need for expensive and unsightly manholes regardless of the burial depth.

- Complies with the requirements of IAPMO/UPC, ICC, IPC & CSA Standards
- Easy to perform maintenance & inspection from ground level
- Capable of handling back pressure up to 75 psi





Scan to view video demo

UPC FILE NO. 4068

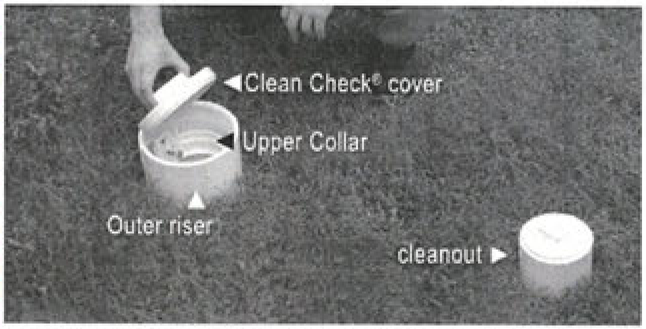
ICC ES PMG

TYPICAL SURFACE MAINTAINABLE OUTLET STRUCTURE

TYPICAL SURFACE MAINTAINABLE OUTLET STRUCTURE

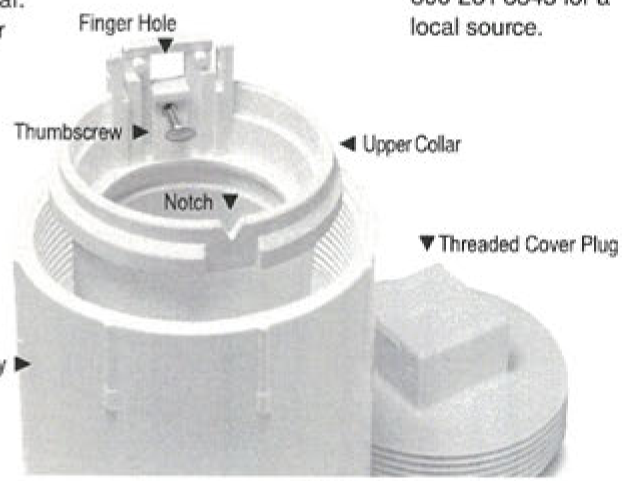
Maintenance Procedure

CLEAN CHECK®



The following steps will guide you through a proper inspection of your Clean Check® Extendable Backwater Valve.

1. Locate the Clean Check® cover.
2. Remove the threaded cover plug by unscrewing it to expose the upper collar of the inner riser assembly.
3. Loosen, but do not remove, the stainless steel thumbscrew located inside the upper collar.
4. Note the locations of the thumbscrew and opposing notch. There are two notches: one in the outer riser pipe and one in the upper collar. This will be necessary for correct repositioning of the inner riser pipe during re-installation.

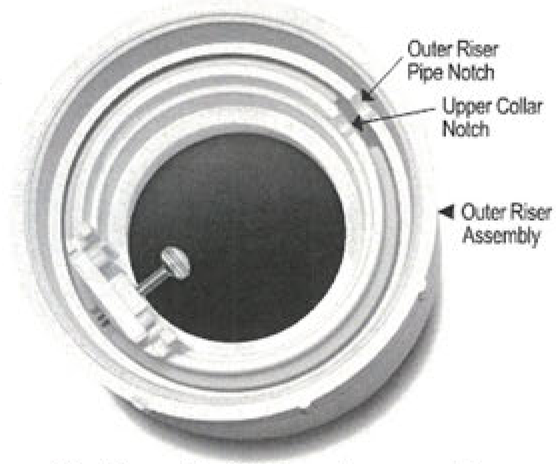


5. Using the finger hole provided above the thumbscrew of the upper collar, extract the inner riser assembly.
6. Clean any debris from the flapper, inner riser assembly, and the in ground valve body.
7. Inspect the flapper for any deterioration or damage caused by the harsh environment in which it operates. If deterioration is present, replace the flapper* (they are available from your local plumbing contractor or wholesale supply house.)

For additional availability, contact: RectorSeal Customer Service at 800-231-3345 for a local source.

Inner Riser Assembly

8. The Clean Check® Extendable Backwater Valve is designed for easy re-installation. To properly re-seat the valve, slowly lower the inner assembly back into the outer riser pipe and rotate it until you feel the unit drop into place. The notch in the upper collar should now be lined up with the notch in the outer riser pipe. **Important:** Correct alignment of the notch in the upper collar and the notch in the outer riser pipe is necessary for correct repositioning of the inner assembly.



9. After seating the inner riser assembly properly, hand tighten the thumbscrew until it re-seats against the inside wall of the outer riser pipe. Be certain the thumbscrew is NOT resting on the top of the larger outer riser pipe.
10. Replace the threaded cover plug.

***Prior to installing new flapper, use hole saw to create outlet orifice in middle of flapper. Orifice shall be the following diameter:**
BR1 - 2.0 IN, BR2 - 1.0 IN, BR3 - 1.0 IN, BR4 - 3.0 IN

5

ATTACHMENT 4

County of San Diego PDP Structural BMP Verification for Permitted Land Development Projects

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County of San Diego BMP Design Manual Verification Form	
Project Summary Information	
Project Name	Otay 250
Record ID (e.g., grading/improvement plan number)	**PDS 2015 – SPA-15-001**
Project Address	9300 Otay Mesa Road Otay, CA
Assessor's Parcel Number(s) (APN(s))	646-080-26 TO 29, 646-080-31 TO 33, 646-240-30, 646-310-17
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Otay 910 & Tijuana 911 Water Tanks 911.12
Responsible Party for Construction Phase	
Developer's Name	Sunroad Otay Partners, LP
Address	4445 Eastgate Mall, Suite 400 San Diego, CA 92121
Email Address	
Phone Number	(858) 362-8500
Engineer of Work	Stevens Cresto Engineering, Inc.
Engineer's Phone Number	(858) 694-5660
Responsible Party for Ongoing Maintenance	
Owner's Name(s)*	
Address	
Email Address	
Phone Number	
*Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.	

County of San Diego BMP Design Manual Verification Form Page 2 of 4					
Stormwater Structural Pollutant Control & Hydromodification Control BMPs* (List all from SWQMP)					
Description/Type of Structural BMP	**Plan Sheet #**	**STRUCT-URAL BMP ID#**	**Maint-enance Category**	**Maintenance Agreement Recorded Doc #**	**Revisions**
Biofiltration/Detention Basin	C-3	BF-1	2		
Biofiltration/Detention Basin	C-3	BF-2	2		
Biofiltration/Detention Basin	C-3	BF-3	2		
Biofiltration/Detention Basin	C-3	BF-4	2		
Biofiltration/Detention Basin	C-3	BF-5	2		
Biofiltration/Detention Basin	C-3	BF-6	2		
Biofiltration/Detention Basin	C-3	BF-7	2		
*All Priority Development Projects (PDPs) require a Structural BMP					

Note: If this is a partial verification of Structural BMPs, provide a list and map denoting Structural BMPs that have already been submitted, those for this submission, and those anticipated in future submissions.

County of San Diego BMP Design Manual Verification Form Page 3 of 4

Checklist for Applicant to submit to PDCI:

- ☐ Copy of the final accepted SWQMP and any accepted addendum.
- ☐ Copy of the most current plan showing the Stormwater Structural BMP Table, plans/cross-section sheets of the Structural BMPs and the location of each verified as-built Structural BMP.
- ☐ Photograph of each Structural BMP.
- ☐ Photograph(s) of each Structural BMP during the construction process to illustrate proper construction.
- ☐ Copy of the approved Structural BMP maintenance agreement and associated security

By signing below, I certify that the Structural BMP(s) for this project have been constructed and all BMPs are in substantial conformance with the approved plans and applicable regulations. I understand the County reserves the right to inspect the above BMPs to verify compliance with the approved plans and Watershed Protection Ordinance (WPO). Should it be determined that the BMPs were not constructed to plan or code, corrective actions may be necessary before permits can be closed.

Please sign your name and seal.

Professional Engineer's Printed Name:

____

Professional Engineer's Signed Name:

____

Date:____________________________________

[SEAL]

County of San Diego BMP Design Manual Verification Form Page 4 of 4

COUNTY - OFFICIAL USE ONLY:

For PDCI: Verification Package #: __________

PDCI Inspector: ____

Date Project has/expects to close: ______________________________

Date verification received from EOW: ____________________________

By signing below, PDCI Inspector concurs that every noted Structural BMP has been installed per plan.

PDCI Inspector's Signature: ___________________________ Date: ______________

FOR WPP:

Date Received from PDCI: ______________________________________

WPP Submittal Reviewer: _______________________________________

WPP Reviewer concurs that the information provided for the following Structural BMPs is acceptable to enter into the Structural BMP Maintenance verification inventory:

List **acceptable** Structural BMPs:

WPP Reviewer's Signature: ___________________________ Date: ______________

6

ATTACHMENT 5

Copy of Plan Sheets Showing Permanent Storm Water BMPs, Source Control, and Site Design

This is the cover sheet for Attachment 5.

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 Step 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 County staff
☐ 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 must be provided. Photocopies of general brochures are not acceptable.
☐ Include all source control and site design measures described in Steps 4 and 5 of the SWQMP. Can be included as a separate exhibit as necessary.

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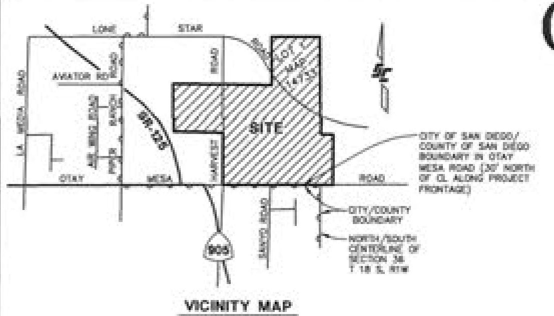
Attachment 5

A reduced copy of the Preliminary Grading Plan is provided here, additional construction detail will be provided at Final Engineering.

COUNTY OF SAN DIEGO TRACT 5607

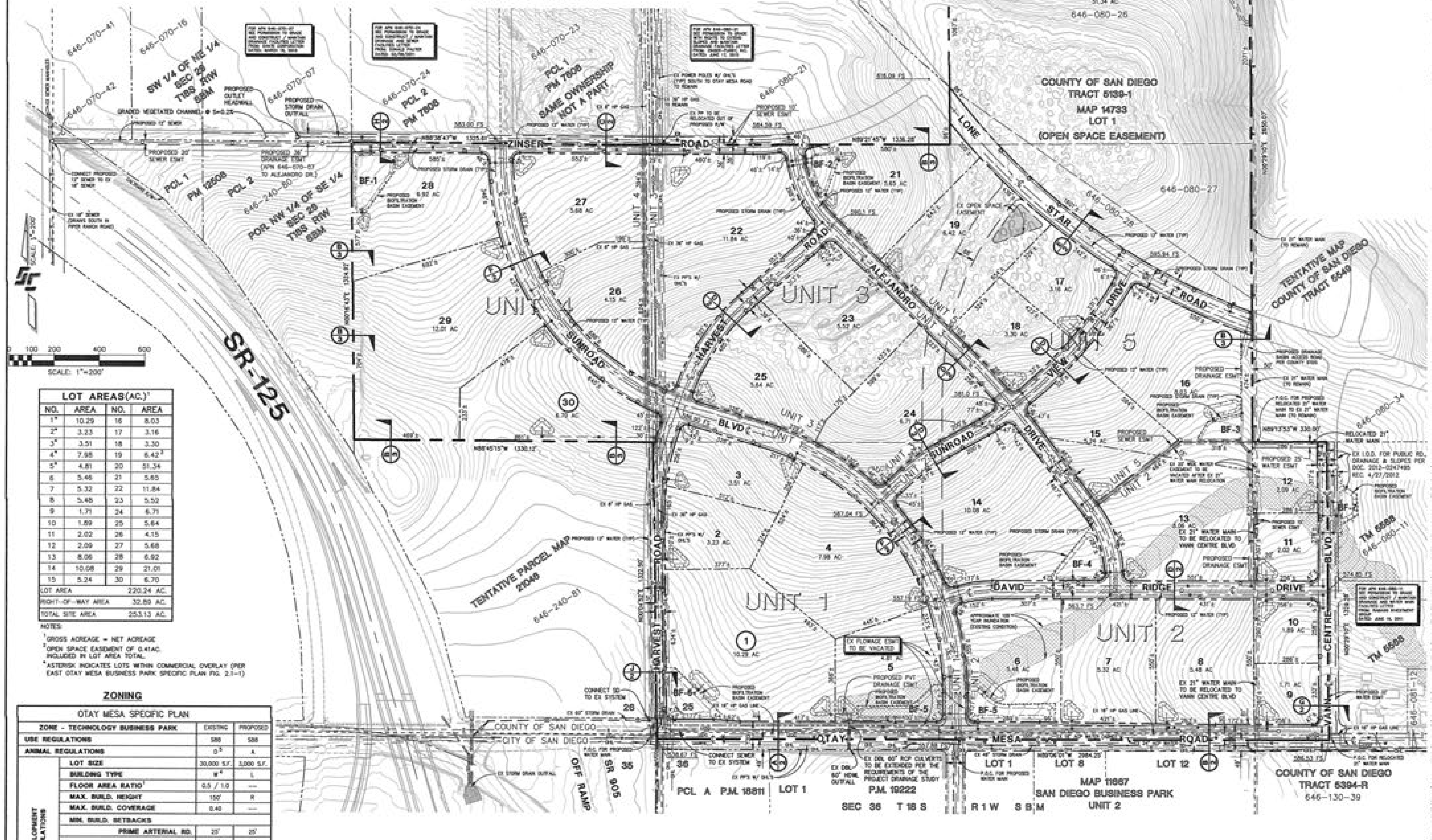
ENVIRONMENTAL LOG NO. 98-19-013B

OTAY 250
TENTATIVE MAP



VICINITY MAP
NO SCALE

SHEET INDEX



SCALE: 1"=200'

LOT AREAS(AC.)[1]			
NO.	AREA	NO.	AREA
1*	10.29	16	8.03
2*	3.23	17	3.16
3*	3.51	18	3.30
4*	7.98	19	6.42[2]
5*	4.81	20	51.34
6	5.46	21	5.65
7	5.32	22	11.84
8	5.48	23	5.52
9	1.71	24	6.71
10	1.89	25	5.64
11	2.02	26	4.15
12	2.09	27	5.68
13	8.06	28	6.92
14	10.08	29	21.01
15	5.24	30	6.70
LOT AREA		220.24 AC.	
RIGHT-OF-WAY AREA		32.89 AC.	
TOTAL SITE AREA		253.13 AC.	

NOTES:

[1] GROSS ACREAGE = NET ACREAGE
[2] OPEN SPACE EASEMENT OF 0.41AC. INCLUDED IN LOT AREA TOTAL.
* ASTERISK INDICATES LOTS WITHIN COMMERCIAL OVERLAY (PER EAST OTAY MESA BUSINESS PARK SPECIFIC PLAN FIG. 2.1-1)

ZONING

OTAY MESA SPECIFIC PLAN			
ZONE - TECHNOLOGY BUSINESS PARK		EXISTING	PROPOSED
USE REGULATIONS		S88	S88
ANIMAL REGULATIONS		O[5]	A
DEVELOPMENT REGULATIONS	LOT SIZE	30,000 S.F.	3,000 S.F.
	BUILDING TYPE	W[4]	L
	FLOOR AREA RATIO[1]	0.5 / 1.0	—
	MAX. BUILD. HEIGHT	150'	R
	MAX. BUILD. COVERAGE	0.40	—
	MIN. BUILD. SETBACKS		
	PRIME ARTERIAL RD.	25'	25'
	MAJOR RD.	20'	20'
	INDUSTRIAL/COMMERCIAL/MIXED USE COLLECTOR RD (4-LANE)	20'	V
	INDUSTRIAL/COMMERCIAL/MIXED USE COLLECTOR RD (2-LANE)	10'	V
	INTERIOR SIDE YARD[2]	0'-30'	V
	REAR YARD	5'	V
	ENCLOSURES[3]	SEE NOTE 3	
SPECIAL AREA REGULATIONS			D,C

ZONING NOTES:

[1] 1.0 FAR WHEN WITHIN 1,250 FT. OF ACTIVITY NODE; 0.5 FAR WHEN LOCATED MORE THAN 1,250 FT FROM ACTIVITY NODE.
[2] SUM OF INTERIOR YARDS SHALL EQUAL AT LEAST 30 FT.; 50 FT. FROM TOP OF SLOPE IF ADJACENT TO THE OTAY VALLEY REGIONAL PARK.
[3] OUTDOOR STORAGE WITH SCREENING PER DEVELOPMENT STANDARDS (FENCING, WALLS AND HEDGES).
[4] W: NON-RESIDENTIAL, ATTACHED OR DETACHED SAME LOT OR SEPARATE LOT.
[5] O: SEE DESIGNATOR "O" OF THE ANIMAL SCHEDULE OF THE COUNTY ZONING ORDINANCE, SECTION 3100.

ASSESSOR'S PARCEL NUMBERS & TAX RATE AREA TABLE

PARCEL NUMBER	TAX RATE AREA
646-310-17	84039
646-080-33	84039
646-080-32	84039
646-080-31	84038
646-080-29	84038
646-080-28	84039
646-240-30	84040
646-080-27	84039
646-080-26	84033

NOTE:

SEE SHEET C-3 FOR MINIMUM ON-LOT BMPS REQUIRED TO SATISFY INTERIM HYDROMODIFICATION CRITERIA.

SLOPE ANALYSIS TABLE

0-15% SLOPES	231.8 AC.
15-25% SLOPES	11.8 AC.
25-50% SLOPES	8.6 AC.
50% OR GREATER SLOPES	0.9 AC.

LOT/UNIT TABLE

LOTS 1-5	UNIT NO. 1
LOTS 6-14	UNIT NO. 2
LOTS 22-25	UNIT NO. 3
LOTS 26-30	UNIT NO. 4
LOTS 15-21	UNIT NO. 5

LEGEND

DESCRIPTION	SYMBOL
PROPOSED LOT NUMBER (*ASTERISK-AT LOT NUMBER INDICATES LOTS WITHIN COMMERCIAL OVERLAY)	(1) THRU (30)
SUBDIVISION BOUNDARY	
PROPOSED LOT LINE	
PROPOSED RIGHT-OF-WAY	
UNIT BOUNDARY LINE	UNIT 1 / UNIT 2
EXISTING RIGHT-OF-WAY	
PROPOSED SEWER MAIN W/MANHOLE	
PROPOSED WATER MAIN	W
PROPOSED STORM DRAIN	SD
PROPOSED STORM DRAIN INLET OR CLEANOUT	
PROPOSED COLLECTION BASIN & RISER (DETENTION BASIN CONTROL STRUCTURE)	
PROPOSED REGIONAL BIOFILTRATION BASIN	BF
100 YEAR INUNDATION AREA (APPROXIMATE)	
SPECIAL FLOOD HAZARD AREA (APPROX.) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD (F.I.R.M. PANELS 06073C2179G & 06073C2183G)	ZONE "AE"

GENERAL NOTES

1. EXISTING ZONING – S-88 TECHNOLOGY BUSINESS PARK/COMMERCIAL OVERLAY.
2. PROPOSED ZONING – S-88 TECHNOLOGY BUSINESS PARK/COMMERCIAL OVERLAY AND MIXED USE-RESIDENTIAL/RETAIL.
3. GROSS ACREAGE WITHIN SUBDIVISION BOUNDARY: 253.13 ACRES, NET AREA: 220.24 ACRES; STREETS: 32.89 ACRES
4. TOTAL NUMBER OF LOTS: 30; 4 COMMERCIAL/TECHNOLOGY BUSINESS PARK LOTS, 25 MIXED USE LOTS, 1 OPEN SPACE LOT. MINIMUM LOT SIZE IS 1.7 ACRES.
5. CONTOUR INTERVALS: 5 FEET MAJOR, 1 FOOT MINOR (MEAN SEA LEVEL DATUM).
6. SPECIAL ASSESSMENT ACT PROCEEDINGS – MAY BE REQUESTED FOR THIS PROJECT.
7. IMPROVEMENTS, EASEMENTS AND DEDICATIONS ARE AS REQUIRED BY THE COUNTY ENGINEER.
8. SCHOOLS:
   SAN YSIDRO SCHOOL DISTRICT
   SWEETWATER UNION HIGH SCHOOL DISTRICT
9. UTILITIES:
   A. SEWER – SAN DIEGO COUNTY SANITATION DISTRICT
   B. WATER – OTAY MUNICIPAL WATER DISTRICT
   C. GAS & ELECTRIC – SAN DIEGO GAS & ELECTRIC COMPANY
   D. TELEPHONE – AT&T
10. FIRE PROTECTION – SAN DIEGO COUNTY RURAL FIRE DISTRICT
11. ALL PROPOSED UTILITIES TO BE UNDERGROUND.
12. ALL EXISTING EASEMENTS NOT REMAINING IN USE SHALL BE VACATED PRIOR TO RECORDATION OF THE FINAL MAP(S) SUBJECT TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS.
13. EXISTING TOPOGRAPHY WAS COMPILED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY, BY MISSION AERIAL PHOTOGRAPHY/PHOTO GEODETIC CORP., 2006-2007.
14. THE FOLLOWING WAIVERS FROM THE SUBDIVISION ORDINANCE DESIGN STANDARDS ARE APPROVED: DESIGN EXCEPTION: SUNROAD BOULEVARD DESIGN SPEED, APPROVAL OBTAINED, LETTER DATED DECEMBER 1, 2008 FROM DPW PROJECT MANAGER.
15. LAMBERT COORDINATES: 146-1785 (CCS27)
16. DRAINAGE: STREETS & STORM DRAIN AS REQUIRED.
17. ALL ONSITE STREETS WILL BE PUBLIC.
18. THIS IS A SOLAR SUBDIVISION AS REQUIRED BY SECTION 81.401 (n), OF THE SUBDIVISION ORDINANCE. ALL LOTS HAVE AT LEAST 100 SQ. FT. OF UNOBSTRUCTED ACCESS TO SUNLIGHT ON THE BUILDABLE PORTION OF THE LOT.
19. THIS PROJECT IS A MULTI-UNIT SUBDIVISION. MULTIPLE FINAL MAPS MAY BE FILED PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT.
20. PHASING OF THE PROJECT WILL BE ACCOMPLISHED BY RECORDATION OF FINAL MAPS BY UNIT.
21. STREET LIGHTS WILL BE INSTALLED TO COMPLY WITH THE REQUIREMENTS AS SPECIFIED BY THE COUNTY STANDARDS.
22. STORM DRAIN DETENTION WILL BE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EAST OTAY MESA BUSINESS PARK SPECIFIC PLAN (SEPT. 15, 2010). THIS DETENTION WILL BE ACCOMPLISHED THROUGH UTILIZATION OF PUBLIC, CATEGORY 3 DETENTION BASINS WHERE INDICATED ON THE TENTATIVE MAP.
23. WATER FACILITIES IF NOT EXISTING ARE ASSUMED FOR EACH STREET AND HALF WIDTH FRONTAGE IMPROVEMENT, SIZING REQUIREMENTS PER WATER DISTRICT.
24. PROPOSED DRIVEWAY LOCATIONS ARE NOT SHOWN HEREON. PRIVATE DRIVEWAY LOCATIONS MAY VARY DEPENDANT UPON THE NEEDS OF FUTURE DEVELOPMENT OF INDIVIDUAL LOTS AND ARE SUBJECT TO A SITE DEVELOPMENT PLAN REVIEW AND APPROVAL.

LEGAL DESCRIPTION

THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 26, TOWNSHIP 18 SOUTH, RANGE 1 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

TOGETHER WITH THE SOUTHWEST QUARTER, AND THE WEST 330 FEET OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER AND THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER, ALL IN SECTION 25, TOWNSHIP 18 SOUTH, RANGE 1 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

EXCEPTING THEREFROM THE FOLLOWING: THE WESTERLY 30 FEET OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER.

BENCH MARK

BRASS DISK STAMPED "JM 134 1969" LOCATED 3.09 MILES EAST ALONG OTAY MESA ROAD FROM INTERSECTION OF OTAY VALLEY ROAD, 20.5' SOUTH OF CENTERLINE OF OTAY MESA ROAD AND ABOUT 170' EAST OF CENTERLINE INTERSECTION OF HARVEST ROAD. STEEL FENCEPOST MARKER LIES 1' SOUTH OF DISK. RECORD FROM COUNTY OF SAN DIEGO VERTICAL CONTROL RECORD. ELEVATION: 541.10 DATUM: U.S.C.& G.S., M.S.L.

GRADING QUANTITIES

CUT:	1,350,000 CY
FILL:	1,350,000 CY
NET:	0 CY

GENERAL PLAN LAND USE DESIGNATION

SPECIFIC PLAN AREA

GENERAL PLAN REGIONAL CATEGORY

VILLAGE

PARK LAND DEDICATION

PARK LAND WILL BE PROVIDED CONSISTENT WITH THE EAST OTAY MESA BUSINESS PARK SPECIFIC PLAN (SEPT. 15, 2010).

STREET NAME APPROVAL

THE PROPOSED STREET NAMES SHOWN WITHIN THE SUBDIVISION BOUNDARY HEREON HAVE RECEIVED PRELIMINARY APPROVAL FROM THE DEPARTMENT OF PLANNING AND LAND USE. BY: NORA RIVERA, DATES: MAY 3, 2001, APRIL 19, 2001 AND OCTOBER 17, 2007.

OWNER/SUBDIVIDER

SUNROAD OTAY PARTNERS, LP
4445 EASTGATE MALL, SUITE 400
SAN DIEGO, CA 92121
PHONE: (858) 362-8500
FAX: (858) 362-8448

SUNROAD OTAY PARTNERS, LP
BY: SUNROAD GP, INC., IT'S GENERAL PARTNER

BY: ______________________ DATE: ________
DAN FELDMAN
PRESIDENT

ENGINEER OF WORK

______________________ DATE
MARK E. STEVENS
R.C.E. 35502

STEVENS · CRESTO ENGINEERING, INC.
CIVIL ENGINEERS · PLANNERS · LAND SURVEYORS

REVISIONS | BY

TENTATIVE MAP

COUNTY OF SAN DIEGO TRACT 5607
OTAY 250
COUNTY OF SAN DIEGO, CALIFORNIA

Date:	JULY 17, 2015
Scale:	AS SHOWN
Job:	14009.01
Sheet	C-1

X:\2014\14009\CAD\PRELIM\TM\14009 C-01 TM.dwg 4/7/2016 8:21:26 AM PDT

COUNTY OF SAN DIEGO TRACT 5607

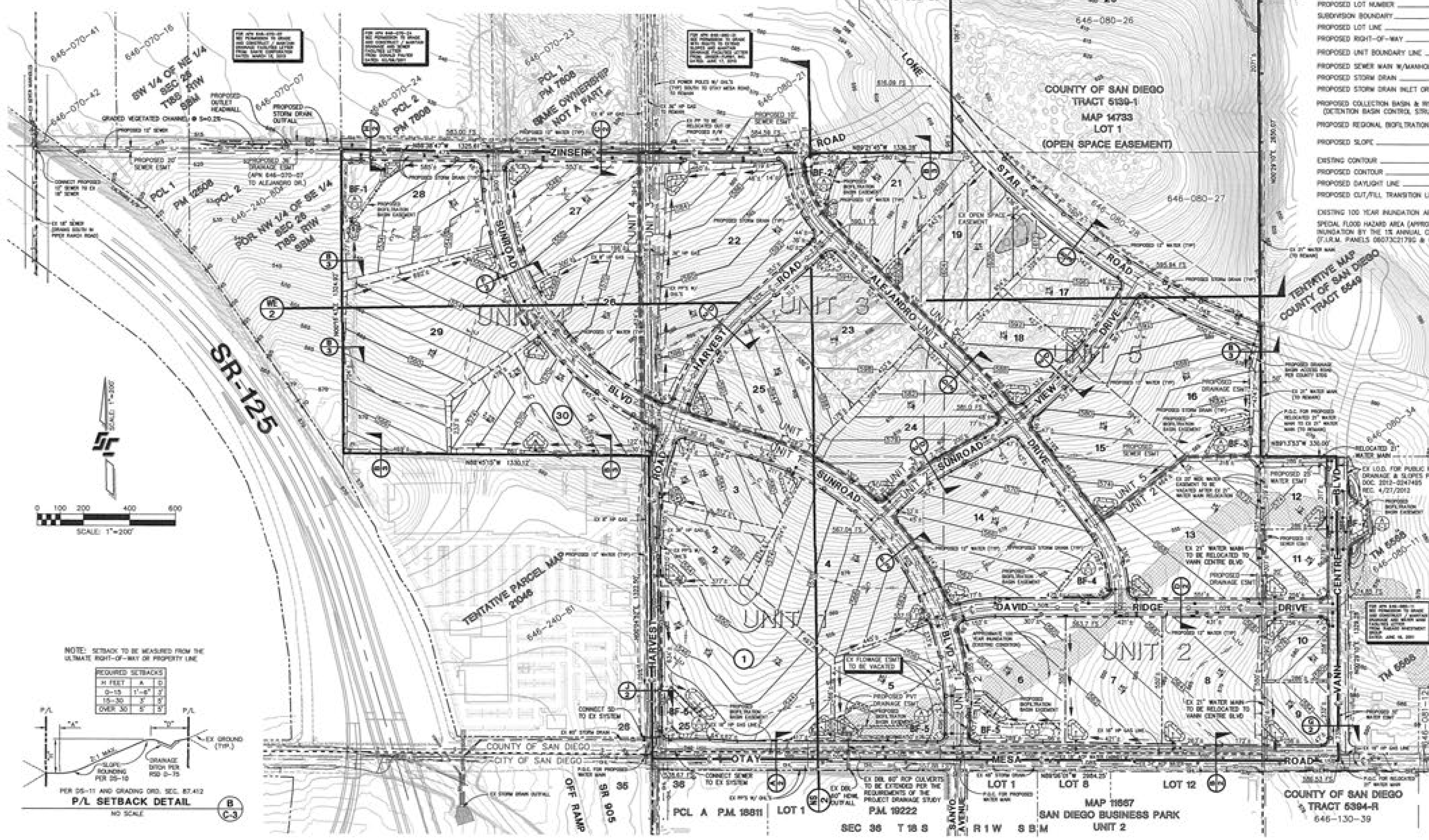
ENVIRONMENTAL LOG NO. 98-19-013B
OTAY 250
PRELIMINARY GRADING PLAN

LEGAL DESCRIPTION

THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 26, TOWNSHIP 18 SOUTH, RANGE 1 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

TOGETHER WITH THE SOUTHWEST QUARTER, AND THE WEST 330 FEET OF THE SOUTHWEST QUARTER OF THE SOUTHEAST QUARTER AND THE SOUTHEAST QUARTER OF THE NORTHWEST QUARTER, ALL IN SECTION 25, TOWNSHIP 18 SOUTH, RANGE 1 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF.

EXCEPTING THEREFROM THE FOLLOWING: THE WESTERLY 30 FEET OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER.



NOTE: SETBACK TO BE MEASURED FROM THE ULTIMATE RIGHT-OF-WAY OR PROPERTY LINE

REQUIRED SETBACKS		
H FEET	A	D
0–15	1'–6"	5'
15–30	3'	5'
OVER 30	5'	5'

PER DS-11 AND GRADING ORD. SEC. 87.412

P/L SETBACK DETAIL (B / C-3)

NO SCALE

WORK TO BE DONE

THE IMPROVEMENTS CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND THE CURRENT SPECIFICATIONS AND STANDARD DRAWINGS OF THE COUNTY OF SAN DIEGO AND THE CURRENT EDITIONS OF THE FOLLOWING DOCUMENTS.

STANDARD SPECIFICATIONS:

1. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION "GREEN BOOK" INCLUDING THE REGIONAL AND COUNTY OF SAN DIEGO SUPPLEMENT AMENDMENT.
2. SAN DIEGO COUNTY GRADING ORDINANCE.
3. CALIFORNIA DEPARTMENT OF TRANSPORTATION, "MANUAL OF TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE WORK ZONES".
4. STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATIONS.

STANDARD DRAWINGS:

1. SAN DIEGO AREA REGIONAL STANDARD DRAWINGS.
2. STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD PLAN.
3. WATER AGENCIES'S STANDARD DRAWINGS (WAS).

LEGEND

DESCRIPTION	SYMBOL
PROPOSED LOT NUMBER	1 THRU 30
SUBDIVISION BOUNDARY	
PROPOSED LOT LINE	
PROPOSED RIGHT-OF-WAY	
PROPOSED UNIT BOUNDARY LINE	UNIT 1 / UNIT 2
PROPOSED SEWER MAIN W/MANHOLE	
PROPOSED STORM DRAIN	SD
PROPOSED STORM DRAIN INLET OR CLEANOUT	
PROPOSED COLLECTION BASIN & RISER (DETENTION BASIN CONTROL STRUCTURE)	
PROPOSED REGIONAL BIOFILTRATION BASIN	BF
PROPOSED SLOPE	2:1
EXISTING CONTOUR	630
PROPOSED CONTOUR	630
PROPOSED DAYLIGHT LINE	
PROPOSED CUT/FILL TRANSITION LINE	C/F
EXISTING 100 YEAR INUNDATION AREA (APPROX.)	
SPECIAL FLOOD HAZARD AREA (APPROX.) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD (F.I.R.M. PANELS 06073C2179G & 06073C2183G)	ZONE "AE"

EROSION AND SEDIMENT CONTROL MEASURES NOTES:

1. ALL UTILITY TRENCHES SHALL BE BLOCKED AT THE PRESCRIBED INTERVALS WITH A DOUBLE ROW OF GRAVEL BAGS WITH A TOP ELEVATION. TWO GRAVEL BAGS BELOW THE GRADED SURFACE OF THE STREET. GRAVEL BAGS ARE TO BE PLACED WITH LAPPED COURSES.
2. AFTER UTILITY TRENCHES ARE BACK FILLED AND COMPACTED, THE SURFACES OVER SUCH TRENCHES SHALL BE MOUNDED SLIGHT TO PREVENT CHANNELING OF WATER IN THE TRENCH AREA. CARE SHOULD BE EXERCISED TO PROVIDE FOR CROSS FLOW AT FREQUENT INTER INTERVALS WHERE TRENCHES ARE NOT ON THE CENTERLINE OF A CROWNED STREET.
3. ALL BUILDING PADS SHOULD BE SLOPED TOWARDS THE DRIVEWAYS AND VELOCITY CHECK DAMS PROVIDED AT THE END OF THE DRIVEWAY APRON OF ALL DRIVEWAYS DRAINING INTO THE STREET.
4. PROVIDE VELOCITY CHECK DAMS IN ALL UNPAVED GRADED CHANNELS.
5. PROVIDE VELOCITY CHECK DAMS IN ALL STREET AREAS. VELOCITY CHECK DAMS MAY BE CONSTRUCTED OF GRAVEL BAGS, TIMBER, OR OTHER EROSION RESISTANT MATERIAL APPROVED BY THE COUNTY ENGINEER, AND SHALL EXTEND COMPLETELY ACROSS THE STREET OR CHANNEL AT RIGHT ANGLES TO THE CENTERLINE. VELOCITY CHECK DAMS MAY ALSO SERVE AS SEDIMENT TRAPS.
6. GRAVEL BAGS AND FILL MATERIAL SHALL BE STOCKPILED AT INTERVALS, READY FOR USE WHEN REQUIRED.
7. ALL EROSION CONTROL DEVICES WITHIN THE DEVELOPMENT SHOULD BE MAINTAINED DURING AND AFTER EVERY RUNOFF PRODUCING STORM. IF POSSIBLE, MAINTENANCE CREWS WOULD BE REQUIRED TO HAVE ACCESS TO ALL AREAS.
8. ANY PROPOSED ALTERNATE CONTROL MEASURES MUST BE APPROVED IN ADVANCE BY ALL RESPONSIBLE AGENCIES; I.E., COUNTY ENGINEER, DEPARTMENT OF SANITATION AND FLOOD CONTROL, OFFICE OF ENVIRONMENTAL MANAGEMENT, ETC.
9. PHYSICAL STABILIZATION THROUGH USE OF GEOTEXTILES, MATS, FIBER ROLLS (SS-7 OR ESC20), BONDED FIBER MATRIX OR OTHER MATERIAL APPROVED BY THE COUNTY FOR STABILIZING SLOPES, OR NOTE 15.
10. VEGETATION STABILIZING USING HYDROSEED (SS-4 OR ESC10) OR ACCEPTABLE LANDSCAPING MAY BE USED ONLY MAY 1 TO AUGUST 15. VEGETATION PROPOSED TO STABILIZE SLOPES MUST BE INSTALLED BY AUGUST 15, WATERED AND ESTABLISHED PRIOR TO OCTOBER 1. THE PROPERTY OWNER OR AUTHORIZED AGENT SHALL SHOW ON THE PLAN A CONTINGENCY PHYSICAL BMP TO BE INSTALLED BY OCTOBER 1 IF HYDROSEED ESTABLISHMENT DOES NOT OCCUR BY THAT DATE. IF LANDSCAPING IS PROPOSED, EROSION CONTROL MEASURES MUST ALSO BE USED WHILE LANDSCAPING IS BEING ESTABLISHED. ESTABLISHED VEGETATION SHALL HAVE A SUBSURFACE MAT OF INTERTWINED MATURE ROOTS WITH A UNIFORM VEGETATIVE COVERAGE OF 70 PERCENT OF THE NATURAL VEGETATIVE COVERAGE OR MORE ON ALL DISTURBED AREAS.
11. ALL MANUFACTURED SLOPES AND CLEARED SLOPES OF 3 TO 1 (HORIZONTAL TO VERTICAL) AND STEEPER ARE TO BE PROTECTED WITH A BMP APPROVED BY THE COUNTY OF SAN DIEGO, AS DESCRIBED IN NUMBER 14 ABOVE. CLEARED SLOPES FLATTER THAN 3 TO 1 MUST STILL BE PROTECTED FROM EROSION USING EITHER AN APPROVED BMP OR BY USING HYDROMULCH WITH A GUAR BINDER. FLAT AREAS OF LESS THAN 5% (LIKE BUILDING PADS, PARKING AREAS, LEACH FIELDS) SHALL HAVE 100% PROTECTION USING GEOTEXTILES, MATS (SS-7 OR ESC20), OR OTHER MATERIAL APPROVED BY THE COUNTY FOR STABILIZING SLOPES, OR USING TRACKING AND SOIL STABILIZERS/BINDERS (SS-5), TEMPORARY SEEDING (SS-4), MULCH/WOOD CHIPS (SS-3, SS-6, SS-8), OR JUTE MATTING (SS-7). THE COUNTY MAY REDUCE THIS REQUIREMENT FOR FLAT AREAS AND THE BELOW REQUIREMENT, PROVIDED FULL SEDIMENT CONTROL IS PROVIDED THROUGH CONSTRUCTED AND MAINTAINED DESILTATION BASINS (SC-2) AT ALL PROJECT DISCHARGE POINTS.
12. AREAS OF GRADED PADS THAT HAVE ACTIVE STRUCTURE CONSTRUCTION UNDERWAY MAY BE PROTECTED BY ROLLED PLASTIC AS PART OF A WEATHER-TRIGGERED ACTION PLAN UNTIL THE STRUCTURE'S ROOF HAS BEEN COMPLETED. THE REMAINDER OF THE PAD AREA MUST CONTINUE TO BE PROTECTED USING EROSION CONTROL MEASURES IDENTIFIED ABOVE.
13. UNPAVED ROADS ARE EXEMPT FROM THE 100% PROTECTION REQUIREMENTS BUT SHALL HAVE APPROPRIATE BMP'S INSTALLED SUCH AS GRAVEL BAG CHEVRONS.

GENERAL NOTES (PRELIMINARY GRADING)

1. THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSION/PERMITS BEFORE COMMENCING SUCH ACTIVITY.
2. THIS "PRELIMINARY GRADING PLAN" DOES NOT CONSTITUTE A CONSTRUCTION DOCUMENT. A FINAL GRADING PLAN, PREPARED (TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS) IN ACCORDANCE WITH COUNTY GRADING ORDINANCE, SHALL BE SUBMITTED TO THE DEPARTMENT OF PUBLIC WORKS. APPROVAL OF THE FINAL GRADING PLAN SHALL BE REQUIRED AND GRADING PERMIT ISSUED PRIOR TO ANY WORK IN THE FIELD.
3. A CONSTRUCTION, EXCAVATION OR ENCROACHMENT PERMIT FROM THE DIRECTOR OF PUBLIC WORKS WILL BE REQUIRED FOR ANY WORK IN THE COUNTY RIGHT-OF-WAY.
4. ALL SLOPES OVER 3 FEET IN HEIGHT SHALL BE PLANTED IN ACCORDANCE WITH SAN DIEGO COUNTY SPECIFICATIONS.
5. A SOILS REPORT SHALL BE REQUIRED PRIOR TO THE ISSUANCE OF A GRADING AND/OR BUILDING PERMIT.
6. APPROVAL OF THESE PLANS BY THE DIRECTOR OF PUBLIC WORKS DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE PROPERTY OWNER'S PERMISSION HAS BEEN OBTAINED AND A VALID GRADING PERMIT HAS BEEN ISSUED.
7. THE DIRECTOR OF PUBLIC WORKS APPROVAL OF THESE PLANS DOES NOT CONSTITUTE COUNTY BUILDING OFFICIAL APPROVAL OF ANY FOUNDATIONS FOR STRUCTURES TO BE PLACED ON THE AREA COVERED BY THESE PLANS. NO WAIVER OF THE GRADING ORDINANCE REQUIREMENTS CONCERNING MINIMUM COVER OVER EXPANSIVE SOILS IS MADE OR IMPLIED (SECTIONS 87.402 & 87.410). ANY SUCH WAIVER MUST BE OBTAINED FROM THE DIRECTOR OF DPLU.
8. ALL SLOPES SHALL BE ROUNDED INTO EXISTING TERRAIN TO PRODUCE A CONTOURED TRANSITION FROM CUT OR FILL FACES TO NATURAL GROUND AND ABUTTING CUT OR FILL SURFACES.
9. NOTWITHSTANDING THE MINIMUM STANDARDS SET FORTH IN THE GRADING ORDINANCE AND NOTWITHSTANDING THE APPROVAL OF THESE PRELIMINARY GRADING PLANS, THE PERMITTEE IS RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO THE ADJACENT PROPERTY. NO PERSON SHALL EXCAVATE ON LAND SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET, SIDEWALK, ALLEY, FUNCTION OF ANY SEWAGE DISPOSAL SYSTEM, OR ANY OTHER PUBLIC OR PRIVATE PROPERTY, WITHOUT SUPPORTING AND PROTECTING SUCH PROPERTY FROM SETTLING, CRACKING, EROSION, SILTING, SCOUR OR OTHER DAMAGE WHICH MIGHT RESULT FROM THE GRADING DESCRIBED ON THIS PLAN. THE COUNTY WILL HOLD THE PERMITTEE RESPONSIBLE FOR CORRECTION OF NON-DEDICATED IMPROVEMENTS WHICH DAMAGE ADJACENT PROPERTY.
10. ALL GRADING DETAILS WILL BE IN ACCORDANCE WITH SAN DIEGO COUNTY STANDARD DRAWINGS DS-8, DS-10, DS-11, D-75 UNLESS SHOWN OTHERWISE ON THESE PLANS.
11. SLOPE RATIOS: DEVIATING FROM THESE RATIOS WILL REQUIRE
    CUT = 2:1 APPROVAL OF THE DIRECTOR OF PUBLIC WORKS
    FILL = 2:1 AFTER REVIEW OF A REPORT FROM A SOILS ENGINEER.
12. EARTHWORK QUANTITIES:
    CUT: 1,350,000 CY
    FILL: 1,350,000 CY
    NET: 0 CY
    A SEPARATE PERMIT MUST BE OBTAINED FOR WASTE OR IMPORT AREA. GRADING QUANTITIES ARE APPROXIMATE AND ARE PROVIDED HEREON FOR PERMIT PURPOSES ONLY. QUANTITIES ARE BASED ON THE DIFFERENCE BETWEEN THE EXISTING SURFACES AND PROPOSED PAD/SUBGRADE SURFACES. VARIATIONS DUE TO LOSS FROM CLEARING AND GRUBBING, STRIPPING, SHRINKAGE, SWELL, UNSUITABLE MATERIAL & REMEDIAL GRADING ARE NOT CONSIDERED NOR FACTORED INTO THESE QUANTITIES. CONTRACTOR SHALL VERIFY QUANTITIES WITH THEIR OWN VOLUME CALCULATIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THEIR OWN INDEPENDENT QUANTITY AND MATERIAL TAKE OFFS AND CONSTRUCT THE DESIGN INDICATED ON THESE DRAWINGS. PROJECT TO BE BID BASED ON CONTRACTOR'S OWN ESTIMATES.
13. SPECIAL CONDITION: IF ANY ARCHAEOLOGICAL RESOURCES ARE DISCOVERED ON THE SITE OF THIS GRADING DURING GRADING OPERATIONS, SUCH OPERATIONS WILL CEASE IMMEDIATELY, AND THE PERMITTEE WILL NOTIFY THE DIRECTOR OF PUBLIC WORKS OF THE DISCOVERY. GRADING OPERATIONS WILL NOT RECOMMENCE UNTIL THE PERMITTEE HAS RECEIVED WRITTEN AUTHORITY FROM THE DIRECTOR OF PUBLIC WORKS TO DO SO.

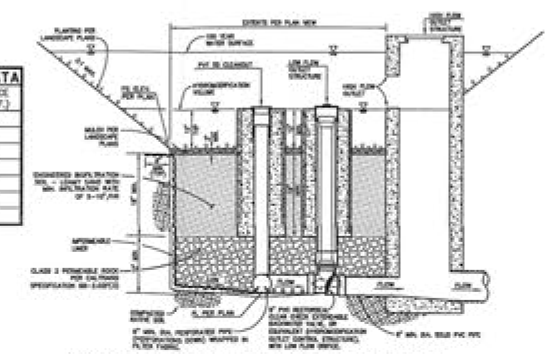
ADVISORY NOTE ON STORMWATER OBLIGATIONS:

1. THE ACTIVITIES SHOWN ON THE PLANS ARE SUBJECT TO ENFORCEMENT UNDER PERMITS FROM THE SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD AND MUST ALSO COMPLY WITH THE REQUIREMENTS OF THE SAN DIEGO COUNTY MUNICIPAL STORM WATER PERMIT. THIS INCLUDES REQUIREMENTS FOR MATERIALS AND WASTES CONTROL, EROSION CONTROL, AND SEDIMENT CONTROL ON PROJECT CONSTRUCTION SITES. THE PERMITTEES OF OPERATIONS SHOWN ON THESE PLANS ARE OBLIGATED TO INSURE COMPLIANCE WITH ALL APPLICABLE STORM WATER REGULATIONS AT ALL TIMES. THE PERMITTEE SHALL ALSO KEEP A COPY OF THE SWPPP (STORM WATER POLLUTION PREVENTION PLAN) ON SITE AND AVAILABLE FOR REVIEW BY COUNTY.
2. DURING THE RAINY SEASON THE AMOUNT OF EXPOSED SOIL ALLOWED AT ONE TIME SHALL NOT EXCEED THAT WHICH CAN BE ADEQUATELY PROTECTED BY THE PROPERTY OWNER OR AUTHORIZED AGENT IN THE EVENT OF A RAINSTORM. 125% OF ALL SUPPLIES NEEDED FOR BMP MEASURES SHALL BE RETAINED ON THE JOB SITE IN A MANNER THAT ALLOWS FULL DEPLOYMENT AND COMPLETE INSTALLATION IN 48 HOURS OR LESS OF A FORECAST RAIN.
3. NO AREA BEING DISTURBED SHALL EXCEED 50 ACRES AT ANY GIVEN TIME WITHOUT DEMONSTRATING TO THE SAN DIEGO COUNTY DPW DIRECTOR'S SATISFACTION THAT ADEQUATE EROSION AND SEDIMENT CONTROL CAN BE MAINTAINED. ANY DISTURBED AREA THAT IS NOT ACTIVELY GRADED FOR 10 DAYS MUST BE FULLY PROTECTED FROM EROSION. UNTIL ADEQUATE LONG-TERM PROTECTIONS ARE INSTALLED, THE DISTURBED AREA SHALL BE INCLUDED WHEN CALCULATING THE ACTIVE DISTURBANCE AREA. ALL EROSION CONTROL MEASURES SHALL REMAIN INSTALLED AND MAINTAINED DURING ANY INACTIVE PERIOD.

BENCH MARK

BRASS DISK STAMPED "JM 154 1969" LOCATED 3.09 MILES EAST ALONG OTAY MESA ROAD FROM INTERSECTION OF OTAY VALLEY ROAD, 20.5' SOUTH OF CENTERLINE OF OTAY MESA ROAD AND ABOUT 170' EAST OF CENTERLINE INTERSECTION OF HARVEST ROAD. STEEL FENCEPOST MARKER LIES 1' SOUTH OF DISK. RECORD FROM COUNTY OF SAN DIEGO VERTICAL CONTROL RECORD. ELEVATION: 541.10 DATUM: U.S.C.& G.S., M.S.L.

BIOFILTRATION BASIN DATA		
BASIN NUM.	MIN. BIOFILTRATION AREA (S.F.)	MIN. SURFACE VOLUME (C.F.)
BF-1	17,889	78,960
BF-2	7,248	18,680
BF-3	10,229	16,260
BF-4	20,820	40,700
BF-5	32,220	84,520
BF-6	12,425	18,750
BF-7	4,358	6,120



HYDROMODIFICATION BIOFILTRATION PLANTER (A / C-3)

TYPICAL SECTION

NO SCALE

X:\2014\14009\CAD\PRELIM\TM\14009 C-03 PGP.dwg 4/7/2016 9:17:19 AM PDT

REVISIONS	BY

STEVENS-CRESTO ENGINEERING, INC.
CIVIL ENGINEERS · PLANNERS · LAND SURVEYORS
9665 CHESAPEAKE DRIVE
SUITE 320
SAN DIEGO, CA 92123-1352
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FAX: 858.694.5661
www.scengr.com

REGISTERED PROFESSIONAL ENGINEER No. 35502 Exp. 9-30-17 CIVIL STATE OF CALIFORNIA

PRELIMINARY GRADING PLAN

COUNTY OF SAN DIEGO TRACT 5607
OTAY 250
COUNTY OF SAN DIEGO, CALIFORNIA

Date:	JULY 17, 2015
Scale:	AS SHOWN
Job:	14009.01
Sheet	C-3

7

ATTACHMENT 6

Copy of Project's Drainage Report

This is the cover sheet for Attachment 6.

If hardcopy or CD is not attached, the following information should be provided:

Title: Drainage Study for Otay 250, Tract 5607
Prepared By: Stevens Cresto Engineering, Inc.
Date: 04/08/16

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8

ATTACHMENT 7

Copy of Project's Geotechnical and Groundwater Investigation Report

This is the cover sheet for Attachment 7.

If hardcopy or CD is not attached, the following information should be provided:

Title:
Prepared By:
Date:

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GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

UPDATED GEOTECHNICAL INVESTIGATION

EAST OTAY MESA CENTER MIXED-USE
OTAY MESA AND HARVEST ROADS
SAN DIEGO COUNTY, CALIFORNIA

PREPARED FOR

SUNROAD ENTERPRISES
SAN DIEGO, CALIFORNIA

JULY 20, 2015
PROJECT 06263-42-03

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 06263-42-03
July 20, 2015

Sunroad Enterprises
4445 Eastgate Mall, Suite 400
San Diego, California 92121

Attention: Mrs. Andrea Contreras Rosati, Vice President and Counsel

Subject: UPDATED GEOTECHNICAL INVESTIGATION
EAST OTAY MESA CENTER MIXED-USE
OTAY MESA AND HARVEST ROADS
SAN DIEGO COUNTY, CALIFORNIA

Dear Mrs. Contreas:

In accordance with your authorization of our proposal (LG-15194 dated June 12, 2015), we herein submit the results of our Updated Geotechnical Investigation for the subject site. The accompanying report presents the findings and conclusions from our study. Based on the results of our study, it is our opinion that the subject site can be developed as proposed, provided the recommendations of this report are followed.

This updated report presents recommendations that should be incorporated into the phases of design and construction. The new recommendations supersede those presented in our reports titled *Soils and Geologic Investigation for Rancon Otay Mesa, dated November 15, 1990* and *Soil and Geologic Investigation for Sunroad Centrum (Rancon Otay Mesa)*, dated February 26, 1999. Differences between the recommendations are attributable to changes in the standard of geotechnical practice that have occurred since the issuing our previous reports. The recommendations presented herein are based on proposed grades shown on the project Preliminary Grading Plan.

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

Very truly yours,

GEOCON INCORPORATED

Raul R. Garcia
GE 2842

REGISTERED PROFESSIONAL ENGINEER
RAUL R. GARCIA
No. 2842
GEOTECHNICAL
STATE OF CALIFORNIA

Garry W. Cannon
CEG 2201
RCE 56468

PROFESSIONAL GEOLOGIST
GARRY WELLS CANNON
No. 2201
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

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

RRG:GWC:dmc

(e-mail) Addressee
(e-mail) Stevens Cresto Engineering Inc.
Attention: Mr. Mark Stevens

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

UPDATED GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of an Updated Geotechnical Investigation for East Otay Mesa Center Mixed-Use project located in the Otay Mesa area of San Diego County, California (see Vicinity Map, Figure 1). The purpose of our work was to review our reports titled *Soil and Geologic Investigation for Rancon Otay Mesa* dated November 15, 1990, and *Updated Geotechnical Investigation for Sunroad Centrum (Rancon Otay Mesa),* dated February 26, 1999, and, based upon our review, to provide updated geotechnical recommendations pertaining to development of the property as presently proposed.

The scope of our services included the following:

- Reviewing our previous geotechnical investigation reports;
- Reviewing readily available published and unpublished geologic geotechnical reports pertaining to the area as indicated in the *List of References*.
- Performing a reconnaissance of the site;
- Plotting the exploratory borings and trenches on the preliminary grading plan;
- Producing four, geologic, cross-sections based on the soil conditions encountered in the exploratory borings and trenches;
- Preparing a geologic map over the preliminary grading plan;
- Reviewing existing grading, foundation and retaining wall recommendations;
- Preparing an updated geotechnical investigation report with updated grading and foundation recommendations based on the proposed grades presented on the preliminary grading plan.

The Geologic Map (Figure 2) was prepared using the *Preliminary Grading Plan* prepared by Stevens Cresto Engineering, plot date May 10, 2015. Stereoscopic aerial photographs dated 1953 (USDA, AXN-3M-24 and AXN-3M-25) were also analyzed to aid geologic mapping and identification of potential geologic constraints.

Laboratory tests were performed on selected representative soil samples obtained from the exploratory borings and trenches to evaluate pertinent physical properties. Descriptions of the field and laboratory procedures and methods are presented in Appendices A and B, respectively.

The conclusions and recommendations presented herein are based on analysis of the data obtained from our reviews, analysis of the laboratory test results, and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The subject property encompasses approximately 250 acres of undeveloped land east and west of Harvest Road and immediately north of Otay Mesa Road in San Diego County, California (see Vicinity Map Figure 1 and Geologic Map, Figure 2, map pocket).

The property is nearly flat-lying to steeply sloping with elevations ranging from approximately 620 feet Mean Sea Level (MSL) in the central portion of the site to approximately 527 feet MSL at the northwest corner.

Existing improvements consist of Harvest Road at the west end, a dirt road along the east property line, several dirt roads trending east-west in the central portion of the site over the existing knoll, an abandoned borrow pit in the north-central portion, and several buried and surface irrigation lines. A seepage pit was observed at the southeast end of the site. Natural drainage is mainly a network of shallow swales and ravines that discharge into Johnson Canyon to the northeast (area designated as open space easement) or into controlled facilities along Otay Mesa Road to the south. Vegetation primarily consists of grasses with brush on the steeper slopes. The central-north section of the site is covered with an extensive volume of dumped soils, trash, and debris.

We understand that project development will consist of grading the property to receive 29, sheet-graded, industrial lots with four major arterial streets and four interior streets. Improvements along Harvest Road and the widening of Otay Mesa Road along the frontage of the property are also planned. The area north of the proposed Lone Star Road is designated open space easement.

Review of the project preliminary grading plan indicates that cuts and fills on the order of 35 and 30 feet, respectively, are proposed to achieve subgrade elevations on the proposed industrial sheet-graded lots. We expect that the lots will be fine-graded at a later date on an individual basis. In addition, extensive remedial grading in the form of removal and compaction of existing topsoils, alluvium/colluvium and the weathered soil of the Otay Formation should be anticipated.

The buildings will be for industrial and/or commercial mixed use and will likely consist of concrete tilt-up walls with concrete reinforced and/or steel structures, supported on conventional continuous and/or spread footings.

3. SOIL AND GEOLOGIC CONDITIONS

During our field investigation we encountered undocumented fill soil, topsoil, alluvium/colluvium, Old Terrace Deposits, and the Otay Formation. These units are described below.

3.1 Undocumented Fill Soils (Qudf)

Undocumented fill soils were observed throughout the north-central portion of the site. The undocumented fill soils contain considerable amounts of vegetation and debris. These soils should be cleaned of vegetation and any deleterious debris prior to being used as structural fill. We expect that that majority of this soil will be removed as part of the normal grading operations to achieve proposed grades.

3.2 Topsoil (Unmapped)

Soft clayey topsoil overlies the majority of the site and have a somewhat uniform thickness of 2 to 3 feet. The topsoil generally consists of silty to sandy clays and clayey sands. The topsoil is potentially compressible and/or highly expansive and will require remedial grading measures in the form of removal and compaction as indicated in the grading section.

3.3 Alluvium/Colluvium (Qal/Qc)

Undifferentiated alluvial/colluvial soils are composed primarily of compressible silty and sandy clays. The thickness of these soils range from 3 to 7 feet with an average of 5 feet. The alluvial/colluvial soils are unsuitable for the support of settlement-sensitive structures or structural fill soils. Accordingly, remedial grading will be required.

3.4 Old Terrace Deposits (Qt)

Quaternary-age Old Terrace Deposits consist of very dense, weakly-cemented to cohesionless sand, cobble, and boulders that cap the broad knoll in the central portion of the property and the southwestern corner of the site. Metavolcanic rock clasts are abundant and indicate that the Old Terrace Deposits probably originated from the nearby Otay Mountains. The soils of these deposits possess satisfactory foundation engineering characteristics in both undisturbed and properly compacted states. The presence of very large boulders (some in excess of 3 feet in diameter), as encountered in Trenches T1 through T6, is not uncommon and, if encountered during grading, may require special handling and placement techniques in compacted fills. Oversize rocks should be placed in accordance with Section 6.3 at Appendix C.

3.5 Otay Formation (To)

The Oligocene-age Otay Formation consists of very dense, light gray-brown to light brown, silty to clayey sandstones and hard, sandy claystones and siltstones. The sandy and clayey units vary in thickness and are typically interbedded. The sandier portions of the Otay Formation are considered to have *low* to *medium* expansive potential, whereas the clayey portions are *medium* to *high* in expansive potential. One bentonite clay seam, with critically *high* expansive potential also was encountered in the exploratory boring LB-7. The claystone units of the Otay Formation typically exhibit low shear strength and accordingly, landslides or other types of slope instability can occur where these soils are present. A study of the previously-referenced aerial photographs and geologic observations made during the drilling and trenching operations did not reveal the presence of landslides; however, we recommend that the potential impact of the Otay Formation on slope stability be further evaluated after final grading plans become available for review. Based on the preliminary grading plan, we expect that highly expansive bentonitic clays may be exposed within 10 feet of subgrade elevation in Lot 17 as indicated in Geologic Cross-section B-B', Figure 3. Highly weathered Otay Formation that requires remedial grading may be encountered where exposed at the surface or beneath alluvium/colluvium. Weathering extends to 5 to 8 feet in some locations.

4. GEOLOGIC STRUCTURE

The general geologic structure is a gently, southwesterly dipping planar strata. Data obtained from Borings B-1, B-2, and B-3 suggest that the Otay Formation generally strikes N60°W and dips 3°SW.

We observed remolded clay seams and/or fractured claystone within bentonitic layers within the Otay Formation during our subsurface investigation. These features are interpreted as bedding parallel shears and may be related to stress relief along weak beds (Hart, M.W., 2000). Bedding parallel shears are postulated to be a significant factor in landsliding processes. However, based on our analysis, the likelihood of these features contributing to sliding within the property limits is low provided that mitigative measures are incorporated in slope design.

5. GROUNDWATER

A permanent groundwater table was not encountered during our field investigation and is not anticipated to significantly impact project development as presently proposed. It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Surface water that is not properly drained will typically perch on the top of the impervious clay soil. Therefore, proper surface drainage of irrigation and rain runoff will be critical to future performance of the project. Seeps were observed in some of the borings and running water was encountered in the Johnson Canyon drainage bottom. The seeps encountered in the borings appear to be related to localized perched ground water conditions.

6. GEOLOGIC HAZARDS

6.1 Seismic Hazard Analysis

According to the computer program *EZ-FRISK (Version 7.65)* there are 6 known active faults located within a search radius of 50 miles from the property. We used the 2008 USGS fault database, which provides several models and combinations of fault data to evaluate fault information. The nearest active faults are the Newport-Inglewood and Rose Canyon Fault Zones, located approximately 12 miles west of the site and are the dominant source of seismic ground motion. Earthquakes that might occur on the Newport-Inglewood and Rose Canyon Fault Zones or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood and Rose Canyon Fault Zones are 7.5 and 0.25g, respectively. Table 6.1.1 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 USGS 2008*, *Campbell-Bozorgnia (2008) NGA USGS 2008*, and *Chiou-Youngs (2007) NGA USGS 2008* acceleration-attenuation relationships.

TABLE 6.1.1
DETERMINISTIC SEISMIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson, (2008) NGA USGS 2008 (g)	Campbell-Bozorgnia, (2008) NGA USGS 2008 (g)	Chiou-Youngs, (2007) NGA USGS 2008 (g)
Newport-Inglewood/Rose Canyon	12	7.5	0.25	0.20	0.25
Rose Canyon	12	6.9	0.21	0.17	0.19
Coronado Bank	19	7.4	0.20	0.14	0.17
Palos Verdes/Coronado Banks	19	7.7	0.21	0.15	0.19
Elsinore	41	7.85	0.14	0.09	0.11
Earthquake Valley	44	6.8	0.08	0.06	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 mapped Quaternary fault is proportional to the slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by *Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008* in the analysis. Table 6.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, (2008) NGA USGS 2008 (g)	Campbell-Bozorgnia, (2008) NGA USGS 2008 (g)	Chiou-Youngs, (2007), NGA USGS 2008 (g)
2% in a 50 Year Period	0.41	0.34	0.39
5% in a 50 Year Period	.031	0.25	0.28
10% in a 50 Year Period	0.23	0.20	0.21

The California Geologic Survey (CGS) provides a program that calculates the ground motion for a 10 percent of probability of exceedence in a 50-year period based on an average of several attenuation relationships. Table 6.1.3 presents the calculated results from the Probabilistic Seismic Hazards Mapping Ground Motion Page from the CGS website.

TABLE 6.1.3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Formational soil	Calculated Acceleration (g) Fill
0.21	0.23	0.27

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

6.2 Liquefaction

Due to the lack of a permanent near-surface groundwater table and the dense nature of proposed compacted fill and the soil of the Old Terrace Deposits and Otay Formation, the risk associated with liquefaction hazard at the site is low.

6.3 Tsunamis and Seiches

The site is located approximately 12 miles from the Pacific Ocean at an elevation of more than 520 feet above Mean Sea Level. The risk associated with inundation hazard due to tsunamis is low.

The site is not located downstream from any large bodies of water. Therefore, risk associated with inundation hazard due to seiche is low.

6.4 Landslides

Based on our review of the referenced geologic literature and our previous investigations on the property, landslide deposits have not been mapped on the site. The risk associated with ground movement hazard due to landslide is low.

6.5 Subsidence and Seismic Settlement

Based on the subsurface conditions encountered during our field investigation, the risk associated with ground subsidence or seismic settlement hazard is low.

6.6 Flooding

The site is not located within an active drainage or floodplain; therefore, the risk associated with inundation hazard due to flooding is low.

6.7 Expansive Soil

Based on our experience and laboratory testing performed at the site and in nearby projects, existing topsoil, alluvium/colluvium and the clayey soil of the Otay Formation, exhibit a *high* to *very high* expansion potential (Expansion Index higher than 90). The Old Terrace Deposits and the sandy soil of the Otay Formation exhibits *low to medium* expansion potential (Expansion Index from 21 to 90).

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 No soil or geologic conditions were encountered that would preclude the proposed development, provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 Our field investigation indicates that the site is underlain by weak and highly expansive claystones and potentially compressible, undocumented fill soils, topsoils, alluvial/colluvial deposits that will require special consideration during grading operations. Formational soils of the Old Terrace Deposits and Otay Formation underlie the surficial materials and extend to the maximum depth of exploration. The undocumented fill soils, topsoils, alluvial/colluvial deposits and the weathered soil of the Otay Formation are unsuitable in their present condition to receive settlement-sensitive improvements and/or additional structural fill soils. The remedial grading recommendations presented in the *Grading* section should be closely followed to properly compact the surficial soils. The soils of the Old Terrace Deposits and unweathered Otay Formation should provide adequate soil support characteristics in their natural state and where placed as properly-compacted fill.

7.1.3 Weak, highly-expansive, bentonitic claystones may be present within 10 feet of subgrade in Lot 17. Bentonite claystones exposed within 10 feet of proposed grade on the sheet graded lots and 6 feet from subgrade in proposed road ways should be removed and replaced with *low*-expansive materials.

7.1.4 We expect anticipated that weak claystones may be present on some of the cut slopes that may require stabilization measures in the form of buttresses or stability fills. Cut slopes should be observed by our project Engineering Geologist during grading operations to check that the soil and geologic conditions are as anticipated in this report.

7.1.5 The undocumented fill soils contain considerable amounts of trash and debris. Extensive sorting and/or export of these soils should be anticipated during grading operations.

7.1.6 The cut operations in the area underlain by Old Terrace Deposits will generate oversize rocks that will require special handling and placement. All oversize materials should be placed in accordance with the grading specifications contained in Appendix C.

7.1.7 Highly expansive soils will be encountered within the topsoils, alluvial and alluvial/colluvial deposits as well as in the soils of the Otay Formation. Highly expansive soils should be placed in the deeper portions of the fill areas. We expect, however, that there are sufficient *low* to *medium* expansive soils available for capping purposes on the site to mitigate the adverse impact of expansive soils.

7.1.8 Perched groundwater may be present within the low-lying alluvial/colluvial areas. Hence, remedial measures in the form of subdrains may be required where filling of the drainage courses is planned. The need for subdrains will be determined upon our review of the final grading plan.

7.1.9 In general, the undisturbed soils are expected to exhibit low erosion potential. However, fill areas or areas stripped of native vegetation will require special consideration to reduce the erosion potential. In this regard, desilting basins, improved surface drainage, and early planting of erosion-resistant ground covers are recommended.

7.1.10 Subsurface conditions observed may be extrapolated to reflect general soil and geologic conditions; however, variations in subsurface conditions between trench and boring locations should be anticipated. The Geologic Map, attached as Figure 2, presents the areal extent of the geologic conditions encountered. Cross-sections A-A', B-B', C-C', D-D', Figures 3 and 4, respectively, present the general soil conditions encountered.

7.1.11 No significant geologic hazard that would adversely affect he proposed project were observed or are known to exist on the site.

7.2 Soil and Excavation Characteristics

7.2.1 Onsite soils can be excavated with moderate to heavy effort with conventional heavy-duty equipment.

7.2.2 Based on our experience in the area and laboratory tests, the soil encountered during the field investigation is considered to be *expansive* (expansion index [EI] higher than 20) as defined by 2013 California Building Code (CBC) Section 1805.5.3. Table 7.2 presents soil classifications based on the Expansion Index.

TABLE 7.2
SOIL CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2010 CBC Expansion Classification
0-20	Very Low	Non-Expansive
21-50	Low	Expansive
51-90	Medium	
91-130	High	
Greater than 130	Very High	

7.3 Temporary Excavations

7.3.1 Temporary excavations should be conducted in conformance with OSHA requirements. Existing undocumented fill, topsoil, alluvium/colluvium and the weathered soil of the Otay Formation can be considered Type B soil in accordance with OSHA guidelines. The Old Terrrace Deposits and the Otay Formation can be considered Type A soil. In general, special shoring will not be necessary if temporary excavations are less than 3 feet high. Temporary excavation depths greater than 3 feet should be laid back at an appropriate inclination or shored. The soils exposed in these excavations should not become saturated or allowed to dry. Surcharge loads should not be permitted within a distance equal to the depth of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.4 Slope Stability

7.4.1 Slope stability analyses using laboratory shear strength information and experience with similar soil conditions in nearby areas indicate that 2:1 (horizontal:vertical) fill slopes constructed of on-site granular materials should have calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions for heights of 40 feet. The 2:1 cut slopes are expected to be excavated predominantly in the Otay Formation. Based on the calculations and experience with similar conditions, 2:1 cut slopes to the planned heights should possess a factor of safety of at least 1.5 with respect to slope stability if free of adversely oriented bedding, joints or fractures. Slope stability calculations for deep-seated and surficial stability conditions are presented on Figures 5 through 8.

7.4.2 Keying and benching operations during grading of the slopes should be performed in accordance with Appendix C. Due to the presence of highly weathered Otay Formation at some locations, keying operations may extend deeper than normal (on the order of 3 to 5 feet).

7.4.3 Cut slopes within the Otay Formation may require further evaluation due to the possible presence of claystone and siltstone lenses. Stability fills may be necessary to prevent surficial sloughage of the slope faces. The potential presence of bentonitic clay lenses and the associated slope stability considerations can be addressed at the time of grading.

7.4.4 We recommend that all cut slope excavations be observed during grading by our engineering geologist to check that soil and geologic conditions do not differ significantly from those anticipated.

7.4.5 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular "soil" fill to reduce the potential for surficial sloughing. In general, soils with an Expansion Index of less than 90 or at least 35 percent sand size particles should be acceptable as "granular" fill. Slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

7.4.6 All slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion. Slope planting should generally consist of drought-tolerant plants having a variable root depth. Slope watering should be kept to a minimum to just support the plant growth.

7.5 Bulking and Shrinkage

7.5.1 Estimates of embankment bulking and shrinkage factors are typically based on comparing laboratory compaction tests with the density of the material in its natural state as encountered in the test borings and trenches. Variations in existing soil density, as well as in compacted fill densities, render shrinkage value estimates very approximate. As an example, the contractor can compact the fill soils to any relative compaction of 90 percent or higher of the maximum laboratory density. Thus, the contractor has approximately a 10 percent range of control over the fill volume. Based on our experience on nearby sites, in our opinion the following shrinkage factors can be used as a basis for estimating how much the on-site soils may shrink or swell (bulk) when excavated from their existing state and placed as compacted fills.

TABLE 7.5
SHRINKAGE AND BULK FACTORS

Soil Unit	Shrink/Bulk Factor
Undocumented Fill Soil	15 to 20 percent Shrink
Topsoil, Alluvium/Colluvium	10 to 15 percent Shrink
Otay Formation	5 to 10 percent Bulk
Old Terrace Deposits	10 to 15 percent Bulk

7.6 Grading

7.6.1. All grading should be performed in accordance with the *Recommend Grading Specifications* contained in Appendix C and the County of San Diego Grading Ordinances. Where the recommendations of Appendix C conflict with this section of the report, the recommendations of this section take precedence.

7.6.2 Earthwork should be observed by, and compacted fill tested by, representatives of Geocon Incorporated.

7.6.3 A preconstruction conference should be held at the site prior to the beginning of grading operations with the developer, contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling requirements can be discussed at that time.

7.6.4 Site preparation should begin with the removal of all deleterious matter and vegetation. The depth of removal should be such that material to be used in fills is free of organic matter. Any existing underground improvements (not projected to remain should be removed and the resulting depressions properly backfilled in accordance with the procedures described herein. Material generated during stripping operations and/or site demolition should be exported from the site.

7.6.5 All undocumented fill, topsoils, and colluvial/alluvial deposits not removed by planned grading should be removed to firm natural ground and properly compacted to at least 90 percent of the maximum dry density as determined by ASTM D 1557 at moisture contents 1 to 3 percent above optimum.

7.6.6 The upper 5 to 8 feet of the Otay Formation is highly weathered and will require removal and compaction as compacted fill. The actual depth of removal will be evaluated in the field during grading operations.

7.6.7 After all unsuitable soils and deleterious material have been removed, areas planned to receive structural fill soils and/or settlement-sensitive improvements should be scarified to a depth of approximately 12 inches, moisture conditioned to 1 to 3 percent above optimum moisture content, and recompacted to a minimum of 90 percent of the dry density determined by ASTM D 1557.

7.6.8 The site should then be brought to final subgrade elevations with structural fill compacted in layers. In general, native site soils are suitable for reuse as fill if free from vegetation, debris and other deleterious matter. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill (including backfill and scarified ground surfaces) should be compacted to at least 90 percent of maximum dry density at optimum moisture content or above, as determined in accordance with the ASTM D 1557, at moisture contents ranging from 1 to 3 percent above the optimum content. Fill soils placed at moisture contents outside this range of moisture content may be considered unacceptable at the discretion of the geotechnical engineer.

7.6.9 Highly-expansive soils (EI >90) should not be placed within the upper 5 feet of finished pad grade. Bentonite with *critically high* expansive potential should not be placed within 10 feet of finish grade. Similarly, cut lots containing highly expansive soils within 5 feet of finish grade should be undercut 5 feet and capped with *low* to *medium* (EI between 21 and 90) expansive materials.

7.6.10 Where bentonite materials are present within 10 feet of finish grade on cut lots, this condition should be evaluated on an individual lot basis and mitigative measures provided in updated geotechnical reports once building location and anticipated structural loading are determined.

7.7 Seismic Design Criteria

7.7.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 7.7.1 summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 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 building structure and improvements should be designed using a Site Class D. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2013 CBC and Table 20.3-1 of ASCE 7-10. The values presented in Table 7.7.1 are for the risk-targeted maximum considered earthquake (MCE_R). The values presented in Table 7.7.1 are for preliminary purposes. Once specific grading plans with building locations are developed for each lot, Geocon Incorporated should be contracted to provide specific seismic design criteria.

TABLE 7.7.1
2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2013 CBC Reference
Site Class	D	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.808 g	Figure 1613..3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.310 g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.177	Table 1613.3.3(1)
Site Coefficient, F_V	1.780	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.951 g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.552 g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.634 g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.368 g	Section 1613.3.4 (Eqn 16-40)

7.7.2 Table 7.7.2 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 7.7.2
2013 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.313 g	Figure 22-7
Site Coefficient, F_{PGA}	1.187	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.372 g	Section 11.8.3 (Eqn 11.8-1)

7.7.3 Conformance to the criteria in Tables 7.7.1 and 7.7.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.8 Foundation Recommendations

7.8.1 Continuous footings or isolated spread footings for one- and/or two-story structures should be at least 12 inches wide and should extend at least 18 inches below lowest adjacent pad grade into properly compacted fill soils as recommended in Section 7.6. Isolated spread footings for one- and/or two-story structures should be at least 2 feet wide and extend 18 inches below lowest adjacent pad grade into properly compacted fill soils. Figure 9 presents a footing dimension detail depicting lowest adjacent grade. Minimum continuous footing reinforcement for one- and/or two-story structures should consist of four No. 4 steel-reinforcing bars placed horizontally in the footings; two near the top and two near the bottom.

7.8.2 The recommended dimensions and steel reinforcement presented above are based on soil characteristics only and are not intended to be in lieu of reinforcement necessary to satisfy structural loading. Actual reinforcement of the foundations should be designed by the project structural engineer.

7.8.3 The recommended allowable bearing capacity for foundations designed as recommended above is 2,500 pounds per square foot for 18-inch-deep footings. This value is for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

7.8.4 Footing excavations should be observed by a representative of Geocon Incorporated prior to placing reinforcing steel to verify that soil conditions are similar to those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.9 Concrete Slabs-on-Grade

7.9.1 Interior concrete slabs-on-grade should be at least 5 inches thick. Where heavy concentrated floor loads are anticipated, the slab thickness should be increased to 6 inches and should be underlain by 4 inches of Class 2 base material compacted to at least 95 percent relative compaction. The allowable soil bearing pressure under slabs with import, *low* expansive soils is 1,500 pounds per square foot.

7.9.2 Minimum reinforcement of slabs-on-grade placed on *low* to *medium* expansive soil should consist of No. 3 reinforcing bars placed at 18 inches on center in both horizontal directions. The concrete slabs-on-grade should also be doweled into the foundation system to prevent vertical movement between the slabs, footings, and walls.

7.9.3 The concrete slab-on-grade recommendations are minimums based on soil support characteristics only. We recommend that the project structural engineer evaluate the structural requirements of the concrete slabs for supporting equipment and storage loads.

7.9.4 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.

7.9.5 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 thick slabs 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.

7.9.6 All exterior concrete flatwork not subject to vehicular traffic should be a minimum of 4 inches thick and conform to the following recommendations. Slab panels in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh to reduce the potential for cracking. In addition, all 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 soils for exterior slabs should be compacted in accordance with criteria presented in the grading section of this report. The subgrade soils should not be allowed to dry prior to placing concrete.

7.9.7 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential soil movement. However, even with the incorporation of these recommendations, foundations and slabs-on-grade will still exhibit some cracking. 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 Cement Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.10 Lateral Loads for Retaining Walls

7.10.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. Expansive soil should not be used as backfill material behind retaining walls. Soil placed for retaining wall backfill should have an Expansion Index less than 50. Existing soils exhibited a *low* to *high* expansion potential. Therefore, stockpiling of *low* expansive soils encountered during grading or import of *low* expansive granular soil may be required for retaining wall backfill.

7.10.2 Where walls are restrained from movement at the top, an active soil pressure equivalent to the pressure exerted by a fluid density of 60 pcf should be used for horizontal backfill. 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 (unit weight 125 pcf).

7.10.3 Soil contemplated for use as retaining wall backfill should be identified in the field prior to backfilling. 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. County of San Diego or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, onsite 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 onsite soil for use as wall backfill if standard wall designs will be used.

7.10.4 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the structures adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 10, attached. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.10.5 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 17H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.372g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

7.10.6 To resist lateral loads, a passive pressure equivalent to the pressure exerted by a fluid density of 300 pcf should be used for design of footings or shear keys poured neat against properly compacted granular fill soils. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

7.10.7 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for design. To resist lateral loads, the passive resistance can be combined with friction.

7.10.8 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet are planned, Geocon Incorporated should be consulted for additional recommendations.

7.11 Preliminary Pavement Recommendations

7.11.1 The following recommendations are for preliminary purposes and are provided for private driveways and parking areas. The final pavement section design will depend upon soil conditions exposed at subgrade elevation and the results of Resistance Value (R-Value) tests. The following preliminary pavement section recommendations are based on an assumed R-Value of 15. Sections are presented for both flexible (asphalt concrete) and rigid (Portland cement concrete) pavement.

7.11.2 The pavement sections for public streets will be determined by the County of San Diego Materials Testing and Engineering Department. The final pavement sections of public streets will be dependent on the traffic index designated by the County of San Diego Materials Testing and Engineering Department and the R-Value laboratory test results of the exposed subgrade soils.

TABLE 7.11.1
FLEXIBLE PAVEMENT SECTIONS RECOMMENDATIONS

Location	Assumed Traffic Index (TI)	Assumed R-Value	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls for automobiles and light-duty vehicles	4.5	15	3	6.0
Driveways for automobiles and light-duty vehicles	5.5	15	3	10.0
Driveways and parking areas for heavy-duty trucks and fire lanes	7.0	15	4	13.0

TABLE 7.11.2
RIGID PAVEMENT SECTIONS RECOMMENDATIONS

Location	Average Daily[1] Truck Traffic (ADTT assumed)	Assumed R-Value	Portland Cement Concrete[2] (inches)	Class 2 Aggregate Base Thickness (inches)
Parking stalls[3] for automobiles and light-duty vehicles	25-100	20	5	4
Driveways[3] for automobiles and light-duty vehicles	300-500	20	6[†]	4
Driveways and parking areas for heavy-duty trucks and fire lanes	100-500	20	7[‡]	4

[1]ADTT values have been assumed for planning purposes herein and should be confirmed by the design team during future plan development.

[2]Concrete shall have a minimum $M_R \geq 600$ psi. This analysis assumes the construction of concrete shoulders.

[3]Parking stalls and driveways assume typical light truck and car traffic.

[†]Slabs should be reinforced with No. 3 reinforcing bars at 24 inches on center in both horizontal directions.

[‡]Slabs should be reinforced with No. 4 reinforcing bars at 24 inches on center in both horizontal directions.

7.11.3 The subgrade soils should be compacted to a minimum relative compaction of 95 percent at 1 to 3 percent above the optimum moisture content. The depth of subgrade compaction should be approximately 12 inches.

7.11.4 Class 2 base should conform to Section 26-1.-02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* and should be compacted to a minimum of 95 percent of the maximum dry density at near optimum moisture content. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Green Book).*

7.11.5 Where trash bin enclosures are planned within asphalt paved areas, we recommend that the pavement sections be equivalent to the heavy-duty truck categories presented in the respective tables. The concrete should extend into the roadway sufficiently so that all wheels of the trash truck are on the concrete when loading.

7.11.6 Rigid Portland cement concrete sections were evaluated using methods suggested by the American Concrete Institute *Guide for Design and Construction of Concrete Parking Lots (ACI330R-08).*

7.11.7 Construction joints should be provided at a maximum spacing of 12 feet each way to control shrinkage. Installation of these types of joints should be made immediately after concrete finishing.

7.11.8 Construction jointing, doweling, and reinforcing should be provided in accordance with recommendations of the American Concrete Institute.

7.11.9 The performance of asphalt concrete pavements and Portland cement concrete pavements is highly dependent upon providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. If planter islands are proposed, the perimeter curb should extend at least 12 inches below proposed subgrade elevations. In addition, the surface drainage within the planter should be such that ponding will not occur.

7.11.10 Our experience indicates that even with these provisions, a groundwater condition can develop as a result of increased irrigation, landscaping and surface runoff.

7.12 Bio-Retention Basin and Bio-Swale Recommendations

7.12.1 The site will be underlain by compacted fill, Old Terrace Deposits and Otay Formation. Based on our experience with the onsite soils and infiltration testing in nearby projects, the onsite soil has very low permeability and generally very low infiltration characteristics. It is our opinion the existing soil is unsuitable for infiltration of storm water runoff.

7.12.2 Any bio-retention basins, bioswales, and bio-remediation areas should be designed by the project civil engineer and reviewed by Geocon Incorporated. Typically, bioswales consist of a surface layer of vegetation underlain by clean sand. A subdrain should be provided beneath the sand layer. Water should not be allowed to infiltrate adjacent to the planned improvements. We recommend that retention basins, be properly lined to prevent water infiltration into the underlying soil. Prior to discharging into the storm drain pipe or other approved outlet structure, a seepage cutoff wall should be constructed at the interface between the subdrain and storm drainpipe. The concrete cut-off wall should extend at least 6 inches beyond the perimeter of the gravel-packed subdrain system. Figure 11 presents a typical bioswale detail.

7.12.3 The landscape architect should be consulted to provide the appropriate plant recommendations if a vegetated swale is to be implemented. If drought resistant plants are not used, irrigation may be required.

7.13 Drainage and Maintenance

7.13.1 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 2013 CBC 1803.3 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 storm drains and conduits that carry runoff away from the proposed structure.

7.13.2 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.

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

7.14 Grading and Foundation Plan Review

7.14.1 Geocon Incorporated should review the grading plans and foundation plans prior to final design submittal to determine if additional analysis and/or recommendations are required.

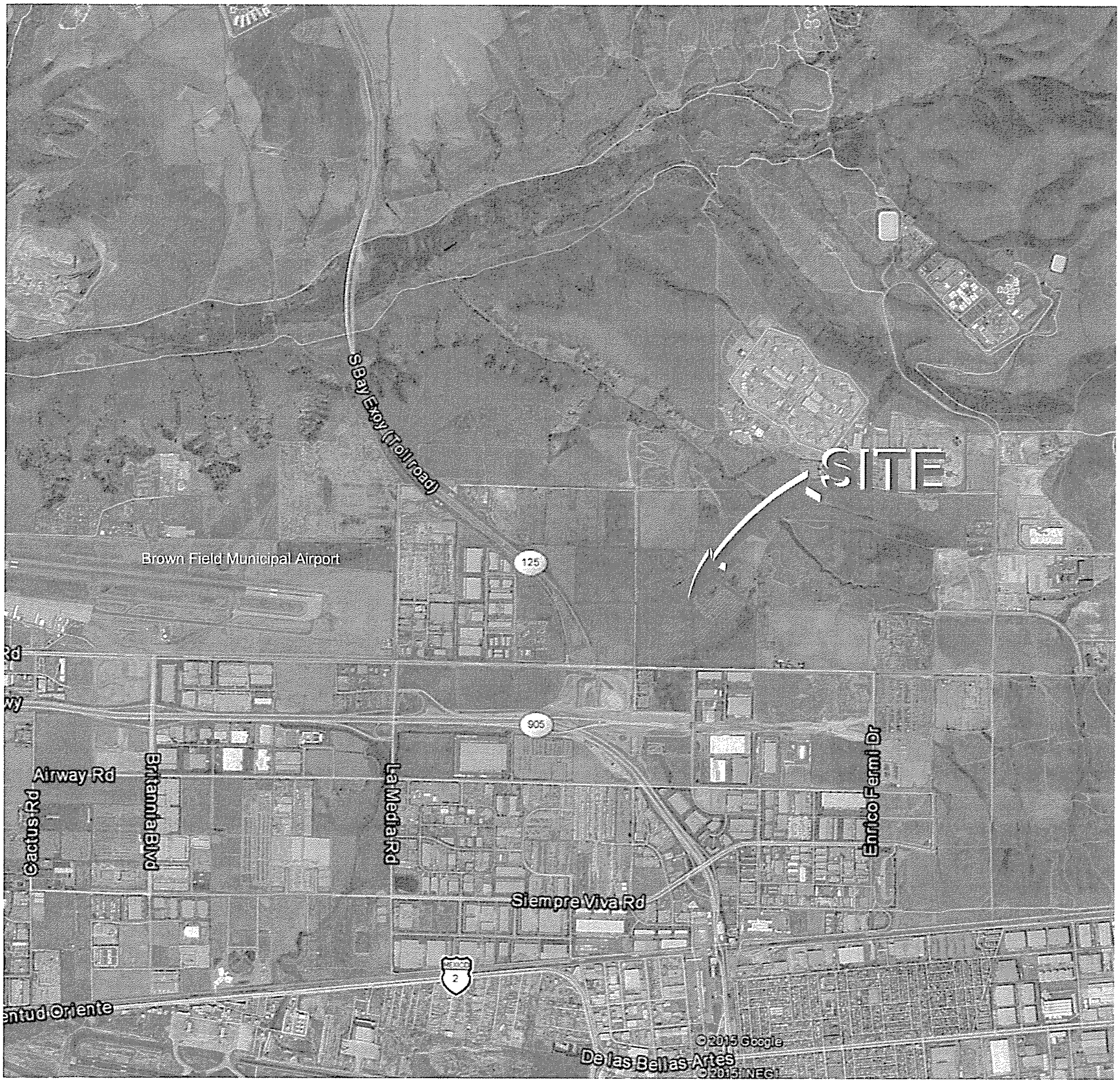
LIMITATIONS AND UNIFORMITY OF CONDITIONS

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.



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N

NO SCALE

VICINITY MAP

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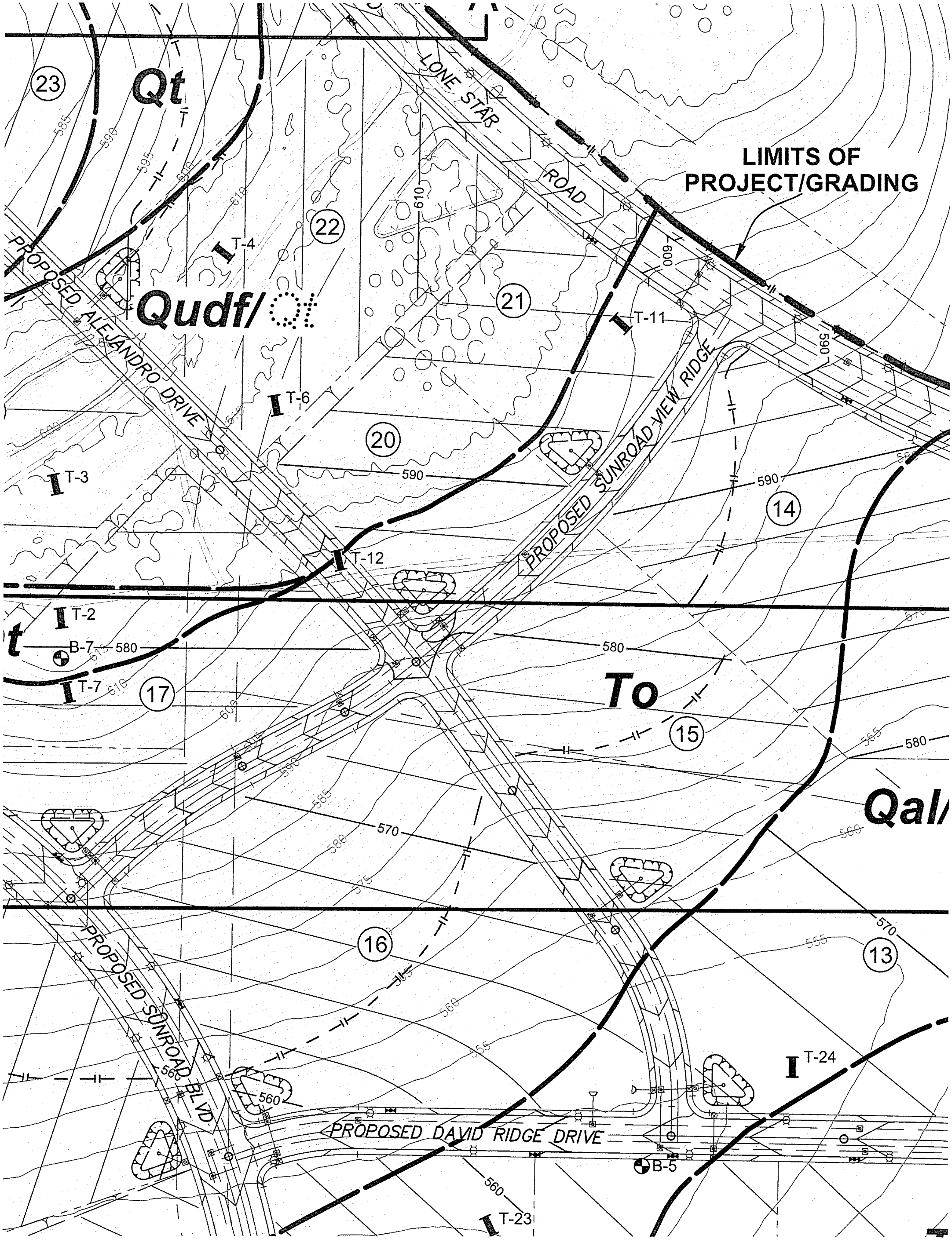
RG / RS		DSK/GTYPD	DATE 07 - 20 - 2015	PROJECT NO. 06263 - 42 - 03	FIG. 1

Plotted:07/17/2015 2:01PM \| By:JONATHAN WILKINS \| File Location:Y:\PROJECTS\06263-42-03 East Otay Mesa Center Mixed Use\DETAILS\06263-42-03_VicMap.dwg


LIMITS OF PROJECT/GRADING
LONE STAR ROAD
PROPOSED ALEJANDRO DRIVE
PROPOSED SUNROAD VIEW RIDGE
PROPOSED SUNROAD BLVD
PROPOSED DAVID RIDGE DRIVE
Qt
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To
Qal
T-2
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T-4
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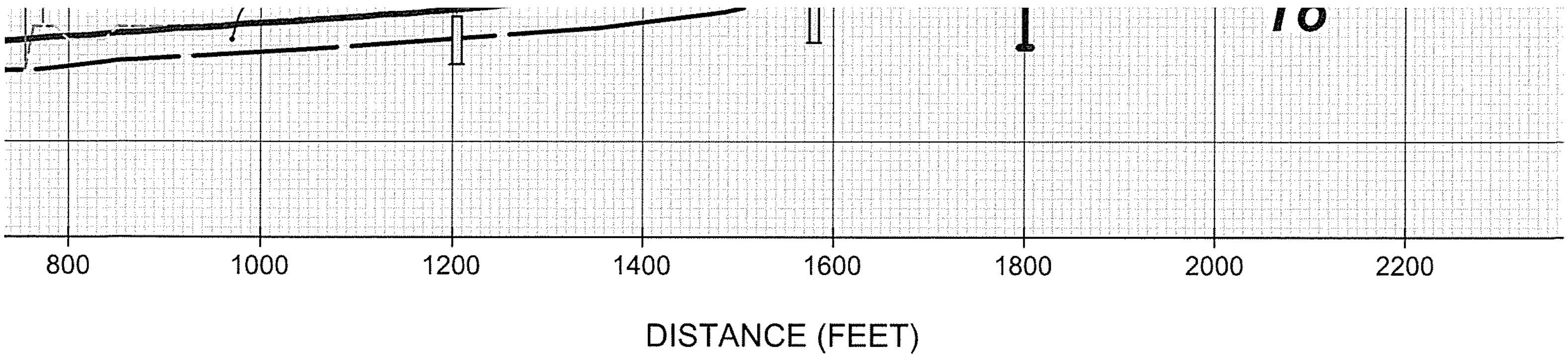
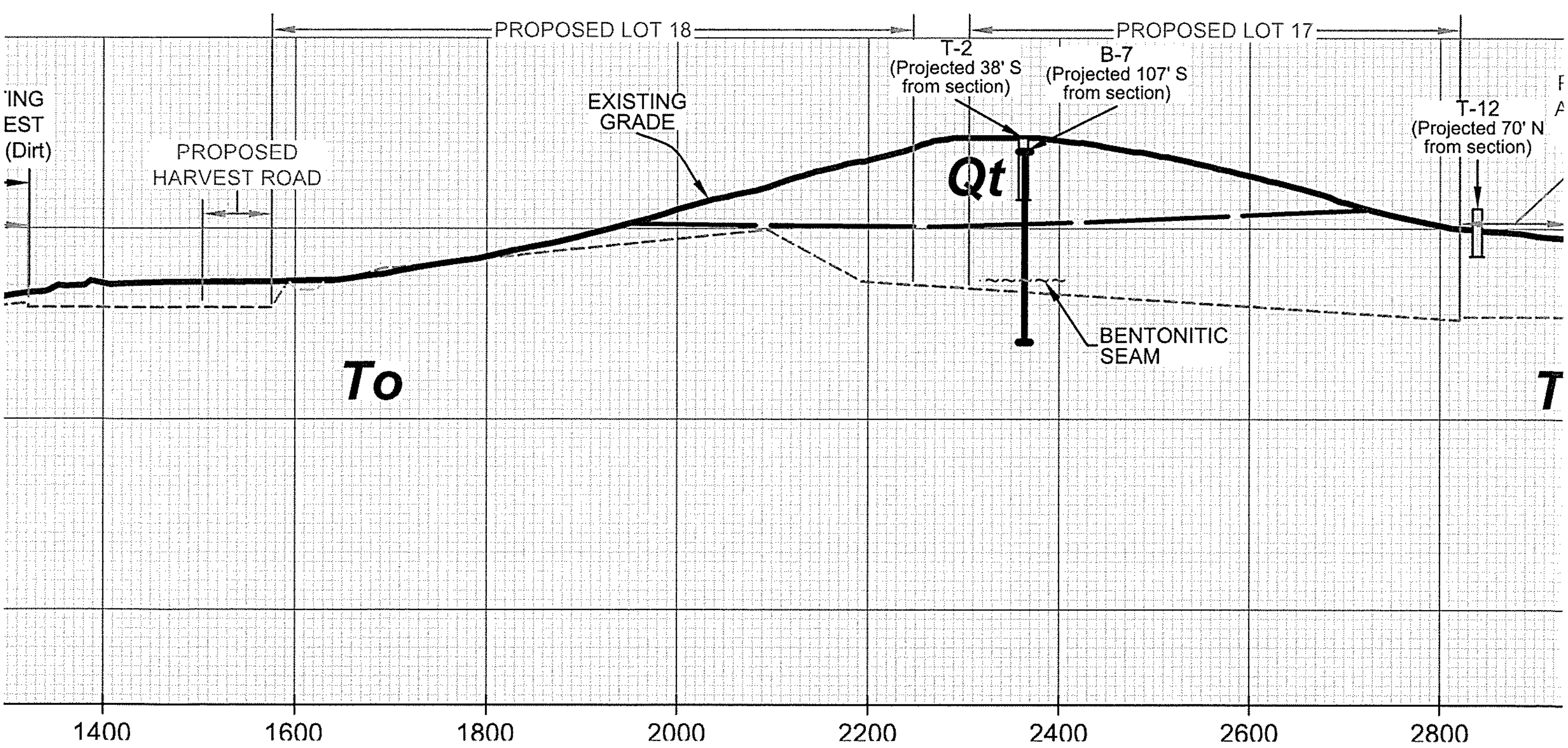
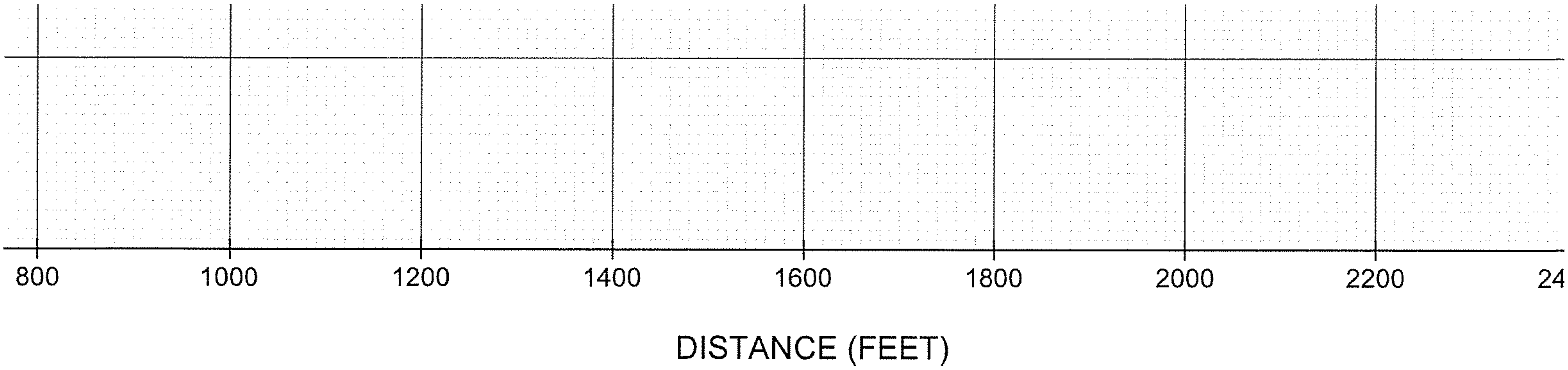


GEOLOGIC CROSS-SECTION A-A'

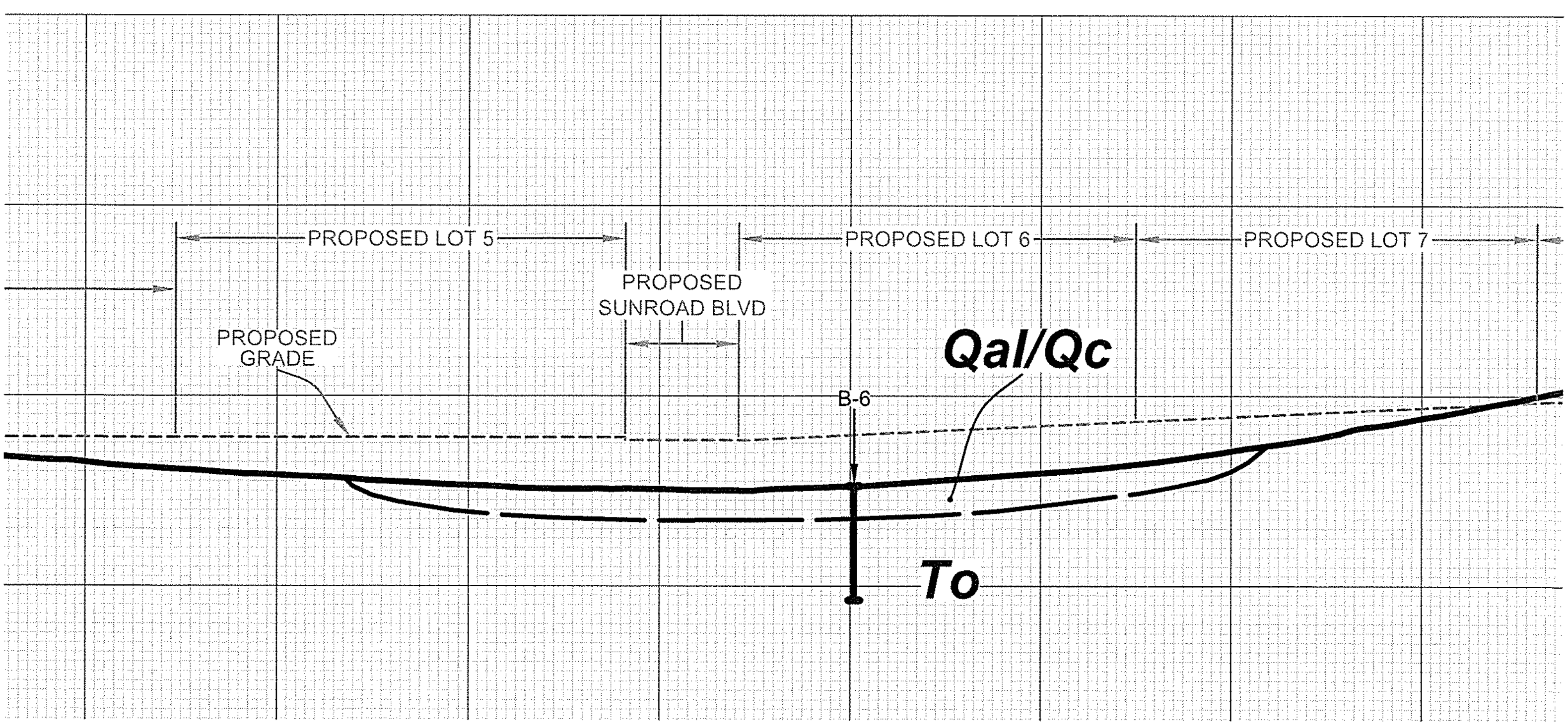
SCALE: 1" = 200' (Horiz.); 1" = 40' (Vert.)





GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 200' (Horiz.); 1" = 40' (Vert.)



ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= 40 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 118.3 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 35 degrees
APPARENT COHESION	C	= 150 pounds per square foot
NO SEEPAGE FORCES		

ANALYSIS :

$\gamma_{c\phi} = \dfrac{\gamma_t H \tan\phi}{C}$		EQUATION (3-3), REFERENCE 1
$FS = \dfrac{N_{cf} C}{\gamma_t H}$		EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	= 22.1	CALCULATED USING EQ. (3-3)
N_{cf}	= 60	DETERMINED USING FIGURE 10, REFERENCE 2
FS	= 1.9	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1......Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2......Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - FILL SLOPES

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ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)	
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 118.3 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 35 degrees
APPARENT COHESION	C	= 150 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z \cos^2 i \tan \phi}{\gamma_t\ Z \sin i \cos i} = 2.1$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - FILL SLOPES

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RG / RS		DSK/GTYPD	DATE 07 - 20 - 2015	PROJECT NO. 06263 - 42 - 03	FIG. 6

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= 40 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 132.3 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 35 degrees
APPARENT COHESION	C	= 500 pounds per square foot
NO SEEPAGE FORCES		

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{N_{cf} C}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\lambda_{c\phi}$	=	7.0	CALCULATED USING EQ. (3-3)
Ncf	=	25	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	2.5	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1......Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2......Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - CUT SLOPES

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RG / RS		DSK/GTYPD	DATE 07 - 20 - 2015	PROJECT NO. 06263 - 42 - 03	FIG. 7

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)	
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 132.3 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 35 degrees
APPARENT COHESION	C	= 350 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z \cos^2 i \tan \phi}{\gamma_t\ Z \sin i \cos i} = 4.1$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - CUT SLOPES

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EAST OTAY MESA CENTER MIXED-USE

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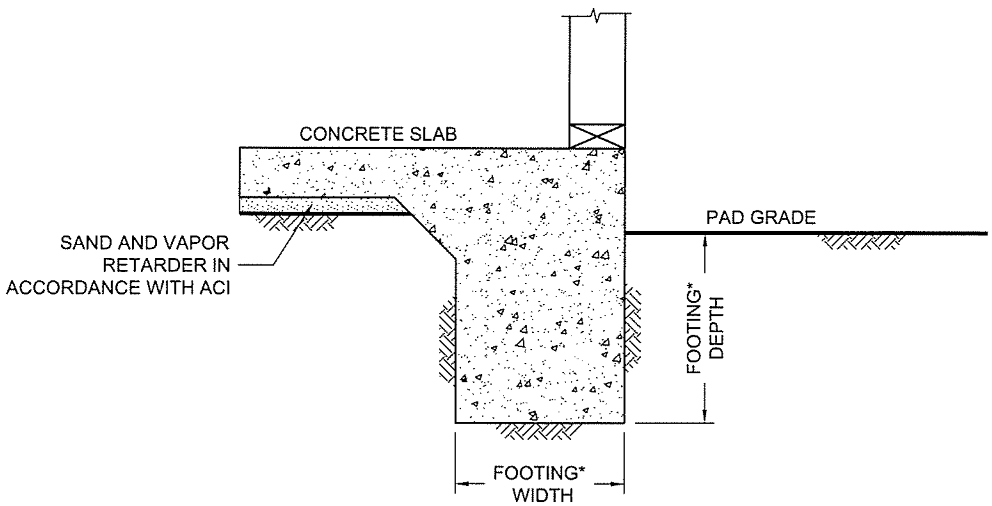
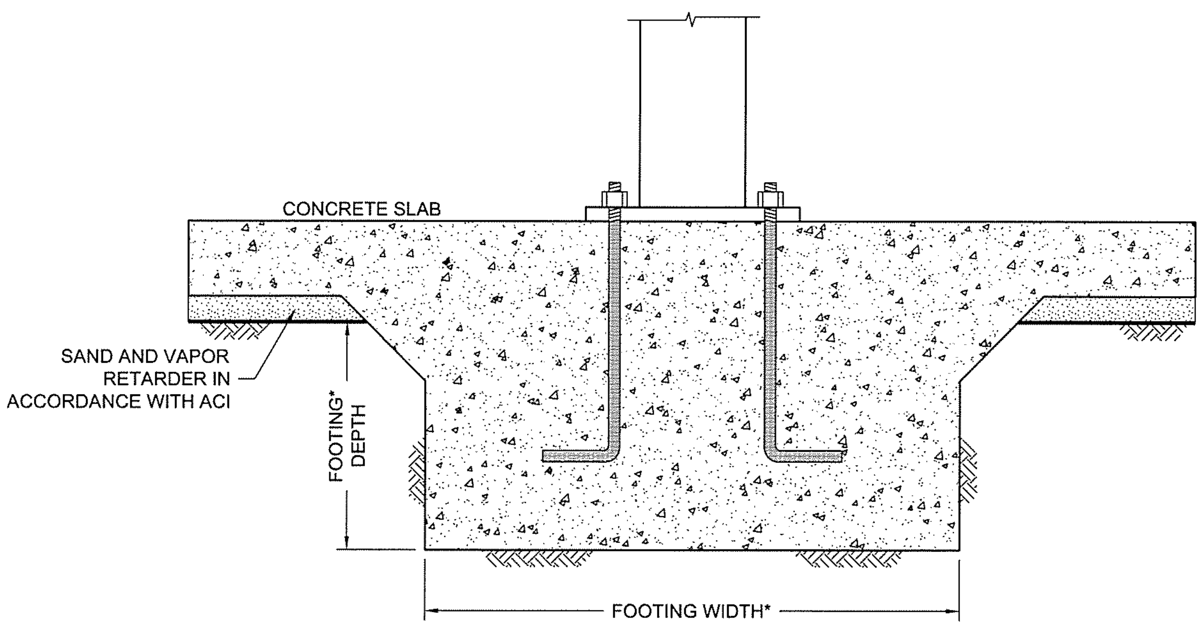
RG / RS		DSK/GTYPD	DATE 07 - 20 - 2015	PROJECT NO. 06263 - 42 - 03	FIG. 8





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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EAST OTAY MESA CENTER MIXED-USE
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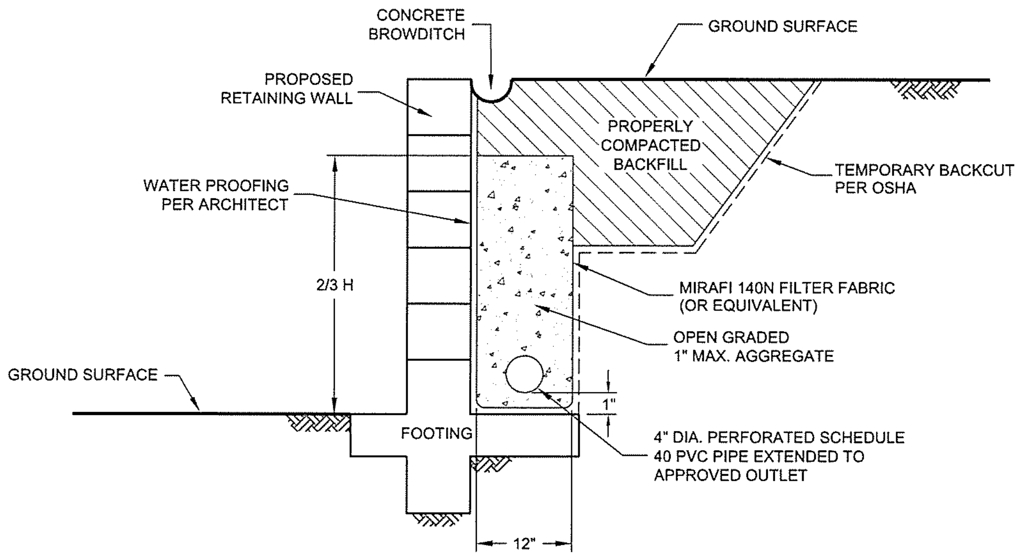
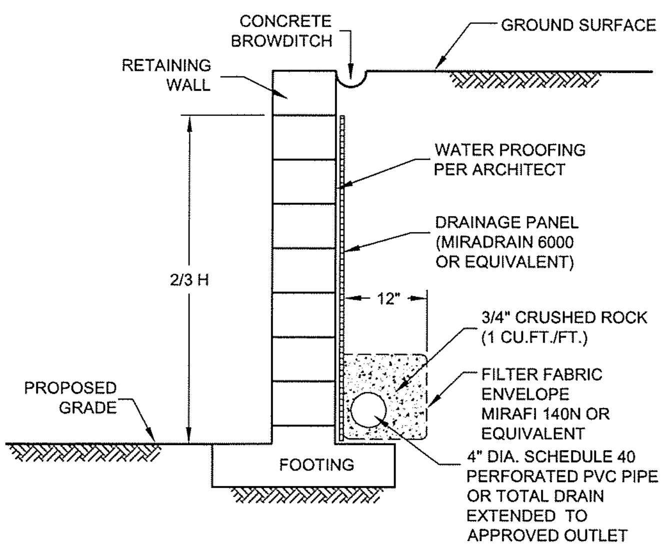
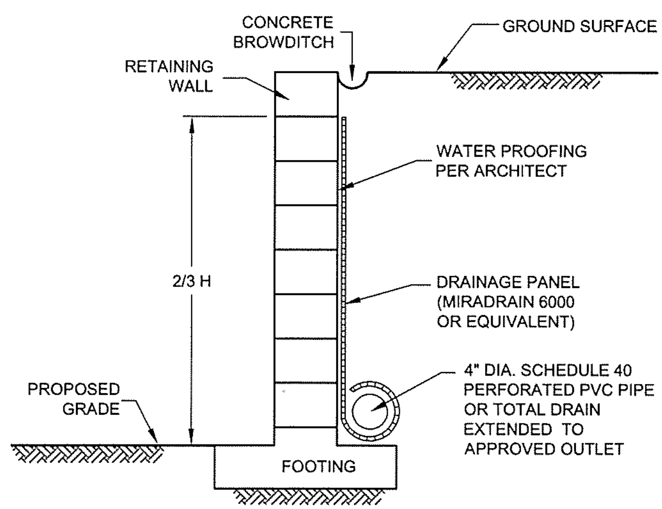
RG / RS		DSK/GTYPD	DATE 07 - 20 - 2015	PROJECT NO. 06263 - 42 - 03	FIG. 9







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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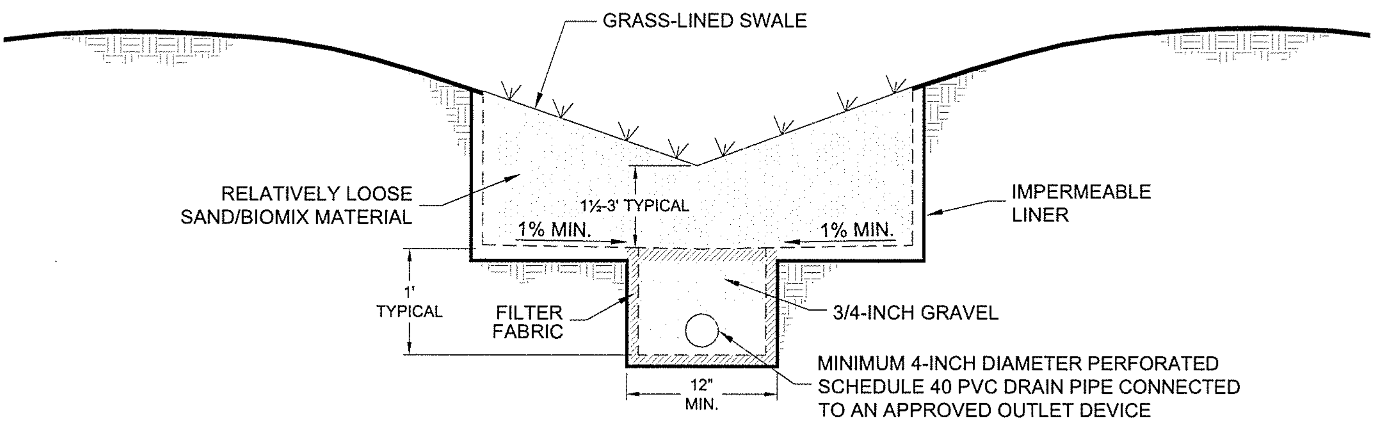
RG / RS		DSK/GTYPD

DATE 07 - 20 - 2015	PROJECT NO. 06263 - 42 - 03	FIG.10

Plotted:07/17/2015 1:47PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\06263-42-03 East Otay Mesa Center Mixed Use\DETAILS\06263-42-03_(RWDD7A).dwg



NO SCALE

VEGETATED SWALE BIOFILTER DETAIL

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RG / CW		DSK/GTYPD	DATE 07 - 20 - 2015	PROJECT NO. 06263 - 42 - 03	FIG. 11

Y:\PROJECTS\06263-42-03 East Otay Mesa Center Mixed Use\DETAILS\VSBD_2 (Bioswale).dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed between September 7 and September 20, 1990, and consisted of geologic mapping of 11 large-diameter exploratory borings and 26 exploratory trenches at the approximate locations shown on the attached Geologic Map, Figure 2 (Map Pocket). The borings were advanced to depths ranging from 20 feet to 90 feet below existing grade utilizing an E100 drill-rig equipped with a 30-inch-diameter bucket auger. The trenches were excavated utilizing a John Deere 710 backhoe and/or a John Deere 555 trackhoe.

Relatively undisturbed samples were obtained from the borings by driving a three-inch O. D. split-tube sampler into the soil mass with blows from the drill rig's Kelly bar falling 12 inches. The sampler was equipped with 1-inch by 2⅜-inch brass sampler rings to facilitate removal and testing. Disturbed samples of prevailing soils were also obtained from the borings and trenches.

The soil conditions encountered in the trenches were visually examined, classified, and logged in general conformance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D 2844). The logs of the exploratory borings and trenches are presented on Figures A-1 through A-45. The logs depict the various soil types encountered and indicate the depths at which samples were obtained.

FILE NO. 04581-03-01

BORING B 1

ELEVATION 572 DATE COMPLETED 9/10/90

EQUIPMENT E-100 BUCKET DRILL

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				CL	**TOPSOIL** Soft, dry, dark gray, Sandy CLAY			
3–8	B1-1			SM	**OTAY FORMATION** Highly weathered, fractured, dry, whitish gray Silty fine SANDSTONE interbedded with Sandy SILTSTONE	3/12"	103.3	16.1
8–10				CL	Hard, humid, fractured purplish CLAYSTONE, bedding attitude near horizontal			
10–14	B1-2			SM	Very dense, humid, light gray Silty fine SANDSTONE	3/12"	105.8	16.6
14–15	B1-4			ML	Purplish sandy siltstone from 14 to 15 feet			
15–20	B1-3			SM	Very dense, humid, light gray Silty fine SANDSTONE	5/12"	108.7	16.2
20–22.5	B1-5			ML	Very stiff to hard, humid, purplish-brown Clayey SILTSTONE. Contact gradational	3/12"	84.1	35.8
22.5–23				CH	Bentonite layer approximately 6 inches thick, attitude horizontal. Shear zone bedding plane fault 1/2 inch thick - horizontal			
23–27	B1-6			ML	Hard, humid, pinkish-gray, Clayey SILTSTONE	13/12"	125.7	10.5
27–28.3				SM	Grades into massive, gray, very fine silty sandstone at 27 feet			
28.3–30	B1-7			ML	Grades into hard, purplish siltstone	10/12"	114.8	17.1

Figure A-1 Log of Test Boring B 1, page 1 of 3

ECKE

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.

FILE NO. 04581-03-01

BORING B 1

ELEVATION 572 DATE COMPLETED 9/10/90

EQUIPMENT E-100 BUCKET DRILL

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	at 29 feet Grades into hard, purplish siltstone at 29 feet (continued)			
32				SM	Very dense, moist, light gray, massive, fine Silty SANDSTONE			
34				CL	Hard claystone layer. Attitude near horizontal			
36				SM	Very dense, moist, light gray, massive, fine Silty SANDSTONE			
38				CL	Hard claystone bed from 38.5 to 39.5 feet			
40	B1-8			SM	Very dense, moist, light gray, massive, fine Silty SANDSTONE	20/12"	129.3	6.0
42				SP	Very hard, well-cemented sandstone from 42.5 to 43.5			
44				SM	Very dense, moist, light gray, massive, fine Silty SANDSTONE			
46				SM	Very hard, moist, massive, light gray Sandy SILTSTONE			
48–54	B1-9			SM	Very dense, moist, gray, massive fine Silty SANDSTONE	17/12"	106.6	20.6
56				CL	Very hard, massive, humid, purplish brown Silty CLAYSTONE			
58				CH	Very hard, purplish-gray, Bentonitic CLAY conchoidal fracturing			

Figure A-2 Log of Test Boring B 1, page 2 of 3

ECKE

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.

FILE NO. 04581-03-01

BORING B 1

ELEVATION 572 DATE COMPLETED 9/10/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B1-10			CH	Very hard, purplish-gray, Bentonitic CLAY conchoidal fracturing (continued) Hard, pink BENTONITE	11/12"	65.5	54.6
62–70				ML	Shear zone, soft, highly remolded 1 to 3 inch thick. Attitude near horizontal 62 to 63 feet. Very dense, moist, massive, dark gray fine Silty SANDSTONE Grades into very hard, light brown siltstone at 63.5 feet			
70–75	B1-11			SM	Very dense, moist, massive, brownish-gray, very fine, Silty SANDSTONE		126.9	6.6
75–79				SM	Very hard, moist, purplish-brown, massive Sandy SILTSTONE			
79–83	B1-12			SM	Very dense, massive, fine SANDSTONE		117.1	13.3
83–90				SM	Very hard, humid, massive, Sandy SILTSTONE			
90					TRENCH TERMINATED AT 90 FEET		92.5	27.0

Figure A-3 Log of Test Boring B 1, page 3 of 3

ECKE

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.

FILE NO. 04581-03-01

BORING B 2

ELEVATION 576 DATE COMPLETED 9/11/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3		CL	**TOPSOIL** Loose, dry, dark gray Silty CLAY			
3–7.5	B2-1	SM	**OTAY FORMATION** Medium dense, humid, fractured, weathered light grayish-brown Silty SANDSTONE	3/12"	102.6	17.4
7.5–9.5		CL	Hard, humid, purple, massive CLAYSTONE			
9.5–12.5	B2-2	SM	Grades into very dense massive, Silty SANDSTONE	9/12"	118.2	11.9
12.5–14		CL	Hard, humid, purple claystone from 12.5 to 14 feet			
14–19.5	B2-3	SM	Grades into very dense massive, Silty SANDSTONE	8/12"	122.2	11.4
19.5–20.5	B2-4	CL	Hard, purple, humid claystone from 19.5 to 20.5 feet	7/12"	108.9	19.0
20.5–24.5		SM	Grades into very dense massive, Silty SANDSTONE			
24.5–25.5	B2-5	CH	Hard pink bentonite bed approximately horizontal from 24.5 to 25.5 feet	6/12"	111.3	11.4
25.5–27		SM				
27–28		SP	Grades into very dense massive, Silty SANDSTONE			
28–		SM	Hard, well-cemented sandstone from			

Figure A-4 Log of Test Boring B 2, page 1 of 3

ECKE

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.

FILE NO. 04581-03-01

BORING B 2

ELEVATION 576 DATE COMPLETED 9/11/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-6			SM	27 to 28 feet Very dense, massive, Silty SANDSTONE (continued)	14/12"	118.4	10.3
32				CL	Hard, humid, brown Sandy CLAYSTONE			
34–46	B2-7 (40)			SM	Very dense, humid, massive, light gray, very fine Silty SANDSTONE		105.7	9.8
46				CL	Hard, humid, dark gray Silty CLAYSTONE			
49	B2-8 (50)			SM	Very dense, humid, massive, light gray, medium cemented, very fine Silty SANDSTONE	9/12"	103.3	13.9
55.5				CL	Hard, humid, purple, CLAYSTONE Grades into hard, dark gray bentonitic claystone at 56.5 feet			
57.5				CH	Hard, brittle, pinkish-brown BENTONITE			

Figure A-5 Log of Test Boring B 2, page 2 of 3

ECKE

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.

FILE NO. 04581-03-01

BORING B 2

ELEVATION 576 DATE COMPLETED 9/11/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B2-9						64.4	57.4
60–69				SP	Very dense, humid, gray, massive fine SANDSTONE			
					BORING TERMINATED AT 69 FEET			

Figure A-6 Log of Test Boring B 2, page 3 of 3

ECKE

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.

FILE NO. 04581-03-01

BORING B 3

ELEVATION 606 DATE COMPLETED 9/12/90

EQUIPMENT E-100 BUCKET DRILL

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				CL	**TOPSOIL** Soft, dry, blackish-brown Sandy CLAY			
3–6	B3-1			SC	**OTAY FORMATION** Fractured, weathered, dry, whitish-tan Clayey SANDSTONE	2/12"	99.2	20.6
6–9				SM	Very dense, moist, light gray, fine, massive, Silty SANDSTONE			
9–10	B3-2			ML	Stiff, humid, light brown SILTSTONE (volcanic tuff)	6/12"	111.7	11.5
10–14				SM	Very dense, moist, light gray, fine, massive, Silty SANDSTONE			
14–15	B3-3			CL	Hard, humid, purplish-brown CLAYSTONE	8/12"	112.7	15.1
15–21	B3-4			SM	Very dense, moist, light gray, fine, massive, Silty SANDSTONE	7/12"	113.5	9.9
21–22				SP	Well cemented SANDSTONE from 21 to 21.5 feet			
22–23				SM	Very dense, moist, light gray, fine, massive, Silty SANDSTONE			
23–26	B3-5			CL	Hard, humid, purple, massive CLAYSTONE	16/12"	114.4	13.2
26–27.7				SP	Very dense, humid, light gray, fine SANDSTONE			
27.7–30				CL	Hard, humid, light brown, massive CLAYSTONE			

Figure A-7 Log of Test Boring B 3, page 1 of 3

ECKE

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED) ⊠ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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BORING B 3

ELEVATION 606 DATE COMPLETED 9/12/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B3-6			SM	Hard, humid, massive, light gray Sandy SILTSTONE	14/12"	119.3	12.4
36				SM	Very dense, moist, light gray, very fine Silty SANDSTONE Hard, well cemented concretions from 37.5 to 39 feet			
40	B3-7			CL/SM	Hard purplish CLAYSTONE interbedded with very dense, light gray Silty SANDSTONE. Thickness of beds 1 to 2 feet, Contact gradational, general attitude near horizontal.		99.7	13.2
47	B3-10				Shear zone. Bedding plane fault. Thickness approximately 1 inch. Attitude horizontal. Developed along purplish claystone (above) and gray siltstone (below) from 47.5 to 47.75 feet			
50	B3-8			SM-ML	Very dense, humid, light gray, fine Silty SANDSTONE interbedded with gray Shaley SILTSTONE	23/12"	116.6	14.9
53				CL	Very hard, humid, purplish-brown CLAYSTONE, grades into clayey sandstone			
56				SM	Very dense, humid, massive, light gray, fine Silty SANDSTONE. Occasional cemented zones.			

Figure A-8 Log of Test Boring B 3, page 2 of 3

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 3

ELEVATION 606 DATE COMPLETED 9/12/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60–69	B3-9			SM	Very dense, humid, massive, light gray, fine Silty SANDSTONE. Occasional cemented zones. (continued)		105.7	13.2
69–73	B3-11			CL	Hard, humid, purplish-brown CLAYSTONE	20/12"	110.9	18.5
73–76.5				SM	Very dense, humid, light gray Silty SANDSTONE with occasional siltstone zones			
76.5–77				CH	Hard, brittle, pinkish-brown bentonite seam. Thickness approximately 4 inches, poorly developed shear zone. Attitude near horizontal from 76.5 to 77 feet			
77–81	B3-12			SM	Very dense, humid, light gray Silty SANDSTONE with occasional siltstone zones	50/12"	114.4	11.0

BORING TERMINATED AT 81 FEET

Figure A-9 Log of Test Boring B 3, page 3 of 3

ECKE

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 4

ELEVATION 559 DATE COMPLETED 9/12/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3		CL	**TOPSOIL/ALLUVIUM/COLLUVIUM** Soft, dry, dark gray Sandy CLAY			
3–6	B4-1	SM	**OTAY FORMATION** Highly weathered, moist, whitish-tan Sandy SILT	2/12"	107.9	17.6
6–9		SM	Medium dense, humid, light gray Silty SAND			
9–11	B4-2	SM	Stiff, moist, fine Sandy SILTSTONE (volcanic tuff) Poorly developed shear zone attitude horizontal at 10 feet	1/12"	91.3	30.5
11–16	B4-3	SM-ML	Very dense, moist, light grayish-brown, massive, very fine Silty SANDSTONE/ SILTSTONE	4/12"	100.8	23.8
16–20		CL	Very hard, humid, purple-brown massive CLAYSTONE			
20–25	B4-4	SM	Very dense, moist, massive, trace Silty SANDSTONE with trace of silt	4/12"	103.0	23.2

BORING TERMINATED AT 25 FEET

Figure A-10 Log of Test Boring B 4, page 1 of 1

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 5

ELEVATION 547 DATE COMPLETED 9/12/90

EQUIPMENT E-100 BUCKET DRILL

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				CL	**TOPSOIL/ALLUVIUM/COLLUVIUM** Soft, dry, dark gray Sandy CLAY. Becomes moist, blackish-gray clay at 2.5 feet			
5–10	B5-1			CL/SM	**OTAY FORMATION** Soft, moist to wet, mottled, highly weathered bioturbated CLAY. Medium dense, moist, grayish-brown fine Silty SAND. CaCO3 concentrations from 8 to 8.5 feet	1/12"	104.2	19.3
10–13	B5-2			CL	Stiff, moist, purple-brown CLAYSTONE. Well cemented concretion from 11 to 11.5 feet	3/12"	94.9	20.8
13–17				SM	Very stiff, moist, dark gray, Sandy SILTSTONE			
18	B5-3			ML	Hard, humid, gray SILTSTONE		103.2	20.9
20			▽		Light seepage at 20 feet			
22	B5-4						102.5	22.8
25					BORING TERMINATED AT 25 FEET			

Figure A-11 Log of Test Boring B 5, page 1 of 1

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 6

ELEVATION 539 DATE COMPLETED 9/12/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3		CL	**ALLUVIUM\COLLUVIUM** Medium stiff, dry-slightly damp, red-brown to gray-brown Sandy CLAY. Very gravelly at 2.5 feet			
3–5		CL	**OTAY FORMATION** Medium stiff, moist, mottled red-brown and light tan Silty CLAY with CaCO3 seams; some interbedded medium dense, moist, gray-brown Silty fine SAND; highly weathered. Becomes stiff at 5 feet			
5	B6-1			1/12"	102.3	21.1
5–11.5		ML	Stiff moist-wet, light tan SILTSTONE. Becomes wet from 11 to 11.5 feet			
10	B6-2			4/12"	108.5	20.5
11.5–19.3		SM	Very dense, moist-wet, gray micaceous SANDSTONE, some interbedded hardened red-brown oxidized layers. Becomes saturated at 14 feet. Highly cemented sandstone at 18.5 feet			
15	B6-3			3/12"	109.1	18.3
19.3–20		CL	Stiff, saturated, light red-brown CLAYSTONE			
20	B6-4			5/12"	106.4	21.1
20–25		SM	Dense, saturated dark gray SANDSTONE			

BORING TERMINATED AT 25 FEET

Figure A-12 Log of Test Boring B 6, page 1 of 1

ECKE

SAMPLE SYMBOLS: ... SAMPLING UNSUCCESSFUL; ... STANDARD PENETRATION TEST; ... DRIVE SAMPLE (UNDISTURBED); ... DISTURBED OR BAG SAMPLE; ... CHUNK SAMPLE; ... WATER TABLE OR SEEPAGE

FILE NO. 04581-03-01

BORING B 7

ELEVATION 615 DATE COMPLETED 9/13/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–3		CL	**TOPSOIL** Soft, dry, dark gray Sandy CLAY. Cobbles at 2.5 feet			
3–7	B7-1	ML	**OTAY FORMATION** Highly weathered, dry, whitish-tan, fractured calichified SILTSTONE. Numerous krotovinas along the topsoil contact	4/12"	91.7	15.5
7–9		SM	Stiff, humid, dark gray, fractured Sandy SILTSTONE			
9–13	B7-2	SM	Very dense, humid, light gray, massive weakly cemented fine Silty SANDSTONE	5/12"	109.7	12.0
13–14		ML	Hard, humid, dark gray Sandy SILTSTONE. Bedding near horizontal.			
14–22.5	B7-3	SM	Very dense, humid, light gray, massive weakly cemented fine Silty SANDSTONE	10/12"	126.6	11.3
	B7-4			10/12"	118.6	11.8
22.5–23		SM	Volcanic tuff bed. Attitude horizontal from 22.5 to 23 feet			
23–25	B7-5	SM-CL	Very stiff to hard, humid, purplish-brown Sandy SILTSTONE/CLAYSTONE	14/12"	124.8	10.6
25–29		SM	Very dense, humid, light gray, fine Silty SANDSTONE. Bentonitic tuff seam. from 27.5 to 28 feet, Attitude horizontal. Purple, hard, claystone from 28 to 28.5 feet			

Figure A-13 Log of Test Boring B 7, page 1 of 2

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 7

ELEVATION 615 DATE COMPLETED 9/13/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B7-6			SM	Very dense, humid, light gray, fine Silty SANDSTONE (continued)	10/12"	109.3	22.2
32				CL	Hard, humid, purplish-brown, Silty CLAYSTONE			
				SP	Very dense, humid, gray massive SANDSTONE			
34				ML	Hard, purplish-brown siltstone from 34 to 35 feet			
36				SP	Very dense, gray, massive SANDSTONE			
38								
40					BORING TERMINATED AT 40 FEET			

Figure A-14 Log of Test Boring B 7, page 2 of 2

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 8

ELEVATION 539 DATE COMPLETED 9/13/90

EQUIPMENT E-100 BUCKET DRILL

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	**TOPSOIL** Loose, slightly damp to damp, yellow-brown CLAY with minor caliche, abundant grass and root matter			
2				CL				
	B8-1				**ALLUVIUM/COLLUVIUM** Stiff, damp, brown, Sandy CLAY with Becomes dark brown CaCO3, from 3 to 4 feet	1/12"	110.9	12.1
4								
	B8-4			CL				
6	B8-2			SM	Dense, damp, gray-brown, Clayey fine to medium SAND with CaCo3	PUSH	87.8	31.7
8				SM	Stiff, moist, brown Sandy CLAY			
10	B8-3			SM	**OTAY FORMATION** Highly weathered, dense, moist, gray-brown Silty SAND with sub-horizontal layers of highly weathered white volcanic tuff Stiff, hard, moist, light gray-pinkish gray volcanic tuff at 8 feet	2/12"	97.1	26.6
12			▽					
14					Dense to hard, damp to moist, gray-brown Silty fine SAND with few interbedded layers of volcanic tuff			
	B8-5					4/12"	105.9	20.1
16								
18					Standing water at 19 feet			
20					BORING TERMINATED AT 20 FEET			

Figure A-15 Log of Test Boring B 8, page 1 of 1

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▽ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 9

ELEVATION 553 DATE COMPLETED 9/13/90

EQUIPMENT E-100 BUCKET DRILL

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	**TOPSOIL** Loose, dry, dark brown, Clayey SAND with trace gravel			
2–4				CL	**COLLUVIUM** Stiff, damp, dark brown Sandy CLAY. Stiff mottled dark red-brown and light tan sandy clay at 4 feet			
5	B9-1			SM		2/12"	104.8	11.5
6–8				SP	**OTAY FORMATION** Highly weathered, interbedded dense, damp gray SANDSTONE. Krotovina at 5.5 feet			
10–14	B9-2			SP	Very dense, damp, light brownish-gray SANDSTONE	3/12"	107.0	13.6
15	B9-3			SM-ML	Very dense to hard, damp, light pinkish-gray, tuffaceous SANDSTONE. Stiff, hard, damp, purplish-gray to white volcanic tuff SILTSTONE	5/12"	111.9	10.7
16–18				SP	Very dense, damp, light gray-brown interlayered with pinkish-brown SANDSTONE			
19				CL	Medium stiff, damp to moist, light slightly pinkish-tan CLAYSTONE/BENTONITE			
20	B9-4					7/12"	110.9	18.3
22–24				SP	Hard, damp, medium gray-brown SANDSTONE			

BORING TERMINATED AT 25 FEET

Figure A-16 Log of Test Boring B 9, page 1 of 1

ECKE

SAMPLE SYMBOLS ... SAMPLING UNSUCCESSFUL ... STANDARD PENETRATION TEST ... DRIVE SAMPLE (UNDISTURBED) ... DISTURBED OR BAG SAMPLE ... CHUNK SAMPLE ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 10

ELEVATION 518 DATE COMPLETED 9/13/90

EQUIPMENT E-100 BUCKET DRILL

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		CL	**TOPSOIL** Loose, fractured, stiff, damp dark brown Sandy CLAY with little gravel			
2–4		CL	**ALLUVIUM/COLLUVIUM** Stiff, damp, dark brown, Sandy CLAY with gravel, subangular clasts to 3 inches. Base of gravels at 2.5 feet			
5.5	B10-1	CL		PUSH	89.6	27.4
6	B10-2					
6.5–10		SP	**OTAY FORMATION** Stiff, mottled gray-brown to dark brown, Silty CLAY, highly weathered. Dense, moist, interbedded gray-brown SANDSTONE with brown siltstone/claystone			
10	B10-3	ML	Becomes very dense to hard, damp, gray-brown sandstone, finely bedded. Highly cemented layer 4 to 6 inch thick at 9 feet	2/12"	94.1	29.9
12.5		SM	Stiff, moist, light purplish-tan SILTSTONE. Becomes medium stiff, finely bedded at 11.5 feet			
15	B10-4	SM		2/12"	99.1	25.5
16–18			Very dense to hard, moist, medium gray-brown SANDSTONE. 6 inch thick siltstone layer at 13 feet. Highly cemented layer 1 to 2 inch thick at 17.5 feet			
20	B10-5		Siltstone layer 2 to 3 inch thick at 20 feet	6/12"	105.3	20.4
22			Siltstone layer 2 to 3 inch thick at 22 feet			
25			Siltstone layer 2 to 3 inch thick, very hard at 25 feet			
28.5			BORING TERMINATED AT 28.5 FEET			

Figure A-17 Log of Test Boring B 10, page 1 of 1

ECKE

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

BORING B 11

ELEVATION 558 DATE COMPLETED 9/13/90

EQUIPMENT E-100 BUCKET DRILL

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				
2				CL	**TOPSOIL** Highly fractured, stiff, slightly damp, dark brown, slightly gravelly, Sandy CLAY			
4				CL	**ALLUVIUM/COLLUVIUM** Stiff, damp, moist, dark brown, fine Sandy CLAY with little gravel			
6	B11-1			SM	Stiff, damp, grayish brown, CLAY, gravelly in lower 6 inches to 1 foot (subangular clasts to 5 inches)	2/12"	100.0	11.6
				SM-CL				
8				SP	**OTAY FORMATION** Very dense, damp, gray brown Silty SANDSTONE			
10	B11-2			ML-CL	Medium stiff, damp, mottled purplish brown and light tan, SILTSTONE/ CLAYSTONE -Becomes stiff, at 7 feet	1/12"	96.4	23.2
12					Very dense, slightly damp, gray brown SANDSTONE			
14								
16	B11-3			SM	Stiff to very stiff, damp, grayish tan and dark purplish brown SILTSTONE/ CLAYSTONE with interbedded, discontinuous seams of white volcanic tuff siltstone	8/12"	123.2	12.7
18				CL	Very dense to hard, damp, gray brown SANDSTONE			
20				ML	Very stiff, damp, light reddish brown CLAYSTONE with pressure faces			
					Hard, slightly damp, dark gray brown SILTSTONE			

BORING TERMINATED AT 20 FEET

Figure A-18 Log of Test Boring B 11, page 1 of 1

ECKE

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.

FILE NO. 04581-03-01

TRENCH T 1

ELEVATION 607 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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	**TOPSOIL**			
				SC	Loose, dry, slightly damp gray-brown, slightly Clayey fine to coarse SAND			
2								
4				SM	**FLUVIAL TERRACE DEPOSITS** Soft-medium, stiff, damp-moist, dark gray-brown, Clayey fine to medium SAND with abundant subangular cobbles			
6				SM	**OTAY FORMATION** Medium dense, damp, mottled white and light yellow-brown SANDSTONE with CaCO3			
8				SM	Medium dense, dense, damp light gray Silty fine to coarse SAND			
					Very dense, damp, white - to light tan Silty SANDSTONE			

TRENCH TERMINATED AT 9.5 FEET

Figure A-19, Log of Test Trench T 1

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ☒ ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 2

ELEVATION 620 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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				CL	**TOPSOIL** Dark blackish-gray, soft, dry Sandy CLAY			
2–5				SW	**FLUVIAL TERRACE DEPOSITS** Dense, dry, whitish-gray, weathered SAND/COBBLES			
5–10				SW	Very dense, humid, light brown, cohesionless SAND/COBBLE (subrounded metavolcanic rock fragments)			
10–12.5	T2-1			SC	**OTAY FORMATION** Very dense, moist, light gray medium-cemented Clayey SANDSTONE			
					TRENCH TERMINATED AT 12.5 FEET			

Figure A-20, Log of Test Trench T 2

ECKE

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.

FILE NO. 04581-03-01

TRENCH T 3

ELEVATION 611 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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				SC	**TOPSOIL** Loose, slightly-damp, gray-brown, Clayey SAND. Becomes dark-brown at 1 foot			
2.5–11	T3-1 (6)			SW	**FLUVIAL TERRACE DEPOSITS** Dense, damp-moist, yellow-brown, slightly clayey, Gravelly SAND with some cobble to 10 inches. Becomes gravelly sand with cobble, no clay at 6 feet			
11–12	T3-2 (12)			SM	**OTAY FORMATION** Dense, damp, light gray, Silty SANDSTONE			

TRENCH TERMINATED AT 12 FEET

Figure A-21, Log of Test Trench T 3

ECKE

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED) ⊠ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 4

ELEVATION 611 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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				SC-SM	**TOPSOIL/COLLUVIUM** Loose,to medium-dense, damp-dry, gray-brown Clayey, Silty SAND			
2 – 5	T4-1			CL	**FLUVIAL TERRACE DEPOSITS** Medium stiff,to stiff, moist, dark reddish-brown Sandy CLAY. Becomes cobbly (metavolcanic rock fragments) at 4 feet			
5 – 11	T4-2			SM/SW	Dense, damp, light reddish-brown Silty, Gravelly SAND with cobbles. Cobble size increases with depth. Boulders to 3 feet at 10 feet			

TRENCH TERMINATED AT 11 FEET
REFUSAL

Figure A-22, Log of Test Trench T 4

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

FILE NO. 04581-03-01

TRENCH T 5

ELEVATION 627 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–1.5				SM-SC	**TOPSOIL** Loose, dryish damp, gray-brown Silty SAND			
1.5–3.5				SW	Becomes dark brown, clayey with abundant cobbles			
3.5–7.5					**TERRACE DEPOSITS** Dense, damp, light yellowish, reddish-brown, SAND/COBBLE to greater than 12 inches, Subangular Boulders to 2 feet, at 4.5 feet			
7.5–10.5	T5-1			SM-SW	**OTAY FORMATION** Very dense, damp, light gray-brown, weakly cemented SANDSTONE			

TRENCH TERMINATED AT 10.5 FEET

Figure A-23, Log of Test Trench T 5

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◨ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 8

ELEVATION 607 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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				SC	**TOPSOIL** Loose to medium dense, damp, dark gray-brown clayey SAND with trace gravel			
2 – 4				SC-CL	**FLUVIAL TERRACE DEPOSITS** Medium dense, damp, gray-brown, Clayey SAND/Sandy CLAY with cobbles (meta-volcanic rock fragments)			
4 – 5				CL	Medium stiff, damp-moist dark red-brown Sandy CLAY			
5 – 6				SM	**OTAY FORMATION** Very dense, slightly damp, light greenish-gray Silty SANDSTONE			
6 – 6.5				SC-CL	Medium dense, medium stiff, damp-moist, reddish brown, Clayey SAND/Sandy CLAY			
6.5 – 8.5				SM	Medium dense to dense, damp, white light gray-brown mottled CaCO3 cemented SANDSTONE			

TRENCH TERMINATED AT 8.5 FEET

Figure A-27, Log of Test Trench T 8

ECKE

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 9

ELEVATION 610 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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				SC	**TOPSOIL** Loose-medium dense, damp dark brown, Clayey SAND with cobbles, few boulders			
2–4				CL	**TERRACE DEPOSITS** Medium stiff, damp, yellow brown, Sandy CLAY			
4–8	T9-1			CL	**OTAY FORMATION** Stiff, damp, pale yellow-brown Sandy CLAY with clay films on ped faces			
8–10				SP	Very dense, damp, light brown SANDSTONE			

TRENCH TERMINATED AT 10 FEET

Figure A-28, Log of Test Trench T 9

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 10

ELEVATION 600 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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				SC-CL	**TOPSOIL** Loose, damp, dark gray-brown, Clayey SAND/Sandy CLAY			
4				CL	**OTAY FORMATION** Medium dense, weathered, damp white-light tan, Sandy CLAY			
6				CL-SM CL/ML	Dense, damp, light gray-tan, Sandy CLAYSTONE/SILTSTONE			

TRENCH TERMINATED AT 7 FEET

Figure A-29, Log of Test Trench T 10

ECKE

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 11

ELEVATION 612 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 1.5				SC-CL	**TOPSOIL** Loose to medium dense, dry-damp, dark brown Clayey SAND with subangular to subrounded cobbles			
1.5 – 2.5					Becomes stiff sandy clay at 1.5 feet			
2.5 – 3.5				SC	**OTAY FORMATION** Weathered, medium dense, damp, yellow-brown Clayey SAND			
3.5 – 7				SM	Dense, damp, yellowish gray-brown SANDSTONE			
7 – 9				CL-ML	Dense, slightly damp, tan SILTSTONE/CLAYSTONE			

TRENCH TERMINATED AT 9 FEET

Figure A-30, Log of Test Trench T 11

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 12

ELEVATION 605 DATE COMPLETED 9/7/90

EQUIPMENT JD 710 BACKHOE

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-CL	**TOPSOIL** Loose to medium dense, damp, dark brown, Clayey SAND. Becomes stiff sandy clay at 1.5 feet			
2								
4				SW-SM	**OTAY FORMATION** Dense, damp, yellow-brown, Silty fine to coarse SAND			
6				SM	Very dense, damp, gray-brown SANDSTONE			
8				CL-ML	Medium dense, damp-moist, yellow-brown SILTSTONE/CLAYSTONE			
10					TRENCH TERMINATED AT 10 FEET			

Figure A-31, Log of Test Trench T 12

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 13

ELEVATION 560 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACK HOE

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	T13-1			CL	**TOPSOIL** Loose, damp, dark brown Sandy CLAY			
4				CL	**OTAY FORMATION** Medium stiff, damp, mottled white to medium tan Sandy CLAY			
6				CL-ML	Dense, dry to slightly damp, light tan SILTSTONE/CLAYSTONE			

TRENCH TERMINATED AT 7.5 FEET

Figure A-32, Log of Test Trench T 13

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 14

ELEVATION 553 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**ALLUVIUM/COLLUVIUM** Soft to medium stiff, humid, blackish-gray Sandy CLAY			
4 – 5				CL	Stiff, moist, dark brown Sandy CLAY/ COBBLES			
5 – 6				CL	Stiff, blackish-brown Sandy CLAY			
6 – 8				SC	**OTAY FORMATION** Dense, moist, whitish-brown, weathered Clayey SANDSTONE			
8 – 13				SC	Very dense, moist, grayish-light brown medium to weakly cemented, poorly graded fine Clayey SANDSTONE			

TRENCH TERMINATED AT 13 FEET

Figure A-33, Log of Test Trench T 14

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ▥ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ▨ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 15

ELEVATION 544 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**ALLUVIUM/COLLUVIUM** Soft, dry to humid, blackish-gray Sandy CLAY Numerous CaCO3 concentrations from 2 to 3 feet			
3 – 4				SC	Medium dense, moist, dark brown Clayey SAND/COBBLES			
4 – 5				CL	Stiff moist, black CLAY			
5 – 7				SC				
7 – 10				SM	**OTAY FORMATION** Dense, moist, weathered, light brown Clayey SANDSTONE			
					Very dense, moist, grayish-brown, poorly graded weakly cemented Silty SANDSTONE			

TRENCH TERMINATED AT 10 FEET

Figure A-34, Log of Test Trench T 15

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 16

ELEVATION 532 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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	**ALLUVIUM/COLLUVIUM** Soft, dry, dark-gray, Sandy CLAY			
2				SC	Medium dense, moist, reddish-brown, Clayey SAND, some cobbles			
4				SC	**OTAY FORMATION** Medium dense, moist, light-brown Clayey SANDSTONE			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-35, Log of Test Trench T 16

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 17

ELEVATION 548 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**TOPSOIL** Medium stiff to stiff, humid, blackish gray, Sandy CLAY, with some cobbles			
3 – 6				SC	**OTAY FORMATION** Dense, moist, light brown, poorly graded, Clayey SANDSTONE			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-36, Log of Test Trench T 17

ECKE

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 18

ELEVATION 575 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**TOPSOIL** Soft, dry, dark gray, Sandy CLAY with cobbles			
4 – 17.5				SW	**FLUVIAL TERRACE DEPOSITS** Very dense, moist reddish-brown, well graded cohesionless SAND/COBBLES, occasional boulders. Becomes moderately cemented, very slow trenching at 6.5 feet			
17.5 – 19				SM	**OTAY FORMATION** Dense, moist, light gray, massive, fine SANDSTONE			

TRENCH TERMINATED AT 19 FEET

Figure A-37, Log of Test Trench T 18

ECKE

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◨ ... STANDARD PENETRATION TEST
- ▨ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 19

ELEVATION 564 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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	**TOPSOIL** Soft, dry, dark grayish-brown Sandy CLAY			
2				SM	**OTAY FORMATION** Dense, light brown, dry, highly weathered SANDSTONE			
4								
6				SM	Dense, humid, grayish-brown, massive Silty SANDSTONE			
					TRENCH TERMINATED AT 6 FEET			

Figure A-38, Log of Test Trench T 19

ECKE

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 20

ELEVATION 562 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**TOPSOIL** Soft, humid, blackish-gray Sandy CLAY			
4 – 6				SM	**OTAY FORMATION** Medium dense, dry, whitish, light brown, highly weathered, Silty SANDSTONE			
6 – 7				SP	Very dense, humid, grayish-brown, massive SANDSTONE			
					TRENCH TERMINATED AT 7 FEET			

Figure A-39, Log of Test Trench T 20

ECKE

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.

FILE NO. 04581-03-01

TRENCH T 21

ELEVATION 563 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**TOPSOIL** Soft, humid, dark gray, Sandy CLAY			
3–6				ML	**OTAY FORMATION** Medium dense, dry, whitish-tan, highly weathered SILTSTONE			
6–7				SM	Dense, humid, whitish-gray Silty SANDSTONE			
					TRENCH TERMINATED AT 7 FEET			

Figure A-40, Log of Test Trench T 21

ECKE

SAMPLE SYMBOLS ☐ ... SAMPLING UNSUCCESSFUL ◨ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED) ⊠ ... DISTURBED OR BAG SAMPLE ▨ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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FILE NO. 04581-03-01

TRENCH T 22

ELEVATION 537 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0–6				CL	**ALLUVIUM/COLLUVIUM** Soft, moist, blackish-brown Sandy CLAY			
6–9				SC	**OTAY FORMATION** Highly weathered, moist, mottled whitish-tan, brown Clayey SAND, highly bioturbated			
9–11				SM	Dense, moist to wet, gray, weakly cemented, fine Silty SANDSTONE			

TRENCH TERMINATED AT 11 FEET

Figure A-41, Log of Test Trench T 22

ECKE

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.

FILE NO. 04581-03-01

TRENCH T 23

ELEVATION 544 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 6				CL	**ALLUVIUM/COLLUVIUM** Soft, moist, blackish-brown Sandy CLAY			
6 – 7				SW	Medium dense, moist, reddish-brown fine to coarse SAND with cobbles			
7 – 9				SM	**OTAY FORMATION** Medium dense, wet, grayish-brown weathered, Silty SANDSTONE			

TRENCH TERMINATED AT 9 FEET

Figure A-42, Log of Test Trench T 23

ECKE

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.

FILE NO. 04581-03-01

TRENCH T 24

ELEVATION 550 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**ALLUVIUM/COLLUVIUM** Soft, dry, dark grayish-black Silty CLAY			
3 – 6				SC	**OTAY FORMATION** Medium dense, moist, highly weathered, grayish-brown, Clayey SANDSTONE			
6 – 8				SM	Dense, moist, gray, fine, Silty SANDSTONE			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-43, Log of Test Trench T 24

ECKE

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.

FILE NO. 04581-03-01

TRENCH T 25

ELEVATION 442 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**TOPSOIL** Soft, dry, black Sandy CLAY, rare cobbles. Becomes moist at 2 feet			
4 – 7				SM	**OTAY FORMATION** Highly weathered, humid, whitish, Silty SANDSTONE			
7 – 7.5				CH	Thin bentonite layer from 7 to 7.5 feet			
7.5 – 9					**SANTIAGO PEAK VOLCANICS** Hard metavolcanic ROCK			

TRENCH TERMINATED AT 9 FEET

Figure A-44, Log of Test Trench T 25

ECKE

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.

FILE NO. 04581-03-01

TRENCH T 26

ELEVATION 445 DATE COMPLETED 9/10/90

EQUIPMENT JD 555 TRACKHOE

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				CL	**TOPSOIL** Soft, dry, grayish-black Sandy CLAY, with angular boulders			
2.5 – 6				SM	**OTAY FORMATION** Highly weathered, dry, whitish-brown Sandy SILTSTONE			
6 – 10.5				SM	Very dense, hard, moist, massive light gray Silty SANDSTONE			
10.5 – 11				CH	Hard, pinkish-brown bentonite from 10.5 to 11 feet			
11 – 12					**SANTIAGO PEAK VOLCANICS** Very hard, metavolcanic ROCK			

TRENCH TERMINATED AT 12 FEET

Figure A-45, Log of Test Trench T 26

ECKE

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.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM). The maximum dry density and optimum moisture content of samples were determined in accordance with Test Procedure D1557-78, Method A. In addition, relatively undisturbed ring samples were tested for in-place moisture and density, shear strength and consolidation characteristics. Expansion Index tests were also performed on six samples collected from the exploratory excavations. The results of the tests are presented in tabular and graphical form herein. Moisture-density relationships are presented on the boring logs.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-91

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T2-1	Light gray, Clayey SAND	113.7	15.5
T3-1	Yellowish-brown, well graded SAND	131.1	7.3
T9-1	Light brown CLAY	112.2	16.0
T13-1	Dark brown, Sandy CLAY	114.5	14.9
B1-4	Purplish, Sandy SILT	108.7	15.3
B8-4	Dark brown, Sandy CLAY	117.1	15.1

TABLE B-II
SUMMARY OF IN-PLACE MOISTURE DENSITY AND DIRECT SHEAR TEST RESULTS

Sample No.	Depth (feet)	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T2-1*	12	102.7	15.2	150	35
T3-1*	6	117.7	7.6	120	38
T9-1*	6	101.3	15.7	590	15
B1-10	60	65.5	54.6	2315	6
B2-2	10	118.2	11.9	530	35
B3-5	25	114.4	13.2	1460	11

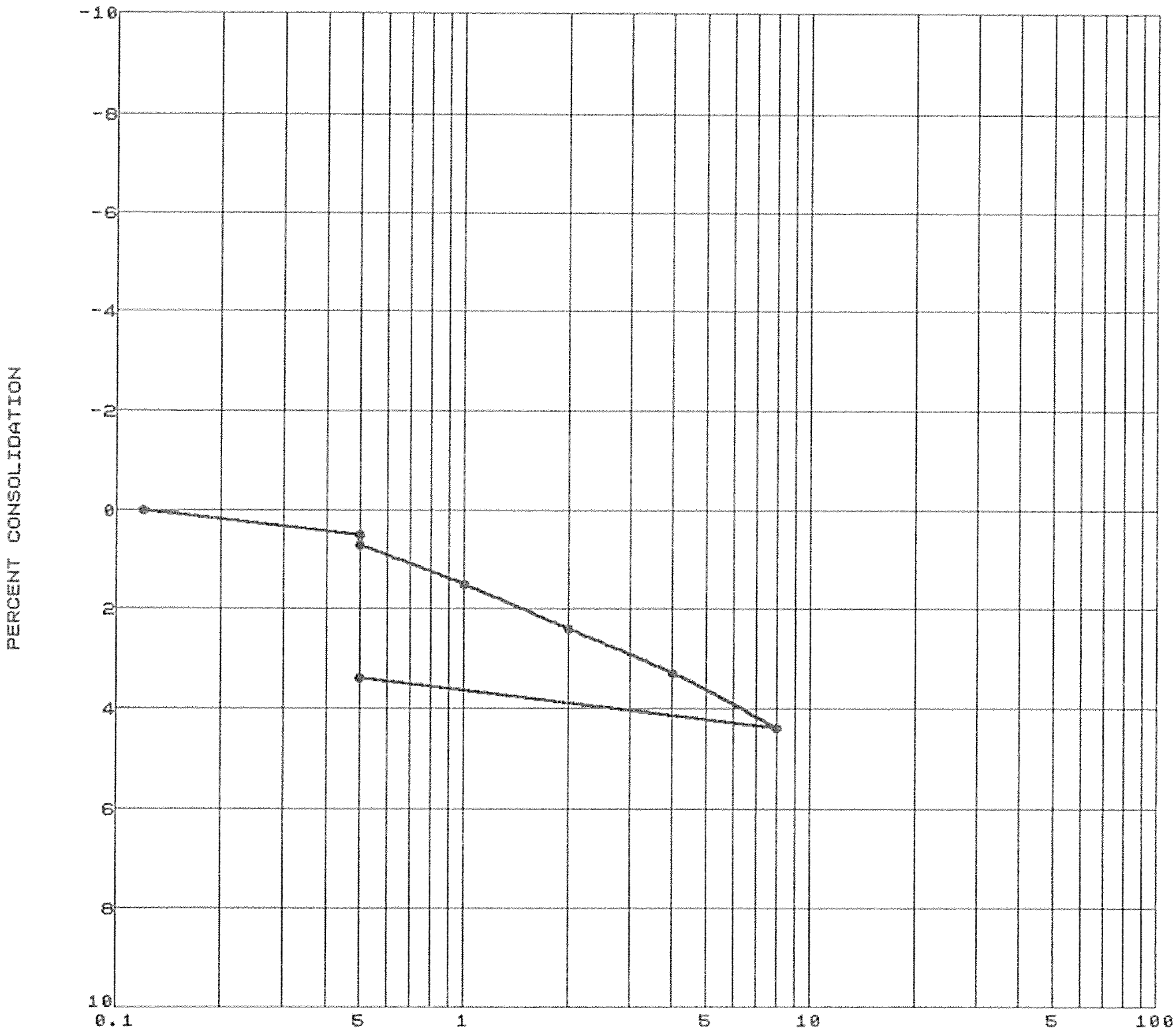
*Soil sample remolded approximately to 90 percent relative density at near optimum moisture content.

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index
	Before Test	After Test		
T2-1	11.0	23.2	106.1	6
T3-1	6.4	13.2	125.1	0
T9-1	11.9	36.4	102.4	160
T13-1	11.7	34.9	103.8	115
B1-4	10.5	32.3	106.7	63
B8-4	9.2	31.4	111.8	88

File No. 04581-03-01

SAMPLE NO. B6-1



APPLIED PRESSURE (ksf)

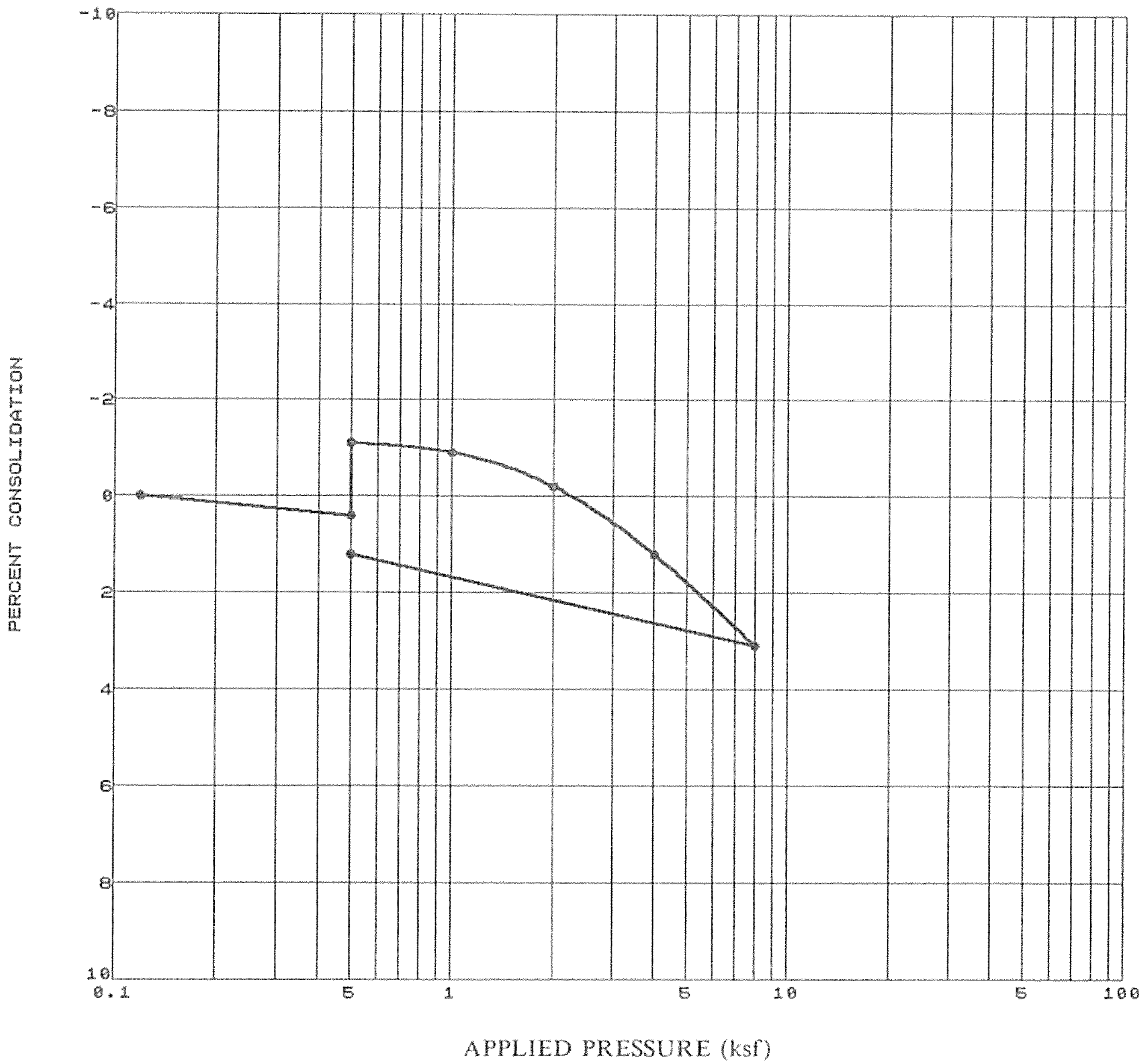
Initial Dry Density (pcf)	102.3		Initial Saturation (%)	87.2
Initial Water Content (%)	21.1		Sample Saturated at (ksf)	0.5

CONSOLIDATION CURVE

RANCON OTAY MESA

SAN DIEGO COUNTY, CALIFORNIA

SAMPLE NO. B8-1



Initial Dry Density (pcf)	110.9	Initial Saturation (%)	67.2
Initial Water Content (%)	12.1	Sample Saturated at (ksf)	0.5

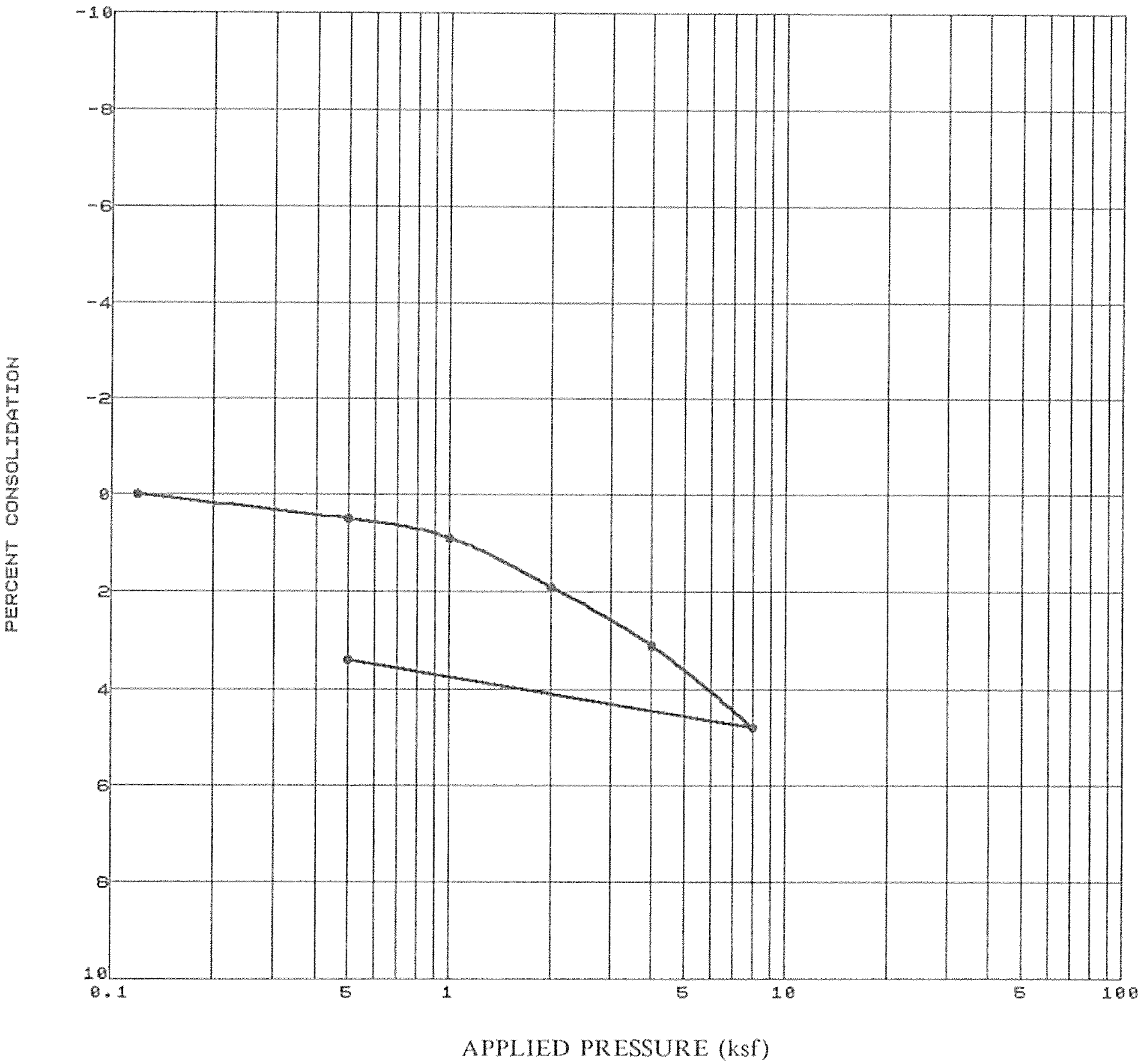
CONSOLIDATION CURVE

RANCON OTAY MESA

SAN DIEGO COUNTY, CALIFORNIA

File No. 04581-03-01

SAMPLE NO. B8-2



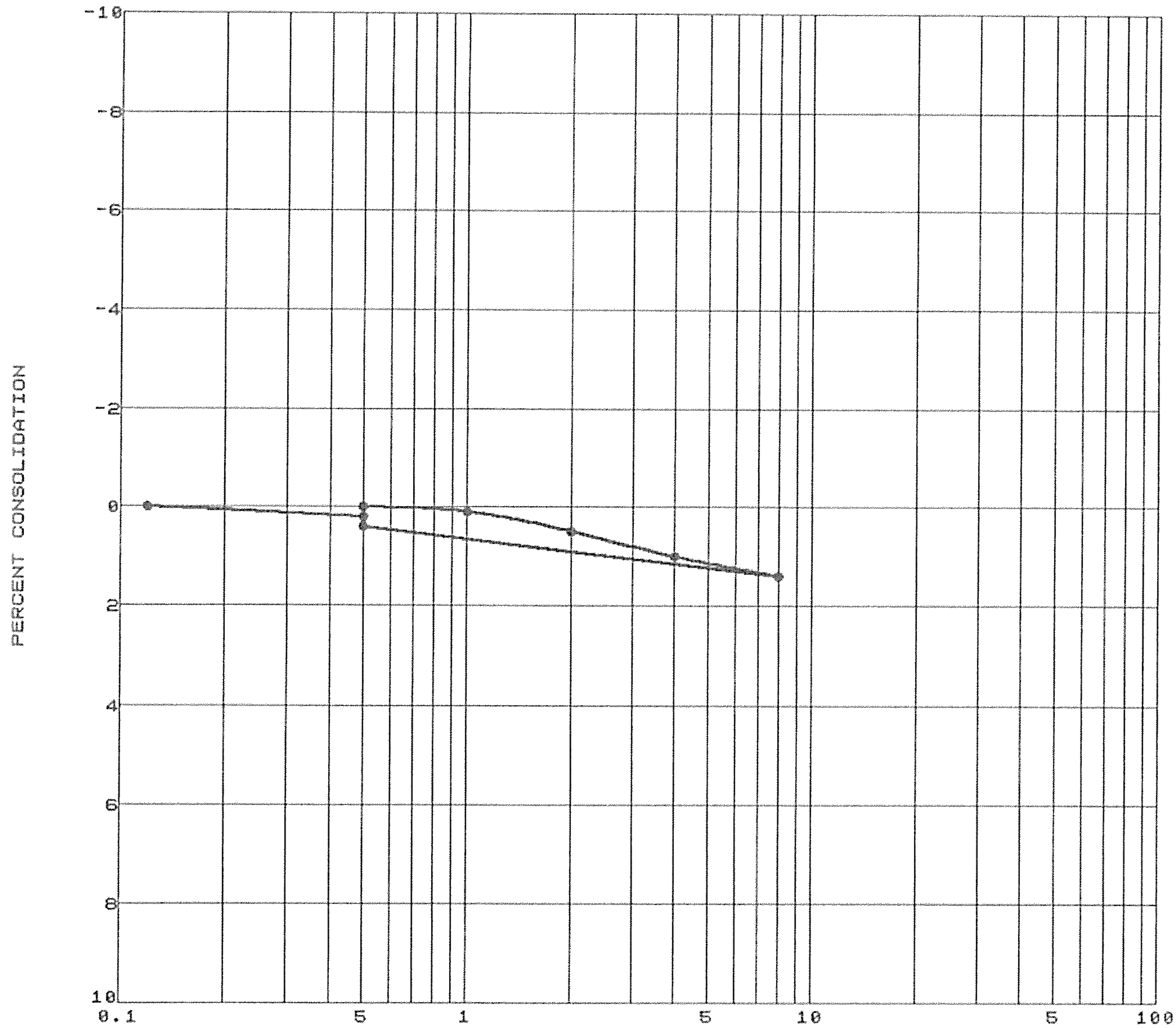
Initial Dry Density (pcf)	87.8		Initial Saturation (%)	92.9
Initial Water Content (%)	31.7		Sample Saturated at (ksf)	0.5

CONSOLIDATION CURVE

RANCON OTAY MESA

SAN DIEGO COUNTY, CALIFORNIA

SAMPLE NO. B9-1



Initial Dry Density (pcf)	104.8	Initial Saturation (%)	57.7
Initial Water Content (%)	11.5	Sample Saturated at (ksf)	0.5

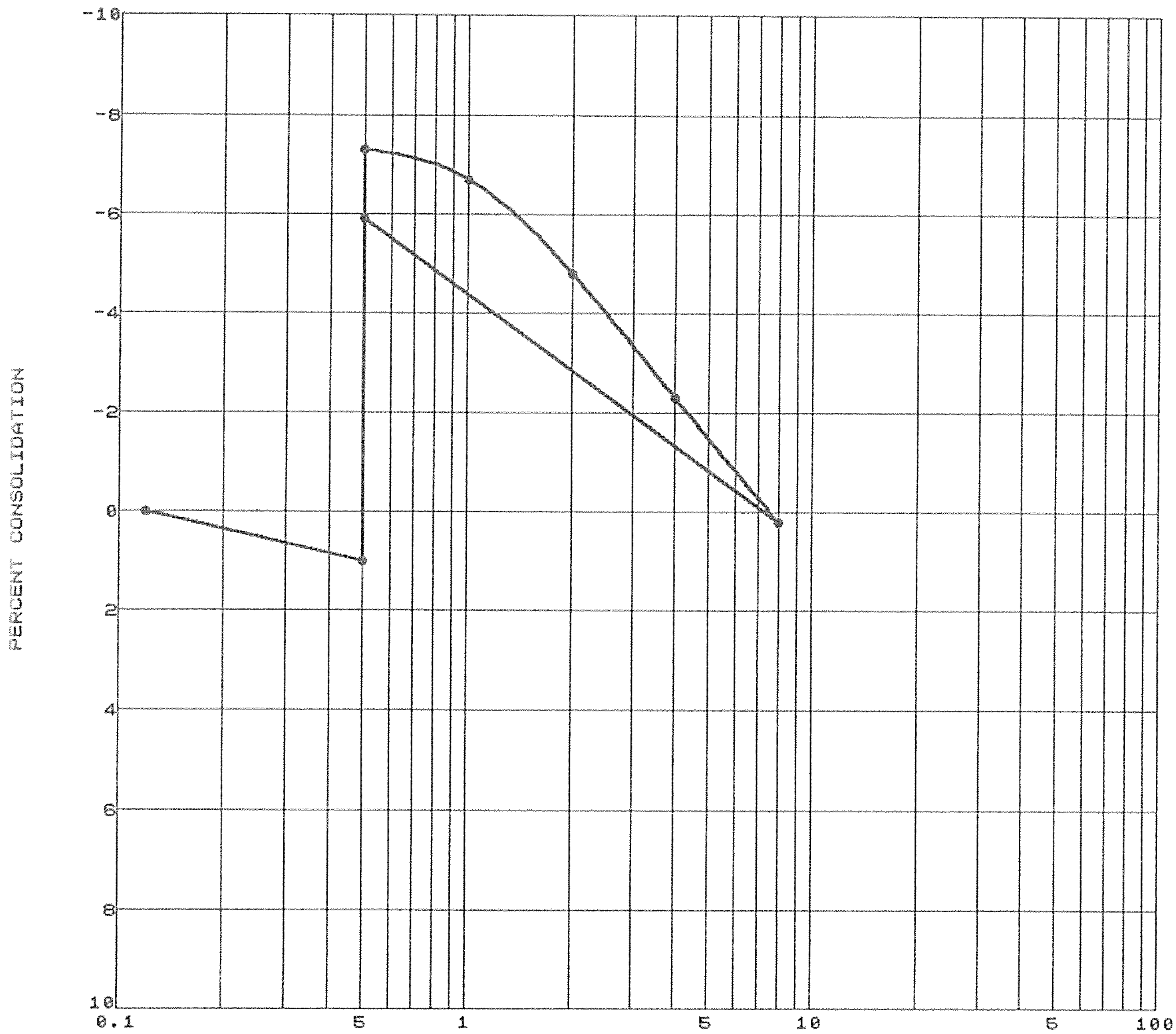
CONSOLIDATION CURVE

RANCON OTAY MESA

SAN DIEGO COUNTY, CALIFORNIA

File No. 04581-03-01

SAMPLE NO. B10-1



APPLIED PRESSURE (ksf)

Initial Dry Density (pcf)	89.6
Initial Water Content (%)	27.4

Initial Saturation (%)	85.0
Sample Saturated at (ksf)	0.5

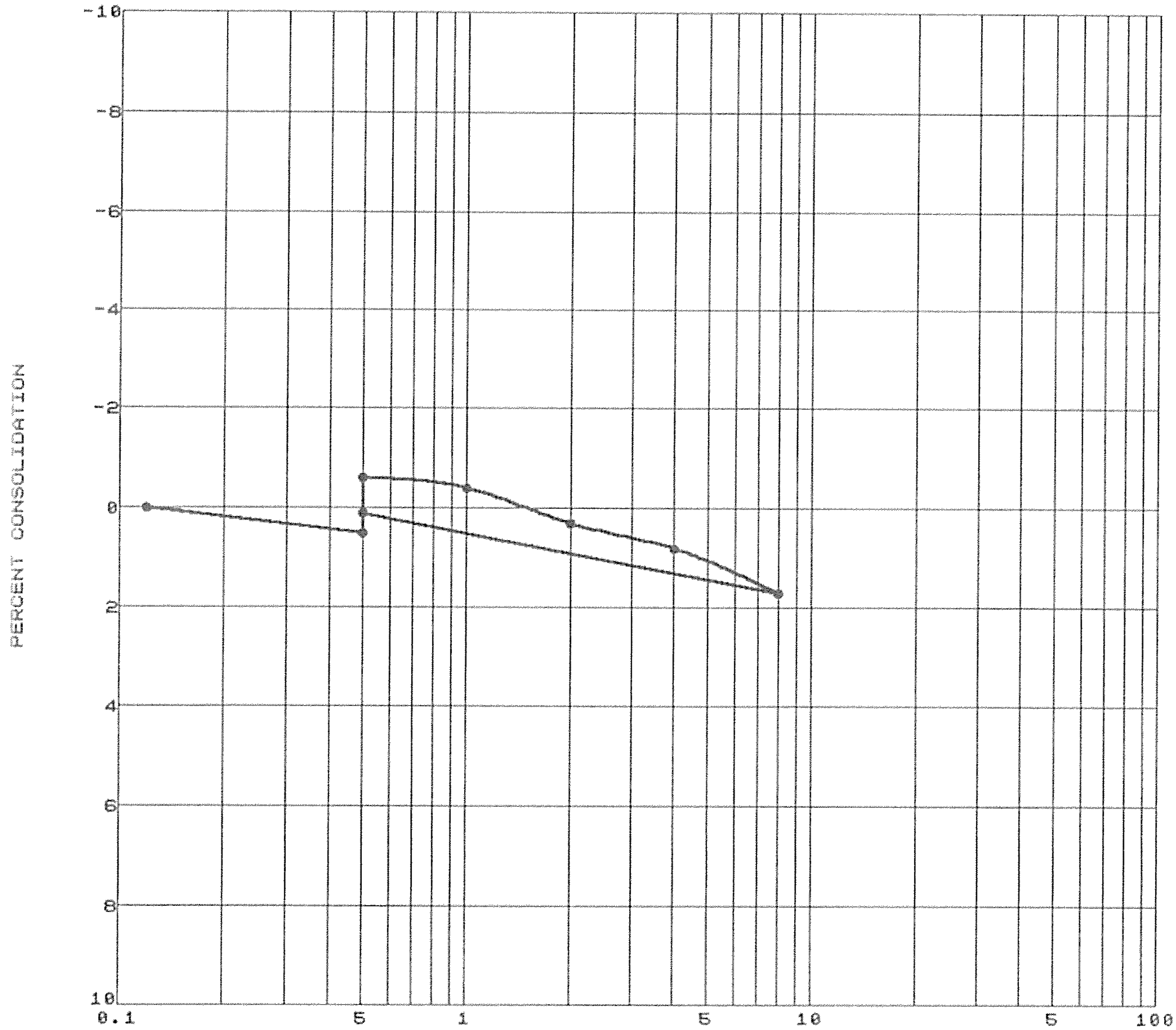
CONSOLIDATION CURVE

RANCON OTAY MESA

SAN DIEGO COUNTY, CALIFORNIA

File No. 04581-03-01

SAMPLE NO. B11-1



Initial Dry Density (pcf)	100.0
Initial Water Content (%)	11.6

Initial Saturation (%)	56.6
Sample Saturated at (ksf)	0.5

CONSOLIDATION CURVE

RANCON OTAY MESA

SAN DIEGO COUNTY, CALIFORNIA

ECKE

Figure B-6

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

EAST OTAY MESA CENTER MIXED-USE
OTAY MESA AND HARVEST ROADS
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. 06263-42-03

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

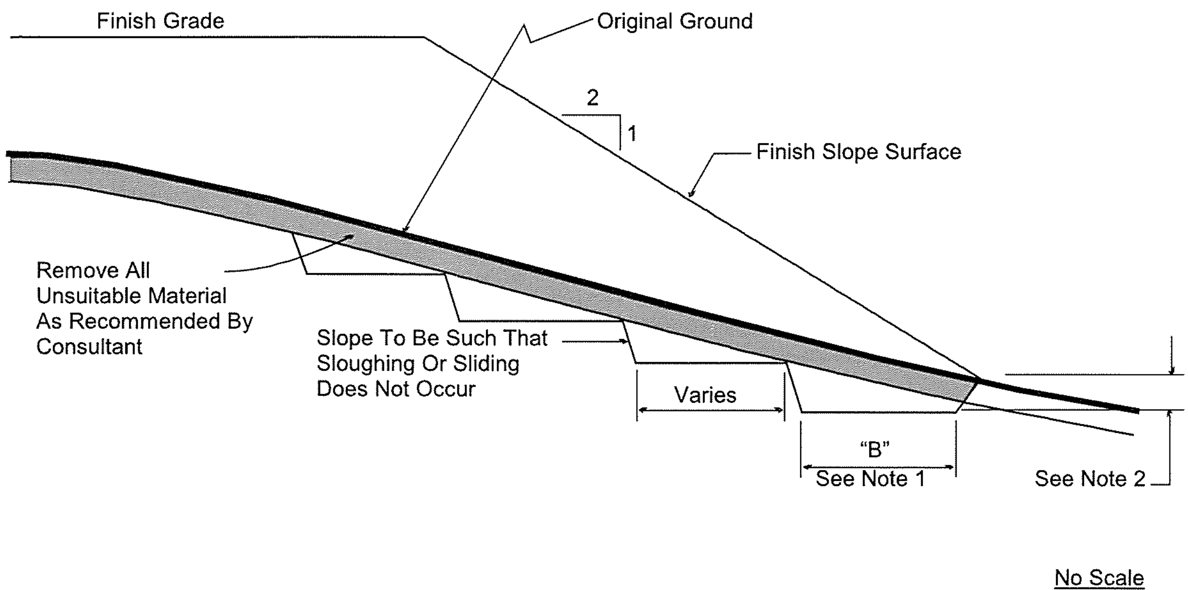
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material 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.

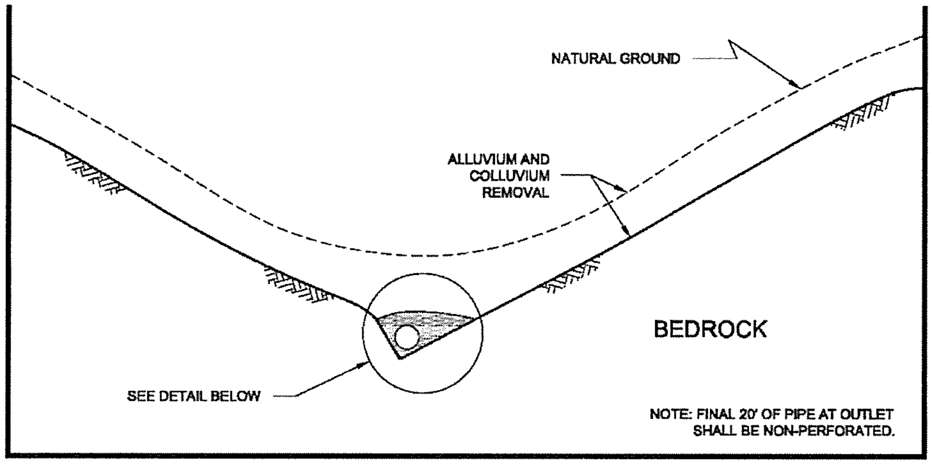
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant 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.

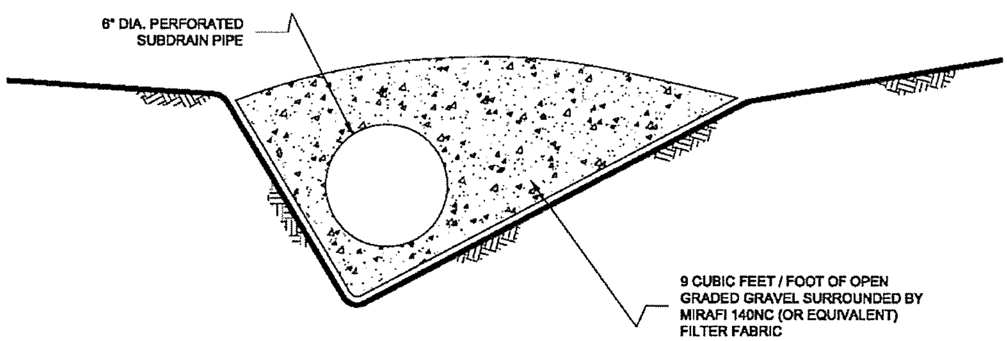
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

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





NOTES:

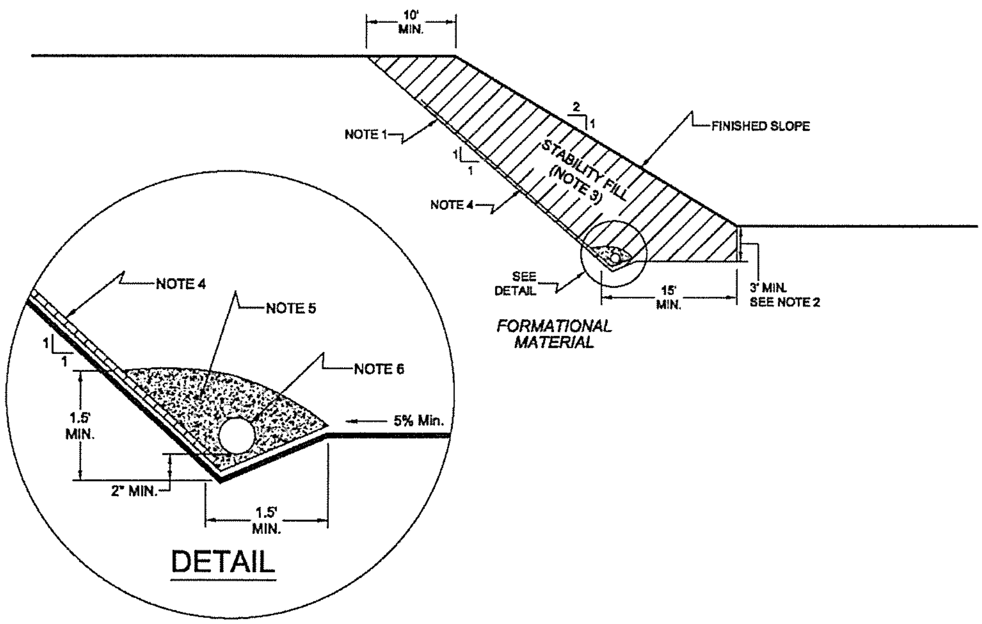
1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

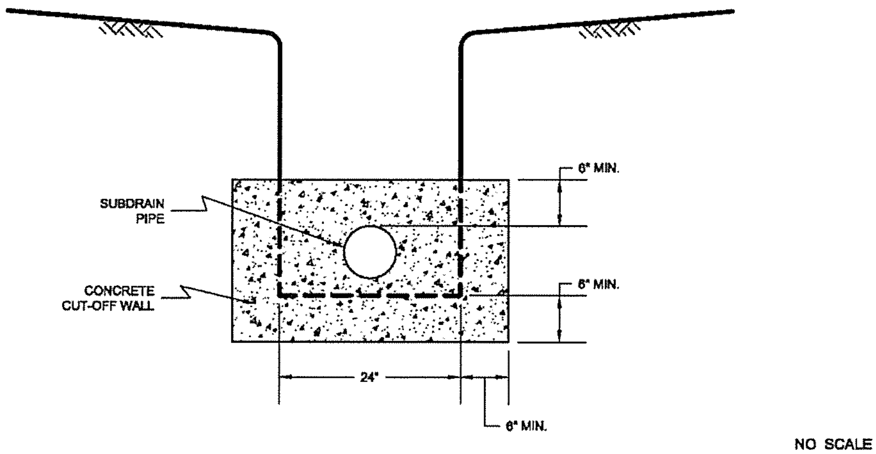
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

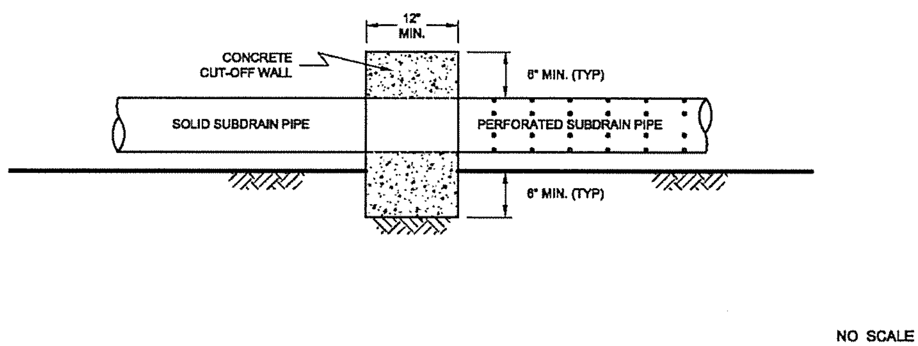
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW

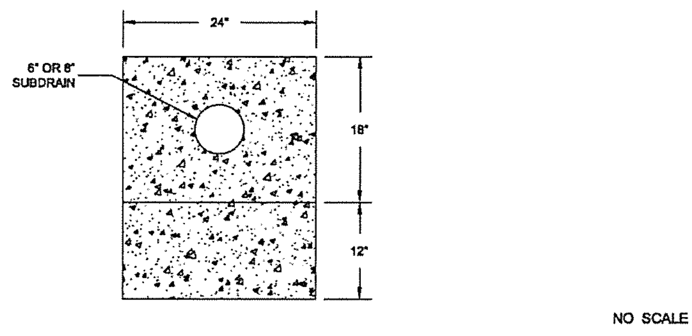


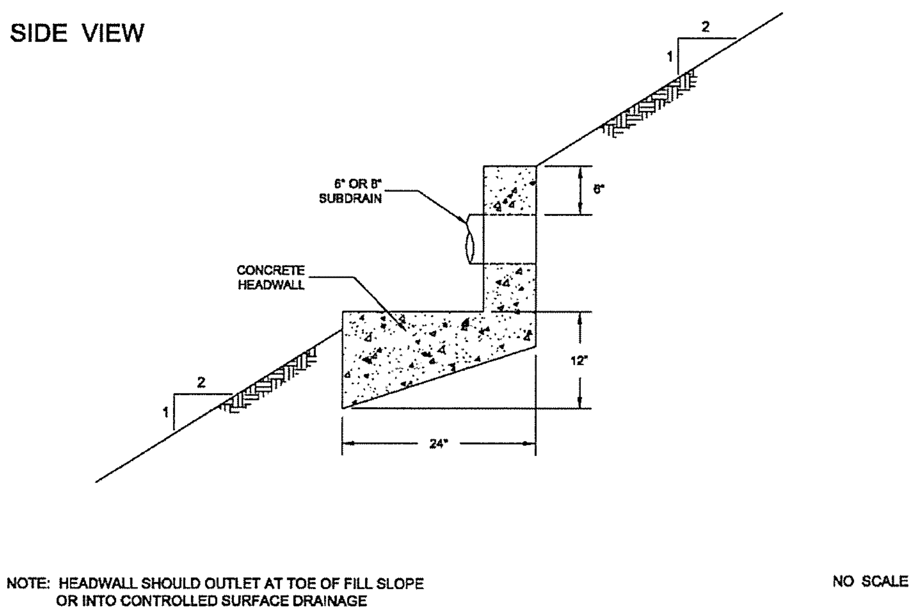
SIDE VIEW



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





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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