APPENDIX S

Stormwater Quality Management Plan

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

The Trails at Carmel Mountain Ranch

VTM PTS#652519

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

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

Engineer of Work:

Chelisa Pack, PE, RCE 71026

Provide Wet Signature and Stamp Above Line

Prepared For:

NUWI - 2 CMR, LLC

2001 Wilshire Blvd., Suite 401

Santa Monica, California 90403

925-708-3638

Prepared By:

PROJECT DESIGN CONSULTANTS

Planning | Landscape Architecture | Engineering | Survey

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Project Design Consultants

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619-235-6471

Date:

April 8, 2020

Approved by: City of San Diego Date

The City of SAN DIEGO

Written by: Garrett Anderson
Job No. 4394.00
P:\4394.00\Engr\Reports\SWQMP.pdf

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

Acronyms

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

Certification Page

Project Name:
Permit Application

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

Engineer of Work's Signature

71026 — PE#

06/30/2021 — Expiration Date

Chelisa Pack

Print Name

Project Design Consultants

Company

Date

Engineer's Stamp

Submittal Record

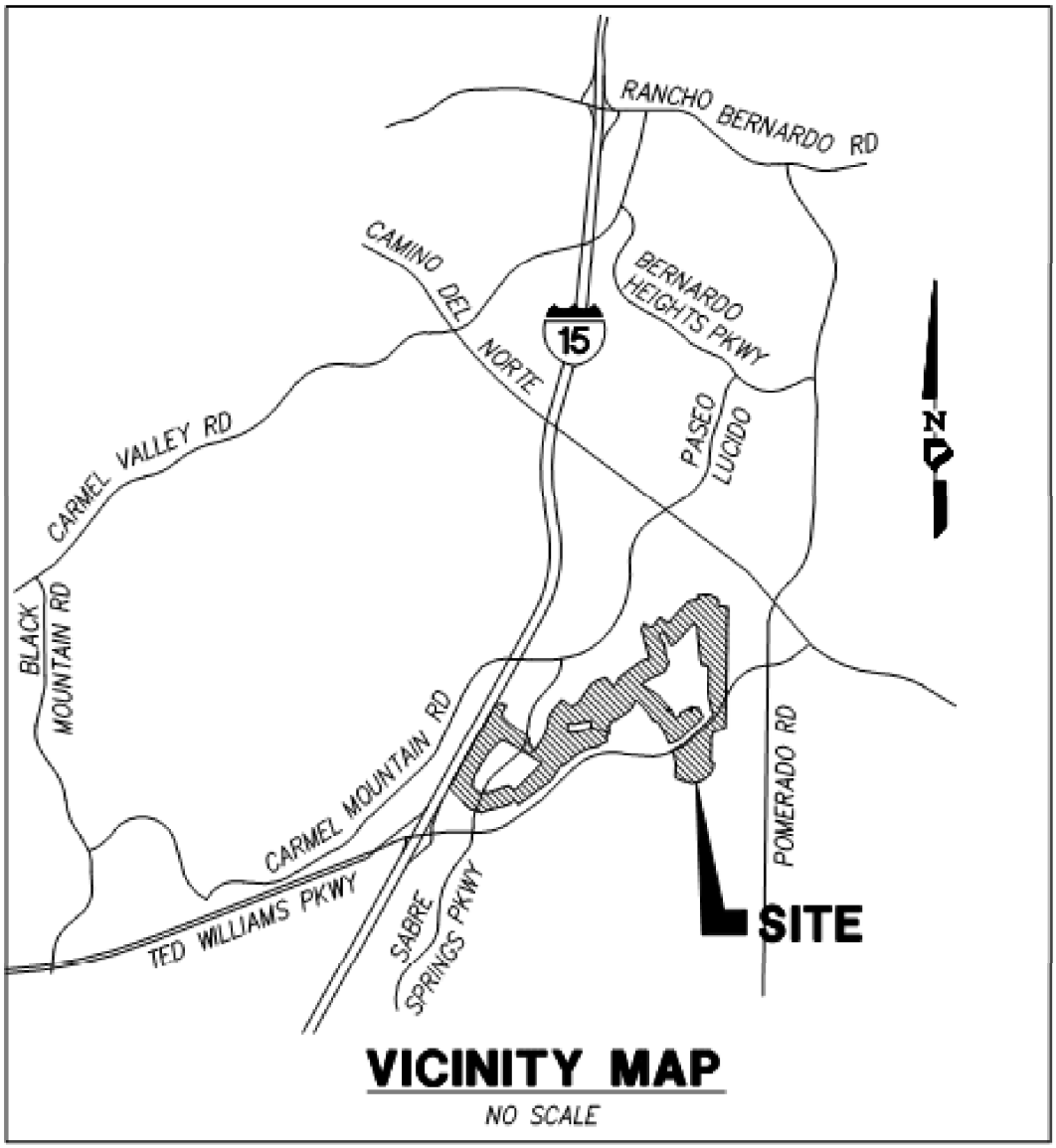
Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck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

Submittal Number	Date	Project Status	Changes
1	10/25/2019	☑ Preliminary Design/Planning/CEQA ☐ Final Design	**Initial Submittal**
2	1/30/2020	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Updated DMA Exhibit, BMP sizing spreadsheets, report body
3	4/8/2020	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Updated Infiltration Feasibility Letter & Hydromodification Attachment
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

Project Name: The Trails at Carmel Mountain Ranch

Project Vicinity Map

Project Name: Carmel Mountain Ranch
Permit Application



City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.

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

Storm Water Requirements Applicability Checklist

FORM
DS-560
OCTOBER 2016

Project Address: 14050 Carmel Ridge Rd, San Diego, CA 92128

Project Number *(for City Use Only)*:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runoff?

   ☐ Yes; WPCP required, skip 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

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

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

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

   ☐ Yes; no document required

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

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

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

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

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

PART B: Determine Construction Site Priority

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

Complete PART B and continued to Section 2

1. ☐ **ASBS**

a. Projects located in the ASBS watershed.

2. ☒ **High Priority**

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

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

3. ☐ **Medium Priority**

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

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

4. ☐ **Low Priority**

a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes	☒ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes	☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes	☒ No

PART D: PDP Exempt Requirements.

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

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

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

1. **Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**
   - **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
   - **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
   - **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

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

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

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

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

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

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

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

1.	**New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☒ Yes	☐ No
2.	**Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces**. This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☒ Yes	☐ No
3.	**New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface.	☐ Yes	☒ No
4.	**New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater.	☒ Yes	☐ No
5.	**New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	☒ Yes	☐ No
6.	**New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☒ Yes	☐ No

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

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

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

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

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

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

Jonathan Frankel	Vice President
Name of Owner or Agent *(Please Print)*	Title
	10/28/2019
Signature	Date

Applicability of Permanent, Post-Construction Storm Water BMP Requirements	Form I-1

Project Identification

Project Name: The Trails at Carmel Mountain Ranch

Permit Application Number: | Date: 4/8/2020

Determination of Requirements

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

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

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Project Name: The Trails at Carmel Mountain Ranch

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

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	The Trails at Carmel Mountain Ranch
Project Address	14050 Carmel Ridge Road San Diego, CA 92128
Assessor's Parcel Number(s) (APN(s))	313-043-09; 313-040-60,62,71,79,80; 313-031-28,32; 313-541-10; 313-660-43; 313-704-01,02; 313-043-01,02,03; 313-653-40; 313-621-29
Permit Application Number	
Project Watershed	Select One: ☐ San Dieguito River ☑ Penasquitos ☐ Mission Bay ☐ San Diego River ☐ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Poway 906.20
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	164.5 Acres (7,165,620 Square Feet)
Area to be disturbed by the project (Project Footprint)	74.2 Acres (3,232,152 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	63.1 Acres (2,747,329 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	11.1 Acres (484,822 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	+300 %

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

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

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

Description / Additional Information:

The site is part of the existing Carmel Mountain Ranch golf course.

Existing Land Cover Includes (select all that apply):

- [x] Vegetative Cover
- [x] Non-Vegetated Pervious Areas
- [x] Impervious Areas

Description / Additional Information:

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

- [ ] NRCS Type A
- [ ] NRCS Type B
- [x] NRCS Type C
- [x] NRCS Type D

Approximate Depth to Groundwater:

- [ ] Groundwater Depth < 5 feet
- [ ] 5 feet < Groundwater Depth < 10 feet
- [x] 10 feet < Groundwater Depth < 20 feet
- [ ] Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- [ ] Watercourses
- [ ] Seeps
- [ ] Springs
- [ ] Wetlands
- [x] None

Description / Additional Information:

The existing site is a man-made golf course.

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Description of Existing Site Topography and Drainage

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

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

Descriptions/Additional Information

1. The existing drainage conveyance is urban.

2. There is no offsite runoff being conveyed through the site.

3. The on-site drainage facilities consist of swales and brow ditches (hardened channels) which direct water from the golf course fairways into Type F catch basins. Type F catch basins then convey water into the public storm drain system via various private storm drains. The public storm drain system then conveys water to different outlets depending on location within the project site.

4. There are six POCs for the project site. Existing course holes 5, 6, and a portion of hole 7 that has run-on onto hole 6 are conveyed to a 48" RCP that outlets into Chicarita Creek (per Drawing 22917-5-D). Existing holes 1, 2, 7, 8, 9, and a portion of the existing clubhouse and associated parking lot are conveyed to a 72" CIPCP that also outlets into Chicarita Creek (per Drawing 22088-12-D). Existing holes 17 and 18 are conveyed into a 72" RCP that outlets near existing hole 14 (per Drawing 22745-23-D). Existing holes 15 and 16 are conveyed to a 72" RCP that outlets into wetland waters of the US southeast of the hole (per Drawing 22745-21). Existing holes 10 and 11 are conveyed into a 54" RCP that outlets into wetland waters of the state at existing hole 12 (per Drawing 23958-8-D). Existing hole 13 is conveyed to a 36" RCP that outlets into natural canyons within hole 13. For specifics on the existing condition drainage analysis, refer to the project's drainage study.

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Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

Project includes clearing and grubbing of the existing Carmel Mountain Ranch golf course and demolition of the existing clubhouse and parking lot. The majority of the existing golf course holes will be regraded and developed for residential development. The Project proposes 1200 3-story units, of which there are 192 affordable housing units, 177 senior apartments, and 514 walk-up apartments. The development also includes multiple open space areas.`

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

The proposed impervious features of the project include the proposed units, driveways, roads, sidewalks, and hardscape area in the open space areas.

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

Under proposed conditions, there will be trees and landscaping areas on the ground level around the proposed residential units. Additionally, there will be multiple pervious open space areas within the Project Area.

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

Grading and changes to site topography will occur due to the proposed development.

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

☑ Yes

☐ No

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

Description / Additional Information:

The improvement plans will propose underground storm drain stubs to convey flow from biofiltration basins to the public storm drain systems within the right-of-way. Onsite drainage within each lot will be determined within the building plans, with private storm drains conveying water from the lots to the biofiltration basins. There will be curb inlets to pick up storm drain runoff from the streets. For specifics on the proposed condition drainage analysis, refer to the project's drainage study.

Form I-3B Page 6 of 11

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

- [x] Onsite storm drain inlets
- [ ] Interior floor drains and elevator shaft sump pumps
- [ ] Interior parking garages
- [ ] Need for future indoor & structural pest control
- [x] Landscape/outdoor pesticide use
- [x] 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
- [x] Fire sprinkler test water
- [x] Miscellaneous drain or wash water
- [x] Plazas, sidewalks, and parking lots

Description/Additional Information:

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) From a regional drainage perspective, the western half of the Project site is conveyed to Chicarita Creek and the eastern half drains to Los Penasquitos Creek. Downstream of the project site Chicarita Creek outlets into Los Penasquitos . Los Penasquitos Creek flows into the Project's receiving water, Penasquitos Lagoon, approximately 12.4 miles from the Project site which discharges into the Pacific Ocean.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations Beneficial Uses for Hydrologic Area 906.20 Los Penasquitos Creek - MUN, AGR, IND, REC1, REC2, WARM, COLD, WILD
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations This is not applicable to the project. There are two ASBS in San Diego, the La Jolla ASBS and the Scripps ASBS. Key pollution threats include urban, road, and stormwater runoff. The project is located approximately 11.5-miles north east of the Scripps ASBS. The project receiving water, Penasquitos Lagoon, discharges water into the Pacific Ocean about 3.5 miles away from the Scripps ASBS. Therefore, the Project does not drain to either of these immediate ASBS.
Provide distance from project outfall location to impaired or sensitive receiving waters Project outfall is Los Penasquitos Creek, which is approximately 2.0 miles downstream.
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands The project is within the vicinity of Wetland Waters of the State and Wetland Waters of the US. As such, all proposed construction will be outside wetland buffers near these waters. The Chicarita Creek floodplain is also an ESL, but will not be disturbed for this project.

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

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

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
Los Penasquitos Creek	Enterococcus	Bacteria
Los Penasquitos Creek	Fecal Coliform	Bacteria
Los Penasquitos Creek	Selenium	Uncategorized
Los Penasquitos Creek	Total Dissolved Solids	Uncategorized
Los Penasquitos Creek	Total Nitrogen as N	Nutrients, Oxygen Demanding
Los Penasquitos Creek	Toxicity	Uncategorized
Los Penasquitos Lagoon	Sedimentation/Siltation	Sediment

Identification of Project Site Pollutants*

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

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

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

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☑ Yes, hydromodification management flow control structural BMPs required.

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

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

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

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

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

Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**

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

☐ Yes

☑ No

Discussion / Additional Information:

There are no CCSYA areas within the project site or any upstream areas with runon onto the project site. See the CCSYA exhibit within the Hydromodification Management Report.

Form I-3B Page 10 of 11

Flow Control for Post-Project Runoff*

***This Section only required if hydromodification management requirements apply**

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

1. POC A - This POC contains flow from DMAs 5 and 6 and outlets into Chicarita Creek via a 48" RCP.
2. POC B - This POC contains flow from DMAs 1, 2, 7, 8, and 9 and outlets into Chicarita Creek via a 72" CIP concrete pipe.
3. POC C - This POC contains flow from DMA 15 and 16 and outlets into a natural canyon in Unit 16 via a 72" RCP.
4. POC D - This POC contains flow from DMAs 17 and 18 and outlets into a natural canyon in Unit 15 via a 72" RCP.
5. POC E - This POC contains flow from DMA 11 and outlets into a natural canyon in Unit 12 via a 54" RCP.
6. POC F - This POC contains flow from DMA 13 and outlets into a natural canyon in Unit 13 via a 36" RCP.

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

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

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

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

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

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

A geomorphic assessment for the project's downstream receiving waters is being completed by Chang Consultants. The full report has been submitted under a separate cover.

Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

There are multiple wetland buffers on the project site as well as proposed setbacks from existing developments. See the project DMA exhibit for more details.

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.

Source Control BMP Checklist for PDPs	Form I-4B

Source Control BMPs

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

Answer each category below pursuant to the following.

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

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

Project Name: The Trails at Carmel Mountain Ranch

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

Site Design BMP Checklist for PDPs	Form I-5B

Site Design BMPs

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

Answer each category below pursuant to the following.

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

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

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

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented: Sidewalks and parking lot aisles will be designed to the minimum widths necessary. There are additional landscaping areas proposed for the site.			
4.3.4 Minimize Soil Compaction	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.4 not implemented: The majority of the site will support building or landscape improvements, so minimizing soil compaction for the site is not applicable.			
4.3.5 Impervious Area Dispersion	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented: Biofiltration/hydromodification basins will retain volume in accordance with the Appendix B.5 worksheets. Impervious area dispersion will be utilized within the project site as an added site design measure, but the storm water calculations or BMP sizing is not dependent upon providing a certain square footage.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☐ No	☑ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☐ No	☑ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Form I-5B Page 3 of 4			
Site Design Requirement	Applied?		
4.3.6 Runoff Collection	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvest and Use Precipitation	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.8 not implemented: Harvest and reuse was found to not be applicable to the project. Refer to calculations in Attachment 1c. It is unknown to PDC whether indoor water re-use is currently allowed per City building codes, as there is not a precedent for how such a system would work. For outdoor water use, the 36-hour wet season demand is not higher than the design capture volume for the project and is therefore considered an infeasible site requirement.			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:
Refer to the DMA map for the site design BMPs for the project.

Summary of PDP Structural BMPs	Form I-6

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

Harvesting of storm water was determined to be infeasible for this project. Refer to Attachment 1C for additional information.

The project has been classified as a no-infiltration condition site based on the geotechnical engineer's infiltration feasibility letter. Refer to Attachment 1D for a copy of the geotechnical engineer's Infiltration Feasibility Condition Letter. The BMP strategy involves utilitizing biofiltration/hydromodification basins to treat and retain onsite flows and minimal offsite runoff at the project site. Refer to the Drainage Management Area (DMA) Exhibit in Attachment 1a for the proposed treatment drainage areas under proposed conditions.

The site plans for each development area are still under development, however, a conservative estimate of the proposed imperviousness was estimate for each area based on the proposed land use.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of 22

(Continued from page 1)

Refer to Attachment 1e for the pertinent BMP calculations. The worksheets in Attachment 1e were provided to show the proposed BMPs will be compliant with both the pollutant control requirements and the City's volume retention requirements. The volume retention requirements are achieved on-site through the aforementioned biofiltration/hydromodification basins. Refer to the BMP Site Map and the plans in Attachment 4 for the locations of the BMPs onsite. For more information, refer to the supporting documentation in Attachment 1. After treatment, the runoff will be directed offsite through proposed private storm drain stubs to the public storm drain systems in nearby public right-of-ways. The proposed basin will be dual-purpose for water quality treatment and hydromodification control. Refer to Attachment 2 for the hydromodification calculations.

Form I-6 Page 3 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 1 - Biofiltration/Hydromodification BMP 1	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 4 of 22 (Copy as many as needed)
Structural BMP ID No. 1 - Biofiltration/Hydromodification BMP 1
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 5 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 2 - Biofiltration/Hydromodification BMP 2	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 6 of 22 (Copy as many as needed)
Structural BMP ID No. 2 - Biofiltration/Hydromodification BMP 2
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 7 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 5 - Biofiltration/Hydromodification BMP 5	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 8 of 22 (Copy as many as needed)
Structural BMP ID No. 5 - Biofiltration/Hydromodification BMP 5
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 9 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 6 - Biofiltration/Hydromodification BMP 6	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 10 of 22 (Copy as many as needed)
Structural BMP ID No. 6 - Biofiltration/Hydromodification BMP 6
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 11 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 8 - Biofiltration/Hydromodification BMP 8	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 12 of 22 (Copy as many as needed)
Structural BMP ID No. 8 - Biofiltration/Hydromodification BMP 8
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 13 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 9 - Biofiltration/Hydromodification BMP 9	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 14 of 22 (Copy as many as needed)
Structural BMP ID No. 9 - Biofiltration/Hydromodification BMP 9
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 15 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 11 - Biofiltration/Hydromodification BMP 11	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 16 of 22 (Copy as many as needed)
Structural BMP ID No. 11 - Biofiltration/Hydromodification BMP 11
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 17 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 16 - Biofiltration/Hydromodification BMP 16	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 18 of 22 (Copy as many as needed)
Structural BMP ID No. 16 - Biofiltration/Hydromodification BMP 16
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 19 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 17 - Biofiltration/Hydromodification BMP 17	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 20 of 22 (Copy as many as needed)
Structural BMP ID No. 17 - Biofiltration/Hydromodification BMP 17
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 21 of 22 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 18 - Biofiltration/Hydromodification BMP 18	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-881-2575
Who will be the final owner of this BMP?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
Who will maintain this BMP into perpetuity?	NUWI - 2 CMR, LLC (Property Owner) 2001 Wilshire Blvd. Suite 401, Santa Monica, CA, 90403
What is the funding mechanism for maintenance?	HOA Fees

Form I-6 Page 22 of 22 (Copy as many as needed)
Structural BMP ID No. 18 - Biofiltration/Hydromodification BMP 18
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

Project Name: The Trails at Carmel Mountain Ranch

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A (optional) ○ Form I-8B (optional) • Partial Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A ○ Form I-8B • Full Infiltration Condition: ○ Form I-8A ○ Form I-8B ○ Worksheet C.4-3 ○ Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included

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

The DMA Exhibit must identify:

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

ATTACHMENT 1A,1B – DMA MAP

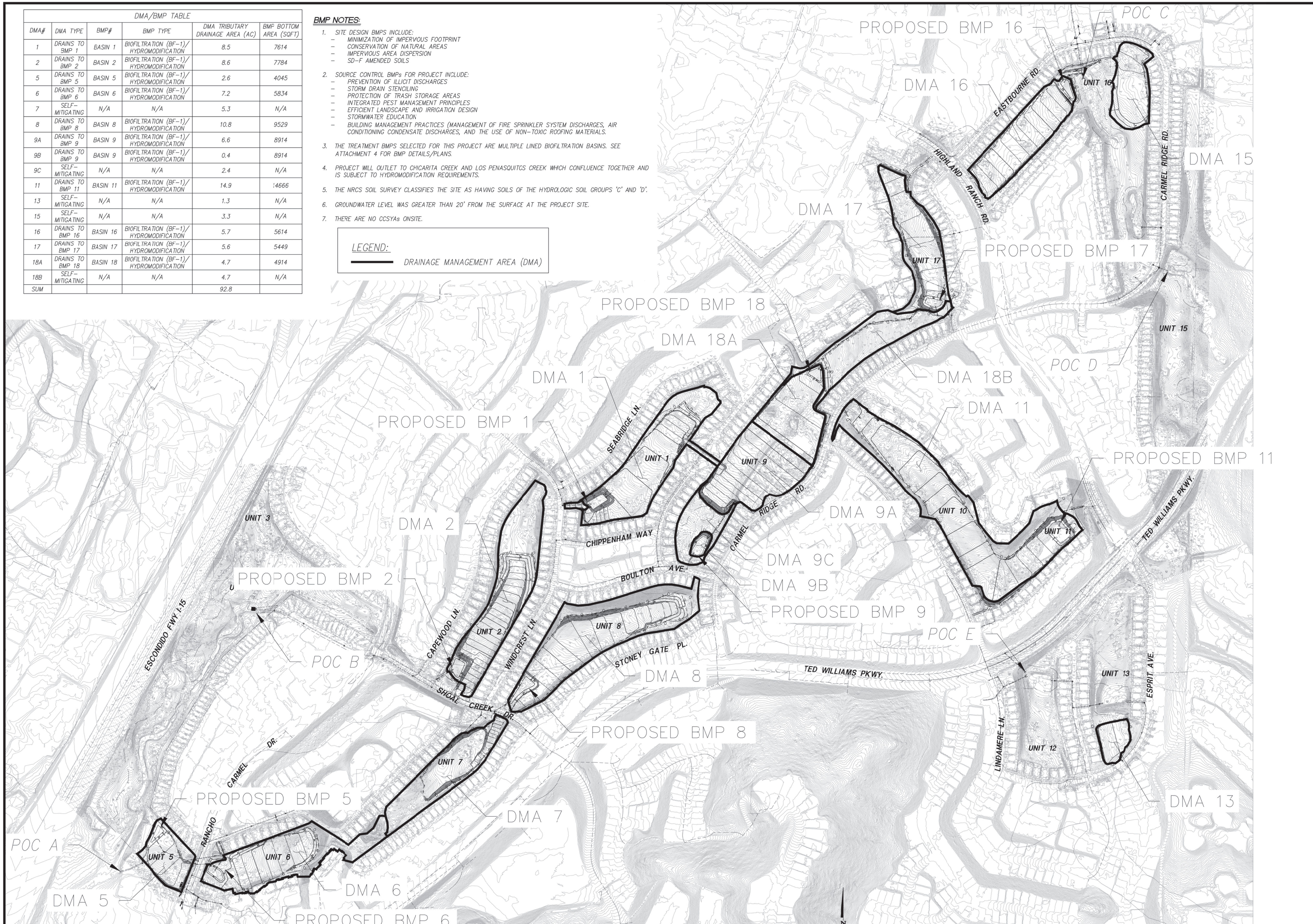
DMA/BMP TABLE					
DMA#	DMA TYPE	BMP#	BMP TYPE	DMA TRIBUTARY DRAINAGE AREA (AC)	BMP BOTTOM AREA (SQFT)
1	DRAINS TO BMP 1	BASIN 1	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	8.5	7614
2	DRAINS TO BMP 2	BASIN 2	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	8.6	7784
5	DRAINS TO BMP 5	BASIN 5	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	2.6	4045
6	DRAINS TO BMP 6	BASIN 6	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	7.2	5834
7	SELF-MITIGATING	N/A	N/A	5.3	N/A
8	DRAINS TO BMP 8	BASIN 8	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	10.8	9529
9A	DRAINS TO BMP 9	BASIN 9	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	6.6	8914
9B	DRAINS TO BMP 9	BASIN 9	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	0.4	8914
9C	SELF-MITIGATING	N/A	N/A	2.4	N/A
11	DRAINS TO BMP 11	BASIN 11	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	14.9	14666
13	SELF-MITIGATING	N/A	N/A	1.3	N/A
15	SELF-MITIGATING	N/A	N/A	3.3	N/A
16	DRAINS TO BMP 16	BASIN 16	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	5.7	5614
17	DRAINS TO BMP 17	BASIN 17	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	5.6	5449
18A	DRAINS TO BMP 18	BASIN 18	BIOFILTRATION (BF-1)/ HYDROMODIFICATION	4.7	4914
18B	SELF-MITIGATING	N/A	N/A	4.7	N/A
SUM				92.8	

BMP NOTES:

1. SITE DESIGN BMPS INCLUDE:
   - MINIMIZATION OF IMPERVIOUS FOOTPRINT
   - CONSERVATION OF NATURAL AREAS
   - IMPERVIOUS AREA DISPERSION
   - SD-F AMENDED SOILS
2. SOURCE CONTROL BMPs FOR PROJECT INCLUDE:
   - PREVENTION OF ILLICIT DISCHARGES
   - STORM DRAIN STENCILING
   - PROTECTION OF TRASH STORAGE AREAS
   - INTEGRATED PEST MANAGEMENT PRINCIPLES
   - EFFICIENT LANDSCAPE AND IRRIGATION DESIGN
   - STORMWATER EDUCATION
   - BUILDING MANAGEMENT PRACTICES (MANAGEMENT OF FIRE SPRINKLER SYSTEM DISCHARGES, AIR CONDITIONING CONDENSATE DISCHARGES, AND THE USE OF NON-TOXIC ROOFING MATERIALS.
3. THE TREATMENT BMPS SELECTED FOR THIS PROJECT ARE MULTIPLE LINED BIOFILTRATION BASINS. SEE ATTACHMENT 4 FOR BMP DETAILS/PLANS.
4. PROJECT WILL OUTLET TO CHICARITA CREEK AND LOS PENASQUITOS CREEK WHICH CONFLUENCE TOGETHER AND IS SUBJECT TO HYDROMODIFICATION REQUIREMENTS.
5. THE NRCS SOIL SURVEY CLASSIFIES THE SITE AS HAVING SOILS OF THE HYDROLOGIC SOIL GROUPS 'C' AND 'D'.
6. GROUNDWATER LEVEL WAS GREATER THAN 20' FROM THE SURFACE AT THE PROJECT SITE.
7. THERE ARE NO CCSYAs ONSITE.

LEGEND:

DRAINAGE MANAGEMENT AREA (DMA)



SCALE:	1"=200'
JOB #:	4394.00
CREATED:	8/22/19

PREPARED BY:

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

CITY OF SAN DIEGO

THE TRAILS AT CMR

DMA MAP
PROPOSED CONDITIONS
EXHIBIT 1A

ATTACHMENT 1C – HARVEST & USE FEASIBILITY CHECKLIST

Harvest and Use Feasibility Checklist	Worksheet B.3-1 : Form I-7

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.
[Provide a summary of calculations here]

Landscape Irrigation:
Assume 500000SF x 1AC / 43560 SF = 11.5 AC of landscaping
Mod. Water Use:1470 gallon/ac/36hr x 11.5 AC = 16905 gallons (CF/7.48gallons) = 2,260CF

3. Calculate the DCV using worksheet B-2.1.
DCV = 120065 (cubic feet)
[Provide a summary of calculations here]

DCV: Composite C x 85th percentile 24-hr storm depth x BMP Drainage Area
DMA 1: 0.67 x 0.66in/12in/ft x 3270466 SF = 120517 CF

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.

ATTACHMENT 1D – INFILTRATION FEASIBILITY LETTER

Project No. 03071-32-45A
April 7, 2020

New Urban West, Incorporated
16935 West Bernardo Drive, Suite 260
San Diego, California 92127

Attention: Mr. Jonathan Frankel

Subject: INFILTRATION FEASIBILITY CONDITION LETTER
CARMEL MOUNTAIN RANCH GOLF COURSE
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Investigation, Carmel Mountain Ranch Golf Course, San Diego, California*, prepared by Geocon Incorporated, draft dated October 18, 2019 (Project No. 03071-32-45A).
2. *Storm Water Infiltration Feasibility Study, Carmel Mountain Golf Course, San Diego, California*, prepared by Geocon Incorporated, dated October 21, 2019 (Project No. 03071-32-45A).
3. *DMA Map, Proposed Conditions, Exhibit 1A, Carmel Mountain Ranch, City of San Diego, California*, prepared by Project Design Consultants, dated August 22, 2019.

Dear Mr. Frankel:

In accordance with your request, we have prepared this letter regarding storm water management for the subject project and to address City of San Diego LDR-Engineering review comments dated March 24, 2020. Previous recommendations specific to storm water management, as well as a summary of expected soil conditions, was provided in Reference Nos. 1 and 2. Reference No. 2 was prepared to address storm water infiltration feasibility in accordance with the 2018 City of San Diego Storm Water Standards Manual. Due to the "No Infiltration" condition identified in Reference No. 2, the City of San Diego is requesting an "Infiltration Feasibility Condition" letter in accordance with Appendix C.1.1 of the City Storm Water Manual.

The following information is provided to support storm water BMP design in accordance with the *2018 City of San Diego Storm Water Standards Manual.*

Based on review of the DMA Map (Reference No. 3), Basins 1, 2, 5, 6, 8, 9, 11, 16, 17, and 18 are proposed to be biofiltration basins and are addressed further below.

SITE AND PROJECT DESCRIPTION

The Carmel Mountain Ranch Golf Course property consists of 164.5-gross acres of land located within San Diego, California. The golf course operated from 1986 until its closure in July 2018.

It is our understanding that approximately 51 acres of the property will be developed to create 1,204 multi-family homes and the remaining approximately 113 acres would include a mix of open space and recreational uses. The development footprints are located within the fairways of the golf course.

PREVIOUS GEOTECHNICAL STUDIES

The Carmel Mountain Golf Course and surrounding residential development areas were graded between March 1984 and January 1988. The majority of the observation and testing services conducted during these operations was performed by Geocon Incorporated as discussed in the referenced reports below. This information and the recent subsurface investigation served as the basis for our interpretation of the geologic conditions, fill geometries and our recommendations discussed herein.

1. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Golf Course, San Diego, California*, dated October 10, 1985 (Project No. D-3071-T02).

2. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Golf Course Clubhouse Area, San Diego, California,* dated August 1, 1985 (Project No. D-3071-T05).

3. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Golf Course Maintenance Yard, San Diego, California,* dated June 19, 1985 (Project No. D-3071-T02).

4. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Parksite, San Diego, California,* dated August 12, 1987 (Project No. D-3071-T23).

5. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Unit No. 3, San Diego, California,* dated March 26, 1987 (Project No. D-3071-T13).

6. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Unit 4 and 36, T.M. 84-0467 W.O. 860538, San Diego, California,* dated July 8, 1987, revised January 31, 1989 (Project No. D-3071-T13).

7. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Unit Nos. 5 and 5A, San Diego, California,* dated September 8, 1986 (Project No. D-3071-T08).

8. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Unit No. 6A, San Diego, California,* dated February 27, 1987 (Project No. D-3071-T06).

9. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Unit No. 10, T.M. 85-0401 W.O. 850401, San Diego, California,* dated November 6, 1986 (Project No. D-3071-T10).

10. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Unit 13, San Diego, California,* dated October 19, 1987 (Project No. D-3071-T15).

11. *Final Report of Testing and Observation Services During Mass Grading Operations for Carmel Mountain Ranch Unit 17, T.M. 86-0376 W.O. 860376, San Diego, California,* dated February 10, 1988 (Project No. D-3071-T21).

HYDROLOGIC SOIL GROUP

The United States Department of Agriculture (USDA), Natural Resources Conservation Services (NRCS), possesses general information regarding the existing soil conditions for areas within the United States. The USDA NRCS website also provides the Hydrologic Soil Group. Table 1 presents the descriptions of the hydrologic soil groups. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

TABLE 1
HYDROLOGIC SOIL GROUP DEFINITIONS

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

The subject site is underlain by surficial deposits consisting of previously-placed compacted fill, alluvium and colluvium. Formational units include Mission Valley Formation, Stadium Conglomerate, granitic rock, and Friars Formation. After completion of the proposed grading operations, the property would generally consist of formational units exposed at grade or compacted fill deposits overlying bedrock materials. The compacted fill and formational materials should be classified as Soil Group D. In addition, the USDA NRCS website also provides an estimated saturated hydraulic conductivity for the existing soils. Tables 3A through 3K present the information from the USDA NRCS website. The Hydrologic Soil Group Map presents output from the USDA NRCS website showing the limits of the soil units.

TABLE 3A
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 1 – BMP 1)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Diablo Clay, 9 to 15% slopes	DaD	54	C	0.06 – 0.20
Diablo Clay, 15 to 30% slopes	DaE2	3	C	0.06 – 0.20
Diablo-Olivenhain Complex	DoE	39	D	0.06 – 0.20
Linne Clay Loam	LsE	4	C	0.2 – 0.57

TABLE 3B
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 2 – BMP 2)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Altamont Clay	AtE	32	C	0.06 – 0.20
Diablo Clay, 9 to 15% slopes	DaD	24	C	0.06 – 0.20
Diablo-Olivenhain Complex	DoE	35	D	0.06 – 0.20
Ramona Sandy Loam	RaB	9	C	0.2 – 0.57

TABLE 3C
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 5 – BMP 5)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Escondido very fine sandy loam	EsC	29	C	0.57 – 1.98
Ramona Sandy Loam	RaB	71	C	0.2 – 0.57

TABLE 3D
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 6 – BMP 6)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Cieneba rocky coarse sandy loam	CMe2	26	D	1.98 – 5.95
Escondido very fine sandy loam	EsC	13	C	0.57 – 1.98
Ramona Sandy Loam	RaC	61	C	0.2 – 0.57

TABLE 3E
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 8 – BMP 8)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Altamont Clay	AtE	41	C	0.06 – 0.20
Cieneba rocky coarse sandy loam	CMe2	12	D	1.98 – 5.95
Diablo-Olivenhain Complex	DoE	26	D	0.06 – 0.20
Linne Clay Loam	LsE	3	C	0.2 – 0.57
Ramona Sandy Loam	RaB	18	C	0.2 – 0.57

TABLE 3F
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 9 – BMP 9)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Diablo Clay, 9 to 15% slopes	DaD	70	C	0.06 – 0.20
Diablo Clay, 15 to 30% slopes	DaE2	2	C	0.06 – 0.20
Linne Clay Loam	LsE	28	C	0.2 – 0.57

TABLE 3G
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 11 – BMP 11)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Diablo Clay, 9 to 15% slopes	DaD	29	C	0.06 – 0.20
Diablo Clay, 15 to 30% slopes	DaE2	5	C	0.06 – 0.20
Diablo-Olivenhain Complex	DoE	9	D	0.06 – 0.20
Linne Clay Loam	LsE	58	C	0.2 – 0.57

TABLE 3H
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 13 – BMP 13)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Cieneba coarse sandy loam	CiE2	99	D	1.98 – 5.95
Ramona Sandy Loam	RaC	1	C	0.2 – 0.57

TABLE 3I
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 16 – BMP 16)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Diablo-Olivenhain Complex	DoE	35	D	0.06 – 0.20
Olivehain cobbly loam	OhC	65	D	0.00 – 0.06

TABLE 3J
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 17 – BMP 17)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Diablo Clay, 9 to 15% slopes	DaD	100	C	0.06 – 0.20

TABLE 3K
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP (DMA 18 – BMP 18)

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	k_{SAT} of Most Limiting Layer (Inches/ Hour)
Diablo Clay, 9 to 15% slopes	DaD	83	C	0.06 – 0.20
Diablo Clay, 15 to 30% slopes	DaE2	17	C	0.06 – 0.20
Linne Clay Loam	LsE	<1	C	0.2 – 0.57

GROUNDWATER ELEVATIONS

Groundwater and seepage was encountered within several of the exploratory trenches and borings performed during the field investigation. Groundwater/seepage was found as shallow as 7 feet in Trench No. T-126 and as deep as 32 feet in Boring No. LB-14. However, due to the geologic conditions and the natural and artificial water sources inherent to the property, groundwater conditions are expected to fluctuate seasonally.

Groundwater is not expected to be encountered within approximately 10 feet from the bottom of proposed BMP's, however, moderate to heavy seepage was observed approximately 11 feet from the bottom of proposed BMP 5.

GROUNDWATER MOUNDING

We do not expect groundwater mounding due to the depth of the groundwater elevation.

EXPANSION CLASSIFICATION

Based on the results of laboratory expansion index testing performed during mass grading operations at the site and during our recent investigation, the onsite soil and geologic units are "non-expansive" (expansion index of 20 or less) and "expansive" (expansion index greater than 20) as defined by 2019 California Building Code (CBC) Section 1803.5.3. The on-site granitic rock and Stadium Conglomerate is considered non-expansive. The colluvium and Mission Valley Formation possesses clayey zones that exhibit a "medium" to "high" expansion potential.

HYDROCOMPRESSION

We do not expect the formational materials to possess a hydrocompression potential due to the very dense nature of the materials. However, based on laboratory consolidation test results, the colluvium and fill materials possess a potential for hydrocompression when wetted. Infiltration BMP's supported on colluvium or fill materials should be avoided due to the hydrocompression potential.

EXISTING SLOPES

The SWS (Section C.2.1.3) states water infiltration should be setback from slopes a minimum distance of 1.5 times the slope height. Existing slopes are located adjacent to several of the proposed storm water BMP's.

NEW OR EXISTING UTILITIES

Utilities are present on and adjacent to the property that provide service to the neighboring structures. Full or partial infiltration should not be allowed in the areas of the existing or proposed utilities to help prevent potential damage/distress to improvements. The setback for infiltration devices should be at least 10 feet and a minimum of a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility.

EXISTING AND PLANNED STRUCTURES

Water should not be allowed to infiltrate within 10 feet of foundations.

SOIL TYPES

Existing/Proposed Compacted Fill – Fill deposits associated with the previous golf course grading operations vary in thickness from a thin veneer to approximately 34 feet (Boring No. LB-1). The materials encountered during our study consisted of mixtures of silty to clayey sands to silty to sandy clays with minor amounts of gravel, cobble and boulder size rock fragments.

Proposed BMP's 2, 8 and 18 will be founded in fill greater than 5 feet thick. The compacted fill will be comprised of mixtures of on-site sand, silt, and clay. The fill will be compacted to a dry density of

at least 90 percent of the laboratory maximum dry density. In our experience, compacted fill does not possess infiltration rates appropriate for infiltration BMP's. Hazards that occur as a result of fill soil saturation include a potential for hydro-consolidation of the granular fill soils, long term fill settlement, differential fill settlement, lateral water migration, and daylight water seepage.

Colluvium – Colluvial deposits were encountered in several of the exploratory borings and trenches with a maximum thickness of 17 feet (Trench No. T-150). These deposits, in general, consist of silty to clayey sands and silty to sandy clays. The lower portions of the colluvium may contain gravel and cobble lenses, as observed in Trench T-150 and Boring LB-11.

Proposed BMP-5 is anticipated to be supported by colluvial deposits. As observed in Trench T-150 and Boring LB-11, the lower portions contain gravel and cobble lenses that are a pathway for water to migrate laterally beyond the project limits. In addition, laboratory testing indicates the colluvium is prone to hydro-compression when subjected to additional water. Hydro-compression ranging between 0.5 and 4 percent of the total thickness could result in upwards of 1 to 8 inches of total settlement. Therefore, due to the potential for lateral water migration and hydro-compression, infiltration BMP's supported by colluvial deposits are not considered feasible.

Granitic Rock – Cretaceous-age granitic rock was encountered on Hole Nos. 1, 2, 7, 8 and 13. Based upon the subsurface excavations, seismic traverses, site reconnaissance and experience with similar geologic conditions in the area, the rock materials exhibit a variable weathering pattern ranging from completely weathered, decomposed granite to outcrops of fresh, extremely strong, hard rock. Granitic rock may contain fractures that provide pathways for lateral migration.

Proposed BMP's 6 and 13 are expected to expose granitic rock. Granitic rock is not considered suitable for infiltration BMP's due to the anticipated very low infiltration rates and high probability of lateral water migration impacting adjacent homes and improvements.

Mission Valley Formation – The Eocene-age Mission Valley Formation was encountered on Hole Nos. 1, 2, 10, 11, and 16 through 18 and consists of hard claystones and siltstones, and dense sandstones. The claystones and siltstones typically possess a medium to high expansion potential and low shear strength, compared to the sandstone units that have a low expansion potential and higher shear strength properties. The uncemented sand layers may provide a pathway for lateral water migration.

Proposed BMP's 1, 9, 11, and 17 are expected to expose Mission Valley Formation. BMP 18 will be underlain by approximately 10 feet of fill over Mission Valley Formation. The Mission Valley Formation is not considered suitable for infiltration BMP's due to the anticipated very low infiltration rates and high probability of lateral water migration impacting adjacent homes and improvements.

Stadium Conglomerate – The Eocene-age Stadium Conglomerate was encountered on Hole Nos. 15 and 16, which overlies the Friars Formation and underlies the Mission Valley Formation. As encountered in exploratory borings and trenches, this deposit generally consists of a sandy to clayey, conglomerate with interbedded silty to gravelly sandstone. In addition, some of the excavations advanced through this unit encountered difficulty and refusal due to cemented layers and boulders. The uncemented gravel and boulder zones may provide a pathway for lateral water migration.

Proposed BMP 16 is expected to expose Stadium Conglomerate. Stadium Conglomerate is not considered suitable for infiltration BMP's due to the anticipated very low infiltration rates and high probability of lateral water migration impacting adjacent homes and improvements.

Soil or Groundwater Contamination

Based on review of the Geotracker website, no active cleanup sites exist on or adjacent to the subject basin locations. In addition, we are not aware of any contaminated soils or shallow groundwater on the site that would preclude storm water infiltration. An environmental assessment was not part of our scope of work.

Slopes and Other Geologic Hazards

Infiltration of storm water adjacent to cut or fill slopes should be avoided. Fill slopes will exhibit instability if water is allowed to saturate the compacted fill. Cut slopes may exhibit daylight seepage.

Several of the proposed BMP's are shown with bottom elevations near or higher than the surrounding residences. The potential for lateral water migration to adversely impact adjacent residences and roadways is high if infiltration BMP's founded in compacted fill or formational materials are used.

STORM WATER DESIGN NARRATIVE

The proposed development is situated in the existing fairways of the golf course. Each of the proposed basins is located down-gradient from the proposed development. The locations of the proposed basins were provided by the Project Civil Engineer considering site topography, proposed grading, and ultimate development. Based on the information provided, each of the BMP locations was chosen based on the future ultimate development for each fairway including; raising the finish grade, constructing roadways, curb and gutters, sidewalks, and associated utilities to mitigate peak flow runoff and satisfy hydromodification requirements for each DMA area.

We performed our site reconnaissance and background research for the subject property to evaluate potential areas of infiltration. We did not perform infiltration tests on the property at this stage in project planning due to the presence of dense formational materials and adjacent homes near each of the proposed

BMP's that in our opinion should preclude infiltration BMP's. We expect the onsite soil and geologic units to exhibit very slow infiltration rates that do not meet the minimum thresholds for full or partial infiltration. In addition, the colluvial deposits and formational materials exhibit features that would potentially allow for lateral water migration to adversely impact neighboring properties and public right of ways.

Table 4 presents a summary of the anticipated soil/geologic conditions beneath each of the proposed BMP locations.

TABLE 4
ANTICIPATED SOIL/GEOLOGIC CONDITIONS BENEATH BMP LOCATIONS

BMP ID	Anticipated Geologic Conditions	Adverse Geologic Conditions
BMP 1	Mission Valley Formation	Low hydraulic conductivity; lateral water migration; adjacent homes
BMP 2	Approximately 19 feet of previously-placed fill over 4 feet of Alluvium then Granitic Rock	Fill soil > 5 feet thick; settlement
BMP 5	Colluvium over Granitic Rock	Low hydraulic conductivity; lateral water migration; settlement; adjacent homes
BMP 6	Granitic Rock	Low hydraulic conductivity; lateral water migration; adjacent to public roadway
BMP 8	Approximately 10 feet of previously-placed fill over 4 feet of Topsoil then Granitic Rock	Fill soil > 5 feet thick; settlement
BMP 9	Mission Valley Formation	Low hydraulic conductivity; lateral water migration; adjacent homes
BMP 11	Mission Valley Formation	Low hydraulic conductivity; lateral water migration; adjacent homes
BMP 16	Stadium Conglomerate or 4 feet of Colluvium over Stadium Conglomerate	Low hydraulic conductivity; lateral water migration; adjacent homes
BMP 17	Mission Valley Formation	Low hydraulic conductivity; lateral water migration; adjacent homes
BMP 18	Approximately 10 feet of compacted fill over Mission Valley Formation	Fill soil > 5 feet thick; settlement

CONCLUSIONS AND RECOMMENDATIONS

Our results indicate that each storm water basin will be underlain by either fill, colluvium, or dense formational materials with sand or gravel lenses that may allow water to migrate laterally. We expect these units to exhibit very slow infiltration characteristics unsuitable for infiltration BMP's. In addition, there is a high potential for lateral water migration through sand or gravel lenses embedded in the colluvial deposits and formational materials to adversely impact neighboring properties and public right of ways. In addition, infiltration BMP's supported by colluvium or compacted fill would result in adverse settlement of the deeper fills and/or heaving of the near surface compacted fills. Considering the site and geologic conditions, it is our opinion that full and partial infiltration is infeasible on this site. Liners and subdrains should be installed within BMP areas. If water is allowed

to infiltrate the soil, water could migrate away from the basins and into public and private improvements, or induce adverse soil movement.

Based on the results of our research and the existing geologic units on the property, it does not appear that the site conditions possess an opportunity for full and partial infiltration based on the underlying geologic conditions and close proximity to existing structures. The potential for lateral water migration to adversely impact neighboring properties and improvements is high. *Therefore, the property should be considered to possess a "No Infiltration" condition in accordance with Appendix C of SWS.*

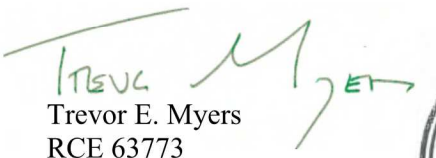
STORM WATER MANAGEMENT DEVICES

Storm water management devices should be properly constructed in accordance with the project plans. Liners and subdrains should be incorporated into the design and construction of the planned storm water BMP's. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 4 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

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

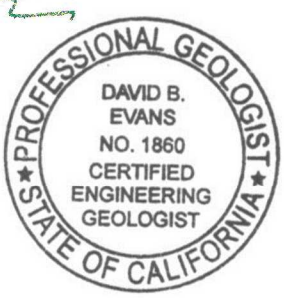
Very truly yours,

GEOCON INCORPORATED



Trevor E. Myers
RCE 63773

David B. Evans
CEG 1860



TEM:DBE:arm

(e-mail) Addressee
(e-mail) Project Design Consultants
Attention: Ms. Chelisa Pack

ATTACHMENT 1E – POLLUTANT CONTROL BMP DESIGN WORKSHEETS/CALCULATIONS

ATTACHMENT 1B: Worksheet B.2-1: DCV

85th percentile 24-hr storm depth from Figure B.1.= 0.66 in

DMA ID	BMP ID	BMP Drainage Area (ac)	BMP Drainage Area (SF)	Impervious Area (ac)	Amended Soils (ac) (C=0.1)	Natural A Soils (ac) (C=0.1)	Natural B Soils (ac) (C=0.14)	Natural C Soils (ac) (C=0.23)	Natural D Soils (ac) (C=0.3)	% Impervious	Composite C[1]	Tree Credit Volume (cf)	Rain Barrels Credit Volume (cf)	Design Capture Volume (DCV) (CF)
1	1	8.5	369341	5.5	1.47				1.5	65%	0.66	0	0	13312
2	2	8.6	376482	4.7	1.21				2.73	54%	0.60	0	0	12393
5	5	2.6	114449	2.0	0.63					76%	0.71	0	0	4456
6	6	7.2	312818	4.0	0.93				2.29	55%	0.61	0	0	10412
7[2]	N/A	5.3	N/A	N/A	N/A				5.3	N/A	N/A	N/A	N/A	N/A
8	8	10.8	470539	6.5	1.64				2.7	60%	0.63	0	0	16267
9A+9B	9	7.0	303084	5.6	1.40					80%	0.74	0	0	12317
9C[2]	N/A	2.4	N/A	N/A	N/A				2.4	N/A	N/A	N/A	N/A	N/A
11	11	14.9	650467	10.1	2.33			1.11	1.41	67%	0.67	0	0	23917
13[2]	N/A	1.3	N/A	N/A	N/A				1.3	N/A	N/A	N/A	N/A	N/A
15[2]	N/A	3.3	N/A	N/A	N/A				3.3	N/A	N/A	N/A	N/A	N/A
16	16	5.7	250047	4.6	1.09					81%	0.75	0	0	10287
17	17	5.6	242564	4.4	1.17					79%	0.73	0	0	9773
18A	18	4.7	205259	3.5	1.18					75%	0.70	0	0	7904
18B[2]	N/A	4.7	N/A	N/A	N/A				4.65	N/A	N/A	N/A	N/A	N/A
Site Total		92.6	3295048	50.9	13.05	0.00	0.00	1.11	27.58	55%	0.60	0	0	133222

Notes:

1) Equation for composite C factor = (0.9*Impervious Area +C*Pervious Area)/Total Area per BMP Design Manual.

2) DMAs 7, 9C, 13, 15, and 18B are self-mitigating areas which do not drain to BMPs.

C factors are from Table B.1-1 of Oct 2018 City BMP Design Manual.

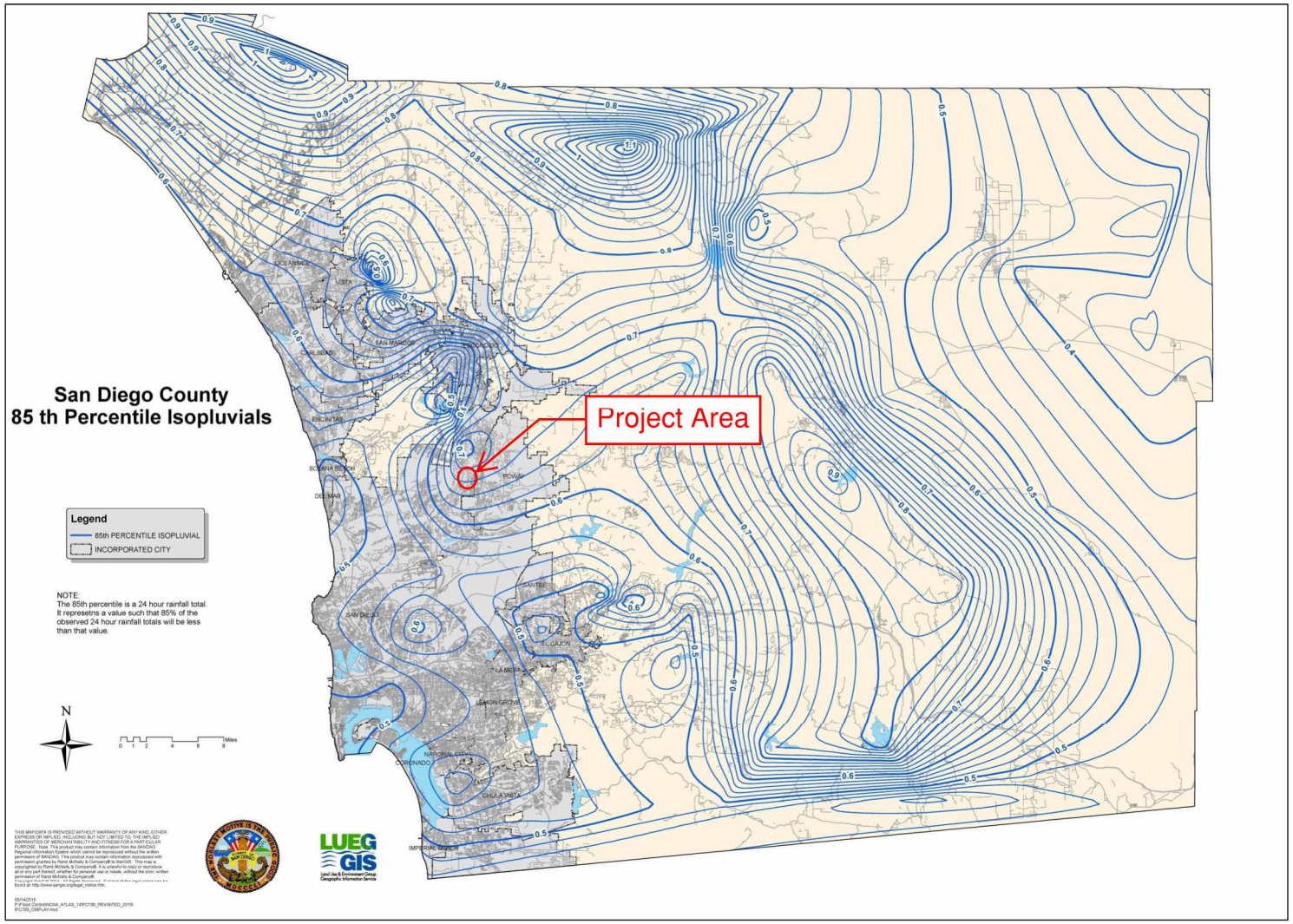


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	3	in
H	3.13	
Max hydromod Q through underdrain	0.41782	cfs
Footprint of the BMP	7614	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**2.37**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	1 (DMA 1)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	369341	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.66	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	13312	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	2.37	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	14.22	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.2	inches
15	Total Depth Treated [Line 13 + Line 14]	30.42	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	19967	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	7877	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	9984	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	7395	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	7261	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	7395	sq. ft.
23	Provided BMP Footprint	7614	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	1 (DMA 1)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	369340.56	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.655298232	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	13312	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	306	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	1 (DMA 1)	

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		369340.56	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.655298232	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		242028	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		7261	sq. ft.
5	Biofiltration BMP Footprint		7614	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]					0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]					7614	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.05	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	306	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-15.30828466	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	3	in
H	3.13	
Max hydromod Q through underdrain	0.41782	cfs
Footprint of the BMP	7784	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**2.32**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	2 (DMA 2)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	376482	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.60	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	12393	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	2.32	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	13.92	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.2	inches
15	Total Depth Treated [Line 13 + Line 14]	30.12	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	18590	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	7406	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	9295	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	6885	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	6760	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	6885	sq. ft.
23	Provided BMP Footprint	7784	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	2 (DMA 2)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	376481.77	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.598524749	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	12393	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	285	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	2 (DMA 2)	

Volume Retention for No Infiltration Condition		Worksheet B.5-6	
1	Area draining to the biofiltration BMP	376481.77	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.598524749	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	225334	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	6760	sq. ft.
5	Biofiltration BMP Footprint	7784	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	7784	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.15	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	285	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-42.75706142	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	12	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	2	in
H	3.67	
Max hydromod Q through underdrain	0.20115	cfs
Footprint of the BMP	4045	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**2.15**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	5 (DMA 5)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	114449	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.75	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	4709	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	2.15	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	12.9	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	22.2	inches
15	Total Depth Treated [Line 13 + Line 14]	35.1	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	7063	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	2415	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	3531	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1909	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	2568	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	2568	sq. ft.
23	Provided BMP Footprint	4045	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	5 (DMA 5)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	114449.1	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.748021632	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	4709	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	108	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch
	BMP ID	5 (DMA 5)

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		114449	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.748021632	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		85610	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		2568	sq. ft.
5	Biofiltration BMP Footprint		4045	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]					0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]					4045	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.57	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	237	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-134.8656318	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	27	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	4.5	in
H	3.56	
Max hydromod Q through underdrain	1.00375	cfs
Footprint of the BMP	5834	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**5.00**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	6 (DMA 6)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	312818	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.61	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	10412	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	27	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5.00	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	17.4	inches
15	Total Depth Treated [Line 13 + Line 14]	47.4	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	15618	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	3954	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	7809	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	5386	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	5679	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	5679	sq. ft.
23	Provided BMP Footprint	5834	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	6 (DMA 6)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	312818.21	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.605179465	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	10412	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	239	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	6 (DMA 6)	

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		312818.21	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.605179465	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		189311	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		5679	sq. ft.
5	Biofiltration BMP Footprint		5834	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	5834	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.03	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	239	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-7.184358408	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	3	in
H	3.13	
Max hydromod Q through underdrain	0.41782	cfs
Footprint of the BMP	9529	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**1.89**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	8 (DMA 8)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	470539	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.63	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	16267	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	1.89	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	11.34	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.2	inches
15	Total Depth Treated [Line 13 + Line 14]	27.54	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	24401	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	10632	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	12200	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	9037	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	8873	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	9037	sq. ft.
23	Provided BMP Footprint	9529	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	8 (DMA 8)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	470538.54	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.628570756	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	16267	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	374	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	8 (DMA 8)	

Volume Retention for No Infiltration Condition		Worksheet B.5-6	
1	Area draining to the biofiltration BMP	470538.54	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.628570756	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	295767	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	8873	sq. ft.
5	Biofiltration BMP Footprint	9529	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	9529	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.07	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	374	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-26.19014713	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	4	in
H	3.08	
Max hydromod Q through underdrain	0.73782	cfs
Footprint of the BMP	8914	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**3.58**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	9 (DMAs 9A&9B)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	303084	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.74	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	12317	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	3.58	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	21.48	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.2	inches
15	Total Depth Treated [Line 13 + Line 14]	37.68	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	18476	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	5884	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	9238	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	6843	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	6719	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	6719	sq. ft.
23	Provided BMP Footprint	8914	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	9 (DMAs 9A&9B)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	303083.5	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.73891552	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	12317	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	283	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	9 (DMAs 9A&9B)	

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		303083.5	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.73891552	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		223953	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		6719	sq. ft.
5	Biofiltration BMP Footprint		8914	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	8914	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.33	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	283	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-93.48922243	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	3	in
H	3.13	
Max hydromod Q through underdrain	0.41782	cfs
Footprint of the BMP	14666	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**1.23**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	11 (DMA 11)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	650467	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.67	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	23917	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	1.23	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	7.38	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.2	inches
15	Total Depth Treated [Line 13 + Line 14]	23.58	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	35876	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	18257	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	17938	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	13287	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	13046	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	13287	sq. ft.
23	Provided BMP Footprint	14666	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	11 (DMA 11)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	650466.9	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.668527591	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	23917	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	550	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	11 (DMA 11)	

Volume Retention for No Infiltration Condition			Worksheet B.5-6
1	Area draining to the biofiltration BMP	650466.9	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.668527591	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	434855	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	13046	sq. ft.
5	Biofiltration BMP Footprint	14666	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	14666	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.12	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	550	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-66.01099963	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	3	in
H	3.13	
Max hydromod Q through underdrain	0.41782	cfs
Footprint of the BMP	5614	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**3.22**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	16 (DMA 16)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	250047	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.75	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	10287	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	3.22	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	19.32	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.2	inches
15	Total Depth Treated [Line 13 + Line 14]	35.52	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	15431	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	5213	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	7715	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	5715	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	5611	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	5611	sq. ft.
23	Provided BMP Footprint	5615	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	16 (DMA 16)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	250047.06	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.748021632	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	10287	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	237	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	16 (DMA 16)	

Volume Retention for No Infiltration Condition		Worksheet B.5-6	
1	Area draining to the biofiltration BMP	250047.06	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.748021632	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	187041	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	5611	sq. ft.
5	Biofiltration BMP Footprint	5615	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	5615	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	237	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	0	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	27	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	3	in
H	3.63	
Max hydromod Q through underdrain	0.45001	cfs
Footprint of the BMP	5449	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**3.57**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	17 (DMA 17A)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	242564	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.73	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	9773	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	27	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	3.57	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	21.40603728	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	17.4	inches
15	Total Depth Treated [Line 13 + Line 14]	38.80603728	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	14660	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	4533	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	7330	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	5055	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	5331	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	5331	sq. ft.
23	Provided BMP Footprint	5449	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	17 (DMA 17)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	242564.08	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.732558291	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	9773	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	225	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	17 (DMA 17A)	

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		242564.08	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.732558291	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		177692	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		5331	sq. ft.
5	Biofiltration BMP Footprint		5449	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]					0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]					5449	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.02	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	225	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-4.495615898	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	17 (DMA 17)	

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		242564.08	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.732558291	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		177692	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		5331	sq. ft.
5	Biofiltration BMP Footprint		5449	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	5449	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.02	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	225	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-4.495615898	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	4	in
H	3.08	
Max hydromod Q through underdrain	0.73782	cfs
Footprint of the BMP	4914	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**5.00**	in/hr

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	18 (DMA 18A)	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	205259	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.70	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	7904	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.2	inches
15	Total Depth Treated [Line 13 + Line 14]	46.2	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	11857	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	3080	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	5928	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	4391	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	4311	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	4311	sq. ft.
23	Provided BMP Footprint	4914	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	18 (DMA 18A)	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	205258.51	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.700173469	
3	85th percentile 24-hour rainfall depth	0.66	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	7904	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	182	cu. ft.

The City of SAN DIEGO	Project Name	Carmel Mountain Ranch	
	BMP ID	18 (DMA 18A)	

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		205258.51	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.700173469	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		143717	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		4311	sq. ft.
5	Biofiltration BMP Footprint		4914	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]					0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]					4914	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.14	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	182	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-25.45220331	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

E.18 BF-1 Biofiltration

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

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

Description

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

Typical bioretention with underdrain components include:

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

Design Adaptations for Project Goals

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

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

Recommended Siting Criteria

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

Example Schematic Design – Plan and Section View

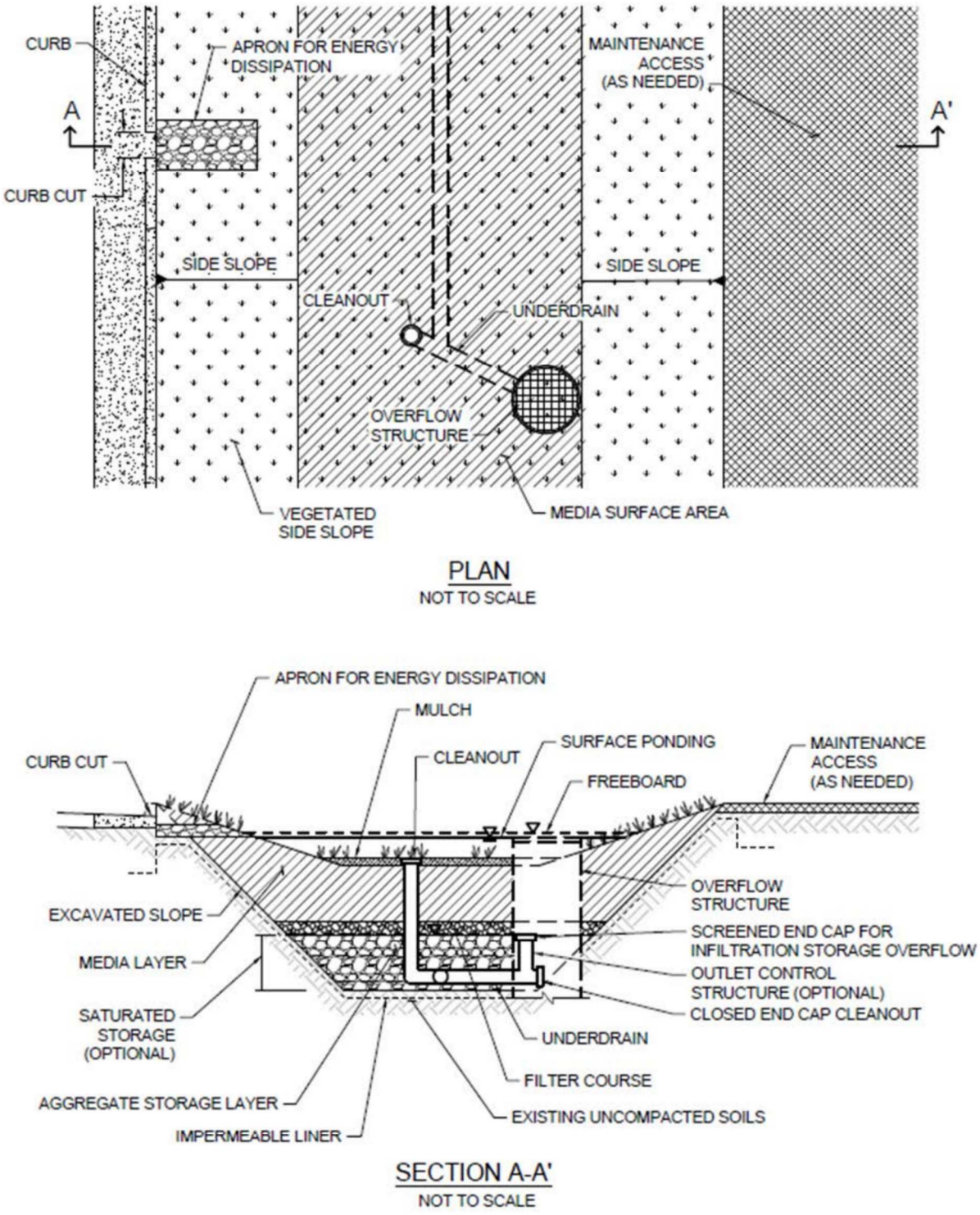


Figure E.18-1 : Typical Plan and Section View of a Biofiltration BMP

Recommended BMP Component Dimensions

BMP Component	Dimension	Intent/Rationale
Freeboard	≥ 2 inches	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
Surface Ponding	≥ 6 and ≤ 12 inches	The minimum ponding depth is required so that the runoff is uniformly spread throughout the basin (minimizes the likelihood of short circuiting). Deep surface ponding raises safety concerns. When the BMP is adjoining walkways the minimum surface ponding depth can be reduced to 4 inches. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of the City Engineer if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence) and 3) potential for elevated clogging risk is evaluated (Worksheet B.5.4).
Ponding Area Side Slopes	3H:1V or shallower	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Mulch	≥ 3 inches	Mulch will suppress weeds and maintain moisture for plant growth.
Media Layer	≥ 18 inches	A deep media layer provides additional filtration and supports plants with deeper roots. Where the minimum depth of 18 inches is used, only shallow-rooted species shall be planted. A minimum 24-inch media layer shall typically be required to support vegetation, with a minimum 36-inch media layer depth required for trees.
Filter Course	6 inches	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3" layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3" layer of ASTM No 8 Stone (Appendix F.4). This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.
Underdrain Diameter	≥ 8 inches	Minimum diameter required for maintenance by City crews. For privately maintained BMPs, a minimum underdrain diameter of 6 inches is allowed.
Cleanout Diameter	≥ 8 inches	Facilitates simpler cleaning, when needed. For privately maintained BMPs, cleanout diameter of 6 inches is allowed.

Deviations to the recommended BMP component dimensions may be approved at the discretion of the City Engineer if it is determined to be appropriate.

Design Criteria and Considerations

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

	Design Criteria	Intent/Rationale
Surface Ponding		
□	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hour for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.
Vegetation		
□	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.26.	Plants suited to the climate and ponding depth are more likely to survive.
□	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch		
□	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		
□	Media maintains a minimum filtration rate of 5 in/hr. over lifetime of facility. Additional Criteria for media hydraulic conductivity described in the bioretention soil media model specification (Appendix F.3)	A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.

	Design Criteria	Intent/Rationale
□	Media shall be a minimum 18 inches deep for filtration purposes, with a minimum 24-inch media layer depth typically required to support vegetation and a minimum 36-inch media layer depth required for trees. Media shall meet the following specifications. Model bioretention soil media specification provided in Appendix F.3 or County of San Diego Low Impact Development Handbook: Appendix G - Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications, the media meets the pollutant treatment performance criteria in Section F.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications shall be followed. For non-standard or proprietary designs, compliance with Appendix F.1 ensures that adequate treatment performance will be provided.
□	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Refer to Appendix B.5 for guidance to support use of smaller than 3% footprint..
□	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		
□	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade and can result in poor water quality performance for turbidity and suspended solids. Filter fabric is more likely to clog.
□	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility and impede infiltration.
□	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3" layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3" layer of ASTM No 8 Stone (Appendix F.4).	This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.

	Design Criteria	Intent/Rationale
Aggregate Storage Layer		
□	ASTM #57 open graded stone is used for the storage layer and a two layer filter course (detailed above) is used above this layer	This layer provides additional storage capacity. ASTM #8 stone provides an acceptable choking/bridging interface with the particles in ASTM #57 stone.
□	The depth of aggregate provided (12-inch typical) and storage layer configuration is adequate for providing conveyance for underdrain flows to the outlet structure.	Proper storage layer configuration and underdrain placement will minimize facility drawdown time.
Inflow, Underdrain, and Outflow Structures		
□	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
□	Inflow velocities are limited to 3 ft./s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
□	Curb cut inlets are at least 18 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
□	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
□	Minimum underdrain diameter is 8 inches.	Minimum diameter required for maintenance by City crews. For privately maintained BMPs, a minimum underdrain diameter of 6 inches is allowed.
□	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
□	An underdrain cleanout with a minimum 8-inch diameter and lockable cap is placed every 50 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance. For privately maintained BMPs, cleanout diameter of 6 inches is allowed.
□	Overflow is safely conveyed to a downstream storm drain system or discharge point Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.
Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only		

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

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

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

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

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

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:

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

Project Name: The Trails at Carmel Mountain Ranch

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

The Hydromodification Management Exhibit must identify:

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

Preliminary Hydromodification Management Study

THE TRAILS AT CARMEL MOUNTAIN RANCH

VTM *PTS #652519*

City of San Diego, CA
April 8, 2020

Prepared for:
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Registration Expires 06/30/21

1. INTRODUCTION

This report summarizes hydromodification design for the Carmel Mountain Ranch Project located in the City of San Diego, CA. The hydromodification calculations were performed utilizing continuous simulation analysis to size the storm water treatment and control facilities. Storm Water Management Model (SWMM) version 5.1 distributed by USEPA is the basis of both existing and proposed conditions modeling within this report. The biofiltration basin/hydromodification basin sizing and link configuration with the specialized outlet configuration ensures compliance with the Hydromodification Management Plan (HMP) requirements from the San Diego Regional Water Quality Control Board (SDRWQCB).

2. PROJECT DESCRIPTION

The Trails at Carmel Mountain Ranch Project is a proposed residential community located in the City of San Diego. The site is approximately 164.5 acres in size and is located east of Interstate 15, west of Pomerado Road, and between Carmel Mountain Road and Ted Williams Parkway. The Property was formerly operated as a golf course and is currently owned by PACS Enterprises, LLC. The Proposed Project includes approximately 101.4 acres of open space (including natural open space, landscaped slopes, and parkland), and a total of approximately 1200 residential units.

3. HYDROMODIFICATION MODELING OVERVIEW

3. 1 Model Description

PCSWMM is a proprietary software which utilizes the EPA's Stormwater Management Model (SWMM) as its computational engine, while providing added processing and analytical capabilities to streamline design. PCSWMM is essentially a user-friendly shell for SWMM that allows rapid development and analysis of SWMM models.

PCSWMM was employed for this study based on the ability to efficiently create, edit and compare models, perform detention routing with the same software, and moreover, due to the tendency for SWMM to produce results that have been found to more accurately represent San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM).

SWMM is a semi-distributed hydrologic and hydraulic modeling software that simulates the rainfall-runoff response of a watershed based on linear-reservoir overland flow routing. This

overland flow routine accounts for the connectedness of pervious, impervious, and Low Impact Development (LID) BMPs to the drainage system. LID BMPs are represented with a module in SWMM that simulates the water balance through standard LID BMP components, accounting for soil percolation, evapotranspiration, underdrain outflow, various media layer storage and subgrade infiltration (if applicable). These controls provide a wide range of customizability between the various associated parameters and the ability to route underdrain or overflow to other SWMM elements, like Storages Nodes and conduits to represent almost any conceivable LID system.

The outflow from these LID controls, storage components or watersheds is translated into the hydraulic component of the model that utilizes energy and momentum principles to determine flow through conduits, orifices and other structures. The hydraulics may be computed based on either the kinematic or dynamic-wave equations. In this study the former was used because there was no need to take downstream hydraulic grade line effects into consideration.

3.2 Hydromodification Criteria

The San Diego Regional Water Quality Control Board (SDRWQCB) requires the exceedance duration of post-developed flow rates be maintained to within 10% of the pre-developed flow durations. This must occur for flow frequencies ranging from a fraction of the 2-year flow (Q2) to the 10-year flow (Q10). These flow frequency values may be calculated directly from SWMM statistics or estimated based on accepted USGS regression equations. These equations estimate flows based on a correlation with watershed area and the mean annual rainfall developed for the region. For this project the SWMM output was used because of the exceedingly small values calculated by regression equations, which were developed with data from significantly larger watersheds.

The fraction of the Q2 that must be controlled is dependent on the relative erodibility of the channel being discharged to, categorized as either High, Medium, or Low susceptibility. By default it is assumed that all channels have a High susceptibility, and that therefore the low flow threshold of 0.1 of the Q2 must be controlled. A Geomorphic Assessment of Receiving Channels may be performed to indicate whether the channel erosion susceptibility can be categorized as Medium or Low, allowing control to 0.3 or 0.5 of the Q2, respectively.

The low-flow threshold used in the analysis for Carmel Mountain Ranch project is the 0.5Q2 low-flow threshold, as determined as "medium susceptibility" by the geomorphic channel assessment analysis performed for the downstream locations. A complete geomorphic assessment report completed by Wayne Chang is being submitted with this report.

3.3 Model Development

The inputs required for a SWMM model include rainfall, evapotranspiration rates, watershed characteristics and BMP configurations. The sources for some of these parameters are provided in Table 1 below.

Table 1: Hydrology Criteria

Rain Gage	'Poway' – from Project Clean Water website
Evapotranspiration	Daily E-T Rates taken from Table G.1-1 in the City of San Diego BMP Design Manual based on location in Zone 6 of California irrigation Management Information System "Reference Evapotranspiration Zones"
Overland Flow Path Length	Based on available digital topographic data for pre-development conditions and proposed grading plan for post-project conditions.
Soils/Green-Ampt Parameters	Values for Hydrologic Soil Group 'C and D' taken from Table G.1-4 in the City of San Diego BMP Design Manual. A 25% reduction is applied whenever native soils are compacted. For this project, the 25% reduction factor applies to both pre-development and post-development conditions.

The drainage area to each point of compliance (POC) was delineated with the project boundary plus small fragments of adjacent land that drain through the site for both existing and proposed conditions. For the proposed model this drainage area has been broken up into the contributing drainage management (DMA) areas that drain to BMPs. POC A contains flow from DMAs 5 and 6 and outlets into Chicarits via a 48" RCP. POC B contains flow from DMAs 1, 2, 8, and 9 (9A-9C) and outlets into Chicarita Creek via a 72" CIP concrete pipe. DMA 16 flows to POC C and outlets into a natural canyon in Unit 16 via a 72" RCP. DMAs 17 and 18 (18A and 18B) are conveyed to POC D which outlets into a natural canyon in Unit 15 via a 72" RCP. Finally, POC E contains flow from DMA 11 and outlets into a natural canyon in Unit 12 via a 54" RCP. See the

Storm Water Quality Management Plan (SWQMP) for more information regarding the pollutant control strategy and DMAs.

The overland flow path lengths were drawn from a visual inspection of the watershed contours, extending from the upper ridge to the apparent flow path, perpendicular to the contours. The percent imperviousness was calculated based on the estimated imperviousness in the site plan to develop the same values used to calculate the Design Capture Volume provided in Attachment 1e of the SWQMP. An electronic copy of the model is provided in Attachment C of this report.

4. Modeling for Hydromodification Compliance

The pre-developed conditions for the site were modelled based on the existing topography and landcover with zero imperviousness. For the post-developed condition, the proposed site footprint was represented as an equivalent imperviousness and a short overland flow path length typical of urban drainage systems. The lined biofiltration basins were modelled by coupling the bioretention LID component to properly represent the media and underdrain, with the storage component to represent the basin surface storage. The parameters utilized for the biofiltration parameters were based on the published values in the City of San Diego Stormwater Standards. The basins outlet to new proposed storm drains that connect to separate backbone storm drains that discharge to Chicarita Creek and/or natural canyons offsite.

It was determined that this suite of BMPs would be sufficient to provide flow control with the storage depths and outlet size provided herein based on the SWMM modeling results. The Status Report SWMM output files for the existing condition models are provided in Attachment D and the proposed condition output files are provided in Attachment E.

4.1 Flow Frequency Analysis

The SWMM statistics calculator was used to determine the pre-developed and post developed flow rates for the 2, 5, and 10-year recurrence intervals. These are provided below with the resultant low flow threshold based on the geomorphic assessment. The SWMM output used to calculate these values is provided in Attachment F.

A Geomorphic Assessment of Receiving Channels, often referred to as a SCCWRP analysis, was performed by Chang Consultants for the Points of Compliance along Chicarita Creek and the

natural canyons on the east side of the project. It was determined that the channels had a low susceptibility to erosion meaning that a 0.5 factor could be used as to calculate the low flow threshold from the flow rate of the 2-year recurrence interval.

Table 2 – Pre-Developed and Post-Mitigated Flows for POC A (BMP Basins 5 and 6)

Return Period	Pre-project - Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.5xQ2	1.495	0.363
2-year	2.989	0.727
5-year	3.933	1.185
10-year	4.800	1.813

Table 3 – Pre-Developed and Post-Mitigated Flows for POC B (BMP Basins 1, 2, 8, and 9)

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.5xQ2	5.480	1.693
2-year	10.960	3.385
5-year	15.256	4.617
10-year	16.118	7.114

Table 4 – Pre-Developed and Post-Mitigated Flows for POC C (BMP Basin 16)

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.5xQ2	0.992	0.262
2-year	1.983	0.524
5-year	2.721	0.572
10-year	2.941	0.599

Table 5 – Pre-Developed and Post-Mitigated Flows for POC D (BMP Basins 17 and 18)

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.5xQ2	1.580	0.580
2-year	3.160	1.160
5-year	4.279	1.756
10-year	4.572	2.636

Table 6 – Pre-Developed and Post-Mitigated Flows for POC E (BMP Basin 11)

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.5xQ2	1.749	0.212
2-year	3.497	0.425
5-year	4.630	0.782
10-year	5.164	2.400

4.2 Biofiltration Basins

The basins are composed of above ground storage as well as biofiltration media. These components were represented as an LID control ("Bio-retention cell") in series with a storage node as simulated in SWMM. The module allows the user to represent the various stages of a biofiltration basin including ponding, media, and gravel storage above and below the underdrain. These layer depths were assigned per the design developed for pollutant control as shown in Table 8 and the parameter values were assigned with the standard values taken from Table G.1-7 in the BMP Design Manual (with some refinement). The underdrain is offset to allow for the dead storage needed. The drain coefficients are calculated based on media infiltration of 5 in/hr and basin layer depth and listed in Table 7. Drain coefficient calculation is based on C factor calculation equation in the BMP Design Manual (Page G-27).

$$C = c_g \left(\frac{605}{A_{LID}} \right) \left(\frac{\pi D^2}{8} \right) \sqrt{\frac{g}{6}}$$

where,

cg is the orifice discharge coefficient, typically 0.60-0.65 for thin walled plates and higher for thicker walls;
ALID is the cumulative footprint area (ft^2) of all LID controls;
D is the underdrain orifice diameter (in); and
g is the gravitational constant (32.2 ft/s^2).

Table 7 – Biofiltration Model Summary

Biofiltration BMP #	Surface Area (sf)	Layer Depth			Underdrain Orifice (in)	Drain Coefficient
		Ponding (in)	Soil (in)	Gravel Storage (in)		
1	7614	6	27	12	3	0.39
2	7784	6	27	12	3	0.38
5	4045	12	27	12	2	0.32
6	5792	6	27	12	4.5	1.1
8	9529	6	27	12	3	0.31
9	8913	6	27	12	4	0.59
11	14666	6	27	12	3	0.20
16	5615	6	27	12	3	0.53
17	5109	6	27	12	3	0.58
18	4914	6	27	12	4	1.1
Media and storage parameters taken from Table G.1-7 in BMP Design Manual, including media infiltration = 5 in/hr						

To control the flows with this configuration, except for underdrain orifices, a series of flow orifices were connected between the biofiltration basin storage node connected to the point of compliance. The orifice design is summarized in Table 8.

Table 8 – Biofiltration Orifice Design

Biofiltration BMP #	Low Flow Orifice		Mid Flow Orifice		High Flow Orifice		Overflow Weir	
	Dia. (in)	Offset (ft)	Dia. (in)	Offset (ft)	Dia. (in)	Offset (ft)	Dia. (ft) or Size (ftxft)	Offset (ft)
1	2	0.5	2	2	-	-	4.75x4.75	4.5
2	3	0.5	2-4in	2.5	-	-	4.75x4.75	4.5
5	1	1.0	1	2	-	-	4.75x4.75	3
6	4	0.5	3-3in	2	-	-	4.75x4.75	3.75
8	3	0.5	4	2	-	-	4.75x4.75	4.25
9	4	0.5	3-3in	2	-	-	4.75x4.75	3.5
11	1.5	0.5	3	3	3	5	4.75x4.75	6
16	3	0.5	-	-	-	-	4.75x4.75	4.25
17	3	0.5	4	2.5	-	-	4.75x4.75	4
18	2	0.5	3	2.5	-	-	4.75x4.75	3.75

4.3 Flow Duration Curves for Hydromodification Compliance

The pre and post developed flow duration exceedance curves were developed for the hourly flow data using an automatic partial duration series calculator in PCSWMM. These curves are graphed over the flow ranges listed in Tables 2-6 and are provided in Attachment G. In all cases the duration of post developed flows are brought to well within that of the pre developed flows within the low flow and high flow thresholds, indicating that the suite of BMPs will provide the flow attenuation required for compliance.

5.0 SUMMARY

The predeveloped conditions of the Trails at Carmel Mountain Ranch project were modelled in SWMM to determine a baseline of flow durations that would need to be controlled in the post-developed conditions. The proposed development was also modelled in SWMM with biofiltration basins with significant storage. Based on the SWMM model results for this study it is determined that the combination of ten biofiltration basin LID BMPs will be able to satisfy the hydromodification criteria. This study is intended to demonstrate that these controls as sized are capable of providing hydromodification compliance and a full outlet design will be performed during final engineering.