# H-1

# Stormwater Intake Form & Priority Development Project Stormwater Quality Management Plan

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# CITY OF ENCINITAS
# STORMWATER INTAKE FORM AND PRIORITY DEVELOPMENT PROJECT STORMWATER QUALITY MANAGEMENT PLAN (SWQMP)

**FOR:**
TORREY CREST
CASE NO: MULTI -004309-2021; SUB-004310-2021; DR-004311-2021;
CDPNF-004312-2021 / CPP-004313-2021; SRVRQST-004316-2021

1220 – 1240 MELBA ROAD, 1190 ISLAND VIEW LANE
ENCINITAS, CA 92024
APN: 259-180-09, -10, -16, & -33-00; 259-181-02, -03, & -04-00

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**PREPARED FOR:**
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**DATE OF SWQMP:**
2/26/2024
REVISION #7


**TENTATIVE MAP PREPARED BY:**
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## PREPARER'S CERTIFICATION

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

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 BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP Storm Water Quality Management Plan (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.

PE #80356

Engineer of Work's Signature, PE Number

Engineer's Seal


Tyler G Lawson
Print Name

Pasco, Laret, Suiter, & Associates
Company

February 26, 2024
Date

## PROJECT OWNER'S CERTIFICATION

This PDP SWQMP has been prepared for TORREY PACIFIC CORPORATION by PASCO, LARET, SUITER & ASSOCIATES. The PDP SWQMP is intended to comply with the PDP requirements of the City of Encinitas BMP Design Manual, which is a design manual for compliance with local City of Encinitas and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan. Once the undersigned transfers its interests in the property, its successor-in-interest shall bear the aforementioned responsibility to implement the best management practices (BMPs) described within this plan, including ensuring on-going operation and maintenance of structural BMPs. A signed copy of this document shall be available on the subject property into perpetuity.

_____
Project Owner's Signature

Dan Staver
Print Name

Torrey Pacific Corporation
Company

_____
Date

## 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 the fourth column, summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

| Submittal Number | Date | Project Status | Summary of Changes |
|---|---|---|---|
| 1 | 1/7/21 | ☑ Preliminary Design / Planning/ CEQA<br>□ Final Design | Initial Submittal |
| 2 | 7/26/21 | ☑ Preliminary Design / Planning/ CEQA<br>□ Final Design | Resubmittal, revised 4 DMA's / BMP's to a single DMA / BMP |
| 3 | 3/22/22 | ☑ Preliminary Design / Planning/ CEQA<br>□ Final Design | Resubmittal |
| 4 | 3/7/23 | ☑Preliminary Design / Planning/ CEQA<br>□ Final Design | Resubmittal, Revised 3 DMA's / 2 BMP's |
| 5 | 10/26/23 | ☑Preliminary Design / Planning/ CEQA<br>Final Design | Resubmittal |
| 6 | 2/26/24 | ☑Preliminary Design / Planning/ CEQA<br>Final Design | Resubmittal |

## PROJECT IDENTIFICATION

| | |
|---|---|
| Project/Applicant Name: Torrey Crest / Torrey Pacific Corporation | |
| Permit/Application Number: MULTI -004309-2021 | Date: October 26, 2023 |
| Site Address: 1220 – 1240 Melba Rd / 1190 Island View Ln | APN: 259-180-09, -10, -16, & -33-00; 259-181-02, -03, & -04-00 |
| Scope of work/project description:<br><br>Project proposes demolition of all existing onsite improvements and construction of 30x new single-family detached homes plus one proposed ADU, new private road with onstreet parking, and miscellaneous surface, grading, and utility improvements typical of this type of development. | |

## DETERMINATION OF PROJECT STATUS AND REQUIREMENTS

This form will identify permanent, post construction BMP requirements. Refer to City of Encinitas Stormwater BMP Design Manual for guidance.

| | | |
|---|---|---|
| **Step 1:** Is the project a "development project"? Development projects are defined as "construction, rehabilitation, redevelopment, or reconstruction of any public or private projects". See Section 1.3 and Table 1-2 of the manual for guidance. For example, interior remodels, roof replacements, and electrical and plumbing work are not development projects. | ☑ Yes | ***Go to Step 2.*** |
| | □ No | ***Stop.***<br>Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below. |

If "No", provide discussion / justification explaining why the project is not a "development project":

**Step 2:** Complete questions below for Project Type Determination.

The project is (select one): □New Development ☑ Redevelopment

The total proposed, newly created and/or replaced impervious area is: 174,610 $ft^2$

Is the project in any of the following categories, (a) through (f) below?

| | | | |
|---|---|---|---|
| Yes ☑ | No □ | (a) | New development projects or redevelopment projects that create and/or replaced 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects. |
| Yes ☑ | No □ | (b) | Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects. |
| Yes □ | No ☑ | (c) | New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses:<br>(i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and |

| | | | |
|---|---|---|---|
| | | | refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812).<br>(ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater.<br>(iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.<br>(iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles. |
| Yes<br>□ | No<br>☑ | (d) | New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharge directly to an Environmentally Sensitive Area (ESA). "Discharge 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).<br>Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and SDRWQCB; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and SDRWQCB; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See manual Section 1.4.2 for additional guidance. |
| Yes<br>□ | No<br>☑ | (e) | New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses:<br>(i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.<br>(ii) Retail gasoline outlets. This category includes retail gasoline outlets that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic of 100 or more vehicles per day. |
| Yes<br>☑ | No<br>□ | (f) | New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.<br>*Note: See manual Section 1.4.2 for additional guidance.* |

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

☑ Yes – **The project is a <u>Priority Development Project</u>, the applicant shall provide PDP Post Construction BMPs and *continue to Step 3*.**

□No – **The project is a <u>Standard or Basic Project</u>. *Stop here and complete the "City of Encinitas Stormwater Intake Form for All Developments and Standard Projects SWQMP".***

The following is for *<u>redevelopment PDPs</u>* only:

The area of existing (pre-project) impervious area at the project site is: <u>39,852</u> $ft^2$ (A)

The total proposed newly created or replaced impervious area is: <u>174,610</u> $ft^2$ (B)

Percent impervious surface created or replaced (B/A)*100: <u>438</u>%

The percent impervious surface created or replaced is (select one based on the above calculation):

□ Less than or equal to fifty percent (50%) – only new and/or replaced impervious areas are considered PDP subject to treatment and HMP criteria

OR

☑ Greater than fifty percent (50%) – the entire site is a PDP; treatment and HMP criteria apply to entire site regardless of whether it is replaced

| | | |
|---|---|---|
| **Step 3 (PDPs only):**<br>Do hydromodification control requirements apply?<br>See Section 1.6 of the BMP Design Manual for guidance. | ☑ Yes | PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6).<br>***Go to Step 4.*** |
| | □ No | PDP structural BMPs required for pollutant control (Chapter 5) only.<br>Provide brief discussion of exemption to hydromodification control below.<br>***Go to "Site Information Checklist"*** |
| Discussion / justification if hydromodification control requirements do not apply: | | |
| **Step 4 (PDPs subject to treatment and hydromodification controls):**<br>Does protection of critical coarse sediment yield areas apply based on review of City of Encinitas Potential Critical Coarse Sediment Yield Area Map?<br>See Section 6.2 of the BMP Design Manual for guidance. | □ Yes | Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2).<br>***Go to "Site Information Checklist"*** |
| | ☑ No | Management measures not required for protection of critical coarse sediment yield areas.<br>Provide brief discussion below.<br>***Go to "Site Information Checklist"*** |
| Discussion / justification if management measures not required for protection of critical coarse sediment yield areas:<br><br>Project site does not contain any potential Critical Coarse Sediment Yield Areas per the City of Encinitas Potential Critical Coarse Sediment Yield Area Map in the City's BMP Design Manual.<br><br>However, project site contains one small triangle located toward the NE corner of the property as seen on the City's GIS. This area identified is not a potential CCSYA and is not subject to management measures for protection of critical coarse sediment yield areas – see discussion included on Page 15 of this report for additional analysis and determination. | | |

# SITE INFORMATION CHECKLIST

| | |
|---|---|
| Project's Watershed<br>(Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier) | Carlsbad Hydrologic Unit, San Marcos Creek Hydrologic Area, Batiquitos Lagoon Sub-Area (905.41) & Escondido Creek Hydrologic Area (904.61) |
| Parcel Area<br>(Total area of Assessor's Parcel(s) associated with the project) | 6.65 Acres (289,479 Square Feet) |
| Area to be Disturbed by the Project<br>(Project Area) | 6.28 Acres (273,457 Square Feet) |
| Project Proposed Impervious Area<br>(Subset of Project Area) | 4.01 Acres (174,610 Square Feet) |
| Project Proposed Pervious Area<br>(Subset of Project Area) | 2.27 Acres (98,847 Square Feet) |
| Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area. | |

**Description of Existing Site Condition**

Current status of the site (select all that apply):

☑ Existing development

☑ Previously graded but not built out

□ Demolition completed without new construction

□ Agricultural or other non-impervious use

□ Vacant, undeveloped/natural

Description / Additional Information:

The site consists of existing residences, both in use and vacant, as well as driveways and miscellaneous hardscape and landscape improvements typical of the surrounding area and properties, including manufactured slopes and vegetative cover. A portion of the property is also currently undeveloped.

Existing Land Cover includes (select all that apply):

☑ Vegetative Cover

☑ Non-Vegetated Pervious Areas

☑ Impervious Areas

Description / Additional Information:

Existing site consists of multiple structures and residences. Existing impervious areas consist of asphalt driveways and miscellaneous structures. Vegetative cover includes landscaped areas and planting on previously manufactured slopes.

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

□ NRCS Type A

□ NRCS Type B

□ NRCS Type C

☑ NRCS Type D (Per site investigation performed by Geocon, Inc.)

Approximate Depth to Groundwater (GW):

□ GW Depth < 5 feet

□ 5 feet < GW Depth < 10 feet

□ 10 feet < GW Depth < 20 feet

☑ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

□ Watercourses

□ Seeps

□ Springs

□ Wetlands

☑ None

Description / Additional Information:

**Description of Existing Site Drainage Patterns**

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

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

Describe existing site drainage patterns:

The site itself contains 34 feet of elevation change within the proposed disturbed area. An existing single-family residence and structures toward the center-north portion of the property sit on the property's high point, with drainage falling away in all directions from this location. Existing drainage can be considered urban but runoff primarily drains via sheet flow as there do not appear to be any existing onsite storm drain.

While the site appears to ultimately discharge to two major watersheds and receiving bodies, runoff in the existing condition discharges from the property from 5 main locations (Drainage basins EX-1 through -5). The two discharge locations that eventually are routed to Moonlight Beach are Drainage basins EX-1 and EX-2. Drainage basin EX-1 discharges from the southwest corner of the property to Melba Road, where it continues west past the intersection of Balour Drive to a low spot at the intersection of Melba Road and Evergreen Drive near Ocean Knoll Elementary. From here, it is routed northwest through the canyon north, eventually reaching infrastructure in Encinitas Boulevard. Drainage basin EX-2 appears to leave the site from the northwest and along Island View Lane (heading west to Balour Drive). Once in Balour Drive, it is routed north to an existing curb inlet west of Oak Crest Middle School. The portion of the subject property under Island View Lane, a 15-ft x 690-ft parcel, is undisturbed by the project and has been excluded from this analysis. Runoff leaving to the west along both Melba Road and Island View Lane continue downstream towards Encinitas Boulevard, ultimately draining to the Pacific Ocean via Moonlight State Beach.

The remaining discharge locations from the property (EX-3, EX-4, and EX-5) are ultimately routed to San Marcos Creek and the Batiquitos Lagoon. Drainage basin EX-3 discharges to the northeast corner of the site towards Witham Road into an existing brow ditch within a public drainage easement. The ditch drains to the north through neighboring properties before outletting via an 18" storm drain connected to a curb outlet in a water line easement to the Witham Road curb face, where it further continues north to a storm drain inlet at Witham and Beechtree Drive. Drainage basin EX-4 discharges in a similar situation at the northeast corner, but south of the existing drainage ditch, where it travels through the adjacent properties, heads south on Witham Road and east on Crest Drive, and enters a curb inlet at the Hickoryhill Drive intersection. Lastly, basin EX-5 discharges east of the property onto adjacent lots and eventually makes its way down to Crest Drive to confluence with basin EX-4. Runoff leaving the site to the northeast towards Witham Road as well as the drainage reaching Crest Drive eventually reaches storm drain infrastructure at the intersection of Encinitas Boulevard with N. El Camino Real. This system ultimately continues to route drainage north to an outlet to the natural Encinitas Creek channel on the north side of Garden View Lane. This channel then eventually discharges into San Marcos Creek, a tributary of the Batiquitos Lagoon.

For continued discussion, see sheet 17 of 29.

| Description of Proposed Site Development |
|---|
| Project Description / Proposed Land Use and/or Activities:<br><br>Project proposes demolition of all existing onsite improvements and construction of 30-lot single-family residential detached homes plus one ADU with new private road, and miscellaneous surface, grading, storm water and utility improvements to support the new homes. |
| List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):<br><br>Proposed impervious features of the project include the building footprints and roof areas, private road pavement, concrete sidewalk, driveways, and private walkways / porches. |
| List/describe proposed pervious features of the project (e.g., landscape areas):<br><br>Pervious features of the project include graded slopes, landscape areas around the building footprint on each lot, proposed trees where shown on the project landscape plan, and centrally located biofiltration basin for storm water treatment. |
| Does the project include grading and changes to site topography?<br>☑ Yes<br>□ No<br><br>Description / Additional Information:<br><br>Retaining walls and site grading are proposed to accommodate the new lots and to construct buildable pads. The site generally will continue to slope up from Melba Road to a high point located near the center of the property. The proposed site layout will have the lots south of the high point drain toward a BMP in the southeastern corner of the site. The lots north of the high point will drain to a BMP in the northwest corner. The project proposes ~22,000 CY of cut and ~6,500 CY of fill for ~15,500 CY of export, along with remedial grading. |

**Description of Proposed Site Drainage Patterns**

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

☑ Yes

□ No

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

Describe proposed site drainage patterns:

The project site can be consolidated into two major drainage basins in the proposed condition. The majority of runoff from EX-5 will be routed towards Melba Road to minimize cross-lot drainage onto neighboring properties as much as feasible. A small (less than a tenth of an acre) self-mitigating area will remain in EX-5 as part of PR-1. Within EX-1, runon from 1250 Melba Road – delineated as OFF-1 will be conveyed directly to the Melba Road curb face, by passing the site and any treatment. A small self-mitigating area that drains offsite in the rear yard of Lot 1 to accommodate existing topography around two large Torrey Pine trees will also remain as a part of PR-1. Basin PR-1 will be comprised of the onsite portion of EX-1 and the majority of EX-5.

Basin EX-2 drains toward Island View Lane where no existing storm drain infrastructure exist, runoff sheet flows through the adjacent lots. A small (less than a tenth of an acre) self-mitigating area will remain in EX-2, post project PR-2. For the case of basin EX-3 draining offsite to a brow ditch located within a public drainage easement off the northeast corner of the property, it was the strong recommendation of City of Encinitas engineering staff to prevent any proposed water from continuing to discharge into this conveyance system. Section 6.201 of the City of Encinitas Engineering Design Manual (EDM) provides the City Engineer discretion to eliminate existing cross-lot drainage if an alternate solution is feasible. A small self-mitigating area that drains offsite from EX-3 will remain as PR-3. This public drainage easement and ditch run through the rear yards of several properties along Witham Road, and present access and maintenance challenges for the City of Encinitas Public Works Department to ensure proper drainage and conveyance over the long term. In the existing condition, it is already prone to flooding due to poor maintenance of the channel. Similarly, EX-4 drains offsite in the northwest corner, but runoff drains south of the existing brow ditch. In the existing condition runoff sheet flows through adjacent lots until runoff reaches Witham Road. To improve the existing cross lot drainage conditions, runoff will be routed toward northwest corner. Basin PR-4 will be comprised of EX-2, the majority of EX-3 and all of EX-4.

For continued discussion, see sheet 18 of 31.

**Identification and Narrative of Receiving Water and Pollutants of Concern**

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

Storm water leaving a majority of the site will enter the existing public storm drain system eventually in Encinitas Blvd. This system will eventually discharge into Moonlight State Beach and ultimately the Pacific Ocean west of Coast Highway 101. The remainder of the site will discharge from the northeast of the project and heads northeast toward El Camino Real. Eventually, the storm drain system outlets to the natural Encinitas creek channel on the north side of Garden View Lane, which conveys to Batiquitos Lagoon via San Marcos Creek.

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 | Pollutant(s)/Stressor(s) | TMDLs / WQIP Highest Priority Pollutant |
|---|---|---|
| Cottonwood Creek (outlet) | Trash | Indicator Bacteria |
| | Indicator Bacteria | |
| Pacific Ocean | | |
| | | |

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

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

**Hydromodification Management Requirements**

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

☑ 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):

**Critical Coarse Sediment Yield Areas***

*This section only required if hydromodification management requirements apply

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

☑ Yes

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

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

☑ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite

□ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment

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

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

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

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

□ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2.b of the SWQMP.

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

Discussion / Additional Information:

Area identified on City's GIS map is not a potential Critical Coarse Sediment Yield Area. See discussion provided on Page 17 of 31 of this report.

**Flow Control for Post-Project Runoff***

*This section only required if hydromodification management requirements apply

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

There are (2) point of compliance for flow control / hydromodification management leaving the subject property; POC-1 is located at the southwest corner of the property entering the Melba Road right-of-way. POC-2 is located at the northeast corner of the property discharging to Witham Road. Refer to the project's DMA and HMP exhibit for location.

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

☑ No, the low flow threshold is 0.1Q2 (default low flow threshold)

□ Yes, the result is low flow threshold 0.1Q2

□ Yes, the result is low flow threshold 0.3Q2

□ Yes, the result is low flow threshold 0.5Q2

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

Channel assessment has not been performed for project site. Thus, low-flow threshold of 0.1Q2 is assumed for the project.

Discussion / Additional Information: (optional)

**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 site constraints that have influence on the storm water management design as well as the overall laying out of the site plan. First, as it relates to storm water, the project geotechnical engineer has identified low infiltration rates for the underlying topsoils, preventing any further infiltration in the post-project condition as part of the storm water strategy. See further discussion of BMP strategy, implementation, including the proposed storage system to comply with hydromodification low-flow requirements.

**Optional Additional Information or Continuation of Previous Sections As Needed**

**Description of Existing Site Drainage Patterns**

Existing drainage Basin EX-1, discharging from the southwest corner of the project site, has an area of approximately 3.32 acres and has a peak flow rate of 8.46 cfs. Existing drainage basin EX-2, discharging from the northwest corner of the project site has an area of approximately 0.75 acres and has a peak flow rate of 2.02 cfs. Existing drainage basin EX-3, discharging from the northeast corner of the project site, has an area of approximately 1.00 acres and a peak flow rate of 2.23 cfs. Existing drainage basin EX-4, discharging from the northeast corner of the project site, has an area of approximately 0.65 acres and a peak flow rate of 1.58 cfs. Existing drainage basin EX-5, discharging from the east of the project site, has an area of approximately 0.96 acres and a peak flow rate of 2.59 cfs. Refer to project Hydrology Report / Drainage Study prepared by Pasco, Laret, Suiter & Associates under separate cover for additional information.

**Description of Proposed Site Drainage Patterns**

The two onsite HMP-sized flow-control biofiltration detention basin and BMP system ("Basin") provides pollutant control as well as hydromodification management and mitigation of the 100-year, 6-hour storm event peak flow rate. Basin PR-1 and PR-4 will serve to capture, treat, and detain storm water and is composed of a cross-section of an engineered soil, storage layer, and hydraulic mulch on the surface. Runoff from higher frequency, lower intensity storm events will first be filtered through the Basin section to the storage layer that connects into the 36" x 36" emergency outlet brooks box.

During higher intensity storm events, water will pond on the surface of the Basin, and enter an overflow catch basin that will route water to the surface of Melba Road or Witham Road. Similar to the existing condition, runoff leaving from the southwest corner of the site continues downstream, entering existing public storm drain infrastructure and eventually reaching storm drain improvements in Encinitas Boulevard north of St. John School before outletting in Moonlight State Beach. Basin EX-5 in the existing condition was excluded from the drainage analysis for PR-1 to ensure discharge leaving the property to Melba Road and ultimately drainage to Moonlight State Beach is mitigated to the peak flow draining to that watershed determined in the pre-development condition. Runoff leaving the site from the northeast corner will outlet onto Witham Road drain south towards Crest Drive the continues to drain to the east until runoff reaches an existing curb inlet at the intersection of Crest Drive and Hickhoryhill Drive. Basin EX-2 in the existing condition was excluded from the drainage analysis in PR-4 to ensure discharge leaving the property to Witham Road, confluencing in the public buried storm drain infrastructure at the intersection of Encinitas Boulevard and N El Camino Real and ultimately draining to San Marcos Creek is mitigated to the peak flow draining to that watershed determined in the pre-development condition.

The total unmitigated, undetained peak flow rate for the 100-year, 6-hour storm event generated for the analyzed drainage area is 24.29 cfs. Based on the analysis included in this report, the proposed onsite detention facilities accommodate the increase in peak runoff generated in the proposed condition, mitigating peak flows to below pre-developed conditions. The site has been designed and graded in a way to minimize earthwork to the greatest extent feasible and maintain historic drainage patterns. Water leaving the subject property will continue to do so from the same points of discharge as in the existing condition. Refer to project Hydrology Report / Drainage Study prepared by Pasco, Laret, Suiter & Associates under separate cover for additional information.

This space provided for additional information or continuation of information from previous sections as needed.

**Discussion of Critical Coarse Sediment Yield Areas**

Priority Development Projects (PDPs) must satisfy critical coarse sediment yield area (CCSYA) requirements as addressed in Appendix H of the City of Encinitas BMP Design Manual.

Regional-level mapping of potential critical coarse sediment yield areas was prepared using regional data sets included from the Regional WMAA.

A small portion of the site was identified on the City of Encinitas' GIS as containing a potential Critical Coarse Sediment Yield Area (PCCSYA). Per Section 6.2.1 of the City of Encinitas BMP Design Manual, "GLU's (Geomorphic Landscape Units) are areas with a combination of open (undeveloped) land cover, high relative sediment production based on a normalized revised universal soil loss equation analysis, and coarse-grained geologic material (material that is expected to produce greater than 50% sand when weathered)."

However, per Appendix H of the City of Encinitas BMP Design Manual, the "regional data set .. may not conform to all site conditions, or does not reflect changes to particular areas that have occurred since the underlying data was developed. This means slopes, geology, or land cover at the project site can be mischaracterized in the regional data set."

Consistent with the City of Encinitas BMP Design Manual section 6.2 and Appendix H, a detailed project-level verification of site specific GLU's was conducted. None of the GLU's listed in Table 6-1 of the BMP manual are present, as the area in question does not contain a combination of slope, geology, and land cover as listed in Table 6-1 (slope in this area is less than 10%). Thus, the area identified on the City's GIS are Potential CCSYA's that become non-Critical Coarse Sediment Yield Areas. Thus, there are no critical coarse sediment yield areas to be protected based on verification of GLUs onsite.

**Discussion of Green Streets Design Standards**

# SOURCE CONTROL BMP CHECKLIST

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the 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? | | |
|---|---|---|---|
| **SC-1** Prevention of Illicit Discharges into the MS4 | ☑ Yes | □ No | □ N/A |
| **SC-2** Storm Drain Stenciling or Signage | ☑ Yes | □ No | □ N/A |
| **SC-3** Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | □ Yes | □ No | ☑ N/A |
| **SC-4** Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | □ Yes | □ No | ☑ N/A |
| **SC-5** Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | ☐ Yes | □ No | ☑ N/A |
| **SC-6** Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below) | | | |
| □ Onsite storm drain inlets | ☑ Yes | □ No | □ N/A |
| □ Interior floor drains and elevator shaft sump pumps drain to sewer | ☑ Yes | □ No | □ N/A |
| □ Interior parking garages drain to sewer | ☑ 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/Trash areas must be covered | ☑ Yes | □ No | ☐ N/A |
| □ Industrial processes | □ Yes | □ No | ☑ N/A |
| □ Outdoor storage of equipment or materials must be covered | □ Yes | □ No | ☑ N/A |
| □ Vehicle and equipment cleaning | □ 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 |

Discussion / justification if SC-1 through SC-6 not implemented. Justification must be provided for ALL "No" answers shown above.

Project has no permanent outdoor materials storage areas or materials stored in outdoor work areas. Project proposes pool equipment structure that will be covered.

# SITE DESIGN BMP CHECKLIST

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the 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.

| Source Control Requirement | Applied? | | |
|---|---|---|---|
| **SD-1** Maintain Natural Drainage Pathways and Hydrologic Features | ☑ Yes | □ No | □ N/A |
| **SD-2** Conserve Natural Areas, Soils, and Vegetation | ☑ Yes | ☐ No | □ N/A |
| **SD-3** Minimize Impervious Area | ☑ Yes | □ No | □ N/A |
| **SD-4** Minimize Soil Compaction | □ Yes | ☑ No | □ N/A |
| **SD-5** Impervious Area Dispersion - Directly Connected Impervious Areas (e.g. roof downspouts connected to street) are not allowed | ☑ Yes | □ No | □ N/A |
| **SD-6** Runoff Collection | ☑ Yes | □ No | □ N/A |
| **SD-7** Landscaping with Native or Drought Tolerant Species | ☑ Yes | □ No | □ N/A |
| **SD-8** Harvesting and Using Precipitation | □ Yes | ☑ No | □ N/A |

Discussion / justification if SD-1 through SD-8 not implemented. Justification must be provided for ALL "No" answers shown above.

SD-4: Minimizing soil compaction will be implemented to the greatest extent feasible, but will not occur under building footprints.

Project proposed to mass grade entire site, as well as develop and landscape. A full landscape plan is proposed to create appropriately landscaped areas.

SD-8: Harvesting and reuse deemed infeasible for this site

# PDP STRUCTURAL BMPS

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

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

Use this section to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (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.

---

The structural BMP chosen for this project is a biofiltration basin with impermeable liner (BF-1). After an initial site investigation and infiltration testing of the project topsoil / Very Old Paralic Deposits (Qvop) layer, the project geotechnical engineer identified low infiltration characteristics of the underlying soils, and recommended a “No Infiltration” condition along with using a liner for all BMP facilities.

PR-1 has a proposed structural BMP system consisting of a pre-treatment biofiltration basin with impermeable liner (BF-1), and a gravel storage layer. PR-4 has a proposed structural BMP system consisting of a pre-treatment biofiltration basin with impermeable liner (BF-1) and a proprietary StormTrap storage layer. Refer to Attachment 2d for additional details. The system will integrate both pollutant control measures with flow control for hydromodification management. The biofiltration pre-treatment basins have been sized to provide a minimum surface area of 3.0% of the contributing area times adjusted runoff factor draining to it to comply with water quality requirements per Appendix B of the City of Encinitas BMP Design Manual. There are no site design BMP’s proposed for the project for which the runoff factor can be adjusted.

The basin, and detention storage system has been sized to demonstrate compliance with HMP requirements using the Environmental Protection Agency’s (EPA) Storm Water Management Model (SWMM), including using the no infiltration.

## STRUCTURAL BMP SUMMARY INFORMATION

Copy this page as necessary to provide information on each individual proposed structural BMP

| | |
|---|---|
| Structural BMP ID No: BF-1 | DMA No: 1 / DMA A |
| Construction Plan Sheet No: Civil Design Review / CDP Plan Sheets 4-7 | |
| Type of structural BMP:<br>□ Retention by harvest and use (HU-1)<br>□ Retention by infiltration basin (INF-1)<br>□ Retention by bioretention (INF-2)<br>□ Retention by permeable pavement (INF-3)<br>□ Partial retention by biofiltration with partial retention (PR-1)<br>☑ Biofiltration (BF-1)<br>□ Biofiltration with Nutrient Sensitive Media Design (BF-2)<br>□ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F<br>□ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)<br>□ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)<br>□ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)<br>☐ Detention pond or vault for hydromodification management<br>☑ Other (describe in discussion section below) | |
| Purpose:<br>□ Pollutant control only<br>□ Hydromodification control only<br>☑ Combined pollutant control and hydromodification control<br>□ Pre-treatment/forebay for another structural BMP<br>□ Other (describe in discussion section below) | |
| Who will inspect and certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms required by the City Engineer (See Section 1.12 of the BMP Design Manual) | Tyler G Lawson<br>Associate Principal<br>Pasco, Laret, Suiter & Associates |
| Who will be the final owner of this BMP? | Torrey Pacific Corporation / HOA |
| Who will maintain this BMP into perpetuity? | Torrey Pacific Corporation / HOA |
| What is the funding mechanism for maintenance? | Torrey Pacific Corporation / HOA |
| Discussion (as needed):<br><br>The Homeowner's Association created with the new lots will be responsible for the maintenance of storm water facilities into perpetuity, as required by the City. The proposed structural BMP system consists of a pre-treatment biofiltration basin, with a gravel detention storage layer. Refer to Attachment 2d for additional details. | |

## STRUCTURAL BMP SUMMARY INFORMATION

Copy this page as necessary to provide information on each individual proposed structural BMP

| | |
|---|---|
| Structural BMP ID No: BF-1 | DMA No: 2 / DMA B |
| Construction Plan Sheet No: Civil Design Review / CDP Plan Sheets 4-7 | |
| Type of structural BMP:<br>□ Retention by harvest and use (HU-1)<br>□ Retention by infiltration basin (INF-1)<br>□ Retention by bioretention (INF-2)<br>□ Retention by permeable pavement (INF-3)<br>□ Partial retention by biofiltration with partial retention (PR-1)<br>☑ Biofiltration (BF-1)<br>□ Biofiltration with Nutrient Sensitive Media Design (BF-2)<br>□ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F<br>□ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)<br>□ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)<br>□ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)<br>☐ Detention pond or vault for hydromodification management<br>☑ Other (describe in discussion section below) | |
| Purpose:<br>□ Pollutant control only<br>□ Hydromodification control only<br>☑ Combined pollutant control and hydromodification control<br>□ Pre-treatment/forebay for another structural BMP<br>□ Other (describe in discussion section below) | |
| Who will inspect and certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms required by the City Engineer (See Section 1.12 of the BMP Design Manual) | Tyler G Lawson<br>Associate Principal<br>Pasco, Laret, Suiter & Associates |
| Who will be the final owner of this BMP? | Torrey Pacific Corporation / HOA |
| Who will maintain this BMP into perpetuity? | Torrey Pacific Corporation / HOA |
| What is the funding mechanism for maintenance? | Torrey Pacific Corporation / HOA |
| Discussion (as needed):<br><br>The Homeowner's Association created with the new lots will be responsible for the maintenance of storm water facilities into perpetuity, as required by the City. The proposed structural BMP system consists of a pre-treatment biofiltration basin, proprietary StormTrap (or equivalent) detention storage system. Refer to Attachment 2d for additional details. | |

# ATTACHMENT 1 - BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

**Indicate which items are included behind this cover sheet:**

| Attachment | Contents | Checklist |
|---|---|---|
| Attachment 1a | DMA Exhibit (Required)<br><br>See DMA Exhibit Checklist on the back of this Attachment cover sheet. | ☑ Included |
| Attachment 1b | Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)*<br><br>*Provide table in this Attachment OR on DMA Exhibit in Attachment 1a | ☑ Included on DMA Exhibit in Attachment 1a<br>□ Included as Attachment 1b, separate from DMA Exhibit |
| Attachment 1c | Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs)<br><br>Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7. | ☑ Included<br>□ Not included because the entire project will use infiltration BMPs |
| Attachment 1d | Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs)<br><br>Refer to Appendices C and D of the BMP Design Manual to complete Form I-8. | ☑ Included<br>□ Not included because the entire project will use harvest and use BMPs |
| Attachment 1e | Pollutant Control BMP Design Worksheets / Calculations (Required)<br><br>Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines | ☑ Included |

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

The DMA Exhibit must identify:

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

# ATTACHMENT 2 - BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

□ Mark this box if this attachment is not included because the project is exempt from PDP hydromodification management requirements.

**Indicate which items are included behind this cover sheet:**

| Attachment | Contents | Checklist |
|---|---|---|
| Attachment 2a | Hydromodification Management Exhibit (Required) | ☑ Included<br><br>See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet. |
| Attachment 2b | Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional)<br><br>See Section 6.2 of the BMP Design Manual. | ☑ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required)<br><br>Optional analyses for Critical Coarse Sediment Yield Area Determination<br>□ 6.2.1 Verification of Geomorphic Landscape Units Onsite<br>□ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment<br>□ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite |
| Attachment 2c | Geomorphic Assessment of Receiving Channels (Optional)<br>See Section 6.3.4 of the BMP Design Manual. | □ Not performed<br>☑ Included<br>□ Submitted as separate stand-alone document |
| Attachment 2d | Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required)<br>See Chapter 6 and Appendix G of the BMP Design Manual | □ Included<br>☑ Submitted as separate stand-alone document |
| Attachment 2e | Vector Control Plan (Required when structural BMPs will not drain in 96 hours) | □ Included<br>☑ Not required because BMPs will drain in less than 96 hours |

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

The Hydromodification Management Exhibit must identify:

☑ Underlying hydrologic soil group

☑ Approximate depth to groundwater

□ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)

☑ Critical coarse sediment yield areas to be protected

☑ Existing topography

☑ Existing and proposed site drainage network and connections to drainage offsite

☑ Proposed grading

☑ Proposed impervious features

☑ Proposed design features and surface treatments used to minimize imperviousness

☑ Point(s) of Compliance (POC) for Hydromodification Management

☑ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)

☑ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

# ATTACHMENT 3 - STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

**Indicate which items are included behind this cover sheet:**

| Attachment | Contents | Checklist |
|---|---|---|
| Attachment 3a | Structural BMP Maintenance Thresholds and Actions (Required) | ☑ Included<br><br>See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet. |
| Attachment 3b | Draft Maintenance Agreement (when applicable) | □ Included<br>□ Not Applicable |

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

□ **Preliminary Design / Planning / CEQA level submittal:**

Attachment 3a must identify:

□ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

□ **Final Design level submittal:**

Attachment 3a must identify:

□ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)

□ How to access the structural BMP(s) to inspect and perform maintenance

□ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)

□ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable

□ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)

□ Recommended equipment to perform maintenance

□ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

# ATTACHMENT 4 - COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

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

**The plans must identify:**

□ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs

□ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit

□ Details and specifications for construction of structural BMP(s)

□ Signage indicating the location and boundary of structural BMP(s) as required by the [City Engineer]

□ How to access the structural BMP(s) to inspect and perform maintenance

□ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)

□ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable

□ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)

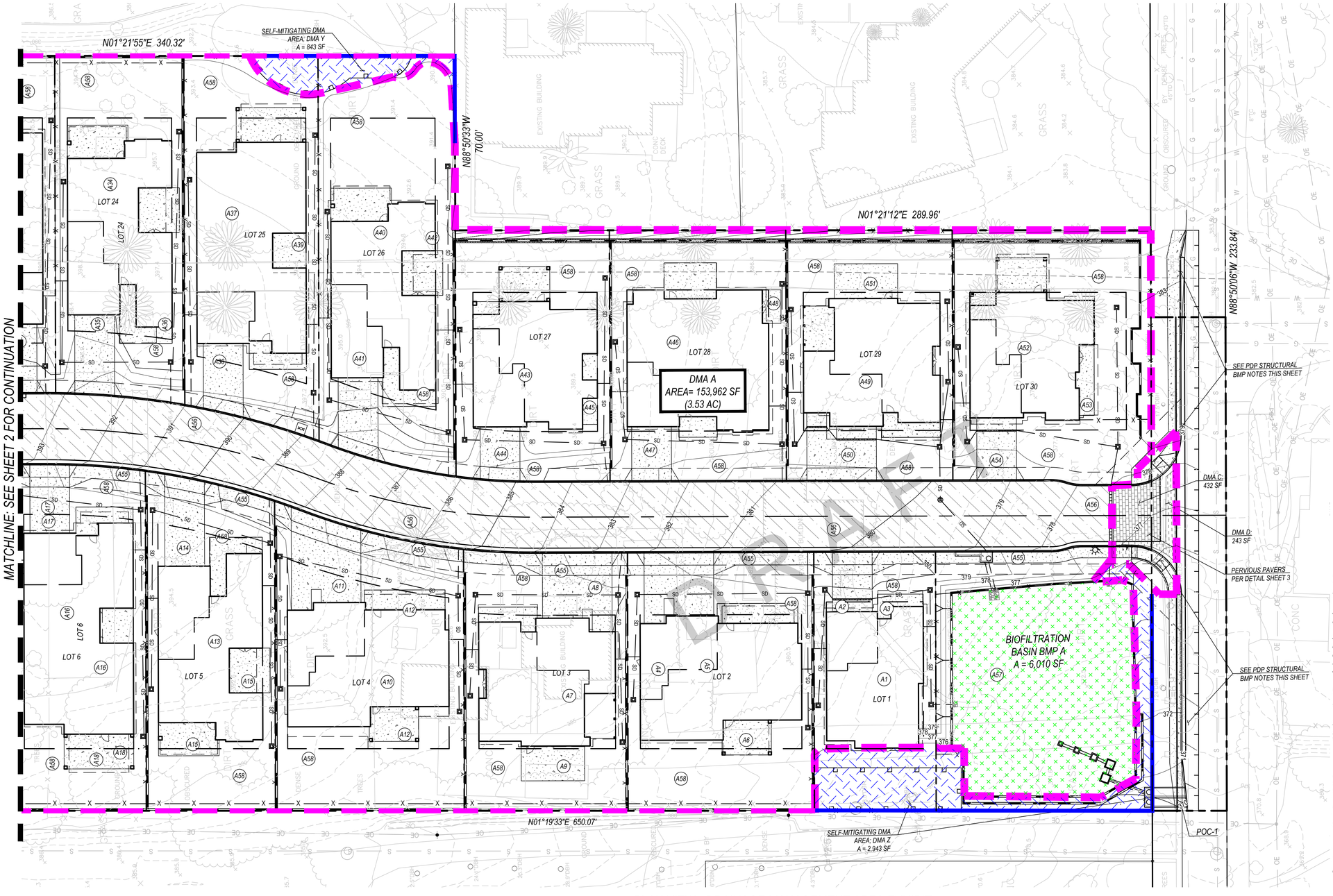
□ Recommended equipment to perform maintenance

□ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

□ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)

□ All BMPs must be fully dimensioned on the plans

□ When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number shall be provided. Photocopies of general brochures are not acceptable.




## LEGEND

- PROPERTY BOUNDARY
- CENTERLINE OF ROAD
- RIGHT-OF-WAY
- ADJACENT PROPERTY LINE
- EXISTING CONTOUR LINE
- PROPOSED CONTOUR LINE
- DMA DRAINAGE BASIN BOUNDARY
- PROPOSED / REMOVED AND REPLACED IMPERVIOUS AREA WITHIN DISTURBED AREA OF SITE
- BMP / BIOFILTRATION BASIN AREA
- SELF-MITIGATING AREA PER BMP DESIGN MANUAL SECTION 5.2.1

## PROJECT SITE AREA CALCULATIONS

| | |
|---|---|
| TOTAL GROSS SITE AREA | 289,479 SF (6.646 AC) |
| AREA DISTURBED BY PROJECT | 273,457 SF (6.278 AC) |
| EXISTING IMPERVIOUS AREA | 39,852 SF (0.915 AC) |
| EXISTING PERVIOUS AREA | 231,129 SF (5.306 AC) |
| TOTAL DMA AREA (DMA A) | 153,962 SF (3.53 AC) |
| TOTAL DMA AREA (DMA B) | 114,153 SF (2.62 AC) |
| TOTAL DMA AREA (DMA C) | 432 SF (0.001 AC) |
| TOTAL DMA AREA (DMA D) | 243 SF (0.0006 AC) |
| TOTAL SELF-MITIGATING DMA AREAS | 4,667 SF (0.11 AC) |
| TOTAL PROPOSED IMPERVIOUS AREA | 151,866 SF (3.48 AC) |
| **15% LOT HARDSCAPE CONTINGENCY | 22,744 SF (0.52 AC) |
| ASSUMED TOTAL IMPERVIOUS AREA | 174,610 SF (4.01 AC) |
| TOTAL PROPOSED PERVIOUS AREA | 98,847 SF (2.27 AC) |

**15% FUTURE LOT HARDSCAPE CONTINGENCY BASED ON ROOF AREA AND PRIVATE WALKWAYS / PATIOS, EXCLUSIVE OF PRIVATE ROAD, SIDEWALK, AND PRIVATE DRIVEWAYS; RESULTS IN **500 SF** OF FUTURE HARDSCAPE ALLOTTED TO EACH LOT

## SELF-RETAINING DMA - DMA C

TOTAL BASIN SIZE = 432 SF (0.010 AC)

SELF-RETAINING IMPERVIOUS AREA = 432 SF
RATIO OF DMA AREA TO PERV. PAVER AREA = 1:1

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-RETAINING PERVIOUS PAVER DMAS THAT RETAIN RUNOFF TO A LEVEL DETERMINED TO CONSTITUTE FULL RETENTION OF THE ENTIRE DCV. PERVIOUS PAVERS THAT HAVE A RATIO OF 1.5:1 OR LESS FOR TOTAL DRAINAGE AREA TO AREA OF PERVIOUS PAVERS CAN BE CONSIDERED SELF-RETAINING.

## DE MINIMIS DMA - DMA D

TOTAL BASIN SIZE = 243 SF (0.006 AC)

SECTION 5.2.2 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR DE MINIMIS AREAS THAT ARE LESS THAN 250 SF AND ALL DE MINIMIS AREAS FOR THE SITE ARE LESS THAN 2 PERCENT OF THE TOTAL REMOVED OR REPLACED IMPERVIOUS AREA

## SOIL TYPE INFORMATION

SOIL: TYPE D SOILS FOR VERY OLD PARALIC DEPOSITS TOPSOIL PER "STORM WATER MANAGEMENT INVESTIGATION" REPORT PREPARED BY GEOCON, INC. DATED 7/16/21; (TYPE B HYDROLOGIC SOILS PER WEB SOIL SURVEY APPLICATION AVAILABLE THROUGH UNITED STATES DEPARTMENT OF AGRICULTURE)

## TREATMENT CONTROL BMPS

BIOFILTRATION WITH IMPERVIOUS LINER BF-1

GRAPHIC SCALE: 1" = 20'

20 0 20 40 60

## PLAN VIEW - DRAINAGE MANAGEMENT AREA EXHIBIT

SCALE: 1" = 20' HORIZONTAL

## GROUNDWATER INFORMATION

GROUNDWATER NOT ENCOUNTERED DURING SITE INVESTIGATION, AND EXPECTED AT DEPTHS GREATER THAN 50 FEET BELOW EXISTING GRADES PER "STORM WATER MANAGEMENT INVESTIGATION" PREPARED BY GEOCON, INC. DATED 1/8/21

## COARSE SEDIMENT YIELD

NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED ONSITE OR UPSTREAM OF SUBJECT PROPERTY. REFER TO DISCUSSION IN PRIORITY DEVELOPMENT PROJECT SWQMP PREPARED BY PASCO, LARET, SUITER & ASSOCIATES

## SELF-MITIGATING DMA - DMA V

TOTAL BASIN SIZE = 70 SF (0.002 AC)

SELF-MITIGATING IMPERVIOUS AREA = 0 SF
% IMPERVIOUS = 0.0%

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

## SELF-MITIGATING DMA - DMA X

TOTAL BASIN SIZE = 811 SF (0.019 AC)

SELF-MITIGATING IMPERVIOUS AREA = 0 SF
% IMPERVIOUS = 0.0%

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

## SELF-MITIGATING DMA - DMA Y

TOTAL BASIN SIZE = 843 SF (0.019 AC)

SELF-MITIGATING IMPERVIOUS AREA = 0 SF
% IMPERVIOUS = 0.0%

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

## SELF-MITIGATING DMA - DMA Z

TOTAL BASIN SIZE = 2,943 SF (0.067 AC)

SELF-MITIGATING IMPERVIOUS AREA = 0 SF
% IMPERVIOUS = 0.0%

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

ATTACHMENT 1A
DRAINAGE MANAGEMENT AREA EXHIBIT
1220-1240 MELBA ROAD
CITY OF ENCINITAS

PLSA
PLSAENGINEERING.COM

J:\ACTIVE JOBS\3086 STAVER-MELBA\CIVIL\REPORTS\SWQMP\Discretionary\OPTION 2 - 2 BMP'S\ATTACHMENTS\Attachment 1 - Pollutant Removal

PLSA 3086

N89°03'27"W 630.77'

N 01°28'55" E 149.27'

S 01°17'14" W 166.11'

N 88°53'23" W 253.12'

N01°21'55"E

SELF-MITIGATING
DMA AREA; DMA X
A = 811 SF

DMA B
AREA= 113,286 SF
(2.60 AC)

BIOFILTRATION
BASIN BMP B
A = 3,030 SF

SELF-MITIGATING
DMA AREA; DMA V
A = 937 SF

DMA A
AREA= 153,962 SF
(3.53 AC)

LOT 9
LOT 8
LOT 7
LOT 6
LOT 10
LOT 11
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
LOT 17
LOT 18
LOT 19
LOT 20
LOT 21
LOT 22
LOT 23
LOT 24



## BMP LEGEND

*POST-CONSTRUCTION SITE DESIGN BMPs*

| | | | |
|---|---|---|---|
| SD-1 | MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES | SD-5 | IMPERVIOUS AREA DISPERSION |
| SD-2 | CONSERVE NATURAL AREAS, SOILS, AND VEGETATION | SD-6 | RUNOFF COLLECTION |
| SD-3 | MINIMIZE IMPERVIOUS AREA | SD-7 | LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES |

| SOURCE CONTROL BMPs | | APPLIED |
|---|---|---|
| SC-1 | PREVENTION OF ILLICIT DISCHARGES INTO THE MS4 | YES |
| SC-2 | STORM DRAIN STENCILING AND POSTING OF SIGNAGE | YES |
| SC-3 | PROTECTED OUTDOOR MATERIALS STORAGE AREAS | N/A |
| SC-4 | PROTECT MATERIALS STORED IN OUTDOOR WORK AREAS | N/A |
| SC-5 | PROTECT TRASH STORAGE AREAS | YES |
| SC-6 | ADDITIONAL BMPs BASED ON POTENTIAL RUNOFF POLLUTANTS: | |
| A | ONSITE STORM DRAIN INLET | YES |
| B | INTERIOR FLOOR DRAINS & ELEVATOR SHAFT SUMPS | N/A |
| C | INTERIOR PARKING GARAGES | N/A |
| D | NEED FOR FUTURE INDOOR & STR. PEST CONTROL | N/A |
| E | LANDSCAPE / OUTDOOR PESTICIDE USE | YES |
| F | POOLS, SPAS, PONDS, FOUNTAIN, & WATER FEATURES | N/A |
| G | FOOD SERVICE | N/A |
| H | TRASH OR REFUSE AREAS | YES |
| I | INDUSTRIAL PROCESSES | N/A |
| J | OUTDOOR STORAGE OF EQUIP. OR MATERIALS | N/A |
| K | VEHICLE AND EQUIPMENT CLEANING | N/A |
| L | VEHICLE / EQUIPMENT REPAIR AND MAINTENANCE | N/A |
| M | FUEL DISPENSING AREAS | N/A |
| N | LOADING DOCKS | N/A |
| O | FIRE SPRINKLER TEST WATER | N/A |
| P | MISCELLANEOUS DRAIN OR WASH WATER | N/A |
| Q | PLAZAS, SIDEWALKS, DRIVEWAYS, AND PARKING LOTS | N/A |

GRAPHIC SCALE: 1" = 20'

20 0 20 40 60

## ATTACHMENT 1A
## DRAINAGE MANAGEMENT AREA EXHIBIT

1220-1240 MELBA ROAD
CITY OF ENCINITAS

PLSA
PLSAENGINEERING.COM

MATCHLINE: SEE SHEET 1 FOR CONTINUATION

## PLAN VIEW - DRAINAGE MANAGEMENT AREA EXHIBIT

SCALE: 1" = 20' HORIZONTAL

## DMA A - AREA CALCULATIONS

| | | |
|---|---|---|
| IMPERVIOUS AREA | (BUILDING / ROOF) | 60,371 SF |
| | (DRIVEWAYS) | 7,466 SF |
| | (LOT HARDSCAPE) | 3,353 SF |
| | (PRIVATE DRIVE/WALKWAY) | 19,074 SF |
| | (**15% FUTURE CONTINGENCY) | 13,540 SF |
| | TOTAL | 103,804 SF |
| PERVIOUS AREA | (LANDSCAPED AREA) | 57,688 SF |
| | (BIOFILTRATION BASIN) | 6,010 SF |
| | (15% FUTURE CONTINGENCY) | -13,540 SF |
| | TOTAL | 50,158 SF |
| TOTAL BASIN AREA | 153,962 SF | |
| % IMPERVIOUS AREA | 67.4% | |

**15% FUTURE LOT HARDSCAPE CONTINGENCY BASED ON ROOF AREA AND PRIVATE WALKWAYS / PATIOS, EXCLUSIVE OF PRIVATE ROAD, SIDEWALK, AND PRIVATE DRIVEWAYS

DMA TABLE - TREATMENT (BASIN A)

| AREA NAME | AREA (SF) | POST-PROJECT SURFACE TYPE | SURFACE RUNOFF FACTOR | ADJUSTMENT FACTOR | AREA X ADJUSTED RUNOFF (SF) |
|---|---|---|---|---|---|
| A1 | 2069 | LOT 1 ROOF | 0.9 | 1 | 1862 |
| A2 | 215 | LOT 1 DRIVEWAY | 0.9 | 1 | 194 |
| A3 | 117 | LOT 1 HARDSCAPE | 0.9 | 1 | 105 |
| A4 | 3366 | LOT 2 ROOF | 0.9 | 1 | 3029 |
| A5 | 453 | LOT 2 DRIVEWAY | 0.9 | 1 | 408 |
| A6 | 70 | LOT 2 HARDSCAPE | 0.9 | 1 | 63 |
| A7 | 2942 | LOT 3 ROOF | 0.9 | 1 | 2648 |
| A8 | 494 | LOT 3 DRIVEWAY | 0.9 | 1 | 445 |
| A9 | 357 | LOT 3 HARDSCAPE | 0.9 | 1 | 321 |
| A10 | 3611 | LOT 4 ROOF | 0.9 | 1 | 3250 |
| A11 | 684 | LOT 4 DRIVEWAY | 0.9 | 1 | 616 |
| A12 | 55 | LOT 4 HARDSCAPE | 0.9 | 1 | 50 |
| A13 | 3235 | LOT 5 ROOF | 0.9 | 1 | 2912 |
| A14 | 426 | LOT 5 DRIVEWAY | 0.9 | 1 | 383 |
| A15 | 168 | LOT 5 HARDSCAPE | 0.9 | 1 | 151 |
| A16 | 4169 | LOT 6 ROOF | 0.9 | 1 | 3752 |
| A17 | 279 | LOT 6 DRIVEWAY | 0.9 | 1 | 251 |
| A18 | 115 | LOT 6 HARDSCAPE | 0.9 | 1 | 104 |
| A19 | 3419 | LOT 7 ROOF | 0.9 | 1 | 3077 |
| A20 | 266 | LOT 7 DRIVEWAY | 0.9 | 1 | 239 |
| A21 | 194 | LOT 7 HARDSCAPE | 0.9 | 1 | 175 |
| A22 | 4169 | LOT 8 ROOF | 0.9 | 1 | 3752 |
| A23 | 288 | LOT 8 DRIVEWAY | 0.9 | 1 | 259 |
| A24 | 115 | LOT 8 HARDSCAPE | 0.9 | 1 | 104 |
| A25 | 3177 | LOT 9 ROOF | 0.9 | 1 | 2859 |
| A26 | 270 | LOT 9 DRIVEWAY | 0.9 | 1 | 243 |
| A27 | 290 | LOT 9 HARDSCAPE | 0.9 | 1 | 261 |
| A28 | 3177 | LOT 22 ROOF | 0.9 | 1 | 2859 |
| A29 | 485 | LOT 22 DRIVEWAY | 0.9 | 1 | 437 |
| A30 | 290 | LOT 22 HARDSCAPE | 0.9 | 1 | 261 |
| A31 | 4245 | LOT 23 ROOF | 0.9 | 1 | 3821 |
| A32 | 433 | LOT 23 DRIVEWAY | 0.9 | 1 | 390 |
| A33 | 203 | LOT 23 HARDSCAPE | 0.9 | 1 | 183 |
| A34 | 3235 | LOT 24 ROOF | 0.9 | 1 | 2912 |
| A35 | 526 | LOT 24 DRIVEWAY | 0.9 | 1 | 473 |
| A36 | 168 | LOT 24 HARDSCAPE | 0.9 | 1 | 151 |
| A37 | 4179 | LOT 25 ROOF | 0.9 | 1 | 3761 |
| A38 | 444 | LOT 25 DRIVEWAY | 0.9 | 1 | 400 |
| A39 | 117 | LOT 25 HARDSCAPE | 0.9 | 1 | 105 |
| A40 | 3418 | LOT 26 ROOF | 0.9 | 1 | 3076 |
| A41 | 486 | LOT 26 DRIVEWAY | 0.9 | 1 | 437 |
| A42 | 208 | LOT 26 HARDSCAPE | 0.9 | 1 | 187 |
| A43 | 2292 | LOT 27 ROOF | 0.9 | 1 | 2063 |
| A44 | 354 | LOT 27 DRIVEWAY | 0.9 | 1 | 319 |
| A45 | 450 | LOT 27 HARDSCAPE | 0.9 | 1 | 405 |
| A46 | 3693 | LOT 28 ROOF | 0.9 | 1 | 3324 |
| A47 | 347 | LOT 28 DRIVEWAY | 0.9 | 1 | 312 |
| A48 | 79 | LOT 28 HARDSCAPE | 0.9 | 1 | 71 |
| A49 | 2944 | LOT 29 ROOF | 0.9 | 1 | 2650 |
| A50 | 640 | LOT 29 DRIVEWAY | 0.9 | 1 | 576 |
| A51 | 357 | LOT 29 HARDSCAPE | 0.9 | 1 | 321 |
| A52 | 3031 | LOT 30 ROOF | 0.9 | 1 | 2728 |
| A53 | 376 | LOT 30 DRIVEWAY | 0.9 | 1 | 338 |
| A54 | 0 | LOT 30 HARDSCAPE | 0.9 | 1 | 0 |
| A55 | 4008 | WALKWAY | 0.9 | 1 | 3607 |
| A56 | 15066 | PRIVATE DRIVE | 0.9 | 1 | 13559 |
| A57 | 6010 | BMP D | 0.3 | 1 | 1803 |
| A58 | 57688 | LANDSCAPE | 0.3 | 1 | 17306 |
| | | | | TOTAL | 100347 |

TOTAL DMA SIZE = 100,347 SF
ADD 15% HARDSCAPE CONTINGENCY = 9,204 SF * 0.9 - 9,204 SF * 0.3
ADJUSTED DMA SIZE = 105,869 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 0.03 * 105,869 SF = 3,176 SF

**6,010 SF PROPOSED > 3,176 SF REQUIRED;
THEREFORE STANDARD BIOFILTRATION MINIMUM AREA REQUIREMENTS MET**

## DMA A - DCV CALCULATIONS

AREA TRIBUTARY TO BMP (A) = 153,962 SF / 3.53 AC

TOTAL DMA SIZE (Cx*Ax) = 105,869 SF
WEIGHTED RUNOFF FACTOR (Cx) = 0.74
85TH PERCENTILE RAINFALL DEPTH (d) = 0.54 INCHES

DCV (C*d*A*3,630) = 4,764 CU. FT.

## DMA B - AREA CALCULATIONS

| | | |
|---|---|---|
| IMPERVIOUS AREA | (BUILDING / ROOF) | 35,580 SF |
| | (DRIVEWAYS) | 9,905 SF |
| | (LOT HARDSCAPE) | 1,296 SF |
| | (PRIVATE DRIVE/WALKWAY) | 13,188 SF |
| | (**15% FUTURE CONTINGENCY) | 9,220 SF |
| | TOTAL | 70,687 SF |
| PERVIOUS AREA | (LANDSCAPED AREA) | 48,799 SF |
| | (BIOFILTRATION BASIN) | 3,030 SF |
| | (15% FUTURE CONTINGENCY) | -8,783 SF |
| | TOTAL | 42,599 SF |
| TOTAL BASIN AREA | 113,286 SF | |
| % IMPERVIOUS AREA | 52.4% | |

DMA TABLE - TREATMENT (BASIN B)

| AREA NAME | AREA (SF) | POST-PROJECT SURFACE TYPE | SURFACE RUNOFF FACTOR | ADJUSTMENT FACTOR | AREA X ADJUSTED RUNOFF (SF) |
|---|---|---|---|---|---|
| B1 | 3366 | LOT10 ROOF | 0.9 | 1 | 3029 |
| B2 | 1742 | LOOT 10 DRIVEWAY | 0.9 | 1 | 1568 |
| B3 | 70 | LOT 10 HARDSCAPE | 0.9 | 1 | 63 |
| B4 | 3544 | LOT 11 ROOF | 0.9 | 1 | 3190 |
| B5 | 1304 | LOT 11 DRIVEWAY | 0.9 | 1 | 1174 |
| B6 | 0 | LOT 11 HARDSCAPE | 0.9 | 1 | 0 |
| B7 | 2942 | LOT 12 ROOF | 0.9 | 1 | 2648 |
| B8 | 859 | LOT 12 DRIVEWAY | 0.9 | 1 | 773 |
| B9 | 357 | LOT 12 HARDSCAPE | 0.9 | 1 | 321 |
| B10 | 3025 | LOT 13 ROOF | 0.9 | 1 | 2723 |
| B11 | 463 | LOT 13 DRIVEWAY | 0.9 | 1 | 417 |
| B12 | 0 | LOT 13 HARDSCAPE | 0.9 | 1 | 0 |
| B13 | 2942 | LOT 14 ROOF | 0.9 | 1 | 2648 |
| B14 | 784 | LOT 14 DRIVEWAY | 0.9 | 1 | 706 |
| B15 | 357 | LOT 14 HARDSCAPE | 0.9 | 1 | 321 |
| B16 | 2438 | LOT 15 ROOF | 0.9 | 1 | 2194 |
| B17 | 366 | LOT 15 DRIVEWAY | 0.9 | 1 | 329 |
| B18 | 0 | LOT 15 HARDSCAPE | 0.9 | 1 | 0 |
| B19 | 3031 | LOT 16 ROOF | 0.9 | 1 | 2728 |
| B20 | 425 | LOT 16 DRIVEWAY | 0.9 | 1 | 383 |
| B21 | 0 | LOT 16 HARDSCAPE | 0.9 | 1 | 0 |
| B22 | 1472 | LOT 17 ROOF | 0.9 | 1 | 1325 |
| B23 | 567 | LOT 17 DRIVEWAY | 0.9 | 1 | 510 |
| B24 | 0 | LOT 17 HARDSCAPE | 0.9 | 1 | 0 |
| B25 | 3544 | LOT 18 ROOF | 0.9 | 1 | 3190 |
| B26 | 1235 | LOT 18 DRIVEWAY | 0.9 | 1 | 1112 |
| B27 | 0 | LOT 18 HARDSCAPE | 0.9 | 1 | 0 |
| B28 | 3544 | LOT 19 ROOF | 0.9 | 1 | 3190 |
| B29 | 861 | LOT 19 DRIVEWAY | 0.9 | 1 | 775 |
| B30 | 0 | LOT 19 HARDSCAPE | 0.9 | 1 | 0 |
| B31 | 3047 | LOT 20 ROOF | 0.9 | 1 | 2742 |
| B32 | 834 | LOT 20 DRIVEWAY | 0.9 | 1 | 751 |
| B33 | 357 | LOT 20 HARDSCAPE | 0.9 | 1 | 321 |
| B34 | 2507 | LOT 21 ROOF | 0.9 | 1 | 2256 |
| B35 | 465 | LOT 21 DRIVEWAY | 0.9 | 1 | 419 |
| B36 | 225 | LOT 21 HARDSCAPE | 0.9 | 1 | 203 |
| B37 | 1498 | WALKWAY | 0.9 | 1 | 1348 |
| B38 | 13188 | PRIVATE DRIVE | 0.9 | 1 | 11869 |
| B39 | 3030 | BMP D | 0.3 | 1 | 909 |
| B40 | 48897 | LANDSCAPE | 0.3 | 1 | 14669 |
| | | | | TOTAL | 70801 |

TOTAL DMA SIZE = 70,866 SF
ADD 15% HARDSCAPE CONTINGENCY = 8,783 SF * 0.9 - 8,783 SF * 0.3
ADJUSTED DMA SIZE = 76,136 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 0.03 * 76,136 SF = 2,284 SF

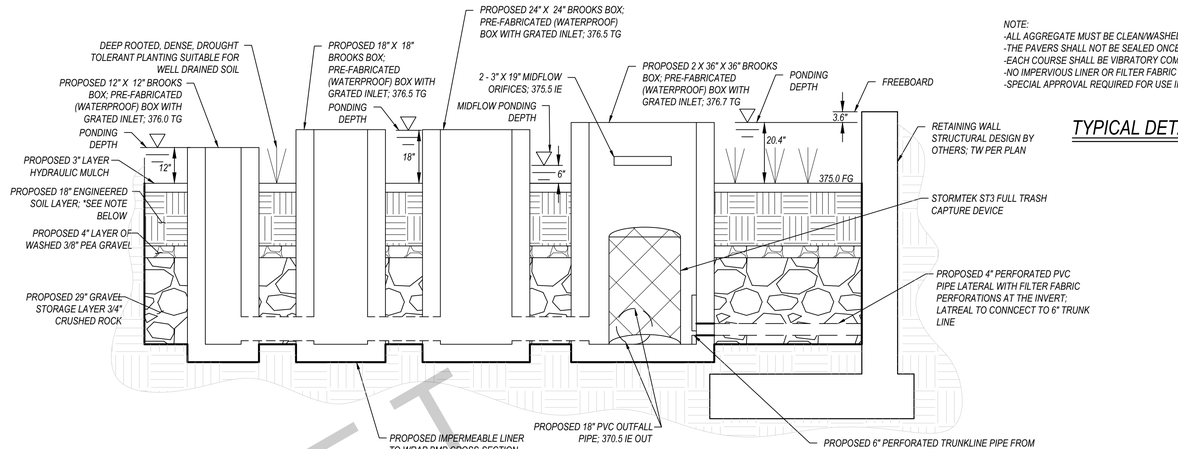
**3,030 SF PROPOSED > 2,284 SF REQUIRED;
THEREFORE STANDARD BIOFILTRATION MINIMUM AREA REQUIREMENTS MET**

## DMA B - DCV CALCULATIONS

AREA TRIBUTARY TO BMP (A) = 113,286 SF SF / 2.60 AC

TOTAL DMA SIZE (Cx*Ax) = 76,136 SF
WEIGHTED RUNOFF FACTOR (Cx) = 0.65
85TH PERCENTILE RAINFALL DEPTH (d) = 0.54 INCHES

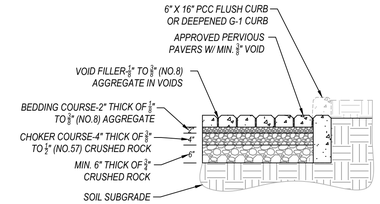
DCV (C*d*A*3,630) = 3,426 CU. FT.




## TYPICAL SECTION - BIOFILTRATION BASIN A

NOT TO SCALE

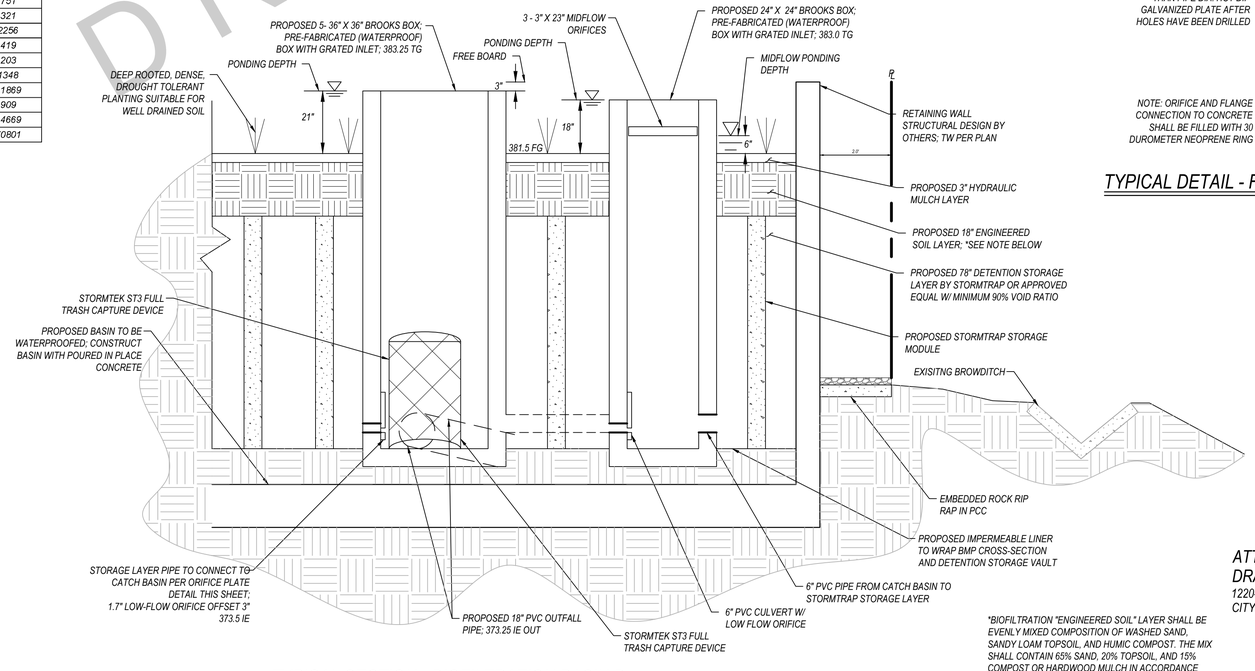
*BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE EVENLY MIXED COMPOSITION OF WASHED SAND, SANDY LOAM TOPSOIL, AND HUMIC COMPOST. THE MIX SHALL CONTAIN 65% SAND, 20% TOPSOIL, AND 15% COMPOST OR HARDWOOD MULCH IN ACCORDANCE WITH COUNTY OF SAN DIEGO LID BIOSWALE MEDIA




NOTE:
-ALL AGGREGATE MUST BE CLEAN/WASHED AND FREE OF FINES (SAND, SILT, ETC.)
-THE PAVERS SHALL NOT BE SEALED ONCE THE VOID FILLER HAS BEEN ADDED
-EACH COURSE SHALL BE VIBRATORY COMPACTED BEFORE PLACEMENT OF NEXT COURSE
-NO IMPERVIOUS LINER OR FILTER FABRIC IS TO BE USED
-SPECIAL APPROVAL REQUIRED FOR USE IN HIGHLY EXPANSIVE SOIL-SUBDRAIN MAY BE REQUIRED

## TYPICAL DETAIL - PERVIOUS PAVERS

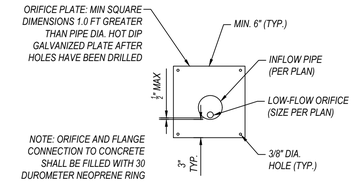
NOT TO SCALE




## TYPICAL SECTION - BIOFILTRATION BASIN B

NOT TO SCALE

*BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE EVENLY MIXED COMPOSITION OF WASHED SAND, SANDY LOAM TOPSOIL, AND HUMIC COMPOST. THE MIX SHALL CONTAIN 65% SAND, 20% TOPSOIL, AND 15% COMPOST OR HARDWOOD MULCH IN ACCORDANCE WITH COUNTY OF SAN DIEGO LID BIOSWALE MEDIA




NOTE: ORIFICE AND FLANGE CONNECTION TO CONCRETE SHALL BE FILLED WITH 30 DUROMETER NEOPRENE RING

## TYPICAL DETAIL - FLOW CONTROL ORIFICE PLATE

NOT TO SCALE

ATTACHMENT 1B
DRAINAGE MANAGEMENT AREA CALCS
1220-1240 MELBA ROAD
CITY OF ENCINITAS

PLSA
PLSAENGINEERING.COM

| Harvest and Use Feasibility Checklist | 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. Toilet & Urinal Demand -> 9.3 Gal / resident Landscape Demand -> 1,470 Gal / irrigated acre moderate water use

9.3 gal/day x (0.13368 cu ft/gal) x (1.5 days) = 1.86 cu ft / person over 36 hrs
30 units x 4.0 people/unit x (1.86 cu ft / person = 36 hr) = 223 cu ft / 36 hrs (toilet/urinal flushing)
3.09 ac irrigated x 1,470 gal / ac - 36 hr x 0.13368 cu ft / gal = 607 cu ft / 36 hrs (landscaping)
Total = 223 cu ft + 607 cu ft = 830 cu ft

3. Calculate the DCV using worksheet B-2.1.

DCV = 7,811 (cubic feet) Total

| 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.

| Categorization of Infiltration Feasibility Condition | Worksheet C.4-1 |
|---|---|

**Part 1 - Full Infiltration Feasibility Screening Criteria**

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

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

Provide basis:

Based on the USGS Soil Survey, the property possesses Hydrologic Soil Group D classifications and an infiltration rate of less than 0.5 inches per hour. We performed 4 infiltration tests in two areas of the site within the underlying Very Old Paralic Deposits. The results indicate an average rate of 0.003 inches per hour (with an applied factor of safety of 2). Therefore, full infiltration is considered infeasible at the site.

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

Provide basis:

Infiltration should not be allowed in areas of the site which would negatively affect the adjacent properties and improvements or the existing sloping conditions on the site. Infiltration would cause seepage and erosion on the existing slopes if it were allowed.

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

| Worksheet C.4-1 Page 2 of 4 | | | |
|---|---|---|---|
| Criteria | Screening Question | **Yes** | **No** |
| 3 | **Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis:<br><br>We anticipate that groundwater is present at depths of greater than 50 feet. Therefore, infiltration due to groundwater elevations would be considered feasible.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 4 | **Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis:<br><br>A shallow groundwater table does not exist within 10 feet of the proposed grades and we are not aware of any wells within 100 feet of the site.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| **Part 1 Result*** | If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration**<br><br>If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2 | | No Infiltration |

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

## Worksheet C.4-1 Page 3 of 4

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

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

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

Provide basis:

Based on the USGS Soil Survey, the property possesses Hydrologic Soil Group D classifications and an infiltration rate of less than 0.5 inches per hour. We performed 4 infiltration tests in two areas of the site within the underlying Very Old Paralic Deposits. The results indicate an average rate of 0.003 inches per hour (with an applied factor of safety of 2). Therefore, full infiltration is considered infeasible at the site.

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

Provide basis:

Infiltration should not be allowed in areas of the site which would negatively affect the adjacent properties and improvements or the existing sloping conditions on the site. Infiltration would cause seepage and erosion on the existing slopes if it were allowed.

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

| Worksheet C.4-1 Page 4 of 4 | | | |
|---|---|---|---|
| Criteria | Screening Question | **Yes** | **No** |
| 7 | **Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis:<br><br>We anticipate that groundwater is present at depths of greater than 50 feet. Therefore, infiltration due to groundwater elevations would be considered feasible.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates. | | | |
| 8 | **Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis:<br><br>We did not provide a study regarding water rights. However, these rights are not typical in the San Diego County area.<br><br>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates. | | | |
| **Part 2 Result*** | If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.**<br><br>If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.** | | No Infiltration |

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

**Worksheet B.2-1. DCV** DMA A

| Design Capture Volume | | Worksheet B-2.1 | | |
|---|---|---|---|---|
| 1 | 85th percentile 24-hr storm depth from Figure B.1-1 | d= | 0.54 | inches |
| 2 | Area tributary to BMP (s) | A= | 3.53 | acres |
| 3 | Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1) | C= | 0.74 | unitless |
| 4 | Street trees volume reduction | TCV= | 0 | cubic-feet |
| 5 | Rain barrels volume reduction | RCV= | 0 | cubic-feet |
| 6 | Calculate DCV =<br>(3630 x C x d x A) – TCV - RCV | DCV= | 4,764 | cubic-feet |

*AREA TRIBUTARY TO BMP (A)* = *153,962 SF / 3.53 AC*

*TOTAL DMA SIZE (Cx*Ax)* = *105,869 SF*
*WEIGHTED RUNOFF FACTOR (Cx)* = *0.74*
*85TH PERCENTILE RAINFALL DEPTH (d)* = *0.54 INCHES*

*DCV (C*d*A*3,630)* = *4,764 CU. FT.*

**Worksheet B.2-1. DCV**

| Design Capture Volume | | Worksheet B-2.1 | | |
|---|---|---|---|---|
| 1 | 85th percentile 24-hr storm depth from Figure B.1-1 | d= | 0.54 | inches |
| 2 | Area tributary to BMP (s) | A= | 2.60 | acres |
| 3 | Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1) | C= | 0.65 | unitless |
| 4 | Street trees volume reduction | TCV= | 0 | cubic-feet |
| 5 | Rain barrels volume reduction | RCV= | 0 | cubic-feet |
| 6 | Calculate DCV =<br>(3630 x C x d x A) – TCV - RCV | DCV= | 3,426 | cubic-feet |

*AREA TRIBUTARY TO BMP (A)* = *113,286 SF SF / 2.60 AC*

*TOTAL DMA SIZE (Cx*Ax)* = *76,136 SF*
*WEIGHTED RUNOFF FACTOR (Cx)* = *0.65*
*85TH PERCENTILE RAINFALL DEPTH (d)* = *0.54 INCHES*

*DCV (C*d*A*3,630)* = *3,426 CU. FT.*

| Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs | | | DMA 1 |
|---|---|---|---|
| **Simple Sizing Method for Biofiltration BMPs** | | **Worksheet B.5-1** | |
| 1 | Remaining DCV after implementing retenion BMPs | 4764 | cubic-feet |
| **Partial Retention** | | | |
| 2 | Infiltration rate from Worksheet D.5-1 if partial infiltation is feasible | 0 | in/hr |
| 3 | allowable drawdown time for aggregate storage below the underdrain | 36 | hours |
| 4 | Depth of runoff that can be infilrated [Line 2 x Line 3] | 0 | inches |
| 5 | Aggregate pore space | 0.4 | in/in |
| 6 | Required depth of gravel below the underdrain [Line 4 / Line 5] | 0 | inches |
| 7 | Assumed surface area of biofiltration BMP | 6010 | sq-ft |
| 8 | Media Retained pore space | 0.2 | in/in |
| 9 | Volume retrained by BMP [Line 4 + (Line 12 x Line 8)/12] x Line 7 | 1803 | cubic-feet |
| 10 | DCV that requires biofiltration [Line 1 - Line 9] | 2961 | cubic-feet |
| **BMP Parameters** | | | |
| 11 | Surface Ponding [6in minimum, 12 inch maximum] | 16 | inches |
| 12 | Media Thickness [18 inches minimum] | 18 | inches |
| 13 | Aggregate Storage Above underdrain invert (12 inches typical) - use 0 inches for sizing if the aggregate is not over the entire bottom surface area | 30 | inches |
| 14 | Media available pore space | 0.2 | in/in |
| 15 | Media filtration rate to be used for sizing | 5 | in/hr |
| **Baseline Calculations** | | | |
| 16 | Allowable Routing Time for Sizing | 6 | hours |
| 17 | Depth filtered during strom [Line 15 x Line 16] | 30 | inches |
| 18 | Depth of detention storage [line 11 + (Line 12 Line 14) + (Line 13 x Line 5)] | 31.6 | inches |
| 19 | Total Depth Treated [Line 17 + Line 18] | 37.6 | inches |
| **Option 1 - Biofilter 1.5 times the DVC** | | | |
| 20 | Required biofiltrated volume [1.5 x Line 10] | 4441.5 | cubic-feet |
| 21 | Required Footprint [Line 20 / Line 19] x 12 | 1418 | sq-ft |
| **Option 2 - Store 0.75 of the remaining DCV in pores and ponding** | | | |
| 22 | Required Storage (surface + pores) Volume [0.75 x Line 10] | 2221 | cubic-feet |
| 23 | Required Footprint [Line 22 / Line 18] x 12 | 538 | sq-ft |
| **Footprint of the BMP** | | | |
| 24 | Area draining to the BMP | 153962 | sq-ft |
| 25 | Adjusted Runoff Factor for drainage area (Refere to Appendix B.1 and B.2) | 0.74 | |
| 26 | Minimum BMP Footprint [Line 24 x Line 25 X 0.03] | 3418 | sq-ft |
| 27 | Footprint of the BMP = Maximum(minimum(Line 21, Line 23), Line 26) | 3418 | sq-ft |

| Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs | | | DMA 2 |
|---|---|---|---|
| **Simple Sizing Method for Biofiltration BMPs** | | **Worksheet B.5-1** | |
| 1 | Remaining DCV after implementing retenion BMPs | 3426 | cubic-feet |
| **Partial Retention** | | | |
| 2 | Infiltration rate from Worksheet D.5-1 if partial infiltation is feasible | 0 | in/hr |
| 3 | allowable drawdown time for aggregate storage below the underdrain | 36 | hours |
| 4 | Depth of runoff that can be infilrated [Line 2 x Line 3] | 0 | inches |
| 5 | Aggregate pore space | 0.4 | in/in |
| 6 | Required depth of gravel below the underdrain [Line 4 / Line 5] | 0 | inches |
| 7 | Assumed surface area of biofiltration BMP | 3030 | sq-ft |
| 8 | Media Retained pore space | 0.2 | in/in |
| 9 | Volume retrained by BMP [Line 4 + (Line 12 x Line 8)/12] x Line 7 | 909 | cubic-feet |
| 10 | DCV that requires biofiltration [Line 1 - Line 9] | 2517 | cubic-feet |
| **BMP Parameters** | | | |
| 11 | Surface Ponding [6in minimum, 12 inch maximum] | 18 | inches |
| 12 | Media Thickness [18 inches minimum] | 18 | inches |
| 13 | Aggregate Storage Above underdrain invert (12 inches typical) - use 0 inches for sizing if the aggregate is not over the entire bottom surface area | 15 | inches |
| 14 | Media available pore space | 0.2 | in/in |
| 15 | Media filtration rate to be used for sizing | 5 | in/hr |
| **Baseline Calculations** | | | |
| 16 | Allowable Routing Time for Sizing | 6 | hours |
| 17 | Depth filtered during strom [Line 15 x Line 16] | 30 | inches |
| 18 | Depth of detention storage [line 11 + (Line 12 Line 14) + (Line 13 x Line 5)] | 27.6 | inches |
| 19 | Total Depth Treated [Line 17 + Line 18] | 33.6 | inches |
| **Option 1 - Biofilter 1.5 times the DVC** | | | |
| 20 | Required biofiltrated volume [1.5 x Line 10] | 3775.5 | cubic-feet |
| 21 | Required Footprint [Line 20 / Line 19] x 12 | 1348 | sq-ft |
| **Option 2 - Store 0.75 of the remaining DCV in pores and ponding** | | | |
| 22 | Required Storage (surface + pores) Volume [0.75 x Line 10] | 1888 | cubic-feet |
| 23 | Required Footprint [Line 22 / Line 18] x 12 | 586 | sq-ft |
| **Footprint of the BMP** | | | |
| 24 | Area draining to the BMP | 113286 | sq-ft |
| 25 | Adjusted Runoff Factor for drainage area (Refere to Appendix B.1 and B.2) | 0.65 | |
| 26 | Minimum BMP Footprint [Line 24 x Line 25 X 0.03] | 2209 | sq-ft |
| 27 | Footprint of the BMP = Maximum(minimum(Line 21, Line 23), Line 26) | 2209 | sq-ft |

# E.12 BF-1 Biofiltration

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

**MS4 Permit Category**
Biofiltration

**Manual Category**
Biofiltration

**Applicable Performance Standard**
Pollutant Control
Flow Control

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

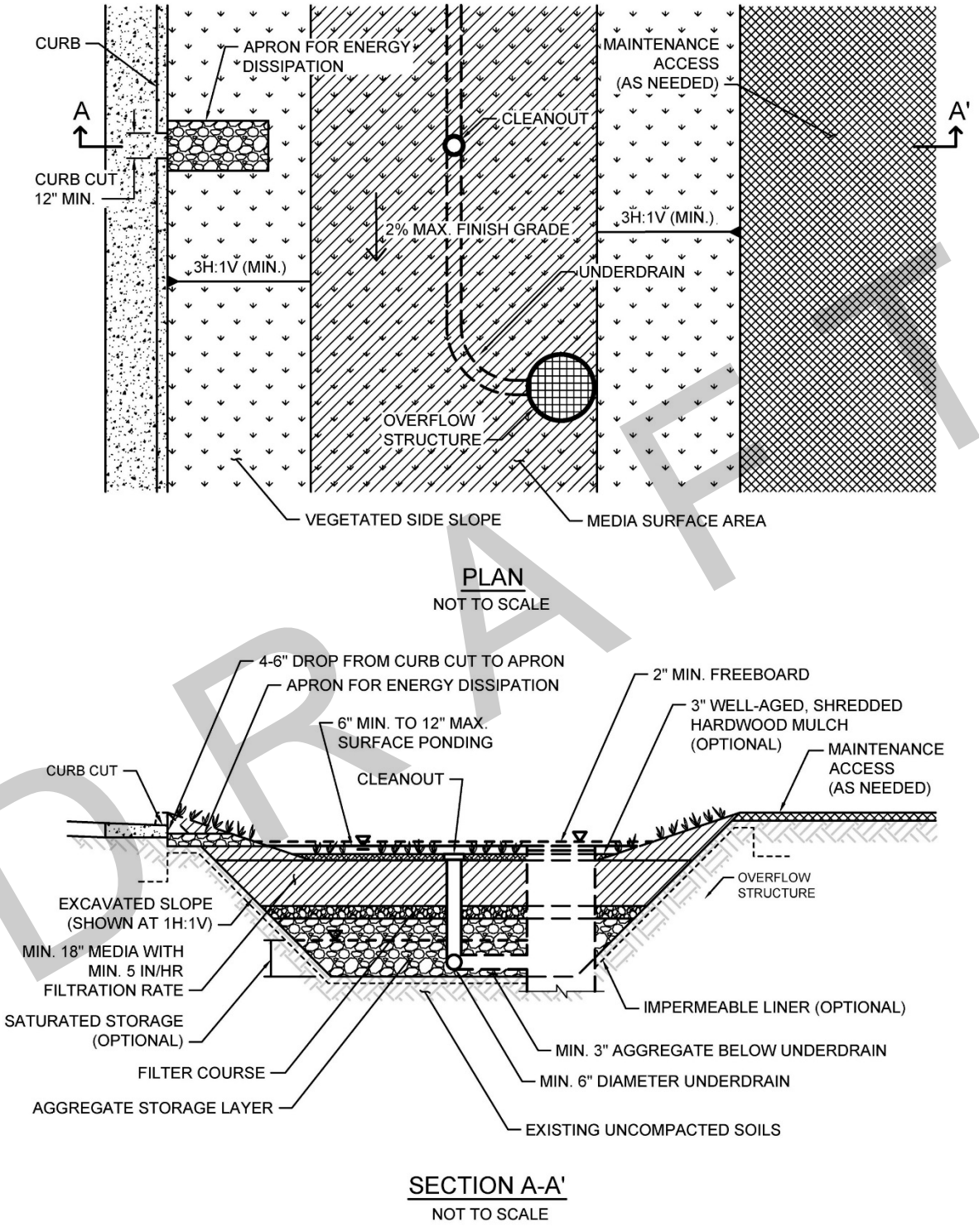
## *Description*

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

Typical bioretention with underdrain components include:

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

- Overflow structure




**Typical plan and Section view of a Biofiltration BMP**

### *Design Adaptations for Project Goals*

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

### *Design Criteria and Considerations*

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

| *Siting and Design* | | *Intent/Rationale* |
|---|---|---|
| ☐ | Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities). | Must not negatively impact existing site geotechnical concerns. |
| ☐ | An impermeable liner or other hydraulic restriction layer is included if site constraints indicate that infiltration or lateral flows should not be allowed. | Lining prevents stormwater 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.<br>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 |

| *Siting and Design* | | *Intent/Rationale* |
|---|---|---|
| | | 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. |
| *Surface Ponding* | | |
| ☐ | Surface ponding is limited to a 24-hour drawdown time. | Surface ponding limited to 24 hour for plant health. |
| ☐ | Surface ponding depth is ≥ 6 and ≤ 12 inches.<br><br>SEE BMP SURFACE DRAWDOWN CALCULATION IN ATTACHMENT 2 | Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns.<br><br>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/or flatter side slopes) and 3) potential for elevated clogging risk is considered. |
| ☐ | A minimum of 2 inches of freeboard is provided. | Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge. |
| ☐ | Side slopes are stabilized with vegetation and are = 3H:1V or shallower. | Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain. |
| *Vegetation* | | |
| ☐ | Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.20. | Plants suited to the climate and ponding depth are more likely to survive. |

| *Siting and Design* | | *Intent/Rationale* |
|---|---|---|
| ☐ | An irrigation system with a connection to water supply should be provided as needed. | Seasonal irrigation might be needed to keep plants healthy. |
| *Mulch (Optional or Mandatory – Dependent on jurisdiction)* | | |
| ☐ | A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided. | Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply. |
| *Media Layer* | | |
| ☐ | Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. An initial filtration rate of 8 to 12 in/hr is recommended to allow for clogging over time; the initial filtration rate should not exceed 12 inches per hour. | A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed. |
| ☐ | Media is a minimum 18 inches deep, meeting either of these two media specifications:<br>City of San Diego Low Impact Development Design Manual (page B-18) (July 2011, unless superseded by more recent edition) **or** County of San Diego Low Impact Development Handbook: Appendix G -Bioretention Soil Specification (June 2014, unless superseded by more recent edition).<br>Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the City or County LID Manual, the media meets the pollutant treatment performance criteria in Section F.1. | A deep media layer provides additional filtration and supports plants with deeper roots.<br>Standard specifications shall be followed.<br>For non-standard or proprietary designs, compliance with F.1 ensures that adequate treatment performance will be provided. |
| ☐ | Media surface area is 3% of contributing area times adjusted runoff factor or greater. | 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.<br>Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, |

| *Siting and Design* | | *Intent/Rationale* |
|---|---|---|
| | | impervious area dispersion, etc.). Refer to Appendix B.2 guidance.<br>Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria. |
| ☐ | Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2). | Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients. |
| *Filter Course Layer* | | |
| ☐ | A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used. | Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade. Filter fabric is more likely to clog. |
| ☐ | Filter course is washed and free of fines. | Washing aggregate will help eliminate fines that could clog the facility and impede infiltration. |
| ☐ | Filter course calculations assessing suitability for particle migration prevention have been completed. | Gradation relationship between layers can evaluate factors (e.g., bridging, permeability, and uniformity) to determine if particle sizing is appropriate or if an intermediate layer is needed. |
| *Aggregate Storage Layer* | | |
| ☐ | Class 2 Permeable per Caltrans specification 68-1.025 is recommended for the storage layer. Washed, open-graded crushed rock may be used, however a 4-6 inch washed pea gravel filter course layer at the top of the crushed rock is required. | Washing aggregate will help eliminate fines that could clog the aggregate storage layer void spaces or subgrade. |
| ☐ | The depth of aggregate provided (12-inch typical) and storage layer configuration is adequate for providing conveyance for underdrain flows to the outlet structure. | Proper storage layer configuration and underdrain placement will minimize facility drawdown time. |
| *Inflow, Underdrain, and Outflow Structures* | | |
| ☐ | Inflow, underdrains and outflow structures are accessible for inspection and maintenance. | Maintenance will prevent clogging and ensure proper operation of the flow |

| *Siting and Design* | | *Intent/Rationale* |
|---|---|---|
| | | control structures. |
| ☐ | Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows. | High inflow velocities can cause erosion, scour and/or channeling. |
| ☐ | Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed. | Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion. |
| ☐ | Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer. | A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked. |
| ☐ | Minimum underdrain diameter is 6 inches. | Smaller diameter underdrains are prone to clogging. |
| ☐ | Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent. | Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration. |
| ☐ | An underdrain cleanout with a minimum 6-inch diameter and lockable cap is placed every 250 to 300 feet as required based on underdrain length. | Properly spaced cleanouts will facilitate underdrain maintenance. |
| ☐ | Overflow is safely conveyed to a downstream storm drain system or discharge point Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins. | Planning for overflow lessens the risk of property damage due to flooding. |

### *Conceptual Design and Sizing Approach for Stormwater Pollutant Control Only*

To design bioretention with underdrain for stormwater 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 Stormwater 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 stormwater pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

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

**Indicate which items are included behind this cover sheet:**

| Attachment | Contents | Checklist |
|---|---|---|
| Attachment 2a | Hydromodification Management Exhibit (Required) | ☑ Included<br><br>See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet. |
| Attachment 2b | Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional)<br><br>See Section 6.2 of the BMP Design Manual. | ☑ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required)<br><br>Optional analyses for Critical Coarse Sediment Yield Area Determination<br>□ 6.2.1 Verification of Geomorphic Landscape Units Onsite<br>□ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment<br>□ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite |
| Attachment 2c | Geomorphic Assessment of Receiving Channels (Optional)<br>See Section 6.3.4 of the BMP Design Manual. | □ Not performed<br>☑ Included<br>□ Submitted as separate stand-alone document |
| Attachment 2d | Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required)<br>See Chapter 6 and Appendix G of the BMP Design Manual | □ Included<br>☑ Submitted as separate stand-alone document |
| Attachment 2e | Vector Control Plan (Required when structural BMPs will not drain in 96 hours) | □ Included<br>☑ Not required because BMPs will drain in less than 96 hours |

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

The Hydromodification Management Exhibit must identify:

☑ Underlying hydrologic soil group

☑ Approximate depth to groundwater

□ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)

☑ Critical coarse sediment yield areas to be protected

☑ Existing topography

☑ Existing and proposed site drainage network and connections to drainage offsite

☑ Proposed grading

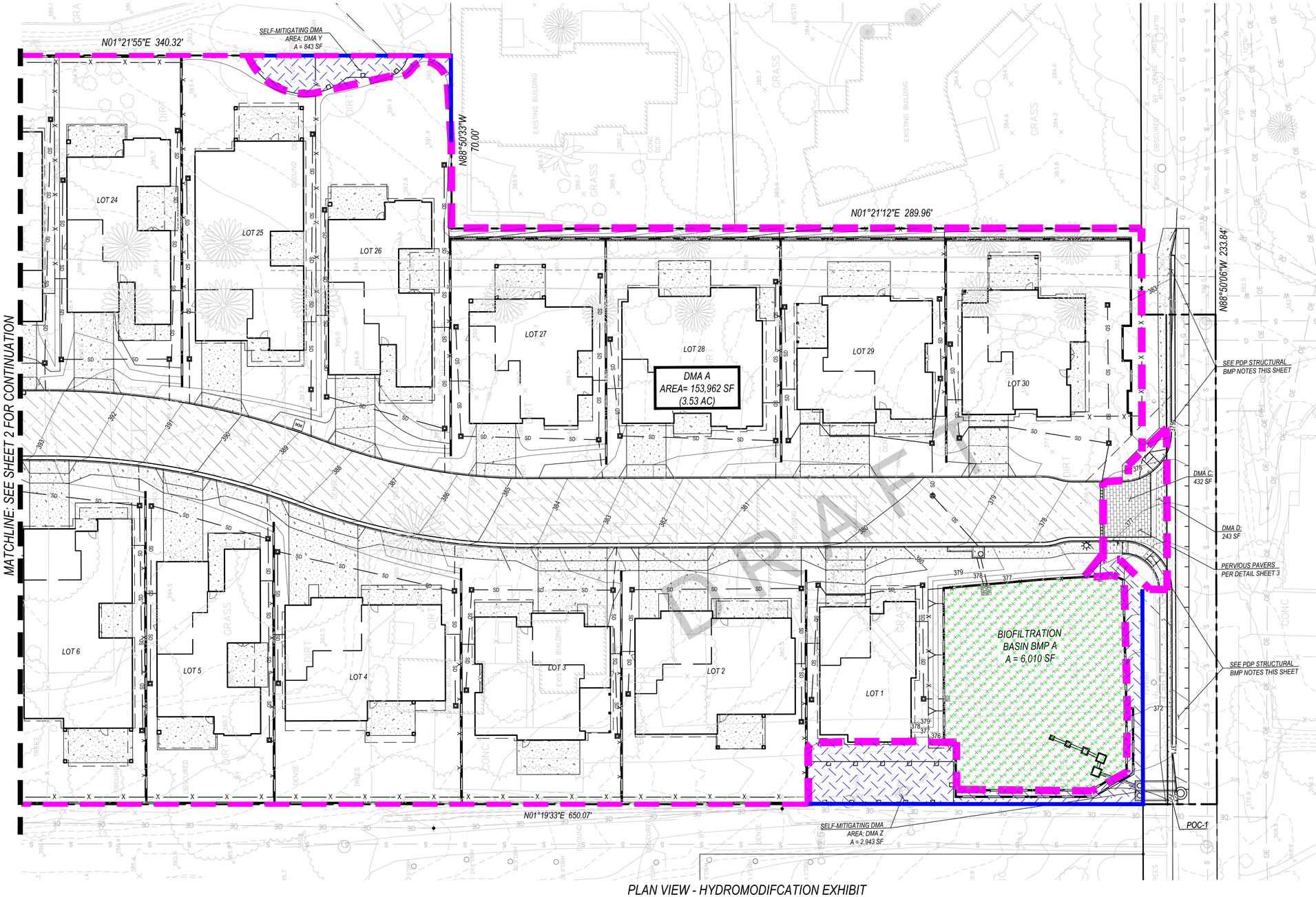
☑ Proposed impervious features

☑ Proposed design features and surface treatments used to minimize imperviousness

☑ Point(s) of Compliance (POC) for Hydromodification Management

☑ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)

☑ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)




## PLAN VIEW - HYDROMODIFCATION EXHIBIT

SCALE: 1" = 20' HORIZONTAL

## LEGEND

- PROPERTY BOUNDARY
- CENTERLINE OF ROAD
- RIGHT-OF-WAY
- ADJACENT PROPERTY LINE
- EXISTING CONTOUR LINE
- PROPOSED CONTOUR LINE
- DMA DRAINAGE BASIN BOUNDARY
- PROPOSED / REMOVED AND REPLACED IMPERVIOUS AREA WITHIN DISTURBED AREA OF SITE
- BMP / BIOFILTRATION BASIN AREA
- SELF-MITIGATING AREA PER BMP DESIGN MANUAL SECTION 5.2.1
- POINT OF COMPLIANCE

## PROJECT SITE AREA CALCULATIONS

| | |
|---|---|
| TOTAL GROSS SITE AREA | 289,479 SF (6.646 AC) |
| AREA DISTURBED BY PROJECT | 273,457 SF (6.278 AC) |
| EXISTING IMPERVIOUS AREA | 39,852 SF (0.915 AC) |
| EXISTING PERVIOUS AREA | 231,129 SF (5.306 AC) |
| TOTAL DMA AREA (DMA A) | 153,962 SF (3.53 AC) |
| TOTAL DMA AREA (DMA B) | 114,153 SF (2.62 AC) |
| TOTAL DMA AREA (DMA C) | 432 SF (0.001 AC) |
| TOTAL DMA AREA (DMA D) | 243 SF (0.0006 AC) |
| TOTAL SELF-MITIGATING DMA AREAS | 4,667 SF (0.11 AC) |
| TOTAL PROPOSED IMPERVIOUS AREA | 151,866 SF (3.48 AC) |
| **15% LOT HARDSCAPE CONTINGENCY | 22,744 SF (0.52 AC) |
| ASSUMED TOTAL IMPERVIOUS AREA | 174,610 SF (4.01 AC) |
| TOTAL PROPOSED PERVIOUS AREA | 98,847 SF (2.27 AC) |

**15% FUTURE LOT HARDSCAPE CONTINGENCY BASED ON ROOF AREA AND PRIVATE WALKWAYS / PATIOS, EXCLUSIVE OF PRIVATE ROAD, SIDEWALK, AND PRIVATE DRIVEWAYS; RESULTS IN **500 SF** OF FUTURE HARDSCAPE ALLOTTED TO EACH LOT

## SELF-RETAINING DMA - DMA C

| | | |
|---|---|---|
| TOTAL BASIN SIZE | = | 432 SF (0.010 AC) |
| SELF-RETAINING IMPERVIOUS AREA | = | 432 SF |
| RATIO OF DMA AREA TO PERV. PAVER AREA | = | 1:1 |

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-RETAINING PERVIOUS PAVER DMAS THAT RETAIN RUNOFF TO A LEVEL DETERMINED TO CONSTITUTE FULL RETENTION OF THE ENTIRE DCV. PERVIOUS PAVERS THAT HAVE A RATIO OF 1.5:1 OR LESS FOR TOTAL DRAINAGE AREA TO AREA OF PERVIOUS PAVERS CAN BE CONSIDERED SELF-RETAINING.

## DE MINIMIS DMA - DMA D

| | | |
|---|---|---|
| TOTAL BASIN SIZE | = | 243 SF (0.006 AC) |

SECTION 5.2.2 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR DE MINIMIS AREAS THAT ARE LESS THAN 250 SF AND ALL DE MINIMIS AREAS FOR THE SITE ARE LESS THAN 2 PERCENT OF THE TOTAL REMOVED OR REPLACED IMPERVIOUS AREA

## SOIL TYPE INFORMATION

SOIL: TYPE D SOILS FOR VERY OLD PARALIC DEPOSITS TOPSOIL PER "STORM WATER MANAGEMENT INVESTIGATION" REPORT PREPARED BY GEOCON, INC. DATED 7/16/21; (TYPE B HYDROLOGIC SOILS PER WEB SOIL SURVEY APPLICATION AVAILABLE THROUGH UNITED STATES DEPARTMENT OF AGRICULTURE)

## TREATMENT CONTROL BMPS

| | |
|---|---|
| BIOFILTRATION WITH IMPERVIOUS LINER | BF-1 |

## GROUNDWATER INFORMATION

GROUNDWATER NOT ENCOUNTERED DURING SITE INVESTIGATION, AND EXPECTED AT DEPTHS GREATER THAN 50 FEET BELOW EXISTING GRADES PER "STORM WATER MANAGEMENT INVESTIGATION" PREPARED BY GEOCON, INC. DATED 1/8/21

## COARSE SEDIMENT YIELD

NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED ONSITE OR UPSTREAM OF SUBJECT PROPERTY. REFER TO DISCUSSION IN PRIORITY DEVELOPMENT PROJECT SWQMP PREPARED BY PASCO, LARET, SUITER & ASSOCIATES

## SELF-MITIGATING DMA - DMA W

| | | |
|---|---|---|
| TOTAL BASIN SIZE | = | 184 SF (0.004 AC) |
| SELF-MITIGATING IMPERVIOUS AREA | = | 0 SF |
| % IMPERVIOUS | = | 0.0% |

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

## SELF-MITIGATING DMA - DMA X

| | | |
|---|---|---|
| TOTAL BASIN SIZE | = | 811 SF (0.019 AC) |
| SELF-MITIGATING IMPERVIOUS AREA | = | 0 SF |
| % IMPERVIOUS | = | 0.0% |

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

## SELF-MITIGATING DMA - DMA Y

| | | |
|---|---|---|
| TOTAL BASIN SIZE | = | 843 SF (0.019 AC) |
| SELF-MITIGATING IMPERVIOUS AREA | = | 0 SF |
| % IMPERVIOUS | = | 0.0% |

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

## SELF-MITIGATING DMA - DMA Z

| | | |
|---|---|---|
| TOTAL BASIN SIZE | = | 2,943 SF (0.067 AC) |
| SELF-MITIGATING IMPERVIOUS AREA | = | 0 SF |
| % IMPERVIOUS | = | 0.0% |

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM, WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

GRAPHIC SCALE: 1" = 20'

20 0 20 40 60

ATTACHMENT 2a
HYDROMODIFICATION EXHIBIT
1220-1240 MELBA ROAD
CITY OF ENCINITAS

PLSA
PLSAENGINEERING.COM

N89°03'27"W 630.77'

N 01°28'55" E 149.27'

SELF-MITIGATING
DMA AREA; DMA X
A = 811 SF

DMA B
AREA= 113,286 SF
(2.60 AC)

BIOFILTRATION
BASIN BMP B
A = 3,030 SF

SELF-MITIGATING
DMA AREA; DMA V
A = 937 SF

LOT 10
LOT 11
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
LOT 17
LOT 18
LOT 19
LOT 20
LOT 21
LOT 22
LOT 23
LOT 24
LOT 6
LOT 7
LOT 8
LOT 9

I SHOT THE WALL UP TO THIS POINT
I'M CERTAIN THE SHOTS ARE CORRECT
UNSURE WHY THE AERIAL IS NOT
MATCHING THE LOCATION.

THE WALL LOOKS SOMETHING LIKE
THIS, WITH A JOG. ADDITIONAL
FIELD SHOTS MAY BE NECESSARY.

N 88°53'23" W 253.12'

S 01°17'14" W 166.11'

MATCHLINE SEE BELOW

MATCHLINE SEE ABOVE

N01°21'55"E

POC-2

MATCHLINE: SEE SHEET 1 FOR CONTINUATION

PLAN VIEW - HYDROMODIFICATION EXHIBIT
SCALE: 1" = 20' HORIZONTAL

GRAPHIC SCALE: 1" = 20'
20 0 20 40 60

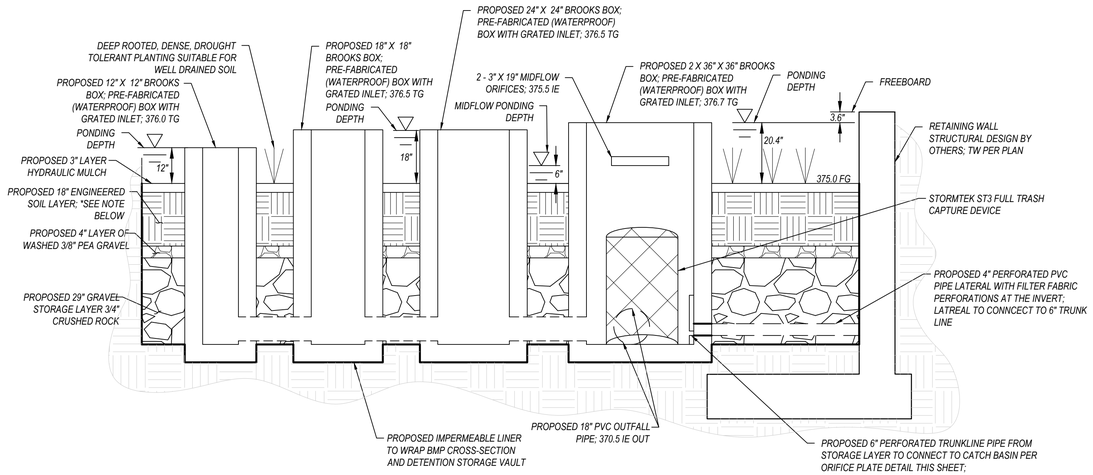
PLAN VIEW - HYDROMODIFICATION EXHIBIT
SCALE: 1" = 20' HORIZONTAL

ATTACHMENT 2a
HYDROMODIFICATION EXHIBIT
1220-1240 MELBA ROAD
CITY OF ENCINITAS

PLSA
PLSAENGINEERING.COM

PLSA 3086

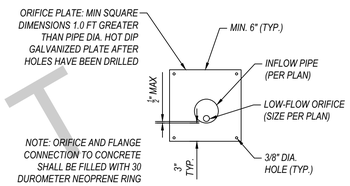
J:\ACTIVE JOBS\3086 STAVER-MELBA\CIVIL\REPORTS\SWQMP\Discretionary\OPTION 2 - 2 BMP'S\ATTACHMENTS\Attachment 2 - HMP\Att 2a - HMP Exhibit




## TYPICAL SECTION - BIOFILTRATION BASIN A

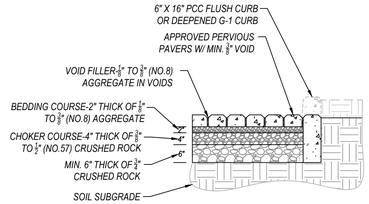
NOT TO SCALE

*BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE EVENLY MIXED COMPOSITION OF WASHED SAND, SANDY LOAM TOPSOIL, AND HUMIC COMPOST. THE MIX SHALL CONTAIN 65% SAND, 20% TOPSOIL, AND 15% COMPOST OR HARDWOOD MULCH IN ACCORDANCE WITH COUNTY OF SAN DIEGO LID BIOSWALE MEDIA




## TYPICAL DETAIL - FLOW CONTROL ORIFICE PLATE

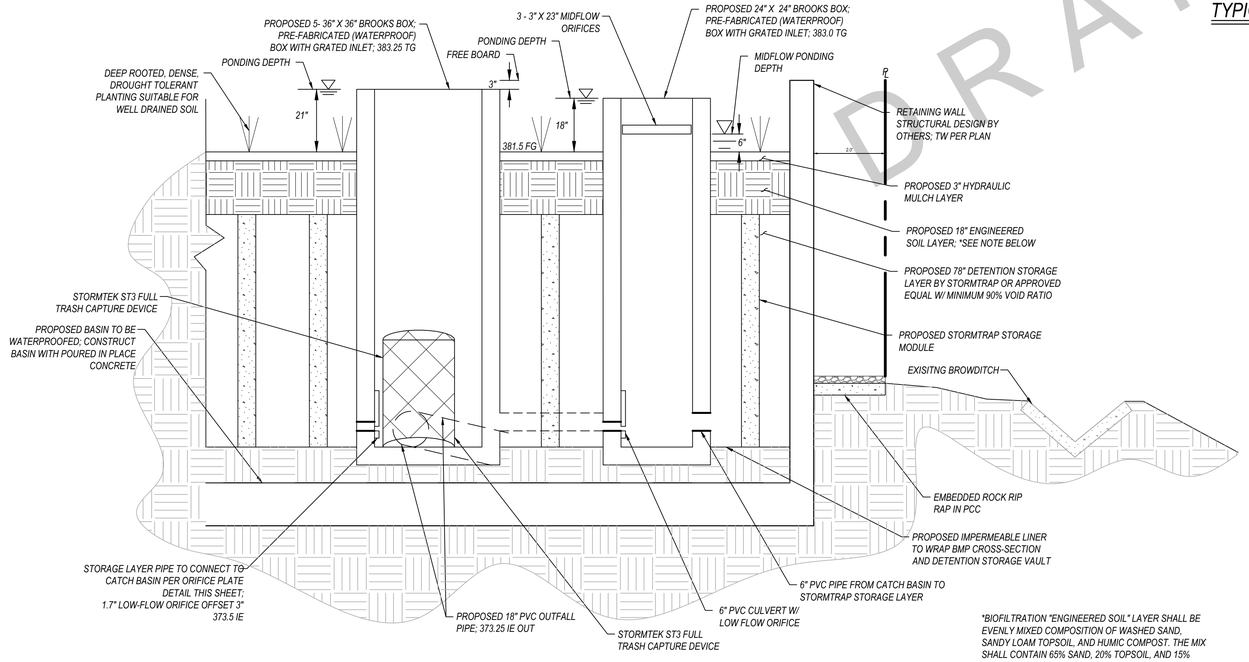
NOT TO SCALE




NOTE:
-ALL AGGREGATE MUST BE CLEAN/WASHED AND FREE OF FINES (SAND, SILT, ETC.)
-THE PAVERS SHALL NOT BE SEALED ONCE THE VOID FILLER HAS BEEN ADDED
-EACH COURSE SHALL BE VIBRATORY COMPACTED BEFORE PLACEMENT OF NEXT COURSE
-NO IMPERVIOUS LINER OR FILTER FABRIC IS TO BE USED
-SPECIAL APPROVAL REQUIRED FOR USE IN HIGHLY EXPANSIVE SOIL-SUBDRAIN MAY BE REQUIRED

## TYPICAL DETAIL - PERVIOUS PAVERS

NOT TO SCALE




## TYPICAL SECTION - BIOFILTRATION BASIN B

NOT TO SCALE

*BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE EVENLY MIXED COMPOSITION OF WASHED SAND, SANDY LOAM TOPSOIL, AND HUMIC COMPOST. THE MIX SHALL CONTAIN 65% SAND, 20% TOPSOIL, AND 15% COMPOST OR HARDWOOD MULCH IN ACCORDANCE WITH COUNTY OF SAN DIEGO LID BIOSWALE MEDIA



ATTACHMENT 2a
DRAINAGE MANAGEMENT AREA CALCS
1220-1240 MELBA ROAD
CITY OF ENCINITAS

PLSA
PLSAENGINEERING.COM

**Attachment 2d.1 – SWMM / Hydromodification Analysis Discussion**

**SWMM / Hydromodification Analysis / Discussion**

**2d.2.1 Hydromodification Analysis**

To satisfy the requirements of the MS4 Permit, a hydromodification management strategy has been developed for the project based on the Final Hydromodification Management Plan dated March 2011 (Final HMP). A continuous simulation model, the Storm Water Management Model (SWMM) version 5.1 by the Environmental Protection Agency (EPA) was selected to size mitigation measures. The SWMM model is capable of modeling hydromodification management facilities to mitigate the effects of increased runoff from the post-development conditions and use changes that may cause negative impacts (i.e. erosion) to downstream channels.

**2d.2.2 Hydromodification Criteria**

Pursuant to the MS4 Permit, post-development runoff conditions (flow rates and durations) must not exceed pre-development runoff conditions by more than 10% (for the range of flows that result in increased potential for erosion, or degraded instream habitat downstream of the project. Based on the Final HMP:

- For flow rates between the pre-project lower threshold (10%, 30%, or 50%) of the pre-project 2-year runoff event ($0.1Q_2$, $0.3Q_2$, or $0.5Q_2$) to the pre-project 10-year event ($Q_{10}$), the post-project discharge rates and durations may not deviate above the pre-project rates and durations by more than 10% over more than 10% of the length of the flow duration curve.

A channel screening analysis may be performed to determine a larger lower flow threshold. However, at this time a low flow threshold of $0.1Q_2$ (high susceptibility) is assumed for erosion of the downstream channel.

**5.1.2 SWMM Model Development**

SWMM is a rainfall-runoff model used for single event or continuous simulation of runoff quantity from primarily urban areas. SWMM calculates and routes runoff based on user-specified input including precipitation data, subcatchment characteristics, soil data, routing information, and BMP configuration. SWMM is capable of modeling various hydrologic processes including but not limited to time-varying precipitation, evaporation, storage, infiltration, and retention LID facilities.

**5.1.3 SWMM Input**

A pre-development and post-development model were created using the following global information:

| Parameter | Input | Source |
|---|---|---|
| Precipitation | Oceanside Rainfall Data | Project Clean Water |
| Evaporation | Encinitas ETo Zone Data | CIMIS ETo Zones Map |
| Soils | B | Field Infiltration / Testing Methods |

Each HMP flow-control biofiltration facility consists of a basin with surface area square footage per plan, 18 inches of engineered soil and as well as a storage layer consisting of gravel or Permavoid, along with an impermeable liner to prevent infiltration. Runoff generated during high-frequency, low-intensity storm events will be biofiltered through the engineered soil and gravel layers, then collected in a series of small PVC drainpipes and directed to an emergency overflow / outlet structure located in the biofiltration basin. Runoff will be mitigated into the outlet structure via a restrictor plate with an HMP low-flow orifice, restricting flow to meet hydromodification management requirements. In larger storm events, runoff not filtered through the engineered soil and gravel layers will be conveyed via an overflow outlet structure consisting of a 3-foot by 3-foot grate located on top of the catch basin. Runoff conveyed via the outlet structure will bypass the soil layers and be conveyed directly to a proposed 12-inch PVC drainpipe to direct discharge offsite. Refer to Attachment 2d.2 of this Storm Water Quality Management Plan (SWQMP) for a general cross-section of the HMP biofiltration basin and additional results of the hydromodification management compliance analysis.

Each HMP biofiltration basin has been designed to comply with both pollutant control and hydromodification management criteria. The HMP biofiltration portion in the SWMM model is specified as an "LID Control" within the "Subcatchment" to define the ponding depth, bioretention soil layer, gravel layer, and low flow orifice restrictor.

### 5.1.4 SWMM Processing and Output

The HMP sizing was determined assuming a completely pervious existing site condition. The pre-development project $0.1Q_2$ and $Q_{10}$ were determined to be 0.025 cfs and 0.493 cfs, respectively for POC-1, 0.058 cfs and 1.12 cfs for POC-2, and 0.13 cfs and 2.52 cfs for POC-3. After routing through each HMP biofiltration basin, the post-development, mitigated project $0.1Q_2$ and $Q_{10}$ were determined to be 0.002 cfs and 0.345 cfs, respectively for POC-1, 0.005 cfs and 0.94 cfs for POC-2, and 0.05 cfs and 2.11 cfs for POC-3. Additional information and data from the SWMM model including input files, rain gage and evaporation data, and flow duration and frequency curves are included hereon.

## 5.2 Storm Water Pollutant Control

To meet the requirements of the MS4 Permit, the HMP biofiltration facility is designed to treat onsite storm water pollutants contained in the volume of runoff from a 24-hour, 85th percentile storm event by slowly infiltrating runoff through an engineered soil layer and gravel layer.

### 5.2.1 Numeric Sizing Requirements for Pollutant Control BMPs

Pursuant to the MS4 Permit, Pollutant Control BMPs shall be designed to retain onsite pollutants contained in the post-development Design Capture Volume (DCV). The DCV is the volume of runoff resulting from the 24-hour, 85th percentile storm event. The DCV calculations for the project are located in Attachment 1 of the project's Storm Water Quality Management Plan (SWQMP). The Pollutant Control BMP proposed for the project is a biofiltration basin. Each proposed HMP biofiltration basin does not provide infiltration, therefore pursuant to the MS4 Permit and Appendix B.5 of the BMP Design Manual, each HMP biofiltration basin is designed to biofilter 1.5 times the DCV or store 0.75 times the DCV in pores and ponding.

**Attachment 2d.2 – Additional SWMM Support Documentation**

```
[TITLE]
;;Project Title/Notes
3086 Staver Melba
Pre-Development Condition

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

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

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

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .06    .08    .11    .15    17     .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         YES

[RAINGAGES]
```

```
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
OCEANSIDE        INTENSITY 1:00     1.0      TIMESERIES OCEANSIDE

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-A            OCEANSIDE        POC-1            2.92     0        560      6        0
DMA-B            OCEANSIDE        POC-2            2.6      0        399      5.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-A            0.012      0.08       0.05       0.1        25         OUTLET
DMA-B            0.012      0.08       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
DMA-A            9          0.025      0.33       7          0
DMA-B            9          0.025      0.33       7          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
;Basin 200
POC-1            0          FREE                        NO
POC-2            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "Rainfall_data\oceanside.dat"

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

[TAGS]

[MAP]
DIMENSIONS -905.312 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -836.352           5783.905
```

```
POC-2             501.045           5898.837

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

[Polygons]
;;Subcatchment   X-Coord           Y-Coord
;;-------------- ------------------ ------------------
DMA-A             -805.007          7507.893
DMA-B             542.839           7539.239

[SYMBOLS]
;;Gage           X-Coord           Y-Coord
;;-------------- ------------------ ------------------
OCEANSIDE         -18.514           8498.329
```

```
[TITLE]
;;Project Title/Notes
3086 Staver Melba
Post-Project Condition

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

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

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

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .06    .08    .11    .15    17     .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         YES

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

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

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-A            OCEANSIDE        BMP-A            3.392    70       2081     4        0
DMA-Z            OCEANSIDE        POC-1            0.067    0        117      13       0
BMP-A            OCEANSIDE        DIV-A            0.13797  0        120      0        0
DMA-B            OCEANSIDE        BMP-B            2.53     64       2205     3        0
BMP-B            OCEANSIDE        DIV-B            0.06956  0        61       0        0
DMA-V            OCEANSIDE        POC-2            0.022    0        192      50       0

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

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
DMA-A            9          0.019      0.33       7          0
DMA-Z            9          0.019      0.33       7          0
BMP-A            9          0.025      0.33       7          0
DMA-B            9          0.019      0.33       7          0
BMP-B            9          0.025      0.33       7          0
DMA-V            9          0.019      0.33       7          0

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BMP-A            BC
BMP-A            SURFACE    6          0          0          0          5
BMP-A            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-A            STORAGE    33         0.67       0          0          NO
BMP-A            DRAIN      0.1541     0.5        3          6          0          0

BMP-B            BC
BMP-B            SURFACE    6          0          0          0          5
BMP-B            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-B            STORAGE    78         0.99       0          0          NO
BMP-B            DRAIN      0.3148     0.5        3          6          0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo
FromPerv
```

```
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ------------
---- ----------
BMP-A            BMP-A            1       6009.97    0          0          100        0          *                        *
0
BMP-B            BMP-B            1       3030.03    0          0          100        0          *                        *
0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO
POC-2            0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV-B            0          BYPASS-B         CUTOFF     0.224      0          0          0          0
DIV-A            0          BYPASS-A         CUTOFF     0.164      0          0          0          0

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

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
BYPASS-B         DIV-B            STOR-B           400        0.01       0          0          0          0
LOWFLOW-B        DIV-B            POC-2            400        0.01       0          0          0          0
LOWFLOW-A        DIV-A            POC-1            400        0.01       0          0          0          0
BYPASS-A         DIV-A            STOR-A           400        0.01       0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
OUTLET-A         STOR-A           POC-1            0          TABULAR/DEPTH   OUTLET-A                    NO
OUTLET-B         STOR-B           POC-2            0          TABULAR/DEPTH   OUTLET-B                    NO

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

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUTLET-A         Rating     0          0
```

```
OUTLET-A                  0.05        0.11
OUTLET-A                  0.1         0.32
OUTLET-A                  0.15        0.59
OUTLET-A                  0.2         0.91
OUTLET-A                  0.25        1.27
OUTLET-A                  0.3         1.56
OUTLET-A                  0.35        1.78
OUTLET-A                  0.4         1.98
OUTLET-A                  0.45        2.16
OUTLET-A                  0.5         2.32
OUTLET-A                  0.55        2.55
OUTLET-A                  0.6         2.83
OUTLET-A                  0.65        3.14
OUTLET-A                  0.7         3.47
OUTLET-A                  0.75        3.83
OUTLET-A                  0.8         4.2
OUTLET-A                  0.85        4.6
OUTLET-A                  0.9         4.87
OUTLET-A                  0.95        5.07
OUTLET-A                  1           5.26
OUTLET-A                  1.05        5.7
OUTLET-A                  1.1         6.35
OUTLET-A                  1.15        7.13
OUTLET-A                  1.2         8.01
OUTLET-A                  1.25        9.43
OUTLET-A                  1.3         11.29
OUTLET-A                  1.35        13.46
OUTLET-A                  1.4         15.89
OUTLET-A                  1.45        18.55
OUTLET-A                  1.5         20.4
;
OUTLET-B          Rating  0           0
OUTLET-B                  0.05        0.21
OUTLET-B                  0.1         0.58
OUTLET-B                  0.15        1.07
OUTLET-B                  0.2         1.65
OUTLET-B                  0.25        2.31
OUTLET-B                  0.3         2.68
OUTLET-B                  0.35        2.69
OUTLET-B                  0.4         2.7
OUTLET-B                  0.45        2.71
OUTLET-B                  0.5         2.71
OUTLET-B                  0.55        2.72
OUTLET-B                  0.6         2.73
OUTLET-B                  0.65        2.74
OUTLET-B                  0.7         2.75
OUTLET-B                  0.75        2.75
OUTLET-B                  0.8         2.76
OUTLET-B                  0.85        2.77
OUTLET-B                  0.9         2.78
OUTLET-B                  0.95        2.78
```

```
OUTLET-B                    1          2.79
OUTLET-B                    1.05       2.8
OUTLET-B                    1.1        2.81
OUTLET-B                    1.15       2.81
OUTLET-B                    1.2        2.82
OUTLET-B                    1.25       2.83
OUTLET-B                    1.3        3.93
OUTLET-B                    1.35       5.95
OUTLET-B                    1.4        8.55
OUTLET-B                    1.45       11.63
OUTLET-B                    1.5        15.13
;
STOR-A           Storage    0          6010
STOR-A                      1.5        6010
;
STOR-B           Storage    0          3030
STOR-B                      1.5        3030

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "Rainfall_data\oceanside.dat"

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

[TAGS]

[MAP]
DIMENSIONS -3453.124 0.000 10000.000 10173.475
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -657.277           1115.023
POC-2            2515.806           1263.225
DIV-B            2530.844           4082.924
DIV-A            -563.380           3955.399
STOR-B           4888.152           4063.285
STOR-A           -3055.920          3917.502

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

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

```
;;-------------- ------------------ ------------------
DMA-A            -773.639           8123.209
DMA-Z            -2672.441          1165.476
BMP-A            -680.751           5950.704
DMA-B            2425.575           8203.445
BMP-B            2455.652           6052.954
DMA-V            4561.027           1406.090

;;Storage Node   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
STOR-B           4888.152           4063.285
STOR-A           -3055.920          3917.502

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OCEANSIDE        718.531            9575.849
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
------------------------------------------------------------

3086 Staver Melba
Pre-Development Condition

***************
Analysis Options
***************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Total Precipitation ......       310.541       675.090
Evaporation Loss .........         5.942        12.917
Infiltration Loss ........       242.540       527.262
Surface Runoff ...........        68.293       148.463
Final Storage ............         0.000         0.000
Continuity Error (%) .....        -2.007


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        68.293        22.254
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        68.293        22.254
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000
```

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

| Subcatchment | Total Precip in | Total Runon in | Total Evap in | Total Infil in | Imperv Runoff in | Perv Runoff in | Total Runoff in | Total Runoff 10^6 gal | Peak Runoff CFS | Runoff Coeff |
|---|---|---|---|---|---|---|---|---|---|---|
| DMA-A | 675.09 | 0.00 | 12.91 | 526.34 | 0.00 | 149.59 | 149.59 | 11.86 | 3.29 | 0.222 |
| DMA-B | 675.09 | 0.00 | 12.93 | 528.29 | 0.00 | 147.19 | 147.19 | 10.39 | 2.92 | 0.218 |

Analysis begun on: Fri Jan 5 10:21:33 2024
Analysis ended on: Fri Jan 5 10:21:49 2024
Total elapsed time: 00:00:16

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------

  3086 Staver Melba
  Post-Project Condition
  WARNING 04: minimum elevation drop used for Conduit BYPASS-B
  WARNING 04: minimum elevation drop used for Conduit LOWFLOW-B
  WARNING 04: minimum elevation drop used for Conduit LOWFLOW-A
  WARNING 04: minimum elevation drop used for Conduit BYPASS-A

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... GREEN_AMPT
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 08/28/1951 05:00:00
  Ending Date .............. 05/23/2008 23:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 01:00:00
  Wet Time Step ............ 00:15:00
  Dry Time Step ............ 04:00:00
  Routing Time Step ........ 60.00 sec


  **************************        Volume         Depth
  Runoff Quantity Continuity     acre-feet        inches
  **************************     ---------       -------
  Initial LID Storage ......         0.036         0.070
  Total Precipitation ......       349.839       675.090
  Evaporation Loss .........        44.859        86.566
  Infiltration Loss ........        80.796       155.913
  Surface Runoff ...........        21.430        41.355
  LID Drainage .............       208.530       402.404
  Final Storage ............         0.049         0.094
  Continuity Error (%) .....        -1.655


  **************************        Volume         Volume
  Flow Routing Continuity        acre-feet       10^6 gal
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......       229.960        74.936
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
```

| | | |
|---|---|---|
| External Outflow ..... | 229.948 | 74.932 |
| Flooding Loss ..... | 0.000 | 0.000 |
| Evaporation Loss ..... | 0.000 | 0.000 |
| Exfiltration Loss ..... | 0.000 | 0.000 |
| Initial Stored Volume .... | 0.000 | 0.000 |
| Final Stored Volume ..... | 0.000 | 0.000 |
| Continuity Error (%) ..... | 0.005 | |

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

**********
Routing Time Step Summary
**********

| | | |
|---|---|---|
| Minimum Time Step | : | 60.00 sec |
| Average Time Step | : | 60.00 sec |
| Maximum Time Step | : | 60.00 sec |
| % of Time in Steady State | : | 0.00 |
| Average Iterations per Step | : | 1.00 |
| % of Steps Not Converging | : | 0.00 |

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

| Subcatchment | Total Precip in | Total Runon in | Total Evap in | Total Infil in | Imperv Runoff in | Perv Runoff in | Total Runoff in | Total Runoff 10^6 gal | Peak Runoff CFS | Runoff Coeff |
|---|---|---|---|---|---|---|---|---|---|---|
| DMA-A | 675.09 | 0.00 | 51.51 | 144.13 | 432.16 | 58.82 | 490.98 | 45.22 | 4.04 | 0.727 |
| DMA-Z | 675.09 | 0.00 | 9.31 | 479.76 | 0.00 | 198.15 | 198.15 | 0.36 | 0.08 | 0.294 |
| BMP-A | 675.09 | 12070.64 | 1142.58 | 0.00 | 0.00 | 0.00 | 11602.82 | 43.47 | 4.20 | 0.910 |
| DMA-B | 675.09 | 0.00 | 47.60 | 173.12 | 395.43 | 70.46 | 465.89 | 32.01 | 3.00 | 0.690 |
| BMP-B | 675.09 | 16945.01 | 1217.68 | 0.00 | 0.00 | 0.00 | 16402.25 | 30.98 | 2.87 | 0.931 |
| DMA-V | 675.09 | 0.00 | 8.99 | 477.97 | 0.00 | 203.12 | 203.12 | 0.12 | 0.03 | 0.301 |

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

| Subcatchment | LID Control | Total Inflow in | Evap Loss in | Infil Loss in | Surface Outflow in | Drain Outflow in | Initial Storage in | Final Storage in | Continuity Error % |
|---|---|---|---|---|---|---|---|---|---|
| BMP-A | BMP-A | 12745.73 | 1142.63 | 0.00 | 977.73 | 10625.52 | 2.10 | 2.21 | -0.00 |
| BMP-B | BMP-B | 17620.10 | 1217.73 | 0.00 | 1502.75 | 14900.12 | 2.10 | 2.24 | -0.00 |

**********
Node Depth Summary
**********

| Node | Type | Average Depth Feet | Maximum Depth Feet | Maximum HGL Feet | Time of Max Occurrence days hr:min | Reported Max Depth Feet |
|---|---|---|---|---|---|---|
| POC-1 | OUTFALL | 0.00 | 0.00 | 0.00 | 0 00:00 | 0.00 |
| POC-2 | OUTFALL | 0.00 | 0.00 | 0.00 | 0 00:00 | 0.00 |
| DIV-B | DIVIDER | 0.00 | 0.00 | 0.00 | 0 00:00 | 0.00 |
| DIV-A | DIVIDER | 0.00 | 0.00 | 0.00 | 0 00:00 | 0.00 |
| STOR-B | STORAGE | 0.00 | 0.29 | 0.29 | 18857 12:02 | 0.29 |
| STOR-A | STORAGE | 0.00 | 0.75 | 0.75 | 18857 12:16 | 0.71 |

**********
Node Inflow Summary
**********

| Node | Type | Maximum Lateral Inflow CFS | Maximum Total Inflow CFS | Time of Max Occurrence days hr:min | Lateral Inflow Volume 10^6 gal | Total Inflow Volume 10^6 gal | Flow Balance Error Percent |
|---|---|---|---|---|---|---|---|
| POC-1 | OUTFALL | 0.08 | 4.01 | 18857 12:16 | 0.36 | 43.8 | 0.000 |
| POC-2 | OUTFALL | 0.03 | 2.89 | 18857 12:01 | 0.121 | 31.1 | 0.000 |
| DIV-B | DIVIDER | 2.87 | 2.87 | 18857 12:01 | 31 | 31 | 0.000 |
| DIV-A | DIVIDER | 4.20 | 4.20 | 18857 12:01 | 43.5 | 43.5 | 0.000 |
| STOR-B | STORAGE | 0.00 | 2.65 | 18857 12:01 | 0 | 2.12 | 0.070 |
| STOR-A | STORAGE | 0.00 | 4.04 | 18857 12:01 | 0 | 3.55 | 0.072 |

**********
Node Flooding Summary
**********

No nodes were flooded.

**********
Storage Volume Summary
**********

| Storage Unit | Average Volume 1000 ft³ | Avg Pcnt Full | Evap Pcnt Loss | Exfil Pcnt Loss | Maximum Volume 1000 ft³ | Max Pcnt Full | Time of Max Occurrence days hr:min | Maximum Outflow CFS |
|---|---|---|---|---|---|---|---|---|
| STOR-B | 0.000 | 0.0 | 0.0 | 0.0 | 0.893 | 19.6 | 18857 12:02 | 2.64 |
| STOR-A | 0.001 | 0.0 | 0.0 | 0.0 | 4.513 | 50.1 | 18857 12:16 | 3.84 |

**********
Outfall Loading Summary
**********

| Outfall Node | Flow Freq Pcnt | Avg Flow CFS | Max Flow CFS | Total Volume 10^6 gal |
|---|---|---|---|---|
| POC-1 | 5.23 | 0.06 | 4.01 | 43.826 |
| POC-2 | 3.95 | 0.06 | 2.89 | 31.100 |
| System | 4.59 | 0.12 | 6.85 | 74.926 |

**********
Link Flow Summary
**********

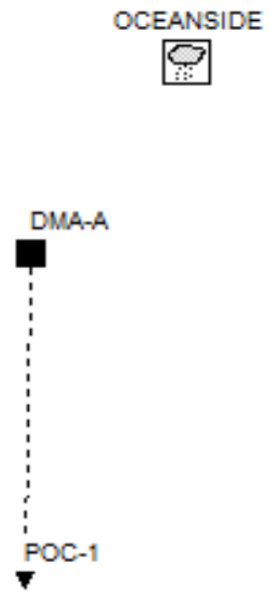
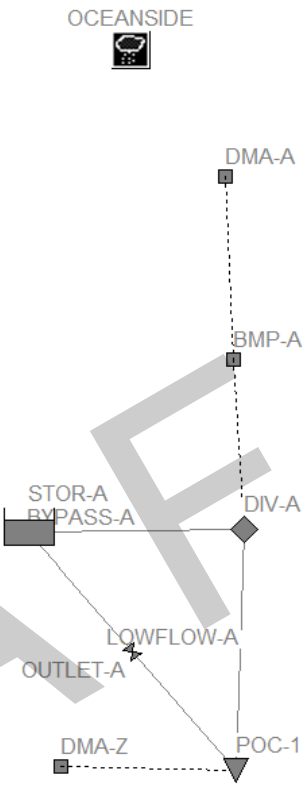
| Link | Type | Maximum \|Flow\| CFS | Time of Max Occurrence days | hr:min | Maximum \|Veloc\| ft/sec | Max/ Full Flow | Max/ Full Depth |
|---|---|---|---|---|---|---|---|
| BYPASS-B | DUMMY | 2.65 | 18857 | 12:01 | | | |
| LOWFLOW-B | DUMMY | 0.22 | 9626 | 09:44 | | | |
| LOWFLOW-A | DUMMY | 0.16 | 141 | 06:58 | | | |
| BYPASS-A | DUMMY | 4.04 | 18857 | 12:01 | | | |
| OUTLET-A | DUMMY | 3.84 | 18857 | 12:16 | | | |
| OUTLET-B | DUMMY | 2.64 | 18857 | 12:02 | | | |

**********
Conduit Surcharge Summary
**********

No conduits were surcharged.

Analysis begun on: Fri Jan 5 10:48:06 2024
Analysis ended on: Fri Jan 5 10:49:45 2024
Total elapsed time: 00:01:39

# POC-1
# SWMM MODEL SCHEMATICS

| PRE-DEVELOPMENT MODEL | POST-PROJECT MODEL |
|---|---|
|  |  |

3086 Staver Melba
1/5/2024

## POC-1 SWMM INPUT

| PRE-DEVELOPMENT | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMA | BMP | Area (ac) | Width (Area/Flow Length) (ft) | % Slope | % Impervious | % "A" Soils | % "B" Soils | % "D" Soils | Weighted Infiltration (in/hr): | Weighted Suction Head (in): | Weighted Initial Deficit: | N-perv [1] |
| DMA-A | N/A | 2.92 | 560 | 6.0% | 0% | 0% | 0% | 100% | 0.025 | 9.000 | 0.330 | 0.08 |
| | **Total:** | **2.92** | | | | | | | | | | |

1. Per the Manning's n Values for Overland Flow table (Tory Walker Engineering):
DMA is shrubs and bushes = 0.08

| POST-PROJECT | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMA | BMP | Area (ac) | Width (Area/Flow Length) (ft) | % Impervious | % Slope | % "A" Soils | % "B" Soils | % "D" Soils | Weighted Infiltration (in/hr): | Weighted Suction Head (in): | Weighted Initial Deficit: | N-perv [1] |
| DMA-A | A | 3.392 | 2081 | 70% | 4% | 0% | 0% | 100% | 0.019 | 9.000 | 0.330 | 0.06 |
| BMP-A | A | 0.13797 | 120 | 0% | 0% | 0% | 0% | 100% | 0.025 | 9.000 | 0.330 | 0.06 |
| DMA-Z | NA | 0.067 | 117 | 0% | 13% | 0% | 0% | 100% | 0.019 | 9.000 | 0.330 | 0.06 |
| | **Total:** | **3.60** | | | | | | | | | | |

1. Per the Manning's n Values for Overland Flow table (Tory Walker Engineering):
DMA is a combination of average grass, closely clipped sod and shrubs and bushes = (0.04+0.08)/2 = 0.06

| Infiltration: | | |
|---|---|---|
| D: | 0.025 | in/hr |

| Suction Head: | | |
|---|---|---|
| D: | 9 | in |

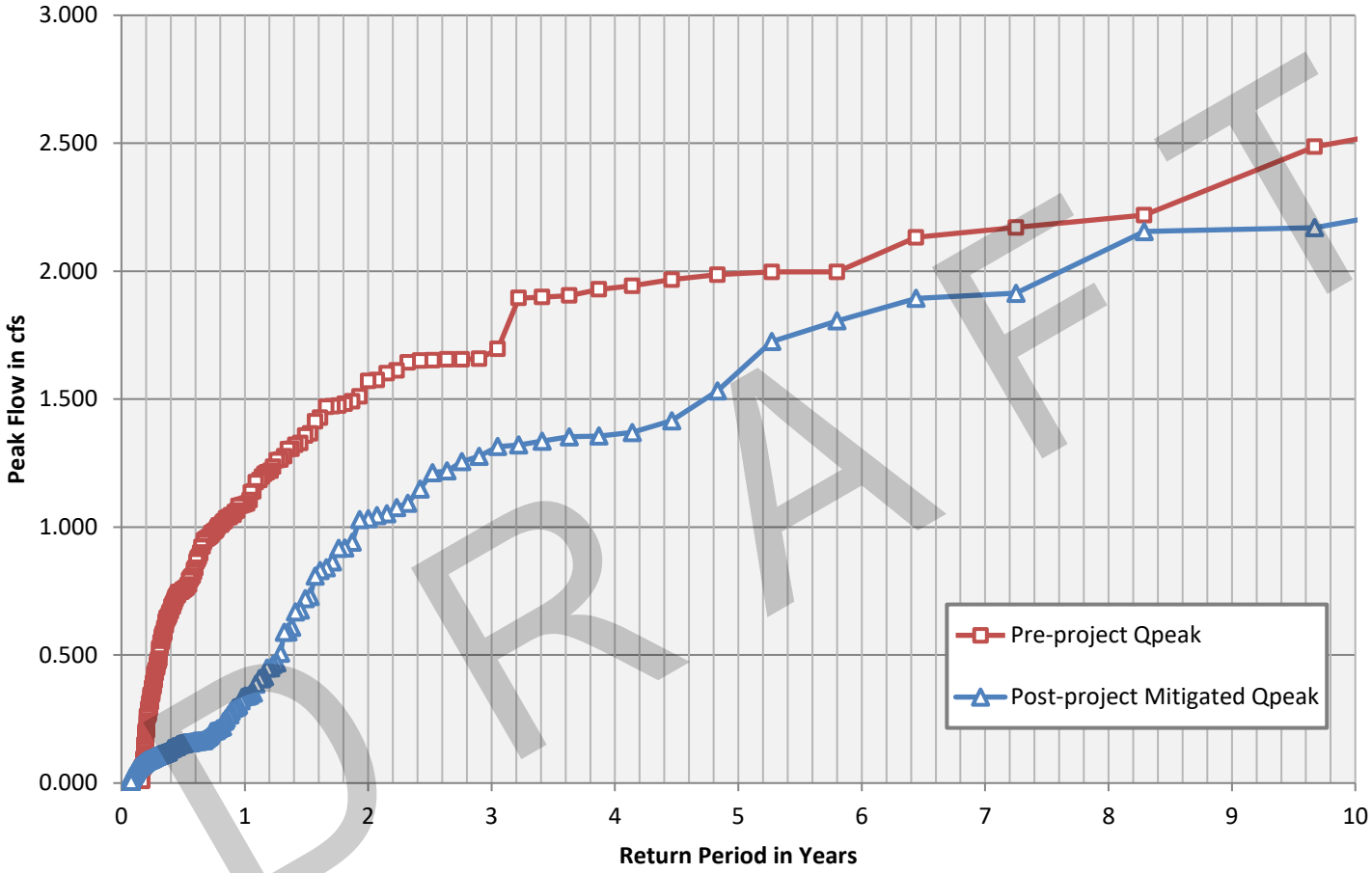
| Initial Deficit | |
|---|---|
| D: | 0.33 |

**POC-1**

**Peak Flow Frequency Summary**

| Return Period | Pre-project Qpeak (cfs) | Post-project - Mitigated Q (cfs) |
|---|---|---|
| LF = 0.1xQ2 | 0.157 | 0.103 |
| 2-year | 1.571 | 1.033 |
| 5-year | 1.990 | 1.607 |
| 10-year | 2.515 | 2.199 |

# Peak Flow Frequency Curves
# POC-1



| | | |
|---|---|---|
| **Low-flow Threshold:** | 10% | |
| **0.1xQ2 (Pre):** | 0.157 | cfs |
| **Q10 (Pre):** | 2.515 | cfs |
| **Ordinate #:** | 100 | |
| **Incremental Q (Pre):** | 0.02358 | cfs |
| **Total Hourly Data:** | 497370 | hours |

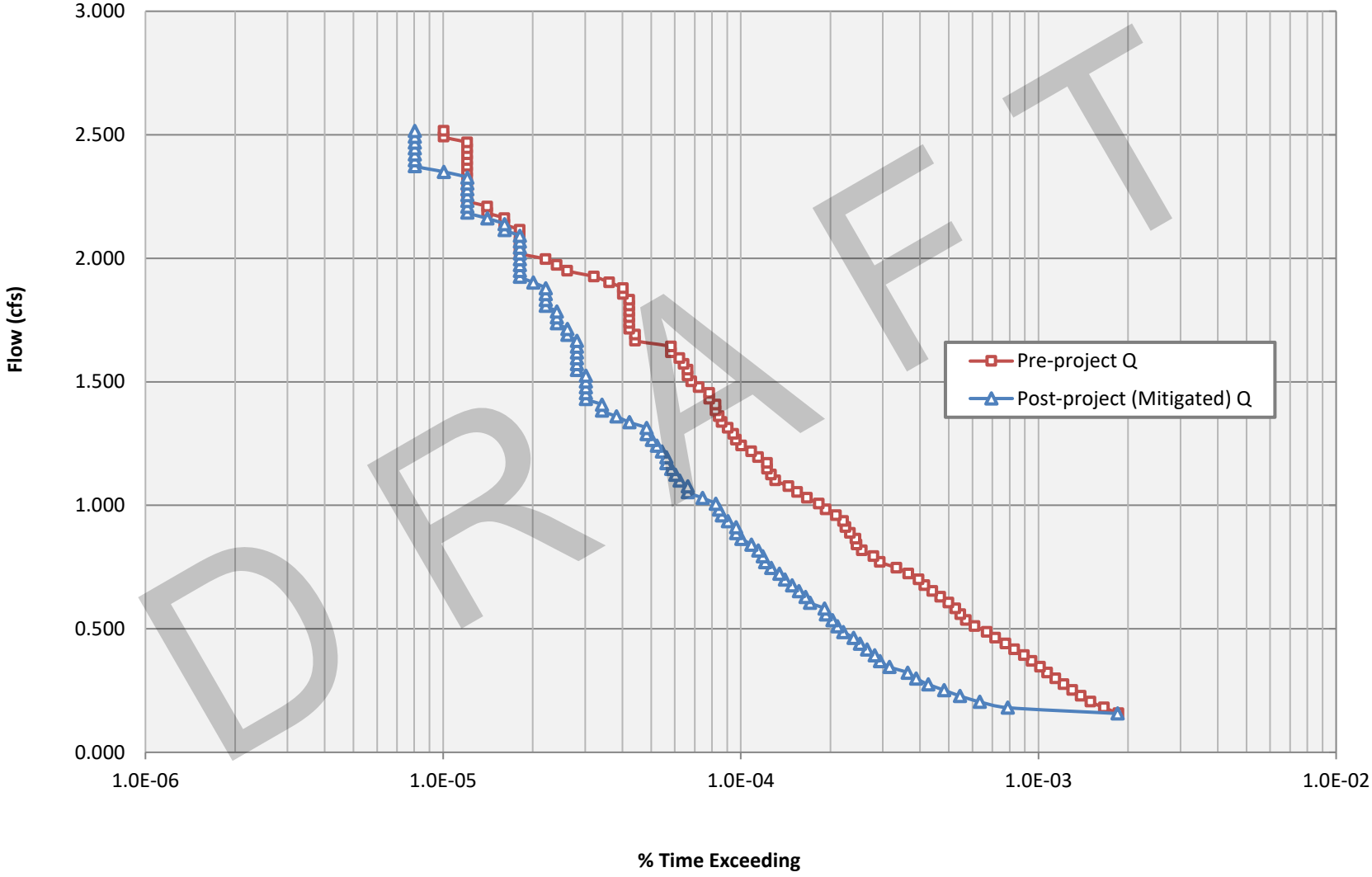
**POC-1**

**The proposed BMP:** PASSED

| Interval | Pre-project Flow (cfs) | Pre-project Hours | Pre-project % Time Exceeding | Post-project Hours | Post-project % Time Exceeding | Percentage | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 0 | 0.157 | 924 | 1.86E-03 | 918 | 1.85E-03 | 99% | Pass |
| 1 | 0.181 | 827 | 1.66E-03 | 392 | 7.88E-04 | 47% | Pass |
| 2 | 0.204 | 745 | 1.50E-03 | 316 | 6.35E-04 | 42% | Pass |
| 3 | 0.228 | 690 | 1.39E-03 | 271 | 5.45E-04 | 39% | Pass |
| 4 | 0.251 | 647 | 1.30E-03 | 240 | 4.83E-04 | 37% | Pass |
| 5 | 0.275 | 605 | 1.22E-03 | 212 | 4.26E-04 | 35% | Pass |
| 6 | 0.299 | 568 | 1.14E-03 | 193 | 3.88E-04 | 34% | Pass |
| 7 | 0.322 | 533 | 1.07E-03 | 181 | 3.64E-04 | 34% | Pass |
| 8 | 0.346 | 504 | 1.01E-03 | 157 | 3.16E-04 | 31% | Pass |
| 9 | 0.369 | 472 | 9.49E-04 | 146 | 2.94E-04 | 31% | Pass |
| 10 | 0.393 | 445 | 8.95E-04 | 140 | 2.81E-04 | 31% | Pass |
| 11 | 0.416 | 413 | 8.30E-04 | 132 | 2.65E-04 | 32% | Pass |
| 12 | 0.440 | 386 | 7.76E-04 | 125 | 2.51E-04 | 32% | Pass |
| 13 | 0.464 | 356 | 7.16E-04 | 119 | 2.39E-04 | 33% | Pass |
| 14 | 0.487 | 334 | 6.72E-04 | 110 | 2.21E-04 | 33% | Pass |
| 15 | 0.511 | 304 | 6.11E-04 | 105 | 2.11E-04 | 35% | Pass |
| 16 | 0.534 | 284 | 5.71E-04 | 101 | 2.03E-04 | 36% | Pass |
| 17 | 0.558 | 272 | 5.47E-04 | 96 | 1.93E-04 | 35% | Pass |
| 18 | 0.582 | 262 | 5.27E-04 | 95 | 1.91E-04 | 36% | Pass |
| 19 | 0.605 | 248 | 4.99E-04 | 85 | 1.71E-04 | 34% | Pass |
| 20 | 0.629 | 233 | 4.68E-04 | 82 | 1.65E-04 | 35% | Pass |
| 21 | 0.652 | 219 | 4.40E-04 | 78 | 1.57E-04 | 36% | Pass |
| 22 | 0.676 | 206 | 4.14E-04 | 74 | 1.49E-04 | 36% | Pass |
| 23 | 0.699 | 197 | 3.96E-04 | 70 | 1.41E-04 | 36% | Pass |
| 24 | 0.723 | 182 | 3.66E-04 | 67 | 1.35E-04 | 37% | Pass |
| 25 | 0.747 | 166 | 3.34E-04 | 63 | 1.27E-04 | 38% | Pass |
| 26 | 0.770 | 146 | 2.94E-04 | 60 | 1.21E-04 | 41% | Pass |
| 27 | 0.794 | 139 | 2.79E-04 | 59 | 1.19E-04 | 42% | Pass |
| 28 | 0.817 | 127 | 2.55E-04 | 57 | 1.15E-04 | 45% | Pass |
| 29 | 0.841 | 122 | 2.45E-04 | 54 | 1.09E-04 | 44% | Pass |
| 30 | 0.864 | 121 | 2.43E-04 | 50 | 1.01E-04 | 41% | Pass |
| 31 | 0.888 | 116 | 2.33E-04 | 48 | 9.65E-05 | 41% | Pass |
| 32 | 0.912 | 112 | 2.25E-04 | 48 | 9.65E-05 | 43% | Pass |
| 33 | 0.935 | 110 | 2.21E-04 | 45 | 9.05E-05 | 41% | Pass |
| 34 | 0.959 | 104 | 2.09E-04 | 43 | 8.65E-05 | 41% | Pass |
| 35 | 0.982 | 96 | 1.93E-04 | 42 | 8.44E-05 | 44% | Pass |
| 36 | 1.006 | 91 | 1.83E-04 | 41 | 8.24E-05 | 45% | Pass |
| 37 | 1.030 | 83 | 1.67E-04 | 37 | 7.44E-05 | 45% | Pass |
| 38 | 1.053 | 77 | 1.55E-04 | 33 | 6.63E-05 | 43% | Pass |
| 39 | 1.077 | 72 | 1.45E-04 | 33 | 6.63E-05 | 46% | Pass |
| 40 | 1.100 | 65 | 1.31E-04 | 31 | 6.23E-05 | 48% | Pass |
| 41 | 1.124 | 63 | 1.27E-04 | 30 | 6.03E-05 | 48% | Pass |
| 42 | 1.147 | 61 | 1.23E-04 | 29 | 5.83E-05 | 48% | Pass |
| 43 | 1.171 | 61 | 1.23E-04 | 28 | 5.63E-05 | 46% | Pass |
| 44 | 1.195 | 57 | 1.15E-04 | 28 | 5.63E-05 | 49% | Pass |
| 45 | 1.218 | 54 | 1.09E-04 | 27 | 5.43E-05 | 50% | Pass |
| 46 | 1.242 | 50 | 1.01E-04 | 26 | 5.23E-05 | 52% | Pass |
| 47 | 1.265 | 48 | 9.65E-05 | 25 | 5.03E-05 | 52% | Pass |
| 48 | 1.289 | 47 | 9.45E-05 | 24 | 4.83E-05 | 51% | Pass |
| 49 | 1.313 | 45 | 9.05E-05 | 24 | 4.83E-05 | 53% | Pass |
| 50 | 1.336 | 43 | 8.65E-05 | 21 | 4.22E-05 | 49% | Pass |
| 51 | 1.360 | 42 | 8.44E-05 | 19 | 3.82E-05 | 45% | Pass |
| 52 | 1.383 | 41 | 8.24E-05 | 17 | 3.42E-05 | 41% | Pass |
| 53 | 1.407 | 41 | 8.24E-05 | 17 | 3.42E-05 | 41% | Pass |
| 54 | 1.430 | 39 | 7.84E-05 | 15 | 3.02E-05 | 38% | Pass |

| Interval | Pre-project Flow (cfs) | Pre-project Hours | Pre-project % Time Exceeding | Post-project Hours | Post-project % Time Exceeding | Percentage | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 55 | 1.454 | 39 | 7.84E-05 | 15 | 3.02E-05 | 38% | Pass |
| 56 | 1.478 | 36 | 7.24E-05 | 15 | 3.02E-05 | 42% | Pass |
| 57 | 1.501 | 34 | 6.84E-05 | 15 | 3.02E-05 | 44% | Pass |
| 58 | 1.525 | 33 | 6.63E-05 | 15 | 3.02E-05 | 45% | Pass |
| 59 | 1.548 | 33 | 6.63E-05 | 14 | 2.81E-05 | 42% | Pass |
| 60 | 1.572 | 32 | 6.43E-05 | 14 | 2.81E-05 | 44% | Pass |
| 61 | 1.595 | 31 | 6.23E-05 | 14 | 2.81E-05 | 45% | Pass |
| 62 | 1.619 | 29 | 5.83E-05 | 14 | 2.81E-05 | 48% | Pass |
| 63 | 1.643 | 29 | 5.83E-05 | 14 | 2.81E-05 | 48% | Pass |
| 64 | 1.666 | 22 | 4.42E-05 | 14 | 2.81E-05 | 64% | Pass |
| 65 | 1.690 | 22 | 4.42E-05 | 13 | 2.61E-05 | 59% | Pass |
| 66 | 1.713 | 21 | 4.22E-05 | 13 | 2.61E-05 | 62% | Pass |
| 67 | 1.737 | 21 | 4.22E-05 | 12 | 2.41E-05 | 57% | Pass |
| 68 | 1.761 | 21 | 4.22E-05 | 12 | 2.41E-05 | 57% | Pass |
| 69 | 1.784 | 21 | 4.22E-05 | 12 | 2.41E-05 | 57% | Pass |
| 70 | 1.808 | 21 | 4.22E-05 | 11 | 2.21E-05 | 52% | Pass |
| 71 | 1.831 | 21 | 4.22E-05 | 11 | 2.21E-05 | 52% | Pass |
| 72 | 1.855 | 20 | 4.02E-05 | 11 | 2.21E-05 | 55% | Pass |
| 73 | 1.878 | 20 | 4.02E-05 | 11 | 2.21E-05 | 55% | Pass |
| 74 | 1.902 | 18 | 3.62E-05 | 10 | 2.01E-05 | 56% | Pass |
| 75 | 1.926 | 16 | 3.22E-05 | 9 | 1.81E-05 | 56% | Pass |
| 76 | 1.949 | 13 | 2.61E-05 | 9 | 1.81E-05 | 69% | Pass |
| 77 | 1.973 | 12 | 2.41E-05 | 9 | 1.81E-05 | 75% | Pass |
| 78 | 1.996 | 11 | 2.21E-05 | 9 | 1.81E-05 | 82% | Pass |
| 79 | 2.020 | 9 | 1.81E-05 | 9 | 1.81E-05 | 100% | Pass |
| 80 | 2.043 | 9 | 1.81E-05 | 9 | 1.81E-05 | 100% | Pass |
| 81 | 2.067 | 9 | 1.81E-05 | 9 | 1.81E-05 | 100% | Pass |
| 82 | 2.091 | 9 | 1.81E-05 | 9 | 1.81E-05 | 100% | Pass |
| 83 | 2.114 | 9 | 1.81E-05 | 8 | 1.61E-05 | 89% | Pass |
| 84 | 2.138 | 8 | 1.61E-05 | 8 | 1.61E-05 | 100% | Pass |
| 85 | 2.161 | 8 | 1.61E-05 | 7 | 1.41E-05 | 88% | Pass |
| 86 | 2.185 | 7 | 1.41E-05 | 6 | 1.21E-05 | 86% | Pass |
| 87 | 2.209 | 7 | 1.41E-05 | 6 | 1.21E-05 | 86% | Pass |
| 88 | 2.232 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 89 | 2.256 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 90 | 2.279 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 91 | 2.303 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 92 | 2.326 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 93 | 2.350 | 6 | 1.21E-05 | 5 | 1.01E-05 | 83% | Pass |
| 94 | 2.374 | 6 | 1.21E-05 | 4 | 8.04E-06 | 67% | Pass |
| 95 | 2.397 | 6 | 1.21E-05 | 4 | 8.04E-06 | 67% | Pass |
| 96 | 2.421 | 6 | 1.21E-05 | 4 | 8.04E-06 | 67% | Pass |
| 97 | 2.444 | 6 | 1.21E-05 | 4 | 8.04E-06 | 67% | Pass |
| 98 | 2.468 | 6 | 1.21E-05 | 4 | 8.04E-06 | 67% | Pass |
| 99 | 2.491 | 5 | 1.01E-05 | 4 | 8.04E-06 | 80% | Pass |
| 100 | 2.515 | 5 | 1.01E-05 | 4 | 8.04E-06 | 80% | Pass |

# Flow Duration Curve
# [Pre vs. Post (Mitigated)]
# POC-1



## POC-1

## SWMM Model Flow Coefficient Calculation

**BMP-A**

| PARAMETER | ABBREV. | Bio-Retention Cell LID BMP | |
|---|---|---|---|
| Ponding Depth | PD | 6 | in |
| Bioretention Soil Layer | S | 21 | in |
| Gravel Layer | G | 33 | in |
| TOTAL | | 5.0 | ft |
| | | 60 | in |
| Orifice Coefficient | $c_g$ | 0.6 | -- |
| Low Flow Orifice Diameter | D | 1.675 | in |
| Drain exponent | n | 0.5 | -- |
| Flow Rate (volumetric) | Q | 0.164 | cfs |
| Ponding Depth Surface Area | $A_{PD}$ | 6010 | $ft^2$ |
| Bioretention Surface Area | $A_S, A_G$ | 6010 | $ft^2$ |
| | $A_S, A_G$ | 0.1380 | ac |
| Porosity of Bioretention Soil | | 0.40 | - |
| Flow Rate (per unit area) | q | 2.940 | in/hr |
| Effective Ponding Depth | $PD_{eff}$ | **6.00** | in |
| Flow Coefficient | C | **0.1541** | -- |

## Summary for Pond 2P: STOR BMP-A Alt 1

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 375.50' | 9,015 cf | **BMP-A (Conic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 375.50 | 6,010 | 0.00 | 0 | 0 | 6,010 |
| 377.00 | 6,010 | 100.00 | 9,015 | 9,015 | 6,422 |

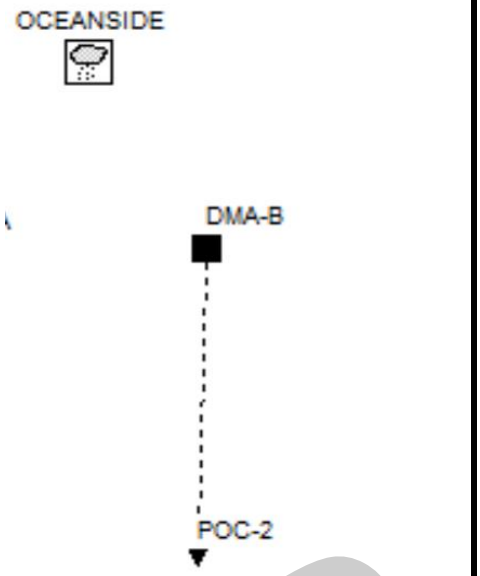
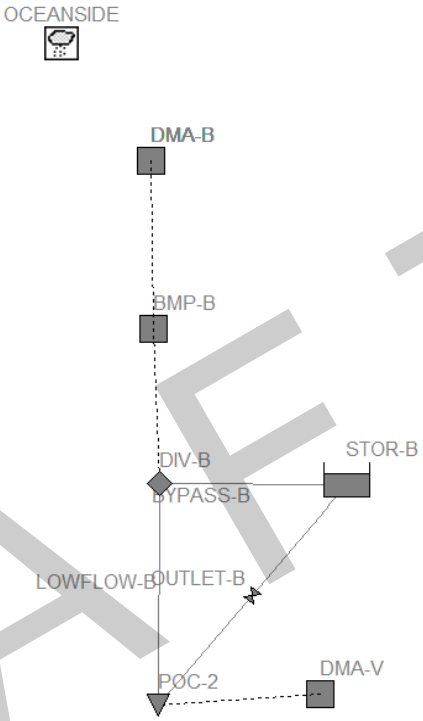
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 370.50' | **18.000" Round Culvert**<br>L= 18.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 370.50' / 370.41' S= 0.0050 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |
| #2 | Device 1 | 375.50' | **19.000" W x 3.000" H Vert. Orifice X 2.00** C= 0.600<br>Limited to weir flow at low heads |
| #3 | Device 1 | 376.00' | **12.000" x 12.000" Horiz. Grate X 0.50**<br>C= 0.600 in 12.000" x 12.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #4 | Device 1 | 376.50' | **18.000" x 18.000" Horiz. Grate X 0.50**<br>C= 0.600 in 18.000" x 18.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #5 | Device 1 | 376.50' | **24.000" x 24.000" Horiz. Grate X 0.50**<br>C= 0.600 in 24.000" x 24.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #6 | Device 1 | 376.70' | **36.000" x 36.000" Horiz. Grate X 0.50**<br>C= 0.600 in 36.000" x 36.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #7 | Device 1 | 376.70' | **36.000" x 36.000" Horiz. Grate X 0.50**<br>C= 0.600 in 36.000" x 36.000" Grate (100% open area)<br>Limited to weir flow at low heads |

## Stage-Discharge for Pond 2P: STOR BMP-A Alt 1

| Elevation (feet) | Primary (cfs) |
|---|---|
| 375.50 | 0.00 |
| 375.55 | 0.11 |
| 375.60 | 0.32 |
| 375.65 | 0.59 |
| 375.70 | 0.91 |
| 375.75 | 1.27 |
| 375.80 | 1.56 |
| 375.85 | 1.78 |
| 375.90 | 1.98 |
| 375.95 | 2.16 |
| 376.00 | 2.32 |
| 376.05 | 2.55 |
| 376.10 | 2.83 |
| 376.15 | 3.14 |
| 376.20 | 3.47 |
| 376.25 | 3.83 |
| 376.30 | 4.20 |
| 376.35 | 4.60 |
| 376.40 | 4.87 |
| 376.45 | 5.07 |
| 376.50 | 5.26 |
| 376.55 | 5.70 |
| 376.60 | 6.35 |
| 376.65 | 7.13 |
| 376.70 | 8.01 |
| 376.75 | 9.43 |
| 376.80 | 11.29 |
| 376.85 | 13.46 |
| 376.90 | 15.89 |
| 376.95 | 18.55 |
| 377.00 | **20.40** |

| | | |
|---|---|---|
| **Drawdown Calculation for BMP** | A | |
| Project Name | Staver Melba | |
| Project No | 3086 | |
| **Surface Drawdown Time:** | **5.2** | hr |
| **Total Drawdown Time:** | 19.4 | hr |
| **Surface Area** | 6010 | sq ft |
| **Underdrain Orifice Diameter:** | 1.675 | in |
| **C:** | 0.6 | |
| **Ponding** (to invert of lowest discharge opening in outlet structure): | 0.5 | ft |
| **Amended Soil Depth:** | 1.75 | ft |
| **Gravel Depth:** | 2.5 | ft |
| **Orifice Q =** | 0.159 | cfs |
| **Effective Depth** | 22.2 | in |
| **Flow Rate controlled by orifice** | 1.145 | in/hr |

# POC-2
# SWMM MODEL SCHEMATICS

| PRE-DEVELOPMENT MODEL | POST-PROJECT MODEL |
|---|---|
|  |  |

3086 Staver Melba
1/5/2024

## POC-2 SWMM INPUT

| PRE-DEVELOPMENT | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMA | BMP | Area (ac) | Width (Area/Flow Length) (ft) | % Slope | % Impervious | % "A" Soils | % "B" Soils | % "D" Soils | Weighted Infiltration (in/hr): | Weighted Suction Head (in): | Weighted Initial Deficit: | N-perv [1] |
| DMA-B | N/A | 2.60 | 399 | 5.5% | 0% | 0% | 0% | 100% | 0.025 | 9.000 | 0.330 | 0.08 |
| | **Total:** | **2.60** | | | | | | | | | | |

1. Per the Manning's n Values for Overland Flow table (Tory Walker Engineering):
DMA is shrubs and bushes = 0.08

| POST-PROJECT | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMA | BMP | Area (ac) | Width (Area/Flow Length) (ft) | % Impervious | % Slope | % "A" Soils | % "B" Soils | % "D" Soils | Weighted Infiltration (in/hr): | Weighted Suction Head (in): | Weighted Initial Deficit: | N-perv [1] |
| DMA-B | B | 2.53 | 2205 | 64% | 3% | 0% | 0% | 100% | 0.019 | 9.000 | 0.330 | 0.06 |
| BMP-B | B | 0.06956 | 61 | 0% | 0% | 0% | 0% | 100% | 0.025 | 9.000 | 0.330 | 0.06 |
| DMA-V | NA | 0.022 | 192 | 0% | 50% | 0% | 0% | 100% | 0.019 | 9.000 | 0.330 | 0.06 |
| | **Total:** | **2.62** | | | | | | | | | | |

1. Per the Manning's n Values for Overland Flow table (Tory Walker Engineering):
DMA is a combination of average grass, closely clipped sod and shrubs and bushes = (0.04+0.08)/2 = 0.06

| Infiltration: | | |
|---|---|---|
| D: | 0.025 | in/hr |

| Suction Head: | | |
|---|---|---|
| D: | 9 | in |

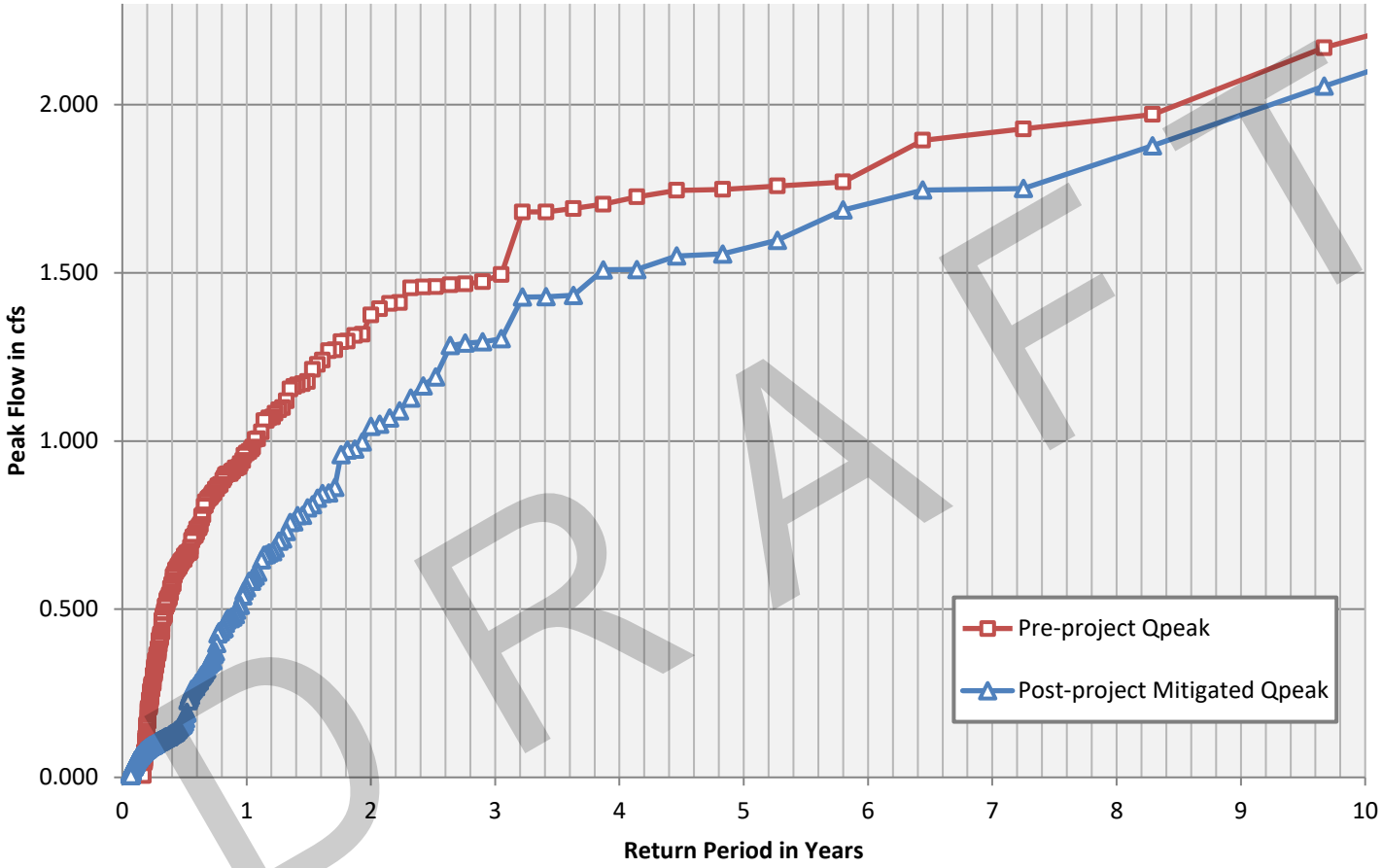
| Initial Deficit | |
|---|---|
| D: | 0.33 |

## POC-2

## Peak Flow Frequency Summary

| Return Period | Pre-project Qpeak (cfs) | Post-project - Mitigated Q (cfs) |
|---|---|---|
| LF = 0.1xQ2 | 0.138 | 0.104 |
| 2-year | 1.375 | 1.044 |
| 5-year | 1.752 | 1.572 |
| 10-year | 2.202 | 2.096 |

# Peak Flow Frequency Curves
# POC-2



**Low-flow Threshold:** 10%

**POC-2**

**0.1xQ2 (Pre):** 0.138 cfs

**Q10 (Pre):** 2.202 cfs

**Ordinate #:** 100

**Incremental Q (Pre):** 0.02065 cfs

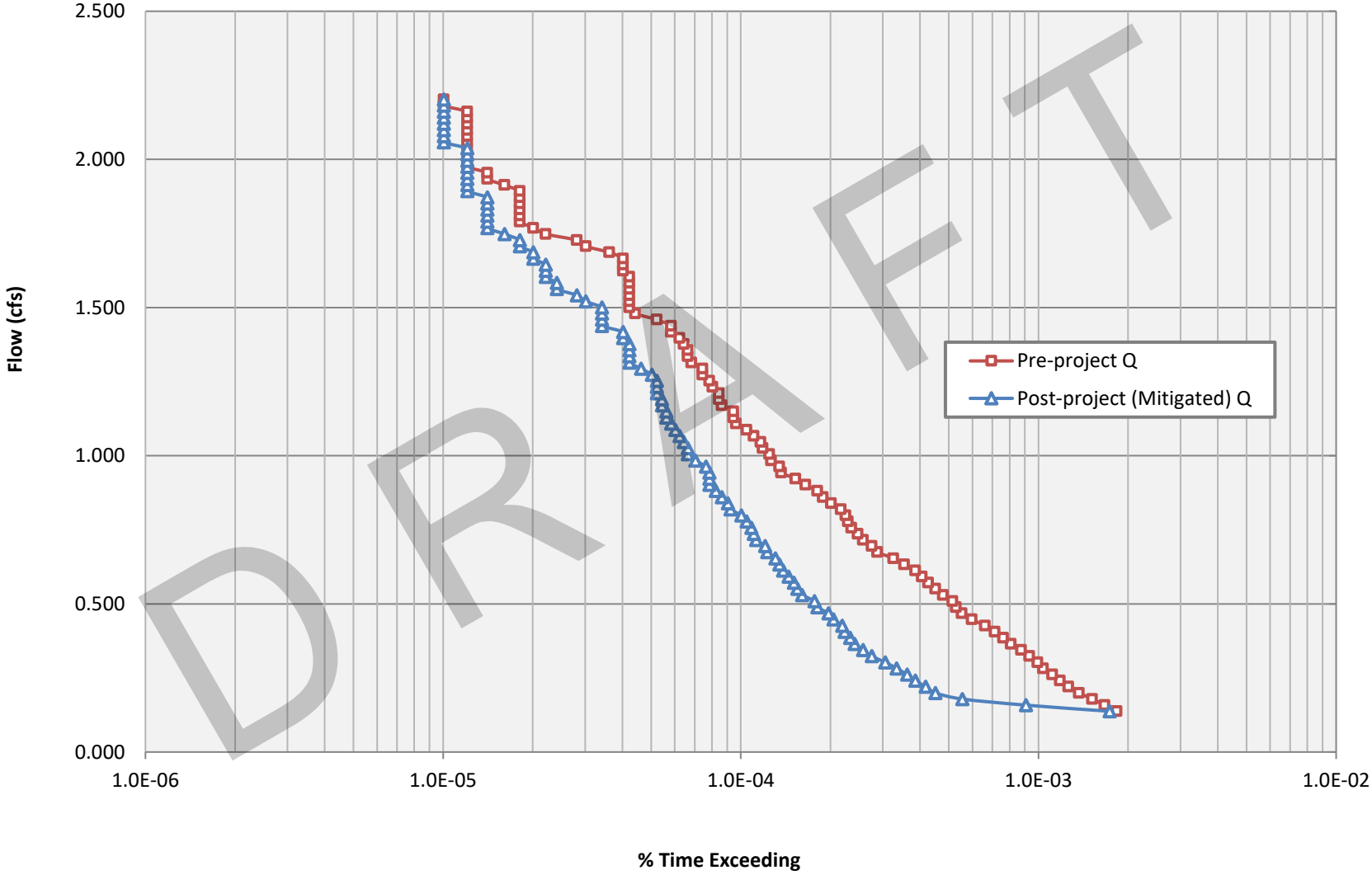
**Total Hourly Data:** 497370 hours

**The proposed BMP:** PASSED

| Interval | Pre-project Flow (cfs) | Pre-project Hours | Pre-project % Time Exceeding | Post-project Hours | Post-project % Time Exceeding | Percentage | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 0 | 0.138 | 912 | 1.83E-03 | 863 | 1.74E-03 | 95% | Pass |
| 1 | 0.158 | 830 | 1.67E-03 | 452 | 9.09E-04 | 54% | Pass |
| 2 | 0.179 | 754 | 1.52E-03 | 276 | 5.55E-04 | 37% | Pass |
| 3 | 0.199 | 681 | 1.37E-03 | 224 | 4.50E-04 | 33% | Pass |
| 4 | 0.220 | 627 | 1.26E-03 | 208 | 4.18E-04 | 33% | Pass |
| 5 | 0.241 | 588 | 1.18E-03 | 192 | 3.86E-04 | 33% | Pass |
| 6 | 0.261 | 554 | 1.11E-03 | 180 | 3.62E-04 | 32% | Pass |
| 7 | 0.282 | 516 | 1.04E-03 | 166 | 3.34E-04 | 32% | Pass |
| 8 | 0.303 | 494 | 9.93E-04 | 152 | 3.06E-04 | 31% | Pass |
| 9 | 0.323 | 464 | 9.33E-04 | 137 | 2.75E-04 | 30% | Pass |
| 10 | 0.344 | 435 | 8.75E-04 | 128 | 2.57E-04 | 29% | Pass |
| 11 | 0.365 | 402 | 8.08E-04 | 120 | 2.41E-04 | 30% | Pass |
| 12 | 0.385 | 379 | 7.62E-04 | 116 | 2.33E-04 | 31% | Pass |
| 13 | 0.406 | 355 | 7.14E-04 | 111 | 2.23E-04 | 31% | Pass |
| 14 | 0.427 | 329 | 6.61E-04 | 109 | 2.19E-04 | 33% | Pass |
| 15 | 0.447 | 297 | 5.97E-04 | 102 | 2.05E-04 | 34% | Pass |
| 16 | 0.468 | 275 | 5.53E-04 | 98 | 1.97E-04 | 36% | Pass |
| 17 | 0.489 | 263 | 5.29E-04 | 90 | 1.81E-04 | 34% | Pass |
| 18 | 0.509 | 256 | 5.15E-04 | 88 | 1.77E-04 | 34% | Pass |
| 19 | 0.530 | 238 | 4.79E-04 | 80 | 1.61E-04 | 34% | Pass |
| 20 | 0.550 | 224 | 4.50E-04 | 77 | 1.55E-04 | 34% | Pass |
| 21 | 0.571 | 212 | 4.26E-04 | 75 | 1.51E-04 | 35% | Pass |
| 22 | 0.592 | 202 | 4.06E-04 | 72 | 1.45E-04 | 36% | Pass |
| 23 | 0.612 | 192 | 3.86E-04 | 69 | 1.39E-04 | 36% | Pass |
| 24 | 0.633 | 176 | 3.54E-04 | 67 | 1.35E-04 | 38% | Pass |
| 25 | 0.654 | 162 | 3.26E-04 | 65 | 1.31E-04 | 40% | Pass |
| 26 | 0.674 | 143 | 2.88E-04 | 61 | 1.23E-04 | 43% | Pass |
| 27 | 0.695 | 137 | 2.75E-04 | 60 | 1.21E-04 | 44% | Pass |
| 28 | 0.716 | 128 | 2.57E-04 | 56 | 1.13E-04 | 44% | Pass |
| 29 | 0.736 | 123 | 2.47E-04 | 55 | 1.11E-04 | 45% | Pass |
| 30 | 0.757 | 117 | 2.35E-04 | 54 | 1.09E-04 | 46% | Pass |
| 31 | 0.778 | 114 | 2.29E-04 | 52 | 1.05E-04 | 46% | Pass |
| 32 | 0.798 | 112 | 2.25E-04 | 50 | 1.01E-04 | 45% | Pass |
| 33 | 0.819 | 108 | 2.17E-04 | 46 | 9.25E-05 | 43% | Pass |
| 34 | 0.840 | 100 | 2.01E-04 | 45 | 9.05E-05 | 45% | Pass |
| 35 | 0.860 | 94 | 1.89E-04 | 43 | 8.65E-05 | 46% | Pass |
| 36 | 0.881 | 90 | 1.81E-04 | 41 | 8.24E-05 | 46% | Pass |
| 37 | 0.901 | 82 | 1.65E-04 | 39 | 7.84E-05 | 48% | Pass |
| 38 | 0.922 | 76 | 1.53E-04 | 39 | 7.84E-05 | 51% | Pass |
| 39 | 0.943 | 68 | 1.37E-04 | 39 | 7.84E-05 | 57% | Pass |
| 40 | 0.963 | 67 | 1.35E-04 | 38 | 7.64E-05 | 57% | Pass |
| 41 | 0.984 | 63 | 1.27E-04 | 35 | 7.04E-05 | 56% | Pass |
| 42 | 1.005 | 62 | 1.25E-04 | 33 | 6.63E-05 | 53% | Pass |
| 43 | 1.025 | 59 | 1.19E-04 | 33 | 6.63E-05 | 56% | Pass |
| 44 | 1.046 | 58 | 1.17E-04 | 32 | 6.43E-05 | 55% | Pass |
| 45 | 1.067 | 55 | 1.11E-04 | 31 | 6.23E-05 | 56% | Pass |
| 46 | 1.087 | 52 | 1.05E-04 | 30 | 6.03E-05 | 58% | Pass |
| 47 | 1.108 | 48 | 9.65E-05 | 29 | 5.83E-05 | 60% | Pass |
| 48 | 1.129 | 47 | 9.45E-05 | 28 | 5.63E-05 | 60% | Pass |
| 49 | 1.149 | 47 | 9.45E-05 | 28 | 5.63E-05 | 60% | Pass |
| 50 | 1.170 | 43 | 8.65E-05 | 27 | 5.43E-05 | 63% | Pass |
| 51 | 1.191 | 42 | 8.44E-05 | 27 | 5.43E-05 | 64% | Pass |
| 52 | 1.211 | 42 | 8.44E-05 | 26 | 5.23E-05 | 62% | Pass |
| 53 | 1.232 | 40 | 8.04E-05 | 26 | 5.23E-05 | 65% | Pass |
| 54 | 1.253 | 39 | 7.84E-05 | 26 | 5.23E-05 | 67% | Pass |

| Interval | Pre-project Flow (cfs) | Pre-project Hours | Pre-project % Time Exceeding | Post-project Hours | Post-project % Time Exceeding | Percentage | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 55 | 1.273 | 37 | 7.44E-05 | 25 | 5.03E-05 | 68% | Pass |
| 56 | 1.294 | 37 | 7.44E-05 | 23 | 4.62E-05 | 62% | Pass |
| 57 | 1.314 | 34 | 6.84E-05 | 21 | 4.22E-05 | 62% | Pass |
| 58 | 1.335 | 33 | 6.63E-05 | 21 | 4.22E-05 | 64% | Pass |
| 59 | 1.356 | 33 | 6.63E-05 | 21 | 4.22E-05 | 64% | Pass |
| 60 | 1.376 | 32 | 6.43E-05 | 21 | 4.22E-05 | 66% | Pass |
| 61 | 1.397 | 31 | 6.23E-05 | 20 | 4.02E-05 | 65% | Pass |
| 62 | 1.418 | 29 | 5.83E-05 | 20 | 4.02E-05 | 69% | Pass |
| 63 | 1.438 | 29 | 5.83E-05 | 17 | 3.42E-05 | 59% | Pass |
| 64 | 1.459 | 26 | 5.23E-05 | 17 | 3.42E-05 | 65% | Pass |
| 65 | 1.480 | 22 | 4.42E-05 | 17 | 3.42E-05 | 77% | Pass |
| 66 | 1.500 | 21 | 4.22E-05 | 17 | 3.42E-05 | 81% | Pass |
| 67 | 1.521 | 21 | 4.22E-05 | 15 | 3.02E-05 | 71% | Pass |
| 68 | 1.542 | 21 | 4.22E-05 | 14 | 2.81E-05 | 67% | Pass |
| 69 | 1.562 | 21 | 4.22E-05 | 12 | 2.41E-05 | 57% | Pass |
| 70 | 1.583 | 21 | 4.22E-05 | 12 | 2.41E-05 | 57% | Pass |
| 71 | 1.604 | 21 | 4.22E-05 | 11 | 2.21E-05 | 52% | Pass |
| 72 | 1.624 | 20 | 4.02E-05 | 11 | 2.21E-05 | 55% | Pass |
| 73 | 1.645 | 20 | 4.02E-05 | 11 | 2.21E-05 | 55% | Pass |
| 74 | 1.665 | 20 | 4.02E-05 | 10 | 2.01E-05 | 50% | Pass |
| 75 | 1.686 | 18 | 3.62E-05 | 10 | 2.01E-05 | 56% | Pass |
| 76 | 1.707 | 15 | 3.02E-05 | 9 | 1.81E-05 | 60% | Pass |
| 77 | 1.727 | 14 | 2.81E-05 | 9 | 1.81E-05 | 64% | Pass |
| 78 | 1.748 | 11 | 2.21E-05 | 8 | 1.61E-05 | 73% | Pass |
| 79 | 1.769 | 10 | 2.01E-05 | 7 | 1.41E-05 | 70% | Pass |
| 80 | 1.789 | 9 | 1.81E-05 | 7 | 1.41E-05 | 78% | Pass |
| 81 | 1.810 | 9 | 1.81E-05 | 7 | 1.41E-05 | 78% | Pass |
| 82 | 1.831 | 9 | 1.81E-05 | 7 | 1.41E-05 | 78% | Pass |
| 83 | 1.851 | 9 | 1.81E-05 | 7 | 1.41E-05 | 78% | Pass |
| 84 | 1.872 | 9 | 1.81E-05 | 7 | 1.41E-05 | 78% | Pass |
| 85 | 1.893 | 9 | 1.81E-05 | 6 | 1.21E-05 | 67% | Pass |
| 86 | 1.913 | 8 | 1.61E-05 | 6 | 1.21E-05 | 75% | Pass |
| 87 | 1.934 | 7 | 1.41E-05 | 6 | 1.21E-05 | 86% | Pass |
| 88 | 1.955 | 7 | 1.41E-05 | 6 | 1.21E-05 | 86% | Pass |
| 89 | 1.975 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 90 | 1.996 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 91 | 2.017 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 92 | 2.037 | 6 | 1.21E-05 | 6 | 1.21E-05 | 100% | Pass |
| 93 | 2.058 | 6 | 1.21E-05 | 5 | 1.01E-05 | 83% | Pass |
| 94 | 2.078 | 6 | 1.21E-05 | 5 | 1.01E-05 | 83% | Pass |
| 95 | 2.099 | 6 | 1.21E-05 | 5 | 1.01E-05 | 83% | Pass |
| 96 | 2.120 | 6 | 1.21E-05 | 5 | 1.01E-05 | 83% | Pass |
| 97 | 2.140 | 6 | 1.21E-05 | 5 | 1.01E-05 | 83% | Pass |
| 98 | 2.161 | 6 | 1.21E-05 | 5 | 1.01E-05 | 83% | Pass |
| 99 | 2.182 | 5 | 1.01E-05 | 5 | 1.01E-05 | 100% | Pass |
| 100 | 2.202 | 5 | 1.01E-05 | 5 | 1.01E-05 | 100% | Pass |

# Flow Duration Curve
# [Pre vs. Post (Mitigated)]
# POC-2



## POC-2

## SWMM Model Flow Coefficient Calculation

**BMP-B**

| PARAMETER | ABBREV. | Bio-Retention Cell LID BMP | |
|---|---|---|---|
| Ponding Depth | PD | 6 | in |
| Bioretention Soil Layer | S | 21 | in |
| Permavoid Layer | G | 78 | in |
| TOTAL | | 8.8 | ft |
| | | 105 | in |
| Orifice Coefficient | $c_g$ | 0.6 | -- |
| Low Flow Orifice Diameter | D | 1.7 | in |
| Drain exponent | n | 0.5 | -- |
| Flow Rate (volumetric) | Q | 0.224 | cfs |
| Ponding Depth Surface Area | $A_{PD}$ | 3030 | $ft^2$ |
| Bioretention Surface Area | $A_S, A_G$ | 3030 | $ft^2$ |
| | $A_S, A_G$ | 0.0696 | ac |
| Porosity of Bioretention Soil | | 0.40 | - |
| Flow Rate (per unit area) | q | 7.970 | in/hr |
| Effective Ponding Depth | $PD_{eff}$ | **6.00** | in |
| Flow Coefficient | C | **0.3148** | -- |

## Summary for Pond 11P: STOR BMP-B Alt 1

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 382.00' | 4,545 cf | **BMP-B (Conic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 382.00 | 3,030 | 0.00 | 0 | 0 | 3,030 |
| 383.50 | 3,030 | 100.00 | 4,545 | 4,545 | 3,323 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Secondary | 373.50' | **6.000" Round 6" Culvert**<br>L= 18.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 373.50' / 373.32' S= 0.0100 '/' Cc= 0.900<br>n= 0.013, Flow Area= 0.20 sf |
| #2 | Device 1 | 382.00' | **23.000" W x 3.000" H Vert. Midflow Orifice X 3.00** C= 0.600<br>Limited to weir flow at low heads |
| #3 | Device 1 | 383.00' | **24.000" x 24.000" Horiz. Grate X 0.50**<br>C= 0.600 in 24.000" x 24.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #4 | Secondary | 373.25' | **18.000" Round 18" Culvert**<br>L= 10.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 373.25' / 373.15' S= 0.0100 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |
| #5 | Device 4 | 383.25' | **36.000" x 36.000" Horiz. Grate X 0.50**<br>C= 0.600 in 36.000" x 36.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #6 | Device 4 | 383.25' | **36.000" x 36.000" Horiz. Grate X 0.50**<br>C= 0.600 in 36.000" x 36.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #7 | Device 4 | 383.25' | **36.000" x 36.000" Horiz. Grate X 0.50**<br>C= 0.600 in 36.000" x 36.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #8 | Device 4 | 383.25' | **36.000" x 36.000" Horiz. Grate X 0.50**<br>C= 0.600 in 36.000" x 36.000" Grate (100% open area)<br>Limited to weir flow at low heads |
| #9 | Device 4 | 383.25' | **36.000" x 36.000" Horiz. Grate X 0.50**<br>C= 0.600 in 36.000" x 36.000" Grate (100% open area)<br>Limited to weir flow at low heads |

## Stage-Discharge for Pond 11P: STOR BMP-B Alt 1

| Elevation (feet) | Secondary (cfs) |
|---|---|
| 382.00 | 0.00 |
| 382.05 | 0.21 |
| 382.10 | 0.58 |
| 382.15 | 1.07 |
| 382.20 | 1.65 |
| 382.25 | 2.31 |
| 382.30 | 2.68 |
| 382.35 | 2.69 |
| 382.40 | 2.70 |
| 382.45 | 2.71 |
| 382.50 | 2.71 |
| 382.55 | 2.72 |
| 382.60 | 2.73 |
| 382.65 | 2.74 |
| 382.70 | 2.75 |
| 382.75 | 2.75 |
| 382.80 | 2.76 |
| 382.85 | 2.77 |
| 382.90 | 2.78 |
| 382.95 | 2.78 |
| 383.00 | 2.79 |
| 383.05 | 2.80 |
| 383.10 | 2.81 |
| 383.15 | 2.81 |
| 383.20 | 2.82 |
| 383.25 | 2.83 |
| 383.30 | 3.93 |
| 383.35 | 5.95 |
| 383.40 | 8.55 |
| 383.45 | 11.63 |
| 383.50 | **15.13** |

**Drawdown Calculation for BMP** B

Project Name Staver Melba

Project No 3086

| | | |
|---|---|---|
| **Surface Drawdown Time:** | **1.9** | hr |
| **Total Drawdown Time:** | 12.8 | hr |
| **Surface Area** | 3030 | sq ft |
| **Underdrain Orifice Diameter:** | 1.7 | in |
| **C:** | 0.6 | |
| **Ponding** (to invert of lowest discharge opening in outlet structure): | 0.5 | ft |
| **Amended Soil Depth:** | 1.75 | ft |
| **Permavoid Depth:** | 6.25 | ft |
| **Orifice Q =** | 0.220 | cfs |
| **Effective Depth** | 81.45 | in |
| **Flow Rate controlled by orifice** | 3.140 | in/hr |

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

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

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

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



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

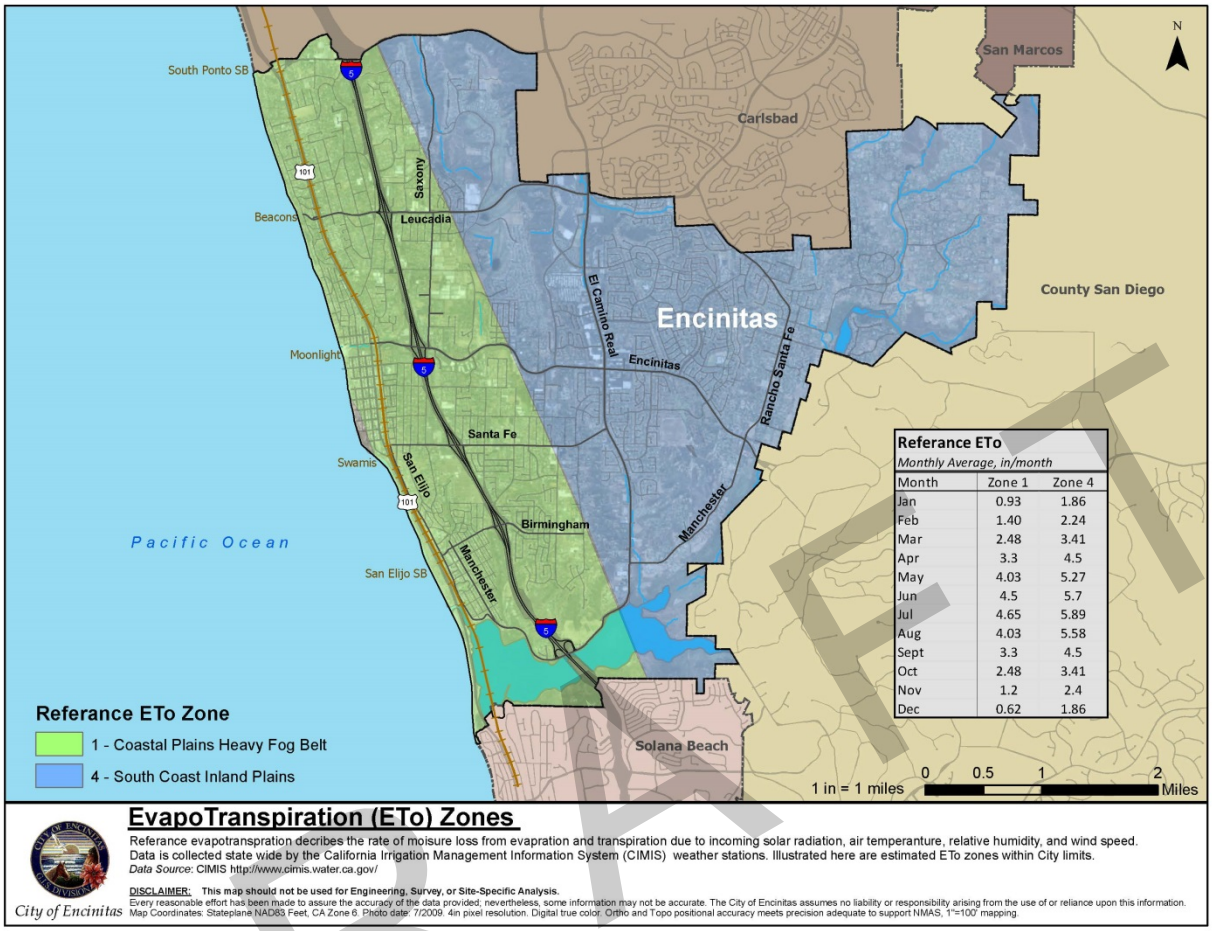



**Figure G.1-2: California Irrigation Management Information System "Reference Evapotranspiration Zones"**

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

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

# ATTACHMENT 3 - STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

**Indicate which items are included behind this cover sheet:**

| Attachment | Contents | Checklist |
|---|---|---|
| Attachment 3a | Structural BMP Maintenance Thresholds and Actions (Required) | ☑ Included<br><br>See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet. |
| Attachment 3b | Draft Maintenance Agreement (when applicable) | □ Included<br>□ Not Applicable |

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

□ **Preliminary Design / Planning / CEQA level submittal:**

Attachment 3a must identify:

□ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

□ **Final Design level submittal:**

Attachment 3a must identify:

□ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)

□ How to access the structural BMP(s) to inspect and perform maintenance

□ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)

□ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable

□ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)

□ Recommended equipment to perform maintenance

□ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

# APPENDIX 3a
## BMP MAINTENANCE THRESHOLDS

### BMP DESCRIPTION

| | |
|---|---|
| BIOFILTRATION (6,010 SF) | STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO: _____<br>O&M RESPONSIBLE PARTY DESIGNEE: TORREY PACIFIC CORPORATION |

### POST-CONSTRUCTION PERMANENT BMP OPERATION & MAINTENANCE PROCEDURE DETAILS

| MAINTENANCE INDICATORS | MAINTENANCE ACTION |
|---|---|
| ACCUMULATION OF SEDIMENT, LITTER, OR DEBRIS | REMOVE AND PROPERLY DISPOSE OF ACCUMULATED MATERIALS, WITHOUT DAMAGE TO THE VEGETATION |
| POOR VEGETATION ESTABLISHMENT | RE-SEED, RE-PLANT, OR RE-ESTABLISH VEGETATION PER ORIGINAL PLANS |
| OVERGROWN VEGETATION | MOW OR TRIM AS APPROPRIATE, BUT NOT LESS THAT THE DESIGN HEIGHT OF THE VEGETATION PER ORIGINAL PLANS. |
| EROSION DUE TO CONCENTRATED IRRIGATION FLOW | REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND ADJUST THE IRRIGATION SYSTEM |
| EROSION DUE TO CONCENTRATED STORM WATER RUNOFF FLOW | REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADDING STONE AT FLOW ENTRY POINTS OR MINOR RE-GRADING TO RESTORE PROPER DRAINAGE ACCORDING TO THE ORIGINAL PLAN. |
| STANDING WATER IN BIOFILTRATION AREAS | MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADJUSTING IRRIGATION SYSTEM, REMOVING OBSTRUCTION OF DEBRIS OR INVASIVE VEGETATION, OR CLEANING UNDERDRAINS |
| OBSTRUCTED INLET OR OUTLET STRUCTURE | CLEAR OBSTRUCTIONS |
| DAMAGE TO INLET OR OUTLET STRUCTURE | REPAIR OR REPLACE AS APPLICABLE |

| MAINTENANCE EQUIPMENT AND ACCESS |
|---|
| USE LANDSCAPE EQUIPMENT FOR MAINTENANCE; ACCESS BMP FROM PRIVATE ROAD SERVING THE SUBJECT PROPERTY OFF OF MELBA ROAD |

| INSPECTION FACILITATION |
|---|
| INSTALL A 1' x 1', 1.5' x 1.5', 2' x 2' AND TWO 3' X 3' OUTLET RISER STRUCTURE TO PROVIDE OBSERVATION ACCESS FOR INSPECTION OF MAINTENANCE THRESHOLDS WITHIN EACH BMP; MARKING TO BE PROVIDED ON BMP COMPONENTS TO DETERMINE HOW FULL BMP IS. |



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# APPENDIX 3a
## BMP MAINTENANCE THRESHOLDS

### BMP DESCRIPTION

| | |
|---|---|
| BIOFILTRATION (3,030 SF) | STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO: _____<br>O&M RESPONSIBLE PARTY DESIGNEE: TORREY PACIFIC CORPORATION |

### POST-CONSTRUCTION PERMANENT BMP OPERATION & MAINTENANCE PROCEDURE DETAILS

| MAINTENANCE INDICATORS | MAINTENANCE ACTION |
|---|---|
| ACCUMULATION OF SEDIMENT, LITTER, OR DEBRIS | REMOVE AND PROPERLY DISPOSE OF ACCUMULATED MATERIALS, WITHOUT DAMAGE TO THE VEGETATION |
| POOR VEGETATION ESTABLISHMENT | RE-SEED, RE-PLANT, OR RE-ESTABLISH VEGETATION PER ORIGINAL PLANS |
| OVERGROWN VEGETATION | MOW OR TRIM AS APPROPRIATE, BUT NOT LESS THAT THE DESIGN HEIGHT OF THE VEGETATION PER ORIGINAL PLANS. |
| EROSION DUE TO CONCENTRATED IRRIGATION FLOW | REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND ADJUST THE IRRIGATION SYSTEM |
| EROSION DUE TO CONCENTRATED STORM WATER RUNOFF FLOW | REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADDING STONE AT FLOW ENTRY POINTS OR MINOR RE-GRADING TO RESTORE PROPER DRAINAGE ACCORDING TO THE ORIGINAL PLAN. |
| STANDING WATER IN BIOFILTRATION AREAS | MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADJUSTING IRRIGATION SYSTEM, REMOVING OBSTRUCTION OF DEBRIS OR INVASIVE VEGETATION, OR CLEANING UNDERDRAINS |
| OBSTRUCTED INLET OR OUTLET STRUCTURE | CLEAR OBSTRUCTIONS |
| DAMAGE TO INLET OR OUTLET STRUCTURE | REPAIR OR REPLACE AS APPLICABLE |

| MAINTENANCE EQUIPMENT AND ACCESS |
|---|
| USE LANDSCAPE EQUIPMENT FOR MAINTENANCE; ACCESS BMP FROM LOT 19 WITH IN THE PROPOSED DEVELOPMENT |

| INSPECTION FACILITATION |
|---|
| INSTALL 2' X 2' AND 5-3' X 3' OUTLET RISER STRUCTURE TO PROVIDE OBSERVATION ACCESS FOR INSPECTION OF MAINTENANCE THRESHOLDS WITHIN EACH BMP; MARKING TO BE PROVIDED ON BMP COMPONENTS TO DETERMINE HOW FULL BMP IS. |



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# BF-1
# Biofiltration

**BMP MAINTENANCE FACT SHEET**
**FOR**
**STRUCTURAL BMP BF-1 BIOFILTRATION**

**Biofiltration** facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Biofiltration facilities have limited or no infiltration. They are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Typical biofiltration components include:

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

**Normal Expected Maintenance**

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

**Non-Standard Maintenance or BMP Failure**

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

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

**Other Special Considerations**

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

# BF-1
# Biofiltration

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

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

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

**References**

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San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet BF-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

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# BF-1
## Biofiltration

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

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

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

# BF-1
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| Date: | Inspector: | BMP ID No.: |
|---|---|---|
| Permit No.: | APN(s): | |

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

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

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## Biofiltration

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

# BF-1
## Biofiltration

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

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

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

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

# ATTACHMENT 4 - COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

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

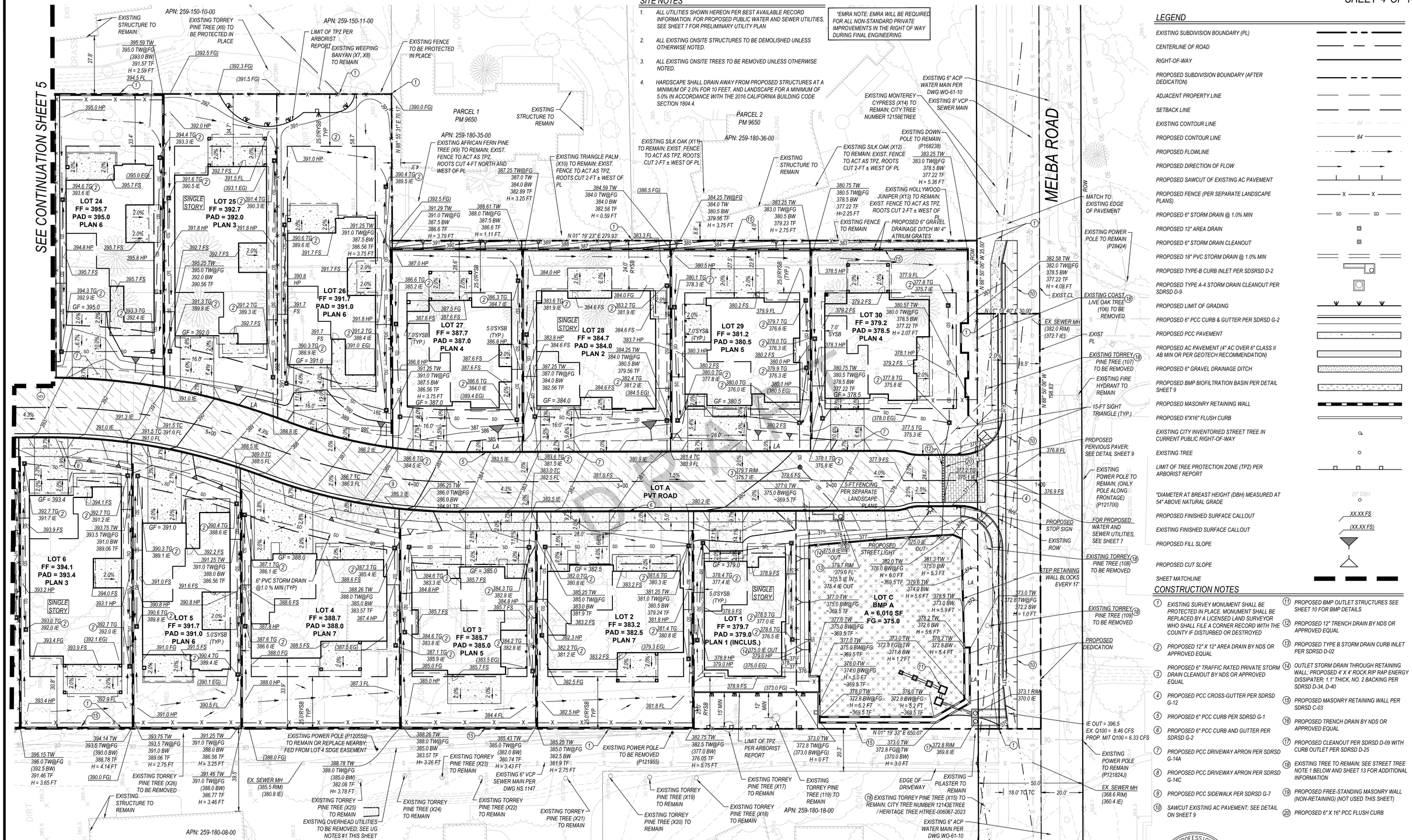
**The plans must identify:**

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

## SITE NOTES

1. ALL UTILITIES SHOWN HEREON PER BEST AVAILABLE RECORD INFORMATION. FOR PROPOSED PUBLIC WATER AND SEWER UTILITIES, SEE SHEET 7 FOR PRELIMINARY UTILITY PLAN
2. ALL EXISTING ONSITE STRUCTURES TO BE DEMOLISHED UNLESS OTHERWISE NOTED.
3. ALL EXISTING ONSITE TREES TO BE REMOVED UNLESS OTHERWISE NOTED.
4. HARDSCAPE SHALL DRAIN AWAY FROM PROPOSED STRUCTURES AT A MINIMUM OF 2.0% FOR 10 FEET, AND LANDSCAPE FOR A MINIMUM OF 5.0% IN ACCORDANCE WITH THE 2016 CALIFORNIA BUILDING CODE SECTION 1804.4.

*EMRA NOTE: EMRA WILL BE REQUIRED FOR ALL NON-STANDARD PRIVATE IMPROVEMENTS IN THE RIGHT OF WAY DURING FINAL ENGINEERING




## LEGEND

- EXISTING SUBDIVISION BOUNDARY (PL)
- CENTERLINE OF ROAD
- RIGHT-OF-WAY
- PROPOSED SUBDIVISION BOUNDARY (AFTER DEDICATION)
- ADJACENT PROPERTY LINE
- SETBACK LINE
- EXISTING CONTOUR LINE
- PROPOSED CONTOUR LINE
- PROPOSED FLOWLINE
- PROPOSED DIRECTION OF FLOW
- PROPOSED SAWCUT OF EXISTING AC PAVEMENT
- PROPOSED FENCE (PER SEPARATE LANDSCAPE PLANS)
- PROPOSED 6" STORM DRAIN @ 1.0% MIN
- PROPOSED 12" AREA DRAIN
- PROPOSED 6" STORM DRAIN CLEANOUT
- PROPOSED 18" PVC STORM DRAIN @ 1.0% MIN
- PROPOSED TYPE-B CURB INLET PER SDSRSD D-2
- PROPOSED TYPE A-4 STORM DRAIN CLEANOUT PER SDRSD D-9
- PROPOSED LIMIT OF GRADING
- PROPOSED 6" PCC CURB & GUTTER PER SDRSD G-2
- PROPOSED PCC PAVEMENT
- PROPOSED AC PAVEMENT (4" AC OVER 6" CLASS II AB MIN OR PER GEOTECH RECOMMENDATION)
- PROPOSED 6" GRAVEL DRAINAGE DITCH
- PROPOSED BMP BIOFILTRATION BASIN PER DETAIL SHEET 9
- PROPOSED MASONRY RETAINING WALL
- PROPOSED 6"X16" FLUSH CURB
- EXISTING CITY INVENTORIED STREET TREE IN CURRENT PUBLIC RIGHT-OF-WAY
- EXISTING TREE
- LIMIT OF TREE PROTECTION ZONE (TPZ) PER ARBORIST REPORT
- *DIAMETER AT BREAST HEIGHT (DBH) MEASURED AT 54" ABOVE NATURAL GRADE
- PROPOSED FINISHED SURFACE CALLOUT
- EXISTING FINISHED SURFACE CALLOUT
- PROPOSED FILL SLOPE
- PROPOSED CUT SLOPE
- SHEET MATCHLINE

## CONSTRUCTION NOTES

1. EXISTING SURVEY MONUMENT SHALL BE PROTECTED IN PLACE. MONUMENT SHALL BE REPLACED BY A LICENSED LAND SURVEYOR WHO SHALL FILE A CORNER RECORD WITH THE COUNTY IF DISTURBED OR DESTROYED
2. PROPOSED 12" X 12" AREA DRAIN BY NDS OR APPROVED EQUAL
3. PROPOSED 6" TRAFFIC RATED PRIVATE STORM DRAIN CLEANOUT BY NDS OR APPROVED EQUAL
4. PROPOSED PCC CROSS-GUTTER PER SDRSD G-12
5. PROPOSED 6" PCC CURB PER SDRSD G-1
6. PROPOSED 6" PCC CURB AND GUTTER PER SDRSD G-2
7. PROPOSED PCC DRIVEWAY APRON PER SDRSD G-14A
8. PROPOSED PCC DRIVEWAY APRON PER SDRSD G-14C
9. PROPOSED PCC SIDEWALK PER SDRSD G-7
10. SAWCUT EXISTING AC PAVEMENT; SEE DETAIL ON SHEET 9
11. PROPOSED BMP OUTLET STRUCTURES SEE SHEET 10 FOR BMP DETAILS
12. PROPOSED 12" TRENCH DRAIN BY NDS OR APPROVED EQUAL
13. PROPOSED TYPE B STORM DRAIN CURB INLET PER SDRSD D-02
14. OUTLET STORM DRAIN THROUGH RETAINING WALL; PROPOSED 4' X 4' ROCK RIP RAP ENERGY DISSIPATER; 1.1' THICK, NO. 2 BACKING PER SDRSD D-34, D-40
15. PROPOSED MASONRY RETAINING WALL PER SDRSD C-03
16. PROPOSED TRENCH DRAIN BY NDS OR APPROVED EQUAL
17. PROPOSED CLEANOUT PER SDRSD D-09 WITH CURB OUTLET PER SDRSD D-25
18. EXISTING TREE TO REMAIN; SEE STREET TREE NOTE 1 BELOW AND SHEET 13 FOR ADDITIONAL INFORMATION
19. PROPOSED FREE-STANDING MASONRY WALL (NON-RETAINING) (NOT USED THIS SHEET)
20. PROPOSED 6" X 16" PCC FLUSH CURB

## ABBREVIATIONS

*SEE SHEET 1 FOR ABBREVIATION LEGEND

## PROPOSED EASEMENTS / DEDICATIONS

*SEE SHEET 2 FOR PROPOSED EASEMENTS AND DEDICATIONS

## UG NOTES

1. EXISTING OVERHEAD UTILITIES TO BE REMOVED ALONG WESTERN PL BETWEEN POLE P121824J AND P120556 AND ON NORTHERN PL OF 1210 MELBA ROAD BETWEEN P120556 AND P120555. NEW UNDERGROUND SERVICE VIA PROJECT TO P120559 AND P120558 TO BE ADDED; OVERHEAD SERVICE FROM P120558 TO 1210 MELBA ROAD BARN TO REMAIN AND OVERHEAD SERVICE FROM P120559 TO 1210 MELBA RESIDENCE TO REMAIN.

## PLAN VIEW - PRELIMINARY GRADING PLAN

SCALE: 1" = 20' HORIZONTAL

## STREET TREE NOTE

1. SEE SHEET 13 FOR MELBA ROAD FRONTAGE OPTION "A". TREES 106, 107, 108, 109, X15 AND X16 TO BE REMOVED FROM MELBA ROAD FRONTAGE OPTION "A". REFER TO SEPARATE ARBORIST REPORT FOR RECOMMENDATIONS WITHIN THE TREE PROTECTION ZONE (TPZ) FOR THE EXISTING TREES ON PRIVATE PROPERTY AND ALONG PROPERTY BOUNDARY TO BE PROTECTED IN PLACE

GRAPHIC SCALE: 1" = 20'

REGISTERED PROFESSIONAL ENGINEER
TYLER G LAWSON
No. 80356
Exp. 12/31/24
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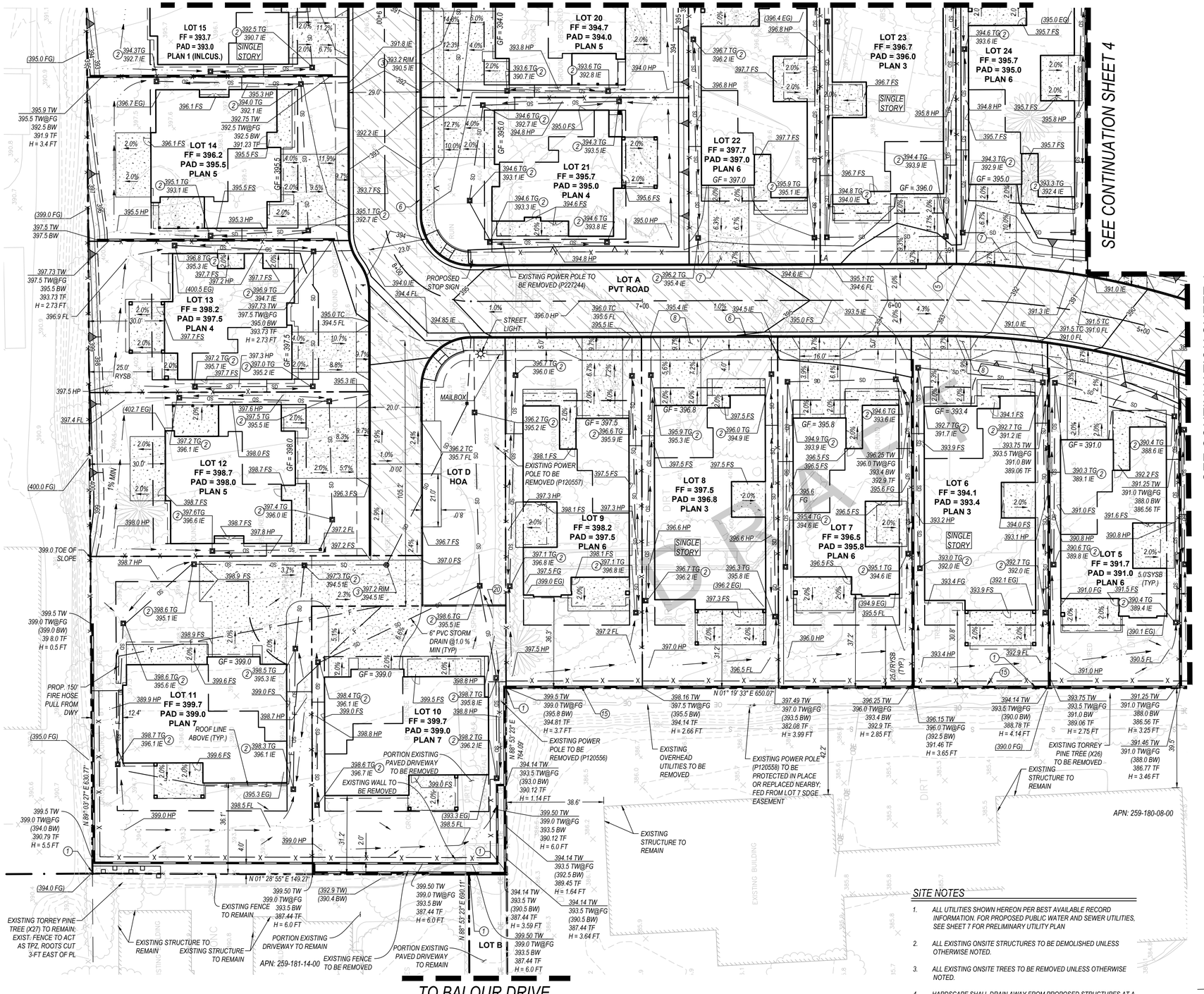
PLSAENGINEERING.COM

MATCHLINE: SEE SHEET 6




PLAN VIEW - PRELIMINARY GRADING PLAN

SCALE: 1" = 20' HORIZONTAL

## LEGEND

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- CENTERLINE OF ROAD
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- SETBACK LINE
- EXISTING CONTOUR LINE — 64
- PROPOSED CONTOUR LINE — 64
- PROPOSED FLOWLINE
- PROPOSED DIRECTION OF FLOW
- PROPOSED SAWCUT OF EXISTING AC PAVEMENT
- PROPOSED FENCE (PER SEPARATE LANDSCAPE PLANS) — X — X
- PROPOSED 6" STORM DRAIN @ 1.0% MIN — SD — SD
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## PROPOSED EASEMENTS / DEDICATIONS

*SEE SHEET 2 FOR PROPOSED EASEMENTS AND DEDICATIONS

0 20' 40' 60'

GRAPHIC SCALE: 1" = 20'

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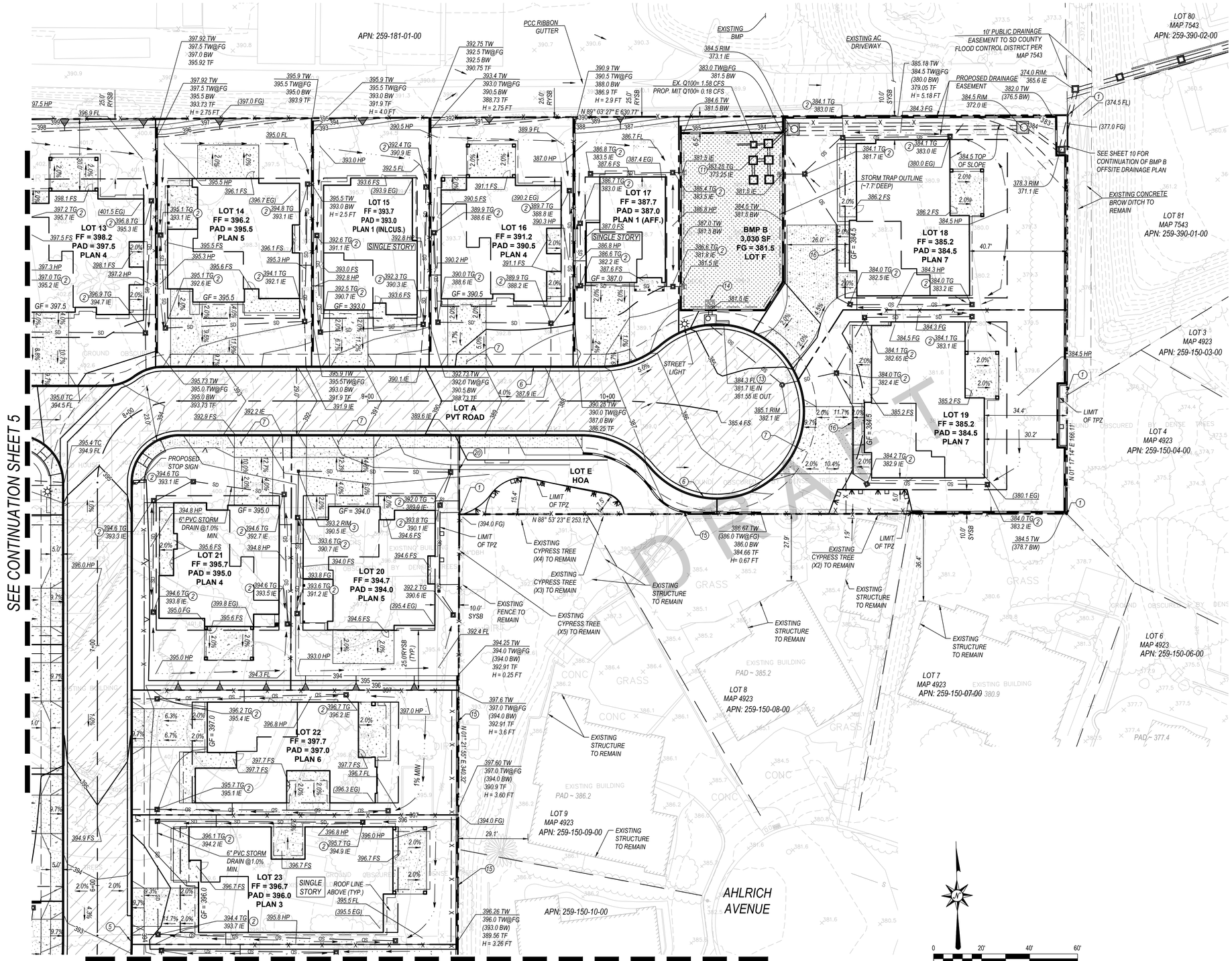


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20. PROPOSED 6" X 16" PCC FLUSH CURB

0 20' 40' 60'

GRAPHIC SCALE: 1" = 20'

## PROPOSED EASEMENTS / DEDICATIONS

*SEE SHEET 2 FOR PROPOSED EASEMENTS AND DEDICATIONS

## PLAN VIEW - PRELIMINARY GRADING PLAN

SCALE: 1" = 20' HORIZONTAL

REGISTERED PROFESSIONAL ENGINEER TYLER G LAWSON No. 80356 Exp. 12/31/24 CIVIL STATE OF CALIFORNIA

PLSA
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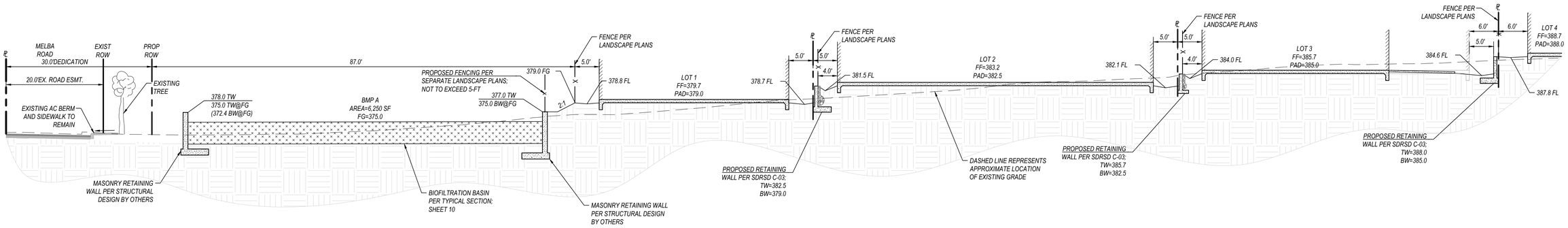
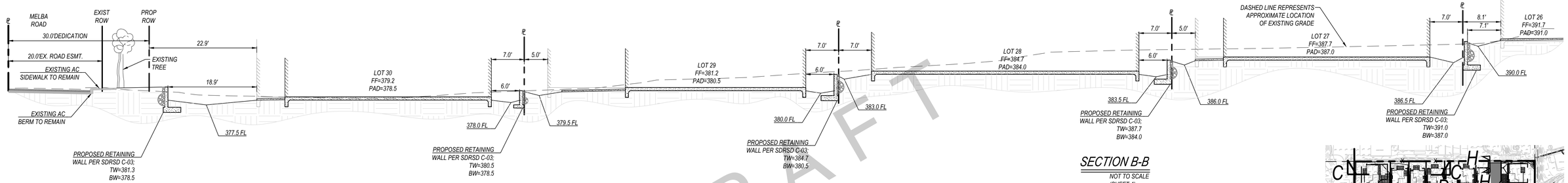


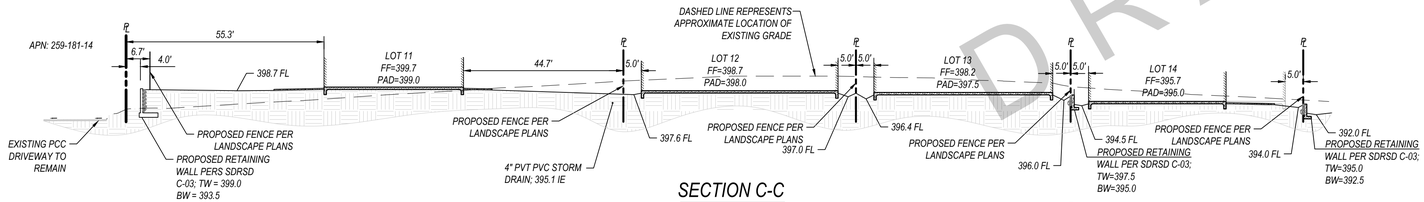

## SECTION A-A

NOT TO SCALE
(SHEET 4)



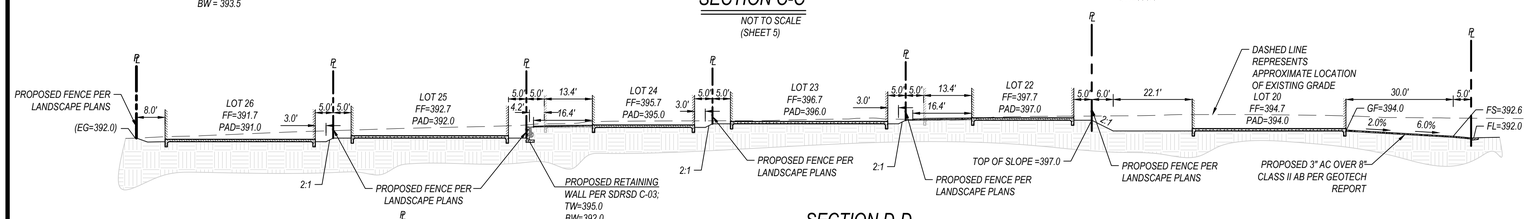

## SECTION B-B

NOT TO SCALE
(SHEET 4)



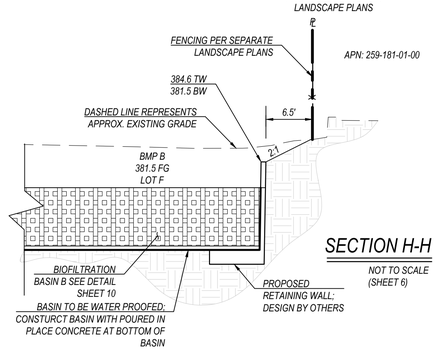

## SECTION C-C

NOT TO SCALE
(SHEET 5)



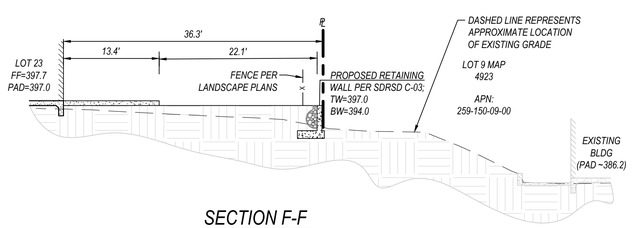

## SECTION D-D

NOT TO SCALE
(SHEET 4 & 5)



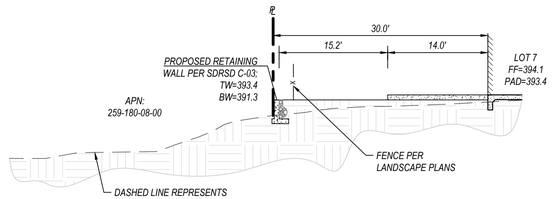

## SECTION H-H

NOT TO SCALE
(SHEET 6)



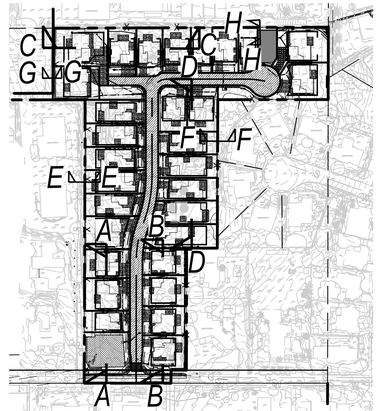

## SECTION F-F

NOT TO SCALE
(SHEET 6)



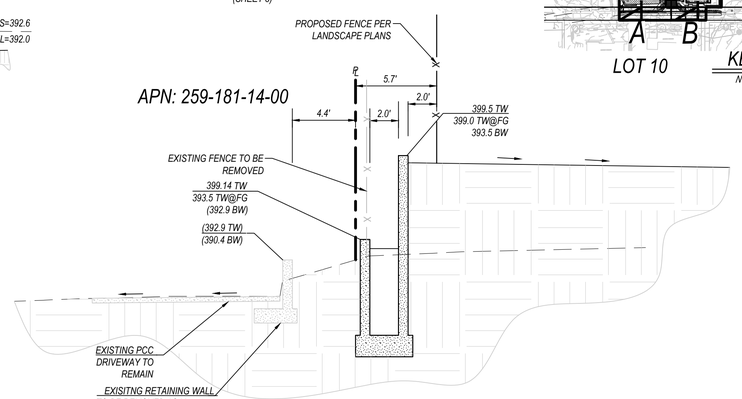

## SECTION E-E

NOT TO SCALE
(SHEET 5)




## KEY MAP

NOT TO SCALE




## SECTION G-G

NOT TO SCALE
(SHEET 6)

NOTE: BUILDING HEIGHT TO BE MEASURED FROM THE LOWER OF EXISTING OR PROPOSED FINISHED GRADES

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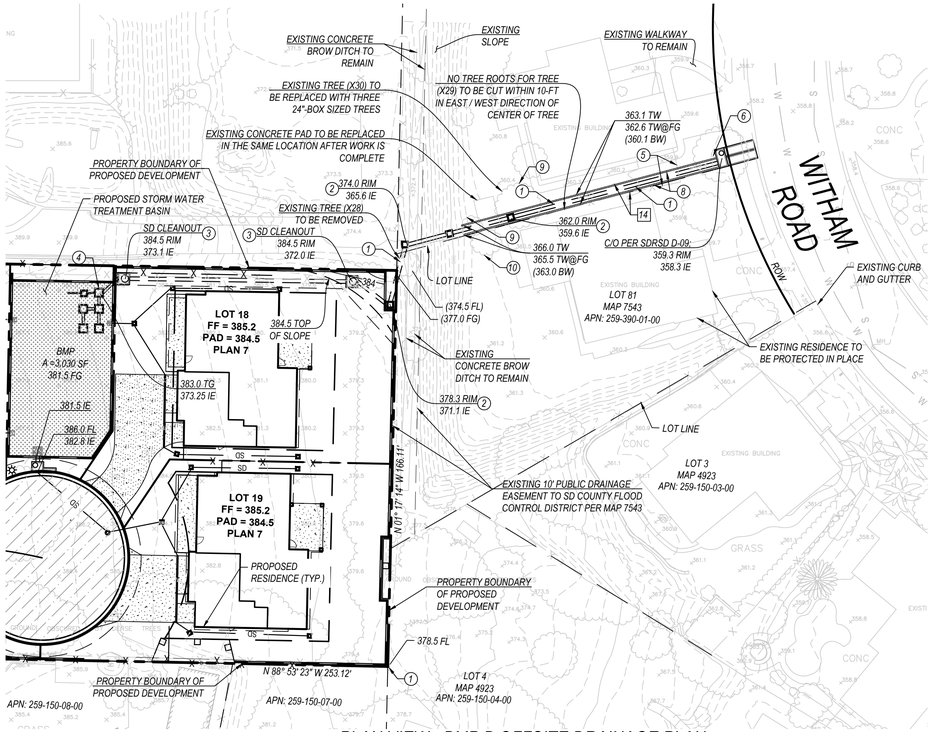



## PLAN VIEW - BMP B OFFSITE DRAINAGE PLAN

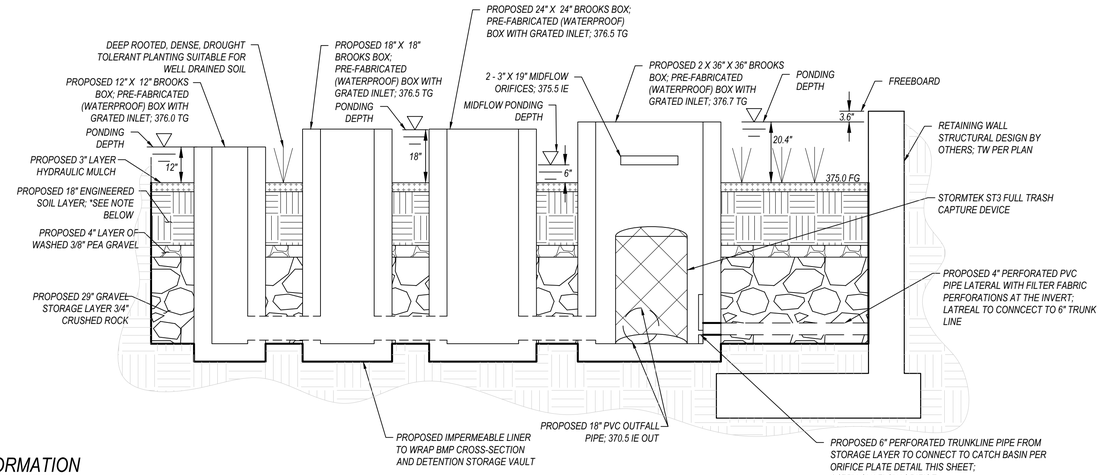
SCALE: 1" = 30' HORIZONTAL

## PROPOSED EASEMENT INFORMATION

14 PROPOSED DRAINAGE EASEMENT (ON LOT 80) FOR THE BENEFIT OF THE PROPOSED DEVELOPMENT

## CONSTRUCTION NOTES

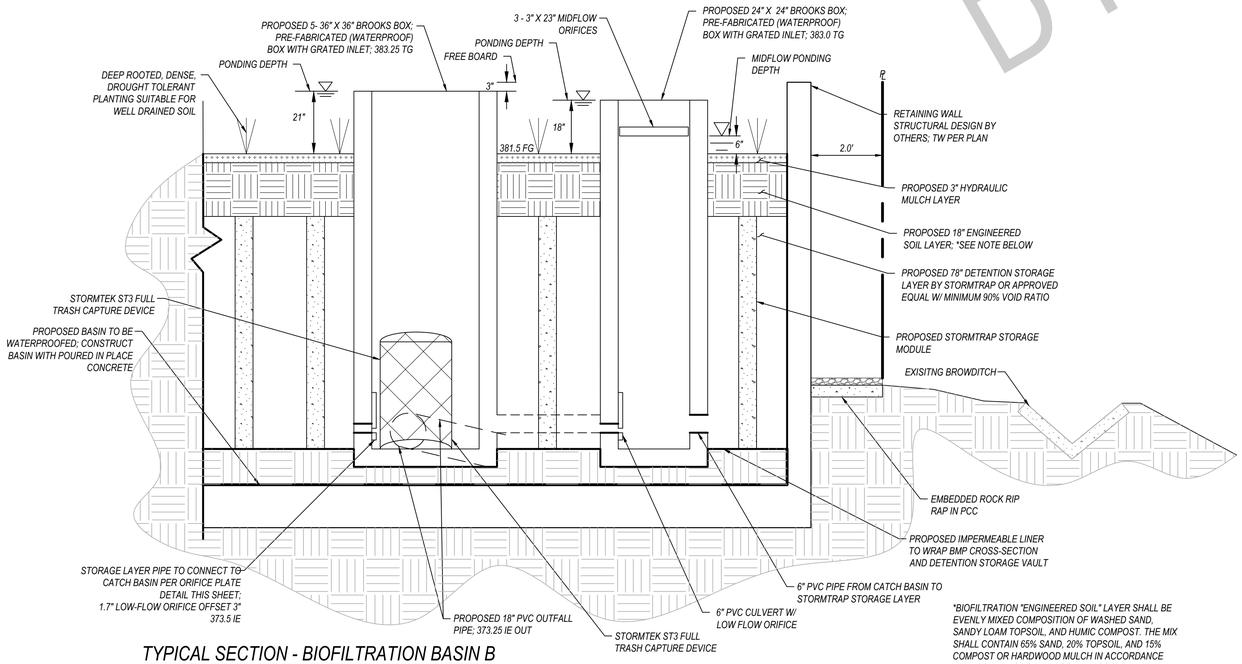
1. PROPOSED 18" HDPE STORM DRAIN OUTLET PIPE FROM BMP; WATER TIGHT JOINTS
2. PROPOSED 24" X 24" BROOKS BOX CLEANOUT W/ INTERLOCKING LID
3. PROPOSED TYPE A CLEANOUT PER SDRSD D-9
4. PROPOSED BMP STRUCTURES SEE DETAIL THIS SHEET
5. EXISTING FENCE TO BE BE REMOVED AND REPLACED AS NECESSAY
6. EXISTING TREE PREVIOUSLY REMOVED
7. CONNECT 18" HDPE STORM DRAIN TO SDRSD D-09 CLEANOUT
8. PROPOSED WOODEN SURFACE PLANTER BOX
9. EXISITNG TREE TO BE REMOVED PER SEPARATE AGREEMENT WITH OWNER
10. EXISTING TREE (X29) TO BE PROTECTED IN PLACE; NO TREE ROOTS TO BE CUT WITHIN 15-FT OF TRUNK OF TREE




## TYPICAL SECTION - BIOFILTRATION BASIN A

NOT TO SCALE

*"BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE EVENLY MIXED COMPOSITION OF WASHED SAND, SANDY LOAM TOPSOIL, AND HUMIC COMPOST. THE MIX SHALL CONTAIN 65% SAND, 20% TOPSOIL, AND 15% COMPOST OR HARDWOOD MULCH IN ACCORDANCE WITH COUNTY OF SAN DIEGO LID BIOSWALE MEDIA




## TYPICAL SECTION - BIOFILTRATION BASIN B

NOT TO SCALE

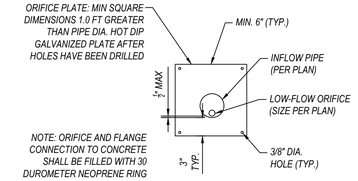
*"BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE EVENLY MIXED COMPOSITION OF WASHED SAND, SANDY LOAM TOPSOIL, AND HUMIC COMPOST. THE MIX SHALL CONTAIN 65% SAND, 20% TOPSOIL, AND 15% COMPOST OR HARDWOOD MULCH IN ACCORDANCE WITH COUNTY OF SAN DIEGO LID BIOSWALE MEDIA




## DETAIL- BIOFILTRATION BASIN A OUTLET STRUCTURES

SCALE: 1" = 10'

GRAPHIC SCALE 1" = 10'
10 0 10 20 30




## TYPICAL DETAIL - FLOW CONTROL ORIFICE PLATE

NOT TO SCALE

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