City of Escondido
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

ESCONDIDO ASSEMBLAGE - HOFTIEZER
TENTATIVE SUBDIVISION MAP

0 Ash Street,
Escondido, CA 92026

ASSESSOR'S PARCEL NUMBER(S):
224-130-10-00

ENGINEER OF WORK:

William J. Suiter, RCE 68964

PREPARED FOR:

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PDP SWQMP PREPARED BY:

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DATE OF SWQMP:
August 2022

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APPROVAL DATE:

ESCONDIDO
City of Choice

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- Attachment 1b: Form I-5, Categorization of Infiltration Feasibility Condition
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Attachment 2: Backup for PDP Hydromodification Control Measures
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- Attachment 2c: Management of Critical Coarse Sediment Yield Areas
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Attachment 3: Structural BMP Maintenance Plan
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Attachment 4: City of Escondido PDP Structural BMP Verification

Attachment 5: Copy of Plan Sheets Showing Permanent Storm Water BMPs

ACRONYMS

ACP	Alternative Compliance Project
APN	Assessor's Parcel Number
BMP	Best Management Practice
DMA	Drainage Management Area
EOW	Engineer of Work
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
PDP	Priority Development Project
PE	Professional Engineer
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWDM	Storm Water Design Manual
SWQMP	Storm Water Quality Management Plan
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan

PDP SWQMP PREPARER'S CERTIFICATION PAGE

Project Name: Escondido Assemblage - Hoftiezer, PTM
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 City of Escondido Storm Water Design Manual, which is a design manual for compliance with the City of Escondido Municipal Code (Chapter 22, Article 2) 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 City of Escondido has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water 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 City 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

William J. Suiter, RCE 68964
Print Name

Pasco Laret Suiter & Associates, Inc.
Company

_____
Date

Engineer's Seal:

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	December 2021	Initial Submittal
2	May 2022	Second Submittal
3	August 2022	Third Submittal
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: **Escondido Assemblage - Hoftiezer, Tentative Subdivision Map**
Record ID:

VICINITY MAP
NOT TO SCALE

Step 1: Project type determination (Standard or Priority Development Project) (Form I-2a)

Project Summary Information	
Project Name	Escondido Assemblage - Hoftiezer, PTM
Project Address	0 Ash Street, Escondido, CA 92026
Assessor's Parcel Number(s)	224-130-10-00
Permit Application Number	
Project Watershed (Hydrologic Unit)	Select One: ☑ Carlsbad 904 San Dieguito 905
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	5.10 Acres (222,104 Square Feet)
Area to be disturbed by the project (Project Area)	6.05 Acres (263,487 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	2.90 Acres (126,407 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	3.15 Acres (137,080 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Confirmation of Priority Development Project Determination
The project is (select one): ☐ New Development ☑ Redevelopment[1]
The total proposed newly created or replaced impervious area is: 126,407 ft^2

[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.

Solar energy farms that are not also one of the categories listed in Step 2b of Table 1-1. City staff must also determine that appropriate BMPs are provided to mitigate for downstream impacts due to significant changes to the existing hydrology

Is the project in any of the following categories, (a) through (f)?			
Yes ☐	No ☑	(a)	New development projects that create 10,000 square feet or more of impervious surfaces (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.
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.*
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 ☑	(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: (iii) 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. (iv) 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 Storm Water 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 Storm Water Design Manual.

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

The area of existing (pre-project) impervious area at the project site is: 30,357 ft^2 (A)

The total proposed newly created or replaced impervious area is 126,407 ft^2 (B)

Percent impervious surface created or replaced (B/A)*100: 416 %

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 Storm Water Design Manual *in its entirety*.	☐ Standard Project	Standard Project requirements apply, including Standard Project SWQMP. **Complete Form I-1.**
	☑ PDP	Standard and PDP requirements apply, including PDP SWQMP. **SWQMP Required.**
	☐ 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 Green Streets Infrastructure;	Standard Project requirements apply, AND any additional requirements specific to the type of project. City concurrence with the exemption is required. *Provide discussion and list any additional requirements below in this form.*
☐ Projects that are only retrofitting or redeveloping existing paved alleys, streets or roads that are designed and constructed in accordance with the City of Escondido Guidance on Green Infrastructure.	**PDP Exempt.**
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:	

Step 2: Construction Storm Water BMPs

Construction storm water BMPs shall be shown on the Grading Plan and (if applicable) included in the Storm Water Pollution Prevention Plan (SWPPP).

Step 3: City of Escondido PDP SWQMP Site Information Checklist (Form I-2a)

Step 3.1: Description of Existing Site Condition

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:

The existing site consists of open space with a few residential structures.

Existing Land Cover Includes (select all that apply and provide each area on site):
☑Vegetative Cover 5.35 Acres (233,130 Square Feet)
☐Non-Vegetated Pervious Areas _____ Acres (_____ Square Feet)
☑Impervious Areas 0.70 Acres (30,357 Square Feet)

Description / Additional Information:

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):
☐NRCS Type A
☐NRCS Type B
☑NRCS Type C
☐NRCS Type D

Approximate Depth to Groundwater (GW) (or N/A for no infiltration BMPs):
☑GW Depth < 5 feet
☑5 feet < GW Depth < 10 feet
☑10 feet < GW Depth < 20 feet
☑GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):
☐Watercourses
☐Seeps
☐Springs
☐Wetlands
☑None
☐Other

Description / Additional Information:

Step 3.2: Description of Existing Site Drainage Patterns

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

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

Describe existing site drainage patterns:
The development site is approximately 5.03 acres and is surrounded by Stanley Avenue, Ash Street, and Lehner Avenue. In the existing condition, adjacent half width of Stanley Avenue and Ash Street drain onto the site. Storm water runoff from offsite streets and the project property flows overland southerly from the high point at the intersection of Stanley Avenue and Ash Street to the southwestern corner of the site and conveyed by a ditch along the property line and through a private 30" RCP storm drain through the adjacent property per GP16-0011. Drainage from a portion of the southern half of Lehner Avenue is collected in a catch basin and outlets to the project site, as shown on P16-0003. Elevations onsite range from approximately 744 feet to 723 feet.

Runoff from the entire site flows southwesterly through said storm drain on the adjacent property to Saddle Place and continues to the existing 84" RCP storm drain pipe within Lehner Avenue. Drainage is tributary of Escondido Creek which flows southerly to Escondido Creek, which continues southwesterly to San Elijo Lagoon and ultimately to the Pacific Ocean. The table below summarizes the 100-year peak discharge rates.

Summary of 100-yr Peak Discharge Rates

Drainage Basin	Existing		Proposed Undetained	
	Area (ac)	Q_{100} (cfs)	Area (ac)	Q_{100} (cfs)
Area A	6.05	7.33	6.05	10.91

For detailed calculations, refer to the drainage report for the project titled "Preliminary Hydrology Report for Escondido Assemblage – Hoftiezer, PTM" dated August 2022, prepared by Pasco Laret Suiter & Associates.

Step 3.3: Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:

The proposed project consists of the construction of single-family residences, access drives, sidewalk, landscape, associated utilities, and a biofiltration basin BMP to meet the requirements for hydromodification management flow control, storm water pollutant control and to mitigate the 100-year 6-hour storm event. The project also includes Stanley Avenue and Lehner Avenue street widening and right-of-way improvements of Ash Street. Single family residences are proposed off the new Street "A" which is connected to Lehner Avenue. Lot 12 is proposing a future duplex unit whose access is provided off Stanley Avenue.

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

Proposed impervious features include residential structures, access drives, and sidewalk.

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

Proposed pervious features include landscape and open space areas and biofiltration basins.

Does the project include grading and changes to site topography?

☑Yes

☐No

Description / Additional Information:

Grading is proposed to accommodate the proposed lots, access drive and storm drain system.

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	233,130	137,080	-58.8%
Pervious (non-vegetated)			
Impervious	30,357	126,407	+416.4%

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:

In the proposed condition, onsite storm water runoff from Area A will be collected in the proposed storm drain and conveyed southerly to a proposed biofiltration basin located at the south end of the site which will discharge to the 84" RCP storm drain in Lehner Avenue. Open space and perimeter slope areas will flow directly offsite to storm drain inlets that are discharged to the 84" Lehner Avenue storm drain as well. Impervious areas for both Area A include proposed street and sidewalk within the development, as well as an assumed 2,755 sf per individual single family home lot, accounting for house and hardscape, based upon similar adjacent development density. To satisfy the requirements of the MS4 Permit, a hydromodification management strategy has been developed for the project. A continuous simulation model, the EPA Storm Water Management Model (SWMM) was selected to size mitigation measures, which is capable of modeling hydromodification management facilities to mitigate the effects of increased runoff from the post-development conditions and use changes that may cause negative impacts (i.e. erosion) to downstream channels. See Attachment 2a for HMP calculations.

The proposed BMP will provide storm water pollutant control and hydromodification management flow control as well as mitigation for the 100-year storm event peak discharge. The table below summarizes the 100-year peak discharge rates.

Summary of 100-yr Peak Discharge Rates

Drainage Basin	Existing		Proposed		
	Area (ac)	Q_{100} (cfs)	Area (ac)	Undetained Q_{100} (cfs)	Detained Q_{100} (cfs)
Area A	6.05	7.33	6.05	10.91	7.24

For detailed calculations, refer to the drainage report for the project titled "Preliminary Hydrology Report for Escondido Assemblage - Hoftiezer, PTM" dated August 2022, prepared by Pasco Laret Suiter & Associates.

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).

☑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):

Storm water runoff from the project site flows southwesterly to a tributary to Escondido Creek which flow southerly to Escondido Creek, which continues southwesterly to San Elijo Lagoon and ultimately to the Pacific Ocean.

List any 303(d) impaired water bodies[1] 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
Escondido Creek	Benthic Community Effects	TMDL Required
	Bifenthrin	TMDL Required
	DDT (Dichlorodiphenyltrichloroethane)	TMDL Required
	Indicator Bacteria	TMDL Required
	Malathion	TMDL Required
	Manganese	TMDL Required
	Nitrogen	TMDL Required
	Phosphate	TMDL Required
	Selenium	TMDL Required
	Sulfates	TMDL Required
	Total Dissolved Solids	TMDL Required
	Toxicity	TMDL Required
San Elijo Lagoon	Eutrophic	TMDL Required
	Indicator Bacteria	TMDL Required
	Sedimentation/Siltation	TMDL Required
	Toxicity	TMDL Required
Pacific Ocean Shoreline at Cardiff State Beach	Indicator Bacteria	TMDL Required

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 Storm Water Design Manual Appendix B.6):

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

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

[2] 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

Step 3.7: Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the Storm Water 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[3] for the watershed in which the project resides.

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

[3]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**

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

☑ Yes

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

If yes, have any of the optional analyses presented in Section 6.2 of the manual been performed?

☑ 6.2.1 Verification of GLUs (classification that provides an estimate of sediment yield based on geology, hillslope, and land cover) Onsite

□ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment

□ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite

□ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

☑ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite.

□ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 8 of the SWQMP.

□ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

Pursuant to the WMAA maps, two small portions of the proposed project are within potential critical coarse sediment yield areas. One area in the northwest corner of the site will not be disturbed. The second area in the northern corner required further detailed project-level verification of the Geomorphic Landscape Units (GLUs). A GLU is a combination of slope, geology and land cover. The following is a summary of the GLU for the potential critical coarse sediment yield area in the northern corner of the site.

GLU for Project Site Potential Critical Coarse Sediment Yield Area

Dataset	Project Site Potential Critical Coarse Sediment Yield Area	Source
Topography	<10%	Don Read Corporation, April 15, 2014
Land Cover	Eucalyptus Woodland - Forest	SanGIS Ecology-Vegetation layer for San Diego County
Geology	Kmm – Coarse, Bedrock, Impermeable	Geologic Map of the Oceanside 30’ x 60’ Quadrangle, CA

Table H.1-3 in Appendix H of the City of Escondido Storm Water Design Manual dated February 2016 lists GLUs that are considered to be critical coarse sediment yield areas which require protection. The GLU for the potential critical coarse sediment yield area summarized above is not listed on Table H.1-3, therefore pursuant to the City Design Manual, no measures for protection of the area are necessary. Refer to Attachment 2c for support documentation for the verification of GLUs.

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. There are two (2) POCs for the project site. POC-F is located at the southern boundary of the project site. POC-H is located at the northwestern corner of the project site. Refer to the exhibit located in Attachment 2b for POC locations.
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 (Form I-2b)

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 City Storm Water Design Manual for information to implement source control BMPs shown in this checklist. The following checklists serve as guides only. Mark what elements are included in your project. See Storm Water Design Manual Chapter 4 and Appendix E for more information on determining appropriate BMPs for your project.

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 City Storm Water 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?		
SC-1 Prevention of Illicit Discharges into the MS4	☑Yes	☐No	☐N/A
☑ Direct irrigation water away from impervious surfaces ☐ Direct vehicle wash water away from impervious surfaces ☐ Other: _____ *Discussion / justification if SC-1 not implemented:*			
SC-2 Storm Drain Stenciling or Signage	☑Yes	☐No	☐N/A
☑ Stencil or stamp storm drains with anti-dumping message ☑ Post signs prohibiting illegal dumping ☐ Other *Discussion / justification if SC-2 not implemented:*			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☑N/A
☐ Store materials inside a covered enclosure ☐ Direct runoff from downspouts and roofs away from storage areas ☐ Other *Discussion / justification if SC-3 not implemented:* No outdoor storage areas proposed.			

SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☑N/A
□ Locate work area away from storm drains or catch basins □ Work over impermeable surfaces where spills and pollutants can be captured and removed *Discussion / justification if SC-4 not implemented:* No outdoor work areas proposed.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☑N/A
□ Locate trash containers in a roofed, walled enclosure □ Locate trash containers away from storm drains *Discussion / justification if SC-5 not implemented:* No trash storage areas proposed.			
SC-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 SC-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 (Form I-2c)

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 City Storm Water Design Manual for information to implement site design BMPs shown in this checklist. The following checklists serve as guides only. Mark what elements are included in your project. See Storm Water Design Manual Chapter 4 and Appendix E for more information on determining appropriate BMPs for your project.

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 City Storm Water 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?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☑Yes	☐No	☐N/A
☑ Maintain existing drainage patterns *Discussion / justification if SD-1 not implemented:*			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☑Yes	☐No	☐N/A
☑ Preserve trees (see Zoning Code Art. 55 Grading & Erosion Control; Art. 62 Landscape Regulations) □ Avoid sensitive areas such as wetlands and waterways *Discussion / justification if SD-2 not implemented:*			
SD-3 Minimize Impervious Area	☑Yes	☐No	☐N/A
☑ Install parking and driving aisles to minimum width required to meet standards *Discussion / justification if SD-3 not implemented:*			

SD-4 Minimize Soil Compaction	☑Yes	☐No	☐N/A
☑ Avoid compaction in planned landscaped spaces ☑ Till and amend soil for improved infiltration capacity *Discussion / justification if SD-4 not implemented:*			
SD-5 Impervious Area Dispersion	☑Yes	☐No	☐N/A
☑ Drain rooftops, roads or sidewalks into adjacent landscape areas □ Drain impervious surfaces through pervious areas *Discussion / justification if SD-5 not implemented:*			
SD-6 Runoff Collection			
Discussion / justification if SD-6 not implemented:	☑Yes	☐No	☐N/A
SD-7 Landscaping with Native or Drought Tolerant Species			
Discussion / justification if SD-7 not implemented:	☑Yes	☐No	☐N/A
SD-8 Harvesting and Using Precipitation			
Discussion / justification if SD-8 not implemented: Harvesting and using precipitation is not a feasible BMP to implement. Refer to Attachment 1a.	☐Yes	☑No	☐N/A

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 (Form I-3)

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the Storm Water 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 Storm Water Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the City at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 8.2.3.2 of the Storm Water Design Manual). PDP structural BMPs must be maintained into perpetuity, and the City must confirm the maintenance (see Section 7 of the Storm Water 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 Storm Water D*esign 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.*

DMA A:
Step 1A: The DMAs are not self-mitigating, de minimis, or self-retaining.
Step 1B: There are no site design BMPs proposed for the project for which the runoff factor can be adjusted.
Step 2: Harvest and use is not feasible. Refer to Attachment 1a.
Step 3: Infiltration is not feasible. Refer to Attachment 1b.
Step 3C: Biofiltration (BF-1) has been selected and sized per the design criteria to meet both pollutant control and hydromodification flow control requirements.

SMA A and B:
Step 1A: The DMA is pervious and considered to be “self-mitigating” per Section 5.2.1 of the City Design Manual.

DMA B and C: Right-Of-Way Improvements
The right-of-way improvements along Stanley Avenue, Ash Street, and Lehner Avenue will utilize “green street” non-contiguous sidewalks and swales to address pollutant control requirements within the public right-of-ways.

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. A	
Construction Plan Sheet No.	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☑Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☑Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	William J. Suiter, RCE 68964 Pasco Laret Suiter & Associates, Inc. 27127 Calle Arroyo, Suite 1904 San Juan Capistrano, CA 92675
Who will be the final owner of this BMP?	☑HOA ☐Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☑HOA ☐Property Owner ☐City ☐Other (describe)
Discussion (as needed): *(Continue on subsequent pages as necessary)*	

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. B	
Construction Plan Sheet No.	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☑Other (describe in discussion section below)	
Purpose: ☑Pollutant control only ☐Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	William J. Suiter, RCE 68964 Pasco Laret Suiter & Associates, Inc. 27127 Calle Arroyo, Suite 1904 San Juan Capistrano, CA 92675
Who will be the final owner of this BMP?	☑HOA ☐Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☑HOA ☐Property Owner ☐City ☐Other (describe)
Discussion (as needed): *(Continue on subsequent pages as necessary)*	"Green Street" non-contiguous sidewalks with curb adjacent biofiltration rain garden per Green Streets Municipal Handbook prepared by EPA.

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. C1 & C2

Construction Plan Sheet No.

Type of structural BMP:
☐Retention by harvest and use (HU-1)
☐Retention by infiltration basin (INF-1)
☐Retention by bioretention (INF-2)
☐Retention by permeable pavement (INF-3)
☐Partial retention by biofiltration with partial retention (PR-1)
☐Biofiltration (BF-1)
☐Biofiltration with Nutrient Sensitive Media Design (BF-2)
☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐Detention pond or vault for hydromodification management
☑Other (describe in discussion section below)

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	William J. Suiter, RCE 68964 Pasco Laret Suiter & Associates, Inc. 27127 Calle Arroyo, Suite 1904 San Juan Capistrano, CA 92675
Who will be the final owner of this BMP?	☑HOA ☐Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☑HOA ☐Property Owner ☐City ☐Other (describe)
Discussion (as needed): *(Continue on subsequent pages as necessary)*	"Green Street" non-contiguous sidewalks with curb adjacent biofiltration rain gardens per Green Streets Municipal Handbook prepared by EPA.

Step 6.3: Offsite Alternative Compliance Participation Form

THIS FORM IS NOT APPLICABLE AT THIS TIME: An Alternative Compliance Program is under consideration by the City of Escondido.	
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.2-1 (Required) -Worksheet B.3-1 (Form I-4; Required) -Worksheet B.4-1 (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-5, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the Storm Water Design Manual to complete Form I-5.	☑Included ☐Not included because the entire project will use harvest and use BMPs
Attachment 1c	Form I-6, Factor of Safety and Design Infiltration Rate Worksheet (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the Storm Water Design Manual to complete Form I-6.	☐Included ☐Not included because the entire project will use harvest and use BMPs
Attachment 1d	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☑Included
Attachment 1e	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

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ATTACHMENT 1a

Harvest and Use Feasibility Checklist	Form I-4

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

- ■ Toilet and urinal flushing
- ■ Landscape irrigation
- ☐ Other:_____

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

Toilet/Urinal Flushing
(9.3 gal/person-day) x (0.13368 cuft/gal) x (1.5 days) = 1.86 cuft/person-36hr
Assume (63 people) x (1.86 cuft/person-36 hr) = 117 cuft/36hr

Landscape Irrigation
(2.449 ac irrigated) x (390 gal/ac-36hr) x (0.13368 cuft/gal) = 128 cuft/36hr

Total wet season 36-hour demand = 117 cf + 128 cf = 245

3. Calculate the DCV using worksheet B-2.1.

DCV = 5,298 (cubic feet)

3a. Is the 36 hour demand greater than or equal to the DCV?	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36 hour demand less than 0.25DCV?
☐ Yes / ☑ **No** ⇨ ⇩	☐ Yes / ☑ **No** ⇨ ⇩	☑ **Yes** ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	**Harvest and use is considered to be infeasible.**

Is harvest and use feasible based on further evaluation?

- ☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
- ☑ No, select alternate BMPs.

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8/5/22

Appendix B: Stormwater Pollutant Control Hydrologic Calculations and Sizing Methods

Worksheet B.2-1. DCV

DMA A

Design Capture Volume		**Worksheet B-2.1**		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.7	inches
2	Area tributary to BMP (s)	A=	4.45	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1) * See calculation below	C=	0.47	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction (1 cubic foot=7.48 gallons)	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	5272	cubic-feet

	Area (sq ft)	Runoff Factor	A x RF	Weighted RF
Impervious	88742	0.9	79867.8	
Landscape	105179	0.1	10518	
Total	193921		90386	0.47

4.45181359

Escondido Assemblage - Hoftiezer, Street "A"

3537

Simple Sizing Method for Biofiltration BMPs			
1	Remaining DCV After implementing retention BMPs	5273.0	cu-ft
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0.00	inches
5	Aggregate pore space	0.95	in/in
6	Required depth of gravel below the underdrain [Line 4 / Line 5]	3.00	inches
7	Assumed surface area of the biofiltration BMP	2909.0	sq-ft
8	Media retained pore storage	0.2	in/in
9	Volume retained pore storage	872.70	cu-ft
10	DCV that requires biofiltration [Line 1 - Line 9]	4400.3	cu-ft
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	18	inches
12	Media Thickness [18 in Min], also add mulch layer thicknes to this line	18	inches
13	Aggregate Storage above underdrain inver (12 inches typical) - Use 0 inches for sizing if the aggregate is not over the entire bottom surface area	18	inches
14	Freely drained pore storage	0.95	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet, use the outlet controlled rate which will be less than 5 in/hr.) *	5.000	in/hr
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	52.20	inches
19	Total Depth Treated [Line 17 + Line 18]	82.20	inches
Option 1 - Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	6600	cu-ft
21	Required Footprint [Line 20 / Line 19] x 12	963.6	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and poding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	3300	cu-ft
23	Required Footprint [Line 22 / Line 18] x 12	759	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	193,969	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.47	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	2735	sq-ft
28	Footprint of the BMP = Maximum (Minimum(Line 21, Line 23), Line 27)	2735	sq-ft

ATTACHMENT 1b

Categorization of Infiltration Feasibility Condition	Form I-5

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: A falling head percolation test was preformed at tentative basin location with a result of 0.01 in/hr. Applying a FS=2.0 for screening (Section D.5.4) the reliable infiltration rate is 0.005 in/hr.
*Petra report: J.N. 21-374, dated 9/23/2021

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: N/A - infiltration rate < 0.5 in/hr.

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

Criteria	Screening Question	Yes	No
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: N/A - infiltration rate < 0.5 in/hr. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☐
Provide basis: N/A - infiltration rate < 0.5 in/hr. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	☐	☐

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☐	☐

Provide basis: Basins constructed in older alluvium or weathered granitic bedrock will provide infiltration at an appreciable rate (>0.01 in/hr). Basins in compacted fill will not provide infiltration at an appreciable rate.
Refer to Petra J.N. 21-374, dated 9/23/2021

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

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☐

Provide basis: In view of the relatively low infiltration rate determined in the limited feasibility testing to date, infiltration is not anticipated to increase the risks of geotechnical hazards noted in C.2. As development plans are refined, such geotechnical risks shall be further evaluated as a part of the design process. Slope stability, in partcular, shall be evaluated where a basin is to be located in close proximity to either the toe or top of a graded slope or a natural slope steeper than 3:1 (h:v).

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

Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☐
Provide basis: Groundwater was not encountered within the percolation test boring, drilled to a depth of 10 feet. In view of the relative low infiltration test rate, significant risks to groundwater are not anticipated. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☐
Provide basis: There are no know water rights immediately downstream. Natural runoff is expected to be smaller than post development runoff, even with infiltration considered. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 5-8 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	☐ ☐	

ATTACHMENT 1d

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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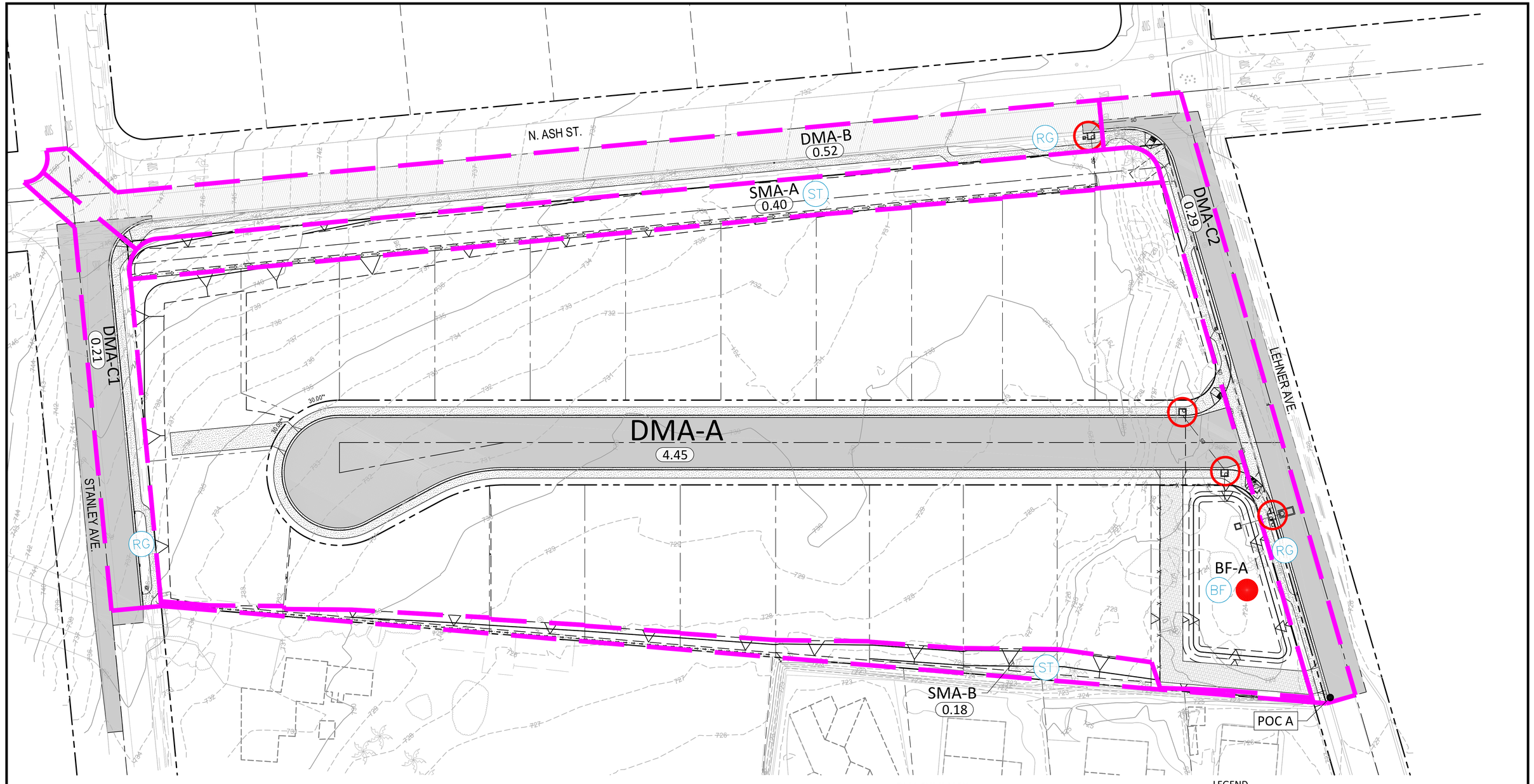
ATTACHMENT 1d



GENERAL INFORMATION

RECEIVING WATERS - ESCONDIDO CREEK

SOIL INFORMATION

SOIL: TYPE C

GROUND WATER INFORMATION

HISTORIC GROUNDWATER LEVELS BETWEEN 2-28± FEET. SEE REPORT PREPARED IN SEPTEMBER 2021 BY PETRA GEOSCIENCES.

WATER QUALITY TECHNICAL REPORT

TITLE - PRIORITY DEVELOPMENT PROJECT STORM WATER QUALITY MANAGEMENT PLAN FOR ESCONDIDO ASSEMBLAGE - HOFTIEZER PTM
DATE - AUGUST 2022
PREPARED BY - PASCO LARET SUITER & ASSOCIATES

MAINTENANCE AGREEMENT DOCUMENT

TITLE -
DATE -
PREPARED BY -

OPERATIONS AND MAINTENANCE PLAN

TITLE -
DATE -
PREPARED BY -

RESPONSIBLE PARTY INFORMATION

NAME - ARGUS LAND COMPANY
ADDRESS - 30200 RANCHO VIEJO RD., SUITE B
SAN JUAN CAPISTRANO, CA 92675

BMP NOTES

1. THESE BMPS ARE MANDATORY TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS OR THERE PLANS.
2. NO CHANGES TO BE PROPOSED BMPS ON THIS SHEET WITHOUT PRIOR APPOVAL FROM THE CITY ENGINEERING DEPARTMENT.
3. NO SUBSTITUTIONS TO THE MATERIAL TYPES OR PLANTING TYPES WITHOU PRIOR APPROVAL FROM THE LAND DEVELOPMENT ENGINEER.
4. NO OCCUPANCY WILL BE GRATED UNTIL THE CITY INSPECTOR STAFF HAS INSPECTED THIS PROJECT FOR APPROPRIATE BMP CONSTRUCTION AND INSTALL.

TREATMENT CONTROL BMPS

VOLUME-BASED BIOFILTRATION BASIN — BF

SELF-TREATING DMA — ST

"GREEN STREET" RAIN GARDEN — RG

SOURCE CONTROL BMPS

INLET STENCILING

DMA SUMMARY

DRAINAGE MANAGEMENT AREA (DMA)	TOTAL AREA (SF/AC)	TOTAL IMPV. AREA (SF/AC)	TOTAL PERV. AREA (SF/AC)	DMA TYPE	BMP TYPE	BMP NAME	BMP AREA PROVIDED (SF)
DMA-A	193,921/ 4.45	88,742/ 2.04	105,179/ 2.41	DRAINS TO BMP	BIOFILTRATION BASIN (BF-A)	BF-A	3,947
DMA-B	22,813/ 0.52	18,633/ 0.43	4,180/ 0.09	DRAINS TO BMP	"GREEN STREET" RAIN GARDEN	RG	N/A
DMA-C1	9,104/ 0.21	7,631/ 0.18	1,473/ 0.03	DRAINS TO BMP	"GREEN STREET" RAIN GARDEN	RG	N/A
DMA-C2	12,681/ 0.29	11,401/ 0.26	1,280/ 0.03	DRAINS TO BMP	"GREEN STREET" RAIN GARDEN	RG	N/A

SCALE: 1" = 30'
0 30 60 90

LEGEND

MAJOR BASIN BOUNDARY
HMP POINT OF COMPLIANCE — POC H
HYDROLOGIC AREA (AC) — 0.60
PROPOSED HARDSCAPE/IMPERVIOUS AREA
PROPOSED LANDSCAPING/PERVIOUS AREA
PROPOSED CL 2 BASE (PERVIOUS) ACCESS ROAD

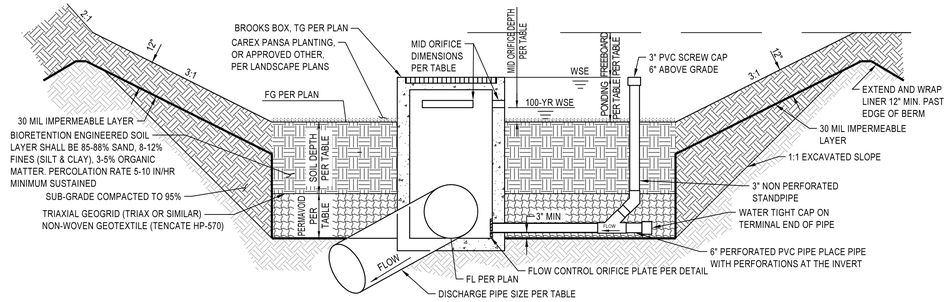
PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 949.661.6695 | www.plsaengineering.com

ESCONDIDO ASSEMBLAGE
HOFTIEZER STREET "A"
POST-PROJECT DMA/HMP EXHIBIT

08/09/2022

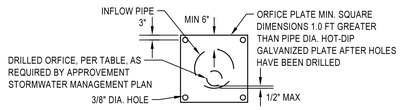
DRAWING:
SHEET 1 OF 1

ATTACHMENT 1e



**NOTE: BACKFILL FOR STORM DRAIN PIPES ENTERING OR EXITING BASIN SHOULD BE BACKFILLED WITH A 2-SACK MIX OF SLURRY

BIOFILTRATION BASIN TABLE									
BASIN NAME	ENGINEERED SOIL LAYER DEPTH	PERMAVOID LAYER DEPTH	PONDING DEPTH	FREEBOARD DEPTH	BROOKS BOX SIZE	DISCHARGE PIPE SIZE	ORIFICE DIA. SIZE	MID ORIFICE SIZE	MID ORIFICE DEPTH
H	18 INCH	30 INCH	18 INCH	9 INCH	36X36	12 INCH	1.6" INCH	10"W X 3"H	9"



FLOW CONTROL ORFICE PLATE

BIORETENTION SOIL MEDIA (BSM) PROPERTIES:

BSM SHOULD ACHIEVE A LONG-TERM, IN PLACE INFILTRATION RATE OF 5 IN/HR. BSM SHOULD HAVE AN APPROPRIATE AMOUNT OF ORGANIC MATERIAL TO SUPPORT PLANT GROWTH (E.G., LOAMY SAND MIXED THOROUGHLY WITH AN ORGANIC MATERIAL). THE BSM SHOULD BE A MIXTURE OF SAND, FINES, AND COMPOST. THE FOLLOWING COMPOSITION INCLUDES THE MEASUREMENTS FOR DETERMINING THE BSM BY VOLUME AND WEIGHT:

BSM		SANDY LOAM			
COMPOSITION	SAND	SAND	SILT	CLAY	COMPOST
VOLUME	65%		20%		15%
WEIGHT	75-80%		10%	3% MAX.	9% MAX*

*9% COMPOST BY WEIGHT RESULTS IN APPROXIMATELY 5% ORGANIC MATTER BY WEIGHT.

IN ADDITION, THE BSM SHOULD MEET THE FOLLOWING STANDARDS:

ORGANIC CONTENT (OC) 2-5%, PH BETWEEN 6.0–8.0, CARBON:NITROGEN RATIO BETWEEN 10:1-20:1, CATION EXCHANGE CAPACITY (CEC) > 5 MILLIEQUIVALENT (MEQ)/100 G SOIL.

IF THE EXISTING SOILS MEET THE CRITERIA, IT CAN BE USED AS THE SOIL MEDIA. IF THE EXISTING SOILS DO NOT MEET THE CRITERIA, A SUBSTITUTE MEDIA MUST BE USED. SOIL MEDIA THAT IS BROUGHT TO THE SITE MUST MEET THE STANDARDS SET FORTH IN THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL: APPENDIX F.3- BIOFILTRATION SOIL MEDIA COMPOSITION, TESTING, AND INSTALLATION (NOV 2018), ALSO CONTAINED IN THE COUNTY OF SAN DIEGO LOW IMPACT DEVELOPMENT HANDBOOK: APPENDIX G- BIORETENTION SOIL SPECIFICATION (JULY 2014, UNLESS SUPERSEDED BY MORE RECENT EDITION).

NUTRIENT SENSITIVE MEDIA DESIGN:

IN CASES WHERE THE BMP DISCHARGES TO RECEIVING WATERS WITH NUTRIENT IMPAIRMENTS OR NUTRIENT TMDLS, THE BSM SHOULD BE DESIGNED TO MINIMIZE THE EXPORT OF NUTRIENTS FROM THE MEDIA. HIGH LEVELS OF PHOSPHORUS IN THE MEDIA HAVE BEEN IDENTIFIED AS THE MAIN CAUSE OF BIOFILTRATION AREAS EXPORTING NUTRIENTS. ALL BSM SHOULD BE ANALYZED FOR BACKGROUND LEVELS OF NUTRIENTS. TOTAL PHOSPHORUS SHOULD NOT EXCEED 15 PPM. THE CARBON:NITROGEN RATIO OF BSM SHALL BE BETWEEN 15 AND 40 TO REDUCE THE POTENTIAL FOR NITRATE LEACHING. IN ADDITION TO ADHERING TO THE COUNTY MEDIA SPECIFICATIONS, THE GUIDELINES SET FORTH IN THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL: APPENDIX E.20- BF-2 NUTRIENT SENSITIVE MEDIA DESIGN (NOV 2018) SHOULD BE FOLLOWED.

STRUCTURAL SOIL PROPERTIES:

ORGANIC CONTENT (OC) > 5 PERCENT, PH BETWEEN 6–8, CATION EXCHANGE CAPACITY (CEC) > 5 MILLIEQUIVALENT (MEQ)/100 G SOIL, INFILTRATION RATES OF 0.5 IN/HR OR GREATER. SOIL MEDIA MUST HAVE AN APPROPRIATE AMOUNT OF ORGANIC MATERIAL TO SUPPORT PLANT GROWTH (E.G., LOAMY SAND MIXED THOROUGHLY WITH AN ORGANIC MATERIAL). IF THE EXISTING SOILS MEET THE CRITERIA, IT CAN BE USED AS THE SOIL MEDIA. IF THE EXISTING SOILS DO NOT MEET THE CRITERIA, A SUBSTITUTE MEDIA MUST BE USED. SOIL MEDIA THAT IS BROUGHT TO THE SITE MUST MEET THE STANDARDS SET FORTH IN COUNTY OF SAN DIEGO BMP DESIGN MANUAL AS WELL AS THE FOLLOWING CRITERIA:

1. SOIL MEDIA CONSISTS OF 85 PERCENT WASHED COURSE SAND, 10 PERCENT FINES (RANGE: 8–12 PERCENT; 8 PERCENT = 2 IN/HR INFILTRATION RATE, 12 PERCENT = 1 IN/HR INFILTRATION RATE), AND 5 PERCENT ORGANIC MATTER.
2. THE SAND PORTION SHOULD CONSIST OF CONCRETE SAND (PASSING A ONE-QUARTER-INCH SIEVE). MORTAR SAND (PASSING A ONE-EIGHTH-INCH SIEVE) IS ACCEPTABLE AS LONG AS IT IS THOROUGHLY WASHED TO REMOVE THE FINES.
3. FINES SHOULD PASS A # 270 (SCREEN SIZE) SIEVE.
4. ORGANIC MATTER IS CONSIDERED AN ADDITIVE TO ASSIST VEGETATION IN INITIAL ESTABLISHMENT AND CONTRIBUTES TO SORPTION OF POLLUTANTS BUT GENERALLY SHOULD BE MINIMIZED (5 PERCENT). ORGANIC MATERIALS WILL OXIDIZE OVER TIME CAUSING AN INCREASE IN PONDING THAT COULD ADVERSELY AFFECT THE PERFORMANCE OF THE BIOFILTRATION AREA. ORGANIC MATERIAL SHOULD CONSIST OF AGED BARK FINES, OR SIMILAR ORGANIC MATERIAL. ORGANIC MATERIAL SHOULD NOT CONSIST OF MANURE OR ANIMAL COMPOST. STUDIES HAVE ALSO SHOWN NEWSPAPER MULCH TO BE AN ACCEPTABLE ADDITIVE (KIM ET AL. 2003; DAVIS 2007).
5. HIGH LEVELS OF PHOSPHORUS IN THE MEDIA HAVE BEEN IDENTIFIED AS THE MAIN CAUSE OF BIOFILTRATION AREAS EXPORTING NUTRIENTS (HUNT AND LORD 2006). ALL STRUCTURAL SOIL SHOULD BE ANALYZED FOR BACKGROUND LEVELS OF NUTRIENTS. TOTAL PHOSPHORUS SHOULD NOT EXCEED 15 PPM.

TYPCIAL BIOFILTRATION BASIN DETAIL

SCALE: NTS

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 949.661.6695 | www.plsaengineering.com

ESCONDIDO ASSEMBLAGE
HOFTIEZER STREET "A"
BMP DMA MAPBOOK EXHIBIT

08/05/2022

DRAWING:
SHEET 1 OF 1

SAVE DATE: 05/04/22 ~ PLOT DATE: 08/05/22 ~ FILE NAME: J:\ACTIVE JOBS\3537 ESCO ASSEMBLAGE\CIVIL\REPORTS\HOF\SWQMP\SWMM\3537-HOF_HMP-POST.dwg

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 Storm Water 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 Storm Water Design Manual.	☑Exhibit depicting onsite and/or upstream sources of critical coarse sediment as mapped in the WMAA AND, ☐Demonstration that the project effectively avoids and bypasses sources of mapped critical coarse sediment OR, ☐Demonstration that project does not generate a net impact on the receiving water.
Attachment 2d	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the Storm Water 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

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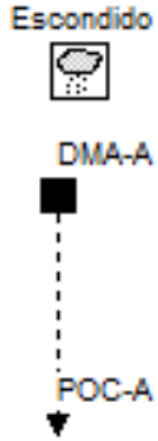
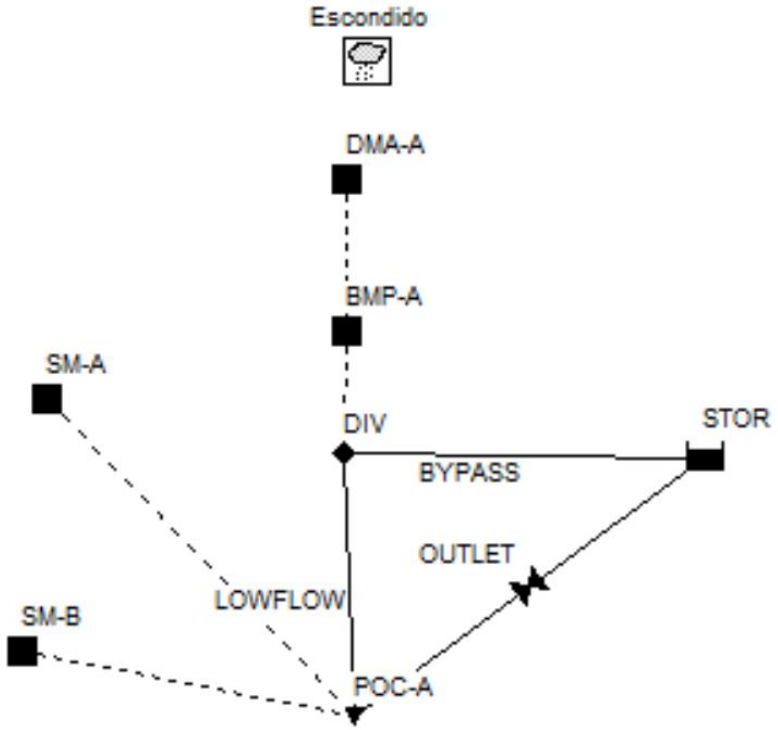
ATTACHMENT 2a

SWMM MODEL SCHEMATICS

PRE-DEVELOPMENT MODEL	POST-PROJECT MODEL
	

3537 HOF
12/8/2021

SWMM INPUT

PRE-PROJECT

DMA	Basin	Area (ac)	Width (Area/Flow Length) (ft)	% Slope	% Impervious	% "B" Soils	% "C" Soils	% "D" Soils	Weighted Infiltration (in/hr):	Weighted Suction Head (in):	Weighted Initial Deficit:	N-perv
A		5.03	602	3.0%	0%	0%	100%	0%	0.100	6.000	0.320	0.060
	Total:	**5.03**										

POST-PROJECT

DMA	BMP	Area (ac)	Width (Area/Flow Length) (ft)	% Impervious	% Slope	% "B" Soils	% "C" Soils	% "D" Soils	Weighted Infiltration (in/hr):	Weighted Suction Head (in):	Weighted Initial Deficit:	N-perv
A	BMP-A	4.40	2061	46%	2.0%	0%	100%	0%	0.100	6.000	0.320	0.06
BMP-A	BMP-A	0.09061	56	0%	0.0%	0%	100%	0%	0.100	6.000	0.320	0.06
SM-A	SM	0.40	311	0%	2.0%	0%	100%	0%	0.100	6.000	0.320	0.06
SM-B	SM	0.14	436	0%	50.0%	0%	100%	0%	0.100	6.000	0.320	0.06
	Total:	**5.03**										

C:	0.1	in/hr

C:	6	in

C:	0.32

POC-1

```
[TITLE]
;;Project Title/Notes
3537 HOF
Pre-Development Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           09/24/1964
START_TIME           13:00:00
REPORT_START_DATE    09/24/1964
REPORT_START_TIME    13:00:00
END_DATE             05/23/2008
END_TIME             22:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .06    .08    .11    .16    .18    .21    .21    .2     .16    .12    .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

POC-1

```
;;-------------- --------- ------ ------ ----------
Escondido        INTENSITY 1:00     1.0      TIMESERIES Escondido

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-A            Escondido        POC-A            5.03     0        602      3        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-A            0.012      0.06       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-A            6          0.1        0.32

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-A            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Escondido        FILE "J:\ACTIVE JOBS\3537 ESCO ASSEMBLAGE\CIVIL\REPORTS\HOF\SWQMP\SWMM\Rain Data\escondido\escondido1.dat"

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-A            192.834            4911.633

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
```

POC-1

```
;;-------------- ------------------ ------------------
DMA-A            192.834            6652.550

[SYMBOLS]
;;Gage          X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Escondido        392.092            7571.018
```

POC-1

```
[TITLE]
;;Project Title/Notes
3537 HOF
Post-Project Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           09/24/1964
START_TIME           13:00:00
REPORT_START_DATE    09/24/1964
REPORT_START_TIME    13:00:00
END_DATE             05/23/2008
END_TIME             22:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .06    .08    .11    .16    .18    .21    .21    .2     .16    .12    .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

POC-1

```
;;-------------- --------- ------ ------ ----------
Escondido        INTENSITY 1:00     1.0      TIMESERIES Escondido

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-A            Escondido        BMP-A            4.4      46       2061     2        0
BMP-A            Escondido        DIV              0.09061  0        56       0        0
SM-A             Escondido        POC-A            0.4      0        311      2        0
SM-B             Escondido        POC-A            0.14     0        436      50       0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-A            0.012      0.06       0.05       0.1        25         OUTLET
BMP-A            0.012      0.06       0.05       0.1        25         OUTLET
SM-A             0.012      0.06       0.05       0.1        25         OUTLET
SM-B             0.012      0.06       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-A            6          0.1        0.32
BMP-A            6          0.1        0.32
SM-A             6          0.1        0.32
SM-B             6          0.1        0.32

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BMP-A            BC
BMP-A            SURFACE    9.72       0          0          0          5
BMP-A            SOIL       18         0.4        0.2        0.1        5          5          1.5
BMP-A            STORAGE    30         0.99       0          0
BMP-A            DRAIN      0.2141     0.5        0          6          0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo
FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ------------
---- ----------
BMP-A            BMP-A            1       3946.97    0          0          100        0          *                        *
0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-A            0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
```

POC-1

```
;;-------------- ---------- ---------------- ---------- ----------
DIV              0          BYPASS           CUTOFF     0.145      0          0          0          0

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          -------- --------
STOR             0        1.5        0          TABULAR    STOR                         0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
BYPASS           DIV              STOR             400        0.01       0          0          0          0
LOWFLOW          DIV              POC-A            400        0.01       0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
OUTLET           STOR             POC-A            0          TABULAR/DEPTH   OUTLET                      NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
BYPASS           DUMMY        0                0          0          0          1
LOWFLOW          DUMMY        0                0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUTLET           Rating     0          0
OUTLET                      0.05       0.06
OUTLET                      0.1        0.17
OUTLET                      0.15       0.31
OUTLET                      0.2        0.48
OUTLET                      0.25       0.67
OUTLET                      0.3        0.82
OUTLET                      0.35       0.94
OUTLET                      0.4        1.04
OUTLET                      0.45       1.14
OUTLET                      0.5        1.22
OUTLET                      0.55       1.3
OUTLET                      0.6        1.38
OUTLET                      0.65       1.45
OUTLET                      0.7        1.52
OUTLET                      0.75       1.58
OUTLET                      0.8        2.08
OUTLET                      0.85       2.95
OUTLET                      0.9        4.04
OUTLET                      0.95       5.33
OUTLET                      1          6.78
OUTLET                      1.05       8.38
OUTLET                      1.1        10.1
```

POC-1

```
OUTLET                     1.15       10.98
OUTLET                     1.2        11.04
OUTLET                     1.25       11.09
OUTLET                     1.3        11.14
OUTLET                     1.35       11.19
OUTLET                     1.4        11.24
OUTLET                     1.45       11.29
OUTLET                     1.5        11.34
;
STOR             Storage   0          4585
STOR                       1.5        5955

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Escondido        FILE "J:\ACTIVE JOBS\3537 ESCO ASSEMBLAGE\CIVIL\REPORTS\HOF\SWQMP\SWMM\Rain Data\escondido\escondido1.dat"

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-A            245.098            1678.922
DIV              147.059            4056.373
STOR             3382.353           4007.353

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-A            160.575            6543.478
BMP-A            183.103            5157.962
SM-A             -2531.174          4535.820
SM-B             -2745.098          2267.157

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

Escondido	392.092	7571.018

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

3537 HOF
Pre-Development Condition


***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 09/24/1964 13:00:00
Ending Date .............. 05/23/2008 22:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       256.161       611.120
Evaporation Loss .........         2.905         6.931
Infiltration Loss ........       234.767       560.081
Surface Runoff ...........        20.050        47.832
Final Storage ............         0.000         0.000
Continuity Error (%) .....        -0.609


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        20.050         6.533
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        20.050         6.533
Flooding Loss ............         0.000         0.000
```

```
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-A	611.12	0.00	6.93	560.08	0.00	47.83	47.83	6.53	3.71	0.078

```
Analysis begun on:  Tue Dec  7 10:08:43 2021
Analysis ended on:  Tue Dec  7 10:09:14 2021
Total elapsed time: 00:00:31
```

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
  --------------------------------------------------------------

  3537 HOF
  Post-Project Condition

  WARNING 04: minimum elevation drop used for Conduit BYPASS
  WARNING 04: minimum elevation drop used for Conduit LOWFLOW

  **********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  **********************************************************

  ***************
  Analysis Options
  ***************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... GREEN_AMPT
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 09/24/1964 13:00:00
  Ending Date .............. 05/23/2008 22:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 01:00:00
  Wet Time Step ............ 00:15:00
  Dry Time Step ............ 04:00:00
  Routing Time Step ........ 60.00 sec


  *************************        Volume         Depth
  Runoff Quantity Continuity     acre-feet        inches
  *************************     ---------       -------
  Initial LID Storage ......         0.014         0.032
  Total Precipitation ......       256.192       611.120
  Evaporation Loss .........        20.448        48.777
  Infiltration Loss ........       134.820       321.600
  Surface Runoff ...........        14.453        34.475
  LID Drainage .............        89.110       212.563
  Final Storage ............         0.037         0.088
  Continuity Error (%) .....        -1.039


  *************************        Volume        Volume
  Flow Routing Continuity        acre-feet      10^6 gal
  *************************     ---------     ---------
```

```
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......       103.562        33.747
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........       103.553        33.744
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.008
```

```
*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.
```

```
************************
Routing Time Step Summary
************************
Minimum Time Step           :    59.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00
```

```
***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-A	611.12	0.00	40.47	299.63	248.50	29.39	277.89	33.20	3.48	0.455
BMP-A	611.12	13494.06	715.21	0.00	0.00	0.00	13387.45	32.94	3.55	0.949
SM-A	611.12	0.00	4.67	555.34	0.00	53.80	53.80	0.58	0.30	0.088
SM-B	611.12	0.00	4.54	552.48	0.00	58.54	58.54	0.22	0.10	0.096

```
**********************
LID Performance Summary
**********************
```

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %

BMP-A	BMP-A	14105.18	715.23	0.00	1586.12	11801.83	1.80	4.13	-0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-A	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
DIV	DIVIDER	0.00	0.00	0.00	0 00:00	0.00
STOR	STORAGE	0.00	0.87	0.87	10332 04:05	0.87

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC-A	OUTFALL	0.40	3.90	10332 04:01	0.807	33.7	0.000
DIV	DIVIDER	3.55	3.55	10332 04:01	32.9	32.9	0.000
STOR	STORAGE	0.00	3.41	10332 04:01	0	3.84	0.074

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR	0.001	0	0	0	4.338	55	10332 04:04	3.40

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-A	5.55	0.06	3.90	33.742
System	5.55	0.06	3.90	33.742

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
BYPASS	DUMMY	3.41	10332 04:01			
LOWFLOW	DUMMY	0.15	424 04:20			
OUTLET	DUMMY	3.40	10332 04:05			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

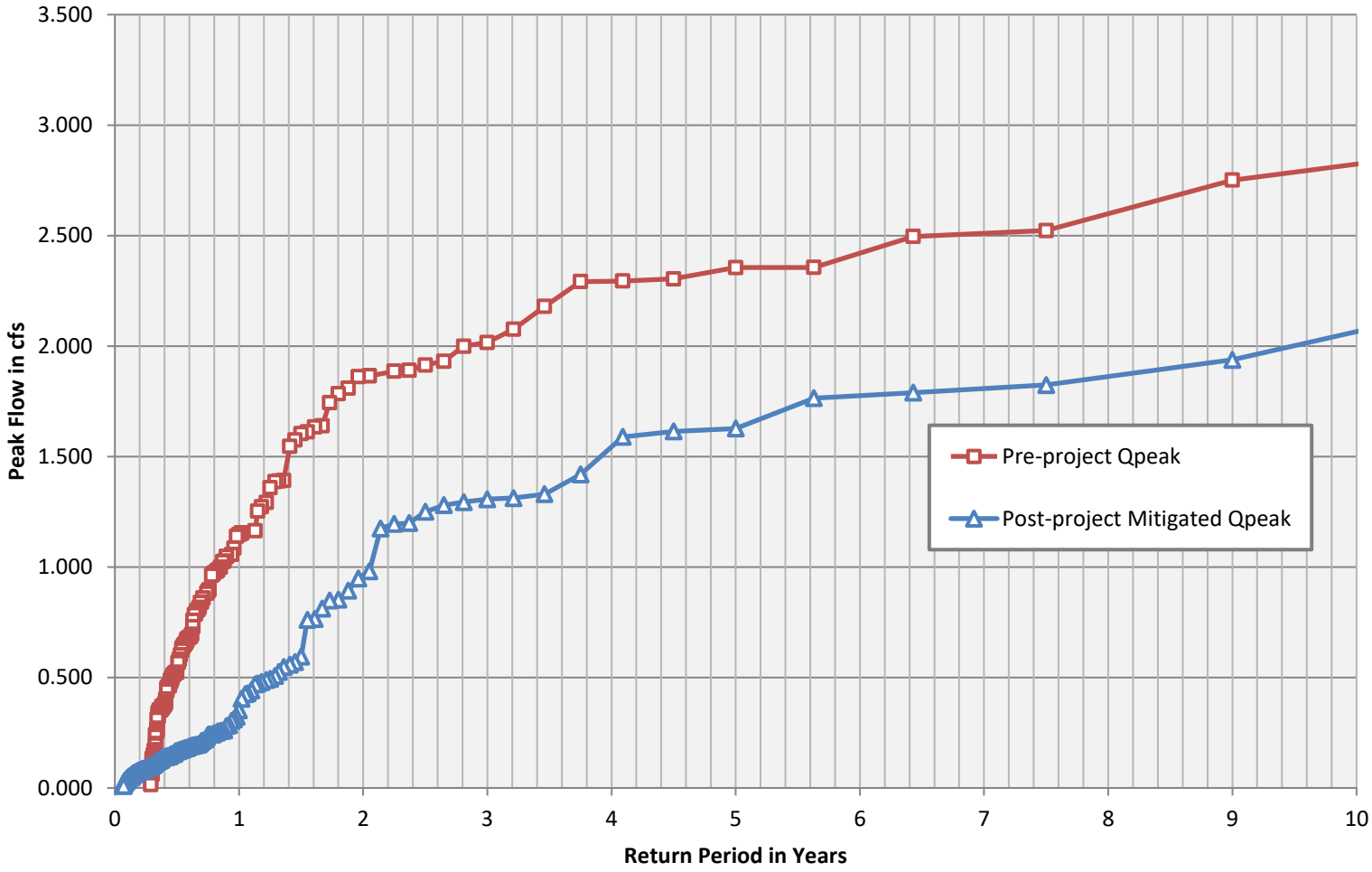
Analysis begun on: Tue Dec 7 10:30:52 2021
Analysis ended on: Tue Dec 7 10:31:32 2021
Total elapsed time: 00:00:40

POC-A

Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.186	0.096
2-year	1.863	0.963
5-year	2.355	1.627
10-year	2.823	2.065

Peak Flow Frequency Curves
POC-A



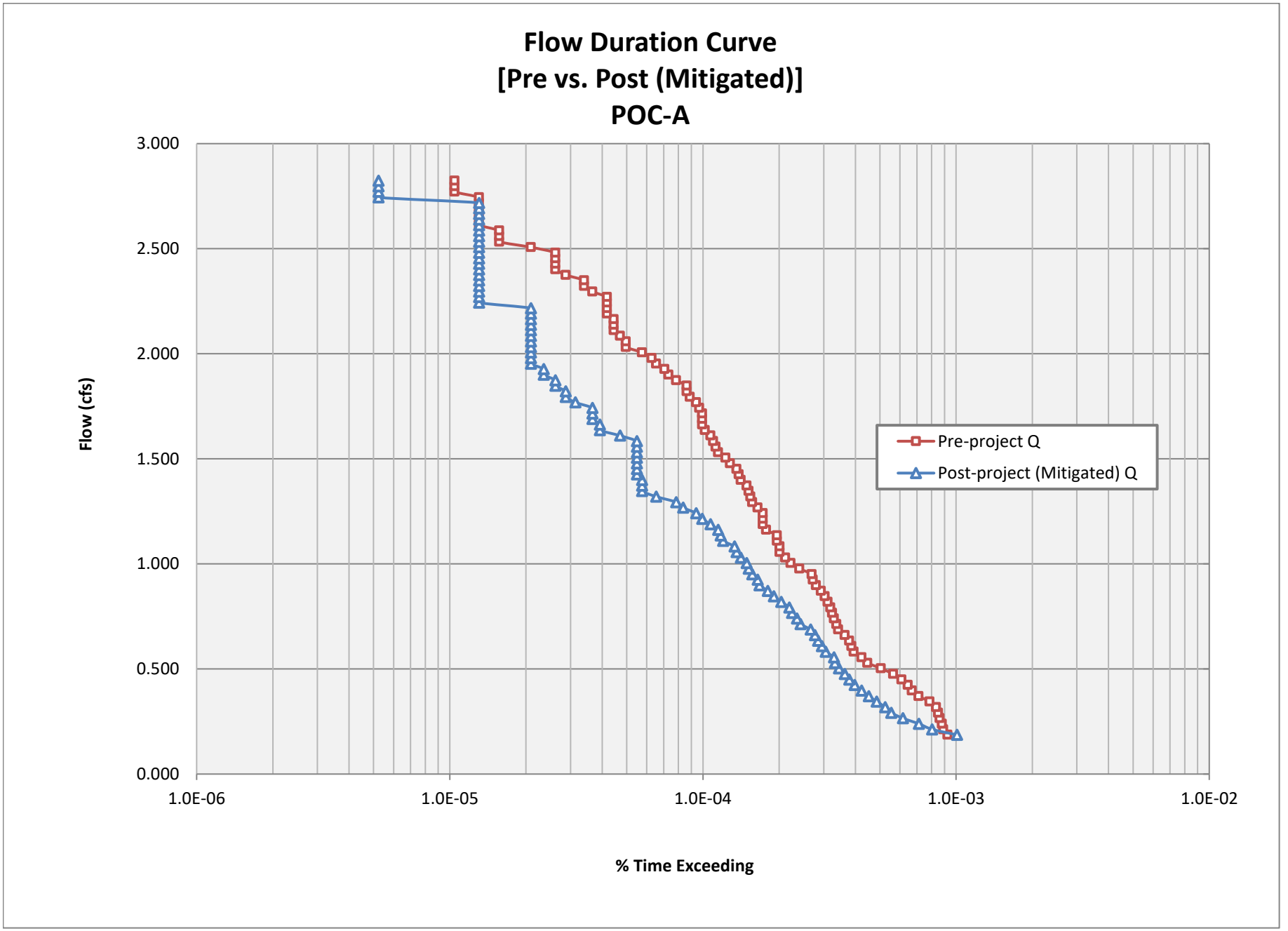
POC-A

Low-flow Threshold:	10%	
0.1xQ2 (Pre):	0.186	cfs
Q10 (Pre):	2.823	cfs
Ordinate #:	100	
Incremental Q (Pre):	0.02637	cfs
Total Hourly Data:	382736	hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.186	354	9.25E-04	386	1.01E-03	109%	Pass
1	0.213	341	8.91E-04	308	8.05E-04	90%	Pass
2	0.239	337	8.81E-04	273	7.13E-04	81%	Pass
3	0.265	330	8.62E-04	236	6.17E-04	72%	Pass
4	0.292	325	8.49E-04	212	5.54E-04	65%	Pass
5	0.318	319	8.33E-04	201	5.25E-04	63%	Pass
6	0.345	301	7.86E-04	186	4.86E-04	62%	Pass
7	0.371	272	7.11E-04	173	4.52E-04	64%	Pass
8	0.397	256	6.69E-04	162	4.23E-04	63%	Pass
9	0.424	247	6.45E-04	152	3.97E-04	62%	Pass
10	0.450	233	6.09E-04	145	3.79E-04	62%	Pass
11	0.476	216	5.64E-04	139	3.63E-04	64%	Pass
12	0.503	193	5.04E-04	132	3.45E-04	68%	Pass
13	0.529	171	4.47E-04	127	3.32E-04	74%	Pass
14	0.556	162	4.23E-04	126	3.29E-04	78%	Pass
15	0.582	151	3.95E-04	117	3.06E-04	77%	Pass
16	0.608	148	3.87E-04	113	2.95E-04	76%	Pass
17	0.635	145	3.79E-04	109	2.85E-04	75%	Pass
18	0.661	139	3.63E-04	106	2.77E-04	76%	Pass
19	0.687	131	3.42E-04	102	2.67E-04	78%	Pass
20	0.714	129	3.37E-04	93	2.43E-04	72%	Pass
21	0.740	126	3.29E-04	90	2.35E-04	71%	Pass
22	0.766	124	3.24E-04	86	2.25E-04	69%	Pass
23	0.793	122	3.19E-04	84	2.19E-04	69%	Pass
24	0.819	119	3.11E-04	78	2.04E-04	66%	Pass
25	0.846	116	3.03E-04	73	1.91E-04	63%	Pass
26	0.872	112	2.93E-04	69	1.80E-04	62%	Pass
27	0.898	107	2.80E-04	64	1.67E-04	60%	Pass
28	0.925	104	2.72E-04	63	1.65E-04	61%	Pass
29	0.951	103	2.69E-04	60	1.57E-04	58%	Pass
30	0.977	92	2.40E-04	58	1.52E-04	63%	Pass
31	1.004	85	2.22E-04	57	1.49E-04	67%	Pass
32	1.030	81	2.12E-04	54	1.41E-04	67%	Pass
33	1.057	77	2.01E-04	52	1.36E-04	68%	Pass
34	1.083	77	2.01E-04	51	1.33E-04	66%	Pass
35	1.109	75	1.96E-04	46	1.20E-04	61%	Pass
36	1.136	75	1.96E-04	45	1.18E-04	60%	Pass
37	1.162	68	1.78E-04	44	1.15E-04	65%	Pass
38	1.188	66	1.72E-04	41	1.07E-04	62%	Pass
39	1.215	66	1.72E-04	38	9.93E-05	58%	Pass
40	1.241	66	1.72E-04	36	9.41E-05	55%	Pass
41	1.268	63	1.65E-04	32	8.36E-05	51%	Pass
42	1.294	60	1.57E-04	30	7.84E-05	50%	Pass
43	1.320	59	1.54E-04	25	6.53E-05	42%	Pass
44	1.347	58	1.52E-04	22	5.75E-05	38%	Pass
45	1.373	57	1.49E-04	22	5.75E-05	39%	Pass
46	1.399	54	1.41E-04	22	5.75E-05	41%	Pass
47	1.426	53	1.38E-04	21	5.49E-05	40%	Pass
48	1.452	52	1.36E-04	21	5.49E-05	40%	Pass
49	1.479	49	1.28E-04	21	5.49E-05	43%	Pass
50	1.505	47	1.23E-04	21	5.49E-05	45%	Pass
51	1.531	44	1.15E-04	21	5.49E-05	48%	Pass
52	1.558	43	1.12E-04	21	5.49E-05	49%	Pass
53	1.584	42	1.10E-04	21	5.49E-05	50%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
54	1.610	41	1.07E-04	18	4.70E-05	44%	Pass
55	1.637	39	1.02E-04	15	3.92E-05	38%	Pass
56	1.663	38	9.93E-05	15	3.92E-05	39%	Pass
57	1.689	38	9.93E-05	14	3.66E-05	37%	Pass
58	1.716	38	9.93E-05	14	3.66E-05	37%	Pass
59	1.742	37	9.67E-05	14	3.66E-05	38%	Pass
60	1.769	36	9.41E-05	12	3.14E-05	33%	Pass
61	1.795	34	8.88E-05	11	2.87E-05	32%	Pass
62	1.821	33	8.62E-05	11	2.87E-05	33%	Pass
63	1.848	33	8.62E-05	10	2.61E-05	30%	Pass
64	1.874	30	7.84E-05	10	2.61E-05	33%	Pass
65	1.900	28	7.32E-05	9	2.35E-05	32%	Pass
66	1.927	27	7.05E-05	9	2.35E-05	33%	Pass
67	1.953	25	6.53E-05	8	2.09E-05	32%	Pass
68	1.980	24	6.27E-05	8	2.09E-05	33%	Pass
69	2.006	22	5.75E-05	8	2.09E-05	36%	Pass
70	2.032	19	4.96E-05	8	2.09E-05	42%	Pass
71	2.059	19	4.96E-05	8	2.09E-05	42%	Pass
72	2.085	18	4.70E-05	8	2.09E-05	44%	Pass
73	2.111	17	4.44E-05	8	2.09E-05	47%	Pass
74	2.138	17	4.44E-05	8	2.09E-05	47%	Pass
75	2.164	17	4.44E-05	8	2.09E-05	47%	Pass
76	2.191	16	4.18E-05	8	2.09E-05	50%	Pass
77	2.217	16	4.18E-05	8	2.09E-05	50%	Pass
78	2.243	16	4.18E-05	5	1.31E-05	31%	Pass
79	2.270	16	4.18E-05	5	1.31E-05	31%	Pass
80	2.296	14	3.66E-05	5	1.31E-05	36%	Pass
81	2.322	13	3.40E-05	5	1.31E-05	38%	Pass
82	2.349	13	3.40E-05	5	1.31E-05	38%	Pass
83	2.375	11	2.87E-05	5	1.31E-05	45%	Pass
84	2.402	10	2.61E-05	5	1.31E-05	50%	Pass
85	2.428	10	2.61E-05	5	1.31E-05	50%	Pass
86	2.454	10	2.61E-05	5	1.31E-05	50%	Pass
87	2.481	10	2.61E-05	5	1.31E-05	50%	Pass
88	2.507	8	2.09E-05	5	1.31E-05	63%	Pass
89	2.533	6	1.57E-05	5	1.31E-05	83%	Pass
90	2.560	6	1.57E-05	5	1.31E-05	83%	Pass
91	2.586	6	1.57E-05	5	1.31E-05	83%	Pass
92	2.612	5	1.31E-05	5	1.31E-05	100%	Pass
93	2.639	5	1.31E-05	5	1.31E-05	100%	Pass
94	2.665	5	1.31E-05	5	1.31E-05	100%	Pass
95	2.692	5	1.31E-05	5	1.31E-05	100%	Pass
96	2.718	5	1.31E-05	5	1.31E-05	100%	Pass
97	2.744	5	1.31E-05	2	5.23E-06	40%	Pass
98	2.771	4	1.05E-05	2	5.23E-06	50%	Pass
99	2.797	4	1.05E-05	2	5.23E-06	50%	Pass
100	2.823	4	1.05E-05	2	5.23E-06	50%	Pass


Flow Duration Curve
[Pre vs. Post (Mitigated)]
POC-A
3.000
2.500
2.000
1.500
1.000
0.500
0.000
Flow (cfs)
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

SWMM Model Flow Coefficient Calculation

BMP-A PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	9	in
Bioretention Soil Layer	S	18	in
Permavoid Layer	G	30	in
TOTAL		4.8	ft
		57	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	1.6	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.145	cfs
Ponding Depth Surface Area	A_{PD}	4585	ft^2
Bioretention Surface Area	A_S, A_G	3947	ft^2
	A_S, A_G	0.0906	ac
Flow Rate (per unit area)	q	1.592	in/hr
Effective Ponding Depth	PD_{eff}	**9.72**	in
Flow Coefficient	C	**0.2141**	--

Summary for Pond 32P: STOR

Volume	Invert	Avail.Storage	Storage Description
#1	100.75'	7,888 cf	**Biofiltration Basin (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
100.75	4,585	0.0	0	0	4,585
101.00	4,804	100.0	1,174	1,174	4,812
101.50	5,254	100.0	2,514	3,687	5,279
102.25	5,955	100.0	4,201	7,888	6,008

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	**12.0" Round Outlet** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 96.00' / 95.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	100.75'	**10.0" W x 3.0" H Vert. Mid-flow Orifice X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.50'	**36.0" x 36.0" Horiz. Grate** C= 0.600 in 36.0" x 36.0" Grate (100% open area) Limited to weir flow at low heads

Stage-Discharge for Pond 32P: STOR

Elevation (feet)	Primary (cfs)
100.75	0.00
100.80	0.06
100.85	0.17
100.90	0.31
100.95	0.48
101.00	0.67
101.05	0.82
101.10	0.94
101.15	1.04
101.20	1.14
101.25	1.22
101.30	1.30
101.35	1.38
101.40	1.45
101.45	1.52
101.50	1.58
101.55	2.08
101.60	2.95
101.65	4.04
101.70	5.33
101.75	6.78
101.80	8.38
101.85	10.10
101.90	10.98
101.95	11.04
102.00	11.09
102.05	11.14
102.10	11.19
102.15	11.24
102.20	11.29
102.25	**11.34**

Drawdown Calculation for BMP-A

Project Name HOF

Project No 3537

Surface Drawdown Time:	5.7	**hr**
Surface Area	**3947**	**sq ft**
Underdrain Orifice Diameter: in	**1.6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.75**	ft
Amended Soil Depth:	**1.5**	ft
Permavoid Depth:	**2.5**	ft
Orifice Q =	**0.145**	cfs
Effective Depth	41.1	in
Infiltration controlled by orifice	1.592	in/hr

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES

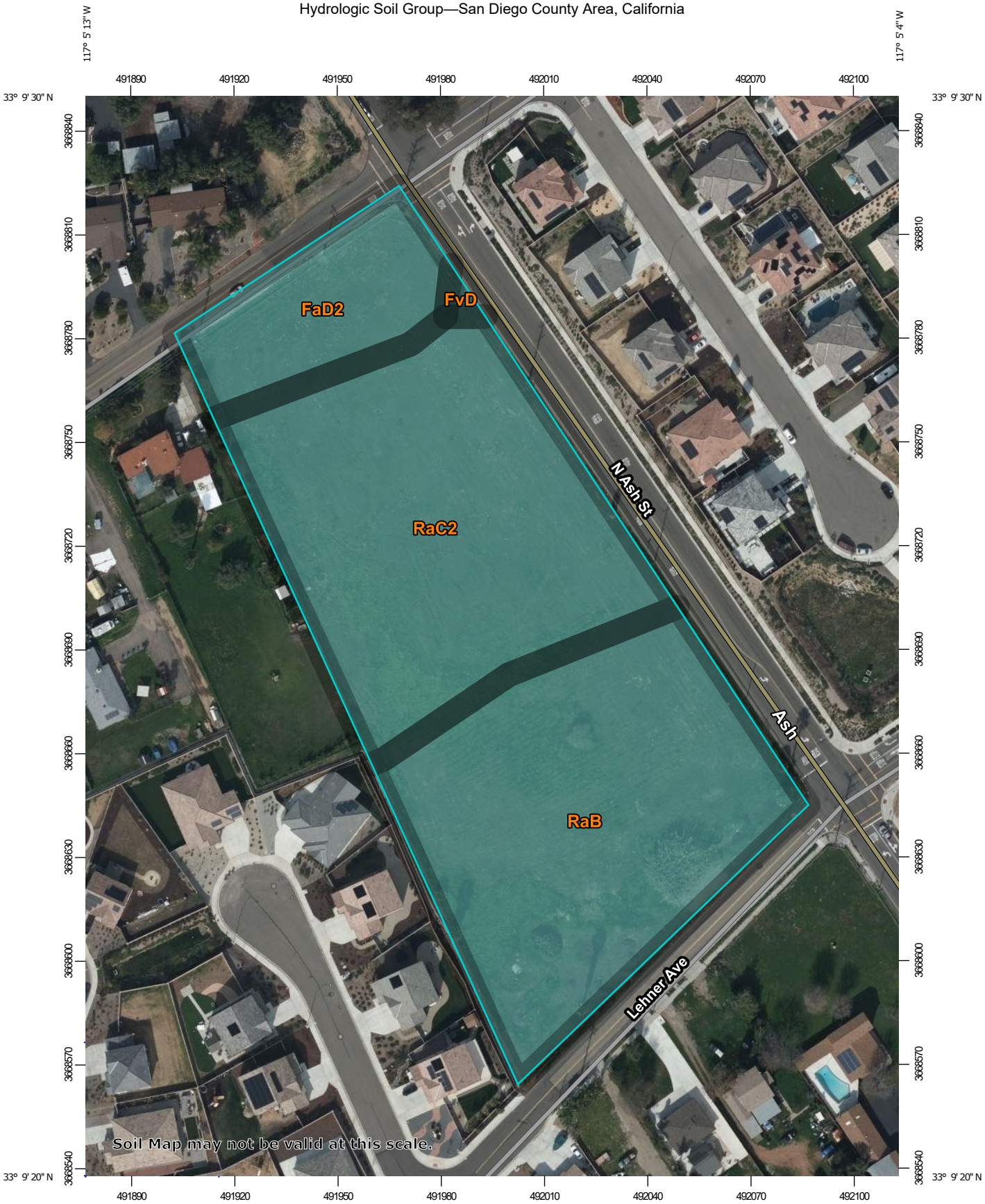
Manning's *n* Values for Overland Flow[1]

The BMP Design Manuals within the County of San Diego allow for a land surface description other than short prairie grass to be used for hydromodification BMP design only if documentation provided is consistent with Table A.6 of the SWMM 5 User's Manual.

In January 2016, the EPA released the SWMM Reference Manual Volume I – Hydrology (SWMM Hydrology Reference Manual). The SWMM Hydrology Reference Manual complements the SWMM 5 User's Manual by providing an in-depth description of the program's hydrologic components. Table 3-5 of the SWMM Hydrology Reference Manual expounds upon Table A.6 of the SWMM 5 User's Manual by providing Manning's *n* values for additional overland flow surfaces. Therefore, in order to provide SWMM users with a wider range of land surfaces suitable for local application and to provide Copermittees with confidence in the design parameters, we recommend using the values published by Yen and Chow in Table 3-5 of the EPA SWMM Reference Manual Volume I – Hydrology. The values are provided in the table below:

Overland Surface	**Manning value (*n*)**
Smooth asphalt pavement	0.010
Smooth impervious surface	0.011
Tar and sand pavement	0.012
Concrete pavement	0.014
Rough impervious surface	0.015
Smooth bare packed soil	0.017
Moderate bare packed soil	0.025
Rough bare packed soil	0.032
Gravel soil	0.025
Mowed poor grass	0.030
Average grass, closely clipped sod	0.040
Pasture	0.040
Timberland	0.060
Dense grass	0.060
Shrubs and bushes	0.080
Land Use	
Business	0.014
Semibusiness	0.022
Industrial	0.020
Dense residential	0.025
Suburban residential	0.030
Parks and lawns	0.040

[1]Content summarized from *Improving Accuracy in Continuous Simulation Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region* (TRWE, 2016).



Map Scale: 1:1,520 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 16, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 24, 2020—Feb 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	C	0.7	12.9%
FvD	Fallbrook-Vista sandy loams, 9 to 15 percent slopes	C	0.0	0.4%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	2.3	42.9%
RaC2	Ramona sandy loam, 5 to 9 percent slopes, eroded	C	2.3	43.8%
Totals for Area of Interest			**5.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

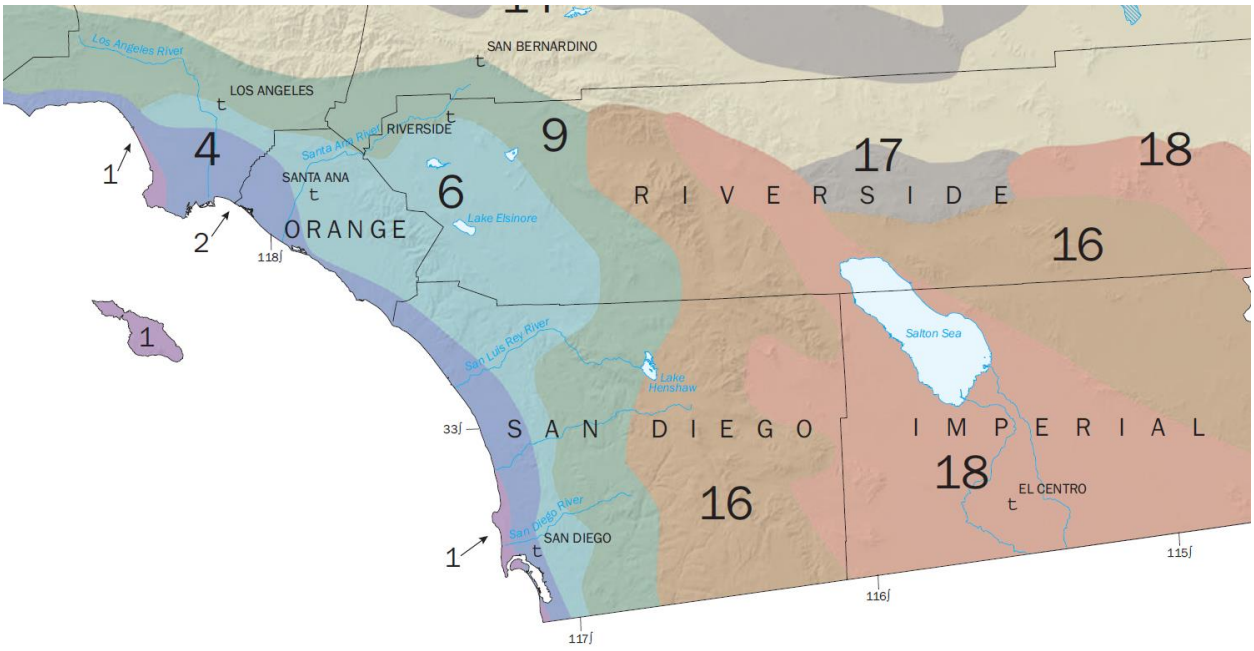


Figure G.1-2: California Irrigation Management Information System "Reference Evapotranspiration Zones"

Table G.1-1: Monthly Average Reference Evapotranspiration by ETo Zone (inches/month and inches/day) for use in SWMM Models for Hydromodification Management Studies in San Diego County CIMIS Zones 1, 4, 6, 9, and 16 (See CIMIS ETo Zone Map)

	January	February	March	April	May	June	July	August	September	October	November	December
Zone	in/month	in/month	in/month	in/month	in/month	in/month	in/month	in/month	in/month	in/month	in/month	in/month
1	0.93	1.4	2.48	3.3	4.03	4.5	4.65	4.03	3.3	2.48	1.2	0.62
4	1.86	2.24	3.41	4.5	5.27	5.7	5.89	5.58	4.5	3.41	2.4	1.86
6	1.86	2.24	3.41	4.8	5.58	6.3	6.51	6.2	4.8	3.72	2.4	1.86
9	2.17	2.8	4.03	5.1	5.89	6.6	7.44	6.82	5.7	4.03	2.7	1.86
16	1.55	2.52	4.03	5.7	7.75	8.7	9.3	8.37	6.3	4.34	2.4	1.55
	January	February	March	April	May	June	July	August	September	October	November	December
Days	31	28	31	30	31	30	31	31	30	31	30	31
Zone	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day
1	0.030	0.050	0.080	0.110	0.130	0.150	0.150	0.130	0.110	0.080	0.040	0.020
4	0.060	0.080	0.110	0.150	0.170	0.190	0.190	0.180	0.150	0.110	0.080	0.060
6	0.060	0.080	0.110	0.160	0.180	0.210	0.210	0.200	0.160	0.120	0.080	0.060
9	0.070	0.100	0.130	0.170	0.190	0.220	0.240	0.220	0.190	0.130	0.090	0.060
16	0.050	0.090	0.130	0.190	0.250	0.290	0.300	0.270	0.210	0.140	0.080	0.050

ATTACHMENT 2b

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)

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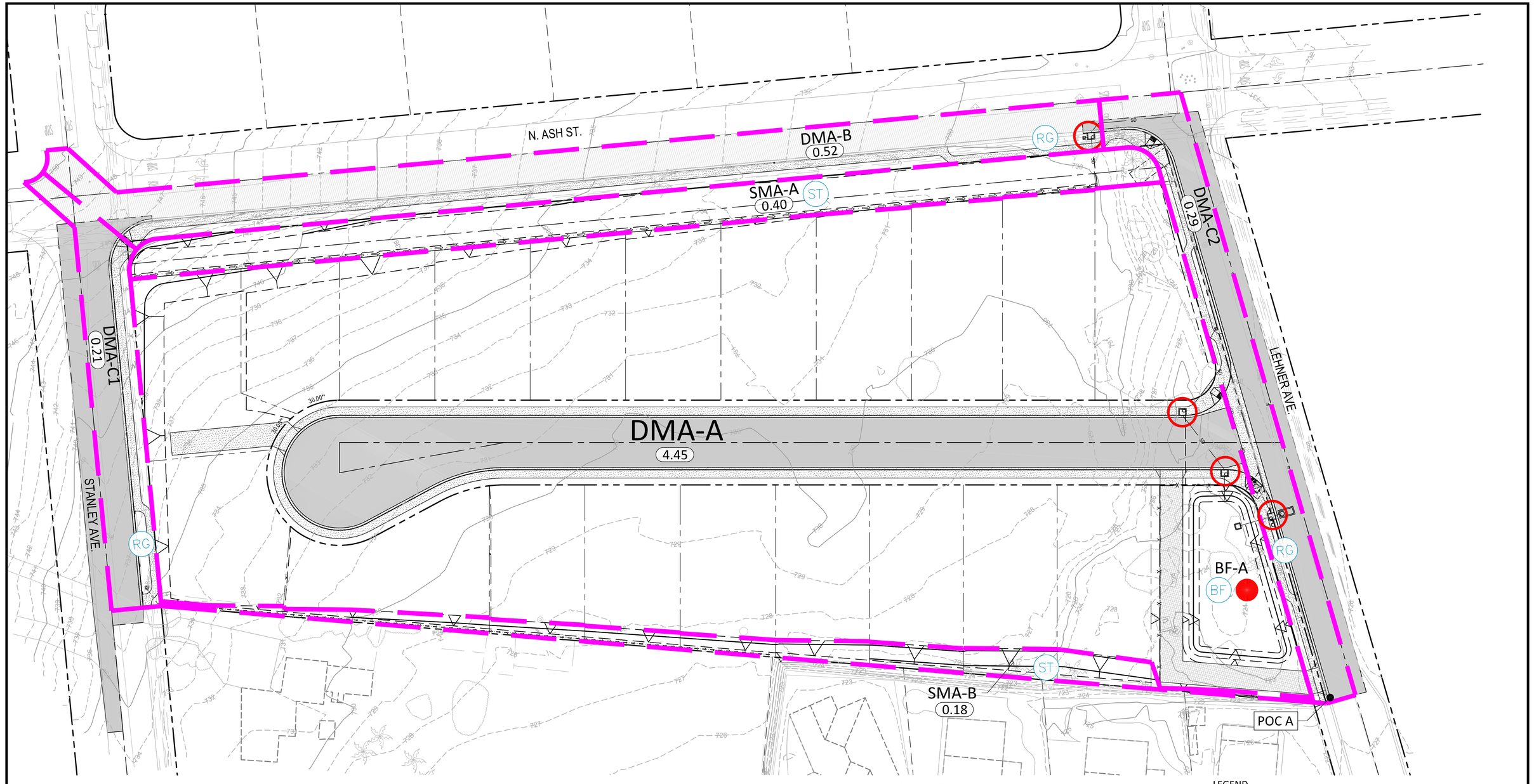


GENERAL INFORMATION

RECEIVING WATERS - ESCONDIDO CREEK

SOIL INFORMATION

SOIL: TYPE C

GROUND WATER INFORMATION

HISTORIC GROUNDWATER LEVELS BETWEEN 2-28± FEET. SEE REPORT PREPARED IN SEPTEMBER 2021 BY PETRA GEOSCIENCES.

WATER QUALITY TECHNICAL REPORT

TITLE - PRIORITY DEVELOPMENT PROJECT STORM WATER QUALITY MANAGEMENT PLAN FOR ESCONDIDO ASSEMBLAGE - HOFTIEZER PTM
DATE - AUGUST 2022
PREPARED BY - PASCO LARET SUITER & ASSOCIATES

MAINTENANCE AGREEMENT DOCUMENT

TITLE -
DATE -
PREPARED BY -

OPERATIONS AND MAINTENANCE PLAN

TITLE -
DATE -
PREPARED BY -

RESPONSIBLE PARTY INFORMATION

NAME - ARGUS LAND COMPANY
ADDRESS - 30200 RANCHO VIEJO RD., SUITE B
SAN JUAN CAPISTRANO, CA 92675

BMP NOTES

1. THESE BMPS ARE MANDATORY TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS OR THERE PLANS.
2. NO CHANGES TO BE PROPOSED BMPS ON THIS SHEET WITHOUT PRIOR APPOVAL FROM THE CITY ENGINEERING DEPARTMENT.
3. NO SUBSTITUTIONS TO THE MATERIAL TYPES OR PLANTING TYPES WITHOU PRIOR APPROVAL FROM THE LAND DEVELOPMENT ENGINEER.
4. NO OCCUPANCY WILL BE GRATED UNTIL THE CITY INSPECTOR STAFF HAS INSPECTED THIS PROJECT FOR APPROPRIATE BMP CONSTRUCTION AND INSTALL.

TREATMENT CONTROL BMPS

VOLUME-BASED BIOFILTRATION BASIN — BF

SELF-TREATING DMA — ST

"GREEN STREET" RAIN GARDEN — RG

SOURCE CONTROL BMPS

INLET STENCILING

DMA SUMMARY

DRAINAGE MANAGEMENT AREA (DMA)	TOTAL AREA (SF/AC)	TOTAL IMPV. AREA (SF/AC)	TOTAL PERV. AREA (SF/AC)	DMA TYPE	BMP TYPE	BMP NAME	BMP AREA PROVIDED (SF)
DMA-A	193,921/ 4.45	88,742/ 2.04	105,179/ 2.41	DRAINS TO BMP	BIOFILTRATION BASIN (BF-A)	BF-A	3,947
DMA-B	22,813/ 0.52	18,633/ 0.43	4,180/ 0.09	DRAINS TO BMP	"GREEN STREET" RAIN GARDEN	RG	N/A
DMA-C1	9,104/ 0.21	7,631/ 0.18	1,473/ 0.03	DRAINS TO BMP	"GREEN STREET" RAIN GARDEN	RG	N/A
DMA-C2	12,681/ 0.29	11,401/ 0.26	1,280/ 0.03	DRAINS TO BMP	"GREEN STREET" RAIN GARDEN	RG	N/A

SCALE: 1" = 30'
0 30 60 90

LEGEND

MAJOR BASIN BOUNDARY
HMP POINT OF COMPLIANCE — POC H
HYDROLOGIC AREA (AC) — 0.60
PROPOSED HARDSCAPE/IMPERVIOUS AREA
PROPOSED LANDSCAPING/PERVIOUS AREA
PROPOSED CL 2 BASE (PERVIOUS) ACCESS ROAD

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 949.661.6695 | www.plsaengineering.com

ESCONDIDO ASSEMBLAGE
HOFTIEZER STREET "A"
POST-PROJECT DMA/HMP EXHIBIT

08/09/2022

DRAWING:
SHEET 1 OF 1

N. ASH ST.

STANLEY AVE.

LEHNER AVE.

DMA-A

6.05

POC A

LEGEND

MAJOR BASIN BOUNDARY

HMP POINT OF COMPLIANCE — POC H

HYDROLOGIC AREA (AC) — 0.60

EXISTING HARDSCAPE/IMPERVIOUS AREA

EXISTING LANDSCAPING/PERVIOUS AREA

SCALE: 1" = 30'

0 30 60 90

PREPARED BY:

PASCO LARET SUITER & ASSOCIATES

San Diego | Solana Beach | Orange County

Phone 949.661.6695 | www.plsaengineering.com

ESCONDIDO ASSEMBLAGE

HOFTIEZER STREET "A"

PRE-PROJECT DMA/HMP EXHIBIT

08/09/2021

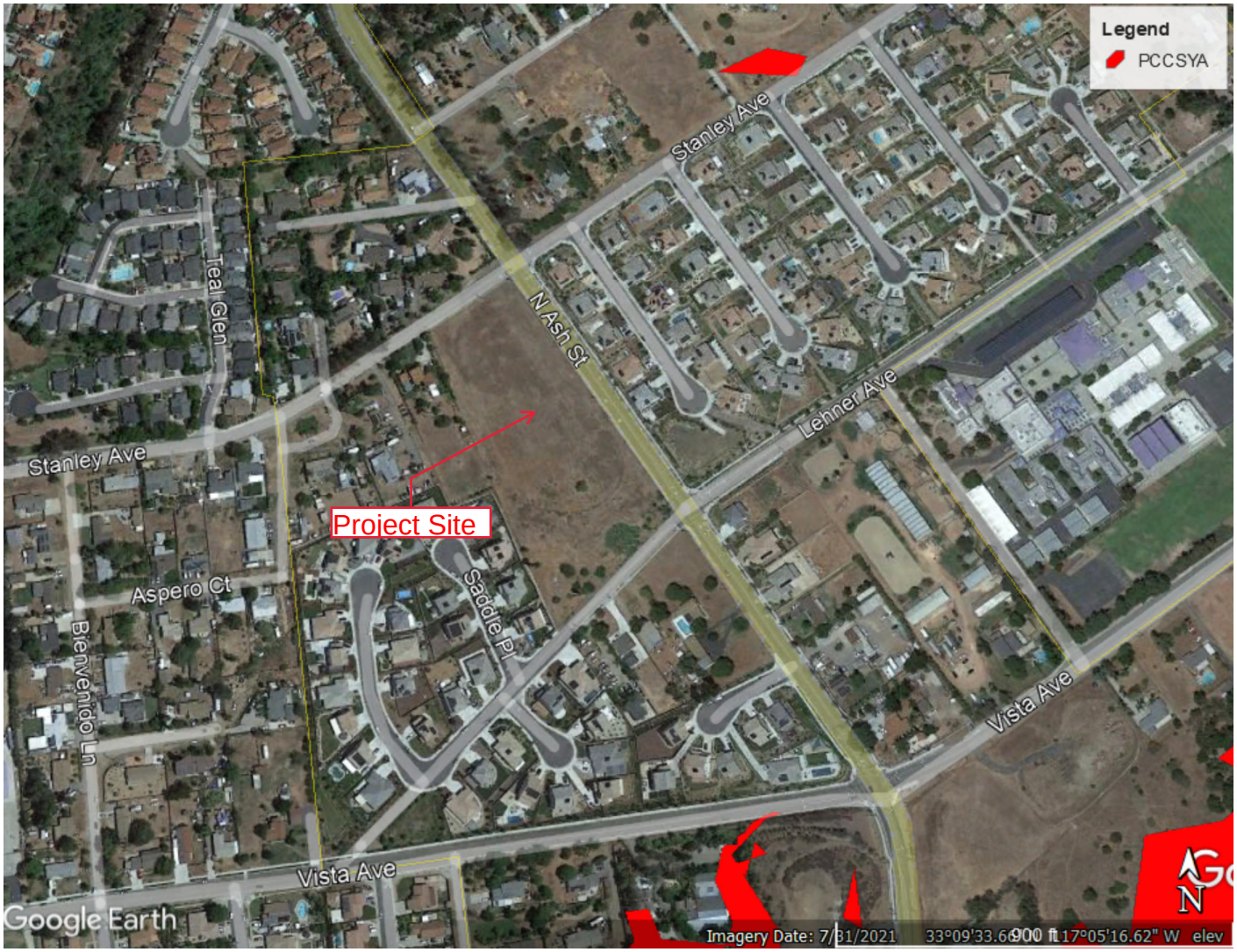
DRAWING:

SHEET 1 OF 1

SAVE DATE: 12/03/21 ~ PLOT DATE: 08/09/22 ~ FILE NAME: J:\ACTIVE JOBS\3537 ESCO ASSEMBLAGE\CIVIL\REPORTS\HOFTSWQMP\SWMM\3537-HOF_HMP-PRE.dwg

ATTACHMENT 2c

Potential Critical Coarse Sediment Yield Areas Regional San Diego County Watersheds



Source: 2015 Regional Potential Critical Coarse Sediment Yield Area Mapping Google Earth kmz file from www.projectcleanwater.org

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 Storm Water Control Facilities Maintenance Agreement (SWCFMA) (when applicable)	☐Included ☐Not Applicable

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ATTACHMENT 3a

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 Storm Water 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 City's standard format (PDP applicant to contact City staff to obtain the current maintenance agreement forms or download from City's website).

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Bioretention Factsheet

1.0 General Description

Figure 1. Bioretention

Potential Treatment Mechanisms								
I	ET	FA	B	RH	S	F	P	T
✓*	✓	✓	✓		✓		✓	✓

Legend:
I = Infiltration
ET = Evapotranspiration
FA = Filtration and/or Adsorption
B = Biochemical Transformation
RH = Rainfall and Runoff Harvest
S = Sedimentation
F = Floatation
P = Plant Uptake
T = Trash Capture

*For unlined systems

Bioretention planters are depressed landscapes into which runoff is directed and allowed to collect, filter, and sometimes infiltrate. These planters come in a variety of configurations. All include a few inches of ponding depth (often 4 to 6 inches). A raised inlet allows a means of bypass in case of overflows. Under the ponding zone is the planting zone. The planting zone is constructed using various media blends that support growth and filter and retain pollutants. Mulch is sometimes applied over the planting zone for plant health and weed management. The ponding zone temporarily stores runoff and promotes percolation into the planting mix and bioretention mix below. In addition to storing the runoff in its pore structure, the bioretention mix filters and biotreats the runoff. In some configurations, water drains into a subsurface storage layer (typically gravel or porous road base) below the bioretention mix. These systems are preferably unlined to allow infiltration into the underlying native soils. A perforated underdrain can be located at the top of the storage component to reduce the amount of untreated overflows that can occur where the soil type or available area limit infiltration. A schematic of this configuration is shown in Figure 2.

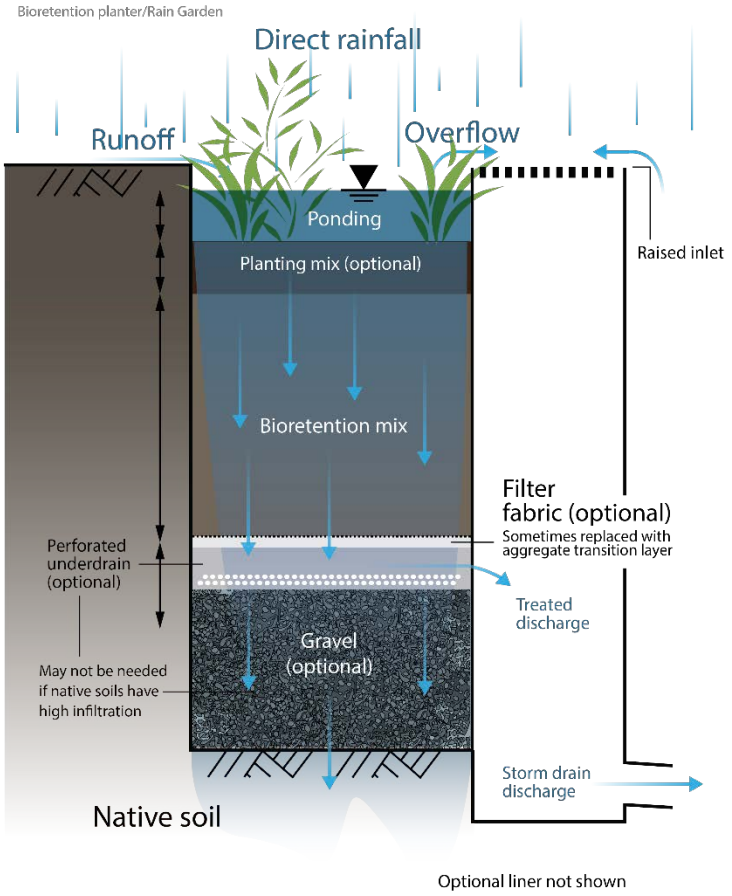


Figure 2. Schematic of a basic bioretention planter

Topsoil may or may not be used within the planters. Some practitioners argue topsoil is necessary for plant growth in some climates, while others believe it is not needed and hinders infiltration. Some use a geotextile fabric placed below the bioretention mix in configurations with gravel storage to prevent the smaller-sized bioretention mix particles from migrating into the storage zone and possibly escaping via the underdrain. Alternatively, to avoid possible fabric clogging, some practitioners use a transitional-sized aggregate or a porous base with smaller pore spaces than gravel.

Bioretention Factsheet

1.1 Variations and Alternative Names

- Rain gardens
- Lined bioretention planters
- Infiltrating stormwater planters
- Bioretention cells/planters
- Vegetated filters
- Biotreatment

2.0 Advantages & Limitations

2.1 Advantages

- ✓ When done well, rain gardens can be both inexpensive and add aesthetic appeal
- ✓ Can create habitat
- ✓ Can be used in areas with limited space
- ✓ Can optimize load reduction by allowing both infiltration and filtration (treat and discharge) components

2.2 Limitations

- × Requires terracing for steeper slopes
- × Limited to a small contributing drainage area

3.0 Siting

The site should be relatively flat and, in some climates, irrigation should be available during the dry season.

4.0 Design Considerations

When designing a bioretention planter or rain garden, the following parameters should be considered:

- ❑ Contributing drainage area
- ❑ Flat layers (no slope)
- ❑ Design volume
- ❑ Drawdown time
- ❑ Transitional side slopes
- ❑ Surcharge depth
- ❑ Soil types and media
- ❑ Layer depths (ponding, planting, and subsurface storage)
- ❑ Area
- ❑ Underdrain
- ❑ Overflow
- ❑ Containment curb/curb cuts (optional)
- ❑ Precise inlet, overflow, and media depth elevations
- ❑ Hydraulic soil group of existing subsurface material at final excavation depth
- ❑ Planting mix design
- ❑ Storage layer:
  - o Usually when underdrain is used
  - o Media type
  - o Media depth
- ❑ Liners for high groundwater or contaminated soils
- ❑ Soils testing of delivered fill material

5.0 Construction Considerations

- ❑ Stabilize drainage area or divert any flows to prevent sediment loading and/or erosion during construction

- ❑ Replace plants damaged during construction
- ❑ Provide temporary irrigation until plants are established
- ❑ Ensure correct elevation before and during concrete work

6.0 MAINTENANCE

- ❑ Plant management
  - o Identification and promotion of desired species
  - o Removal of unwanted species (not all volunteer species are undesirable)
  - o Increased plant density can decrease weeds
- ❑ Litter removal (for areas prone to litter)
- ❑ Inspections for standing water to prevent mosquitos and other vector breeding
  - o Top layer of the planter may need to be replaced if standing water becomes a chronic issue

7.0 REFERENCES

California Stormwater Quality Association (CASQA 2003). *Stormwater Best Management Practice Handbook: New Development and Redevelopment*. January 2003.

California Stormwater Quality Association (CASQA 2017). *Draft Stormwater Best Management Practice Handbook: New Development and Redevelopment*. April 2017.

County of Placer, City of Roseville, City of Auburn, City of Lincoln, and Town of Loomis (County of Placer et al. 2016). *West Placer Storm Water Quality Design Manual*. April 2016.

Sacramento Stormwater Quality Partnership (SSQP 2018). *Stormwater Quality Design Manual*. July 2018.

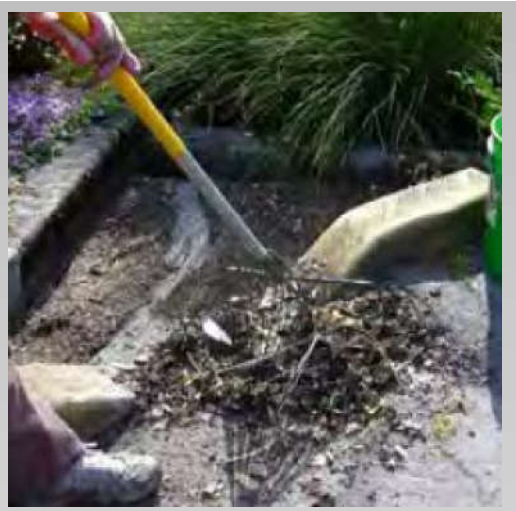
4.2 MAINTENANCE

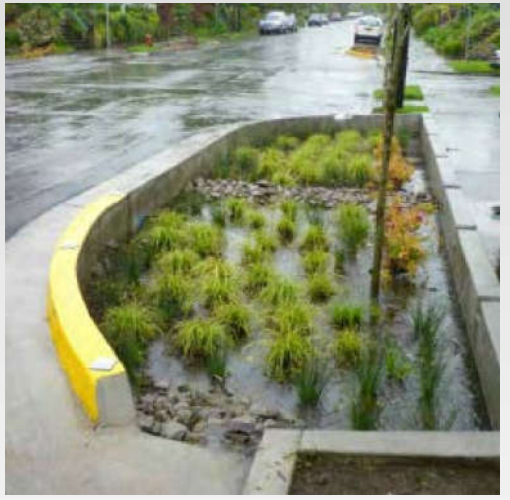
Implementing green infrastructure and Low Impact Development (LID) practices requires maintenance to keep them attractive and functioning. Maintenance levels of care should be considered during the design phase and plants selected from the Green Streets Plant List according to the following levels:

- Low level of care: Annual maintenance; no irrigation
- Medium level of care: Quarterly maintenance; some water available
- High level of care: Monthly maintenance; site is potentially irrigated

San Diego County DPW is typically responsible for maintaining publicly-installed green infrastructure and LID facilities within their right-of-way. The final determination of maintenance responsibility is determined during project review. Private installations must have a maintenance covenant from the owner. Residents can help with maintenance by removing trash and weeds. Refer to the Green Streets Maintenance Schedule for frequency and detail of maintenance.

Type of Maintenance	Dispersion Areas and Biofiltration	Permeable Pavement	Tree Space
Inspect after storms	•	•	
Remove trash/sediment/leaves	•	•	•
Clean inlets/outlets	•		
Adjust mulch and/or stone	•		
Water for establishment	•		•
Weed/remove invasive species	•		•
Prune (as needed)	•		•
Replace mulch (3" depth)	•		•
Street sweeper/vacuum (as needed)		•	





4.3 FUNDING

Funding mechanisms for Green Streets maintenance may include:

- Community Service Districts
- Home Owner's Associations or other private sources

BF-1
Biofiltration

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP BF-1 BIOFILTRATION

Biofiltration 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. Biofiltration 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. Typical biofiltration 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 climate and ponding depth
- Non-floating mulch layer
- 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

Normal Expected Maintenance

Biofiltration requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations

Biofiltration is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

BF-1
Biofiltration

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable	• Inspect annually. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
Standing water in BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

References

American Mosquito Control Association.
http://www.mosquito.org/
California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook
County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html
San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet BF-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

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BF-1
Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

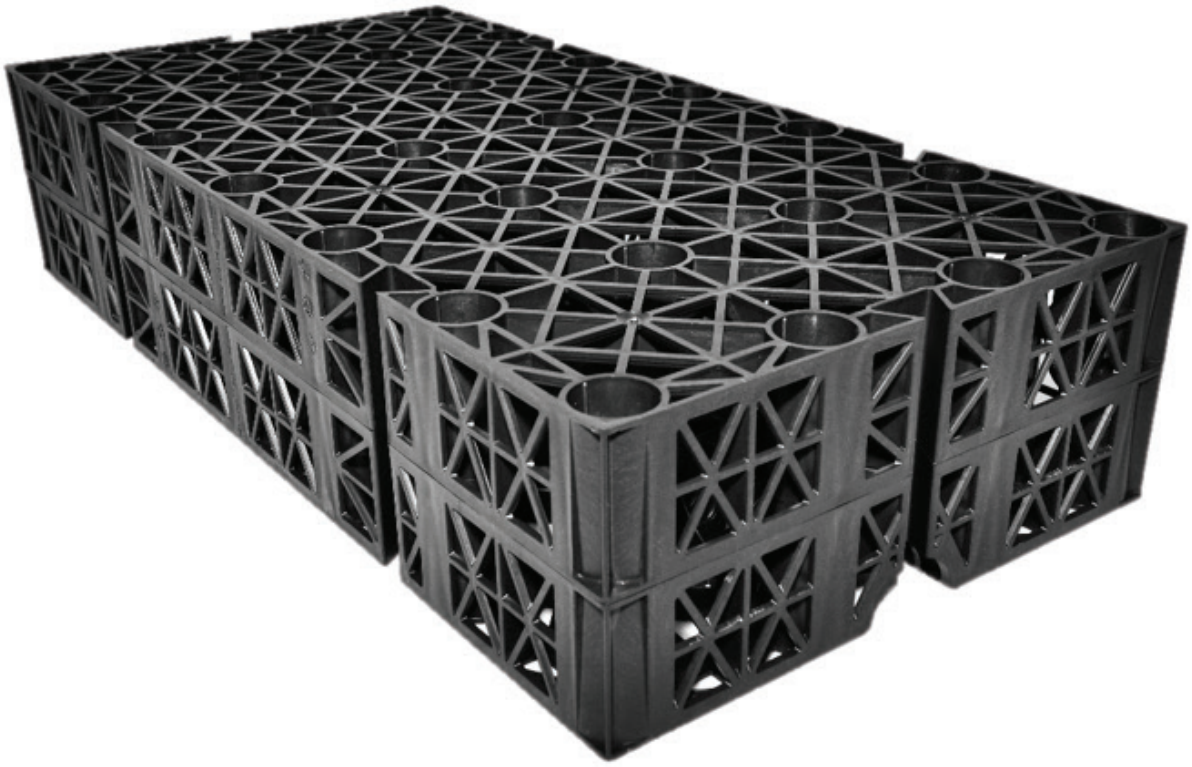
INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

Permavoid®

CIRIA C680
Geo Structural Evaluation Highlights



ABT, INC.
WATER MATTERS

Why CIRIA C680

Sustainability has become synonymous with renewable resources. However, there is a forgotten piece to the circular use of our resources. Structural longevity or “life cycle & life safety” of any structure not only reduces the cost of ownership but exponentially increases the sustainability of our resources. As with any complex equation we would include all of its components.

ABT has been at the forefront of infinite design life for many years. We define ourselves by our development of robust parts that minimize maintenance and replacement. We always have. So, as we began to add components to our “Water Matters” portfolio to accommodate Low Impact Development implementation, the design, function and sustainability of these components were at the top of the list. And as with all initiatives, measurement and validation were necessary. ASTM International subcommittee F17.65 was created to develop a standard for design of modular stormwater collection chambers. Until this standard is established they have recognized CIRIA C680 as the only known standard for these systems. Fortunately for us the Construction Industry Research and Information Association (CIRIA) from the United Kingdom has developed the most complete standard for product evaluation. Hence this brief catalog to assist the design community in product evaluation.


CIRIA C680 London, 2008

Structural design of modular geocellular drainage tanks

Steve Wilson
The Environmental Protection Group Limited

CIRIA sharing knowledge ■ building best practice

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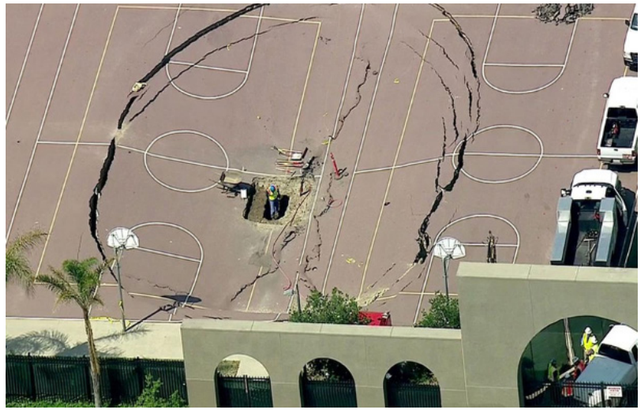
Construction Industry Research and Information Association (CIRIA) C680 is recognized by the American Society of Testing Materials (ASTM) as the standard for design of modular stormwater collection chambers.

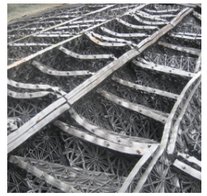
As the demand to control storm water at its source has increased, ponds have lost favor and the use of modular Geo Cellular units have increased. As the engineer of record carries the design liability it is critical applicable test methods be established to determine both short- and long-term suitability.

The American Society of Testing Materials (ASTM) typically fulfills the above role. However, in the case of these buried structures they currently refer to CIRIA C680 (See below).

“The only relevant document relating to the design and testing of modular stormwater collection chambers (as I am aware) is the Construction Industry Research and Information Association (CIRIA) C680 guidance document developed in Britain. ASTM standards have been developed with a similar scope for arch-shaped collection chambers (F2787, F2922, and F2418), though no equivalent standard yet exists for modular (box-type) systems. This is despite the fact that these types of systems are becoming increasing popular, and several failures associated with these systems have occurred in practice.”

https://www.astm.org/DATABASE.CART/WORKITEMS/WK47898.htm





From CIRIA C680

"Frequently engineers, architects and clients rely on manufacturers' claims regarding the load carrying capacity of these types of tank. However, it is important to realize that these tanks are structures and should be designed by competent engineers using sound structural and geotechnical principles as they may be used below areas that are trafficked by heavy goods vehicles that can impose significant loads on them." *CIRIA C680, pg. 1*

SGH—Same Conclusions

Simpson Gumpertz & Heger Inc. (SGH) is a national engineering firm that designs, investigates, and rehabilitates structures, building enclosures, and materials.

Following is a case study illustrating the above:

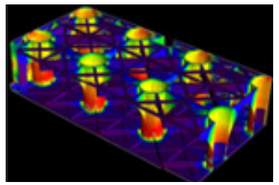
"The new Fluvanna County High School included four buried, stackable crate-type, stormwater detention systems under deep cover. Shortly after installation in 2010, the contractor observed that the backfill material over two of the detention systems had settled several feet. SGH investigated the cause of failure." *Simpson Gumpert*

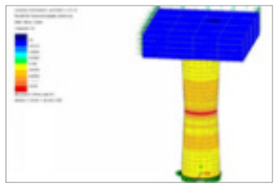
Conclusion

SGH determined that the short-term compression strength of the units was substantially less than that reported by the manufacturer and supplier. We concluded that even at the manufacturer's reported strength, the units were inadequate to safely support long-term loads with an appropriate safety factor. Through our material testing, we demonstrated that the recycled plastics used in the units exhibited highly variable material and mechanical properties, further compromising the structural capacity of the units.

Theoretically, structural products should be proved by several means.

Finite Element Analysis





Laboratory Testing

Field Scale Testing

System \ Element	Vertical Ultimate Strength (psi)	Vertical Yield Strength (psi)	Lateral Yield Strength (psi)	Modulus of Subgrade Reaction (psi/in)	Tensile Strength (lb)	Bending Stiffness (lb-ft)	100 Year Creep Limit (psi)	Max. Aperture (in)
permavoid	168	104	23	486	506	524	24	1.42
[illegible]	43	x	x	x	x	x	x	x
[illegible]	44	x	x	x	x	x	x	x
[illegible]	x	x	x	x	x	x	x	x
[illegible]	65	x	x	x	x	x	x	x
[illegible]	23	x	x	x	x	x	x	x

More Excerpts CIRIA C680

"Geocellular units are not all the same…Engineers who are responsible for approving tank design should undertake their own independent structural design calculations and should ask manufacturers for the necessary test data to allow them to do so." *CIRIA C680, pg. 2*

Be on the watch for the Weak Four.

"The four main contributing factors to most failures are:

1. Inadequate design, often not taking account of particular ground conditions on a site, or not allowing for creep of the units.
2. Lack of understanding of the performance of the tanks, leading to overloading, for example by running heavy plant across tanks that were not designed to carry such loads, or by using unsuitable backfill, for example containing boulders.
3. Lack of appreciation of the influence of groundwater levels or the effect of surface water flows into excavations during construction.
4. Inappropriate laboratory testing that overestimates the strength of the units."

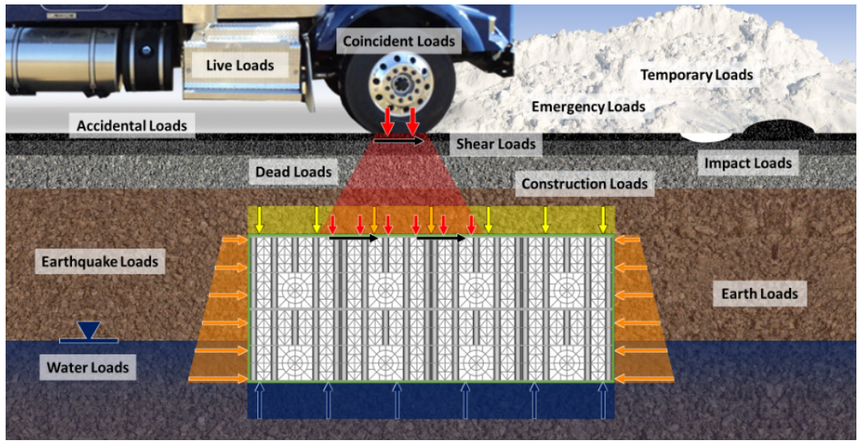
CIRIA C680, pg. 2 See Figure 1.3, pg. 3

Appropriate testing should include…

- Short term compressive strength at yield
- Deflection parameters
- Long term creep
- Cyclic testing (fatigue)
- Plastic deterioration
- Monitored construction

CIRIA C680, pg.2 See Figure 1.3, pg. 3

If you have the time to do it right the second time, then you had the time to do it right the first time!



Popular types of geocellular structures:

1. Injection molded units with internal columns
2. Subbase replacement systems (specific type of injection molded unit)
3. Honeycomb structures
4. Plate structures (boxes that are made from individual injection molded plates.)
5. Plastic profiled sheet structures

CIRIA C680, pg.7–11

Common materials used

- Polypropylene
- HDPE (high density polyethylene)
- PVC (polyvinyl chloride)

Know what surface you are designing underneath.

"The product data for modular units should include data on the rate of deflection under loads so that designers can limit deflections to an acceptable level." *CIRIA C680, pg.17*

Understand the bending parameters.

"Bending also occurs in the individual elements, columns and sheets of the other types of tanks. This has implications when interpreting laboratory test results that are designed to provide simplified design information." *CIRIA C680, pg.18 See Figure 2.15*

A weak joint can be the limiting factor to a unit or a system of units.

"For example, if a unit is manufactured using a strong material but has a weak joint somewhere the joint may dictate the overall performance." *CIRIA C680, pg. 21*

Heavy goods vehicles or distributed load?

Static load testing should be done with a plate covering the entire unit to represent a distributed load, as well as, with a smaller plate to represent an HGV tire load. *CIRIA C680, pg.23*

Temperature affects design.

"The behavior of plastics is affected by temperature. For example, as temperature increase their compressive strength reduces and creep increases. At lower temperatures they become more brittle…There have been cases where stormwater has been at an elevated temperature caused by it flowing over a car park surface that had become heated by the sun." *CIRIA C680, pg.19*

In the end

It is not uncommon to require physical data to be submitted so that a proper structural evaluation can occur.

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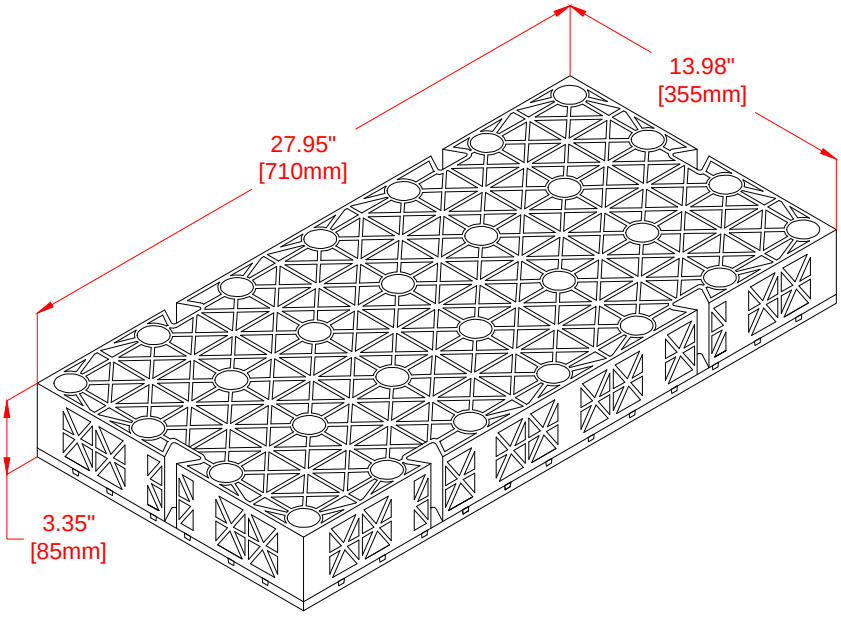
www.abtdrains.com
Toll-free: 800.438.6057
Phone: 704.528.6806

10/26/2020

Permavoid 85

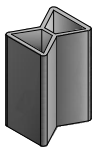
Data Sheet 03-20

Permavoid 85 (PV85) structural cells are multi-functional water management solutions that promote sustainable stormwater behavior. The interconnected, high-strength units create a patented subbase replacement system that attenuates stormwater flows and, when feasible, promotes infiltration even beneath impervious surfaces. Units can be stacked to create multi-layer tanks to fit nearly any site constraints while eliminating the need for traditional conveyance schemes. Permavoid systems can also enhance landscape resiliency through patented capillary cylinders that wick stormwater up toward vegetation without the need for sprinklers, pumps or energy. Permavoid systems are the foundation of resilient, sustainable infrastructure.



PHYSICAL PROPERTIES		
Material	Polypropylene	
Weight per unit	5.08 lbs	2.30 kg
Length	27.95 in	710 mm
Width	13.98 in	355 mm
Depth	3.35 in	85 mm
Area per unit	2.713 ft²	0.252 m²
Occupied volume per unit	0.757 ft³	0.0214 m³
STRUCTURAL PROPERTIES		
Vertical compressive yield	103.7 psi	715 kPa
Lateral compressive yield	22.6 psi	156 kPa
Vertical deflection strength	464 psi / in	126 kPa/mm
Lateral deflection strength	55.3 psi / in	15 kPa/mm
Tensile strength at single joint	6.15 psi	42.4 kPa
Vertical creep limit (100 year)	24 psi	165 kPa
HYDRAULIC PROPERTIES		
Average perforated surface area	46 %	
Volumetric void ratio	92 %	
Void volume per unit	0.696 ft³	0.0197 m³
Conveyance at 0.0% Slope	30 GPM / ft²	20.7 LPS / m²
Conveyance at 1.0% Slope	65 GPM / ft²	44.2 LPS / m²
Conveyance at 2.0% Slope	90 GPM / ft²	61.5 LPS / m²
Conveyance at 3.0% Slope	111 GPM / ft²	75.5 LPS / m²
OTHER PROPERTIES		
Recycled content	100 %	
Recyclability	100 %	
Country of origin	United States of America	

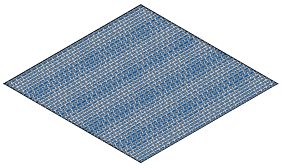
ACCESSORIES



Tie Connector (PVTIE)
1x required per tie slot

Shear Connector (PVSC)
1x required per unit between layers (traffic)
1x required per 3 units between layers (non-traffic)

Capillary Irrigation Cone (2 pieces)
PVWC-36/60 + PVWC-25/30
2x required per unit



Capillary Geotextile (Permatex CAP HP)
Required for capillary irrigation applications
All sides wrapped with 12" [300mm] lap joints min.

GEOTEXTILES

The following are for guidance only. Refer to design documents for site specific requirements.

1. Non-woven fabric for separation and/or infiltration:
   - Tencate - Mirafi 1100N (or approved equal)

2. Woven fabric for separation and/or infiltration:
   - Tencate - Mirafi HP270 (or approved equal)

3. Waterproof Membrane Liner for retention and/or detention:
   - 40 mil HDPE or LLDPE (or approved equal)

ABT, INC. WATER MATTERS
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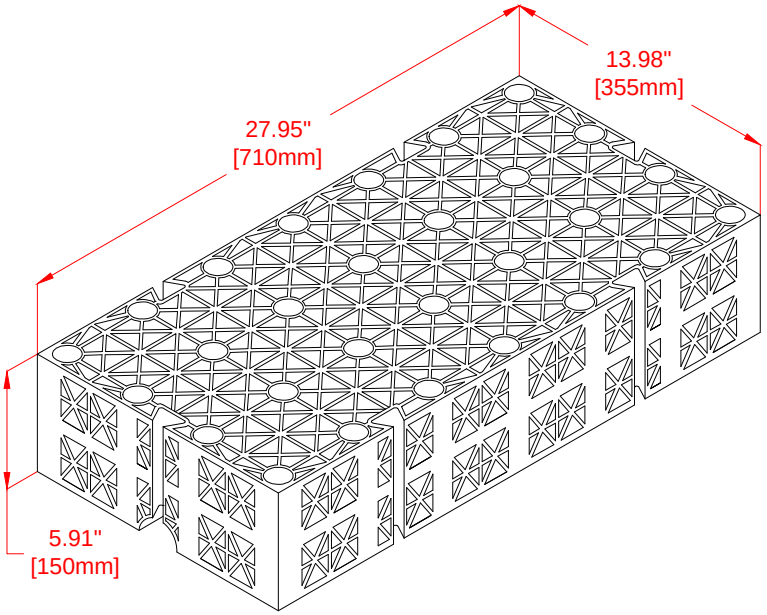
Permavoid 150

Data Sheet 03-20

Permavoid 150 (PV150) structural cells are multi-functional water management solutions that promote sustainable stormwater behavior. The interconnected, high-strength units create a patented subbase replacement system that attenuates stormwater flows and, when feasible, promotes infiltration even beneath impervious surfaces. Units can be stacked to create multi-layer tanks to fit nearly any site constraints while eliminating the need for traditional conveyance schemes. Permavoid systems can also enhance landscape resiliency through patented capillary cylinders that wick stormwater up toward vegetation without the need for sprinklers, pumps or energy to create the ultimate low impact solution.



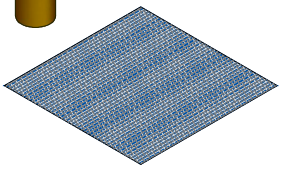
PHYSICAL PROPERTIES		
Material	Polypropylene	
Weight per unit	7.21 lbs	3.27 kg
Length	27.95 in	710 mm
Width	13.98 in	355 mm
Depth	5.91 in	150 mm
Area per unit	2.713 ft²	0.252 m²
Occupied volume per unit	1.335 ft³	0.0378 m³
STRUCTURAL PROPERTIES		
Vertical compressive yield	103.7 psi	715 kPa
Lateral compressive yield	22.6 psi	156 kPa
Vertical deflection strength	464 psi / in	126 kPa/mm
Lateral deflection strength	55.3 psi / in	15 kPa/mm
Tensile strength at single joint	6.15 psi	42.4 kPa
Bending resistance of unit	524 lb-ft	0.71 kN-m
Bending resistance of single joint	118 lb-ft	0.16 kN-m
Vertical creep limit (100 year)	24 psi	165 kPa
HYDRAULIC PROPERTIES		
Average perforated surface area	52 %	
Volumetric void ratio	95 %	
Void volume per unit	1.268 ft³	0.0359 m³
Conveyance at 0.0% Slope	74 GPM / ft²	50.2 LPS / m²
Conveyance at 1.0% Slope	119 GPM / ft²	81.6 LPS / m²
Conveyance at 2.0% Slope	139 GPM / ft²	94.2 LPS / m²
Conveyance at 3.0% Slope	157 GPM / ft²	106.7 LPS / m²
OTHER PROPERTIES		
Recycled content	100 %	
Recyclability	100 %	
Country of origin	United States of America	

ACCESSORIES

Tie Connector (PVTIE)
2x required per tie slot

Shear Connector (PVSC)
1x required per unit between layers (traffic)
1x required per 3 units between layers (non-traffic)

Capillary Irrigation Cone (2 pieces)
PVWC-35/42 + PVWC-27/113
2x required per unit



Capillary Geotextile (Permatex CAP HP)
Required for capillary irrigation applications
All sides wrapped with 12" [300mm] lap joints min.

GEOTEXTILES

The following are for guidance only. Refer to design documents for site specific requirements.

1. Non-woven fabric for separation and/or infiltration:
   - Tencate - Mirafi 1100N (or approved equal)

2. Woven fabric for separation and/or infiltration:
   - Tencate - Mirafi HP270 (or approved equal)

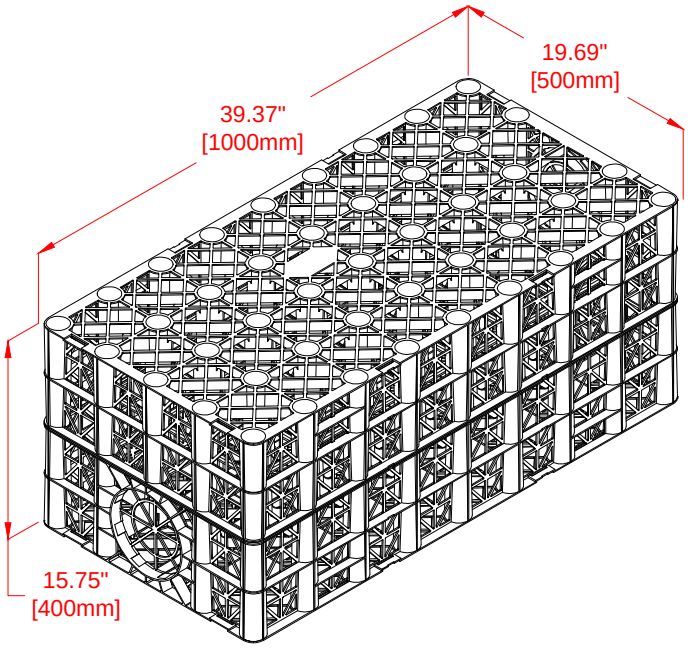
3. Waterproof Membrane Liner for retention and/or detention:
   - 40 mil HDPE or LLDPE (or approved equal)

ABT, INC. WATER MATTERS
P.O. Box 837
259 Murdock Road
Troutman, NC
(800) 438-6057
(704) 528-9806
www.ABTDRAINS.com

Permavoid 400MD

Data Sheet 03-20

Permavoid MD (PV400) structural cells are a water management solution designed for both stormwater quality and quantity. High-strength units capture large volumes of water and promote more natural stormwater behavior through infiltration, retention or detention. Water quality is also enhanced within the system through patented Biomat filtration. The floating composite adsorbs hydrocarbons on the water's surface and allows microbes to naturally digest and eliminate the pollutant. Permavoid MD is suitable for many stormwater management applications ranging from high-speed, heavy duty traffic through landscape areas.

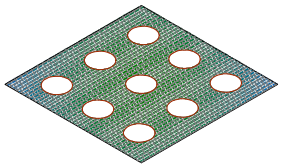


PHYSICAL PROPERTIES		
Material	Polypropylene	
Weight per unit	19.84 lbs	9.0 kg
Length	39.37 in	1000 mm
Width	19.69 in	500 mm
Depth	15.75 in	400 mm
Area per unit	5.382 ft²	0.500 m²
Occupied volume per unit	7.063 ft³	0.200 m³
STRUCTURAL PROPERTIES		
Vertical compressive yield	88.5 psi	610 kPa
Lateral compressive yield	9.1 psi	63 kPa
Vertical deflection strength	221 psi / in	60 kPa/mm
Lateral deflection strength	16.2 psi / in	4.4 kPa/mm
Vertical creep limit (60 year)	23.5 psi	162 kPa
Lateral creep limit (60 year)	4.5 psi	30.9 kPa
HYDRAULIC PROPERTIES		
Average perforated surface area	55 %	
Volumetric void ratio	95 %	
Void volume per unit	6.710 ft³	0.190 m³
OTHER PROPERTIES		
Recycled content	100 %	
Recyclability	100 %	
Country of origin	United States of America	

ACCESSORIES

Clip Connector (PVCLIP)
4x required per unit

Shear Connector (PVSP)
2x required per unit between layers



Biomat Filter ()
Floating hydrocarbon adsorbing / digesting filter
Oil retention capacity 0.184 oz./ft² [56 g/m²]

GEOTEXTILES

The following are for guidance only. Refer to design documents for site specific requirements.

1. Non-woven fabric for separation and/or infiltration:
   - Tencate - Mirafi 1100N (or approved equal)
2. Woven fabric for separation and/or infiltration:
   - Tencate - Mirafi HP270 (or approved equal)
3. Waterproof Membrane Liner for retention and/or detention:
   - 40 mil HDPE or LLDPE (or approved equal)

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(704) 528-9806
www.ABTDRAINS.com

ATTACHMENT 3b

FREE RECORDING REQUESTED
PURSUANT TO GOVERNMENT
CODE SECTION 27383
RECORDING REQUESTED BY:

CITY OF ESCONDIDO

WHEN RECORDED MAIL TO:

CITY ENGINEER
CITY OF ESCONDIDO
201 N. BROADWAY
ESCONDIDO, CA 92025

(SPACE ABOVE FOR RECORDER'S USE ONLY)

Documentary Transfer Tax $_____
Signature _____

STORM WATER CONTROL FACILITY MAINTENANCE AGREEMENT
APN NO. _____

THIS AGREEMENT for the design, construction, maintenance and repair of the Storm Water Control Facilities (SWCF(s)), installed on the property as identified in the San Diego County Assessor Tax Roll for 20__, as APN No. _____, and commonly known as _____, Escondido, California, ("Property") is entered into between the **CITY OF ESCONDIDO**, a municipal corporation ("CITY") and _____, Developer and/or Property Owner ("LOT OWNER(s)"), and in accordance with the CITY of Escondido Grading Plan No. GP__-_____ ("Grading Plan"). ("Agreement")

WHEREAS, installation and maintenance of Storm Water Control Facilities is required pursuant to the Escondido Municipal Code, the California Regional Water Quality Control Board ("RWQCB") and by the CITY as a condition of approval of property development; and

WHEREAS, LOT OWNER(s) is the owner of certain real property being developed that provides benefit to the general public and the CITY and meets the requirements of the California RWQCB Order R9-2013-0001 and National Pollution Discharge Elimination System No. CAS0109266 and subsequent amendments; and

WHEREAS, the current and future subdivision LOT OWNER(s) will use the SWCF(s) as installed per the Grading Plan and the provisions of the Storm Water Quality Management Plan ("Storm Water Plan") prepared by the LOT OWNER(s) and approved by the CITY on _____, 201__; and

WHEREAS, it is the mutual desire of the parties to this Agreement that the SWCF(s) be maintained in a safe and usable condition by the LOT OWNER(s); and

WHEREAS, it is the mutual desire of the parties to this Agreement to establish a method for the maintenance and repair of the SWCF(s); and

WHEREAS, the CITY shall have the right but not the obligation to enforce full compliance with the

terms and conditions of this Agreement; and

WHEREAS, it is the mutual intention of the parties that this Agreement constitute a covenant running with the land, binding upon each successive LOT OWNER of all or any portion of the property.

NOW, THEREFORE, IT IS HEREBY AGREED AS FOLLOWS:

1. The Property is benefited by this Agreement, and present and successive LOT OWNER(s) of all or any portion of the property are expressly bound hereby for the benefit of the land. In the event any of the herein described parcels of land are subdivided further, the LOT OWNER(s), heirs, assigns and successors in interest of each such newly created parcel shall be liable under this Agreement for their then pro rata share of expenses and such pro rata shares of expenses shall be computed to reflect such newly created parcels.

2. The cost and expense of maintaining the SWCF(s) shall be the responsibility of and paid by the LOT OWNER(s) or their heirs, assigns and successors in interest. The SWCF(s) shall be constructed and maintained by the LOT OWNER(s) in accordance with the CITY- approved Grading Plan and Storm Water Plan, on file with the CITY.

3. Repair and maintenance responsibilities for all structural SWCF(s) and required Best Management Practices associated with the project are set forth in the Storm Water Plan. LOT OWNER(s) shall, as changes occur, provide the CITY with the name, title, and phone number the persons or entities responsible for maintenance and reporting activity, the persons or entities responsible for funding, schedules and procedures for inspection and maintenance of the SWCF(s) and implementation of worker training requirements, and any other activities necessary to ensure BMP maintenance. The Storm Water Plan shall provide for the servicing of all SWCF(s) as needed and at least once during August or September of each year, and for the retention of inspection and maintenance records for at least three (3) years. LOT OWNER(s) shall submit annual certification to the CITY's Department of Engineering Services between September 1 and October 1 of each year until the property is redeveloped. The certification shall document all maintenance performed and compliance with applicable permits.

4. CITY shall have the right to inspect the SWCF(s) and records as needed to ensure the SWCF(s) are being properly maintained.

5. Should any LOT OWNER(s) fail to pay their share of costs and expenses as required to use, maintain or repair the SWCF(s) in this Agreement, then the CITY or any other LOT OWNER shall be entitled without further notice to institute legal action for the collection of funds advanced on behalf of the LOT OWNER who did not pay their share of costs and expenses and shall be entitled to recover in such action in addition to the funds advanced, interest thereon at the current prime rate of interest, until paid, all costs and disbursements of such action, including such sum or sums as the court may fix as and for a reasonable attorney's fees.

6. Any liability of the LOT OWNER(s) to any worker employed to make repairs or provide maintenance under this Agreement, or to third persons, as well as any liability of the LOT OWNER(s) for damage to the property of agent, or any such worker, or any third persons, as a result of or arising out of repairs and maintenance under this Agreement, shall be borne, as between the LOT OWNER(s) in the same percentages as they bear the costs and expenses of

such repairs and maintenance. Each LOT OWNER shall be responsible for and maintain his own insurance, if any. By this Agreement, the parties do not intend to provide for the sharing of liability with respect to personal injury or property damage other than that attributable to the repairs and maintenance undertaken under this Agreement. Each of the LOT OWNER(s) agrees to indemnify the others from any and all liability for injury to him or damage to their property when such injury or damage results from, arises out of, or is attributable to any maintenance or repairs undertaken pursuant to this Agreement.

7. CITY Indemnification.

a) To the fullest extent permitted by law, LOT OWNER(s) shall jointly and severally indemnify, defend with legal counsel reasonably satisfactory to the CITY, and hold harmless the CITY and the CITY's officers, directors, employees, and council members (hereinafter referred to as "Indemnitees") from all actions, fines, sanctions, levies, penalties, orders and assessments of any kind harmless against any and all liability, loss, damage, fine, penalty, expense, claim, or cost (including without limitation costs and fees of litigation) of every nature (collectively referred to as "RWQCB Orders") that may arise out of or relate to LOT OWNER(s)'s obligations for implementation of storm water management in accordance with the RWQCB Order R9-2013-0001 and subsequent amendments, including any reasonable attorney's fees, costs and expenses incurred by the Indemnitees in responding to any RWQCB Orders arising out of or relating to implementation of storm water management. LOT OWNER(s) obligations shall include but not be limited to design, construction, maintenance and required documentation of the maintenance activities related to all storm water treatment measures proposed for the project and included in the STORM WATER PLAN, approved _____, arising out of or in connection with this Agreement or its performance (including acts of omission) except for liability caused by the Indemnitiees' willful misconduct.

b) LOT OWNER(s) obligation to defend shall apply whether or not Indemnitees were negligent or otherwise at fault and whether or not the RWQCB's Orders have any merit. LOT OWNER(s) obligation to defend shall apply with full force and effect regardless of any concurrent negligence or fault by the Indemnitees, or any of them. However LOT OWNER(s) shall not be obligated under this Agreement to indemnify any Indemnitee after entry of a non-appealable final judgment after trial or award in a judicial proceeding for that portion of the final judgment that arises from the willful misconduct of that Indemnitee.

c) LOT OWNER(s) duty to defend the Indemnitees is separate, independent and free standing from LOT OWNER(s) duty to indemnify and hold harmless the Indemnitees. LOT OWNER(s) defense obligation shall arise immediately upon receipt by CITY or LOT OWNER(s) of any written Notice of Violation or equivalent notice of intent to levy any fines, penalties or sanctions against Indemnitees by the RWQCB or other enforcement agency, and shall continue until the entry of any final and non-appealable RWQCB or other enforcement orders.

d) LOT OWNER(s) obligation to indemnify, defend and hold harmless shall be carried on to future property OWNERS and shall continue until the time that the site is redeveloped.

e) It is expressly understood and agreed that the foregoing provisions will survive termination of this Agreement, unless the property is properly redeveloped.

(f) The indemnity protections provided by this Agreement are not intended to exceed the indemnity available under applicable law. If the indemnity protections are found by a court to be unlawful in any way, the protection shall be curtailed or adjusted, but only to the minimum extent required to conform to applicable law.

(g) Nothing in the Agreement, the specifications or other contract documents or CITY approval of the plans and specifications or inspection of the work is intended to include a review, inspection, acknowledgment of any responsibility for any such matter, and CITY, CITY's engineer, and their consultants, and each of their officials, directors, officers, employees and agents, shall have absolutely no responsibility or liability thereof.

8. If, in the CITY's sole judgment said SWCF(s) are not being maintained to standards set forth in paragraph 3 of this Agreement, the CITY may thereupon provide written notice to all LOT OWNER(s) to initiate repairs or construction within ninety (90) days. Upon failure to demonstrate good faith to make repairs or construction within ninety (90), the LOT OWNER(s) agree that the CITY may make all needed repairs to said SWCF(s) and/or construct SWCF(s) to meet the standards set forth in paragraph 3 and to then assess costs to all LOT OWNER(s) equally.

9. If the CITY elects to make necessary maintenance or repairs in accordance with this Agreement, said work shall be without warranty. Said repairs shall be accepted "as is" by the LOT OWNER(s) without any warranty of workmanship and be guaranteed and indemnified by them in accordance this Agreement.

10. The foregoing covenants shall run with the land and shall be deemed to be for the benefit of the land of each of the LOT OWNER(s) and each and every person who shall at any time own all or any portion of the property referred to herein.

11. It is understood and agreed that the covenants herein contained shall be binding on the heirs, executors, administrators, successors, and assigns of each of the LOT OWNER(s).

12. This Agreement shall be recorded and that all obligations created shall constitute a covenant running with the land and any subsequent purchaser of all or any portion thereof, by acceptance of delivery of a deed and/or conveyance regardless of form shall be deemed to have consented to and become bound by this Agreement.

13. The terms of this Agreement may be amended in writing upon majority approval of the LOT OWNER(s) and consent of the CITY.

14. This Agreement shall be governed by the laws of the State of California. In the event that any of the provisions of this Agreement are held to be unenforceable or invalid by any court of competent jurisdiction, the validity, and enforceability of the remaining provisions shall not be affected thereby.

SIGNATURE PAGE FOLLOWS ON PAGE 5:

SIGNATURE PAGE

LOT OWNER(s): _____

_____
PRINT NAME AND TITLE

_____ _____
SIGNATURE DATE SIGNED

_____
PRINT NAME AND TITLE

_____ _____
SIGNATURE DATE SIGNED

_____
PRINT NAME AND TITLE

_____ _____
SIGNATURE DATE SIGNED

ATTACH CALIFORNIA ALL PURPOSE NOTARY ACKNOWLEDGMENT FOR ABOVE SIGNATURES

CITY OF ESCONDIDO,
a municipal Corporation

Date Signed: _____ By: _____
Director of Public Works / City Engineer

APPROVED AS TO FORM:
Jeffrey Epp, City Attorney

By: _____

ATTACHMENT 4

City of Escondido PDP Structural BMP Verification for Permitted Land Development Projects

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City of Escondido Storm Water Structural BMP Verification Form Page 1 of 4	
Project Summary Information	
Project Name	Escondido Assemblage - Hoftiezer, PTM
Record ID (e.g., grading/improvement plan number)	
Project Address	0 Ash Street., Escondido, CA 92026
Assessor's Parcel Number(s) (APN(s))	224-130-10-00
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	904.62, Carlsbad HU, Escondido Creek HA, Escondido HSA
Maintenance Notification / Agreement No.	
Responsible Party for Construction Phase	
Developer's Name	Argus Land Company
Address	30200 Rancho Viejo Rd., Suite B San Juan Capistrano, CA 92675
Email Address	
Phone Number	(619) 283-4663
Engineer of Work	Pasco Laret Suiter & Associates, Inc.
Engineer's Phone Number	(949) 661-6695
Responsible Party for Ongoing Maintenance	
Owner's Name(s)*	Future HOA
Address	
Email Address	
Phone Number	
*Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.	

City of Escondido Storm Water Structural BMP Verification Form Page 2 of 4				
Stormwater Structural Pollutant Control & Hydromodification Control BMPs* (List all from SWQMP)				
Description/Type of Structural BMP	**Plan Sheet #**	**Structural BMP ID#**	**Maintenance Agreement Recorded Doc #**	**Revisions**
Biofiltration Basin (BF-1)		A		
"Green Street" biofiltration rain gardens		B, C1, & C2		
*All Priority Development Projects (PDPs) require a Structural BMP				

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

City of Escondido Storm Structural BMP Verification Form Page 3 of 4

Checklist for Engineer of Work (EOW) to submit to Field Engineering:

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

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

Please sign your name and seal.

Professional Engineer's Printed Name:

_____

Professional Engineer's Signed Name:

_____

[SEAL]

Date: _____

City of Escondido Storm Water Structural BMP Verification Form Page 4 of 4

CITY - OFFICIAL USE ONLY:

Permit #:_____

City Inspector: _____

Date Project has/expects to close: _____

Date verification received from Engineer of Work (EOW): _____

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

City Inspector's Signature: _____Date: _____

FOR Environmental Programs:

Date Received from Field Engineering:_____

Environmental Programs Submittal Reviewer:_____

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

List **acceptable** Structural BMPs:

Environmental Programs 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:

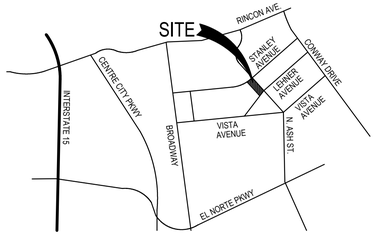
The plans must identify:

☐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 City 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.

***Note: Plan sheets included in this attachment can be full size or half size.**

CITY OF ESCONDIDO TRACT NO.

TENTATIVE SUBDIVISION MAP



VICINITY MAP

NOT TO SCALE

STATEMENT OF FACTS

THE PROPOSED MAP IS CONSISTENT WITH APPLICABLE GENERAL AND SPECIFIC PLANS.

THE DESIGN OR IMPROVEMENT OF THE PROPOSED SUBDIVISION IS CONSISTENT WITH THE APPLICABLE GENERAL OR SPECIFIC PLANS.

THE SITE IS PHYSICALLY SUITABLE FOR THE TYPE OF DEVELOPMENT.

THE SITE IS PHYSICALLY SUITABLE FOR THE PROPOSED DENSITY OF DEVELOPMENT.

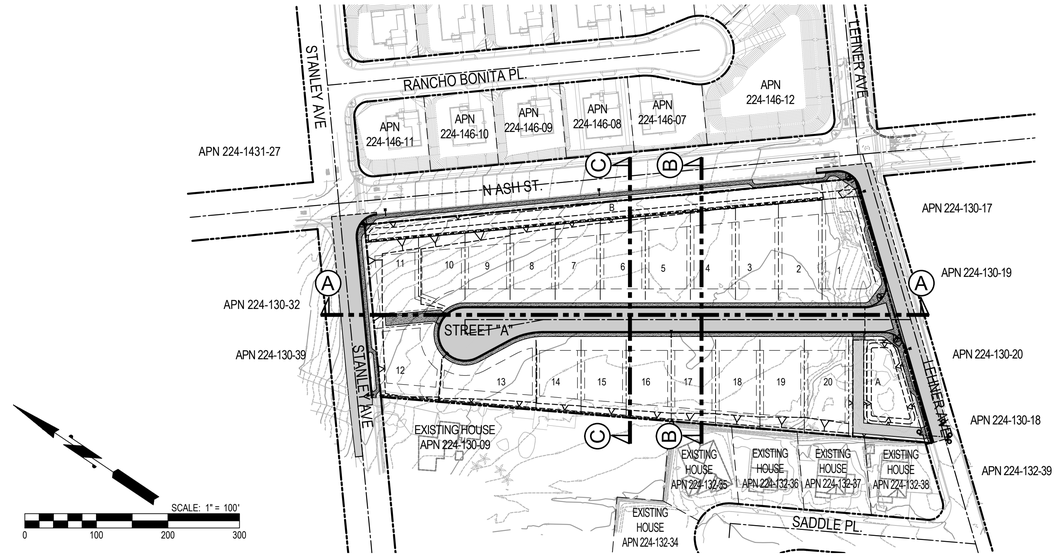
THE DESIGN OF THE SUBDIVISION, OR THE PROPOSED IMPROVEMENTS ARE NOT LIKELY TO CAUSE SUBSTATIAL ENVIRONMENTAL DAMAGE OR SUBSTANTIALLY AND AVOIDABLE INJURE FISH OR WILDLIFE OR THEIR HABITAT.

THE DESIGN OF THE SUBDIVISION OR THE TYPE OF IMPROVEMENTS IS NOT LIKELY TO CAUSE SERIOUS PUBLIC HEALTH PROBLEMS.

THE DESIGN OF THE SUBDIVISION OR THE TYPE OF IMPROVEMENTS WILL NOT CONFLICT WITH EASEMENTS OR RECORD, OR EASEMENTS ESTABLISHED BY COURT JUDGEMENT, AQUIRED BY THE PUBLIC AT LARGE, FOR ACCESS THROUGH OR USE OF, PROPERTY WITHIN THE PROPOSED SUBDIVISION. IN THIS CONNECTION, THE DIRECTOR OF PLANNING AND BUILDING MAY RECOMMEND APPROVAL OF A MAP IF HE FINDS THAT ALTERNATE EASEMENTS, OR ACCESS FOR USE, WILL BE PROVIDED, AND THAT THESE WILL BE SUBSTANTIALLY EQUIVALENT TO ONES PREVIOUSLY ACQUIRED BY THE PUBLIC.

ALL REQUIREMENTS OF THE CALIFORNIA ENVIRONMENTAL QUALITY ACT HAVE BEEN MET.

THE DESIGN OF THE SUBDIVISION HAS PROVIDED, TO THE EXTENT FEASIBLE, FOR FUTURE PASSIVE OR NATURAL HEATING OR COOLING OPPORTUNITIES IN THE SUBDIVISION. (NOTE: SPECIFIC EXAMPLES TO SUBSTANTIATE THIS FINDING MUST BE PROVIDED. EXAMPLES OF PASSIVE OR NATURAL OPPORTUNITIES IN SUBDIVISION DESIGN INCLUDE LOT SIZE OR CONFIGURATION, TO PERMIT ORIENTATION OF A STRUCTURE IN AN APPROPRIATE ALIGNMENT FOR SOUTHERN EXPOSURE, ETC.)



KEY MAP

LEGEND

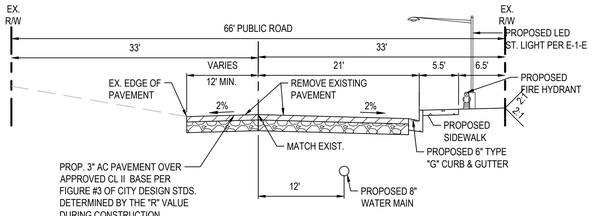
	EXISTING R/W OR PL
	PROPOSED UNIT LINE
	SETBACK LINE
LOT 1 / 468.00 PAD / 3,000 SF	PROPOSED LOT NUMBER PROPOSED PAD ELEVATION PROPOSED LOT AREA
785	EXISTING CONTOURS
785	PROPOSED CONTOURS
Y Y	PROPOSED SLOPE (1.5:1 MAX)
C // F //	PROPOSED CUT/FILL LINE
S S S	EXISTING SEWER LINE
S S S	PROPOSED PUBLIC SEWER LINE
	PROPOSED LATERAL (4" LAT. PER C.O.E. S-2-E)
	PROPOSED PUBLIC SEWER MANHOLE (PER C.O.E. S-1-E)
SD	PROPOSED CATCH BASIN
	EXISTING STORM DRAIN DITCH
SD SD	PROPOSED STORM DRAIN
W W W	EXISTING WATER LINE
W W W	PROPOSED WATER LINE
	PROPOSED FIRE HYDRANT (PER C.O.E. W-3-E)
	PROPOSED WATER SERVICE & BACKFLOW ASSEMBLY (PER C.O.E. W-1-E, W-10-E)
	PROPOSED 4" BLOW-OFF ASSEMBLY (PER C.O.E. W-9-E)
	PROPOSED 2" COMBINATION AIR VALVE (PER C.O.E. W-5-E)
	PROPOSED GATE VALVE
	PROPOSED THRUST BLOCK

NON-PLOTTABLE EASEMENTS

AN EASEMENT AND RIGHT OF WAY NOT EXCEEDING 10 FEET IN WIDTH FOR ALL PIPE LINES AND 20 FEET IN WIDTH FOR ALL DITCH LINES, FOR WATER PURPOSES AND INCIDENTAL PURPOSES NECESSARY THERETO, UPON THE TERMS AND CONDITIONS CONTAINED THEREIN AS GRANTED TO THE ESCONDIDO IRRIGATION DISTRICT IN A DEED RECORDED AUGUST 1, 1895, IN BOOK 238, PAGE 390 OF DEEDS.

BY AN INSTRUMENT RECORDED DECEMBER 16, 1905, IN BOOK 372, PAGE 307 OF DEEDS, ALL RIGHTS, TITLE AND INTEREST OF THE GRANTEE WAS PASSED TO THE ESCONDIDO MUTUAL WATER COMPANY, A CORPORATION AND BY INSTRUMENT RECORDED DECEMBER 30, 1987 AS INSTRUMENT NO. 87-0712928 OF OFFICIAL RECORDS, ALL RIGHTS, TITLE AND INTEREST OF ESCONDIDO MUTUAL WATER COMPANY, A CORPORATION PASSES AND NOW VESTS IN THE CITY OF ESCONDIDO.

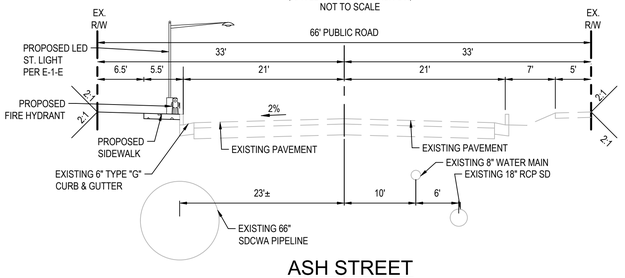
THE LOCATION OF THE EASEMENT CANNOT BE DETERMINED FROM RECORD INFORMATION.



STANLEY AVE.

(APN 224-130-09 TO N. ASH ST.)

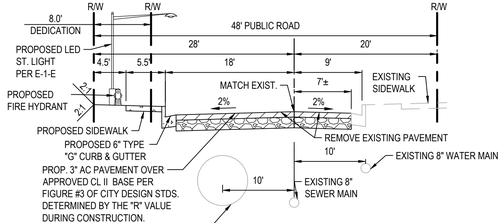
NOT TO SCALE



ASH STREET

(STANLEY AVE. TO LEHNER AVE.)

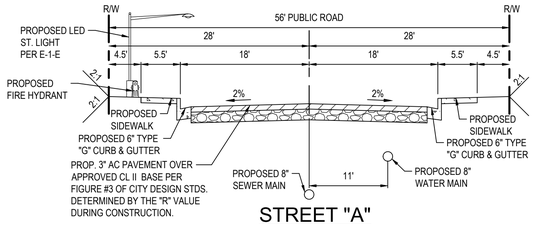
NOT TO SCALE



LEHNER AVE.

(ASH ST. TO APN 224-132-38)

NOT TO SCALE



STREET "A"

NOT TO SCALE

PROPOSED DENSITY

STREET "A":

GROSS ACREAGE =5.09 AC

DENSITY CALCULATION:

APN 224-130-10 5.09 AC * 3.33 DU/AC =17 (ROUNDED UP)
TOTAL AC 5.09 AC TOTAL DUs 17 UNITS ALLOWED

VERY LOW INCOME UNITS:

APN 224-130-10 1 DU (5.88% VERY LOW INCOME PERCENTAGE)
TOTAL DU 1 DUs

DENSITY BONUS CALCULATION:

APN 224-130-10 17 DU * 0.20 DENSITY BONUS =4 (ROUNDED UP)
TOTAL BONUS DUs 4 UNITS ALLOWED

TOTAL STREET "A" DUs 21 UNITS ALLOWED
20 UNITS PROPOSED
- 1 UNIT VERY LOW INCOME UNIT
- 19 UNITS MARKET RATE UNITS

EXCEPTIONS AND EXCLUSIONS

ITEMS 1 AND 2 ARE NON-MAPPING ITEMS AND THEREFORE ARE NOT SHOWN HEREON.

(3) CITY OF ESCONDIDO HOLDER OF AN EASEMENT FOR WATER PURPOSES, RECORDED DECEMBER 30, 1987 AS INSTRUMENT NO. 87-0712928 OF OFFICIAL RECORDS, TO BE QUITCLAIMED.

THE LOCATION OF THE EASEMENT CANNOT BE DETERMINED FROM RECORD INFORMATION.

(4) SAN DIEGO COUNTY WATER AUTHORITY HOLDER OF AN EASEMENT FOR RIGHT OF WAY, RECORDED APRIL 24, 1964 AS INSTRUMENT NO. 64-74532 OF OFFICIAL RECORDS.

ITEMS 5 THROUGH 8 ARE NON-MAPPING ITEMS AND THEREFORE ARE NOT SHOWN HEREON.

(9) COUNTY OF SAN DIEGO HOLDER OF AN EASEMENT FOR SLOPE AND DRAINAGE FOR COUNTY HIGHWAY AND INCIDENTAL PURPOSES, RECORDED DECEMBER 27, 2006 AS INSTRUMENT NO. 2006-0914406 OF OFFICIAL RECORDS, TO BE QUITCLAIMED.

ITEMS 10 THROUGH 14 ARE NON-MAPPING ITEMS AND THEREFORE ARE NOT SHOWN HEREON.

OWNERS CERTIFICATE

WE HEREBY CERTIFY THAT WE ARE THE RECORD OWNERS OF THE PROPERTY SHOWN ON THE TENTATIVE SUBDIVISION MAP AND THAT SAID MAP SHOWS ALL OUR CONTIGUOUS OWNERSHIP IN WHICH WE HAVE ANY DEED OR TRUST INTEREST, WE UNDERSTAND THAT OUR PROPERTY IS CONSIDERED CONTIGUOUS EVEN IF IT IS SEPARATED BY ROADS, STREETS, UTILITY EASEMENTS, OR RAILROAD RIGHTS-OF-WAY.

OWNER

ALBERT J. AND PEARL HOFTIEZER
CO-TRUSTEES OF HOFTIEZER FAMILY TRUST

SUBDIVIDER

ESCONDIDO NORTH LLC
30200 RANCHO VIEJO RD., SUITE B
SAN JUAN CAPISTRANO, CA 92675

JOHN KAYE - MANAGER, AS AGENT FOR OWNER

ENGINEER OF WORK

WILLIAM J. SUITER RCE NO. 68964

REGISTERED PROFESSIONAL ENGINEER
WILLIAM J. SUITER
No. RCE 68964
EXP. 12-31-23
Civil
STATE OF CALIFORNIA

ASSESSOR'S PARCEL NO.

224-130-10-00

LEGAL DESCRIPTION

PORTIONS OF LOT H IN BLOCK 418 OF RESUBDIVISION OF BLOCKS 418 & 419, AND PORTIONS OF LOT 4 IN THE BLOCK 415, OF THE RANCHO RINCON DEL DIABLO, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 1520

FIRE: CITY OF ESCONDIDO

SCHOOL: ESCONDIDO UNION SCHOOL DISTRICT
ESCONDIDO UNION HIGH SCHOOL DISTRICT

SEWER: CITY OF ESCONDIDO

WATER: CITY OF ESCONDIDO

TOPOGRAPHY: AERIAL TOPOGRAPHIC SURVEY PERFORMED BY PASCO LARET SUITER AND ASSOCIATES ON OCTOBER 19, 2021.

SITE ADDRESS

0 ASH STREET
ESCONDIDO, CA 92026

GENERAL NOTES

ALL STREETS ARE PUBLIC.

GRADING AND IMPROVEMENTS SHALL BE IN ACCORDANCE WITH CITY OF ESCONDIDO STANDARDS.

EASEMENTS OF RECORD NOT SHOWN HEREON SHALL BE HONORED, ABANDONED AND/OR RELOCATED TO THE SATISFACTION OF ALL INTERESTED PARTIES, AND PUBLIC UTILITY EASEMENT NECESSARY TO SERVE THIS PROJECT WILL BE COORDINATED WITH SERVING UTILITY COMPANIES.

LOT DIMENSIONS AND AREAS SHOWN HEREON ARE APPROXIMATE. THE DIMENSIONS MAY BE ADJUSTED TO BE CONSISTENT WITH THE FINAL MAP.

TOTAL AREA OF SUBDIVISION: 5.09 GROSS ACRES, 4.71 NET ACRES/DISTURBED

TOTAL LOTS: 20 NUMBERED LOTS AND 2 LETTERED LOTS
LOT 11 OF THIS MAP IS A DESIGNATE FOR 1 SINGLE FAMILY VERY LOW INCOME UNIT.

ZONE: R-1-10 (SINGLE-FAMILY RESIDENTIAL)

GENERAL PLAN: S: SUBURBAN (3.33 DUs/AC.)

PROPOSED SETBACK: FRONT YARD = 10' MINIMUM* (15' TYPICAL)
SIDE YARD = 5' MINIMUM (10' ADJACENT TO STREET)
REAR YARD = 20' MINIMUM

CUL-DE-SAC STREET FRONTAGE = 30' MINIMUM*

*DEVIATIONS FROM SETBACKS TAKEN FOR DENSITY BONUS

ALL LOTS ARE PROPOSED TO BE ON A SANITARY SEWER SYSTEM.

THE EXISTING SLOPE OF THE PARCEL IS LESS THAN 10%

ABREVIATIONS

Ø	DIAMETER	FL	FLOW LINE	SD	STORM DRAIN
AC	ACRE/ACREAGE	FS	FINISHED SURFACE	SF	SQUARE FEET
APN	ASSESOR PARCEL NO.	FYSB	FRONT YARD SETBACK	SFM	SEWER FORCED MAIN
BO	BLOW-OFF	GB	GRADE BREAK	SMH	SANITARY SEWER MANHOLE
CAV	COMBINATION AIR VALVE	GV	GATE VALVE	SS	SANITARY SEWER
CB	CATCH BASIN	H	HEIGHT	SYSB	SIDE YARD SETBACK
CL	CENTERLINE	INV	INVERT	TR	TREE
CY	CUBIC YARDS	MAX	MAXIMUM	TW	TOP OF WALL
DU	DWELLING UNIT	MIN	MINIMUM	TYP	TYPICAL
DWY	DRIVEWAY	MH	MANHOLE	VCP	VITRIFIED CLAY PIPE
E	EAST	PL	PROPERTY LINE	W	WATER
ESMT	EASEMENT	PROP	PROPOSED	WI	WITH
EX	EXISTING	PUE	PUBLIC UTILITY EASEMENT	WM	WATER METER
FF	FINISHED FLOOR	R/W	RIGHT OF WAY		
FG	FINISHED GRADE	RW	RETAINING WALL		
FH	FIRE HYDRANT	RYSB	REAR YARD SETBACK		

EARTHWORK

STREET "A"

CUT: 5,000 CY.
FILL: 7,800 CY.
NET: 2,800 CY (IMPORT)

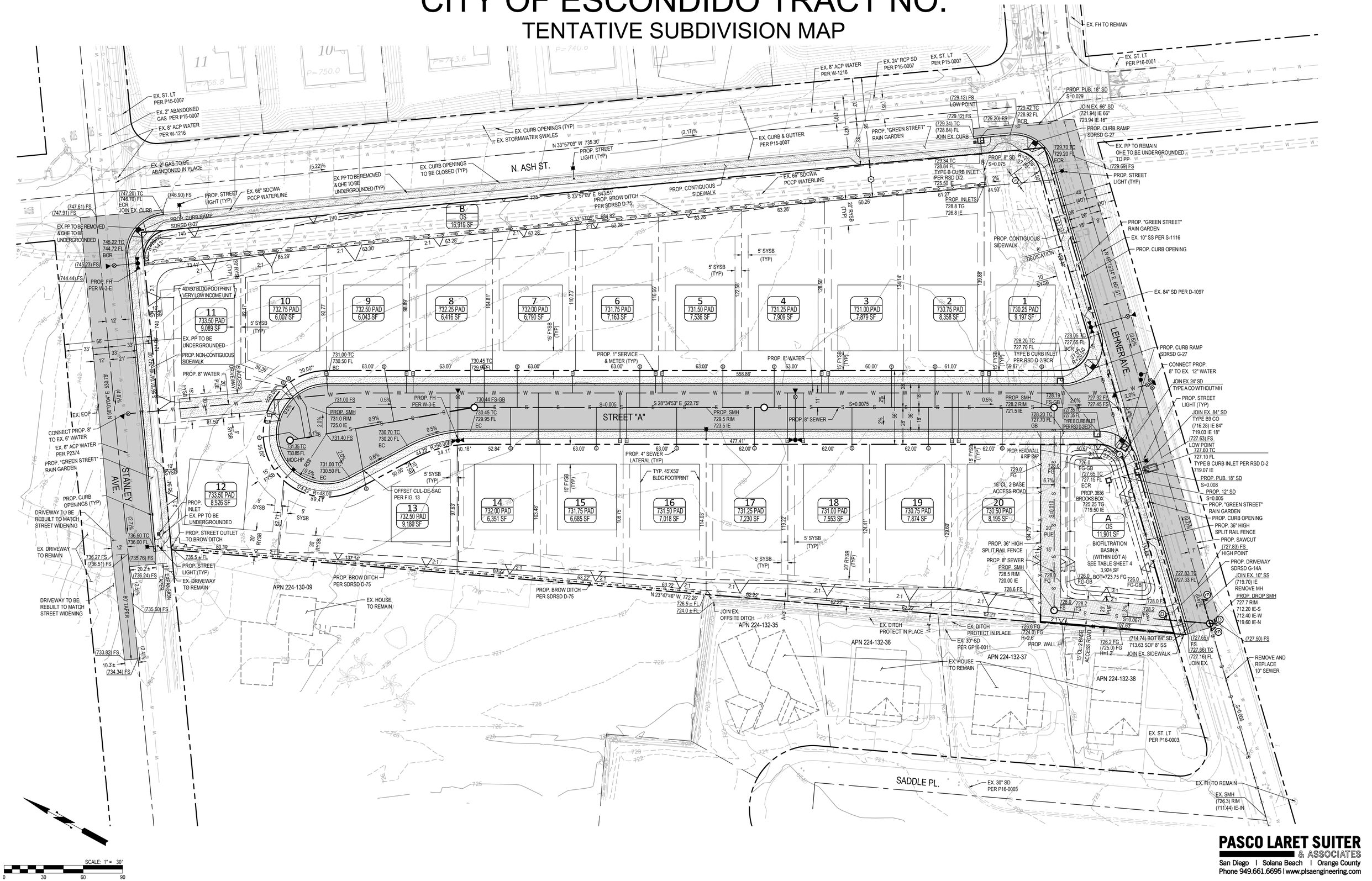
SHEET INDEX

TENTATIVE SUBDIVISION MAP TITLE SHEET 1
TENTATIVE SUBDIVISION MAP SHEET 2
TENTATIVE SUBDIVISION MAP SECTIONS & DETAILS 3

PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 949.661.6695 | www.plsaengineering.com

CITY OF ESCONDIDO TRACT NO.

TENTATIVE SUBDIVISION MAP



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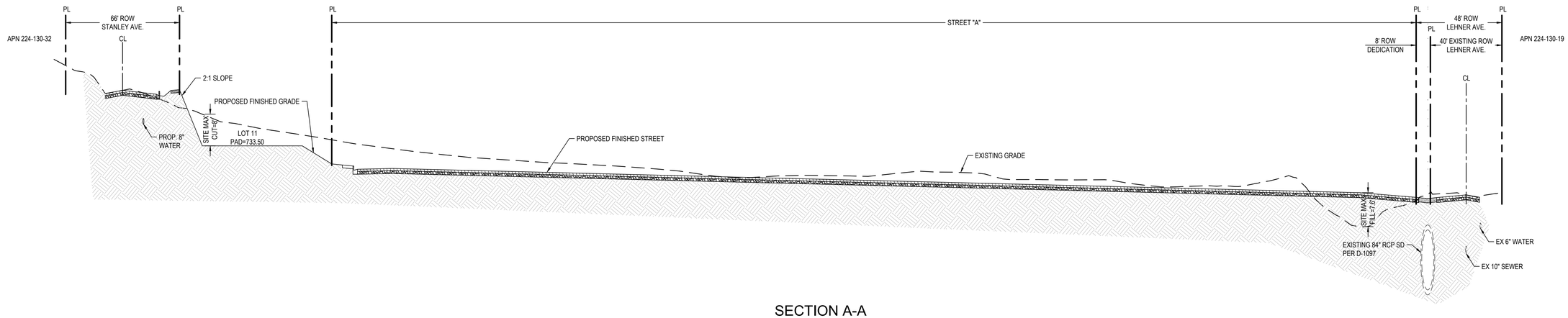
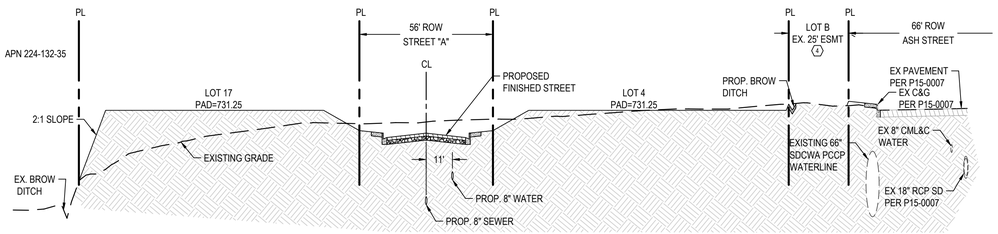
TENTATIVE SUBDIVISION MAP



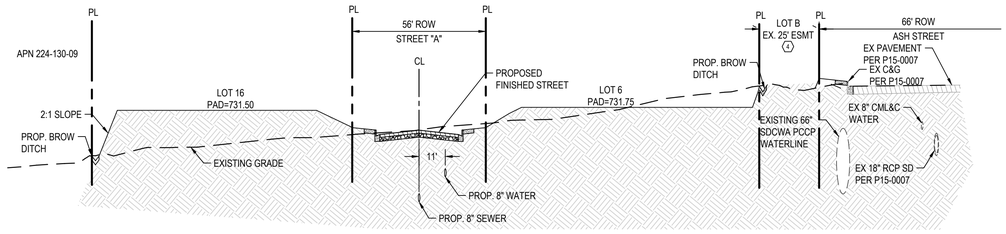
SECTION A-A

HORIZ. SCALE: 1"=30'



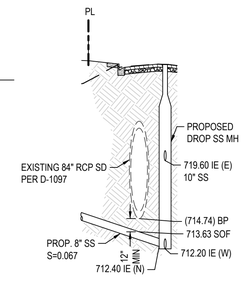
SECTION B-B

HORIZ. SCALE: 1"=30'



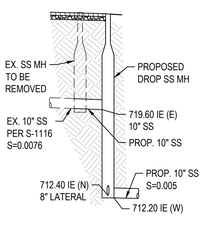
SECTION C-C

HORIZ. SCALE: 1"=30'



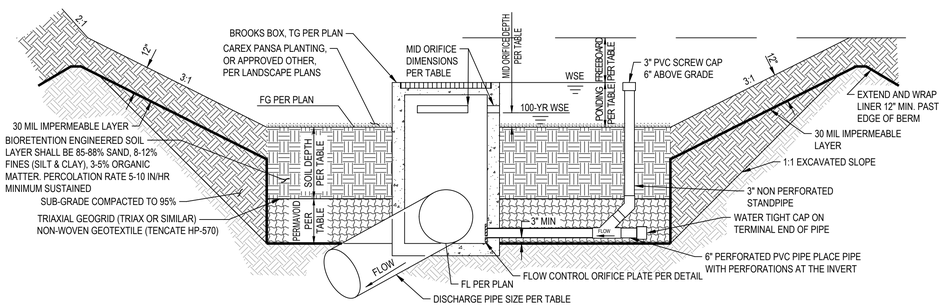
SECTION D-D

HORIZ. SCALE: 1"=30'

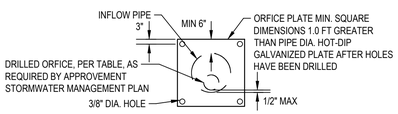


SECTION E-E

HORIZ. SCALE: 1"=30'



**NOTE: BACKFILL FOR STORM DRAIN PIPES ENTERING OR EXITING BASIN SHOULD BE BACKFILLED WITH A 2-SACK MIX OF SLURRY



FLOW CONTROL ORFICE PLATE

BIOFILTRATION BASIN TABLE

BASIN NAME	ENGINEERED SOIL LAYER DEPTH	PERMAVOID LAYER DEPTH	PONDING DEPTH	FREEBOARD DEPTH	BROOKS BOX SIZE	DISCHARGE PIPE SIZE	ORIFICE DIA. SIZE	MID ORIFICE SIZE	MID ORIFICE DEPTH
A	18 INCH	30 INCH	18 INCH	9 INCH	36X36	12 INCH	1.6" INCH	10"W X 3"H	9"

BIOFILTRATION BASIN DETAIL

SCALE: NTS

BIORETENTION SOIL MEDIA (BSM) PROPERTIES:

BSM SHOULD ACHIEVE A LONG-TERM, IN PLACE INFILTRATION RATE OF 5 IN/HR. BSM SHOULD HAVE AN APPROPRIATE AMOUNT OF ORGANIC MATERIAL TO SUPPORT PLANT GROWTH (E.G., LOAMY SAND MIXED THOROUGHLY WITH AN ORGANIC MATERIAL). THE BSM SHOULD BE A MIXTURE OF SAND, FINES, AND COMPOST. THE FOLLOWING COMPOSITION INCLUDES THE MEASUREMENTS FOR DETERMINING THE BSM BY VOLUME AND WEIGHT:

BSM		SANDY LOAM			
COMPOSITION	SAND	SAND	SILT	CLAY	COMPOST
VOLUME	65%		20%		15%
WEIGHT	75-80%		10%	3% MAX.	9% MAX*

*9% COMPOST BY WEIGHT RESULTS IN APPROXIMATELY 5% ORGANIC MATTER BY WEIGHT.

IN ADDITION, THE BSM SHOULD MEET THE FOLLOWING STANDARDS:

ORGANIC CONTENT (OC) 2-5%, PH BETWEEN 6.0–8.0, CARBON:NITROGEN RATIO BETWEEN 10:1-20:1, CATION EXCHANGE CAPACITY (CEC) > 5 MILLIEQUIVALENT (MEQ)/100 G SOIL.

IF THE EXISTING SOILS MEET THE CRITERIA, IT CAN BE USED AS THE SOIL MEDIA. IF THE EXISTING SOILS DO NOT MEET THE CRITERIA, A SUBSTITUTE MEDIA MUST BE USED. SOIL MEDIA THAT IS BROUGHT TO THE SITE MUST MEET THE STANDARDS SET FORTH IN THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL: APPENDIX F.3- BIOFILTRATION SOIL MEDIA COMPOSITION, TESTING, AND INSTALLATION (NOV 2018), ALSO CONTAINED IN THE COUNTY OF SAN DIEGO LOW IMPACT DEVELOPMENT HANDBOOK: APPENDIX G- BIORETENTION SOIL SPECIFICATION (JULY 2014, UNLESS SUPERSEDED BY MORE RECENT EDITION).

NUTRIENT SENSITIVE MEDIA DESIGN:

IN CASES WHERE THE BMP DISCHARGES TO RECEIVING WATERS WITH NUTRIENT IMPAIRMENTS OR NUTRIENT TMDLS, THE BSM SHOULD BE DESIGNED TO MINIMIZE THE EXPORT OF NUTRIENTS FROM THE MEDIA. HIGH LEVELS OF PHOSPHORUS IN THE MEDIA HAVE BEEN IDENTIFIED AS THE MAIN CAUSE OF BIOFILTRATION AREAS EXPORTING NUTRIENTS. ALL BSM SHOULD BE ANALYZED FOR BACKGROUND LEVELS OF NUTRIENTS. TOTAL PHOSPHORUS SHOULD NOT EXCEED 15 PPM. THE CARBON:NITROGEN RATIO OF BSM SHALL BE BETWEEN 15 AND 40 TO REDUCE THE POTENTIAL FOR NITRATE LEACHING. IN ADDITION TO ADHERING TO THE COUNTY MEDIA SPECIFICATIONS, THE GUIDELINES SET FORTH IN THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL: APPENDIX E.20- BF-2 NUTRIENT SENSITIVE MEDIA DESIGN (NOV 2018) SHOULD BE FOLLOWED.

STRUCTURAL SOIL PROPERTIES:

ORGANIC CONTENT (OC) > 5 PERCENT, PH BETWEEN 6–8, CATION EXCHANGE CAPACITY (CEC) > 5 MILLIEQUIVALENT (MEQ)/100 G SOIL, INFILTRATION RATES OF 0.5 IN/HR OR GREATER. SOIL MEDIA MUST HAVE AN APPROPRIATE AMOUNT OF ORGANIC MATERIAL TO SUPPORT PLANT GROWTH (E.G., LOAMY SAND MIXED THOROUGHLY WITH AN ORGANIC MATERIAL). IF THE EXISTING SOILS MEET THE CRITERIA, IT CAN BE USED AS THE SOIL MEDIA. IF THE EXISTING SOILS DO NOT MEET THE CRITERIA, A SUBSTITUTE MEDIA MUST BE USED. SOIL MEDIA THAT IS BROUGHT TO THE SITE MUST MEET THE STANDARDS SET FORTH IN COUNTY OF SAN DIEGO BMP DESIGN MANUAL AS WELL AS THE FOLLOWING CRITERIA:

1. SOIL MEDIA CONSISTS OF 85 PERCENT WASHED COURSE SAND, 10 PERCENT FINES (RANGE: 8–12 PERCENT; 8 PERCENT = 2 IN/HR INFILTRATION RATE, 12 PERCENT = 1 IN/HR INFILTRATION RATE), AND 5 PERCENT ORGANIC MATTER.
2. THE SAND PORTION SHOULD CONSIST OF CONCRETE SAND (PASSING A ONE-QUARTER-INCH SIEVE). MORTAR SAND (PASSING A ONE-EIGHTH-INCH SIEVE) IS ACCEPTABLE AS LONG AS IT IS THOROUGHLY WASHED TO REMOVE THE FINES.
3. FINES SHOULD PASS A # 270 (SCREEN SIZE) SIEVE.
4. ORGANIC MATTER IS CONSIDERED AN ADDITIVE TO ASSIST VEGETATION IN INITIAL ESTABLISHMENT AND CONTRIBUTES TO SORPTION OF POLLUTANTS BUT GENERALLY SHOULD BE MINIMIZED (5 PERCENT). ORGANIC MATERIALS WILL OXIDIZE OVER TIME CAUSING AN INCREASE IN PONDING THAT COULD ADVERSELY AFFECT THE PERFORMANCE OF THE BIOFILTRATION AREA. ORGANIC MATERIAL SHOULD CONSIST OF AGED BARK FINES, OR SIMILAR ORGANIC MATERIAL. ORGANIC MATERIAL SHOULD NOT CONSIST OF MANURE OR ANIMAL COMPOST. STUDIES HAVE ALSO SHOWN NEWSPAPER MULCH TO BE AN ACCEPTABLE ADDITIVE (KIM ET AL. 2003; DAVIS 2007).
5. HIGH LEVELS OF PHOSPHORUS IN THE MEDIA HAVE BEEN IDENTIFIED AS THE MAIN CAUSE OF BIOFILTRATION AREAS EXPORTING NUTRIENTS (HUNT AND LORD 2006). ALL STRUCTURAL SOIL SHOULD BE ANALYZED FOR BACKGROUND LEVELS OF NUTRIENTS. TOTAL PHOSPHORUS SHOULD NOT EXCEED 15 PPM.

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