PRELIMINARY
STORM WATER QUALITY MANAGEMENT PLAN

ALVARADO SPECIFIC PLAN

FEBRUARY 2018

City of La Mesa, CA

prepared for:

RV Communities
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County of San Diego
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

ALVARADO SPECIFIC PLAN– LA MESA
[INSERT RECORD ID (PERMIT) NUMBERS]

7407 ALVARADO ROAD
LA MESA, CA 91942

ASSESSOR'S PARCEL NUMBER(S):
469-021-12, 17, 18, 19

ENGINEER OF WORK:

KENNETH T. KOZLIK, P.E. 71883

PREPARED FOR:

RV COMMUNITIES
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PDP SWQMP PREPARED BY:

FUSCOE ENGINEERING, INC
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DATE OF SWQMP:
February 13, 2018

PLANS PREPARED BY:
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SWQMP APPROVED BY:

APPROVAL DATE:

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Table of Contents

Attachments

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

PDP SWQMP Preparer's Certification Page

Project Name: San Diego RV Resort – La Mesa]
Permit Application Number: [Insert Permit Application Number]

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.

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

Kenneth T. Kozlik, P.E.
Print Name

Fuscoe Engineering, Inc.
Company

_____
Date

Engineer's Seal:

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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	02/13/2018	Initial Submittal
2		
3		
4		

Final Design

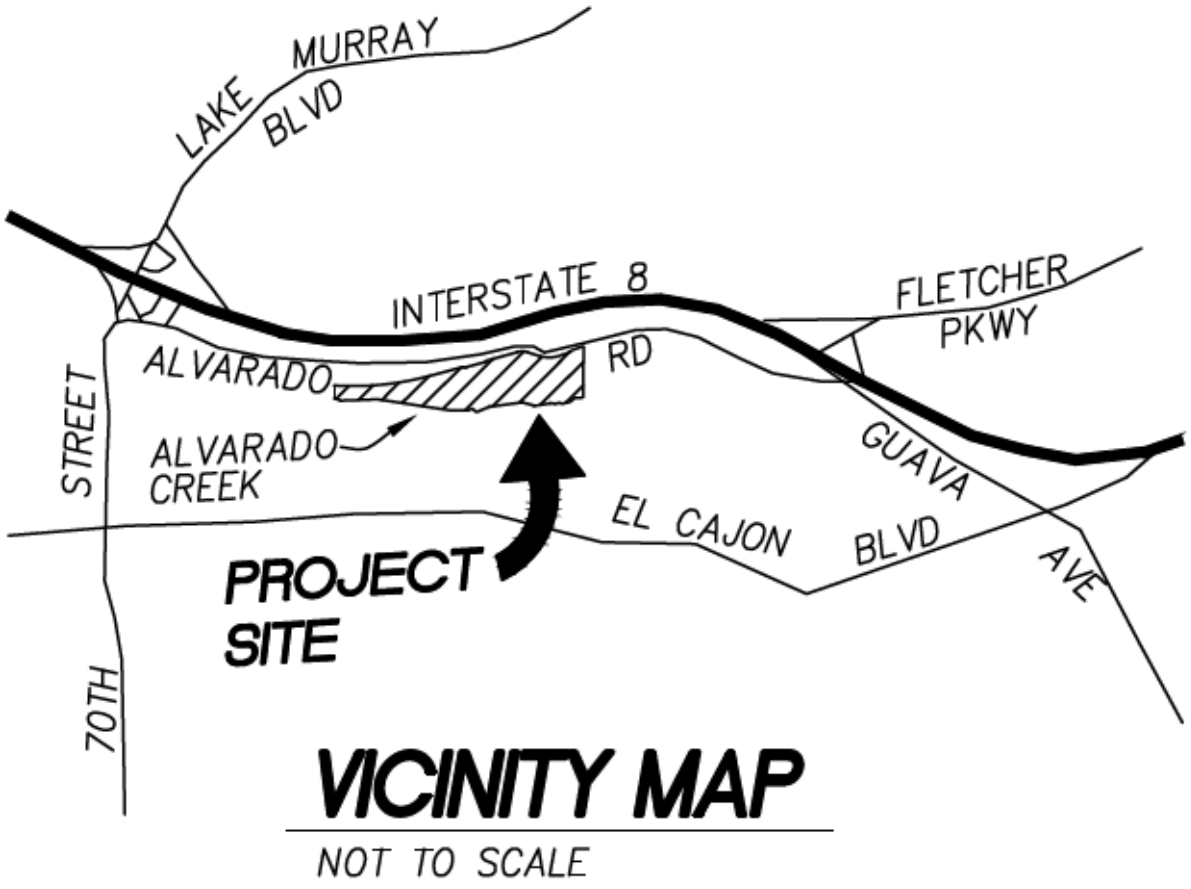
Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

Plan Changes

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

Project Vicinity Map

Project Name: Alvarado Specific Plan
Record ID: [Insert Record ID or Permit Application Number]



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

Is the project part of another Priority Development Project (PDP)? (☐ Yes ☒ No If so, a PDP SWQMP is required. Go to Step 2.			
The project is (select one): ☐ New Development ☒ Redevelopment[1]			
The total proposed newly created or replaced impervious area is: 345,712 ft^2			
The total existing (pre-project) impervious area is: 302,681 ft^2			
The total area disturbed by the project is: 483,661 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: ___			
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 not 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: 302,681 ft^2 (A)
The total proposed newly created or replaced impervious area is 333,202 ft^2 (B)
Percent impervious surface created or replaced (B/A)*100: 110 %
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? 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*.	☐ Standard Project	Standard Project requirements apply, including Standard Project SWQMP. **Complete Standard Project SWQMP.**
	☒ PDP	Standard and PDP requirements apply, including PDP SWQMP. **Complete PDP SWQMP.**
	☐ PDP with ACP	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:	

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	☐	To be determined during final engineering
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	☐	To be determined during final engineering
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	☒	
D. Select sediment control method for all disturbed areas (choose at least one)			
Silt Fence	SC-1	☒	"
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	☒	"
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	☒	"
Spill Prevention and Control	WM-4	☒	
F.2 Waste Management[10]			
Waste Management Concrete Waste Management	WM-8	☒	"
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)	HU 907.11, HA Lower San Diego, HSA Mission San Diego, 7.11

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 3.79 Acres (165,131 Square Feet)
☐ Non-Vegetated Pervious Areas _____ Acres (_____ Square Feet)
☒ Impervious Areas 6.95 Acres (302,681 Square Feet)

Description / Additional Information:
Limits of vegetative cover and non-vegetated unclear.

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): N/A

☐ 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:
East parcel A & B sheet flow from east to west and discharge into Alvarado Creek through either storm drain or spill over the concrete lined channel bank. West parcel A sheet flows east to west with a portion of the area draining south into a storm drain and discharging into Alvarado Creek. The majority of the runoff flows west on to parcel B. Parcel B sheet flows west on to parcel C. Parcel C sheet flows west into an inlet/culvert just west of the property line. The culvert discharges in Alvarado Creek and is undersized & subject to clogging.

Step 3.3: Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:
Project proposes podium style apartment complex with three levels of parking structure and 5 levels of apartments making up a total of approximately 900 apartment units. Associated construction of utilities, hardscape and landscape are included in the scope. The project is bisected by Alvarado Creek. Two buildings will be located on the west side of the site and a third building will be located on the east side of the site.

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

List/describe proposed pervious features of the project (e.g., landscape areas):
Landscaping will be located throughout the site as well as two stormwater treatment biofiltration basins one located on each side of the site, bisected by Alvarado Creek as well as three Modular wetlands to treat sidewalk and road run off.

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	182,287	140,049	-23%
Pervious (non-vegetated)			
Impervious	285,526	326,813	+14%

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:

The east parcels will drain south west through a series of area drains, roof drains and swales into proposed BMP #1 and then discharge into Alvarado Creek. The west parcels will drain similarly through area drains and will flow west to BMP #2 and discharge into Alvarado Creek. The street runoff with drain into one of three modular wetlands located throughout the project. Post treatment the street runoff will discharge into Alvarado Creek.

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):
Site discharges directly into Alvarado Creek

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
Alvarado Creek	*Selenium*	*Selenium/ Bacteria*
San Diego River(Lower)	*Enterococcus, Fecal Coliform, Low Dissolved Oxygen, Manganese, Nitrogen, Phosphorus, TDS, Toxicity*	*Indicator Bacteria*
Pacific Ocean Shoreline at the San Diego River Outlet at Dog Beach	*Enterococcus, Total Coliform*	*Indicator Bacteria,*

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):

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	☐	☒	☒

[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

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 onsite and upstream 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 onsite CCSYAs per existing RPO steep slope encroachment criteria. AND,
- ☐ Bypass: Project has demonstrated that both onsite and upstream 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 upstream 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 upstream 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 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 project drains to 5 POCs, POC 1 - POC 5 discharge to Alvarado Creek.
Has a geomorphic assessment been performed for the receiving channel(s)? ☐ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is the low flow threshold is 0.1Q2 ☐ Yes, the result is the low flow threshold is 0.3Q2 ☒ Yes, the result is the low flow threshold is 0.5Q2 *If a geomorphic assessment has been performed, provide title, date, and preparer:* *Discussion / Additional Information: (optional)*

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: Alvarado Creek runs through site and will continue to with minor partial regrading to maintain required freeboard however limited disturbance to existing creek			
4.3.2 Conserve Natural Areas, Soils, and Vegetation	☐Yes	☐No	☒N/A
Discussion / justification if 4.3.2 not implemented:			
4.3.3 Minimize Impervious Area	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.3 not implemented: Indoor parking, reduced width emergency lane where possible.			
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: Due to structural concerns regarding the large building footprints, it is not feasible to direct drainage to the landscape area around the buildings.			

Site Design Requirement	Applied?		
4.3.6 Runoff Collection	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.6 not implemented: Subdrain's throughout site to assist natural runoff flow direction to proposed basins			
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: Per worksheet B3-1, harvest and reuse is not feasible			

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.

Biofiltration with cistern was selected due size limitations, natural site drainage, soil type and location of Alvarado Creek. A series of roof drains, area drains, and storm drain pipe will convey runoff to the biofiltration BMPs. The biofiltration basins will consist of a shallow 6" ponding layer of mulch, 18" of biofiltration soil media, and a 12"-36" storage layer. Due to the shallow grades required to discharge to Alvarado Creek on BMP #2, the 12" storage layer utilizes Rainstore 3(or equal) detention units to increase the void space and provide hydromodification storage, BMP #2 utilizes a 36" storage layer. Modular wetlands were chosen to treat the sidewalk and road runoff due to size limitations.

(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. 1	
Construction Plan Sheet No. 5	
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)	KENNETH T. KOZLIK, P.E. 6390 GREENWICH DRIVE, SUITE 170 SAN DIEGO, CA 92122 858.554.1500
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.	
Discussion (as needed): *(Continue on subsequent pages as necessary)*	

Step 6.3: Offsite Alternative Compliance Participation Form

PDP INFORMATION	
Record ID:	
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)

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

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)

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

Category	#	Description	Value	Units
Capture & Use Inputs	0	Design Capture Volume for Entire Project Site	13,918	cubic-feet
	1	Proposed Development Type	Residential	unitless
	2	Number of Residents or Employees at Proposed Development	1,800	#
	3	Total Planted Area within Development	142,148	sq-ft
	4	Water Use Category for Proposed Planted Areas	Moderate	unitless
Infiltration Inputs	5	Is Average Site Design Infiltration Rate ≤0.500 Inches per Hour?	Yes	yes/no
	6	Is Average Site Design Infiltration Rate ≤0.010 Inches per Hour?	Yes	yes/no
	7	Is Infiltration of the Full DCV Anticipated to Produce Negative Impacts?	Yes	yes/no
	8	Is Infiltration of Any Volume Anticipated to Produce Negative Impacts?	Yes	yes/no
Calculations	9	36-Hour Toilet Use Per Resident or Employee	1.86	cubic-feet
	10	Subtotal: Anticipated 36 Hour Toilet Use	3,357	cubic-feet
	11	Anticipated 1 Acre Landscape Use Over 36 Hours	196.52	cubic-feet
	12	Subtotal: Anticipated Landscape Use Over 36 Hours	641	cubic-feet
	13	Total Anticipated Use Over 36 Hours	3,998	cubic-feet
	14	Total Anticipated Use / Design Capture Volume	0.29	cubic-feet
	15	Are Full Capture and Use Techniques Feasible for this Project?	No	unitless
	16	Is Full Retention Feasible for this Project?	No	yes/no
	17	Is Partial Retention Feasible for this Project?	No	yes/no
Result	18	Feasibility Category	5	1, 2, 3, 4, 5

Worksheet B.3-1 General Notes:

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

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

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

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

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

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

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

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

Automated Worksheet B.1-1: Calculation of Design Capture Volume (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	0	Drainage Basin ID or Name	1	2									unitless
	1	Basin Drains to the Following BMP Type	Biofiltration	Biofiltration									unitless
	2	85th Percentile 24-hr Storm Depth	0.54	0.54									inches
	3	Design Infiltration Rate Recommended by Geotechnical Engineer											in/hr
	4	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	118,914	207,899									sq-ft
	5	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	6	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	64,522	75,527									sq-ft
	7	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	8	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	9	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	10	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)											sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	11	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No									yes/no
	12	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	13	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	14	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	16	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	17	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	18	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	19	Number of Tree Wells Proposed per SD-A											#
	20	Average Mature Tree Canopy Diameter											ft
	21	Number of Rain Barrels Proposed per SD-E											#
	22	Average Rain Barrel Size											gal
Treatment Train Inputs & Calculations	23	Does BMP Overflow to Stormwater Features in Downstream Drainage?	No	No									unitless
	24	Identify Downstream Drainage Basin Providing Treatment in Series											unitless
	25	Percent of Upstream Flows Directed to Downstream Dispersion Areas											percent
	26	Upstream Impervious Surfaces Directed to Dispersion Area (Ci=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
	27	Upstream Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
Initial Runoff Factor Calculation	28	Total Tributary Area	183,436	283,426	0	0	0	0	0	0	0	0	sq-ft
	29	Initial Runoff Factor for Standard Drainage Areas	0.62	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	30	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	31	Initial Weighted Runoff Factor	0.62	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	32	Initial Design Capture Volume	5,118	8,800	0	0	0	0	0	0	0	0	cubic-feet
Dispersion Area Adjustments	33	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	34	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	35	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	36	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
	37	Runoff Factor After Dispersion Techniques	0.62	0.69	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	unitless
	38	Design Capture Volume After Dispersion Techniques	5,118	8,800	0	0	0	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	39	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	40	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	41	Final Adjusted Runoff Factor	0.62	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	42	Final Effective Tributary Area	113,730	195,564	0	0	0	0	0	0	0	0	sq-ft
	43	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	44	Final Design Capture Volume Tributary to BMP	5,118	8,800	0	0	0	0	0	0	0	0	cubic-feet

Worksheet B.1-1 General Notes:

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).

Automated Worksheet B.5-1: Sizing Lined or Unlined Biofiltration BMPs (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	0	Drainage Basin ID or Name	1	2	-	-	-	-	-	-	-	-	sq-ft
	1	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	-	-	-	-	-	-	-	-	in/hr
	2	Effective Tributary Area	113,730	195,564	-	-	-	-	-	-	-	-	sq-ft
	3	Minimum Biofiltration Footprint Sizing Factor	0.030	0.030	-	-	-	-	-	-	-	-	ratio
	4	Design Capture Volume Tributary to BMP	5,118	8,800	-	-	-	-	-	-	-	-	cubic-feet
	5	Is Biofiltration Basin Impermeably Lined or Unlined?	Lined	Lined									unitless
	6	Provided Biofiltration BMP Surface Area	3,500	6,800									sq-ft
	7	Provided Surface Ponding Depth	10	14									inches
	8	Provided Soil Media Thickness	22	22									inches
	9	Provided Depth of Gravel Above Underdrain Invert	9	9									inches
	10	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	2.83	3.49									inches
	11	Provided Depth of Gravel Below the Underdrain	3	3									inches
Retention Calculations	12	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	13	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	14	Gravel Pore Space Available for Retention	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	15	Effective Retention Depth	1.10	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	16	Calculated Retention Storage Drawdown (Including 6 Hr Storm)	120	120	0	0	0	0	0	0	0	0	hours
	17	Volume Retained by BMP	321	623	0	0	0	0	0	0	0	0	cubic-feet
	18	Fraction of DCV Retained	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	19	Portion of Retention Performance Standard Satisfied	0.07	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	20	Fraction of DCV Retained (normalized to 36-hr drawdown)	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	21	Design Capture Volume Remaining for Biofiltration	4,964	8,448	0	0	0	0	0	0	0	0	cubic-feet
Biofiltration Calculations	22	Max Hydromod Flow Rate through Underdrain	0.3820	0.6073	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	CFS
	23	Max Soil Filtration Rate Allowed by Underdrain Orifice	4.72	3.86	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	in/hr
	24	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	25	Soil Media Filtration Rate to be used for Sizing	4.72	3.86	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	26	Depth Biofiltered Over 6 Hour Storm	28.29	23.15	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	inches
	27	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	28	Effective Depth of Biofiltration Storage	18.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	29	Drawdown Time for Surface Ponding	2	4	0	0	0	0	0	0	0	0	hours
	30	Drawdown Time for Effective Biofiltration Depth	4	6	0	0	0	0	0	0	0	0	hours
	31	Total Depth Biofiltered	46.29	45.15	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	inches
	32	Option 1 - Biofilter 1.50 DCV: Target Volume	7,446	12,672	0	0	0	0	0	0	0	0	cubic-feet
	33	Option 1 - Provided Biofiltration Volume	7,446	12,672	0	0	0	0	0	0	0	0	cubic-feet
	34	Option 2 - Store 0.75 DCV: Target Volume	3,723	6,336	0	0	0	0	0	0	0	0	cubic-feet
	35	Option 2 - Provided Storage Volume	3,723	6,336	0	0	0	0	0	0	0	0	cubic-feet
	36	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	37	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	-	-	-	-	-	-	-	-	yes/no
	38	Overall Portion of Performance Standard Satisfied	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	39	This BMP Overflows to the Following Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	40	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

Worksheet B.5-1 General Notes:

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

Summary of Stormwater Pollutant Control Calculations (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
General Info	0	Drainage Basin ID or Name	1	2	-	-	-	-	-	-	-	-	unitless
	1	85th Percentile Storm Depth	0.54	0.54	-	-	-	-	-	-	-	-	inches
	2	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	-	-	-	-	-	-	-	-	in/hr
	3	Total Tributary Area	183,436	283,426	-	-	-	-	-	-	-	-	sq-ft
	4	85th Percentile Storm Volume (Rainfall Volume)	8,255	12,754	-	-	-	-	-	-	-	-	cubic-feet
Initial DCV	5	Initial Weighted Runoff Factor	0.62	0.69	-	-	-	-	-	-	-	-	unitless
	6	Initial Design Capture Volume	5,118	8,800	-	-	-	-	-	-	-	-	cubic-feet
Site Design Volume Reductions	7	Dispersion Area Reductions	0	0	-	-	-	-	-	-	-	-	cubic-feet
	8	Tree Well and Rain Barrel Reductions	0	0	-	-	-	-	-	-	-	-	cubic-feet
BMP Volume Reductions	9	Effective Area Tributary to BMP	113,730	195,564	-	-	-	-	-	-	-	-	square feet
	10	Final Design Capture Volume Tributary to BMP	5,118	8,800	-	-	-	-	-	-	-	-	cubic-feet
	11	Basin Drains to the Following BMP Type	Biofiltration	Biofiltration	-	-	-	-	-	-	-	-	unitless
	12	Volume Retained by BMP (normalized to 36 hour drawdown)	154	352	-	-	-	-	-	-	-	-	cubic-feet
Total Volume Reductions	13	Total Fraction of Initial DCV Retained within DMA	0.03	0.04	-	-	-	-	-	-	-	-	fraction
	14	Percent of Average Annual Runoff Retention Provided	4.6%	6.1%	-	-	-	-	-	-	-	-	%
	15	Percent of Average Annual Runoff Retention Required	4.5%	4.5%	-	-	-	-	-	-	-	-	%
Performance Standard	16	Percent of Pollution Control Standard Satisfied	100.0%	100.0%	-	-	-	-	-	-	-	-	%
Treatment Train	17	Discharges to Secondary Treatment in Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	18	Impervious Surface Area Still Requiring Treatment	0	0	-	-	-	-	-	-	-	-	square feet
	19	Impervious Surfaces Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
	20	Impervious Surfaces Not Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
Result	21	Deficit of Effectively Treated Stormwater	0	0	-	-	-	-	-	-	-	-	cubic-feet

Summary Notes:

All fields in this summary worksheet are populated based on previous user inputs. If applicable, drainage basin elements that require revisions and/or supplemental information outside the scope of these worksheets are highlighted in orange and summairzed in the red text below. If all drainage basins achieve full compliance without a need for supplemental information, a green message will appear below.

-Congratulations, all specified drainage basins and BMPs are in compliance with stormwater pollutant control requirements. Include 11x17 color prints of this summary sheet and supporting worksheet calculations as part of the SWQMP submittal package.

False

Alvarado Specific Plan			
	Biofiltration 3	**Value**	**Units**
	Pervious	0.03	acres
	Amended Mulched Soils or Landscape	0.1	
	Impervious	1.06	acres
	Concrete or Asphalt	0.9	
	85th percentile, 24-hr storm even rainfall depth	0.54	inches
	Tributary Area	1.09	acres
	Adjusted Runoff Factor for Drainage Area	0.87	
	Flow-Based Biofiltration BMP		
QTY	Treatment Flow Rate (Q)	0.191	cfs
	1.5 X DCV	0.29	cfs
1	Provided Treatment System: Bio-Clean MWS-L-4-8	0.115	cfs
1	Provided Treatment System: Bio-Clean MWS-L-4-19	0.237	cfs
2	Total Treatment	0.35	cfs

Refresh

Alvarado Specific Plan			
	Biofiltration 4	**Value**	**Units**
	Pervious	0.01	acres
	Amended Mulched Soils or Landscape	0.1	
	Impervious	0.32	acres
	Concrete or Asphalt	0.9	
	85th percentile, 24-hr storm even rainfall depth	0.54	inches
	Tributary Area	0.34	acres
	Adjusted Runoff Factor for Drainage Area	0.87	
	Flow-Based Biofiltration BMP		
QTY	Treatment Flow Rate (Q)	0.059	cfs
	1.5 X DCV	0.09	cfs
1	Provided Treatment System: Bio-Clean MWS-L-4-8	0.115	cfs

Refresh

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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?

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

Provide basis:

Estimated infiltration rate is below 0.5" as site is located in Hydrologic Soil Group D Area, known for poor infiltration qualities.

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

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

Provide basis:

A geotechnical report was not written for the subject property at the time the Preliminary SWQMP was written. Estimated infiltration rate is below 0.5". The site is located in Hydrologic Soil Group D Area, known for poor infiltration qualities.

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

3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☒

Provide basis:

Due to proximity to Alvarado Creek, shallow groundwater is anticipated.

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PROJECT NOTES

CRITICAL COURSE SEDIMENT:
THE PROJECT SITE HAS NO CRITICAL COURSE SEDIMENT YIELD AREAS TO BE PROTECTED. SEE SWQMP ATTACHMENT 2C FOR MAP.

GROUNDWATER:
GEOTECH REPORT NOT COMPLETE AT THE TIME THIS EXHIBIT WAS CREATED
UNDERLYING HYDROLOGIC SOIL GROUP: SOIL TYPE D, GROUND WATER ESTIMATED TO BE GREATER THAN 15'

STRUCTURAL BMPs:
2 BIOFILTRATION BASINS ARE PROPOSED FOR WATER QUALITY TREATMENT. TREATED WATER WILL BE CONVEYED INTO PROPOSED CISTERN'S UNDERNEATH EACH BASIN (SEE DETAIL A). CISTERN SIZED TO MEET HYDROMODIFICATION MANAGEMENT REQUIREMENTS. STREET RUNOFF WILL BE DIVERTED TO ROAD SIDE MODULAR WETLANDS, TREATED AND DISCHARGED TO ALVARADO CREEK

SOURCE CONTROL BMPS:
PREVENT ILLICIT DISCHARGES TO MS-4
TRASH STORAGE (SC-G) (LOCATION TO BE DETERMINED)
NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
LANDSCAPE/OUTDOOR PESTICIDE USE
REFUSE AREAS

SITE DESIGN BMPS:
MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES
CONSERVE NATURAL AREAS, OILS AND VEGETATION
MINIMIZE IMPERVIOUS AREA
MINIMIZE SOIL COMPACTION
LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

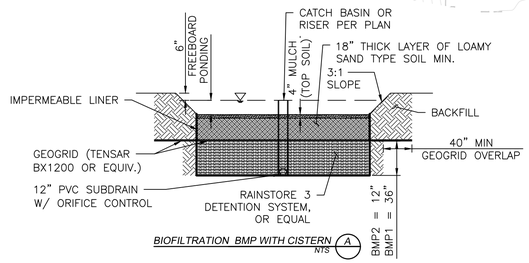
EXISTING CONDITIONS:
IMPERVIOUS AREA = 302,681SF
PERVIOUS AREA = 165,131SF

LEGEND
PROPOSED DMA
BUILDING HARDSCAPE AREA
NON HARDSCAPE AREA
PROPOSED BIOFILTRATION & CISTERN
PROPOSED STORM DRAIN — SD —
HEC-RAS CROSS SECTION
100-YEAR WATER SURFACE ELEVATION 423.7 W.S.
FLOW DIRECTION
DISCHARGE POINT/POINT OF COMPLIANCE POC

INTERSTATE 8
ALVARADO ROAD
ALVARADO CREEK
MTS TROLLEY LINE
BIOCLEAN MODULAR WETLANDS MWS-L-4-8
BIOCLEAN MODULAR WETLANDS MWS-L-4-19
DMA 2
TOTAL AREA = 283,426SF
PERVIOUS = 75,527SF
IMPERVIOUS = 207,899SF
SOIL TYPE D
DMA 3
DMA 4
DMA 1
TOTAL AREA = 183,436SF
PERVIOUS = 64,522SF
IMPERVIOUS = 118,914SF
SOIL TYPE D
EXIST. GAS LINE
POC1
POC2

BF + CISTERN 2
406.00 TOP OF BASIN (8,499 SF)
405.83 PONDING ELEVATION (10" PONDING)
405.00 BOTTOM OF BASIN (6,800 SF)
403.17 BOTTOM OF SOIL/TOP OF CISTERN (18" SOIL)
402.42 ORIFICE INVERT (3.49" MAX ORIFICE)
402.17 BOTTOM OF CISTERN (12" DETENTION)

BF + CISTERN 1
422.50 TOP OF BASIN (5,244 SF)
422.00 PONDING ELEVATION (14" PONDING)
420.83 BOTTOM OF BASIN (3,500 SF)
419.00 BOTTOM OF SOIL/TOP OF CISTERN (18" SOIL)
416.25 ORIFICE INVERT (2.83" MAX ORIFICE)
416.00 BOTTOM OF CISTERN (3' DETENTION)



BIOFILTRATION BMP WITH CISTERN NTS A

DMA ID	DMA AREAS (AC)	BMP ID	TYPE	TREATMENT AREA (SF) REQUIRED	TREATMENT AREA (SF) PROVIDED	VOLUME (CF) REQUIRED	VOLUME (CF) PROVIDED
1	4.21	1	BIOFILTRATION	3,407	3,500	5,118	7,446
2	6.51	2	BIOFILTRATION	6,294	6,800	8,800	12,672
3	1.09	3	MODULAR WETLANDS	- -	- -	0.29CFS	0.35CFS
4	0.34	4	MODULAR WETLANDS	- -	- -	0.09CFS	0.12CFS
SITE	12.15	--		9,701	10,300	13,918	20,118

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

ATTACHMENT 1C DMA/BMP/HMP EXHIBIT
ALVARADO SPECIFIC PLAN SAN DIEGO, CA
PROJECT NUMBER: 2413-001
DATE: FEBRUARY 2018
SHEET 1 OF 1

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

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ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

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

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

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)

BMP Sizing Spreadsheet V2.0

Project Name:	San Diego RV Resort
Project Applicant:	FEI
Jurisdiction:	County of San Diego
Parcel (APN):	469-02-118
Hydrologic Unit:	907.11
Rain Gauge:	Oceanside
Total Project Area (sf):	169,634
Channel Susceptibility:	Low

BMP Sizing Spreadsheet V2.0			
Project Name:	San Diego RV Resort	Hydrologic Unit:	907.11
Project Applicant:	FEI	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	169,634
Parcel (APN):	469-02-118	Low Flow Threshold:	0.5Q2
BMP Name:	BF + Cistern 1	BMP Type:	Cistern
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	Pre-project Slope	Post Project Surface Type	Runoff Factor (Table G.2-1)[1]	N/A	Cistern Volume	N/A	N/A	Cistern Volume (cf)	N/A
Hardscape	120,735	D	Flat	Imp	1.0	N/A	0.12	N/A	N/A	14488	N/A
Planted	48,929	D	Flat	perv	0.1	N/A	0.12	N/A	N/A	587	N/A
Total BMP Area	169,664							Minimum BMP Size		15075	
								Proposed BMP Size*	3500	N/A	N/A
								Minimum Cistern Depth		N/A	in
								Maximum Cistern Depth		N/A	in
								Selected Cistern Depth		36.00	in
								Selected Cistern Volume		15679	cubic feet

Notes:

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

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

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

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, February 2016. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V2.0			
Project Name:	San Diego RV Resort	Hydrologic Unit:	907.11
Project Applicant:	FEI	Rain Gauge:	Oceanside
Jurisdiction:	County of San Diego	Total Project Area:	169,634
Parcel (APN):	469-02-118	Low Flow Threshold:	0.5Q2
BMP Name	BF + Cistern 1	BMP Type:	Cistern

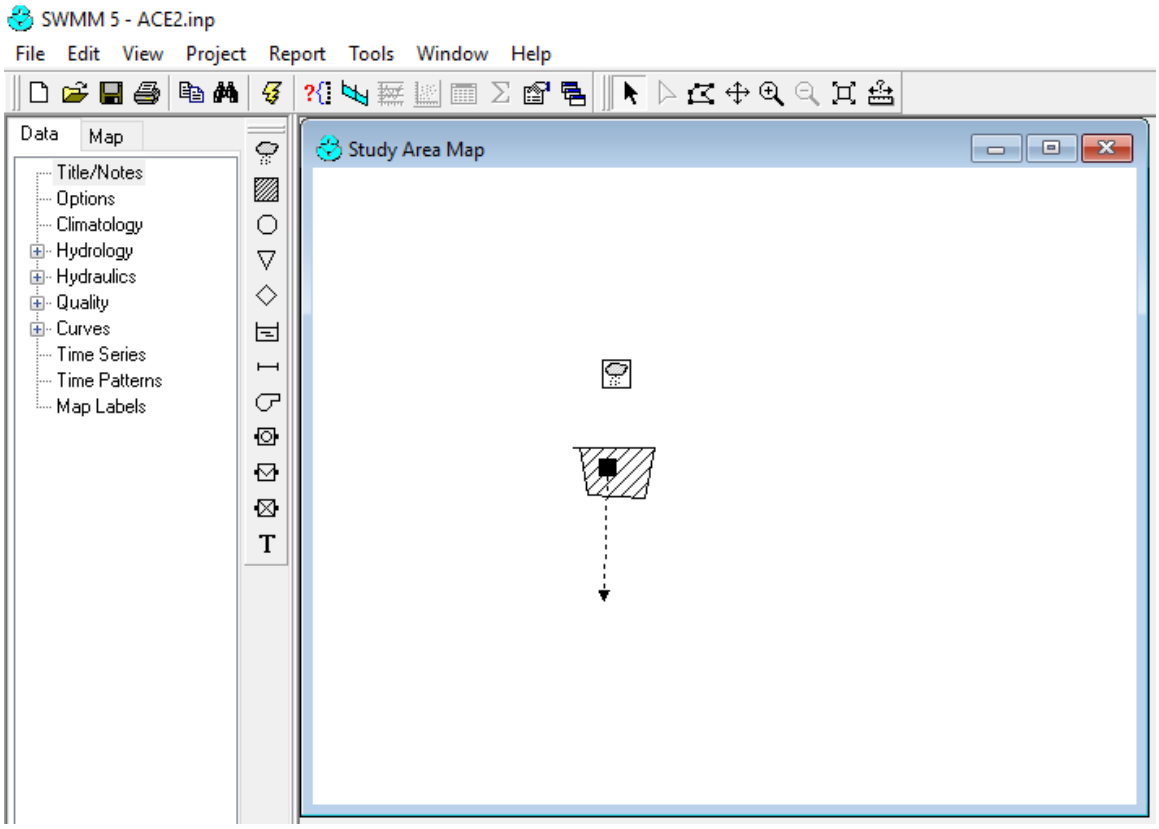
DMA Name	Rain Gauge	Pre-developed Condition			Q_2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Cover	Slope				
Hardscape	Oceanside	D	Scrub	Flat	0.175	2.772	0.243	**4.48**
Planted	Oceanside	D	Scrub	Flat	0.175	1.123	0.098	**1.81**
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					
			Scrub					

0.341	**6.29**	**2.83**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

0.102	**1.77**	**1.50**
Actual Orifice Flow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	provide hand calculation

BF + Cistern 2
SWMM Screen Captures
Existing Condition Model



Rain Gage KearnyMesa

Property	Value
Name	KearnyMesa
X-Coordinate	3338.109
Y-Coordinate	6733.524
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	FILE
TIME SERIES:	
- Series Name	*
DATA FILE:	
- File Name	F:\Projects\2413\001_Support Files\Reports\SWMM\Rain Ga
- Station ID	KearnyMesa
- Rain Units	IN

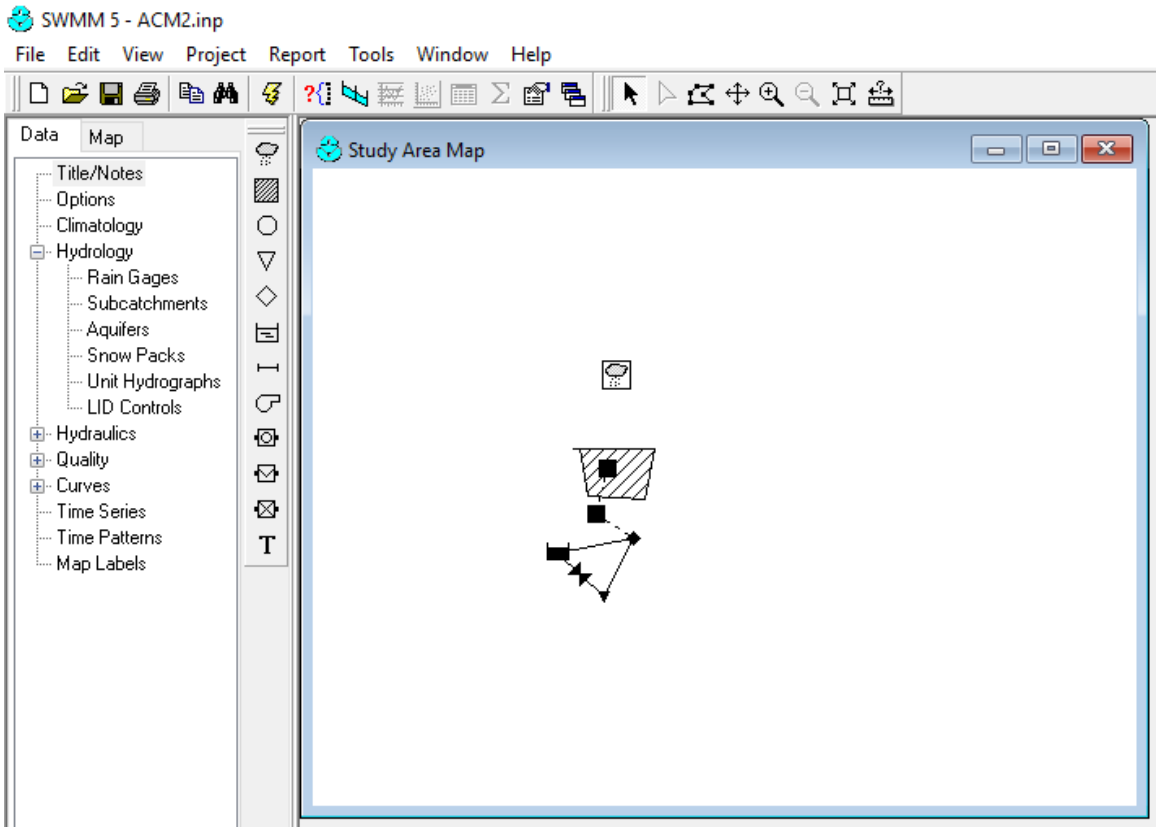
User-assigned name of rain gage

Subcatchment Basin2

Property	Value
Name	Basin2
X-Coordinate	3160.458
Y-Coordinate	5306.590
Description	Basin 2
Tag	Basin2
Rain Gage	KearnyMesa
Outlet	POC2
Area	7.7
Width	183
% Slope	1
% Imperv	0
N-Imperv	0.011
N-Perv	.05
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

BF + Cistern 2
SWMM Screen Captures
Mitigated Condition Model



Rain Gage KearnyMesa

Property	Value
Name	KearnyMesa
X-Coordinate	3338.109
Y-Coordinate	6733.524
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	FILE
TIME SERIES:	
- Series Name	*
DATA FILE:	
- File Name	F:\Projects\2413\001_Support Files\Reports\SWMM\Rain Gaug
- Station ID	KearnyMesa
- Rain Units	IN

User-assigned name of rain gage

Subcatchment Basin2

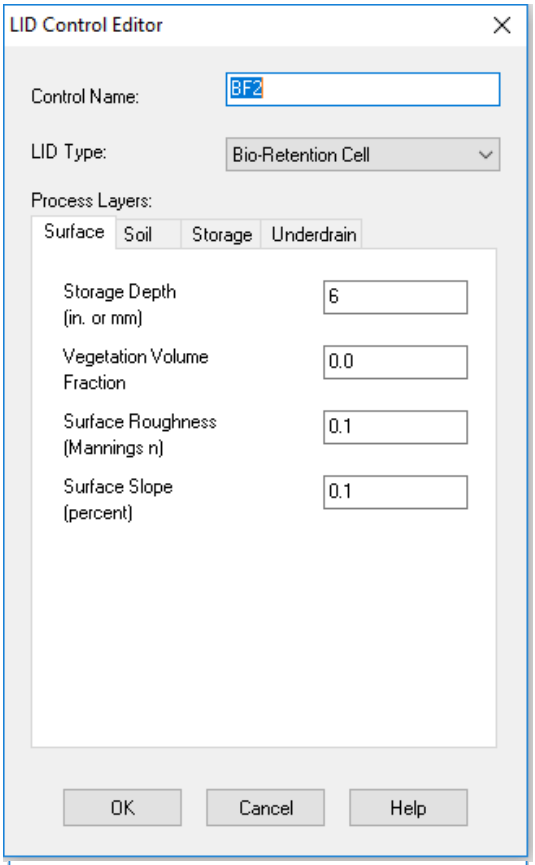
Property	Value
Name	Basin2
X-Coordinate	3160.458
Y-Coordinate	5306.590
Description	Basin 2
Tag	Basin2
Rain Gage	KearnyMesa
Outlet	Biofiltration2
Area	7.7
Width	190
% Slope	1
% Imperv	62
N-Imperv	0.011
N-Perv	.05
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

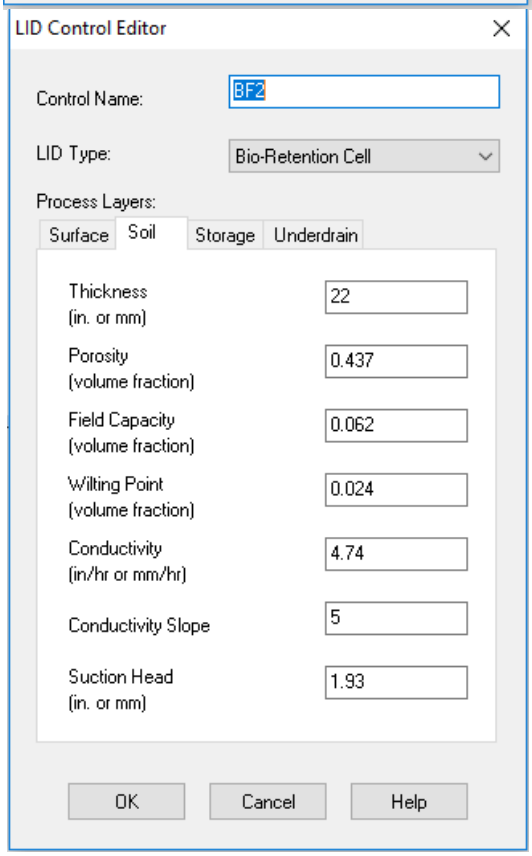
User-assigned name of subcatchment

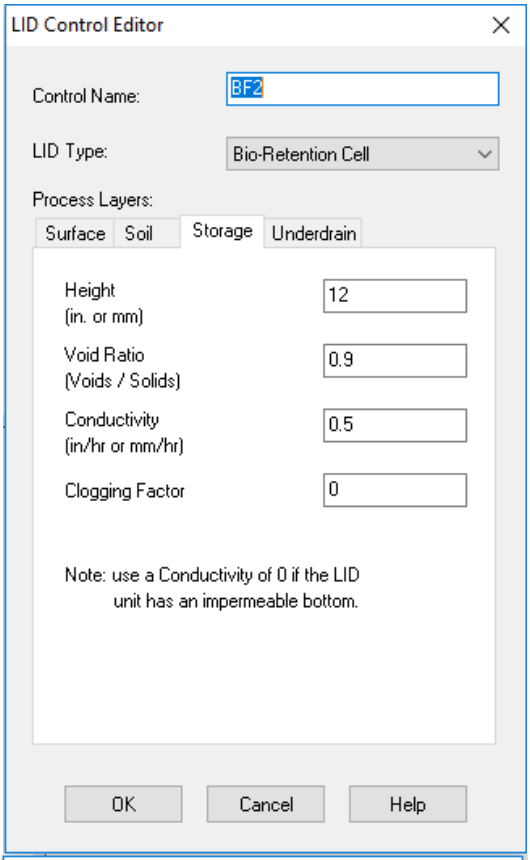
Subcatchment Biofiltration2

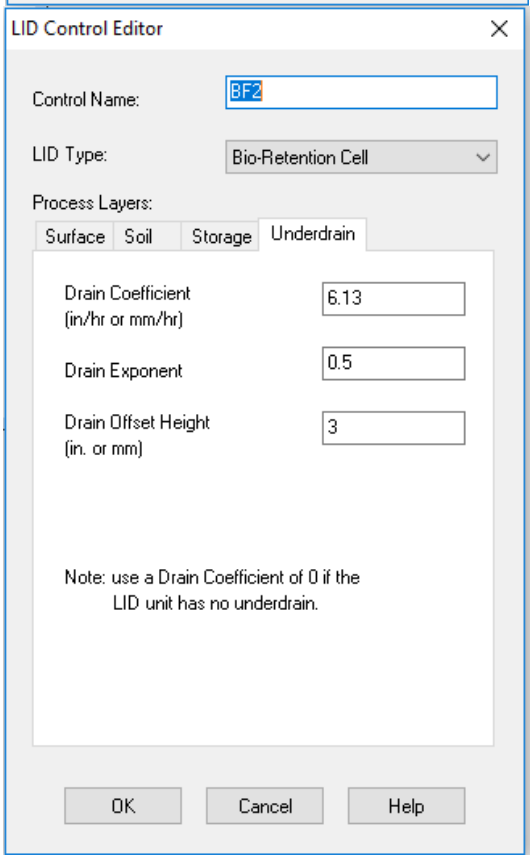
Property	Value
Name	Biofiltration2
X-Coordinate	2981.546
Y-Coordinate	4602.076
Description	
Tag	Biofiltration2
Rain Gage	KearnyMesa
Outlet	D2
Area	0.17
Width	50
% Slope	0.5
% Imperv	0
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	100
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment


LID Control Editor
Control Name:
BF2
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Storage Depth (in. or mm)
6
Vegetation Volume Fraction
0.0
Surface Roughness (Mannings n)
0.1
Surface Slope (percent)
0.1
OK
Cancel
Help


LID Control Editor
Control Name:
BF2
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Thickness (in. or mm)
22
Porosity (volume fraction)
0.437
Field Capacity (volume fraction)
0.062
Wilting Point (volume fraction)
0.024
Conductivity (in/hr or mm/hr)
4.74
Conductivity Slope
5
Suction Head (in. or mm)
1.93
OK
Cancel
Help


LID Control Editor
Control Name:
BF2
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Height
(in. or mm)
12
Void Ratio
(Voids / Solids)
0.9
Conductivity
(in/hr or mm/hr)
0.5
Clogging Factor
0
Note: use a Conductivity of 0 if the LID
unit has an impermeable bottom.
OK
Cancel
Help


LID Control Editor
Control Name:
BF2
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Drain Coefficient
(in/hr or mm/hr)
6.13
Drain Exponent
0.5
Drain Offset Height
(in. or mm)
3
Note: use a Drain Coefficient of 0 if the
LID unit has no underdrain.
OK
Cancel
Help

Divider D2

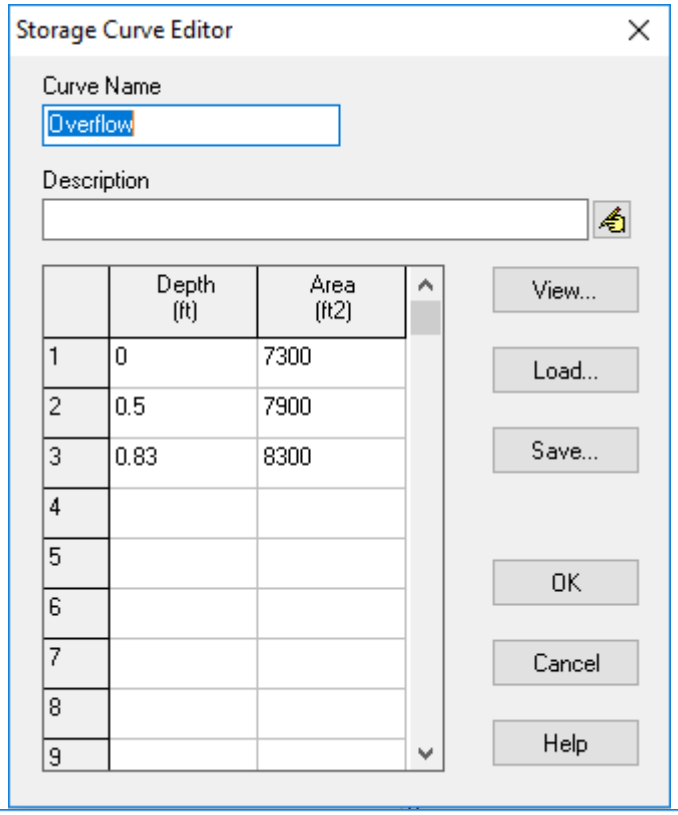
Property	Value
Name	D2
X-Coordinate	3546.713
Y-Coordinate	4221.453
Description	
Tag	D2
Inflows	NO
Treatment	NO
Invert El.	402.42
Max. Depth	3.58
Initial Depth	0
Surcharge Depth	0
Ponded Area	7300
Diverted Link	C2
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	1.5
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

Discharge coefficient for a WEIR divider

Storage Unit S2

Property	Value
Name	S2
X-Coordinate	2358.708
Y-Coordinate	3990.773
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	402
Max. Depth	1
Initial Depth	0
Ponded Area	0
Evap. Factor	0
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Overflow

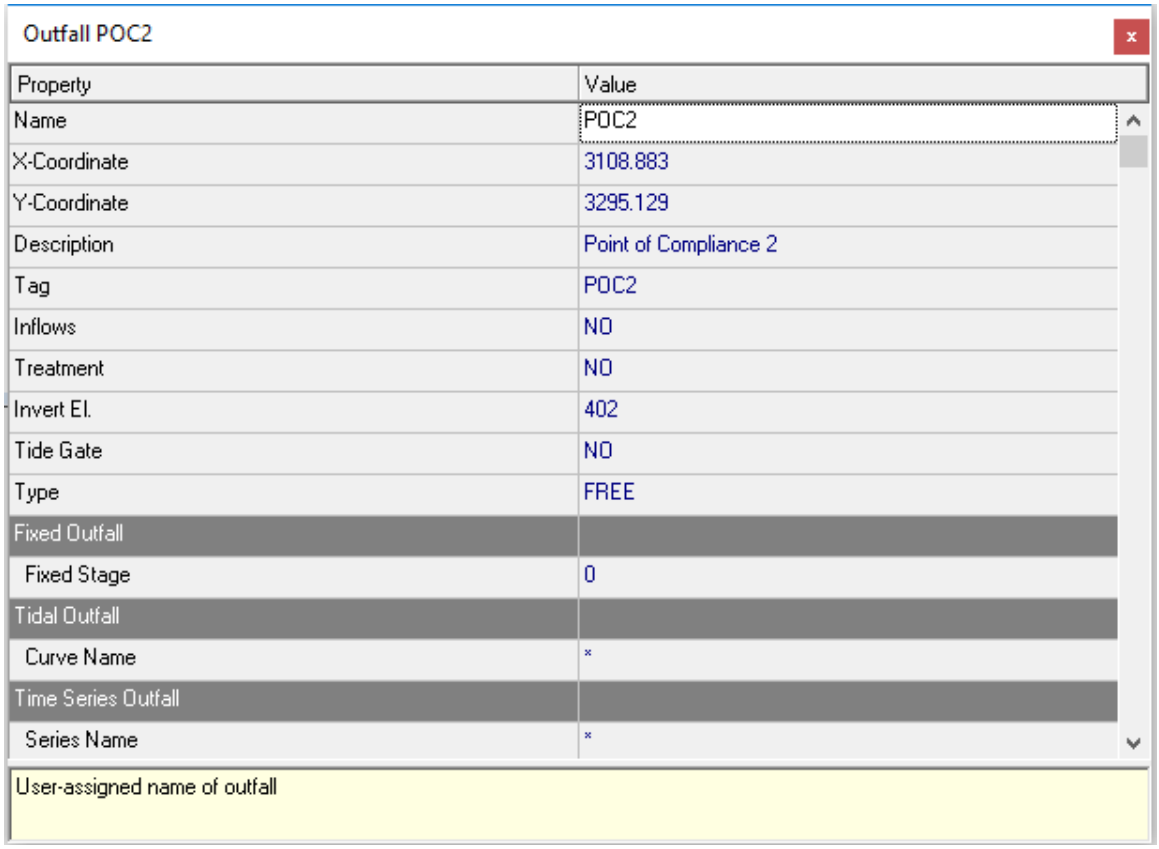
User-assigned name of storage unit



Weir W3

Property	Value
Name	W3
Inlet Node	S2
Outlet Node	POC2
Description	
Tag	
Type	TRANSVERSE
Height	0.5
Length	.25
Side Slope	0
Inlet Offset	0
Discharge Coeff.	3.33
Flap Gate	NO
End Contractions	0
End Coeff.	0

User-assigned name of weir


Outfall POC2
Property
Value
Name
POC2
X-Coordinate
3108.883
Y-Coordinate
3295.129
Description
Point of Compliance 2
Tag
POC2
Inflows
NO
Treatment
NO
Invert El.
402
Tide Gate
NO
Type
FREE
Fixed Outfall
Fixed Stage
0
Tidal Outfall
Curve Name
*
Time Series Outfall
Series Name
*
User-assigned name of outfall

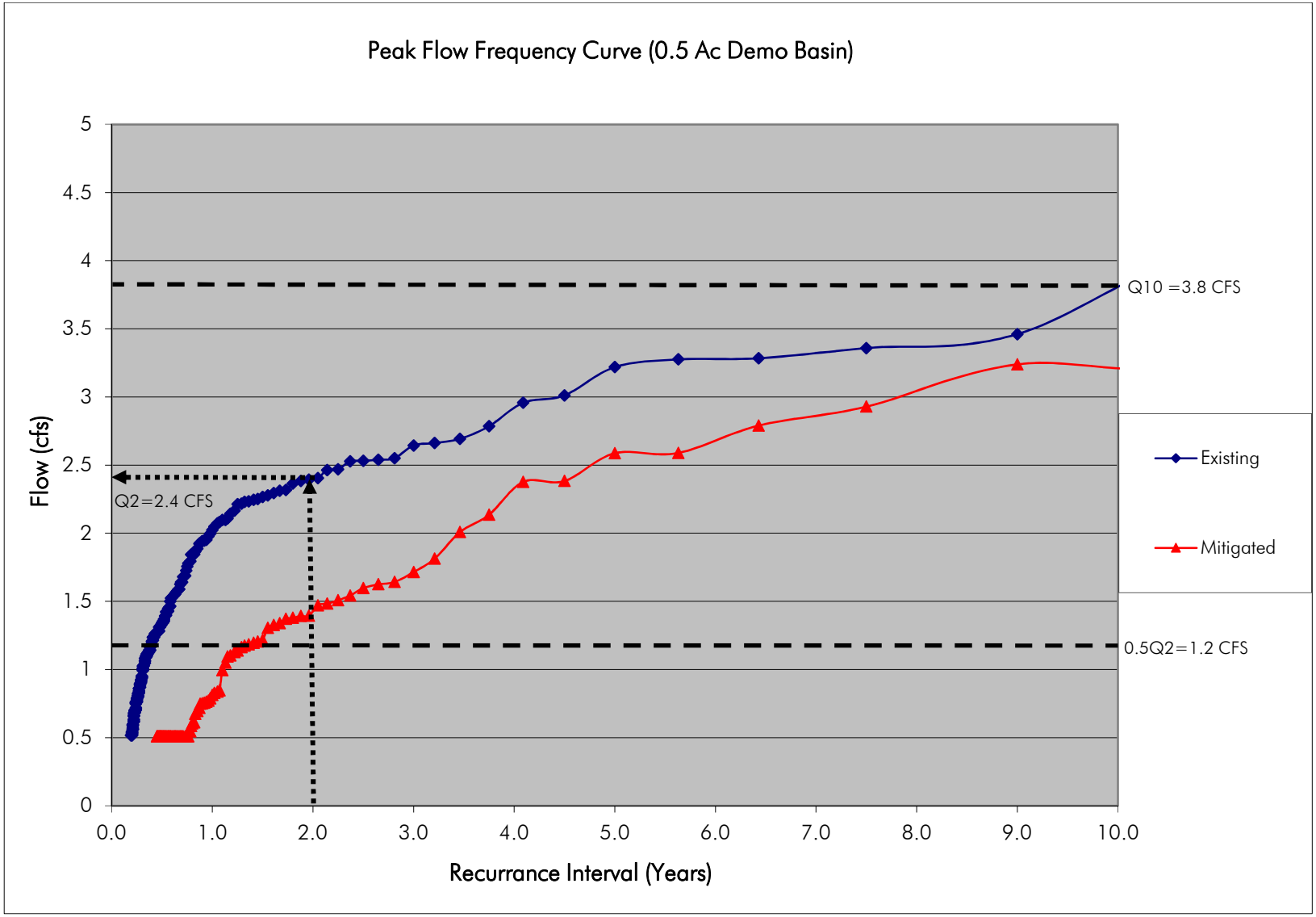
ALVARADO SPECIFIC PLAN
SWMM RESULTS - BF+CISTERN 2

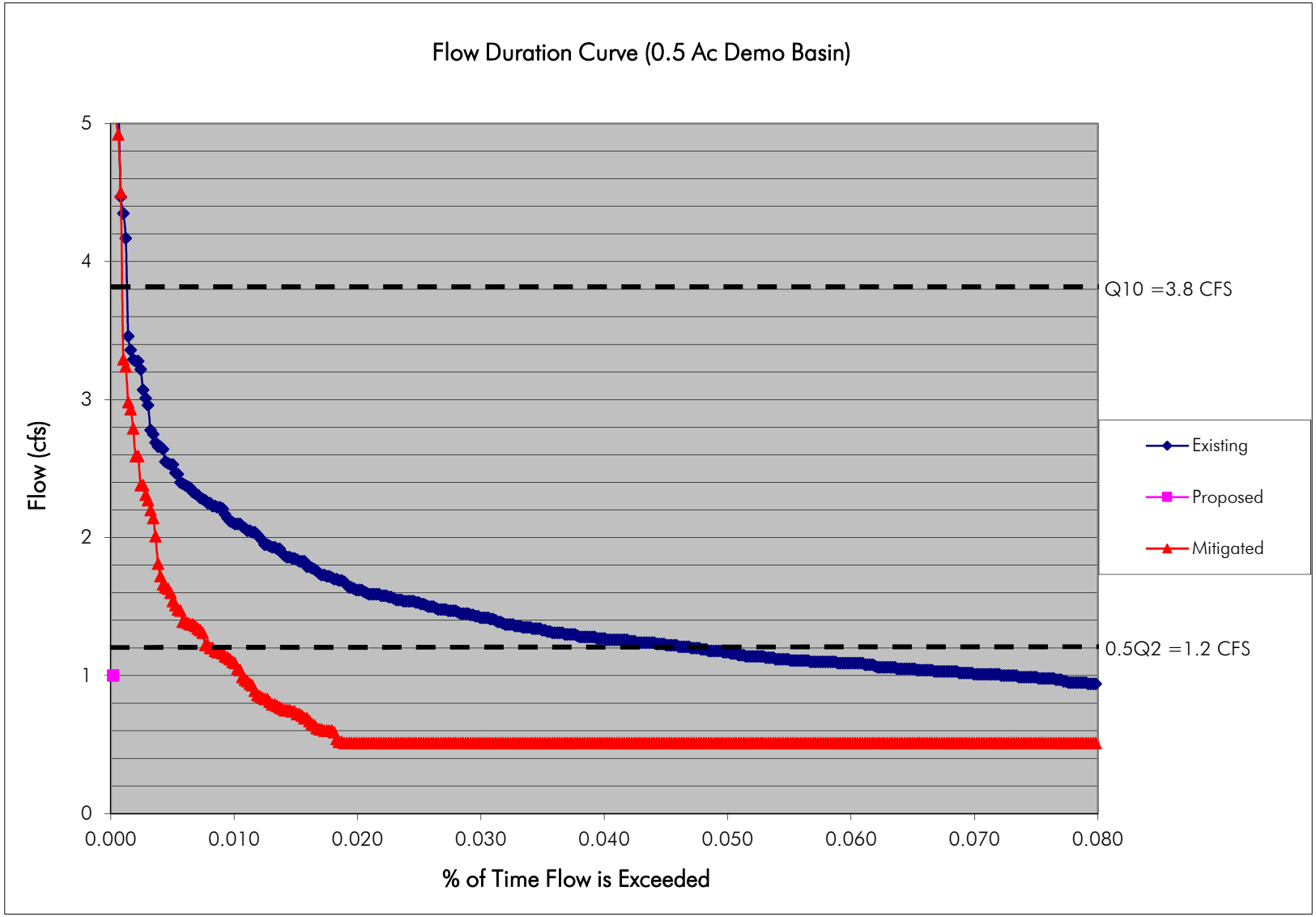
Record Period = 56.8 Years = 20,723 days 18 hours = 497,370 hours

% time Flow Exceeded = 100*m/(497370+1)

Rank (m)	Return Interval (yrs)	Peak Flow (cfs)		% Time Flow Exceeded	Hourly Flow Data (cfs) (Duration Calc)	
		Exist. Cond.	Prop. w/BMP		Exist. Cond.	Prop. w/BMP
1	45	7.247	7.296	0.0002	7.25	7.3
2	22.5	6.206	5.066	0.0004	6.21	5.07
3	15	4.472	4.496	0.0006	5.24	4.92
4	11.25	4.168	3.294	0.0008	4.47	4.5
5	9	3.461	3.239	0.0010	4.35	3.29
6	7.5	3.359	2.929	0.0012	4.17	3.24
7	6.43	3.284	2.79	0.0014	3.46	2.98
8	5.63	3.276	2.589	0.0016	3.36	2.93
9	5	3.219	2.587	0.0018	3.29	2.79
10	4.5	3.012	2.383	0.0020	3.28	2.59
11	4.09	2.958	2.377	0.0022	3.28	2.59
12	3.75	2.785	2.136	0.0024	3.22	2.38
13	3.46	2.693	2.008	0.0026	3.07	2.38
14	3.21	2.662	1.814	0.0028	3.01	2.31
15	3	2.644	1.715	0.0030	2.96	2.27
16	2.81	2.55	1.642	0.0032	2.78	2.2
17	2.65	2.54	1.625	0.0034	2.75	2.14
18	2.5	2.531	1.597	0.0036	2.69	2.01
19	2.37	2.527	1.543	0.0038	2.66	1.81
20	2.25	2.469	1.508	0.0040	2.66	1.72
21	2.14	2.464	1.484	0.0042	2.64	1.66
22	2.05	2.404	1.471	0.0044	2.55	1.64
23	1.96	2.394	1.394	0.0046	2.54	1.63
24	1.88	2.384	1.393	0.0048	2.53	1.6
25	1.8	2.364	1.379	0.0050	2.53	1.54
26	1.73	2.317	1.372	0.0052	2.47	1.51
27	1.67	2.311	1.34	0.0054	2.46	1.48
28	1.61	2.294	1.327	0.0056	2.4	1.47
29	1.55	2.278	1.306	0.0058	2.39	1.39
30	1.5	2.267	1.217	0.0060	2.38	1.39
31	1.45	2.251	1.204	0.0062	2.37	1.38
32	1.41	2.245	1.196	0.0064	2.36	1.37
33	1.36	2.234	1.184	0.0066	2.33	1.37
34	1.32	2.231	1.174	0.0068	2.32	1.36
35	1.29	2.217	1.163	0.0070	2.31	1.34
36	1.25	2.213	1.139	0.0072	2.29	1.33
37	1.22	2.165	1.128	0.0074	2.28	1.31
38	1.18	2.144	1.102	0.0076	2.27	1.22
39	1.15	2.109	1.094	0.0078	2.25	1.22

40	1.13	2.097	1.05	0.0080	2.25	1.2
41	1.1	2.097	0.995	0.0082	2.23	1.2
42	1.07	2.083	0.847	0.0084	2.23	1.18
43	1.05	2.073	0.837	0.0086	2.22	1.17
44	1.02	2.049	0.827	0.0088	2.22	1.17
45	1	2.024	0.813	0.0090	2.21	1.16
46	0.98	1.998	0.787	0.0092	2.17	1.14
47	0.96	1.979	0.77	0.0094	2.14	1.13
48	0.94	1.952	0.764	0.0097	2.12	1.12
49	0.92	1.946	0.755	0.0099	2.11	1.1
50	0.9	1.942	0.751	0.0101	2.1	1.09
51	0.88	1.929	0.748	0.0103	2.1	1.05
52	0.87	1.923	0.717	0.0105	2.1	1.04
53	0.85	1.887	0.694	0.0107	2.08	0.99
54	0.83	1.866	0.674	0.0109	2.07	0.97
55	0.82	1.846	0.612	0.0111	2.05	0.96
56	0.8	1.845	0.603	0.0113	2.05	0.94
57	0.79	1.844	0.585	0.0115	2.04	0.93
58	0.78	1.794	0.545	0.0117	2.04	0.89
59	0.76	1.78	0.51	0.0119	2.02	0.86
60	0.75	1.756	0.51	0.0121	2	0.85
61	0.74	1.726	0.51	0.0123	1.98	0.84
62	0.73	1.689	0.51	0.0125	1.95	0.83
63	0.71	1.681	0.51	0.0127	1.95	0.83
64	0.7	1.641	0.51	0.0129	1.94	0.81
65	0.69	1.64	0.51	0.0131	1.93	0.79
66	0.68	1.625	0.51	0.0133	1.93	0.79
67	0.67	1.589	0.51	0.0135	1.92	0.78
68	0.66	1.586	0.51	0.0137	1.92	0.77
69	0.65	1.576	0.51	0.0139	1.89	0.76
70	0.64	1.567	0.51	0.0141	1.87	0.75
71	0.63	1.555	0.51	0.0143	1.86	0.75
72	0.63	1.554	0.51	0.0145	1.86	0.75
73	0.62	1.545	0.51	0.0147	1.85	0.74
74	0.61	1.538	0.51	0.0149	1.85	0.74
75	0.6	1.529	0.51	0.0151	1.84	0.72
76	0.59	1.523	0.51	0.0153	1.83	0.72
77	0.58	1.501	0.51	0.0155	1.83	0.71
78	0.58	1.465	0.51	0.0157	1.83	0.69
79	0.57	1.457	0.51	0.0159	1.79	0.69
80	0.56	1.448	0.51	0.0161	1.79	0.67
81	0.56	1.429	0.51	0.0163	1.78	0.65
82	0.55	1.424	0.51	0.0165	1.77	0.64
83	0.54	1.422	0.51	0.0167	1.76	0.62
84	0.54	1.398	0.51	0.0169	1.74	0.61
85	0.53	1.392	0.51	0.0171	1.73	0.61
86	0.52	1.37	0.51	0.0173	1.73	0.6
87	0.52	1.356	0.51	0.0175	1.72	0.6
88	0.51	1.355	0.51	0.0177	1.72	0.6

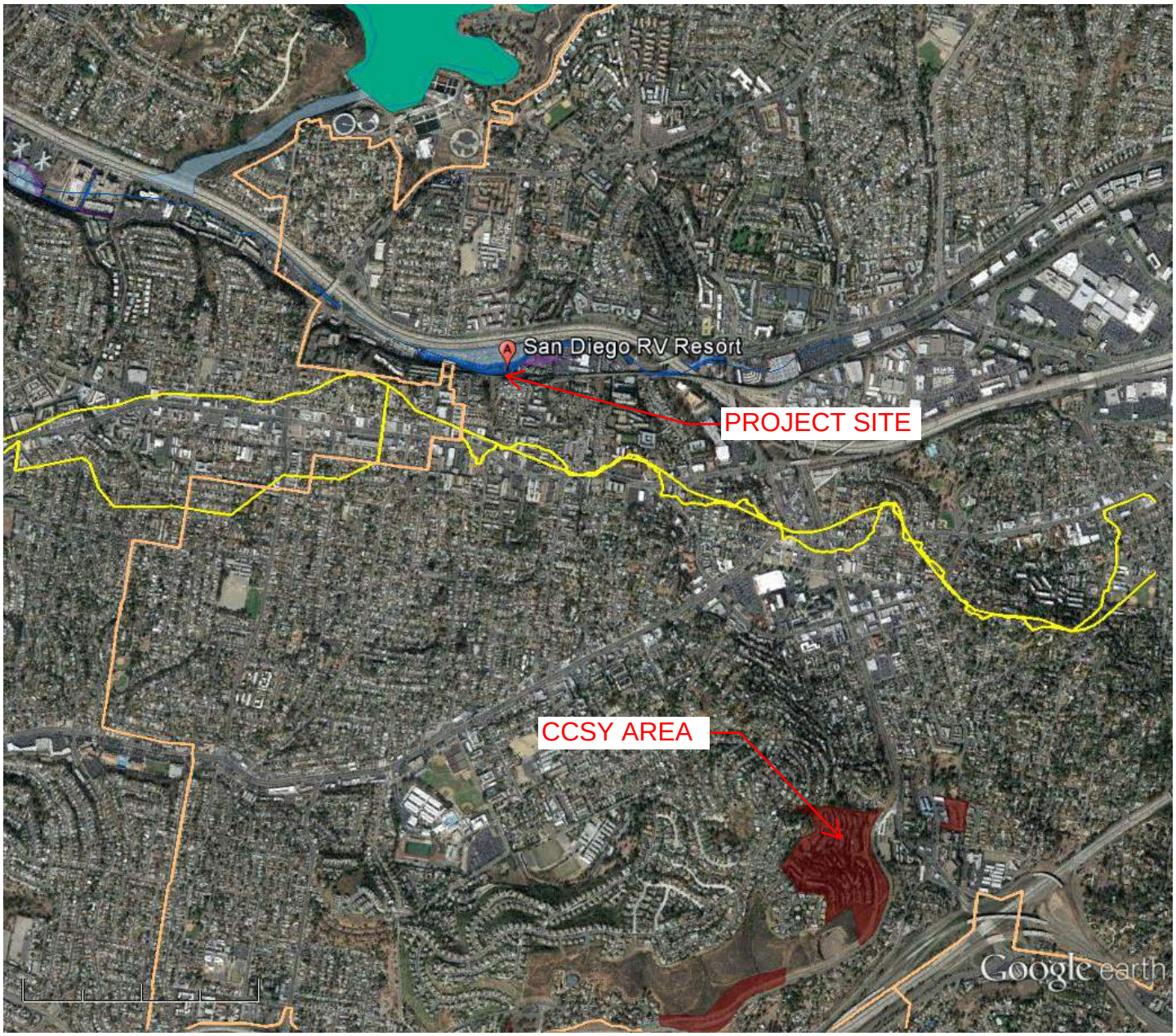

Peak Flow Frequency Curve (0.5 Ac Demo Basin)
Flow (cfs)
Recurrance Interval (Years)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Q10 =3.8 CFS
Q2=2.4 CFS
0.5Q2=1.2 CFS
Existing
Mitigated


Flow Duration Curve (0.5 Ac Demo Basin)
Flow (cfs)
5
4
3
2
1
0
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
% of Time Flow is Exceeded
Q10 =3.8 CFS
0.5Q2 =1.2 CFS
Existing
Proposed
Mitigated

SAN DIEGO RV RESORT
FEBRUARY 2018

LOCATION OF CCSY AREAS

CONCLUSION: NO CCSY AREAS LOCATED ON OR WITHIN PROJECT SITE.



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HYDROMODIFICATION SCREENING

FOR

ALVARADO SPECIFIC PLAN

February 9, 2018

Wayne W. Chang, MS, PE 46548

ChangConsultants

Civil Engineering ◦ Hydrology ◦ Hydraulics ◦ Sedimentation

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Rancho Santa Fe, CA 92067
(858) 692-0760

FOR REVIEW ONLY

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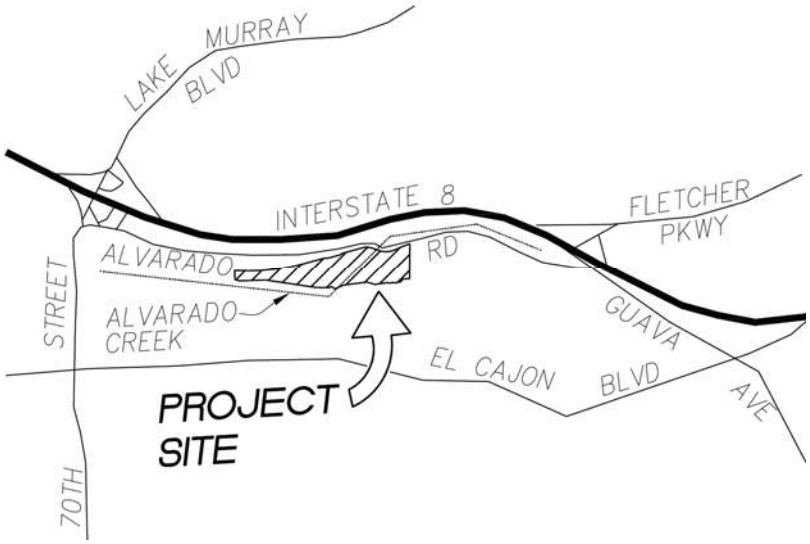
APPENDICES

INTRODUCTION

The City of La Mesa's February 2016, *BMP Design Manual,* outlines 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 a hydromodification screening analysis for the proposed Atlas Specific Plan project located along the south side of Alvarado Road generally between 70th Street on the west and Guava Avenue on the east in the city of La Mesa (see the Vicinity Map). The site covers 12 acres and currently supports an RV campground. The site is surrounded on the north by Interstate 8, on the west by the 70th Street trolley station, on the east by Bob Stall Chevrolet, and on the south by residential development. The project is being designed by Fuscoe Engineering, Inc., and will be developed as a master plan for multi-family, transit-oriented development containing three buildings with five-story dwelling units on three-level garage podiums. A remainder parcel on the very west end will be used for parking, open space and storm-water management.

A significant site feature is Alvarado Creek which bisects the property as it intersects Alvarado Road near the northeasterly portion of the site. The creek continues westerly within the property

towards the adjoining trolley property where it enters hardened, non-erodible storm drainage facilities (reinforced concrete culverts and a concrete channel). These drainage facilities continue west along Alvarado Road and the trolley line. The facilities ultimately discharge into the natural Alvarado Creek channel near College Avenue and San Diego State University. From here, Alvarado Creek continues over 2 miles west to the San Diego River, which ultimately flows to the Pacific Ocean.

The project runoff will be conveyed by the proposed on-site drainage facilities (roof drains, streets, storm drains, etc.) to one of two biofiltration/cistern BMPs. One BMP is at the far west portion of the site and serves the development area west of Alvarado Creek. The second BMP serves the development area east of Alvarado Creek and is at the southwest corner of this area. Storm runoff exiting the BMPs will be directed by proposed storm drain pipes to the adjacent natural Alvarado Creek channel (see the Study Area Exhibit in Appendix A). From here, the runoff continues to the Pacific Ocean as described above.

The SCCWRP screening tool requires both office and field work to establish the vertical and lateral susceptibility of a natural 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 points of compliance (POC), which are the first locations downstream of the site containing a natural drainage course with the potential for erosion. There are two POCs for the project, which are at the two discharge locations from the proposed BMPs into the natural Alvarado Creek channel (see the Study Area Exhibit).

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. This report extends the approved April 27, 2016 channel screening assessment by Chang Consultants titled, *Hydromodification Screening for Westmont Assisted Living.* The 2016 report analyzed Alvarado Creek to 656 feet downstream of Alvarado Road. This report extends the assessment to the downstream concrete culverts.

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. Otherwise English units are used.

Downstream Domain of Analysis

The downstream domain of analysis location for the study area has been determined by assessing and comparing the four bullet items above. As discussed in the Introduction, the project runoff will be conveyed out of the BMPs by proposed storm drain pipes that outlet at two locations into the natural Alvarado Creek channel (see the Study Area Exhibit). The two outlets are the POC's, and the downstream domain of analysis is selected below these POCs. The upstream of the two POCs is labeled POC 1 and the downstream is POC 2.

Per the first bullet item, the first permanent grade control below both POCs was located. A site inspection and review of Google Earth revealed that the first permanent grade control below the POCs occurs where the natural Alvarado Creek channel becomes concrete-lined, which is near the west end of the project site just upstream of the trolley station (see Figure 6 and the Study Area Exhibit). The concrete-lined channel entrance is considered a permanent facility and will maintain the grade of the upstream channel bed. This permanent grade control is approximately 55 feet downstream of POC 2.

The second bullet item is the tidal backwater or lentic (standing or still water such as ponds, pools, marshes, lakes, etc.) waterbody location. The nearest such waterbody is along the San Diego River downstream of Qualcomm Way. This segment of the San Diego River was developed as part of the First San Diego River Improvement Project and contains permanent ponds. The ponds are over 6 miles downstream of the first permanent grade control, so the second bullet item will not govern over the first bullet item in establishing the downstream domain of analysis location.

The final two bullet items are related to the tributary drainage area. As mentioned in the Introduction, Alvarado Creek ultimately confluences with the San Diego River. The confluence is within the Grantville community of the city of San Diego. According to the Federal Emergency Management Agency's May 16, 2012, *Flood Insurance Study, San Diego County, California* (FIS), the Alvarado Creek drainage area at its confluence with the San Diego River covers 14 square miles (see the FIS excerpts in Appendix A). The FIS reveals that the San Diego River drainage area at its confluence with Murphy Canyon Creek, which is near its confluence with Alvarado Creek, covers 420 square miles. Therefore, the confluence of Alvarado Creek with the San Diego River meets both the third and fourth bullet criteria. The Alvarado Creek tributary area

at the confluence encounters a much larger (much greater than 50 or 100 percent/equal order) tributary area from the San Diego River watershed. The confluence is downstream of the first grade control, so the third and fourth bullet items will not govern over the first bullet item in establishing the downstream domain of analysis location. For the fourth bullet item, 50 to 100 percent of the drainage area tributary to the POCs will be accumulated in Alvarado Creek before its confluence with the San Diego River. However, it will not be accumulated before the permanent grade control since the grade control is so close to the POCs, so the fourth bullet item will not apply.

From the above assessment, the downstream domain of analysis location for the POCs is based on the first bullet item, i.e., the grade control criteria. This is the location closest to the POCs from the four bullet criteria. As stated in the first bullet item, the downstream domain of analysis should extend one reach (656 feet) below the grade control. The existing concrete-lined drainage facilities (culverts and channel) below the permanent grade control extend much further downstream than 656 feet, so one reach will be entirely in non-erodible drainage facilities that are not subject to hydromodification. As a result, the downstream domain of analysis occurs at the permanent grade control, i.e., at the beginning of the concrete-lining in Alvarado Creek.

Upstream Domain of Analysis

The natural Alvarado Creek channel extends upstream of the POCs. However, the reach upstream of POC 1 has already been analyzed in the approved Westmont Assisted Living report, which determined a low susceptibility to erosion. Therefore, the upstream domain of analysis location will be at POC 1.

Study Reaches within Domain of Analysis

The entire domain of analysis extends 1,272 feet from the upstream domain of analysis location at POC 1 to the downstream domain of analysis location where the natural Alvarado Creek becomes concrete-lined. The domain of analysis along Alvarado Creek was analyzed as a single study reach, Reach 1. Reach 1 is greater than the 656 foot (200 meters) reach length recommended by SCCWRP. Review of topographic mapping, aerial photographs, and field conditions reveals that the physical (channel geometry and longitudinal slope), vegetative, hydraulic, and soil conditions within Reach 1 are relatively uniform. Subdividing Reach 1 into smaller subreaches of less than 656 feet will not yield varying conclusions within the reach. Although the screening tool was applied across the entire length of Reach 1, the results will be identical for shorter subreaches within Reach 1.

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 quadrangle mapping. For the study area, more detailed information and better topographic mapping was available, so it was used instead of USGS mapping to determine the valley slope and valley width.

The watershed area was determined by Fuscoe Engineering, Inc. (see the Tributary Area Exhibit in Appendix A) using GIS data. The areas tributary to POC 1 and POC 2 are 3,497 and 3,541 acres, respectively. The area tributary to POC 2 is essentially the area tributary to Reach 1 since POC 2 is near the lower end of Reach 1, i.e., the watershed area is 3,541 acres or 5.533 square miles.

The valley slope of Reach 1 was obtained from the project's 1-foot contour interval topographic mapping (see the Study Area Exhibit in Appendix A), which is much more detailed that NED data, so will provide more precise results. The valley slope is the longitudinal slope of the channel bed along the flow line, and is determined by dividing the elevation difference within a reach by the length of the flow line. The valley width is the average channel bottom width, which was measured from the topographic mapping. The tributary drainage area, valley slope, and valley width for Reach 1 are summarized in Table 1.

Reach	Tributary Drainage Area, sq. mi.	Valley Slope, m/m	Valley Width, m
1	5.533	0.0079	15.2

Table 1. Summary of Drainage Area, Valley Slope, and Valley Width

The mean annual precipitation was obtained from the rain gage closest to the site. This is the Western Regional Climate Center's La Mesa gage (see Appendix A). The average annual rainfall measured at the La Mesa gage for the period of record from 1899 to 2006 is 12.93 inches.

The above described 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 8. 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 2 and 7 contain photographs showing channel material within Reach 1. Based on the figures, a site investigation, and the prior Westmont Assisted Living study, the bed material and resistance is generally within the threshold bed category. The Alvarado Creek channel bed in this area contains large grain sizes and cobbles.

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. The other figures show dense vegetative growth within the bed material, which provides resistance consistent with a threshold bed. 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 appropriate results given the range of factors that define erodibility. 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 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 Reach 1 is lined with large gravel, cobbles, and dense vegetation as seen in the figures. The uniform, dense gravel/cobble lining and vegetation falls within Category A, which represents a mix of coarse gravel and cobbles that are tightly packed with less than 5 percent surface material of diameter less than 2 millimeters.

Checklist 2 determines grade control characteristics of the channel bed. This is reliant on the spacing of the grade controls. The three categories for Checklist 2 are related to a grade control spacing of $2/S_v$ and $4/S_v$, where S_v is the valley slope from Appendix A. The $2/S_v$ and $4/S_v$ results are in meters, so a factor is applied to convert to feet. A reach is in Category A if it has a spacing of less than $2/S_v$, in Category B is it has a spacing between $2/S_v$ and $4/S_v$, and in Category C if it has a spacing greater than $4/S_v$. The $2/S_v$ and $4/S_v$ values for Reach 1 are 835 and 1,669 feet, respectively. A grade control is present at the downstream end Reach 1 and the length of Reach 1 is 1,272 feet, which is between its $2/S_v$ and $4/S_v$ values. Therefore, Reach 1 is within Category B.

The Screening 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 value determined in the initial desktop analysis (see Appendix A). The Form 1 results in Appendix A determined an INDEX of 0.0318 for Reach 1. This value corresponds to a d_{50} no larger than 16 mm (16 mm has a value of 0.0490). Since the d_{50} in Reach 1 exceeds 16 mm (0.62 inches) by a large amount as evidenced by the figures, Reach 1 has less than a 50 percent probability of incision and is in Category A.

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

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

The vertical rating score for Reach 1 is based on these values and the equation:

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

Since the vertical rating is less than 4.5, Reach 1 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 is included in Figure 9) 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 extensive mass wasting nor extensive fluvial erosion was evident within Reach 1 during a field investigation (see Figures 1 through 5). In some areas, the channel banks are concrete-lined or have retaining walls, which are not subject to lateral changes.

The next step in the Form 4 decision tree is to assess the consolidation of the bank material. The natural banks in Reach 1 are moderately to well-consolidated. This determination was made because the ground surface was difficult to penetrate with a probe. In addition, the banks showed no evidence of mass crumbling, were composed of relatively well-packed particles, and in some areas support mature vegetation.

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. From the site investigation and the project's 1-foot contour interval topographic mapping, the average bank angle of the natural channel banks in Reach 1 average 1.5:1 (33.7 degrees) or flatter. Form 6 shows that the probability of mass wasting and bank failure has less than 10 percent risk for a 33.7 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, 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 calculation in the spreadsheet in Appendix A shows that the VWI for Reach 1 (0.64) is much less than 2.

From the above steps, the lateral susceptibility rating is low for Reach 1 (colored 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 Alvarado Specific Plan project being designed by Fuscoe Engineering, Inc. The project runoff will be collected, treated, and then conveyed by storm drain pipes to the adjacent natural Alvarado Creek channel. A downstream channel assessment for the POCs in the natural channel was performed based on office analyses and field work. The results indicate a low threshold for vertical and lateral susceptibility for the study reach.

The HMP requires that these results be compared with the critical flow calculator results outlined in the County of San Diego HMP. The critical flow calculator results are included in Appendix B for Reach 1 using the spreadsheet provided by the County. The channel dimensions were estimated from the topographic mapping. Based on these values, the critical flow results returned a low threshold. Therefore, the SCCWRP analyses and critical flow calculator demonstrate that the project can be designed assuming a low susceptibility to erosion, i.e., 0.5Q2.

Figure 1. Looking Downstream towards POC 1 at Upper End of Reach 1

Figure 2. Looking Downstream from Just Below Upper End of Reach 1 (cobble-lined bed)

Figure 3. Looking Upstream from Near Middle of Reach 1

Figure 4. Looking Downstream from Near Middle of Reach 1

Figure 5. Looking Upstream from Lower End of Reach 1 (towards POC 2)

Figure 6. Concrete Channel Lining and Culverts at Lower End of Reach 1

Figure 7. Cobbles on Reach 1 Channel Bed

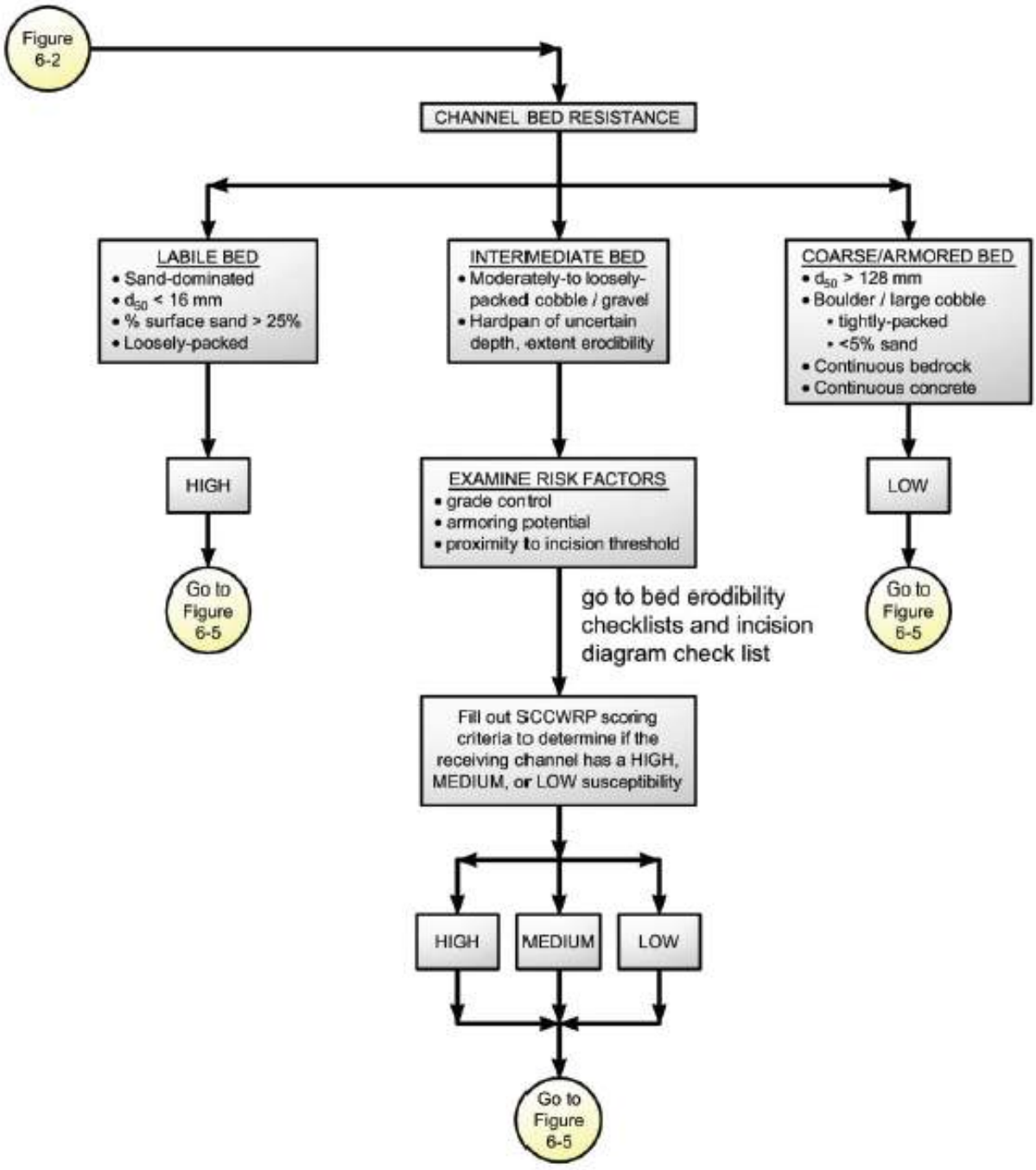


Figure 6-4. SCCWRP Vertical Susceptibility

Figure 8. SCCWRP Vertical Channel Susceptibility Matrix

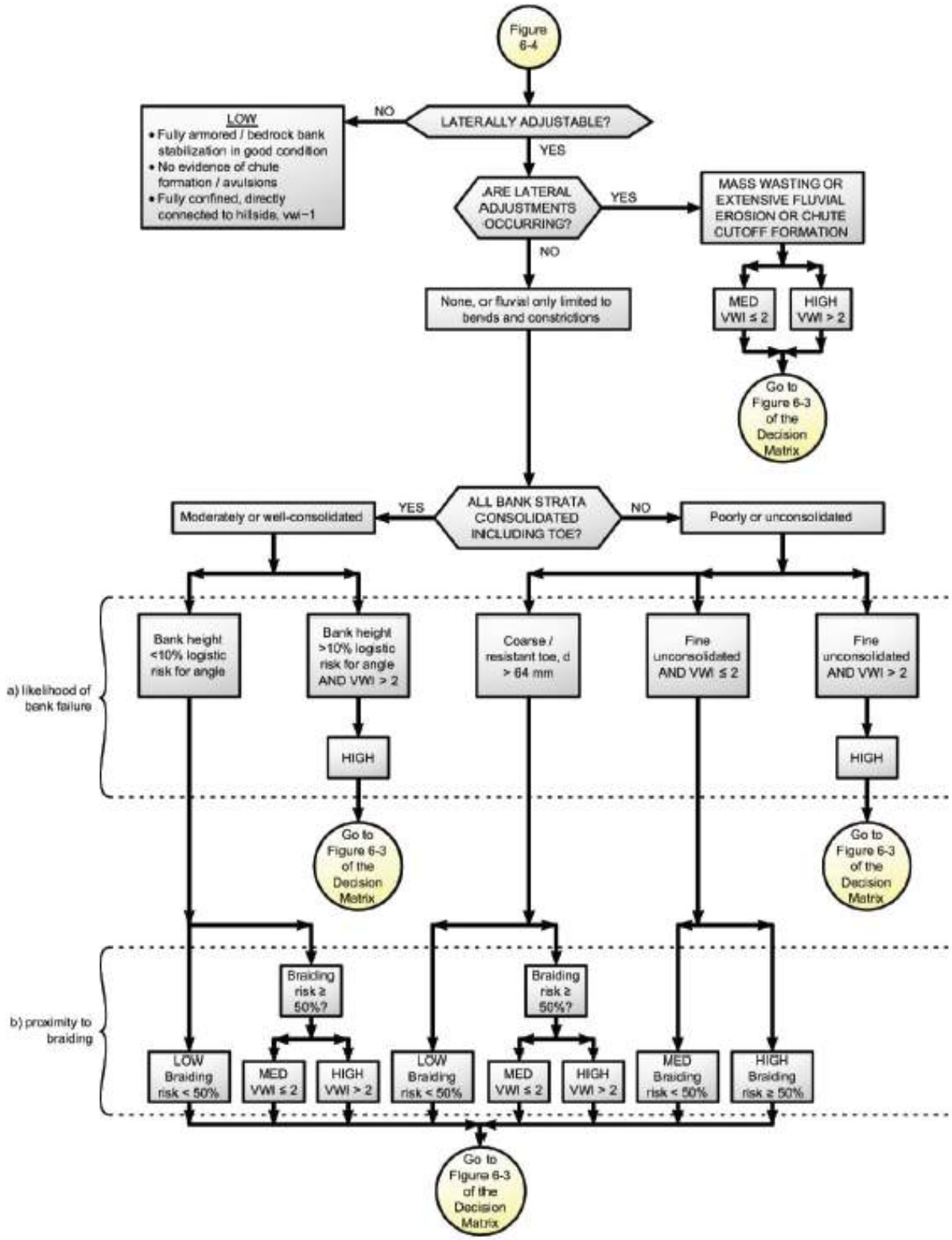


Figure 6-5. Lateral Channel Susceptibility

Figure 9. 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: 32.7717 Longitude: -117.0376

Description (river name, crossing streets, etc.): Alvarado Creek - from downstream of Alvarado Road to 70th Street trolley station.

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.

Note: Lat/Long obtained from Google Earth near middle of study reach.

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	5.533	12.93	0.0079	15.2	579	16.4

Reach	10-Year Screening Index INDEX	Reference Width Wref, m	Valley Width Index VWI, m/m
1	0.032	23.8	0.64

1"=120'

0 120

INTERSTATE 8

ALVARADO ROAD

ALVARADO CREEK

ALVARADO SPECIFIC PLAN
(WESTERLY PORTION)

ALVARADO SPECIFIC PLAN
(EASTERLY PORTION)

BEGIN EXISTING REINFORCED
CONCRETE BOX CULVERTS

PROP. BMP

PROP. STORM DRAIN PIPE
FROM BMP TO ALVARADO
CREEK

POC 2

DOWNSTREAM DOMAIN OF ANALYSIS
LOCATION AT PERMANENT GRADE
CONTROL AT UPPER END OF
CONCRETE-LINED CHANNEL.

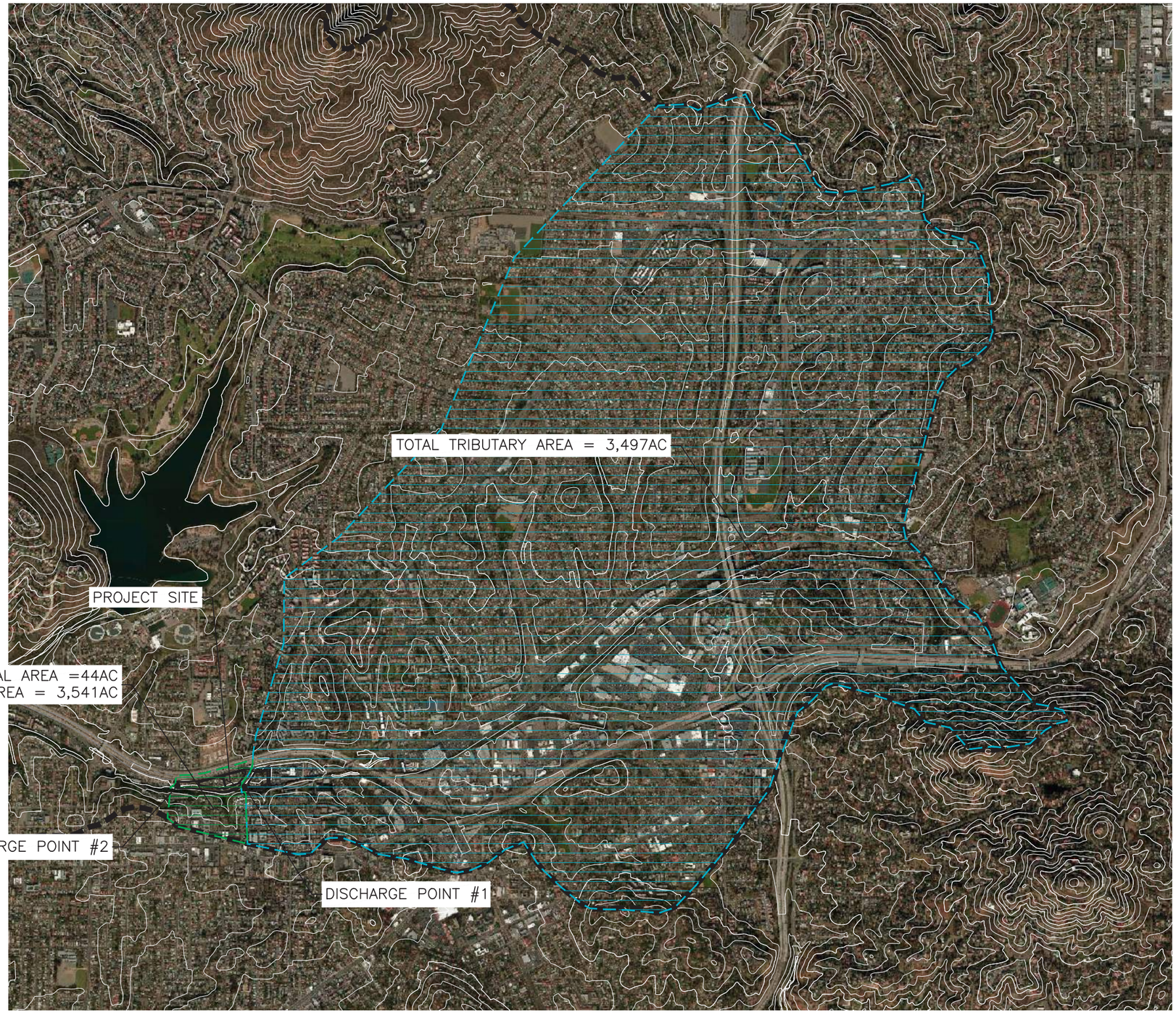
REACH 1
(L=1,272')

POC 2 – UPSTREAM DOMAIN
OF ANALYSIS LOCATION

PROP. STORM DRAIN PIPE
FROM BMP TO ALVARADO
CREEK

PROP. BMP

STUDY AREA EXHIBIT
ALVARADO SPECIFIC PLAN



1000' 0' 500' 1000'

SCALE: 1" = 1000'

SAN DIEGO RV RESORT

TRIBUTARY AREA EXHIBIT

FUSCOE ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 ◆ fax 858.597.0335
www.fuscoe.com

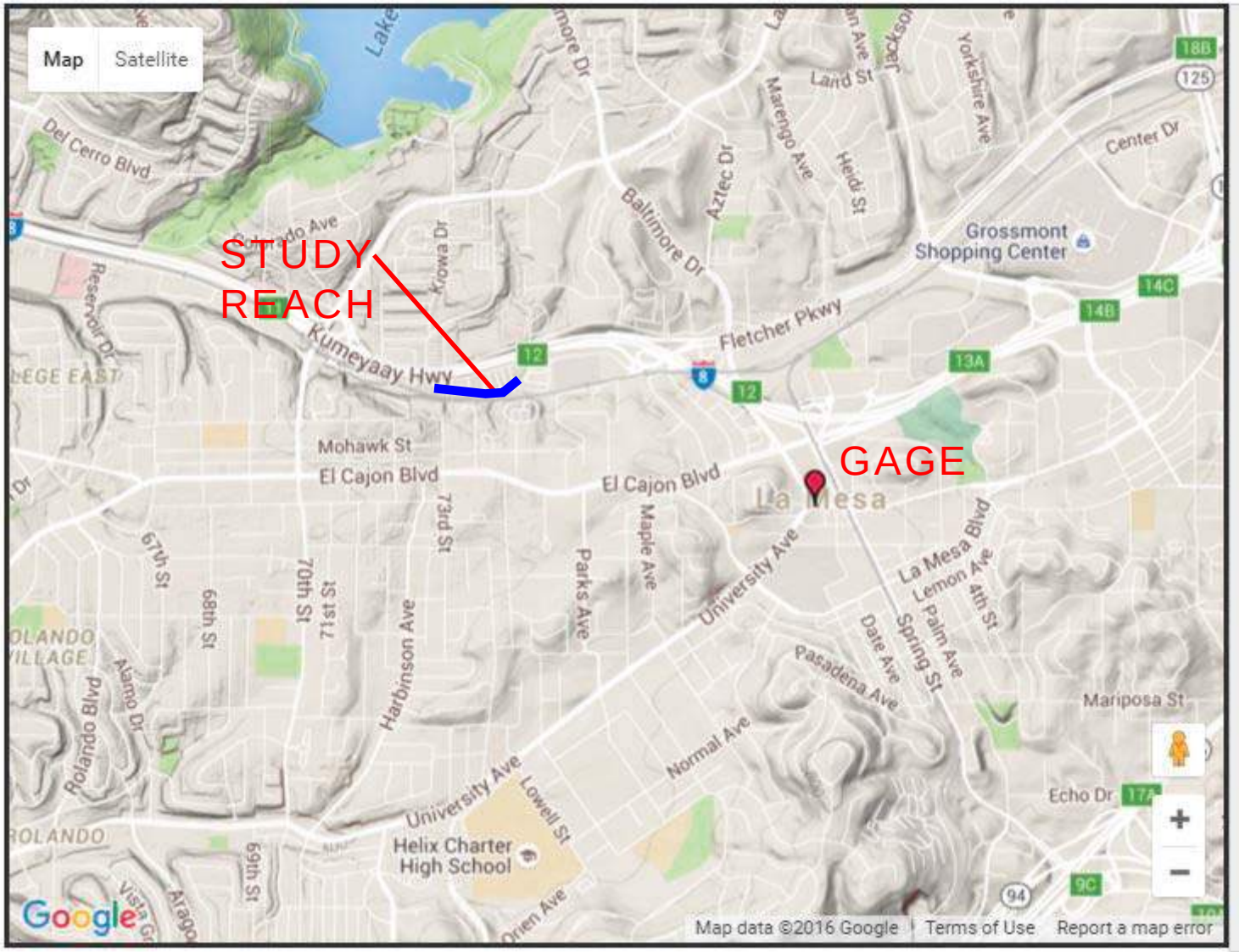
JOB NO. 02413-001

DRAWN BY: FEI

SHEET 1 of 1

F:\Projects\2413\001\Exhibits\2413-001ex-Total Tributary Area.dwg (1/23/2018 5:09 PM) Plotted by: Greg Armstrong

US COOP Station Map



Rain Gage Location

LA MESA, CALIFORNIA (044735)

Period of Record Monthly Climate Summary

Period of Record : 01/01/1899 to 07/22/2006

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	67.1	68.1	68.7	71.7	73.9	77.5	83.1	84.5	83.7	79.0	73.5	68.7	75.0
Average Min. Temperature (F)	43.7	45.1	46.8	50.1	53.8	57.0	61.0	62.2	60.3	55.1	48.3	44.5	52.3
Average Total Precipitation (in.)	2.44	2.42	2.43	1.04	0.29	0.10	0.05	0.09	0.24	0.57	1.37	1.89	12.93
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	0.0	0.0
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.: 96.3% Min. Temp.: 95.7% Precipitation: 97% Snowfall: 97.2% Snow Depth: 97.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

FLOOD INSURANCE STUDY

SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

VOLUME 1 OF 11

Community Name	Community Number
SAN DIEGO COUNTY, UNINCORPORATED AREAS	060284
CARLSBAD, CITY OF	060285
CHULA VISTA, CITY OF	065021
CORONADO, CITY OF	060287
DEL MAR, CITY OF	060288
EL CAJON, CITY OF	060289
ENCINITAS, CITY OF	060726
ESCONDIDO, CITY OF	060290
IMPERIAL BEACH, CITY OF	060291
LA MESA, CITY OF	060292
LEMON GROVE, CITY OF	060723
NATIONAL CITY, CITY OF	060293
OCEANSIDE, CITY OF	060294
POWAY, CITY OF	060702
SAN DIEGO, CITY OF	060295
SAN MARCOS, CITY OF	060296
SANTEE, CITY OF	060703
SOLANA BEACH, CITY OF	060725
VISTA, CITY OF	060297

REVISED
May 16, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
06073CV001C

TABLE 8: SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. miles)	Peak Discharges (cubic feet per second) 10% Annual-Chance	2% Annual-Chance	1% Annual-Chance	0.2% Annual-Chance
Adobe Creek					
2,200 Feet Upstream of Peet Lane	0.67	375	485	560	710
Agua Hedionda Creek					
At Confluence with Buena Creek	6.3	1,600	4,800	7,000	15,500
2,200 Feet Upstream of Rancho Carlsbad Drive	16.5	--	--	7,810	--
Upstream of Calavera Creek	17.3	--	--	8,080	--
At El Camino Real	23.8	--	--	9,850	--
Alvarado Creek					
At Lake Shore Drive	4.6	1,200	2,000	2,300	3,000
At Interstate 8, Near Trailer Park	5.3	1,300	2,200	2,500	3,200
At Interstate 8, Near Murray Boulevard	5.7	1,400	2,400	2,700	3,500
Upstream of Murray Creek	6.3	1,600	2,600	3,000	3,800
Downstream of Murray Creek	10.1	1,700	2,900	3,300	4,200
At Downstream Side of College Avenue	11.4	2,100	3,400	3,900	5,000
Upstream of Tributary Channel	12.1	2,300	3,700	4,300	5,400
Downstream of Tributary Channel	13.4	2,600	4,300	4,800	6,100

-- Data Not Available

TABLE 8: SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. miles)	Peak Discharges (cubic feet per second) 10% Annual-Chance	2% Annual-Chance	1% Annual-Chance	0.2% Annual-Chance
At San Diego River	14.0	2,700	4,500	5,100	6,500
Beaver Hollow Creek					
Approximately 1,200 Feet Downstream of Beaver Hollow Road	5.0	--	--	4,000	--
Beeler Creek					
At U.S. Geological Survey (USGS) Gage on Downstream Side of Pomerado Road	5.5	700	2,400	3,600	9,200
Borrego Palm Canyon					
At Apex of Alluvial Fan	23.3	3,100	7,700	10,650	14,800
Box Canyon					
At Apex of Alluvial Fan	5.9	850	2,600	3,850	4,950
Broadway Creek					
At Mouth	3.8	500	1,200	1,600	4,200
Buena Creek					
At Mouth	6.3	1,880	3,520	4,100	5,420
At Buena Creek Road	1.5	--	--	1,980	--

-- Data Not Available

TABLE 8: SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. miles)	Peak Discharges (cubic feet per second) 10% Annual-Chance	2% Annual-Chance	1% Annual-Chance	0.2% Annual-Chance
Downstream of Confluence with San Clemente Creek	32.1	2,500	7,600	11,000	26,500
Upstream of Confluence with San Clemente Creek	13.7	1,300	4,000	6,200	13,900
Upstream of State Highway 52	13.2	1,300	3,800	6,100	13,400
Downstream of Genesse Avenue	9.7	1,100	3,200	5,000	11,200
Downstream of Interstate Highway 805	6.9	900	2,700	4,100	9,400
Samagutuma Creek					
At Mouth	6.4	900	2,600	4,000	7,000
San Clemente Canyon Creek					
Upstream of Confluence with Rose Canyon Creek	18.4	1,400	4,200	6,900	16,000
Upstream of Genesee Avenue	15.3	1,200	3,600	5,600	12,000
Upstream of Interstate Highway 805	12.5	1,000	3,100	4,900	11,000
San Diego River					
At Confluence with Murphy Canyon Creek	420.0	3,100	17,000	36,000	112,000
Just Downstream of Confluence of San Vicente Creek	290.0	2,500	--	31,000	--

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
□	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 i**n conjunction with Form 3 Checklist 1.**

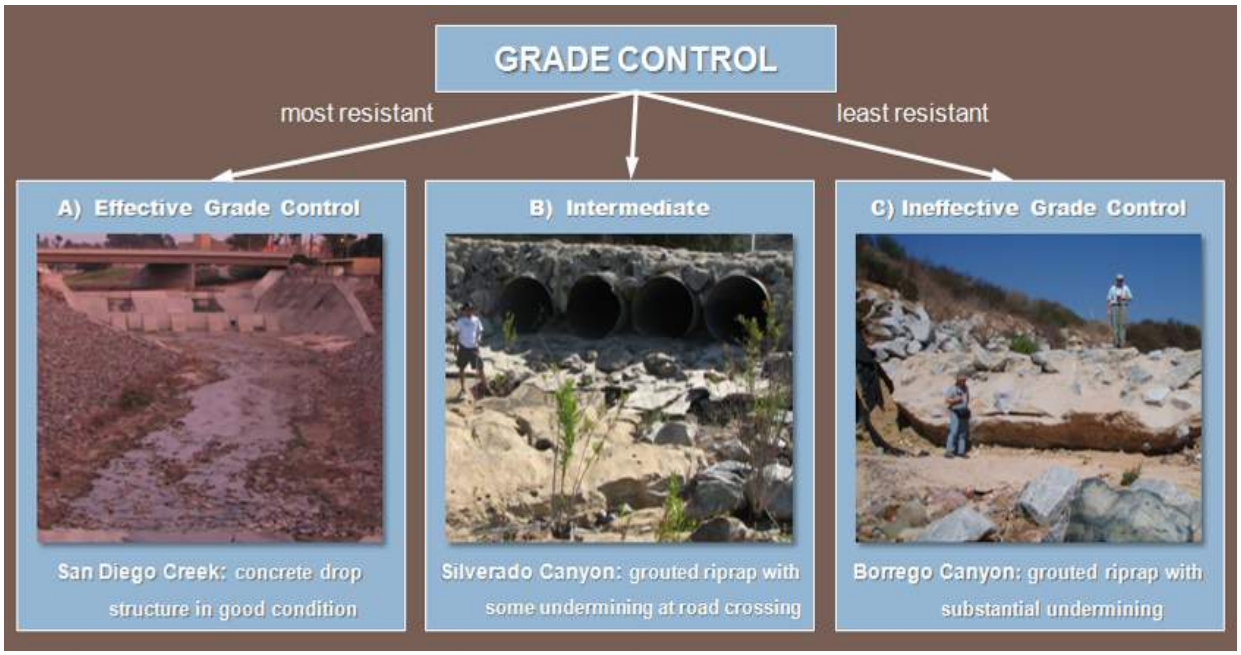
Form 3 Checklist 2: Grade Control

□ 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

X 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

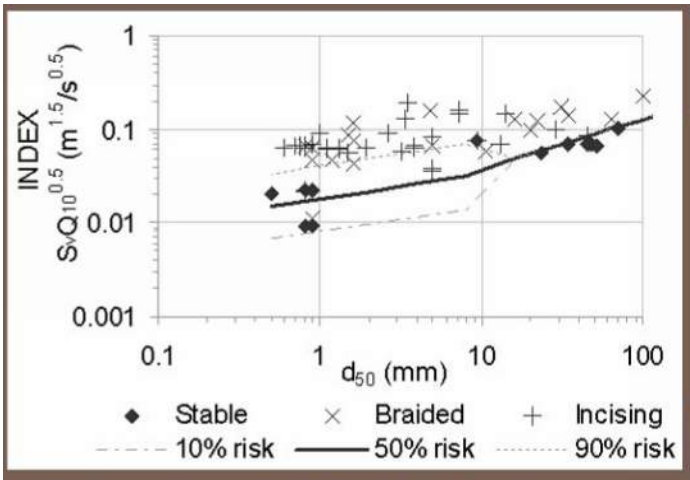
□ C Grade control absent, spaced >100 m or $>4/S_v$ m, or clear evidence of ineffectiveness



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.

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.

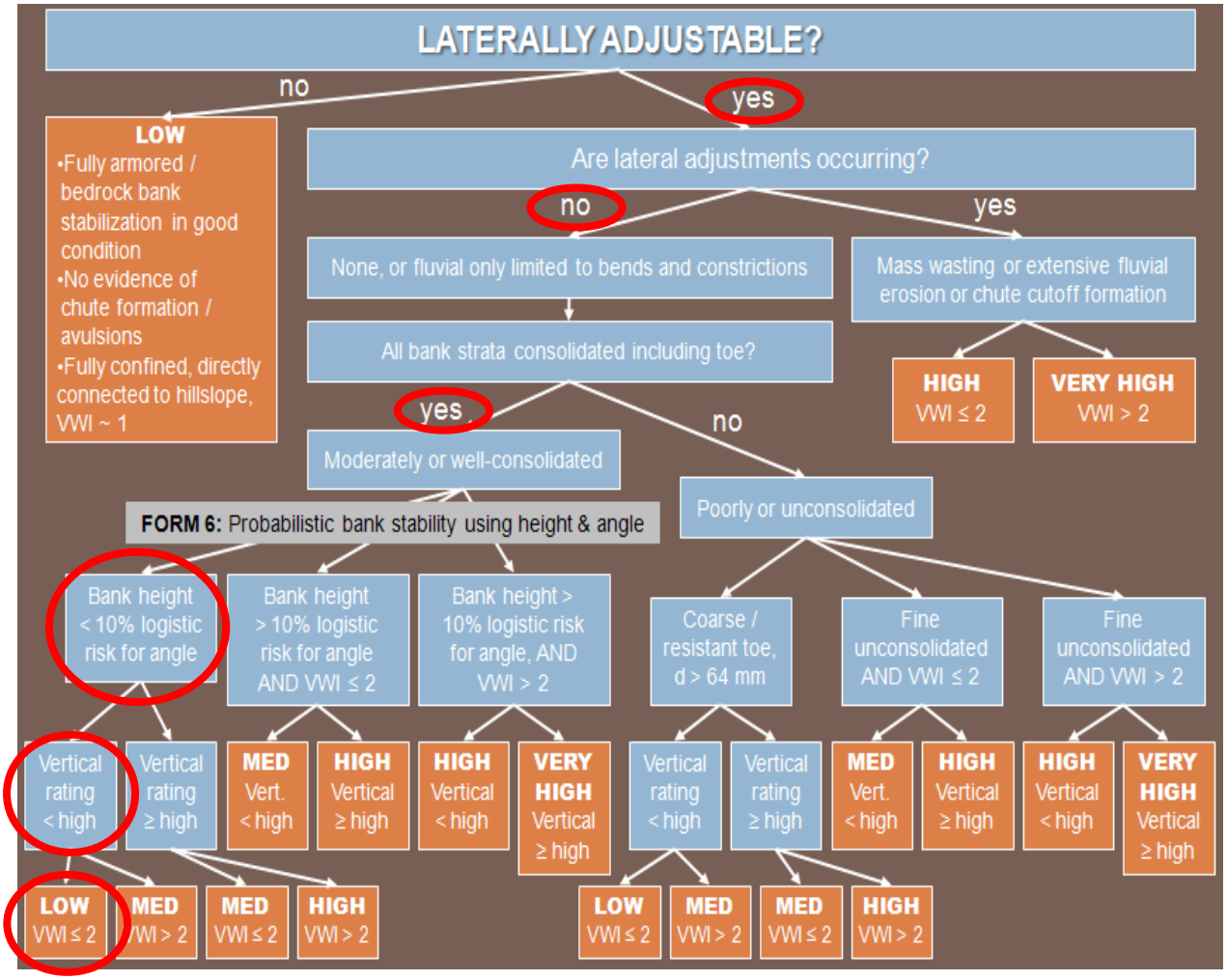
$$Vertical\ Rating = \sqrt{\{(\sqrt{armoring} * grade\ control) * screening\ index\ score\}}$$

3 x 6 x 3 = 3.6

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

FORM 4: LATERAL SUSCEPTIBILTY FIELD SHEET

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



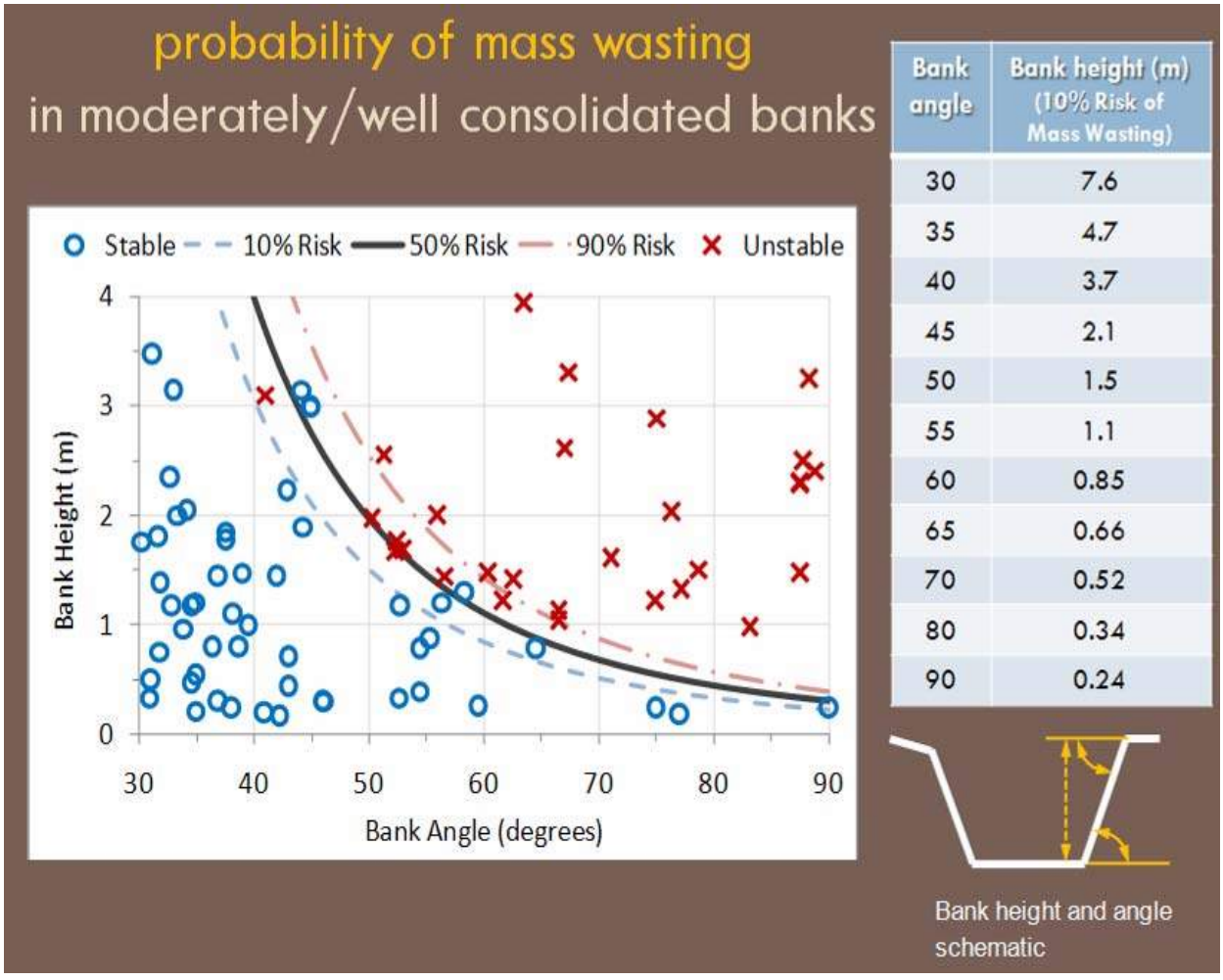
(Sheet 1 of 1)

REACH 1 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	1.5:1 (33.7)	---	---	<10%
Right Bank	1.5:1 (33.7)	---	---	<10%

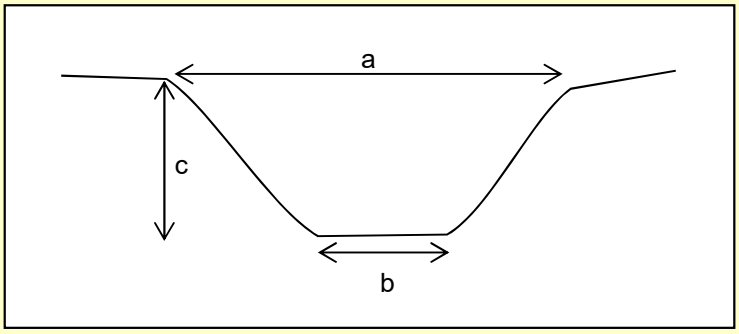


Form 6 Figure 1. Probability Mass Wasting diagram, Bank Angle:Height/% Risk table, and Band Height:Angle schematic.

Critical Flow Calculator

enter all values in green cells
and drop down boxes

Reach 1



Inputs

a) Receiving channel width at top of bank (ft) - see figure on right	70.0
b) Channel width at bed (ft)	50.0
c) Bank height at top of bank (ft)	5.0
Channel gradient (ft/ft)	0.0079
Receiving channel roughness	Same as above with more stones n=0.05
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)	12.93	Receiving water watershed area at PoC (sq mi)	5.533
Project watershed annual precipitation (inches)	12.93	Project watershed area draining to PoC (sq mi)	5.533

Outputs - Flow control range

Receiving water Q2	30.3	**Point of Compliance low flow rate (cfs)**	**15.2**
Project site Q2	30.3	**Low flow class**	**0.5Q2**
		Channel vulnerability	**Low**

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.

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be classified as biofiltration BMPs if they (1) meet the minimum design criteria listed in this appendix, including the pollutant treatment performance standard in Appendix F.1, (2) are designed and maintained in a manner consistent with their performance certifications (See explanation in Appendix F.2), if applicable, and (3) are acceptable at the discretion of the City Engineer. The applicant may be required to provide additional studies and/or required to meet additional design criteria beyond the scope of this document in order to demonstrate that these criteria are met.

Organization

The checklist in this appendix is organized into the seven (7) main objectives associated with biofiltration BMP design. It describes the associated minimum criteria that must be met in order to qualify a biofiltration BMP as meeting the biofiltration standard. The seven main objectives are listed below. Specific design criteria and associated manual references associated with each of these objectives is provided in the checklist in the following section.

1. Biofiltration BMPs shall be allowed only as described in the BMP selection process in this manual (i.e., retention feasibility hierarchy).
2. Biofiltration BMPs must be sized using acceptable sizing methods described in this manual.
3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.
4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control/sequestration processes, and minimize potential for pollutant washout.
5. Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.
6. Biofiltration BMPs must be designed to prevent erosion, scour, and channeling within the BMP.
7. Biofiltration BMP must include operations and maintenance design features and planning considerations to provide for continued effectiveness of pollutant and flow control functions.

Biofiltration Criteria Checklist

The applicant shall provide documentation of compliance with each criterion in this checklist as part of the project submittal. The right column of this checklist identifies the submittal information that is recommended to document compliance with each criterion. Biofiltration BMPs that substantially meet all aspects of Fact Sheets PR-1 or BF-1 should still use this checklist; however additional documentation (beyond what is already required for project submittal) should not be required.

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

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

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

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

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

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

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

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Operation & Maintenance Manual – BIOFILTRATION BMP

1. PURPOSE OF THE BIOFILTRATION BMP MAINTENANCE MANUAL

The purpose of this manual is to provide maintenance instructions for the Biofiltration BMPs located within the San Diego RV Resort. The Biofiltration basin is a pollution control device designed to treat urban runoff before it enters in to the storm drain systems located on the project site. Regular maintenance will help to ensure that the biofiltration functions as it has been designed.

This manual will serve as a reference guide and filed manual to assist the property owner with:

- An overview of the Biofiltration BMP and how it functions
- A description of the location of the Biofiltration BMP
- An understanding of the procedures required to effectively maintain the Biofiltration BMP on a regular basis
- Reproducible copies of the forms, logs and guidance sheets necessary for recording maintenance activities associated with the Biofiltration BMP.

2. GENERAL DESCRIPTION AND FUNCTION OF THE BIOFILTRATION BMP

The Biofiltration BMP is a structure filled with gravel soil and vegetation that drain to an underdrain which connects to the storm drain system. These systems also have an overflow structure to prevent high flows from leaving the planter area.

- 18″ of Biofiltration Soil Media (BSM)
- 4" Mulch Layer
- 12″- 36" height of Rainstore3 for storm water storage , 94%voids

A 6" diameter perforated pvc underdrain will be installed at the bottom of the Rainstore3. This pipe connects to a headwall in Alvarado Creek.

Pollution is mitigated through infiltration of runoff into the porous materials through the biofiltration soil media and stone layers.

3. MAINTENANCE RESPONSIBILITY

The Owner of the site at any point. will be responsible for Site Design, Source Control and Treatment Control BMPs and is ultimately responsible for maintaining the Biofiltration BMP. The goal in maintaining the planter is to ensure that Infiltration is occurring. Regular inspection and replacement of materials within the planter once it becomes ineffective in performing as designed are the major components in the maintenance program. In order to achieve this, the following general procedures shall be followed:

- Qualified maintenance personnel should periodically inspect the planter at least twice a year. The first inspection should happen prior to August 1 and the subsequent inspection should happen during the period between February l and March 31.
- If a problem is identified, it should be rectified as soon as possible to ensure that the trench functions as designed,
- Regular removal of trash and debris should occur as needed. Trash and debris, visible along the surface of the trench shall be promptly removed.

Detailed maintenance procedures are outlined 5.

4. MAINTENANCE INDICATORS AND ACTIVITIES

Functional Maintenance:
Regular functional maintenance is required to ensure that the Biofiltration BMP performs in an effective manner. Functional maintenance consists of both preventative and corrective activities. Logs and guidance sheets are contained herein to use in recording vital information while performing operation Inspection and other infiltration trench maintenance activities. Maintenance records shall be maintained by the property owner for a minimum of five years. The proper use and subsequent storage of these records will assure the City of La Mesa that the Biofiltration BMP is functioning as designed.

Preventative Maintenance:
Preventative maintenance shall be performed on a regular basis. Checklists are included herein to track and record preventative maintenance activities. These activities include trash and debris removal and sediment management,

Trash and debris removal shall be performed to ensure that runoff has adequate surface area to infiltrate through the various layers that comprise the cross section of the trench.

Sediment management will occur when testing Indicates that the Infiltration rate has diminished below the stated acceptable rate.

Corrective Maintenance:
Corrective maintenance will be required on an emergency or non-routine basis to correct problems and restore the intended operation and safe function of the Biofiltration BMP.

Biofiltration BMP Maintenance

- Inspect a minimum of once per year, before the rainy season, and after large storm events or more frequently as needed.
- Clean the planter when the loss of infiltrative capacity is observed. When the standing water is present for a period of time in excess of 72 hours, removal of sediment may be necessary.
- Control mosquitoes as necessary.
- Remove litter and debris from surface as required.

Maintenance Indicators:
Maintenance Indicators are signs or triggers that indicate that maintenance personnel need to check the Biofiltration BMP for maintenance needs. The most common triggers include warnings or accounts of standing water and sediment accumulation. Inspection and Maintenance Checklist in Section 5 below shows conditions and criteria that trigger the need for some specific routine infiltration trench maintenance activities. Emergencies may occasionally arise that would require a more urgent, critical response.

Sediment Management:
The types of storm water pollutants that accumulate in sediment varies, but may include contaminants such as heavy metals, petroleum hydrocarbons, and other organic compounds such as pesticides or solvents. When the sediment has clogged the Biofiltration BMP, remove and properly dispose of Sediment. Regrade if necessary.

Sediment Disposal:
Several methods for disposal are available depending on the concentration of toxins in the waste. Methods can range from recycling the material, to depositing the sediment into appropriate landfills.

At the time of disposal, if the wastes are deemed to be unfit for disposal in a municipal landfill, a full and comprehensive testing program should be run by a qualified person to test for all the constituents outlined under California code of Regulations (CCR) Title 22. Title 22 list concentrations of certain chemicals and their soluble threshold limit concentrations (STLC's) and their total threshold limit concentrations (TTLC's). Chemicals that exceed the allowable concentrations are considered hazardous wastes and must be removed from the sediment.

5. INSPECTION AND MAINTENANCE CHECKLIST

See following page.

Biofiltration BMP Inspection and Maintenance Checklist

Date of Inspection: _____ BMP Name/Location:_____ Inspected by:_____

Type of Inspection: ☐ Monthly ☐ Pre-Wet Season ☐ After Heavy Runoff (1″ or greater) ☒ Annual Prior to Start of Wet Season
☐ Other _____

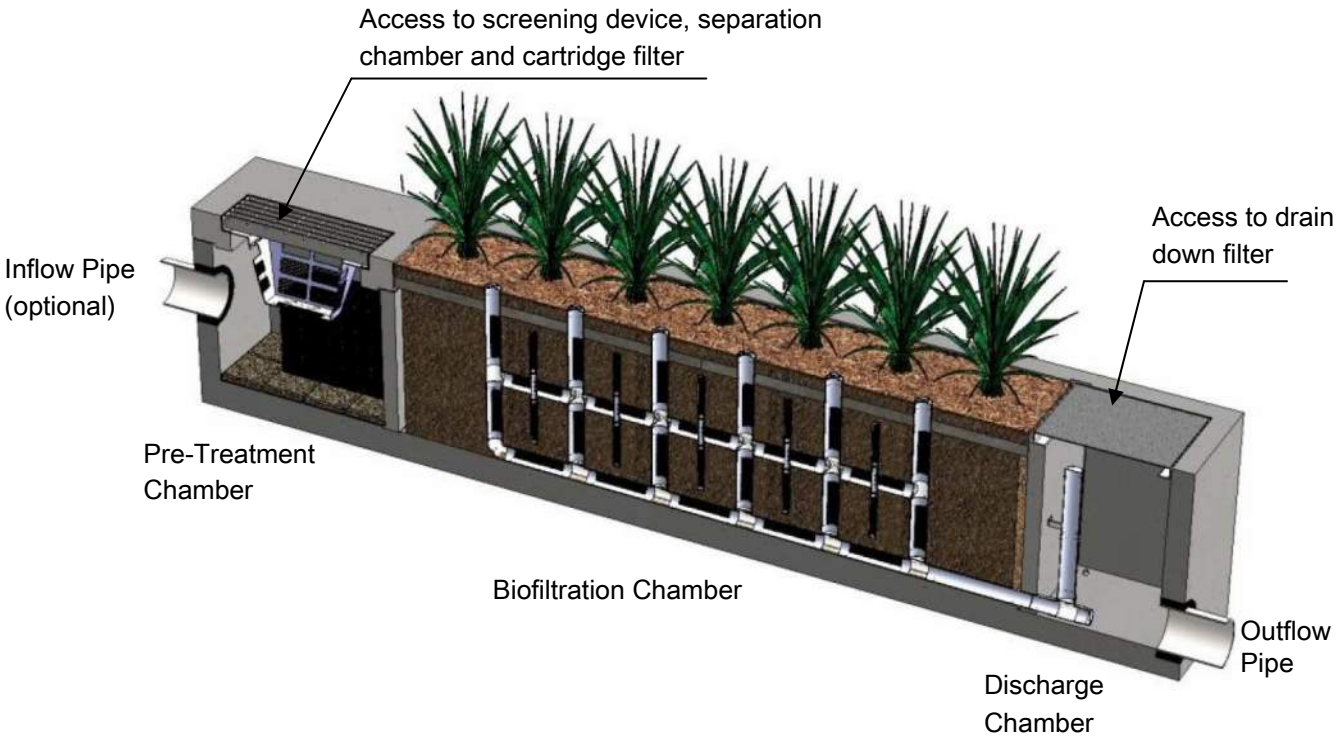
Defect	Conditions When Maintenance is Required	Field Measurement	Measurement Frequency	Maintenance Activity	Maintenance Needed (yes/no)	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Vegetation Management for Aesthetics (optional)	Visual observation and random measurements throughout the side slope area	Visual observation and random measurements throughout the side slope area	Annually, prior to start of wet season	Cut vegetation to an average height of 6-inches and remove trimmings. Remove any trees, or woody vegetation.		
Standing Water	Visual observation	Visual observation	Annually, 96 hours after a target storm (0.60 in) event	Drain facility. Corrective action prior to wet season. Consult engineers if immediate solution is not evident.		
Trash and Debris	Visual observation	Visual observation	Annually, prior to start of wet season	Remove and dispose of trash and debris		
Sediment Management	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually, prior to start of wet season	Remove and properly dispose of sediment. Regrade if necessary. (expected every 2 years)		
Underdrains	Visual Observation	Visual Observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.		
General Maintenance Inspection	Visual observation	Visual observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.		

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.

Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes:

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

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E.18 BF-1 Biofiltration

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

MS4 Permit Category
Biofiltration

Manual Category
Biofiltration

Applicable Performance Standard
Pollutant Control
Flow Control

Primary Benefits
Treatment
Volume Reduction (Incidental)
Peak Flow Attenuation (Optional)

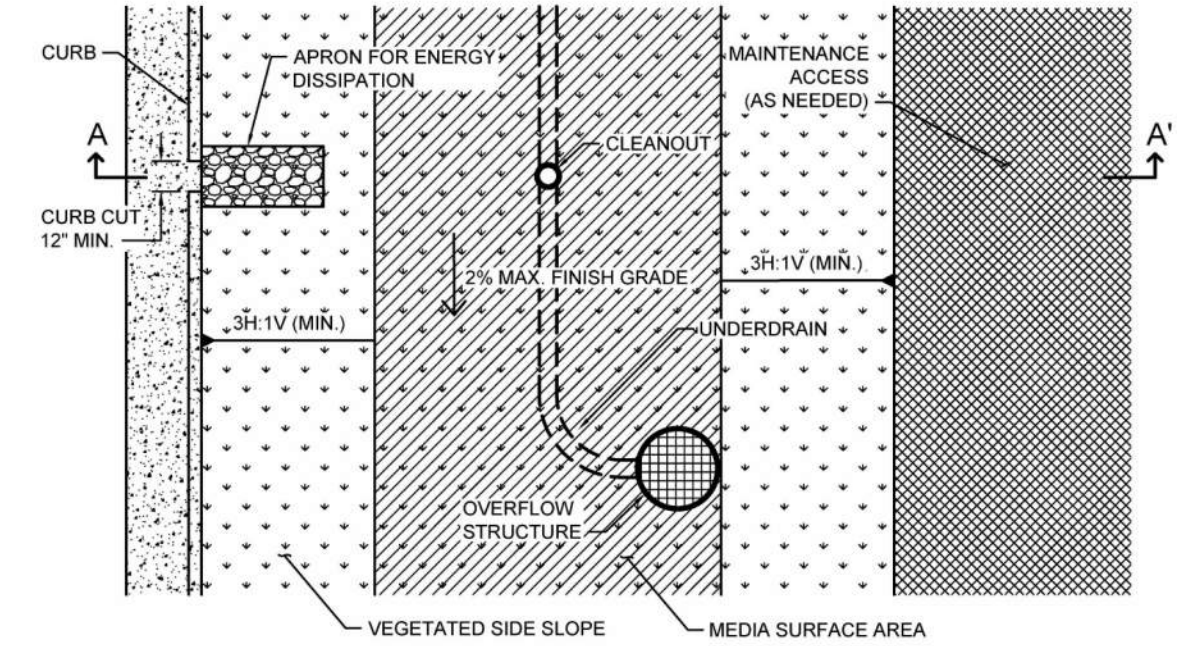
Description

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

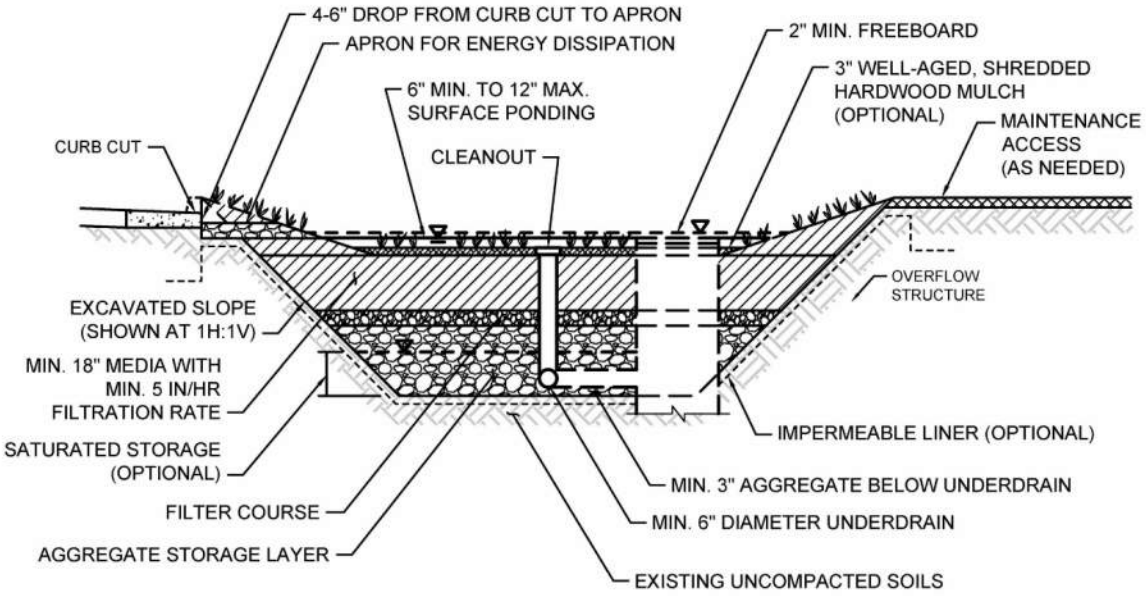
Typical bioretention with underdrain components include:

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

- Impermeable liner or uncompacted native soils at the bottom of the facility
- Overflow structure



PLAN
NOT TO SCALE



SECTION A-A'
NOT TO SCALE

Typical plan and Section view of a Biofiltration BMP

Design Adaptations for Project Goals

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

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

Design Criteria and Considerations

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

	Siting and Design	*Intent/Rationale*
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	An impermeable liner or other hydraulic restriction layer is included if site constraints indicate that infiltration or lateral flows should not be allowed.	Lining prevents storm water from impacting groundwater and/or sensitive environmental or geotechnical features. Incidental infiltration, when allowable, can aid in pollutant removal and groundwater recharge.

Siting and Design		*Intent/Rationale*
☐	Contributing tributary area must be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of County staff if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimize short circuiting of flows in the BMP and 2) incorporate additional design features requested by County staff for proper performance of the regional BMP.
☐	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.
Surface Ponding		
☐	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hour for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of County staff if certified by a landscape architect or agronomist.
☐	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of County staff if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence and/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
☐	A minimum of 2 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.

Surface Ponding		
☐	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Vegetation		
☐	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.20.	Plants suited to the climate and ponding depth are more likely to survive.
☐	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Mandatory)		
☐	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		
☐	Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. An initial filtration rate of 8 to 12 in/hr is recommended to allow for clogging over time; the initial filtration rate should not exceed 12 inches per hour.	A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.

Media Layer		
☐	Media is a minimum 18 inches deep, meeting either of these two media specifications: City of San Diego Storm Water Standards Appendix F (February 2016, unless superseded by more recent edition) **or** County of San Diego Low Impact Development Handbook: Appendix G -Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the 2016 City Storm Water Standards or County LID Manual, the media meets the pollutant treatment performance criteria in Section F.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications must be followed. For non-standard or proprietary designs, compliance with F.1 ensures that adequate treatment performance will be provided.
☐	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria.
☐	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		
☐	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade. Filter fabric is more likely to clog.

Filter Course Layer		
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility and impede infiltration.
☐	Filter course calculations assessing suitability for particle migration prevention have been completed.	Gradation relationship between layers can evaluate factors (e.g., bridging, permeability, and uniformity) to determine if particle sizing is appropriate or if an intermediate layer is needed.
Aggregate Storage Layer		
☐	Class 2 Permeable per Caltrans specification 68-1.025 is recommended for the storage layer. Washed, open-graded crushed rock may be used, however a 4-6 inch washed pea gravel filter course layer at the top of the crushed rock is required.	Washing aggregate will help eliminate fines that could clog the aggregate storage layer void spaces or subgrade.
☐	The depth of aggregate provided (12-inch typical) and storage layer configuration is adequate for providing conveyance for underdrain flows to the outlet structure.	Proper storage layer configuration and underdrain placement will minimize facility drawdown time.
Inflow, Underdrain, and Outflow Structures		
☐	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
☐	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☐	Minimum underdrain diameter is 6 inches.	Smaller diameter underdrains are prone to clogging.

Inflow, Underdrain, and Outflow Structures		
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
☐	An underdrain cleanout with a minimum 6-inch diameter and lockable cap is placed every 250 to 300 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance.
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

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

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

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

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

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Iteratively determine the facility footprint area, surface ponding and/or aggregate storage layer depth required to provide detention storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control levels. Multi-level orifices can be

used within an outlet structure to control the full range of flows.

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

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E.12 HU-1 Cistern

MS4 Permit Category

Retention

Manual Category

Harvest and Use

Applicable Performance Standards

Pollutant Control

Flow Control

Primary Benefits

Volume Reduction

Peak Flow Attenuation

Photo Credit: Water Environment Research Foundation: WERF.org

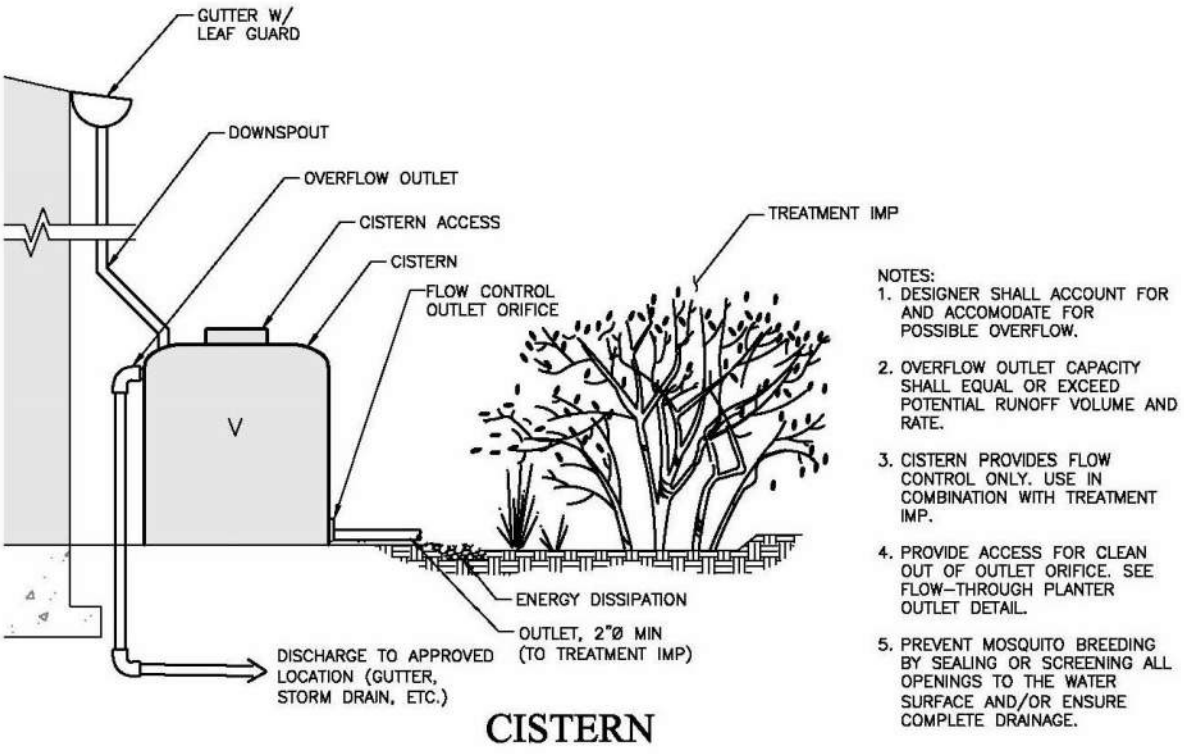
Description

Cisterns are containers that can capture rooftop runoff and store it for future use. With controlled timing and volume release, the captured rainwater can be used for irrigation or alternative grey water between storm events, thereby reducing runoff volumes and associated pollutants to downstream water bodies. Cisterns are larger systems (generally>100 gallons) that can be self-contained aboveground or below ground systems. Treatment can be achieved when cisterns are used as part of a treatment train along with other BMPs that use captured flows in applications that do not result in discharges into the storm drain system. Rooftops are the ideal tributary areas for cisterns.

Typical cistern components include:

- Storage container, barrel or tank for holding captured flows
- Inlet and associated valves and piping
- Outlet and associated valves and piping
- Overflow outlet
- Optional pump

- Optional first flush diverters
- Optional roof, supports, foundation, level indicator, and other accessories



Source: City of San Diego Storm Water Standards

Design Adaptations for Project Goals

Site design BMP to reduce effective impervious area and DCV. Cisterns can be used as a site design feature to reduce the effective impervious area of the site by removing roof runoff from the site discharge. This can reduce the DCV and flow control requirements for the site.

Harvest and use for storm water pollutant control. Typical uses for captured flows include irrigation, toilet flushing, cooling system makeup, and vehicle and equipment washing.

Integrated storm water flow control and pollutant control configuration. Cisterns provide flow control in the form of volume reduction and/or peak flow attenuation and storm water treatment through elimination of discharges of pollutants. Additional flow control can be achieved by sizing the cistern to include additional detention storage and/or real-time automated flow release controls.

Design Criteria and Considerations

Cisterns must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of County staff if it is determined to be appropriate:

Siting and Design		*Intent/Rationale*
☐	Cisterns are sized to detain the full DCV of contributing area and empty within 36 hours.	Draining the cistern makes the storage volume available to capture the next storm. The applicant has an option to use a different drawdown time up to 120 hours if the volume of the facility is adjusted using the percent capture method in Appendix B.4.1.
☐	Cisterns are fitted with a flow control device such as an orifice or a valve to limit outflow in accordance with drawdown time requirements.	Flow control provides flow attenuation benefits and limits cistern discharge to downstream facilities during storm events.
☐	Cisterns are designed to drain completely, leaving no standing water, and all entry points are fitted with traps or screens, or sealed.	Complete drainage and restricted entry prevents mosquito habitat.
☐	Leaf guards and/or screens are provided to prevent debris from accumulating in the cistern.	Leaves and organic debris can clog the outlet of the cistern.
☐	Access is provided for maintenance and the cistern outlets are accessible and designed to allow easy cleaning.	Properly functioning outlets are needed to maintain proper flow control in accordance with drawdown time requirements.
☐	Cisterns must be designed and sited such that overflow will be conveyed safely overland to the storm drain system or discharge point.	Safe overflow conveyance prevents flooding and damage of property.

Conceptual Design and Sizing Approach for Site Design and Storm Water Pollutant Control

1. Calculate the DCV for site design per Appendix B.
2. Determine the locations on the site where cisterns can be located to capture and detain the DCV from roof areas without subsequent discharge to the storm drain system. Cisterns are best located in close proximity to building and other roofed structures to minimize piping. Cisterns can also be used as part of a treatment train upstream by increasing pollutant control through delayed runoff to infiltration BMPs such as bioretention without underdrain facilities.

3. Use the sizing worksheet in Appendix B.3 to determine if full or partial capture of the DCV is achievable.
4. The remaining DCV to be treated should be calculated for use in sizing downstream BMP(s).

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

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

1. Verify that cistern siting and design criteria have been met. Design for flow control can be achieved using various design configurations, shapes, and quantities of cisterns.
2. Iteratively determine the cistern storage volume required to provide detention storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control valve operation.
3. Verify that the cistern is drawdown within 36 hours. The drawdown time can be estimated by dividing the storage volume by the rate of use of harvested water.
4. If the cistern cannot fully provide the flow rate and duration control required by this manual, a downstream structure with additional storage volume or infiltration capacity such as a biofiltration can be used to provide remaining flow control.

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ATTACHMENT 4

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

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County of San Diego PDP-IVF:

Installation Verification Form for Priority Development Projects (PDPs)

This form must be accepted by the County prior to the release of construction permits or granting of occupancy for applicable portions of a Priority Development Project (PDP). Applicants are responsible for providing all requested information. Do not leave any fields blank; indicate *N/A* for any requested item that is not applicable.

PART 1 General Project and Applicant Information

Table 1: Project and Applicant Information

A. Project Summary Information	**ID No. IVF-20__-____ To be assigned by DPW-WPP**
Project Name	Click here to enter text.
Record ID (e.g., grading/improvement plan number, building permit)	Click here to enter text.
Project Address	Click here to enter text.
Assessor's Parcel Number(s) APN(s))	Click here to enter text.
Project Watershed (complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Click here to enter text.
B. Owner Information	
Name	Click here to enter text.
Address	Click here to enter text.
Email Address	Click here to enter text.
Phone Number	Click here to enter text.

Document previously verified BMPs for the PDP in **Table 2**. Include the Verification Form ID No. from **Page 1** if one was issued.

****** DO NOT INCLUDE THIS PAGE UNLESS THIS IS A PARTIAL RECORD PLAN VERIFICATION ******

Table 2: Information on Verifications for Partial Record Plans Only

A: Previous Submittals

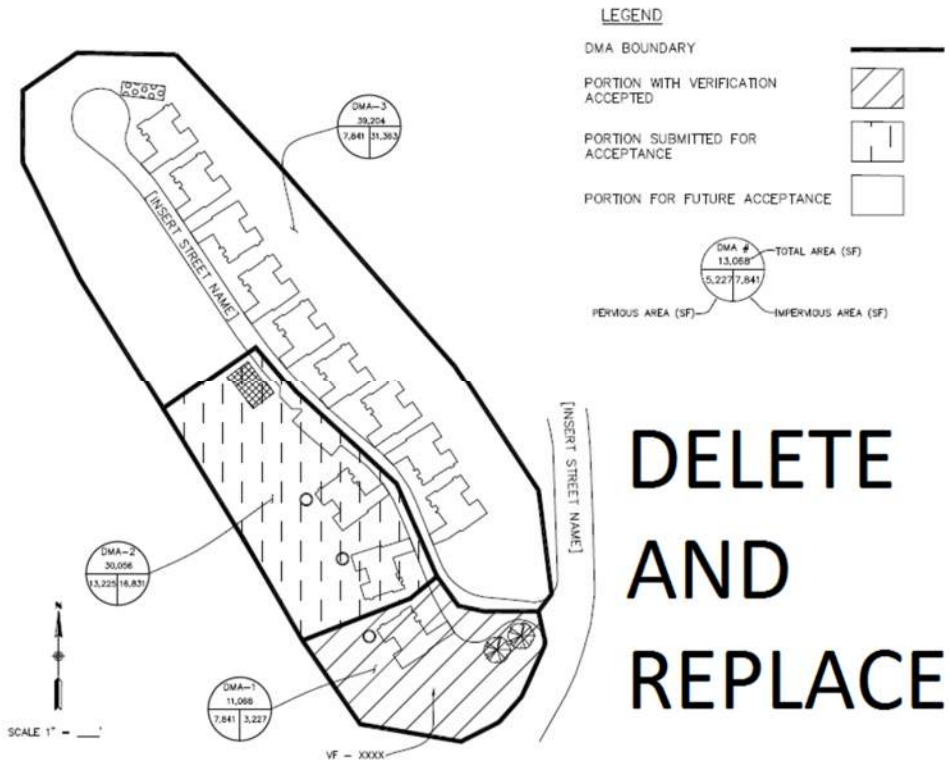
Previous Submittals	Submittal Date	Installation Verification Form ID No. if applicable (e.g., 2016-001)
1	Enter date.	Click here to enter text.
2	Enter date.	Click here to enter text.
3	Enter date.	Click here to enter text.
4	Enter date.	Click here to enter text.
5	Enter date.	Click here to enter text.

Add rows as needed

B: DMA and BMP Map

Please attach a map showing (1) all DMAs for the project site, (2) the DMAs and/or lots accepted under previous Verification Forms, and (3) the locations of Structural BMPs and Significant Site Design BMPs previously accepted OR listed in **Table 3** of this Verification Form.

SAMPLE DMA MAP



PART 2 DMA and BMP Inventory Information

Use this table to document Structural BMPs (S-BMPs) and Significant Site Design BMPs (SSD-BMPs) for the PDP. All DMAs are required to have at least one Structural BMP or Significant Site Design BMP.

- In **Part A**, list all Structural BMPs (including both Pollutant Control and/or Hydromodification as applicable) by DMA.
- Complete **Part B** for all DMAs that contain only Significant Site Design BMPs. SSD-BMPs are Site Design BMPs credited in **Worksheet B-1.1** of the BMP Design Manual for Design Capture Volume (DCV) reductions. Only Tree Wells and Dispersion Areas should be included in this inventory.
- For any DMA that contains both S-BMPs and SD-BMPs, document only the S-BMPs; you do not need to include the SD-BMPs.
- The information provided for each BMP in the table must match that provided in the Stormwater Quality Management Plan (SWQMP), construction plans, maintenance agreements, and other relevant project documentation.

Table 3: Required Information for Structural BMPs and Significant Site Design BMPs

DMA #	BMP Information			Maintenance Category	Maintenance Agreement or Maintenance Notification Recorded Doc. #	Construction Plan Sheet #	Landscape Plan # & Sheet # (For Vegetated BMPs Only)	FOR DPW-WPP USE ONLY *Reviewer concurs that the BMP(s) may be accepted into inventory (date and initial)*
	Quantity	Description/Type of Structural BMP	BMP ID #(s)					
Part A Structural BMPs								
Add rows as needed								
Part B Significant Site Design BMPs								
		Choose an item.						
		Choose an item.						
		Choose an item.						
Add rows as needed								

PART 3 Required Attachments for All BMPs Listed in Table 3

For ALL projects, submit the following to the County inspector (check all that are attached):

☐ Photographs: A photograph of each fully constructed S-BMP or SSD-BMP (or group of BMPs).

☐ Maintenance Agreements: Copies of all approved and recorded Storm Water Maintenance Agreements (SWMAs) or Maintenance Notifications (MNs) for all S-BMPs.

Note: All BMPs proposed for County ownership will remain the responsibility of the owner listed on **Page 1** until a signed Letter of Acceptance of Completion is received by the DPW Watershed Protection Program.

For Grading and Improvement projects only, ALSO submit:

☐ Landscape Plans: An 11" X 17" copy of the most current applicable Landscape Plan sheets where the BMPs are required to be vegetated, including:

- ☐ The Certification of Completion (Form 407), AND
- ☐ The Certificate of Approval from PDS Landscape Architect

Note: For each Landscape Plan, the sheets submitted must show the location of each verified as-built BMP.

☐ Construction Plans: An 11" X 17" copy of the most current applicable approved Construction Plan sheets:

- ☐ Grading Plans, AND/OR
- ☐ Improvement Plans, AND/OR
- ☐ Precise Grading Plan(s) (only for residential subdivisions with tract homes), AND/OR
- ☐ Other (Please specify) Click here to enter text.

Note: For each Construction Plan, the sheets submitted must incorporate all of the following:

- ☐ A BMP Table, AND
- ☐ A plan/cross-section of each verified as-built BMP, AND
- ☐ The location of each verified as-built BMP

Required only for Verifications for Partial Record Plans

☐ If this is a partial record plan verification, please include the following:

- ☐ A list of previously submitted Verification Forms (**Table 2, part A**)
- ☐ A map of DMAs and BMPs (**Table 2, part B**)

PART 4 Engineer of Work Certification

By signing below, I certify that the BMP(s) listed in Table 3 of this Verification Form have been constructed and all 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 and provide your seal below.

[SEAL]

Professional Engineer's Printed Name:

____Click here to enter text._____

Email: _Click here to enter text._____

Phone Number: _Click here to enter text._____

Professional Engineer's Signed Name:

_____

Date: _Click here to enter text._____

COUNTY - OFFICIAL USE ONLY:

For County Inspectors

County Department: _____

Date verification received from EOW: _____

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

Inspector Name: _____

Inspector's Signature: _____ Date: _____

For Building Division Only

Inspection Supervisor Name: _____

Inspector Supervisor's Signature: _____ Date: _____

PDCI & Building, along with the rest of this package, please provide to DPW WPP:

☐ A copy of the final accepted SWQMP and any accepted addendum

For Watershed Protection Program Only

Date Received: _____

WPP Submittal Reviewer: _____

WPP Reviewer concurs that the BMPs accepted in **Part 2** above may be entered into inventory.

WPP Reviewer's Signature: _____ Date: _____

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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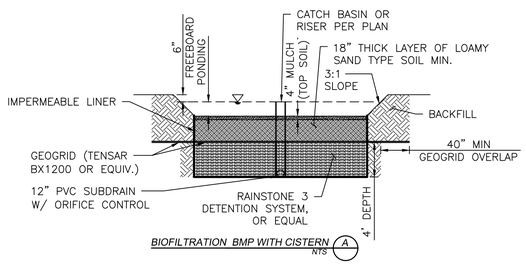
LEGEND

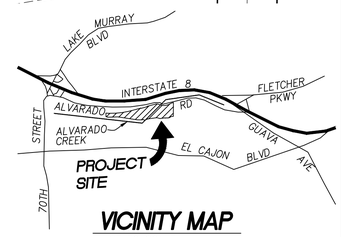
PROPERTY BOUNDARY
RIGHT-OF-WAY
PROPOSED RETAINING WALL
PROPOSED SEWER RELOCATION
EXISTING SEWER TO REMAIN
EXISTING SEWER TO BE ABANDONED/REMOVED
PROPOSED 20' SEWER EASEMENT
PROPOSED STORM DRAIN
PROPOSED WATER

INTERSTATE 8
ALVARADO ROAD
ALVARADO CREEK
MTS TROLLEY LINE

PROPOSED MODULAR WETLANDS MWS-L-4-8
STORM DRAIN & HEADWALL FROM TREATED ROAD RUNOFF, 401.0IE
WEST BIOFILTRATION + CISTERN
406.00 TOP OF BASIN (8,499 SF)
405.83 PONDING ELEVATION (10" PONDING)
405.00 BOTTOM OF BASIN (6,800 SF)
403.17 BOTTOM OF SOIL/TOP OF CISTERN (18" SOIL)
402.42 ORIFICE INVERT (3.49" MAX ORIFICE)
402.17 BOTTOM OF CISTERN (12" DETENTION)
CONNECT TO EX SEWER (395.75IE)
396.31IE
395.91IE
PROPOSED PRIVATE STORM DRAIN
EXISTING FIRE HYDRANT TO BE RELOCATED
1.31%
397.15IE
398.19IE
396.60IE
0.7%
PROPOSED STORM DRAIN CONNECTION TO EX. STORM DRAIN
STORMDRAIN & HEADWALL @ 401.0FL
EX SEWER TO BE ABANDONED
CONNECT TO EX SEWER (397.16IE)
PROPOSED MODULAR WETLANDS MWS-L-4-19
PROPOSED FIRE SERVICE
PROPOSED WATER SERVICE
PROPOSED PRIVATE STORM DRAIN
20' SS EASEMENT
401.28IE
PROPOSED SEWER RELOCATION
EX SEWER TO REMAIN @ 9.82%
ABANDON EX SEWER
EX SEWER TO REMAIN @ 9.82%
405.25IE
RELOCATE EX GAS LINE
STORM DRAIN & HEADWALL @ 412.0FL
REMOVE EX SEWER
404.37IE
PROPOSED PRIVATE STORM DRAIN
PROPOSED FIRE HYDRANT
EXISTING 24" STORM DRAIN TO REMAIN
CONNECT TO EX SEWER
CUT EX SEWER & INSTALL MANHOLE (411.31E)
412.17IE
PROPOSED FIRE SERVICE
PROPOSED WATER SERVICE
(422.80RIM)
(411.60IE)
PROPOSED FIRE SERVICE
PROPOSED WATER SERVICE
PROPOSED PRIVATE STORM DRAIN
PROPOSED MODULAR WETLANDS MWS-L-4-8
411.45IE
STORM DRAIN & HEADWALL FROM TREATED ROAD RUNOFF
PROPOSED PRIVATE STORM DRAIN
EX SEWER TO BE REMOVED
1.1%
20' SS EASEMENT
PROPOSED SS RELOCATION
PROPOSED SWALE
415.28IE
1.1%
(410.83IE)
REMOVE EX SEWER REPLACE AT NEW GRADE
(416.24IE)
PROPOSED MH
CUT EX SEWER & INSTALL MANHOLE
PROPOSED PRIVATE STORM DRAIN
(423.8IE)
PROPOSED FIRE HYDRANT
PROPOSED BROW DITCH
EAST BIOFILTRATION + CISTERN
422.50 TOP OF BASIN (5,244 SF)
422.00 PONDING ELEVATION (14" PONDING)
420.83 BOTTOM OF BASIN (3,500 SF)
419.00 BOTTOM OF SOIL/TOP OF CISTERN (18" SOIL)
416.25 ORIFICE INVERT (2.83" MAX ORIFICE)
416.00 BOTTOM OF CISTERN (3' DETENTION)



BIOFILTRATION BMP WITH CISTERN (A)
NTS



VICINITY MAP
NOT TO SCALE

60' 0' 30' 60'
SCALE: 1" = 60'

REGISTERED PROFESSIONAL ENGINEER
KENNETH T. KOZLIK
No. RCE 71883
EXP. 12-31-19
Civil
STATE OF CALIFORNIA

PAYDAR PROPERTIES
7855 Herschel Avenue
Suite 201
La Jolla, CA 92037
858.456.9201

NO.	DATE	REVISION

ALVARADO SPECIFIC PLAN

CIVIL SITE PLAN & UTILITIES

FUSCOE ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

JOB NO. 2413-001
DRAWN BY: FEI
SHEET 4 of 4

F:\PROJECTS\2413\001\PLANS\TENTATIVE PARCEL MAP\2413-001-TM- UT.DWG (02-08-18 1:26:00PM) Plotted by: Greg Armstrong

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: Preliminary Drainage Study for Alvarado Specific Plan
Prepared By: Fuscoe Engineering
Date: February 2018

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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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