Appendix F3
SWQMP

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

Fenton Parkway Bridge

PRJ#RD3200

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

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

Engineer of Work:

Chelisa Pack, PE, RCE 71026

Provide Wet Signature and Stamp Above Line

Prepared For:

Robert Schultz

5500 Campanile Drive

San Diego, CA 92182

619-594-6017

Prepared By:

PROJECT DESIGN CONSULTANTS
a Bowman company

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471

Project Design Consultants

701 B Street, Suite 800

San Diego, CA, 92101

619-235-6471

Date:

6/19/2024

Approved by: City of San Diego Date

The City of SAN DIEGO

Written by: J. Maynard
Job No. 4497
P:\4497\Engr\Reports\SWQMP-Prelim\4497_SWQMP

Project Name: Fenton Parkway Bridge

Table of Contents

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

Acronyms

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

Certification Page

Project Name:
Permit Application

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

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

Engineer of Work's Signature

71026 — PE#

06/30/2025 — Expiration Date

Chelisa Pack

Print Name

Project Design Consultants

Company

Date

Engineer's Stamp

Project Name: Fenton Parkway Bridge

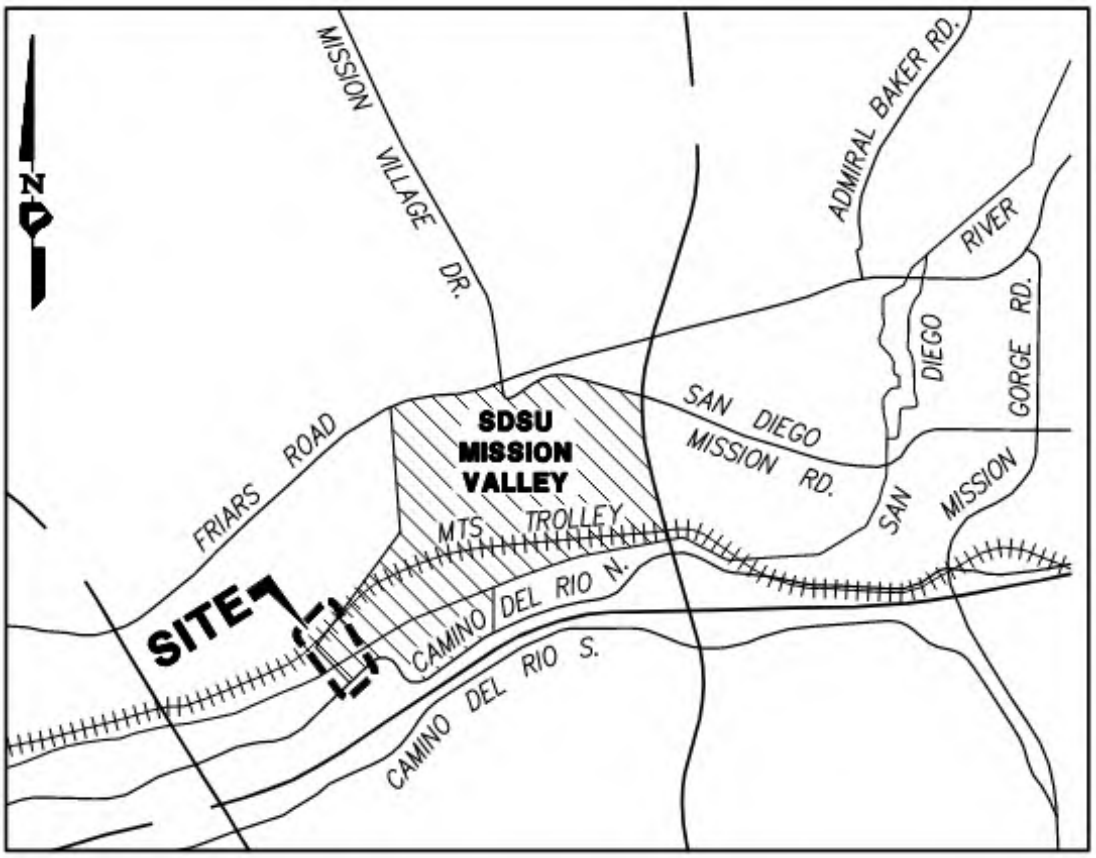
Submittal Record

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

Submittal Number	Date	Project Status	Changes
1	5/23/2023	☑ Preliminary Design/Planning/CEQA ☐ Final Design	**Initial Submittal** FOR 30% DESIGN
2	6/19/2024	☑ Preliminary Design/Planning/CEQA ☐ Final Design	
3		☐ Preliminary Design/Planning/CEQA ☐ Final Design	
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

Project Vicinity Map

Project Name: Fenton Parkway Bridge
Permit Application PRJ#



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

Attach DS-560 form.

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Development Services

THE CITY OF SAN DIEGO

FORM
DS-560
September 2021

Stormwater Requirements Applicability Checklist

Project Address: FENTON PARKWAY, SAN DIEGO, CA 92108 **Project Number:**

SECTION 1: Construction Stormwater Best Management Practices (BMP) Requirements

All construction sites are required to implement construction BMPs per the performance standards in the Stormwater Standards Manual. Some sites are also required to obtain coverage under the State Construction General Permit (CGP)[1], administered by the California State Water Resources Control Board.

For all projects, complete Part A - If the project is required to submit a Stormwater Pollution Prevention Plan (SWPPP) or Water Pollution Control Plan (WPCP), continue to Part B.

PART A – Determine Construction Phase Stormwater Requirements

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

   ◉ Yes, SWPPP is required; skip questions 2-4. ○ No; proceed to the next question.

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

   ○ Yes, WPCP is required; skip questions 3-4. ○ No; proceed to the next question.

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

   ○ Yes, WPCP is required; skip question 4. ○ No; proceed to the next question.

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

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

   ☐ Yes, no document is required.

Check one of the boxes below and continue to Part B

○ **If you checked "Yes" for question 1**, an SWPPP is REQUIRED – **continue to Part B**

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

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

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

CLEAR FORM

PART B – Determine Construction Site Priority

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

Complete Part B and continue to Section 2

☐ **1. ASBS**

A. Projects located in the ASBS watershed.

☑ **2. High Priority**

A. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and are not located in the ASBS watershed.
B. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and are not located in the ASBS watershed.

☐ **3. Medium Priority**

A. Projects that are not located in an ASBS watershed or designated as a High priority site.
B. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and are not located in an ASBS watershed.
C. WPCP projects (>5,000 square feet of ground disturbance) located within the Los Peñasquitos watershed management area.

☐ **4. Low Priority**

A. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

Section 2: Construction Stormwater BMP Requirements

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

PART C – Determine if Not Subject to Permanent Stormwater Requirements

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

- **If "yes" is checked for any number in Part C**: Proceed to Part F and check "Not Subject to Permanent Stormwater BMP Requirements."
- **If "no" is checked for all the numbers in Part C:** Continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact stormwater?

   ○ Yes ◉ No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?

   ○ Yes ◉ No

3. Does the project fall under routine maintenance? Examples include but are not limited to roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay and pothole repair).

   ○ Yes ◉ No

CLEAR FORM

PART D – PDP Exempt Requirements

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

- **If "yes" is checked for any questions in Part D**, continue to Part F and check the box labeled "PDP Exempt."
- **If "no" is checked for all questions in Part D**, continue to Part E.

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

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

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

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

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

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

- **If "yes" is checked for any number in Part E**, continue to Part F and check the box labeled "Priority Development Project."
- **If "no" is checked for every number in Part E**, continue to Part F and check the box labeled "Standard Development Project."

1. **New development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ◉ Yes ○ No

2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ◉ Yes ○ No

3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and beverages for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) 5812), and where the land development creates and/or replaces 5,000 square feet or more of impervious surface. ○ Yes ◉ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ○ Yes ◉ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ○ Yes ◉ No

6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ◉ Yes ○ No

CLEAR FORM

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

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

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

10. **Other Pollutant Generating Project.** These projects are not covered in any of the categories above but involve the disturbance of one or more acres of land and are expected to generate post-construction phase pollutants, including fertilizers and pesticides. This category does not include projects creating less than 5,000 square feet of impervious area and projects containing landscaping without a requirement for the regular use of fertilizers and pesticides (such as a slope stabilization project using native plants). Impervious area calculations need not include linear pathways for infrequent vehicle use, such as emergency maintenance access or bicycle and pedestrian paths if the linear pathways are built with pervious surfaces or if runoff from the pathway sheet flows to adjacent pervious areas. ○ Yes ◉ No

PART F – Select the appropriate category based on the outcomes of Part C through Part E

1. The project is **NOT SUBJECT TO PERMANENT STORMWATER REQUIREMENTS** ○ Yes ○ No

2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Stormwater Standards Manual for guidance. ○ Yes ○ No

3. The Project is **PDP EXEMPT**. Site design and source control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance. ○ Yes ○ No

4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control and structural pollutant control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance on determining if the project requires hydromodification plan management. ◉ Yes ○ No

Chelisa Pack (Agent)	Associate
Name of Owner or Agent	**Title**
Chelisa A. Pack	06/18/2024
Signature	**Date**

CLEAR FORM

Applicability of Permanent, Post-Construction Storm Water BMP Requirements		Form I-1
Project Identification		
Project Name: Fenton Parkway Bridge		
Permit Application Number: PRJ # XXXXXXXX		Date: 5/23/2023
Determination of Requirements		
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.		
Step	**Answer**	**Progression**
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Project Name: Fenton Parkway Bridge

Form I-1 Page 2 of 2		
Step	**Answer**	**Progression**
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to **Step 4**.
	☑ No	BMP Design Manual PDP requirements apply. Go to **Step 4**.
Discussion / justification of prior lawful approval, and identify requirements (not required if prior lawful approval does not apply):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to **Step 5**.
	☑ No	**Stop**. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do not apply: The project has a direct discharge to the San Diego River, therefore, it is exempt from hydromodification.		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). **Stop**.
	☑ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. **Stop**.
Discussion / justification if protection of critical coarse sediment yield areas does not apply:		

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody.
Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

LEGEND

DRAINAGE MANAGEMENT AREAS PER PROJECT TRIBUTARY TO SAN DIEGO RIVER

BMP 1

EXISTING GRATE INLET PER DWG 30033-D (DRAINAGE CONVEYED SOUTHWESTERLY)

EXISTING 18" PVC PER DWG 30033-7-D (DRAINAGE CONVEYED SOUTHWESTERLY TOWARDS FENTON PKWY STORM DRAIN)

EXISTING MODULAR WETLAND CURB TYPE UNITS TYING INTO EXISTING INLETS ON FENTON PARKWAY

FENTON PARKWAY

MISSION VALLEY LIBRARY

RIVER PARK ROAD

EXISTING REINFORCED CONCRETE BOX CULVERT PER DWG 29247-D (TRANSITIONS INTO 96" RCP BEFORE OUTFALL)

EXISTING FEMA 100-YR FLOODPLAIN

EXISTING 96" RCP PER DWG 29247-D

PROPOSED 100-YR FLOODPLAIN PER CLOMR-2 CASE# 20-09-2222R

EXISTING MODULAR WETLAND VAULT TYPE UNIT TYING INTO PROPOSED INLET ON FENTON PARKWAY WITH LATERAL CONNECTION TO PROPOSED 96" RCP STORM DRAIN OUTFALL

PROPOSED EXTENSION 96" RCP SD

PROPOSED BIOFILTRATION BASIN TYING INTO EXISTING 96" RCP STORM DRAIN BEFORE OUTFALL

EXISTING 2 TON RIPRAP PER DWG 29247-D TO BE REUSED

OUTFALL OF PROPOSED 96" RCP SD IE = 43.45

EXISTING 2 TON RIPRAP LINED CHANNEL PER DWG 29247-D

END OF RIPRAP LINED CHANNEL

OUTFALL

10 YR WSE = 48.06 PER CHANGE CONSULTANTS HYDRAULIC ANALYSIS PER STATION 42583 OF THE SAN DIEGO RIVER FOR THE SDSU MISSION VALLEY PROJECT

SAN DIEGO RIVER (HYDROMODIFICATION EXEMPT)

EXISTING FLOODWAY PER CURRENT FEMA PANEL

SAN DIEGO RIVER (HYDROMODIFICATION EXEMPT)

SAN DIEGO RIVER (HYDROMODIFICATION EXEMPT)

42873
52.07

OUTFALL

OUTFALL OF PROPOSED 54" RCP SD IE = 40.00

PROPOSED REALIGNMENT OF 54" RCP BEFORE OUTFALL

RIVER PARK ROAD

PROPOSED MODULAR WETLAND SYSTEM TYING INTO EXISTING 54" RCP STORM DRAIN BEFORE OUTFALL

42583
48.06

MISSION CITY PARKWAY

N

SCALE:	1"=60'
JOB #:	4497.00
CREATED:	5/23/2023

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

SDSU MISSION VALLEY - FENTON PKWY BRIDGE

HYDROMODIFICATION EXEMPT EXHIBIT
PROPOSED CONDITIONS

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Project Name: Fenton Parkway Bridge

Site Information Checklist For PDPs	Form I-3B

Project Summary Information	
Project Name	Fenton Parkway Bridge
Project Address	
Assessor's Parcel Number(s) (APN(s))	
Permit Application Number	PRJ# XXXXXXX
Project Watershed	Select One: ☐ San Dieguito River ☐ Penasquitos ☐ Mission Bay ☑ San Diego River ☐ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Mission San Diego 907.11
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	0.88 Acres (38,253 Square Feet)
Area to be disturbed by the project (Project Footprint)	2.09 Acres (90,823 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	0.95 Acres (41,363 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	1.14 Acres (49,460 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	51 %

NOTE: THIS PROJECT PROPOSES A NEW BRIDGE OVER THE SAN DIEGO RIVER, THEREFORE, THE DISTURBED AREA INCLUDES BOTH THE RIVER DISTURBED AREA AND THE ADDITION OF THE BRIDGE. THUS, THERE IS AN OVERLAPPING DISTURBED AREA AT THE ABUTMENTS.

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

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

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

Description / Additional Information:

Under existing conditions the Fenton Parkway Bridge is composed of the existing streets Fenton Parkway and Mission City Parkway as well as a riparian CDFW jurisdictional streambed that eventually converges with the San Diego River.

Existing Land Cover Includes (select all that apply):

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

Description / Additional Information:

Existing land includes the paved roads of Fenton Parkway and Mission City Parkway as well as a riprap lined streambed.

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

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

Approximate Depth to Groundwater:

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

The geotechnical engineer has estimated that the groundwater elevation is around 44 MSL.

Existing Natural Hydrologic Features (select all that apply):

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

Description / Additional Information:

The project drainage outlets into the San Diego River.

Form I-3B Page 3 of 11

Description of Existing Site Topography and Drainage

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

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

Descriptions/Additional Information

1.The existing drainage conveyance is mostly natural.

2.There is run-on from the adjacent Mission Valley Library and IKEA loading dock entry road (Northside Drive). Mission City Parkway runon that collects into a grate at the intersection of Camino Del Rio North and Mission City Parkway. Water then enters a 54" RCP system that discharges into the San Diego River.

3.Runon from Fenton Parkway is as follows:
Within Fenton Parkway, there are two storm drain laterals that connect to the RCB, an 18" RCP and a 36" RCP. Each lateral conveys drainage from a Type A-1 sag inlet. Both laterals have drainage connections that connect to the back of the inlets. In addition to the street drainage, the 18" RCP lateral conveys drainage from the Del Rio apartment complex and the 36" RCP conveys drainage from the Mission Valley Library and the IKEA loading dock entryway (Northside Drive). Furthermore, two modular wetland units collect runon at the intersection of River Park Road and half of Fenton Parkway which connect to the existing 96” RCP storm drain. Fenton Parkway is a crowned road, thus, at the intersection, the other half of the road drains down River Park Road to an existing Biofitration Basin.
Runon from Mission City Parkway is as follows:
There is an existing high point from the existing bridge south of Mission City Parkway. Mission City Parkway is crowned. One side of the road drains to an existing curb inlet that connects into an existing 54” RCP storm drain. The other side of the crowned street flows into the intersection of Camino Del Rio North and Mission City Parkway. Water then enters a 54" RCP system that discharges into the San Diego River.

4. There are two discharge locations for project drainage, which include the RCP outfall at the riprap lined streambed on the Fenton Parkway side of the river, north, and the 54" RCP storm drain on the Mission City Parkway side of the river, south. For the purposes of this project, the study was limited to analyze runoff into the drainage infrastructure within the disturbance limits of the Fenton Parkway Bridge improvements. Refer to the project drainage study (Attachment 5) for additional information.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The project consists of the creation of a bridge to connect Fenton Parkway and Mission City Parkway over the San Diego River. Additional construction activities include demolition, street improvements, and the protection, relocation, and/or adjustment of associated utilities/improvements to the proposed grades of the street/sidewalks. The Fenton Parkway storm drain conveying project flows and drainage from developments upstream be extended further into the riparian streambed. Mission City Parkway's main storm drain, a 54" RCP storm drain, will be relocated to outlet on the downstream of the proposed bridge abutment.

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

The impervious features of the project consist of the sidewalks, curb/gutter, maintenance access to the proposed basin and the bridge itself.

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

The proposed pervious features include the proposed biofiltration basin and graded slopes.

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

The proposed abutment grading will alter the grading within the edge of the river channel.

Form I-3B Page 5 of 11

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

☑ Yes

☐ No

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

Description / Additional Information:

Under proposed conditions, the existing 96" RCP storm drain discharging drainage from developments upstream on Fenton Parkway will remain, but the outfall headwall will be removed and the pipe extended further into the existing riparian streambed.

Additionally, the existing 54" RCP storm drain on Mission City Parkway that discharges drainage from upstream developments will be relocated to be south of the proposed bridge.

Both storm drains discharge to the San Diego River.

Form I-3B Page 6 of 11

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

- [x] Onsite storm drain inlets
- [ ] Interior floor drains and elevator shaft sump pumps
- [ ] Interior parking garages
- [ ] Need for future indoor & structural pest control
- [x] Landscape/outdoor pesticide use
- [ ] Pools, spas, ponds, decorative fountains, and other water features
- [ ] Food service
- [ ] Refuse areas
- [ ] Industrial processes
- [ ] Outdoor storage of equipment or materials
- [ ] Vehicle and equipment cleaning
- [ ] Vehicle/equipment repair and maintenance
- [ ] Fuel dispensing areas
- [ ] Loading docks
- [ ] Fire sprinkler test water
- [ ] Miscellaneous drain or wash water
- [x] Plazas, sidewalks, and parking lots

Description/Additional Information:

Form I-3B Page 7 of 11

Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

The project site runoff will be directed to two existing main storm drains a 96" RCP and 54" RCP storm drain. Water will be collected in curb inlets, cleaned at various modular wetland units and a proposed biofiltration basin, before connecting into these main lines.

The drainage will then outfall into a riprap lined streambed which converge with the San Diego River.

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations

Per the Basin plan, the San Diego River Watershed (inland surface waters) has the following beneficial uses: MUN, AGR, IND, PROC, REC 1, REC 2, WARM, COLD and WILD.

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations

This is not applicable to the project. There are two ASBS in San Diego, the La Jolla ASBS and the Scripps ASBS. Key pollution threats include urban, road, and stormwater runoff. The Project does not drain to any of these immediate ASBS.

Provide distance from project outfall location to impaired or sensitive receiving waters

The project's receiving water is the San Diego River.

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

Portions of the San Diego River are included in the City's environmentally sensitive lands due to the FEMA floodplain areas onsite.

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

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

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
San Diego River (Lower)	Bacteria, low dissolved oxygen, manganese, nitrogen, phosphorus, total dissolved solids, and toxicity	Nutrients, Oxygen Demanding Substances, Bacteria & Viruses

Identification of Project Site Pollutants*

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

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

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

*TABLE NOT APPLICABLE FOR MODULAR WETLAND UNITS, AS THEY ARE CATEGORIZED AS PROPRIETARY BIOFILTRATION BMPS, NOT FLOW-THRU TREATMENT BMPS.

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☐ Yes, hydromodification management flow control structural BMPs required.

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

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

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

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

Under the municipal permit, the Project is exempt from meeting the hydromodification management requirements because it discharges to an underground storm drain system that eventually empties directly to the San Diego River. This exemption is included in the Final WQIP for the watershed. Refer to the HMP Exemption Exhibit that shows the project's discharge to the San Diego River.

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

Critical Coarse Sediment Yield Areas*
*This Section only required if hydromodification management requirements apply

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

☐ Yes

☑ No

Discussion / Additional Information:

(N/A for this project)

Form I-3B Page 10 of 11
Flow Control for Post-Project Runoff*   ***This Section only required if hydromodification management requirements apply**
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.   (N/A for this project)
Has a geomorphic assessment been performed for the receiving channel(s)?   ☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold)   ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ Yes, the result is the low flow threshold is $0.5Q_2$ If a geomorphic assessment has been performed, provide title, date, and preparer: (N/A for this project)
Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11

Other Site Requirements and Constraints

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

Optional Additional Information or Continuation of Previous Sections As Needed

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

Source Control BMP Checklist for PDPs	Form I-4B

Source Control BMPs

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

Answer each category below pursuant to the following.

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

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

Project Name: Fenton Parkway Bridge

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

Project Name: Fenton Parkway Bridge

Site Design BMP Checklist for PDPs	Form I-5B

Site Design BMPs

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

Answer each category below pursuant to the following.

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

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

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.1 not implemented: The natural drainage pathways and hydrologic features will be maintained. The bridge is over the San Diego River and will minimize impacts to natural drainage pathways.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☑ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.2 not implemented: The existing natural areas are the San Diego River (riverbed/vegetation/trees). For the addition of the bridge, the area under the bridge will conserve the existing natural area because it is above ground. However, at the storm drain outfalls, additional rip rap will be added. There is already some existing rip rap at these locations but additional will be added to aid with potential erosion. Thus, some natural vegetation will not be conserved.			

Project Name: Fenton Parkway Bridge

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☐ No	☑ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☐ No	☑ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Project Name: Fenton Parkway Bridge

Form I-5B Page 3 of 4			
Site Design Requirement	**Applied?**		
4.3.6 Runoff Collection	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvest and Use Precipitation	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.8 not implemented:			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

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

Summary of PDP Structural BMPs	Form I-6

PDP Structural BMPs

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

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

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

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

This SWQMP was prepared for the Fenton Parkway Bridge. This bridge will connect Fenton Parkway with Mission City Parkway. The project is exempt from hydromodification requirements due to the direct discharge to the San Diego River, an exempt water body.

The project was determined to be in a no-infiltration condition by the geotechnical engineer. This SWQMP covers the BMPs that will be constructed per the Fenton Parkway Bridge project. Refer to the DMA/BMP site map in Attachment 1A.
Improvements from the bridge fall within DMAs 1-5 and are classified as follows:
DMA 1 will be treated by BMP #1 (a proposed biofiltration basin). DMA 2 will be a treatment swap area. The swap DMA is labeled DMA-2-Offiste. This area will be treated by a proposed modular wetland system on Mission City Parkway. A treatment swap approach was proposed due to the challenging grading limitations near the south bridge abutment. The existing superelevated cross slope of Camino Del Rio North at the south side of the bridge made it difficult to collect and treat the small amount of bridge runoff draining south towards the Camino Del Rio North intersection. For this reason, the modular wetland unit was added on Mission City Parkway to treat an equivalent or larger amount of impervious surface.

DMA 3, located on Fenton Parkway will be treated by an existing modular wetland unit (per PRJ-104051, DWG#100044-D). DMA 4, located on Fenton Parkway as well, will be treated by BMP # 1 per the SDSU Mission Valley project (per SDSU Mission Valley grading plans permitted by SDSU). The sizing of this biofiltration basin BMP for this DMA is documented under the SDSU Mission Valley SWQMP (under a separate cover and approved by the project owner, SDSU).
DMA 5 is proposed as self-mitigating.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of

(Continued from page 1)

The biofiltration basin includes 18-inches of engineered sandy loam growing media on top of a minimum depth of 12 inches of gravel. In addition to the two main layers for biofiltration, a barrier/filter layer underneath the soil media (and above the gravel layer) is also included. The filter layer includes a 3-inch layer of washed sand on top of a 3-inch layer of #8 choking stone. For the BMP sizing calculations included in Attachment 1e, the 3-inches of washed sand and 3-inches mulch was added to the biofiltration media depth, and the #8 choking stone was added to the gravel depth.

The BMP design for the project complies with both pollutant control and volume retention requirements. The volume retention is analyzed for the entire site on a composite basis and will be met with the large biofiltration basin.

Project Name:

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 1	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☑ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	City of San Diego
Who will maintain this BMP into perpetuity?	City of San Diego
What is the funding mechanism for maintenance?	City of San Diego

Project Name:

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

Project Name:

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 2	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ ~~Biofiltration (BF-1)~~ (BF-3, Proprietary Biofiltration) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☑ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Chelisa Pack Project Design Consultants 619-235-6471
Who will be the final owner of this BMP?	City of San Diego
Who will maintain this BMP into perpetuity?	City of San Diego
What is the funding mechanism for maintenance?	City of San Diego

Project Name:

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

Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

Project Name: Fenton Parkway Bridge

Indicate which Items are Included:

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

ATTACHMENT 1A

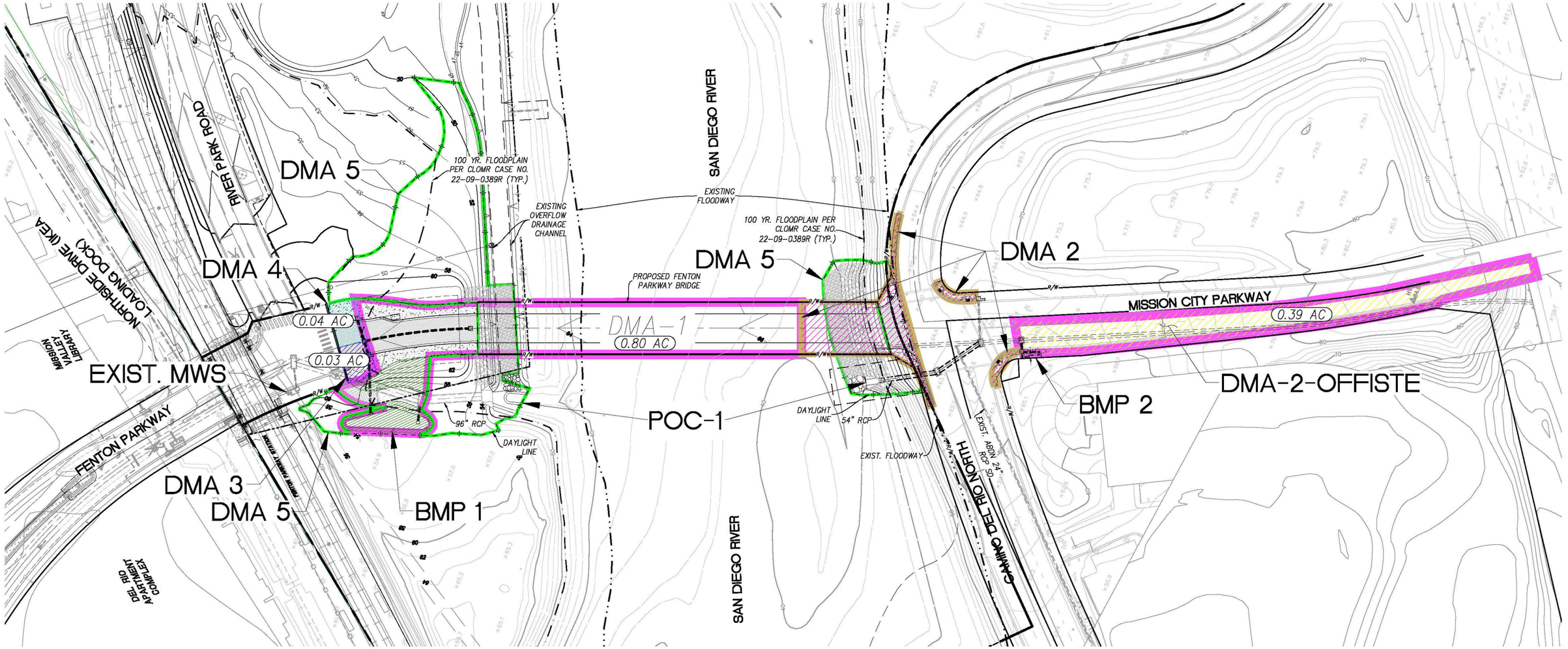
DMA EXHIBIT

Project Name: Fenton Parkway Bridge

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

The DMA Exhibit must identify:

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



N

50 25 0 50 100 150

SCALE: 1"=50'

BMP NOTES:

1. THE PROJECT WAS DETERMINED BY THE GEOTECHNICAL CONSULTANT AS A NO INFILTRATION CONDITION SITE.
2. UNDERLYING SOILS DEFINED AS RIVERWASH PER WEB SOIL SURVEY, WHICH IS ASSIGNED HYDROLOGIC SOIL GROUP NRCS SOIL TYPE D.
3. DESIGN GROUNDWATER ELEVATION IS ESTIMATED TO BE APPROXIMATELY ELEVATION 44' NGVD 29.
4. THE EXISTING NATURAL HYDROLOGIC FEATURES ARE THE SAN DIEGO RIVER
5. THIS PROJECT IS EXEMPT FROM HYDROMODIFICATION REQUIREMENTS, AND THEREFORE CRITICAL COARSE SEDIMENT YIELD AREAS DO NOT NEED TO BE IDENTIFIED. REFER TO THE SWQMP'S FORM I-3B.
6. SOURCE CONTROL BMPs:
   - 4.2.1: PREVENTION OF ILLICIT DISCHARGES IN THE MS4
   - 4.2.2: STORM DRAIN STENCILING OR SIGNAGE
   - 4.2.6: ADDITIONAL BMPs BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
7. VOLUME RETENTION REQUIREMENTS ARE MET WITH THE PROPOSED BIOFILTRATION BASIN. REFER TO WORKSHEETS AND SUPPORTING CALCULATIONS IN ATTACHMENT 1E OF THE SWQMP.

DMA SUMMARY TABLE:

DMA	AREA	ROUTES TO	BMP TYPE
1	0.8	BMP-1, POC-1	BF-1, BIOFILTRATION BASIN
2	0.21	POC-1	SWAP FOR 2-OFFSITE
2-OFFSITE	0.39	BMP-2, POC-1	BF-3, MODULAR WETLAND
3	0.03	EXIST. BF-3, POC-1	BF-3, MODULAR WETLAND
4	0.04	EXIST. BF-1, POC-1	BF-1, BIOFILTRATION BASIN
5	1.03	POC-1	SELF-MITITAGING

* NOTES:

DMA-2-OFFSITE IS AN AREA FOR TREATMENT SWAP. THIS OFFSITE AREA IS TREATED IN PLACE OF DMA 2. SEE LEGEND FOR TREATMENT SWAP AREAS.

DMA-3 IS TREATED BY AN EXISTING MWS-L-4-4-3-8-V-UG (SEE SWQMP FOR MORE INFORMATION UNDER SDSU MISSION VALLEY FENTON PARKWAY EXTENSION DMA EXHIBIT, LABELED MWU #1 PER PRJ-104051, DWG# 100044-D)

DMA-4 IS TREATED BY AN EXISTING BIOFILTRATION BASIN (SEE SWQMP FOR MORE INFORMATION UNDER SDSU AZTEC STADIUM DMA EXHIBIT, LABELED BMP 2 PER SDSU MISSION VALLEY GRADING PLANED PERMIT BY SDSU)

LEGEND:

- DRAINAGE MANAGEMENT AREA (DMA)
- UNTREATED DMA (PER TREATMENT SWAP)
- DRAINAGE MANAGEMENT AREA (DMA-5) (DAYLIGHT-SELF-MITIGATING) = 1.03 AC TOTAL
- DISTURBED AREA IMPROVEMENTS THAT ARE TREATED BY BMPs PER THE SDSU MISSION VALLEY SITE = 0.04 AC
- DISTURBED AREA IMPROVEMENTS THAT ARE TREATED BY EXISTING MWS PER THE FENTON PARWAY EXTENSION SITE = 0.03 AC
- TREATED PERVIOUS AREA = 0.10 AC
- TREATMENT SWAP AREA (UNTREATED) TOTAL = 0.21 AC
- TREATMENT SWAP AREA (OFFSITE TO BE TREATED) TOTAL = 0.39 AC

NOTE: TREATED AREA OF 0.39 AC > UNTREATED AREA OF 0.21 AC

SCALE: 1"=50'

JOB #: 4497.00

CREATED: 5/23/2023

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
701 B Street, Suite 800
San Diego, CA 92101
619.236.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

FENTON PARKWAY BRIDGE

DMA/BMP SITE MAP
PROPOSED CONDITIONS
ATTACHMENT 1A

Last save by JENNIFER MAYNARD, File Name \\projects\p_drive\4497.00\Engr\Reports\SWQMP-Prelim\ATTACHMENTS\A1-Pollutant Control BMPs\4497 DMA EXHIBIT.dwg, Date Last Saved 5/18/2023 9:48:11 AM, Date Plotted Last 5/18/2023 9:50:07 AM

FOR REFERENCE ONLY

FENTON PARKWAY EXTENSION

DMA EXHIBIT

PRJ #1040531, DWG#100044-D

(REDUCED COPY)

TABULAR SUMMARY OF DMAs										
DMA ID	TOTAL DMA AREA (AC)	TOTAL DISTURBED DMA AREA (AC)	TOTAL DISTURBED DMA IMPERVIOUS AREA (AC)	BMP ID	BMP TYPE	BMP BOTTOM AREA (SF)	BMP MODEL NO.	ENTITY RESPONSIBLE FOR MAINTENANCE	CONSTRUCTION PLAN SHEET NO.	NOTE
1	32.05	0.07	0.07	BMP1R	INFILTRATION (BF-1)	27,522	–	SAN DIEGO STATE UNIVERSITY (SDSU)	SDSU MISSION VALLEY GRADING PLANS SHEET NO. 61	PLANS AND SWQMP WERE REVISED AND APPROVED BY SDSU. DMA AREAS IN THIS TABLE WERE REVISED TO REFLECT THE UPDATED DMAs FOR THE FENTON PARKWAY IMPROVEMENTS.
2	3.71	0.08	0.08	BMP2		3,410	–			
3	0.08	0.08	0.08	MWU#1	PROPRIETARY INFILTRATION (BF-3)	–	MWS-L-4-4-3'-6"-V-UG	CITY OF SAN DIEGO	130044-13-C	VOLUME RETENTION REQUIREMENTS ARE MET USING EXCESS SITE DESIGN (IMPERVIOUS AREA DISPERSION) CREDITS FROM SDSU MISSION VALLEY. FENTON PARKWAY EXTENSION IMPROVEMENTS ARE A PART OF THE OVERALL SDSU MISSION VALLEY PROJECT, BUT IS BEING PERMITTED SEPARATELY DUE TO PLANNING AND ENTITLEMENT IN CITY OF SAN DIEGO RIGHT-OF-WAY.
4+7	0.51	0.16	0.14	MWU#2		–	MWS-L-4-15-3'-6"-C-UG		130044-13-C	
5	0.17	0.17	NO TREATMENT DUE TO EXISTING CONSTRAINTS, THEREFORE TREATMENT SWAP APPROACH UTILIZED FOR THESE DMAs. SEE TREATMENT SWAP AREA SUMMARY BELOW.							
6	0.09	0.09								

TREATMENT SWAP AREA SUMMARY			
DMA ID	TARGET AREA (YELLOW HATCH) – NEW/REPLACED IMPERVIOUS AREA (AC) WITHIN DMA REQUIRING TREATMENT	DMA ID	EXISTING EXCESS AREAS BEING TREATED BY SWAP (AC)
6	0.09	4+7	0.40 (IMPERVIOUS)
5	0.17		
TOTAL	0.25 AC	TOTAL	0.40 AC

NOTES

1. THE PROJECT WAS DETERMINED BY THE HYDROLOGIC CONSULTANT AS A NO INFILTRATION CONDITION SITE.
2. UNDERLYING SOILS DEFINED AS HYDROLOGIC SOIL GROUP HSG TYPE D.
3. BOTTOM ELEVATION FOR ELEVATION IS ESTIMATED TO BE APPROXIMATELY ELEVATION 41' MSL.
4. PROJECT IS URBAN. THERE ARE NO EXISTING NATURAL WATERSHED FEATURES.
5. THIS PROJECT IS CURRENT WITH HYDROMODIFICATION REQUIREMENTS, AND THEREFORE OFFSITE DOWNSTREAM HYDROLOGIC AREAS DO NOT NEED TO BE ANALYZED. REFER TO THE SWQMP'S FORM I-3B.
6. SOURCE CONTROL BMPs
   - 4.2.1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
   - 4.2.2 STORM DRAIN SIGNAGE OR MARKING
   - 4.2.3 ACCESSIBLE MAPS SHOWING THE LOCATION OF PERMANENT BMPs REQUIRED
7. VOLUME RETENTION REQUIREMENTS ARE MET USING ACCESSIBLE, ONSITE MISSION IMPERVIOUS AREA DISPERSION CREDIT FROM THE SDSU MISSION VALLEY PROJECT. REFER TO WORKSHEETS AND SUPPORTING CALCULATIONS IN ATTACHMENT 1C OF THIS REPORT.

LEGEND

PROJECT BOUNDARY

LIMITS OF DISTURBANCE

SDSU ACCESS EASEMENT

CITY OF SAN DIEGO PARCEL LINES PER RECORD MAPS

MTS TROLLEY EASEMENT

EXISTING MAJOR CONTOUR (5' INTERVAL)

EXISTING MINOR CONTOUR (1' INTERVAL)

PROPOSED MAJOR CONTOUR (5' INTERVAL)

PROPOSED MINOR CONTOUR (1' INTERVAL)

DRAINAGE MANAGEMENT AREA (DMA BOUNDARY)

DETENTION BMP (FOR TREATMENT SWAP)

BMP FOR OVERALL SDSU MISSION VALLEY SITE PLAN SWQMP (SWQMP PREVIOUSLY APPROVED BY CITY/SDSU; NOW REVISED FOR FENTON PARKWAY IMPROVEMENTS)

EXISTING STORM DRAIN OUTFALL

FLOW DIRECTION

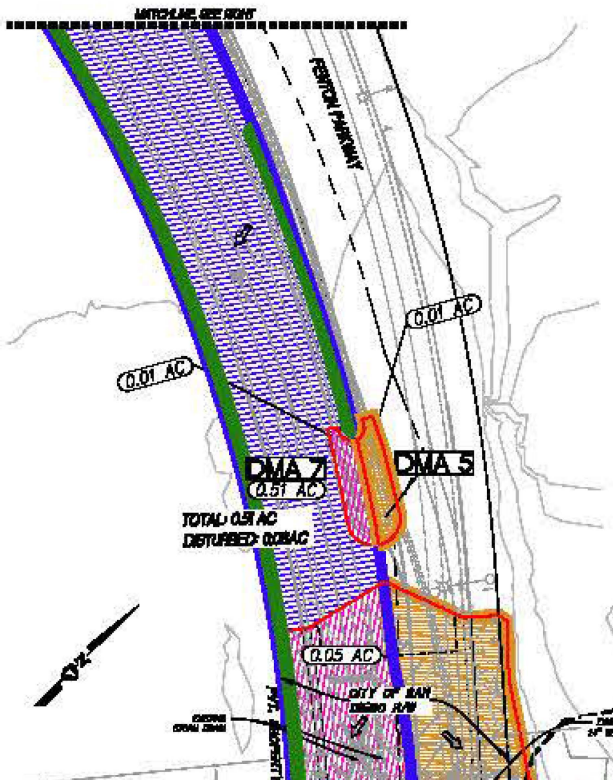
EXISTING EXCESS IMPERVIOUS AREA TREATED BY PROPOSED TREATMENT BMP (SEE MWU #1 & #2) — 0.40 AC

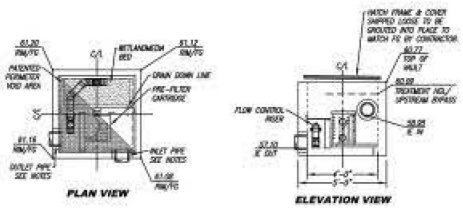
TREATMENT SWAP "TARGET AREA" (NEW/REPLACED IMPERVIOUS AREA FROM NEW IMPROVEMENTS TO DMA 5/DISTURBANCE LIMIT) REQUIRING TREATMENT — 0.25 AC

NEW OR REPLACED PROPOSED IMPERVIOUS AREA TO BE TREATED AT PERMANENT BMP — 0.24 AC

REMAINING AREA PER FENTON PARKWAY EXTENSION IMPROVEMENTS THAT IS TREATED BY DMA 7/8 AND SDSU MISSION VALLEY BMP — 0.17 AC

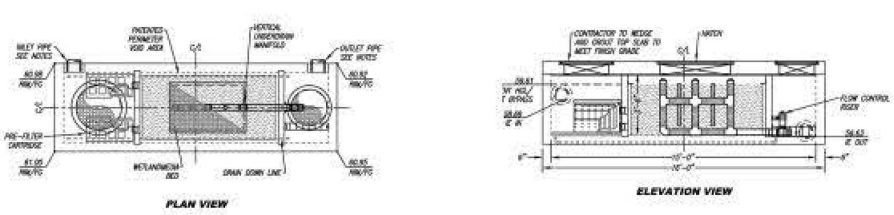
UNTREATED PERVIOUS AREA — 0.01 AC





MWU #1: MWS-L-4-4-3'-6"-V-UG

NOT TO SCALE



MWU #2: MWS-L-4-15-3'-6"-C-UG

NOT TO SCALE

SCALE 1"=40'

SCALE: 1"=40'

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

CITY OF SAN DIEGO

SDSU MISSION VALLEY

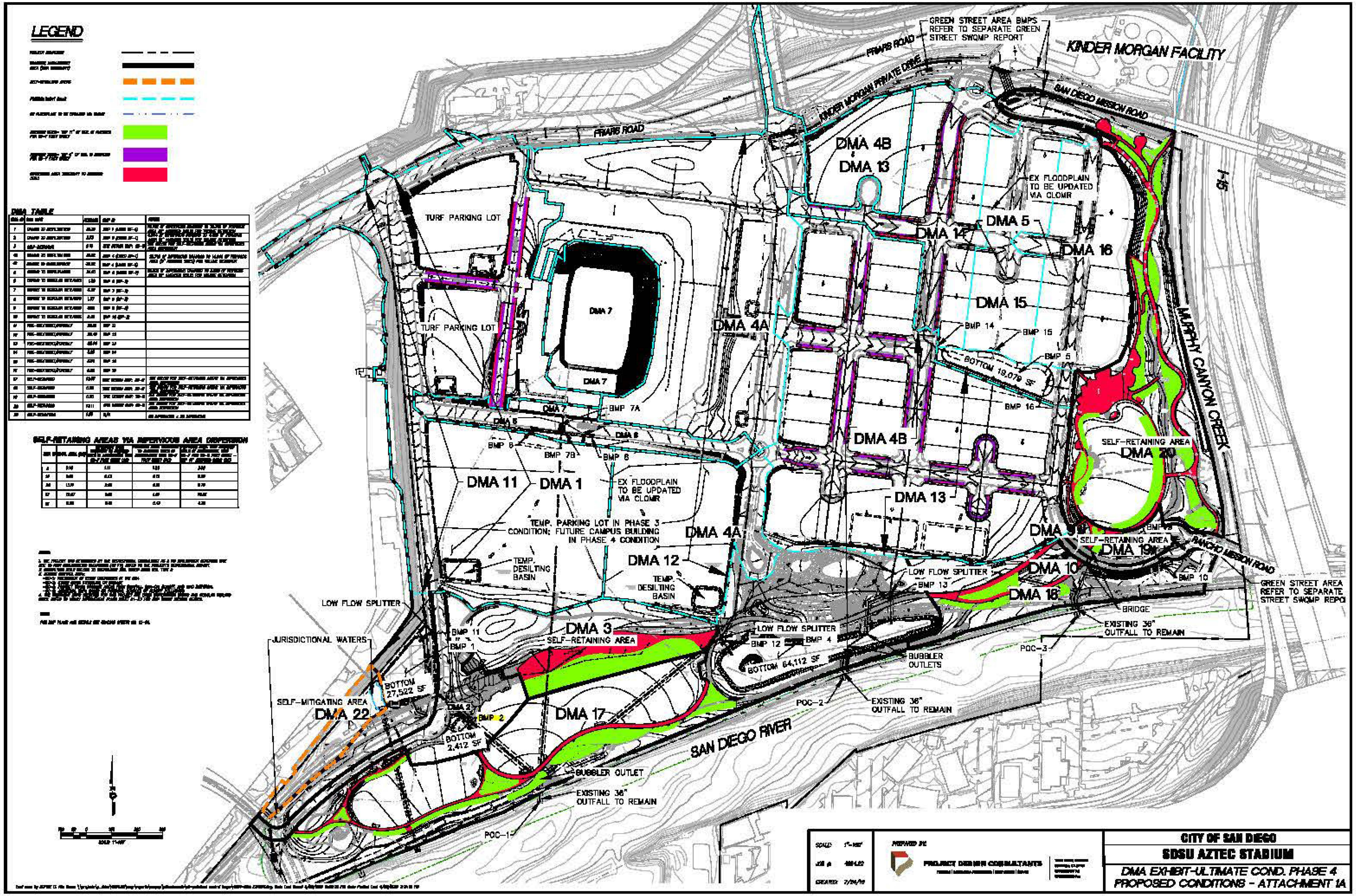
FENTON PKWY EXTENSION

DRAINAGE MANAGEMENT AREA EXHIBIT
ATTACHMENT 1A

FOR REFERENCE ONLY

SDSU MV

DMA EXHIBIT
PTS#663005, DWG#41906-D
SWQMP REPORT DATED
APRIIL 9, 2021
(REDUCED COPY)


LEGEND
DMA TABLE
SELF-RETAINING AREAS VIA IMPERVIOUS AREA DISPERSION
GREEN STREET AREA BMPS REFER TO SEPARATE GREEN STREET SWQMP REPORT
KINDER MORGAN FACILITY
FRIARS ROAD
KINDER MORGAN PRIVATE DRIVE
SAN DIEGO MISSION ROAD
I-15
DMA 4B
DMA 13
EX FLOODPLAIN TO BE UPDATED VIA CLOMR
DMA 5
DMA 14
DMA 16
TURF PARKING LOT
DMA 7
DMA 15
DMA 4A
BMP 14
BMP 15
BMP 5
BOTTOM 19,079 SF
MURPHY CANYON CREEK
BMP 7A
BMP 16
DMA 6
DMA 8
BMP 8
BMP 7B
BMP 6
DMA 4B
SELF-RETAINING AREA
DMA 20
DMA 11
DMA 1
EX FLOODPLAIN TO BE UPDATED VIA CLOMR
DMA 13
TEMP. PARKING LOT IN PHASE 3 CONDITION; FUTURE CAMPUS BUILDING IN PHASE 4 CONDITION
DMA 4A
DMA 9
BMP 9
SELF-RETAINING AREA
DMA 19
RANCHO MISSION ROAD
TEMP. DESILTING BASIN
DMA 12
TEMP. DESILTING BASIN
LOW FLOW SPLITTER
BMP 13
DMA 10
DMA 18
BMP 10
GREEN STREET AREA REFER TO SEPARATE STREET SWQMP REPO
BRIDGE
LOW FLOW SPLITTER
EXISTING 36" OUTFALL TO REMAIN
JURISDICTIONAL WATERS
DMA 3
SELF-RETAINING AREA
LOW FLOW SPLITTER
BMP 11
BMP 1
BMP 12
BMP 4
POC-3
BUBBLER OUTLETS
BOTTOM 64,112 SF
BOTTOM 27,522 SF
SELF-MITIGATING AREA
DMA 22
DMA 2
BMP 2
POC-2
EXISTING 36" OUTFALL TO REMAIN
DMA 17
SAN DIEGO RIVER
BOTTOM 2,412 SF
BUBBLER OUTLET
EXISTING 36" OUTFALL TO REMAIN
POC-1
PROJECT DESIGN CONSULTANTS
CITY OF SAN DIEGO
SDSU AZTEC STADIUM
DMA EXHIBIT-ULTIMATE COND. PHASE 4
PROPOSED CONDITIONS - ATTACHMENT 1A

ATTACHMENT 1B

TABULAR SUMMARY OF BMPs

Project Name: Fenton Parkway Bridge

Tabular Summary of DMAs									Worksheet B-1
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
1	0.80	0.7	88	D	0.83	1318	BMP-1	BF-1	1
2	0.21	0.21	100	D	0.90	377	TREAT-SWAP	N/A	1
2-OFFSITE	0.39	0.39	100	D	090	701	BMP-2	BF-3	1
3	0.03	0.03	100	D	0.90	54	EXIST. MWS	BF-3	1
4	0.04	0.04	100	D	0.90	72	EXIST. BIO BASIN	BF-1	1
5	1.03	0	0	D	0.30	617	N/A	SELF-MIT	1

Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
6	2.50	1.37	81		0.79	3188	2.29		1

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

ATTACHMENT 1C

FORM I-7 HARVEST AND USE FEASIBILITY SCREENING CHECKLIST

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

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

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

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.
[Provide a summary of calculations here]
There are no proposed landscaping per this project, therefore the demand is 0 CF.

3. Calculate the DCV using worksheet B-2.1.
DCV = 3138 (cubic feet)
[Provide a summary of calculations here]
85TH PERCENTILE = 0.55INCHES, DCV = 3630 * C * d * A
EXAMPLE: DMA 1: AREA = 0.80, C=0.83. DCV= 3630*0.83*0.55*0.80 = 1325 CF

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

Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☑ No, select alternate BMPs.

ATTACHMENT 1D

INFILTRATION FEASIBILITY SUPPORTING DOCUMENTATION

GROUP DELTA

San Diego State University
Facilities Planning, Design & Construction
5500 Campanile Drive
San Diego, California 92182-1624

June 18, 2024
Project No. SD605L

Attention: Mr. Paul Jackson
Program Manager – Mission Valley Development

SUBJECT: STORM WATER INFILTRATION FEASIBILITY CONDITION
Fenton Parkway Bridge (DMA 1 and DMA 2)
SDSU Mission Valley, San Diego, California

Mr. Jackson:

As requested by the project civil engineer (Project Design Consultants), Group Delta Consultants, Inc. (Group Delta) is providing this letter summarizing storm water infiltration conditions with regards to the design of permanent storm water Best Management Practices (BMPs) for the proposed Fenton Parkway Bridge located in the southwest portion of San Diego State University Mission Valley (SDSU MV). Group Delta previously submitted two infiltration feasibility condition letters: one for the overall SDSU MV site, and another for the at-grade crossing from Fenton Parkway to River Park Road. Both letters opined that the *No Infiltration* condition applied to the design of permanent storm water BMPs (Group Delta, 2020b; 2022).

We prepared this letter in general accordance with Appendix C.1.1 of the referenced *October 2018 City of San Diego Storm Water Standards* (referred to as the *Design Manual* herein). This letter presents our findings, conclusions, and the recommended *No Infiltration* condition using the *Simple Feasibility Criteria* for the focus areas, which include Drainage Management Area (DMA) 1 located in the southwest corner of the SDSU MV project site and DMA 2 located on the southern side of the proposed Fenton Parkway bridge. The locations of the DMAs are shown in Exhibit 1 (Project Design Consultants, 2023b).

DEVELOPMENT STATUS

DMA-1 includes future park space within SDSU MV and areas where the proposed bridge will extend above the northern portions of the existing San Diego River Channel. The portion of the site within SDSU MV is currently under construction, which should be substantially completed by the end of this year. The river channel is heavily vegetated, and the future park areas are intended to be landscaped. DMA-2 includes portions of Camino Del Rio North and Mission City Parkway, and also areas where the proposed bridge will extend above the southern portion of the existing San Diego River Channel. Similarly, the river channel is heavily vegetated in this area, and Camino Del Rio North and Mission City Parkway are asphalt paved streets with concrete and asphalt curbs and concrete sidewalks.

PROJECT DESCRIPTION

The proposed development in DMA 1 includes the construction the northern portion of the Fenton Parkway Bridge, including an embankment that connects the intersection of Fenton Parkway and River Park Road to the northern bridge abutment. Similarly, DMA 2 includes the construction the southern portion of the Fenton Parkway Bridge, including an smaller embankment that connects the intersection of Camino Del Rio North and Mission City Parkway to the southern embankment. The development includes the placement of up to approximately 10 feet of compacted fill to construct the fill embankments, abutments and associated wing walls, deep foundations to support the bridge. Additional improvements include asphalt concrete pavements, concrete flatwork, permanent storm water BMPs, subsurface utilities, and landscaping. The locations of the proposed improvements are shown in Exhibit 1 (Project Design Consultants, 2023b).

PLANNING PHASE INFILTRATION FEASIBILITY

It is our understanding that the infiltration BMP design for the project is currently in the *Design Phase* as defined in Section C.2 of the Design Manual.

HISTORY OF DESIGN DISCUSSIONS

Prior to performing the planning phase, PDC discussed the lack of potential infiltration locations with Group Delta for the DMAs due to the size of areas, locations of existing impervious area that are required to remain in place to the provide vehicular and pedestrian access, and locations of existing or planned fills, slopes, and subsurface utilities. Due to these constraints alone, it was determined there are no potential infiltration locations within DMA 1 and 2.

FIELD INVESTIGATION AND LABORATORY TESTING

Group Delta performed a subsurface investigation for the Fenton Parkway Bridge consisting of six hollow stem and mud rotary borings, three Cone Penetration Test (CPT) soundings, and a comprehensive suite of laboratory testing of the soil samples collected from the explorations was performed to evaluate soil type, index properties, strength, compressibility/expansion, and corrosivity (Group Delta, 2024). Group Delta also conducted a subsurface investigation of the overall SDSU MV site that consisted of more than 60 explorations including hollow stem and mud rotary borings, Cone Penetration Tests (CPTs), Becker Hammer borings, monitoring well installations, and laboratory testing (Group Delta, 2020a). In addition, over 300 monitoring, extraction and injection wells have been installed at or near the SDCCU Stadium site over the past several decades as part of previous remediation efforts due to fuel hydrocarbons that were observed in the subsurface soils (GeoTracker, 2019). Group Delta's evaluation of the site also included a review of available boring logs for the wells and periodic measurement of groundwater levels in select monitoring wells across the SDSU Mission Valley site. In addition, Group Delta has historical data including three geotechnical borings and one CPT within the immediate vicinity of the project. See the *Previous Investigations* section of this letter for further discussion of this relevant historical data.

GEOLOGY AND SUBSUFRACE CONDITIONS

Our subsurface investigations for the Fenton Parkway Bridge and overall SDSU MV site revealed that thick deposits of poorly consolidated, mostly granular alluvium associated with the San Diego River and Murphy Creek drainages, local deposits of slopewash and colluvium, and relatively shallow fill soils associated with the original stadium and periphery developments construction overlies Tertiary-age Friars Formation at the site. The materials overlying Friars Formation are collectively referred to as

Surficial Soils – Undifferentiated. At the Fenton Parkway Bridge site, the Surficial Soils are estimated to range from 40 to over 80 feet in thickness. Existing fills were measured to be approximately 10 to 20 feet thick at the northern and southern bridge abutments, respectively, which overly alluvium. The Surficial Soils consists of predominately coarse-grained soils with apparent densities that vary from very loose to very dense with a corresponding variable shear strength, stiffness, and hydraulic conductivity. Within the San Diego River channel, the upper five to ten feet of materials generally consists of fine-grained alluvial materials with a relatively soft apparent consistency.

Groundwater was measured in our subsurface explorations for the Fenton Parkway Bridge site at elevations ranging from approximately 35 to 40 feet (Group Delta, 2024). Groundwater was also measured from March through August 2019 in multiple monitoring wells across the overall SDSU MV site. Groundwater was measured at elevations ranging from 38 to 47 feet across the site resulting in a hydraulic gradient of approximately 0.0024 feet per foot (a 7-foot vertical difference over a horizontal distance of 2,900 feet), as described in the referenced report (Group Delta, 2020a). Hydraulic studies performed for this project by others indicate the BFE is approximately +51 feet, or about 15 feet above recent channel bottom (Chang Consultants, 2023; Project Design Consultants, 2023a). Accordingly, we estimate the groundwater elevation to range between approximately +40 and +51 feet in the vicinity of DMA 1 and 2.

PREVIOUS INVESTIGATIONS

Group Delta previously performed three Geotechnical borings ranging from 10 to 120 feet and one CPT to 40 feet in the early 2000s within the vicinity of DMAs 1 and 2. One boring was performed on the northern bank and co-located with the CPT and the two other borings were located on the southern riverbank. The Log of Test Borings is presented in Exhibit 2 (Group Delta, 2001).

The historical boring data appears to be generally consistent with the recently performed explorations, indicating that DMAs 1 and 2 are underlain by fill, and the fill is underlain by alluvium and Friars Formation, at depth. As previously noted in the *Geology and Subsurface Conditions* section of this letter, these conditions are also similar to those encountered at the overall SDSU MV site.

Per Section C.1 of the *Design Manual*, Full and partial infiltration BMPs shall not be placed within existing fill materials greater than 5 feet thick. Review of Group Delta's recent subsurface exploration data indicate that the entirety of DMAs 1 and 2 are underlain with 10 to 20 feet of existing fill.

UTLITY CONFLICTS, SLOPES, AND SETBACKS

Per Section C.1 of the *Design Manual*, full and partial infiltration BMPs shall not be proposed within 10 feet (horizontal radial distance) of underground utilities, structures, retaining walls, etc. Numerous existing underground utilities including several storm drain lines are present within or directly adjacent to DMA 1 and 2. Notable utilities within the DMAs include existing 54-inch diameter and 96-inch diameter storm drains. Several other existing utilities including gas, telecommunications, water, electric, and traffic control existing within Camino Del Rio North and Mission City Parkway. The required setback from these existing utilities and structure precludes the use of infiltration BMPs at the majority of the focus areas.

New fill slopes up to approximately 15 and 25 feet in height are also proposed along the west and east boundaries of DMA 1 and northern boundary of DMA 2, respectively. Per Section C.1 of the *Design*

Manual, Full and partial infiltration BMPs shall not be proposed within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope.

CONCLUSION

Based on the 1) locations of the proposed improvements, 2) civil design constraints to infiltration (i.e., surface flow, low points, storm drain outlet locations, congested site, etc.), 3) the required setbacks to infiltration from existing and proposed underground utilities and slopes, and 4) the existing fill underlying the site, there are no potential locations or typically reasonable design alternatives to achieve full or partial infiltration BMPs at DMAs 1 and 2. For these reasons we recommend the *No Infiltration* condition for final design of permanent storm water BMPs.

CLOSURE

Design and construction considerations with respect to on-site storm water infiltration are based on the criteria listed in *Section C.1* of the *Design Manual*. The conclusion and recommendations for storm water infiltration assume that soil conditions do not deviate appreciably from those described herein. If any of the design considerations addressed require further investigation or analyses, Group Delta may be contacted for additional services.

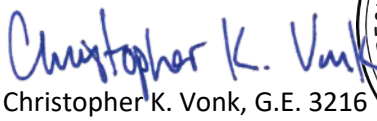
This report was prepared using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable Geotechnical Engineers practicing in similar localities. No warranty, expressed or implied, is made as to the conclusions and professional opinions included in this report.

The findings of this report are valid as of the present date. However, changes in the condition of the site can occur with the passage of time, whether due to natural processes or the work of humans on this or adjacent properties. In addition, changes in applicable or appropriate standards of practice may occur from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

We appreciate this opportunity to be of continued professional service. Feel free to contact the office with any questions or comments, or if you need anything else.

GROUP DELTA CONSULTANTS

Joshua Joksch
Staff Engineer



Christopher K. Vonk, G.E. 3216
Senior Geotechnical Engineer

Attachments: References
Exhibit 1 – BMP/DMA Site Map Proposed Conditions, Attachment 1A, Fenton Parkway Bridge (Project Design Consultants, 2023b)
Exhibit 2 – Plans for the Improvement of Mission City Parkway Bridge over San Diego River, Log of Test Borings (Group Delta, 2001)

Distribution: Addressee, Mr. Paul Jackson (pjackson@sdsu.edu)

REFERENCES

Chang Consultants (2023). *Hydraulic Report for San Diego State University Mission Valley Campus, Fenton Parkway Bridge, For Review Only*, dated August 8.

City of San Diego (2018). *Storm Water Standards,* dated October 1.

GeoTracker (2019). *State Water Resources Control Board GeoTracker Website*, http://geotracker.waterboards.ca.gov/, accessed: July 16.

Group Delta Consultants, Inc. (2024). *Foundation and Geotechnical Design Report, Fenton Parkway Bridge, SDSU Mission Valley, San Diego, California*, Project No. SD605L, dated May 14.

Group Delta Consultants, Inc. (2022). *Storm Water Infiltration Feasibility Condition, Fenton Parkway At-Grade Crossing (DMA 3 through DMA 5), SDSU Mission Valley, San Diego, California*, Project No. SD605G, dated January 31.

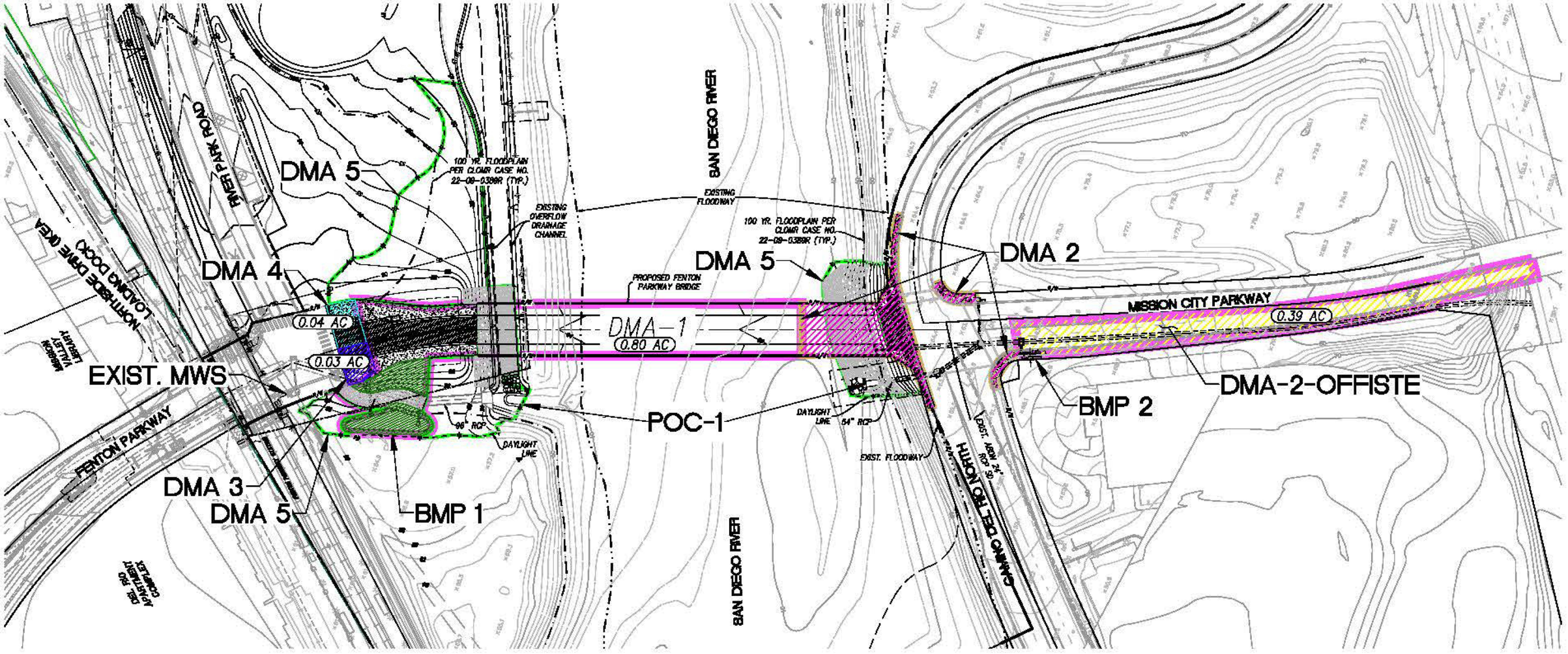
Group Delta Consultants, Inc. (2020a). *Report of Geotechnical Investigation, Site Development, SDSU Mission Valley, San Diego, California*, Project No. SD605, dated March 6.

Group Delta Consultants, Inc. (2020b). *Storm Water Infiltration Feasibility Condition, SDSU Mission Valley, San Diego, California*, Project No. SD605A, dated February 5.

Group Delta Consultants, Inc. (2001). *Log of Test Borings, Plans for the Improvement of Mission City Parkway Bridge over San Diego River, San Diego, California,* dated November 28.

Project Design Consultants (PDC, 2023a). *Plan and Profile, Mass Grading Plan, Improvement Plan, and Signing and Striping Plan For: Fenton Parkway Bridge Over San Diego River, Fenton Parkway Between River Park Rd & Camino Del Rio North, 30% Plans – Not For Construction, Sheets C1 through C3 and CXX (4 Sheets)*, August 29.

Project Design Consultants (2023b). *DMA/BMP Site Map Proposed Conditions, Attachment 1A, SDSU Mission Valley, Fenton Parkway Bridge, City of San Diego*, plotted May 18.



BMP NOTES:

1. THE PROJECT WAS DETERMINED BY THE GEOTECHNICAL CONSULTANT AS A NO INFILTRATION CONDITION SITE.
2. UNDERLYING SOILS DEFINED AS RIVERWASH PER WEB SOIL SURVEY, WHICH IS ASSIGNED HYDROLOGIC SOIL GROUP NRCS SOIL TYPE D.
3. DESIGN GROUNDWATER ELEVATION IS ESTIMATED TO BE APPROXIMATELY ELEVATION 44' NGVD 29.
4. THE EXISTING NATURAL HYDROLOGIC FEATURES ARE THE SAN DIEGO RIVER
   5. THIS PROJECT IS EXEMPT FROM HYDROMODIFICATION REQUIREMENTS, AND THEREFORE CRITICAL COARSE SEDIMENT YIELD AREAS DO NOT NEED TO BE IDENTIFIED. REFER TO THE SWQMP'S FORM I-3B.
6. SOURCE CONTROL BMPs:
   - 4.2.1: PREVENTION OF ILLICIT DISCHARGES IN THE MS4
   - 4.2.2: STORM DRAIN STENCILING OR SIGNAGE
   - 4.2.6: ADDITIONAL BMPs BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
7. VOLUME RETENTION REQUIREMENTS ARE MET WITH THE PROPOSED BIOFILTRATION BASIN. REFER TO WORKSHEETS AND SUPPORTING CALCULATIONS IN ATTACHMENT 1E OF THE SWQMP.

DMA SUMMARY TABLE:

DMA	AREA	ROUTES TO	BMP TYPE
1	0.8	BMP-1, POC-1	BF-1, BIOFILTRATION BASIN
2	0.21	POC-1	SWAP FOR 2-OFFSITE
2-OFFSITE	0.39	BMP-2, POC-1	BF-3, MODULAR WETLAND
3	0.03	EXIST. BF-3, POC-1	BF-3, MODULAR WETLAND
4	0.04	EXIST. BF-1, POC-1	BF-1, BIOFILTRATION BASIN
5	1.03	POC-1	SELF-MITIGATING

* NOTES:

DMA-2-OFFSITE IS AN AREA FOR TREATMENT SWAP. THIS OFFSITE AREA IS TREATED IN PLACE OF DMA 2. SEE LEGEND FOR TREATMENT SWAP AREAS.

DMA-1 IS TREATED BY AN EXISTING MWS-L-4-4-3-B-V-UG (SEE SWQMP FOR MORE INFORMATION UNDER SDSU MISSION VALLEY FENTON PARKWAY EXTENSION DMA EXHIBIT, LABELED MWU (# PER PRJ-104051, DWG# 100044-D)

DMA-4 IS TREATED BY AN EXISTING BIOFILTRATION BASIN (SEE SWQMP FOR MORE INFORMATION UNDER SDSU AZTEC STADIUM DMA EXHIBIT, LABELED BMP 2 PER SDSU MISSION VALLEY GRADING PLANED PERMIT BY SDSU)

LEGEND:

- DRAINAGE MANAGEMENT AREA (DMA)
- UNTREATED DMA (PER TREATMENT SWAP)
- DRAINAGE MANAGEMENT AREA (DMA-5) (DAYLIGHT-SELF-MITIGATING) = 1.03 AC TOTAL
- DISTURBED AREA IMPROVEMENTS THAT ARE TREATED BY BMPs PER THE SDSU MISSION VALLEY SITE = 0.04 AC
- DISTURBED AREA IMPROVEMENTS THAT ARE TREATED BY EXISTING MWS PER THE FENTON PARKWAY EXTENSION SITE = 0.03 AC
- TREATED PERVIOUS AREA = 0.10 AC
- TREATMENT SWAP AREA (UNTREATED) TOTAL = 0.21 AC
- TREATMENT SWAP AREA (OFFSITE TO BE TREATED) TOTAL = 0.39 AC

NOTE: TREATED AREA OF 0.39 AC > UNTREATED AREA OF 0.21 AC

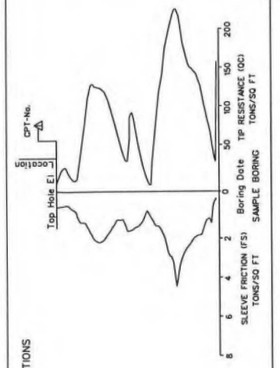
SCALE:	1"=50'
JOB #:	4497.00
CREATED:	5/23/2023

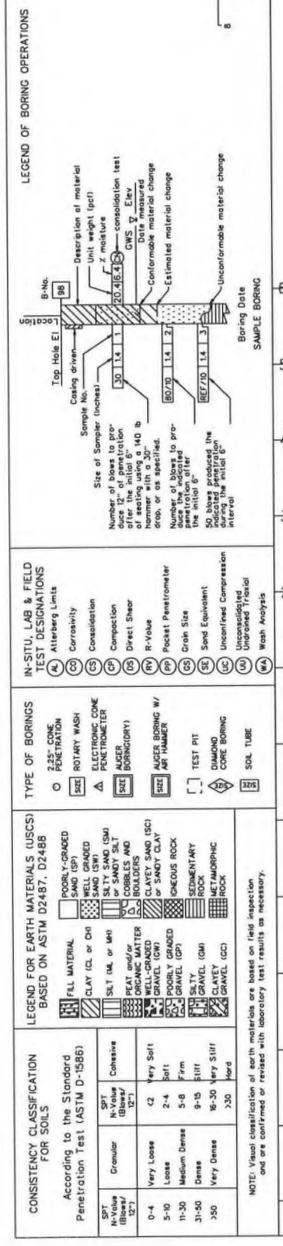
PREPARED BY:

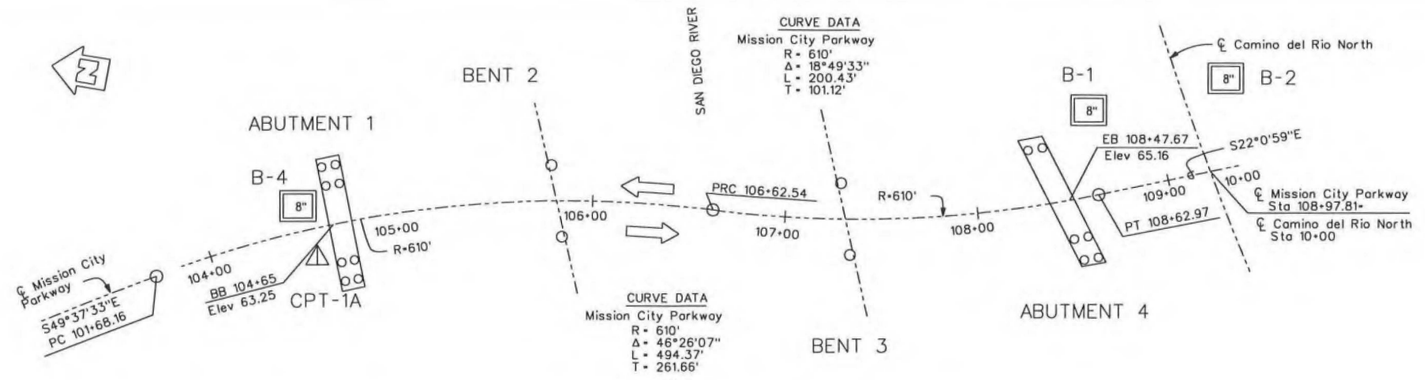
PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey

CITY OF SAN DIEGO
FENTON PARKWAY BRIDGE
DMA/BMP SITE MAP
PROPOSED CONDITIONS
ATTACHMENT 1A

Last save by JENNIFER MAYNARD, File Name \\projects\p_drive\4497.00\Engr\Reports\SWQMP-Prelim\ATTACHMENTS\A1-Pollutant Control BMPs\4497 DMA EXHIBIT.dwg, Date Last Saved 5/18/2023 9:48:11 AM, Date Plotted Last 5/18/2023 9:50:07 AM





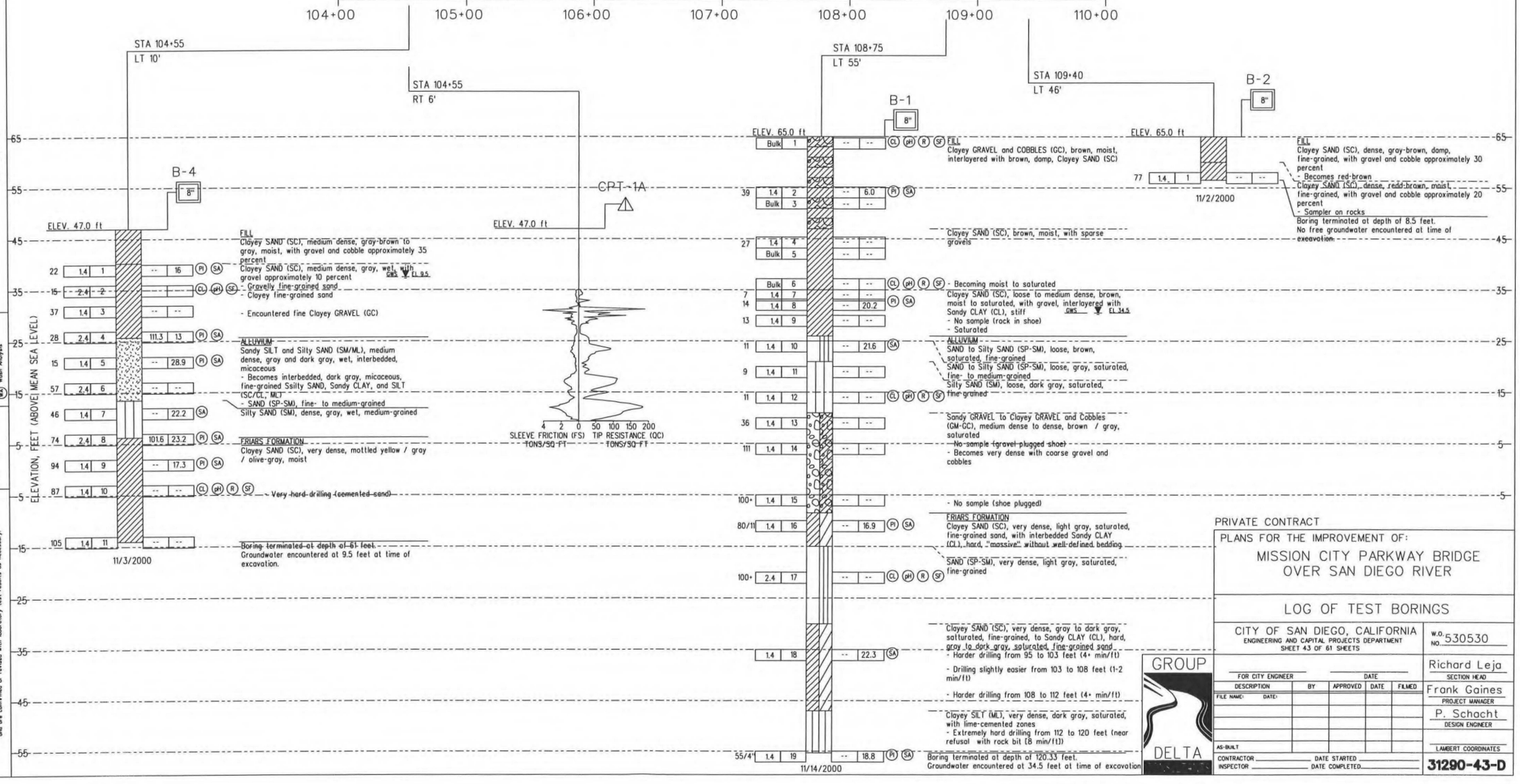


Notes :

1) A safety trip hammer was used using two turns of a rope on cathead mechanism
2) The weight of hammer and height of drop used for the California sampler and SPT sampler are shown in the following table:

Type of Sampler	Outside Diameter	Inside Diameter	Weight of Hammer	Height of drop
California Sampler	3.3"	2.4"	140 lb	30"
SPT Sampler	2"	1.4"	140 lb	30"

3) California drive sampler blow counts can be converted to equivalent SPT blowcounts using a correction factor of about 0.67



PRIVATE CONTRACT

PLANS FOR THE IMPROVEMENT OF:

MISSION CITY PARKWAY BRIDGE OVER SAN DIEGO RIVER

LOG OF TEST BORINGS

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 43 OF 61 SHEETS

W.O. NO. 530530

Richard Leja
SECTION HEAD

Frank Gaines
PROJECT MANAGER

P. Schacht
DESIGN ENGINEER

LAMBERT COORDINATES

31290-43-D

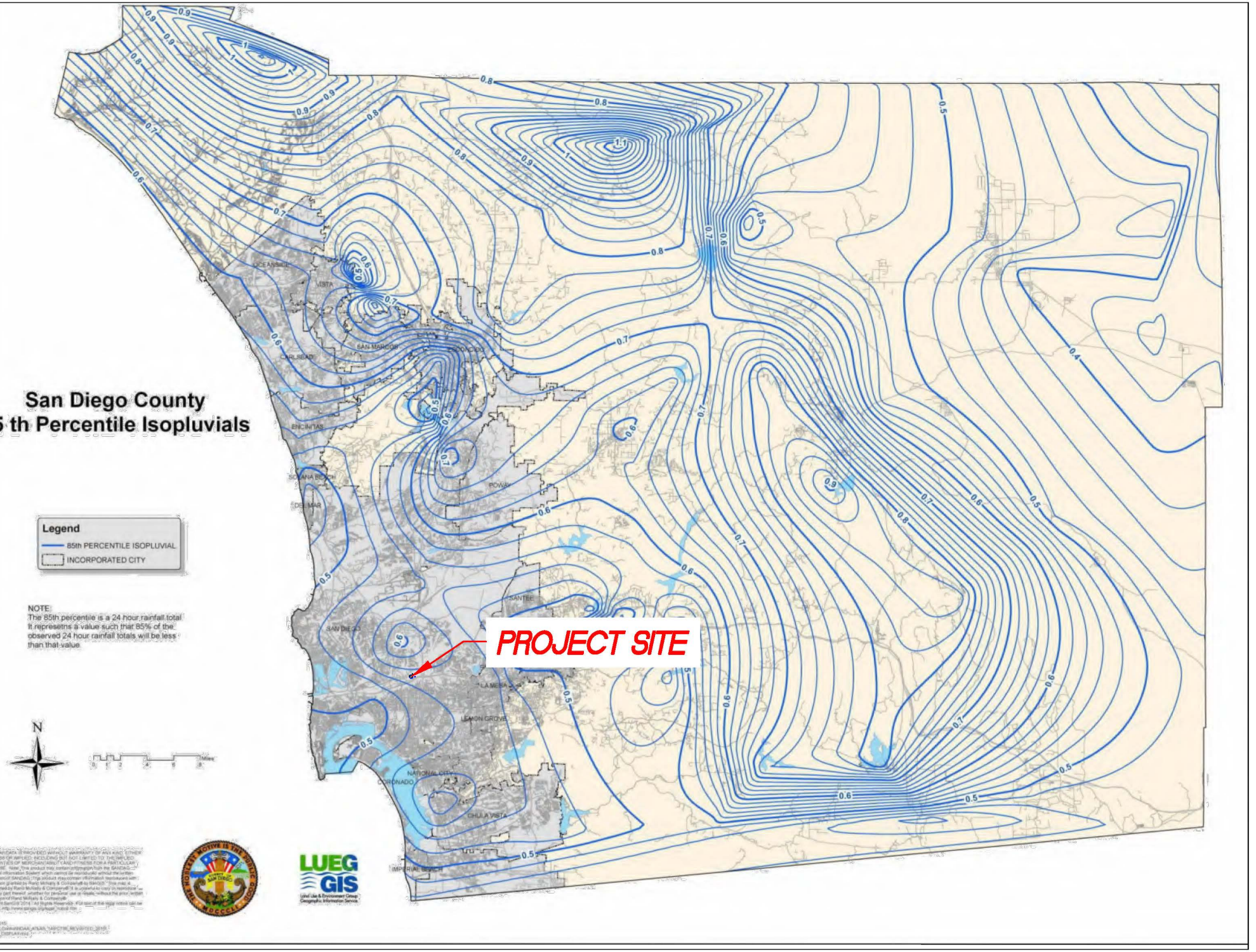
FOR CITY ENGINEER		DATE		
DESCRIPTION	BY	APPROVED	DATE	FILMED
FILE NAME: DATE:				
AS-BUILT				

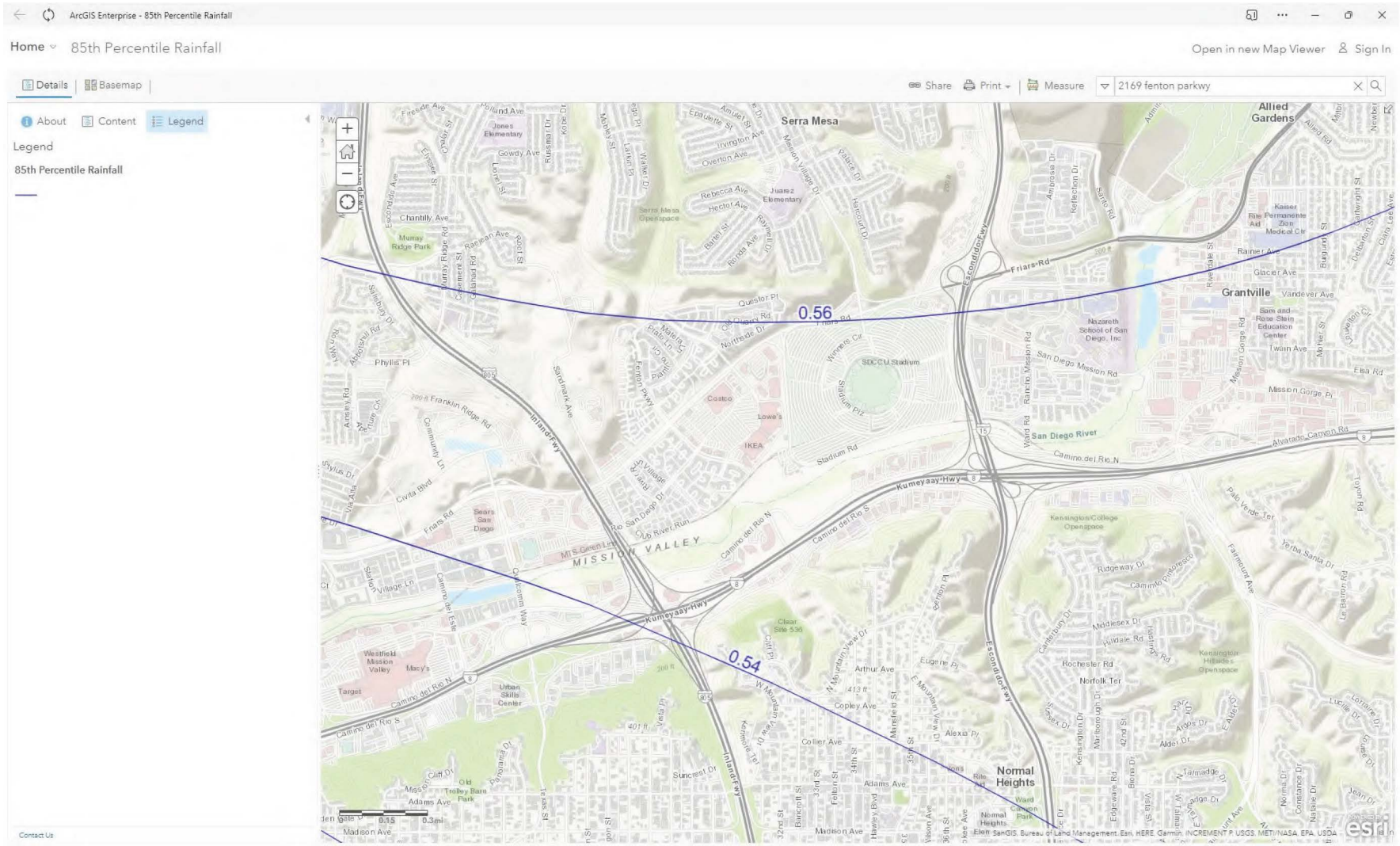
CONTRACTOR _____ DATE STARTED _____
INSPECTOR _____ DATE COMPLETED _____

GROUP DELTA

ATTACHMENT 1E

POLLUTANT CONTROL BMP DESIGN WORKSHEETS/CALCULATIONS


San Diego County
85 th Percentile Isopluvials
Legend
85th PERCENTILE ISOPLUVIAL
INCORPORATED CITY
NOTE:
The 85th percentile is a 24 hour rainfall total
It represetns a value such that 85% of the
observed 24 hour rainfall totals will be less
than that value
PROJECT SITE
N
OCEANSIDE
VISTA
SAN MARCOS
ESCONDIDO
CARLSBAD
ENCINITAS
SOLANA BEACH
POWAY
DEL MAR
SAN DIEGO
SANTEE
LA MESA
LEMON GROVE
NATIONAL CITY
CORONADO
CHULA VISTA
IMPERIAL BEACH
LUEG
GIS


ArcGIS Enterprise - 85th Percentile Rainfall
Home
85th Percentile Rainfall
Open in new Map Viewer
Sign In
Details
Basemap
Share
Print
Measure
2169 fenton parkway
About
Content
Legend
Legend
85th Percentile Rainfall
0.56
0.54
Serra Mesa
Allied Gardens
Grantville
Normal Heights
MISSION VALLEY
Friars Rd
Kumeyaay Hwy
Camino del Rio N
Camino del Rio S
Fenton Pkwy
Stadium Rd
Mission Gorge Rd
San Diego River
Escondido Fwy
Inland Fwy
Costco
IKEA
Target
Macy's
Sears
SDCCU Stadium
Esri

= 0.55

Project: FENTON PARKWAY BRIDGE

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

85th percentile 24-hr storm depth from Figure B.1.= 0.55 in

DMA ID	BMP ID	BMP Drainage Area (ac)	BMP Drainage Area (SF)	Impervious Area (ac)	Amended Soils (ac) (C=0.1)	Natural A Soils (ac) (C=0.1)	Natural B Soils (ac) (C=0.14)	Natural C Soils (ac) (C=0.23)	Natural D Soils (ac) (C=0.3)	% Impervious	Composite C[1]	Tree Credit Volume (cf)	Rain Barrels Credit Volume (cf)	Design Capture Volume (DCV) (CF)
1	1	0.8	34848	0.7	0				0.1	88%	0.83	0	0	1318
2-OFFSITE	2	0.39	16988	0.39	0				0	100%	0.90	0	0	701
3	EXIST. MWS	0.03	1307	0.03	0				0	100%	0.90	0	0	54

Notes:

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

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

The City of SAN DIEGO	Project Name	FENTON PARKWAY BRIDGE	
	BMP ID	1	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	34848	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.83	
3	85th percentile 24-hour rainfall depth	0.55	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	1318	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.8	inches
15	Total Depth Treated [Line 13 + Line 14]	46.8	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	1977	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	507	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	988	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	706	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	862	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	862	sq. ft.
23	Provided BMP Footprint	1456	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	FENTON PARKWAY BRIDGE	
	BMP ID	1	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	34848	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.825	
3	85th percentile 24-hour rainfall depth	0.55	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	1318	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	30	cu. ft.

The City of SAN DIEGO	Project Name	FENTON PARKWAY BRIDGE	
	BMP ID	2	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	16988	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.90	
3	85th percentile 24-hour rainfall depth	0.55	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	701	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	16	cu. ft.

The City of SAN DIEGO	Project Name	FENTON PARKWAY BRIDGE	
	BMP ID	EXIST. MWS	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	1307	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.90	
3	85th percentile 24-hour rainfall depth	0.55	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	54	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	1	cu. ft.

The City of SAN DIEGO	Project Name	FENTON PARKWAY BRIDGE
	BMP ID	DMA 1+ 2-OFFSITE+3

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						53143	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.875	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						46500	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						1395	sq. ft.
5	Biofiltration BMP Footprint						1456	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)							
7	Impervious area draining to the landscape area (sq. ft.)							
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						1456	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?						Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						1.04	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						48	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						-1.90657764	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**							cu. ft.
	2							cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						0	cu. ft.
17	Is Line 16 ≥ Line 15?						Volume Retention Performance Standard is Met	

DMA 4

TREATED BY EXISTING BMP 2 PER SDSU MV PROJECT

FOR REFERENCE ONLY

SDSU MV
POLLUTANT CONTROL BMP DESIGN WORKSHEETS/CALCULATIONS
PTS#663005, DWG#41906-D
SWQMP REPORT DATED
APRIIL 9, 2021
(APPROVED REPORT)

FOR REFERENCE ONLY - CALCULATION EXCERPTS FROM SDSU MISSION VALLEY SWQMP

CALCULATION FOR MEDIA FILTRATION RATE WHEN CONTROLLED BY UNDERDRAIN ORIFICE

Basin 2

Surface ponding [6 inch minimum, 12 inch maximum]	6	
Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	
Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	
Diameter of underdrain orifice	8	in
H	3.17	
Footprint of the BMP	2412	ft^2
Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	**5.00**	in/hr

FOR REFERENCE ONLY - CALCULATION EXCERPTS
FROM SDSU MISSION VALLEY SWQMP

The City of SAN DIEGO

	Project Name	SDSU	
	BMP ID	BMP#2	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	162478.8	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.62	
3	85th percentile 24-hour rainfall depth	0.57	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	4797	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5.00	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.8	inches
15	Total Depth Treated [Line 13 + Line 14]	46.8	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	7196	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	1845	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	3598	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	2570	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.02223	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	2245	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	2245	sq. ft.
23	Provided BMP Footprint	2412	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

FOR REFERENCE ONLY - CALCULATION EXCERPTS
FROM SDSU MISSION VALLEY SWQMP

The City of SAN DIEGO	Project Name	SDSU	
	BMP ID	BMP#2	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	162478.8	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.62	
3	85th percentile 24-hour rainfall depth	0.57	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	4797	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	110	cu. ft.

FOR REFERENCE ONLY - CALCULATION EXCERPTS FROM SDSU MISSION VALLEY SWQMP

The City of SAN DIEGO	Project Name	SDSU
	BMP ID	BMP#2
Alternative Minimum Footprint Sizing Factor for Non-Standard Biofiltration		Worksheet B.5-4

1	Area draining to the BMP	162478.8	sq. ft.
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.621584987	
3	Load to Clog (default value when using Appendix E fact sheets is 2.0)	2	lb/sq. ft.
4	Allowable Period to Accumulate Clogging Load (T_L) (default value is 10)	10	years

Volume Weighted EMC Calculation

Land Use	Fraction of Total DCV	TSS EMC (mg/L)	Product
Single Family Residential		123	0
Commercial		128	0
Industrial	0.6	125	75
Education (Municipal)		132	0
Transportation		78	0
Multi-family Residential		40	0
Roof Runoff		14	0
Low Traffic Areas	0.4	50	20
Open Space		216	0
Other, specify:			0
Other, specify:			0
Other, specify:			0

5	Volume Weighted EMC (sum of all products)	95	mg/L

Sizing Factor for Clogging

6	Adjustment for pretreatment measures Where: Line 6 = 0 if no pretreatment; Line 6 = 0.25 when pretreatment is included; Line 6 = 0.5 if the pretreatment has an active Washington State TAPE approval rating for "pre-treatment."	0.25	
7	Average Annual Precipitation [Provide documentation of the data source in the discussion box; SanGIS has a GIS layer for average annual precipitation]	12	inches
8	Calculate the Average Annual Runoff (Line 7/12) x Line 1 x Line2	100994	cu-ft/yr
9	Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 5 x (1 – Line 6))/10^6	449	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3	2245	sq. ft.
11	Calculate the Minimum Footprint Sizing Factor for Clogging [Line 10/ (Line 1 x Line 2)]	0.022	

Discussion:

FOR REFERENCE ONLY - CALCULATION EXCERPTS
FROM SDSU MISSION VALLEY SWQMP

The City of SAN DIEGO

Project Name	SDSU
BMP ID	BMP#2

Volume Retention for No Infiltration Condition							Worksheet B.5-6	
1	Area draining to the biofiltration BMP						162478.8	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)						0.62	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						100994	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]						3030	sq. ft.
5	Biofiltration BMP Footprint						2412	sq. ft.
Landscape Area (must be identified on DS-3247)								
		Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		4505					
7	Impervious area draining to the landscape area (sq. ft.)		4504					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		1.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		3003	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]						3003	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]						5415	sq. ft.
Volume Retention Performance Standard								
12	Is Line 11 ≥ Line 4?		Volume Retention Performance Standard is Met					
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]						1.79	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]						110	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]						-87.16572687	cu. ft.
Site Design BMP								
	Identification	**Site Design Type**					**Credit**	
16	**1**							cu. ft.
	2							cu. ft.
	3							cu. ft.
	4							cu. ft.
	5							cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.						0	cu. ft.
17	Is Line 16 ≥ Line 15?		Volume Retention Performance Standard is Met					

DMA 3

TREATED BY EXISTING MWU#1 PER FENTON PARKWAY EXTENSION PROJECT
(CALCULATIONS INCLUDE EXISTING AREA TO MWS PLUS NEW AREA FROM BRIDGE PROJECT TO MWS)

FENTON PARKWAY BRIDGE

TABULAR SUMMARY OF BMPs

WORKSHEET B-1

85TH PERCENTILE 24-HOUR STORM DEPTH 0.55 IN.

DMA ID	BMP DRAINAGE AREA (AC.)	BMP DRAINAGE AREA (SF)	IMPERVIOUS AREA (AC)	AMENDED SOILS (AC)	% IMPERVIOUS	HSG	COMPOSITE C	BMP ID	DESIGN CAPTURE VOLUME (CF)	POLLUTANT CONTROL TYPE	DRAINS TO (POC ID)
3	0.11	4791.6	0.11	0.00	100%	D	0.90	MWU#1	198	BF-3	1

NOTES:

* MWU#1 IS AN EXISTING MODULAR WELTLAND PER SDSU MISSION VALLEY FENTON PARKWAY EXTENTSION PROJECT

** COMBINED DMA FROM SDSU MISSION VALLEY FENTON PARKWAY EXTENTIONS (0.08 ACRES) AND PROPOSED DMA X FROM FENTON PARKWAY BRIDGE DMA 3 (0.03 ACRES) = 0.11 ACRES

FENTON PARKWAY BRIDGE

WORKSHEET B.2-1: DCV

85TH PERCENTILE 24-HOUR STORM DEPTH 0.55 INCHES

DMA ID	BMP ID	BMP DRAINAGE AREA (AC.)	BMP DRAINAGE AREA (SF)	IMPERVIOUS AREA (AC)	AMENDED SOILS (AC)	% IMPERVIOUS	COMPOSITE C	TREE CREDIT VOLUME (CF)	RAIN BARRELS CREDIT VOLUME (CF)	DESIGN CAPTURE VOLUME (CF)
3	MWU#1	0.11	4792	0.11	0.00	100%	0.90	0.0	0.0	198
									TOTAL DCV =	**198**

Fenton Parkway Bridge

Modular Wetland Unit Sizing

BMP-ID	A (AC)	C	1.5 x Q (cfs)[1]	MWS Model	MWS Qdesign
MWU#1	0.11	0.90	0.030	4'X4' VAULT TYPE	0.052

Notes:

1. Water quality flow rate = 1.5 x 0.2 x C x A

MODULAR WETLAND SYSTEMS LINEAR SPECIFICATION

TREATMENT FLOWRATE (CFS)	MODEL NO.	DIMENSIONS	WETLANDMEDIA SURFACE AREA (SF)
0.052	MWS-L-4-4	4' x 4'	23
0.073	MWS-L-4-6	4' x 6'	32
0.115	MWS-L-4-8	4' x 8'	50
0.144	MWS-L-4-13	4' x 13'	63
0.175	MWS-L-4-15	4' x 15'	76
0.206	MWS-L-4-17	4' x 17'	90
0.237	MWS-L-4-19	4' x 19'	103
0.268	MWS-L-4-21	4' x 21'	117
0.147	MWS-L-6-8	7' x 9'	64
0.230	MWS-L-8-8	8' x 8'	100
0.346	MWS-L-8-12	8' x 12'	151
0.462	MWS-L-8-16	8'x16'	201
0.577	MWS-L-8-20	8'x20'	252
0.693	MWS-L-8-24	8'x24'	302

FOR REFERENCE ONLY

FENTON PARKWAY EXTENSION POLLUTANT CONTROL BMP DESIGN WORKSHEETS/CALCULATIONS (APPROVED REPORT)

SDSU Fenton Parkway Extension

Modular Wetland Unit Sizing

BMP-ID	A (AC)	C	1.5 x Q (cfs)[1]	MWS Model	MWS Qdesign
MWU#1	0.08	0.90	0.023	4'X4' VAULT TYPE	0.052
MWU#2	0.61	0.82	0.149	4'X15' VAULT TYPE	0.175

Notes:

1. Water quality flow rate = 1.5 x 0.2 x C x A

MODULAR WETLAND SYSTEMS LINEAR SPECIFICATION

TREATMENT FLOWRATE (CFS)	MODEL NO.	DIMENSIONS	WETLANDMEDIA SURFACE AREA (SF)
0.052	MWS-L-4-4	4′ x 4′	23
0.073	MWS-L-4-6	4′ x 6′	32
0.115	MWS-L-4-8	4′ x 8′	50
0.144	MWS-L-4-13	4′ x 13′	63
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Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	○ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	○ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	◉ No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

All applicable Appendix B.5 Worksheets including Worksheets B.5-2 are included in the SWQMP Attachment 1E which show that the performance standard has been met based on the proposed biofiltration basin (BMP-1)

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Meets Flow based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	○ Meets Volume based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	○ Does not Meet either criteria	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).
Refer to Attachment 1e for standard sheet provided by vendor.

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	○ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.
See Attachment 1e for Tape Certification and Modular Wetland Calculations, Modular Wetland Brochure, Fact Sheet.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 5: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 5:

Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.

A modular wetland system will be utilized for pollutant treatment control. The BMP unit(s) will have plants. Refer to the Criteria 5 Checklist from Appendix F and the MWS plant selection included in Attachment 1e
The MWS Linear is an advanced biofiltration BMP that promotes biological processes found in both upland bio-retention systems and subsurface wetlands. The system utilizes an advanced horizontal flow design to ensure maximum contact with the wetland media. Bacterial growth, supported by the adjusted loads of the wetland media performs a number of treatment processes. Biologically available forms of nitrogen, phosphorus, and carbon are actively taken into the cells of the biofilm created within the subsurface wetland, and are used for metabolic processes (i.e., energy production and growth). These processes remove metabolites from the media during and between storm events, making the media available to capture more nutrients from subsequent storms. Soil organisms in the wetland chamber can break down a wide array of organic compounds into less toxic forms or completely break them down into carbon dioxide and water. The MWS is approved under TAPE protocol with and without plants meeting the minimum requirements set forth in the performance standard. The development of a schmutzdecke (a biological layer) within this subsurface application creates a diversity of microorganisms that meets the necessary requirement for biological activity.

Criteria	Answer	Progression
Criteria 6: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	◉ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 6:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).

Per Appendix B of the City BMP Design Manual, a proposed BMP should meet the performance standard (per Appendix B.6.2.2) as certified through a third party field scale evaluation. The MWS performance standard was conducted by the Washington State Department of Ecology. Their results are provided in the TAPE certification. Refer to Attachment 1e.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	◉ Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	○ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

Refer to Attachment 3A for Maintenance Guidelines for the Modular Wetland System.

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	○ Yes ○ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

Bio Clean

A Forterra Company

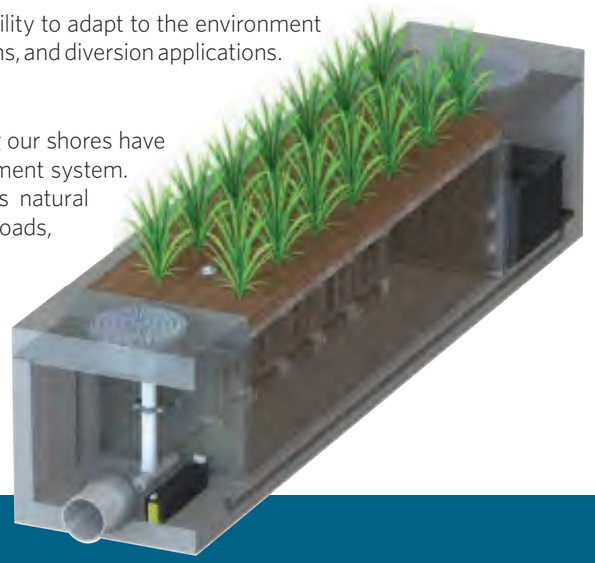
Modular Wetlands® System Linear

A Stormwater Biofiltration Solution

OVERVIEW

The Bio Clean Modular Wetlands® System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint, higher treatment capacity, and a wide range of versatility. While most biofilters use little or no pretreatment, the Modular Wetlands® incorporates an advanced pretreatment chamber that includes separation and pre-filter cartridges. In this chamber, sediment and hydrocarbons are removed from runoff before entering the biofiltration chamber, reducing maintenance costs and improving performance.

Horizontal flow also gives the system the unique ability to adapt to the environment through a variety of configurations, bypass orientations, and diversion applications.



The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as cities grow and develop, our environment's natural filtration systems are blanketed with impervious roads, rooftops, and parking lots.

Bio Clean understands this loss and has spent years re-establishing nature's presence in urban areas, and rejuvenating waterways with the Modular Wetlands® System Linear.

PERFORMANCE

The Modular Wetlands® continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the Modular Wetlands® has been field tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. In fact, the Modular Wetlands® harnesses some of the same biological processes found in natural wetlands in order to collect, transform, and remove even the most harmful pollutants.

66% REMOVAL OF DISSOLVED ZINC	**69%** REMOVAL OF TOTAL ZINC	**38%** REMOVAL OF DISSOLVED COPPER	**64%** REMOVAL OF TOTAL PHOSPHORUS	
45% REMOVAL OF NITROGEN	**50%** REMOVAL OF TOTAL COPPER	**95%** REMOVAL OF MOTOR OIL	**67%** REMOVAL OF ORTHO PHOSPHORUS	**85%** REMOVAL OF TSS

APPROVALS

The Modular Wetlands® System Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world. Here is a list of some of the most high-profile approvals, certifications, and verifications from around the country.

Washington State Department of Ecology TAPE Approved
The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

California Water Resources Control Board, Full Capture Certification
The Modular Wetlands® System is the first biofiltration system to receive certification as a full capture trash treatment control device.

Virginia Department of Environmental Quality, Assignment
The Virginia Department of Environmental Quality assigned the MWS Linear the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) regulation technical criteria.

Maryland Department of the Environment, Approved ESD
Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP Evaluation
The University of Massachusetts at Amherst – Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.

Rhode Island Department of Environmental Management, Approved BMP
Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

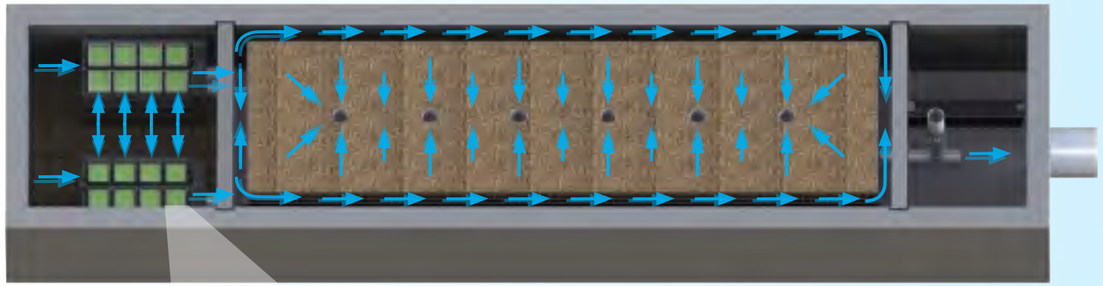
- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

OPERATION

The Modular Wetlands® System Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which:

- Improves performance
- Reduces footprint
- Minimizes maintenance

Figure 1 & Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.



2x to 3x more surface area than traditional downward flow bioretention systems.

Figure 2, Top View

1 PRETREATMENT

SEPARATION

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

PRE-FILTER CARTRIDGES

- Over 25 sq. ft. of surface area per cartridge
- Utilizes BioMediaGREEN™ filter material
- Removes over 80% of TSS and 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber

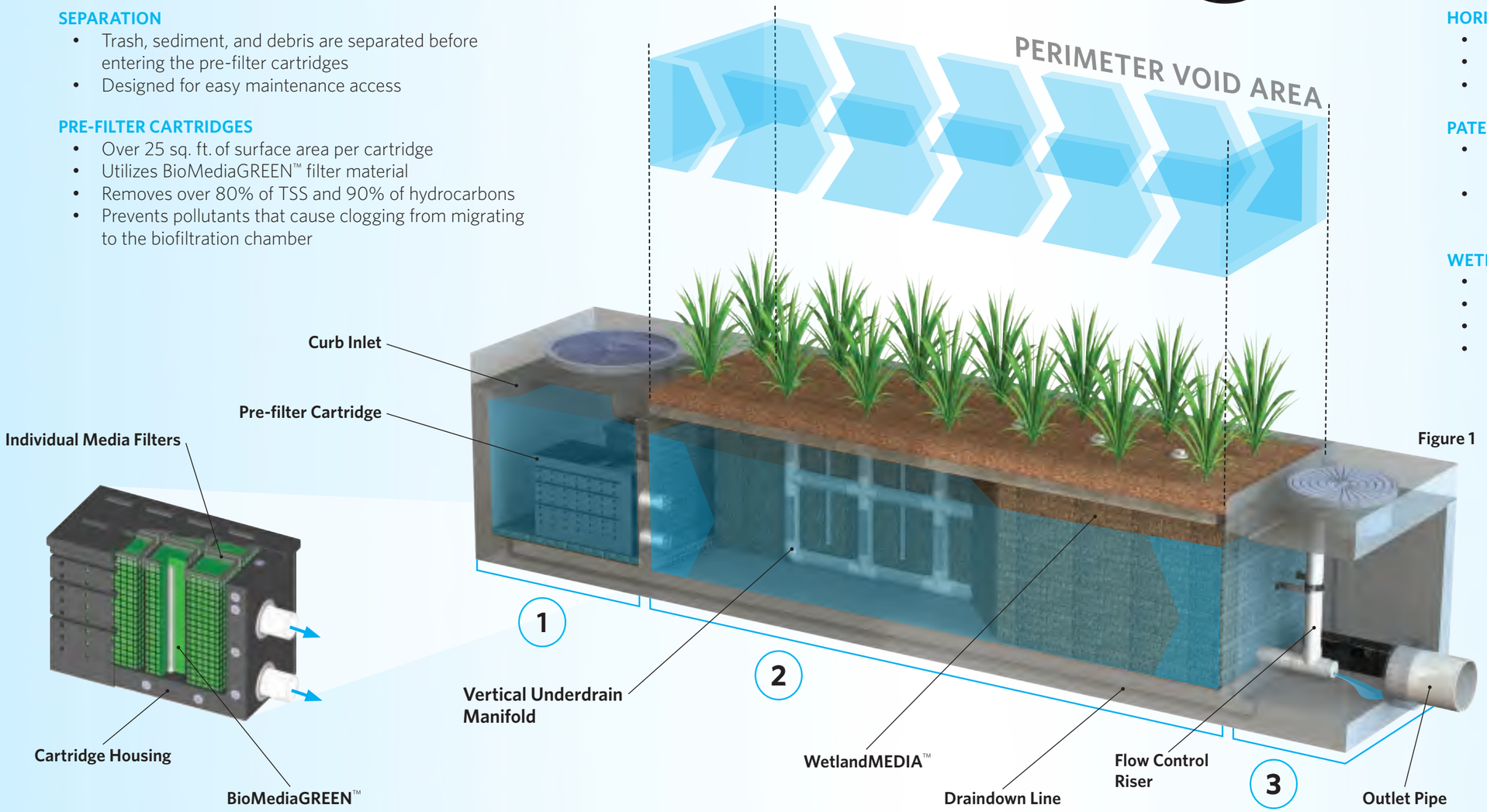


Figure 1

2 BIOFILTRATION

HORIZONTAL FLOW

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

PATENTED PERIMETER VOID AREA

- Vertically extends void area between the walls and the WetlandMEDIA™ on all four sides
- Maximizes surface area of the media for higher treatment capacity

WETLANDMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and lightweight

3 DISCHARGE

FLOW CONTROL

- Orifice plate controls flow of water through WetlandMEDIA™ to a level lower than the media's capacity
- Extends the life of the media and improves performance

DRAINDOWN FILTER

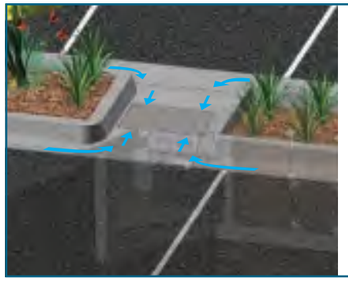
- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

CONFIGURATIONS

The Modular Wetlands® System Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

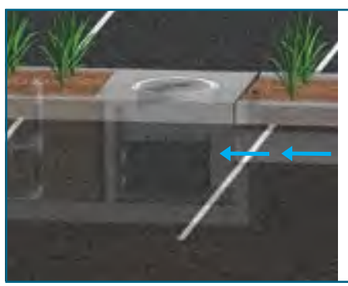
CURB TYPE

The Curb Type configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions. Length of curb opening varies based on model and size.



GRATE TYPE

The Grate Type configuration offers the same features and benefits as the Curb Type but with a grated/drop inlet above the systems pretreatment chamber. It has the added benefit of allowing pedestrian access over the inlet. ADA-compliant grates are available to assure easy and safe access. The Grate Type can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



VAULT TYPE

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pretreatment chamber, meaning the Modular Wetlands® can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/ bioretention systems. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

DOWNSPOUT TYPE

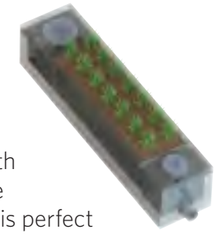
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

ORIENTATIONS

SIDE-BY-SIDE

The Side-By-Side orientation places the pretreatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.

END-TO-END



The End-To-End orientation places the pretreatment and discharge chambers on opposite ends of the biofiltration chamber, therefore minimizing the width of the system to 5 ft. (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is that bypass must be external.

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

The Side-By-Side orientation places the pretreatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pretreatment chamber directly to the discharge chamber.

EXTERNAL DIVERSION WEIR STRUCTURE

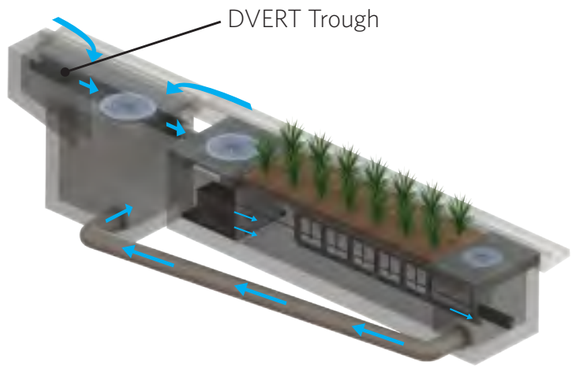
This traditional offline diversion method can be used with the Modular Wetlands® in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the Modular Wetlands® for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

FLOW-BY-DESIGN

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the Modular Wetlands® and into the standard inlet downstream.

DVERT LOW FLOW DIVERSION

This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the Modular Wetlands® via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over



to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the Modular Wetlands® to be installed anywhere space is available.

SPECIFICATIONS

FLOW-BASED DESIGNS

The Modular Wetlands® System Linear can be used in stand-alone applications to meet treatment flow requirements. Since the Modular Wetlands® is the only biofiltration system that can accept inflow pipes several feet below the surface, it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

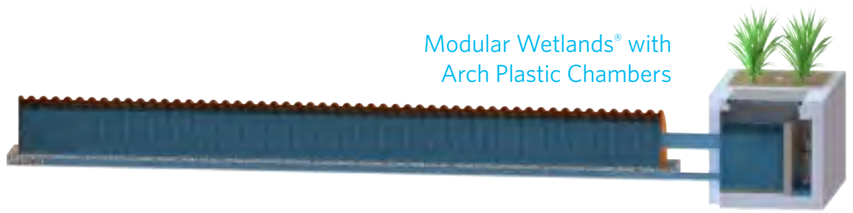
MODEL #	DIMENSIONS	WETLANDMEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4′ x 4′	23	0.052
MWS-L-4-6	4′ x 6′	32	0.073
MWS-L-4-8	4′ x 8′	50	0.115
MWS-L-4-13	4′ x 13′	63	0.144
MWS-L-4-15	4′ x 15′	76	0.175
MWS-L-4-17	4′ x 17′	90	0.206
MWS-L-4-19	4′ x 19′	103	0.237
MWS-L-4-21	4′ x 21′	117	0.268
MWS-L-6-8	7′ x 9′	64	0.147
MWS-L-8-8	8′ x 8′	100	0.230
MWS-L-8-12	8′ x 12′	151	0.346
MWS-L-8-16	8′ x 16′	201	0.462
MWS-L-8-20	9′ x 21′	252	0.577
MWS-L-8-24	9′ x 25′	302	0.693
MWS-L-10-20	10′ x 20′	302	0.693

VOLUME-BASED DESIGNS

HORIZONTAL FLOW BIOFILTRATION ADVANTAGE

Modular Wetlands® with Box Culvert Prestorage

The Modular Wetlands® System Linear offers a unique advantage in the world of biofiltration due to its exclusive horizontal flow design: Volume-Based Design. No other biofilter has the ability to be placed downstream of detention ponds, extended dry detention basins, underground storage systems and permeable paver reservoirs. The systems horizontal flow configuration and built-in orifice control allows it to be installed with just 6" of fall between inlet and outlet pipe for a simple connection to projects with shallow downstream tie-in points. In the example above, the Modular Wetlands® is installed downstream of underground box culvert storage. Designed for the water quality volume, the Modular Wetlands® will treat and discharge the required volume within local draindown time requirements.



Modular Wetlands® with Arch Plastic Chambers

DESIGN SUPPORT

Bio Clean engineers are trained to provide you with superior support for all volume sizing configurations throughout the country. Our vast knowledge of state and local regulations allow us to quickly and efficiently size a system to maximize feasibility. Volume control and hydromodification regulations are expanding the need to decrease the cost and size of your biofiltration system. Bio Clean will help you realize these cost savings with the Modular Wetlands®, the only biofilter than can be used downstream of storage BMPs.

ADVANTAGES

- LOWER COST THAN FLOW-BASED DESIGN
- MEETS LID REQUIREMENTS
- BUILT-IN ORIFICE CONTROL STRUCTURE
- WORKS WITH DEEP INSTALLATIONS

APPLICATIONS

The Modular Wetlands® System Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

INDUSTRIAL

Many states enforce strict regulations for discharges from industrial sites. The Modular Wetlands® has helped various sites meet difficult EPA-mandated effluent limits for dissolved metals and other pollutants.

RESIDENTIAL

Low to high density developments can benefit from the versatile design of the Modular Wetlands®. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

STREETS

Street applications can be challenging due to limited space. The Modular Wetlands® is very adaptable, and it offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

PARKING LOTS

Parking lots are designed to maximize space and the Modular Wetlands'® 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

COMMERCIAL

Compared to bioretention systems, the Modular Wetlands® can treat far more area in less space, meeting treatment and volume control requirements.

MIXED USE

The Modular Wetlands® can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications include:

• Agriculture • Reuse • Low Impact Development • Waste Water

PLANT SELECTION

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the Modular Wetlands® System Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade, the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the Modular Wetlands®, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the Modular Wetlands'® micro/macro flora and fauna.

A wide range of plants are suitable for use in the Modular Wetlands®, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

INSTALLATION

The Modular Wetlands® is simple, easy to install, and has a space-efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles precast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians is available to supervise installations and provide technical support.

MAINTENANCE

Reduce your maintenance costs, man hours, and materials with the Modular Wetlands®. Unlike other biofiltration systems that provide no pretreatment, the Modular Wetlands® is a self-contained treatment train which incorporates simple and effective pretreatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long-term operation, and there is absolutely no need to replace expensive biofiltration media.

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

July 2017

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment

    - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment

    - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment

    - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

    - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
    - Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
    - Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

    - Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
    - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
    - Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
    - Standing water remains in the vault between rain events, or
    - Bypass occurs during storms smaller than the design storm.
    - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
    - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Modular Wetland Systems, Inc.
Applicant's Address:	*PO. Box 869* *Oceanside, CA 92054*

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

<u>Laboratory Testing</u>

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:

Applicant: Zach Kent
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398 Vi9a El Centro
Oceanside, CA 92058
zach.kent@forterrabp.com

Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	**Revision**
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)

Biofiltration Criteria Checklist

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

1	**Biofiltration BMPs shall be allowed to be used only as described in the BMP selection process based on a documented feasibility analysis.** Intent: This manual defines a specific prioritization of pollutant treatment BMPs, where BMPs that retain water (retained includes evapotranspired, infiltrated, and/or harvested and used) must be used before considering BMPs that have a biofiltered discharge to the MS4 or surface waters. Use of a biofiltration BMP in a manner in conflict with this prioritization (i.e., without a feasibility analysis justifying its use) is not permitted, regardless of the adequacy of the sizing and design of the system.	
□	The project applicant has demonstrated that it is not technically feasible to retain the full DCV onsite.	Document feasibility analysis and findings in the PDP SWQMP. Applicant must include harvest and use feasibility and infiltration feasibility in the PDP SWQMP
2	**Biofiltration BMPs must be sized using acceptable sizing methods.** Intent: The MS4 Permit and this manual defines specific sizing methods that must be used to size biofiltration BMPs. Sizing of biofiltration BMPs is a fundamental factor in the amount of storm water that can be treated and also influences volume and pollutant retention processes.	
□	The project applicant has demonstrated that biofiltration BMPs are sized to meet one of the biofiltration sizing options available (Appendix B.5).	Submit sizing worksheets (Appendix B.5) or other equivalent documentation (such as results derived from continuous simulation calculations of treatment volume, retention, etc.) with the PDP SWQMP.
3	**Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.** Intent: Various decisions about BMP placement and design influence how much water is retained via infiltration and evapotranspiration. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention (evapotranspiration and infiltration) of storm water volume.	
□	The biofiltration BMP is sited to allow for maximum infiltration of runoff volume based on the feasibility factors considered in site planning efforts. It is also designed to maximize evapotranspiration through the use of amended media and plants.	Document site planning and feasibility analyses in PDP SWQMP per Section 5.4.
□	The biofiltration BMP meets the volume retention performance standard specified in Table B.5-1 in Appendix B.5.	Included documentation in the PDP SWQMP using worksheets in Appendix B.5 that show that the volume retention performance standard is met. Note, retention depth profiles that are too shallow or too deep may not be acceptable.

□	An impermeable liner or other hydraulic restriction layer on the bottom of the BMP is only used when needed to avoid geotechnical and/or subsurface contamination issues in locations identified as "No Infiltration Condition."	If using an impermeable liner or hydraulic restriction layer, provide documentation of feasibility findings per Appendix C that recommend the use of this feature.
4	**Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control processes, and minimize potential for pollutant washout.** Intent: Various decisions about biofiltration BMP design influence the degree to which pollutants are retained. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention of storm water pollutants.	
□	Media selected for the biofiltration BMP meets minimum quality and material specifications per Appendix F.3 or County LID Manual, including the maximum allowable design filtration rate and minimum thickness of media. OR Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in Appendix F.3 or County LID Manual, field scale testing data are provided to demonstrate that proposed media meets the pollutant treatment performance criteria in Section F.1 below.	Provide documentation that media meets the specifications in Appendix F.3 or County LID Manual. Provide documentation of performance information as described in Section F.1.
□	To the extent practicable, filtration rates are outlet controlled (e.g., via an underdrain and orifice/weir) instead of controlled by the infiltration rate of the media.	Include outlet control in designs or provide documentation of why outlet control is not practicable.
□	Surface ponding is limited to 24 hours from the end of storm event flow to preserve plant health and promote healthy soil structure.	Include calculations to demonstrate that drawdown rate is adequate. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.
□	If nutrients are a pollutant of concern, design of the biofiltration BMP follows nutrient-sensitive design criteria.	Follow specifications for nutrient sensitive design in Fact Sheet BF-2. Or provide alternative documentation that nutrient treatment is addressed and potential for nutrient release is minimized.
□	Media gradation calculations demonstrate that migration of media between layers will be prevented and permeability will be preserved.	Follow specification for choking layer in Fact Sheet PR-1 or BF-1. Or include calculations to demonstrate that choking layer is appropriately specified.

5	**Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.** Intent: Biological processes are an important element of biofiltration performance and longevity.	
☐	Plants have been selected to be tolerant of project climate, design ponding depths and the treatment media composition.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.26.
☐	Plants have been selected to minimize irrigation requirements.	Provide documentation describing irrigation requirements for establishment and long term operation.
☐	Plant location and growth will not impede expected long-term media filtration rates and will enhance long term infiltration rates to the extent possible.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.26.
6	**Biofiltration BMPs must be designed with a hydraulic loading rate to prevent erosion, scour, and channeling within the BMP.** Intent: Erosion, scour, and/or channeling can disrupt treatment processes and reduce biofiltration effectiveness.	
☐	Scour protection has been provided for both sheet flow and pipe inflows to the BMP, where needed.	Provide documentation of scour protection as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☐	Where scour protection has not been provided, flows into and within the BMP are kept to non-erosive velocities.	Provide documentation of design checks for erosive velocities as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☐	For proprietary BMPs, the BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification[21] (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).	Provide copy of manufacturer recommendations and conditions of third-party certification.

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

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

Modular Wetland System - Linear® Plants for Hardy Zone 10

Common Name ***Latin Name***	**Light Exposure**	**Hardy Range**	**Height**	**Flower Color**
canna, canna tropicana, canna lilly *Canna X generalis*	full sun to partial shade	USDA Zones 8-11	2.5 to 8 feet	yellow, orange, red
Lily-of-the-Nile, African Lily, African Blue Lily *Agapanthus spp*	full sun to partial shade	USDA Zones 8-11	2 to 4 feet	blue
Vetiveria zizanioides (L.) Nash Vetiver Grass	full sun	USDA Zones 5-11	2 to 8 feet	green
giant wild rye *Leymus condensatus*	full sun	USDA Zones 3-11	4 to 8 feet	brown
society garlic, pink agapanthus *Tulbaghia violacea*	full sun to full shade	USDA Zones 7-10	1.5 to 3 feet	lavender
Gulf muhlygrass, mist grass, hairawn muhly *Muhlenbergia capillaris*	full sun to partial shade	USDA Zones 5-10	2 to 3 feet	pinkish purple
Lindheimer's muhlygrass, blue muhlygrass *Muhlenbergia lindheimeri*	full sun	USDA Zones 7-11	2 to 4 feet	purple to gray
horsetail, scouring rush, E. prealtum *Equisetum hyemale*	full sun to light shade	USDA Zones 3-11	2 to 4 feet	n/a
cattail, reed-mace *Typha latifolia*	full sun	USDA Zones 2-11	3 to 9 feet	brown
papyrus, Egyptian papyrus, bulrushes *Cyperus papyrus*	full sun to partial shade	USDA Zones 9-11	2 to 10 feet	white
lavender *Lavandula L.*	sun	USDA Zones 5-10	1 to 2 feet	purple

palm sedge *Carex phyllocephala*	full sun to full shade	USDA Zones 7-10	1 to 2 feet	green
lemongrass, oil grass *Cymbopogon citratus*	full sun to partial shade	USDA Zones 10-11	4 to 6 feet	n/a
umbrella sedge, umbrella plant *Cyperus involucratus*	full sun to partial shade	USDA Zones 8-11	2 to 6 feet	green/white
feather grass, Mexican needle grass *Nassella tenuissima*	full sun to partial shade	USDA Zones 7-11	2 to 3 feet	green/brown
sea oats, Chasmanthium paniculatum *Uniola paniculata*	full sun to partial shade	USDA Zones 6-10	3 to 6 feet	golden/brown
Cape lily, Powell's crinum lily *Crinum X powellii*	full sun to partial shade	USDA Zones 6-11	3 to 4 feet	white/pink
African iris, fortnight lily, morea iris *Dietes iridioides*	full sun to partial shade	USDA Zones 8-10	2 to 4 feet	white/purple
whirling butterflies, white gaura *Gaura lindheimeri*	full sun to partial shade	USDA Zones 5-10	2 to 4 feet	white/pink
daylily *Hemerocallis hybrids*	full sun to partial shade	USDA Zones 2-10	1 to 3.5 feet	various
Adam's needle, bear grass, weak-leaf yucca *Yucca filamentosa*	full sun	USDA Zones 5-10	3 to 5 feet	white
brome hummock sedge *carex bromoides*	full sun to partial shade	USDA Zones 2-10	1 ft	green

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The Modular Wetland System - Linear® standard 22' long system will require 18 to 20 plants. Different size systems will require different plant quanitities; please contact us for detailed information.

The plants listed are tolerant to drought and have deep roots to allow for ehanced pollutant removal.

These plants are subject to availability in local areas. If you would like to use a different plant please contact us. We will work with you to ensure the chosen plants work with the projects current landscape theme.

The Modular Wetland System - Linear® should be irrigated like any other planter area. The plants in the system must receive adequate irrigation to ensure plant survival during periods of drier weather. As with all landscape areas the plants within the Modular Wetland System - Linear will require more frequent watering during the establishment period.

For more information please contact at: 760-433-7640 or email: info@modularwetlands.com

E.18 BF-1 Biofiltration

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

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

Description

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

Typical bioretention with underdrain components include:

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

Design Adaptations for Project Goals

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

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

Recommended Siting Criteria

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

Example Schematic Design – Plan and Section View

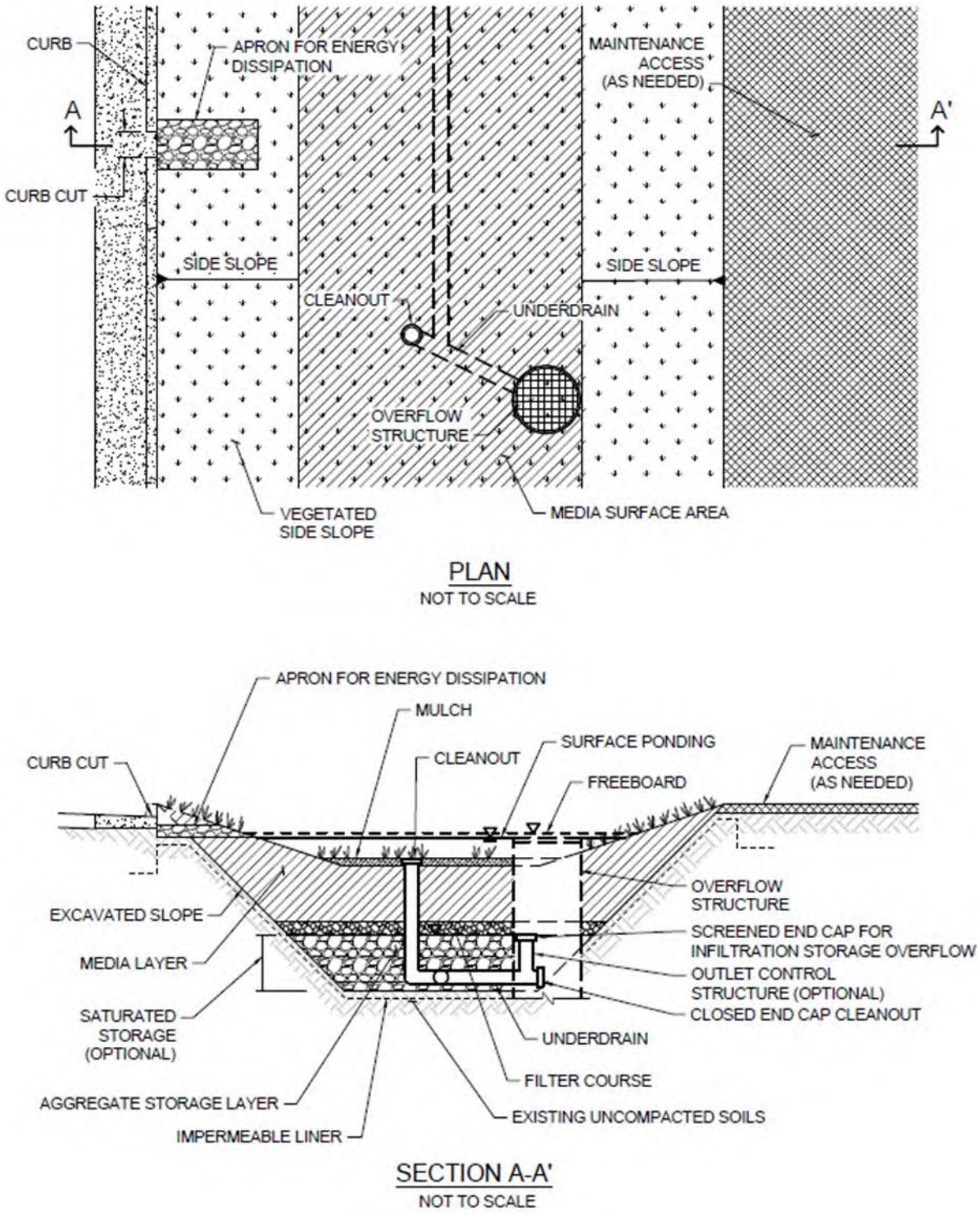

Figure E.18-1 : Typical Plan and Section View of a Biofiltration BMP

Recommended BMP Component Dimensions

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

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

Design Criteria and Considerations

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

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

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

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

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

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

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

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

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

E.19 BF-2 Nutrient Sensitive Media Design

Some studies of bioretention with underdrains have observed export of nutrients, particularly inorganic nitrogen (nitrate and nitrite) and dissolved phosphorus. This has been observed to be a short-lived phenomenon in some studies or a long term issue in some studies. The composition of the soil media, including the chemistry of individual elements is believed to be an important factor in the potential for nutrient export. Organic amendments, often compost, have been identified as the most likely source of nutrient export. The quality and stability of organic amendments can vary widely.

The biofiltration media specifications contained in **Appendix F.3** and the County of San Diego Low Impact Development Handbook: Appendix G -Bioretention Soil Specification (June 2014, unless superseded by more recent edition) were developed with consideration of the potential for nutrient export. These specifications include criteria for individual component characteristics and quality in order to control the overall quality of the blended mixes.

The City and County specifications noted above were developed for general purposes to meet permeability and treatment goals. In cases where the BMP discharges to receiving waters with nutrient impairments or nutrient TMDLs, the biofiltration media should be designed with the specific goal of minimizing the potential for export of nutrients from the media. Therefore, in addition to adhering to the City or County media specifications, the following guidelines should be followed:

1. **Select plant palette to minimize plant nutrient needs**
   A landscape architect or agronomist should be consulted to select a plant palette that minimizes nutrient needs. Utilizing plants with low nutrient needs results in less need to enrich the biofiltration soil mix. If nutrient quantity is then tailored to plants with lower nutrient needs, these plants will generally have less competition from weeds, which typically need higher nutrient content. The following practices are recommended to minimize nutrient needs of the plant palette:
   - **Utilize native, drought-tolerant plants and grasses where possible.** Native plants generally have a broader tolerance for nutrient content, and can be longer lived in leaner/lower nutrient soils.
   - **Start plants from smaller starts or seed.** Younger plants are generally more tolerant of lower nutrient levels and tend to help develop soil structure as they grow. Given the lower cost of smaller plants, the project should be able to accept a plant mortality rate that is somewhat higher than starting from larger plants and providing high organic content.
2. **Minimize excess nutrients in media mix**
   Once the low-nutrient plant palette is established (item 1), the landscape architect and/or agronomist should be consulted to assist in the design of a biofiltration media to balance the interests of plant establishment, water retention capacity (irrigation demand), and the potential for nutrient export. The following guidelines should be followed:
   - **The mix should not exceed the nutrient needs of plants**. In conventional landscape design, the nutrient needs of plants are often exceeded intentionally in order to provide a factor of safety for plant survival. This practice must be avoided in biofiltration media as excess nutrients will increase the chance of export. The mix designer should keep in mind that nutrients can be added later (through mulching,

tilling of amendments into the surface), but it is not possible to remove nutrients, once added.

- **The actual nutrient content and organic content of the selected organic amendment source should be determined when specifying mix proportions.** Nutrient content (i.e., C:N ratio; plant extractable nutrients) and organic content (i.e, % organic material) are relatively inexpensive to measure via standard agronomic methods and can provide important information about mix design. If mix design relies on approximate assumption about nutrient/organic content and this is not confirmed with testing (or the results of prior representative testing), it is possible that the mix could contain much more nutrient than intended.
- **Nutrients are better retained in soils with higher cation exchange capacity.** Cation exchange capacity can be increased through selection of organic material with naturally high cation exchange capacity, such as peat or coconut coir pith, and/or selection of inorganic material with high cation exchange capacity such as some sands or engineered minerals (e.g., low P-index sands, zeolites, rhyolites, etc). Including higher cation exchange capacity materials would tend to reduce the net export of nutrients. Natural silty materials also provide cation exchange capacity; however potential impacts to permeability need to be considered.
- **Focus on soil structure as well as nutrient content.** Soil structure is loosely defined as the ability of the soil to conduct and store water and nutrients as well as the degree of aeration of the soil. Soil structure can be more important than nutrient content in plant survival and biologic health of the system. If a good soil structure can be created with very low amounts of organic amendment, plants survivability should still be provided. While soil structure generally develops with time, biofiltration media can be designed to promote earlier development of soil structure. Soil structure is enhanced by the use of amendments with high humus content (as found in well-aged organic material). In addition, soil structure can be enhanced through the use of organic material with a distribution of particle sizes (i.e., a more heterogeneous mix).
- **Consider alternatives to compost.** Compost, by nature, is a material that is continually evolving and decaying. It can be challenging to determine whether tests previously done on a given compost stock are still representative. It can also be challenging to determine how the properties of the compost will change once placed in the media bed. More stable materials such as aged coco coir pith, peat, biochar, shredded bark, and/or other amendments should be considered.

With these considerations, it is anticipated that less than 10 percent organic amendment by volume could be used, while still balancing plant survivability and water retention. If compost is used, designers should strongly consider utilizing less than 10 percent by volume.

3. **Design with partial retention and/or internal water storage**
   An internal water storage zone, as described in Fact Sheet PR-1 is believed to improve retention of nutrients. For lined systems, an internal water storage zone worked by providing a zone that fluctuates between aerobic and anaerobic conditions, resulting in nitrification/denitrification. In soils that will allow infiltration, a partial retention design (PR-1) allows significant volume reduction and can also promote nitrification/denitrification.

Acknowledgment: This fact sheet has been adapted from the Orange County Technical Guidance Document (May 2011). It was originally developed based on input from: Deborah Deets, City of Los Angeles Bureau of Sanitation, Drew Ready, Center for Watershed Health, Rick Fisher, ASLA, City of Los

Angeles Bureau of Engineering, Dr. Garn Wallace, Wallace Laboratories, Glen Dake, GDML, and Jason Schmidt, Tree People. The guidance provided herein does not reflect the individual opinions of any individual listed above and should not be cited or otherwise attributed to those listed.

E.20 BF-3 Proprietary Biofiltration Systems

The purpose of this fact sheet is to help explain the potential role of proprietary BMPs in meeting biofiltration requirements, when full retention of the DCV is not feasible. The fact sheet does not describe design criteria like the other fact sheets in this appendix because this information varies by BMP product model.

Criteria for Use of a Proprietary BMP as a Biofiltration BMP

A proprietary BMP may be acceptable as a "biofiltration BMP" under the following conditions:

1. The BMP meets the minimum design criteria listed in **Appendix F**, including the selection criteria and pollutant treatment performance standard in **Appendix F.1**;
2. The BMP meets the performance standard for compact BMPs in **Table B.5-1** in **Appendix B.5**;
3. The BMP is designed and maintained in a manner consistent with its performance certifications (See explanation in **Appendix F.2**); and
4. The BMP is acceptable at the discretion of the City Engineer. In determining the acceptability of a BMP, the City Engineer should consider, as applicable, (a) the data submitted; (b) representativeness of the data submitted; (c) consistency of the BMP performance claims with pollutant control objectives; certainty of the BMP performance claims; (d) for projects within the public right of way and/or public projects: maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business; and (e) other relevant factors. If a proposed BMP is not accepted by the City Engineer, a written explanation/reason will be provided to the applicant.

Guidance for Sizing a Proprietary BMP as a Biofiltration BMP

Proprietary biofiltration BMPs must meet the same sizing guidance as non-proprietary BMPs. Sizing is typically based on capturing and treating 1.50 times the DCV not reliably retained. Guidance for sizing biofiltration BMPs to comply with requirements of this manual is provided in **Appendix B.5** and **Appendix F.2**.

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Attachment 2
Backup for PDP Hydromodification Control Measures

This is the cover sheet for Attachment 2.

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

Project Name: Fenton Parkway Bridge

Indicate which Items are Included:

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

N/A HYDROMODFICIATION NOT REQUIRED

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Project Name: Fenton Parkway Bridge

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☑ Included ☐ Not applicable

ATTACHMENT 3A

MAINTENANCE AGREEMENT

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

Attachment 3: For private entity operation and maintenance, Attachment 3 must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☑ Vicinity map
- ☑ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☑ BMP and HMP location and dimensions
- ☑ BMP and HMP specifications/cross section/model
- ☑ Maintenance recommendations and frequency
- ☑ LID features such as (permeable paver and LS location, dim, SF).

WILL BE PROVIDED IN FINAL ENGINEERING

ATTACHMENT 3B

STRUCTURAL BMP MAINTENANCE THRESHOLDS AND ACTIONS

WILL BE PROVIDED IN FINAL ENGINEERING

General Maintenance Information

Maintenance of Structural BMP Basins (Biofiltration, Partial Infiltration, Infiltration):

Inspection. Perform inspections monthly of the basins for sediment/trash accumulation, inlet and outlet structures, vegetation health, basin erosion, and standing water in basins.

INSPECTION ITEMS	TYPICAL MAINTENANCE INDICATOR(S)	MAINTENANCE ACTIONS
Trash and Debris	Trash and debris accumulation in area.	Remove and dispose of properly.
Sedimentation	Accumulation of sediment. (Overflow inlets should be at least 6-inches above bottom of basin.)	Remove and properly dispose of accumulated materials, without damage to the vegetation. Maintain integrity of side slopes. Do not drive heavy equipment on bottom of basins. Use ramps for staging equipment.
Vegetation	Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans. Maintain vegetation health.
	Overgrown vegetation	Mow or trim as appropriate.
	Presence of weeds	Remove weeds.
Erosion	Erosion due to concentrated irrigation flow or storm water flow.	Inspect soil and repair/re-seed/re-plant eroded areas after big storm events or as needed. Repair energy dissipation (riprap or splashblock).
Inlet and Outlet Structures	Check for clogging.	Clear obstructions. Inspect underdrain via cleanout(s) and outlet structure. Remove removable orifice place on downstream end of underdrain and cleanout underdrain and replace orifice plate.
Standing Water (beyond 96 hours after a rain event)	Inspect perforated underdrain pipe using cleanout riser and inspect downstream connection.	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, unclogging perforated underdrain, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.

Bio Clean
A Forterra Company

Modular Wetlands® Linear

A Stormwater Biofiltration Solution

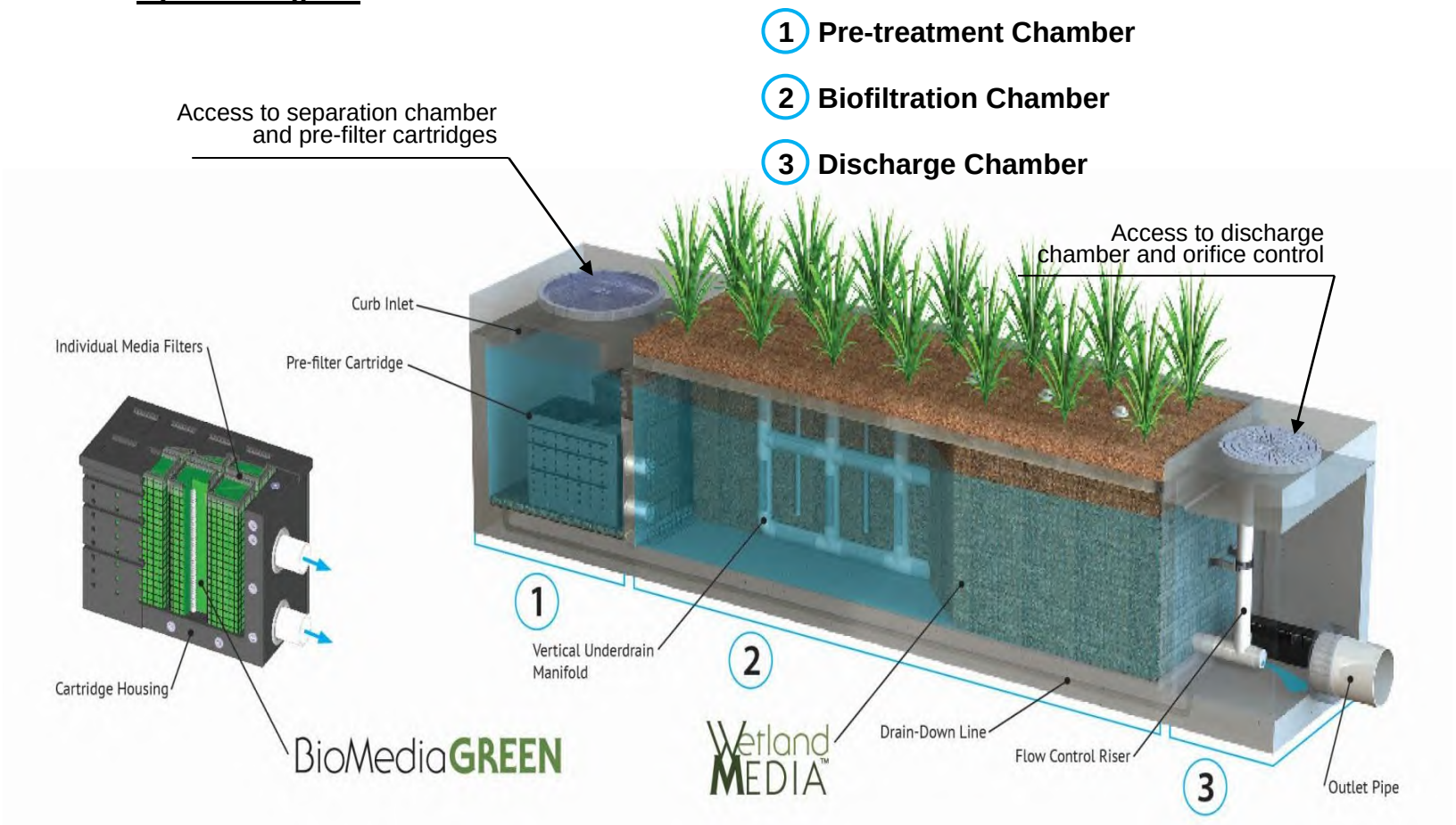
OPERATION & MAINTENANCE MANUAL

Inspection Guidelines for Modular Wetland System - Linear

Inspection Summary

- Inspect Pre-Treatment, Biofiltration and Discharge Chambers – average inspection interval is 6 to 12 months.
    - (1*5 minute average inspection time*).
- NOTE: Pollutant loading varies greatly from site to site and no two sites are the same. Therefore, the first year requires inspection monthly during the wet season and every other month during the dry season in order to observe and record the amount of pollutant loading the system is receiving.

System Diagram



Inspection Overview

As with all stormwater BMPs inspection and maintenance on the MWS Linear is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. This is recommended because pollutant loading and pollutant characteristics can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding on roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance a BMP will exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the MWS Linear:

- Modular Wetland Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- 7/16” open or closed ended wrench.
- Large permanent black marker (initial inspections only – first year)
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system.

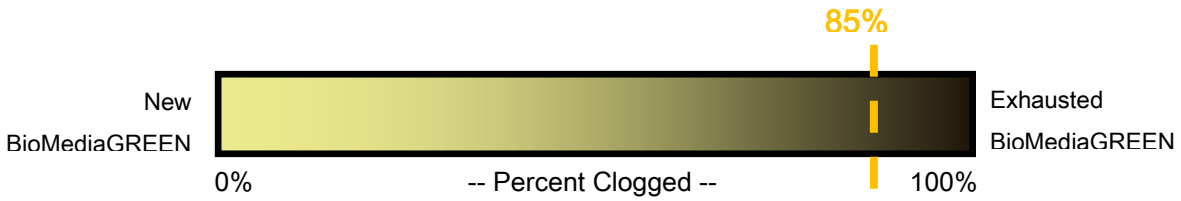
Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the MWS Linear are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long term inspection and maintenance interval requirements.

The MWS Linear can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

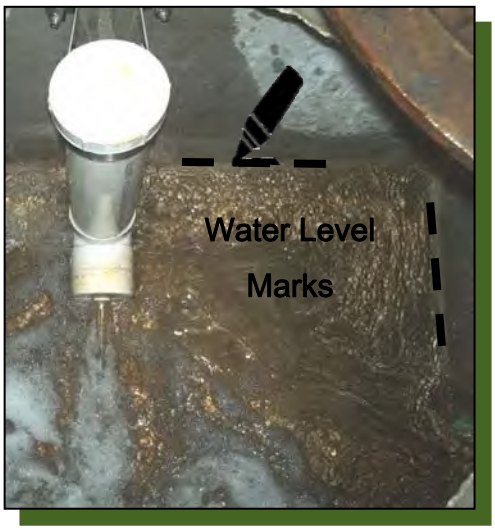
- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system and all of its chambers.
- Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, debris and sediment accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick estimate the amount of trash, debris and sediment in this chamber. Record this depth on the inspection form.

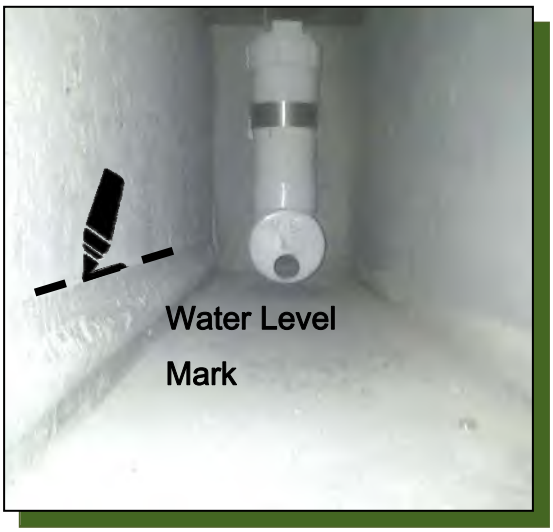
- Through visual observation inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediments on the cartridges, any build-up on the top of the cartridges, or clogging of the holes. Record this information on the inspection form. The pre-filter cartridges can further be inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber – see notes above regarding confined space entry). Record the color of the material. New material is a light green in color. As the media becomes clogged it will turn darker in color, eventually becoming dark brown or black. Using the below color indicator record the percentage of media exhausted.



- The biofiltration chamber is generally maintenance free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection and indicate through visual observation or digital photographs if trimming of the vegetation is needed.
- The discharge chamber houses the orifice control structure, drain down filter and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the Pre-Filter Cartridge as mentioned above. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL). The water level of the flowing water should be compared to the watermark level on the side walls which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form is there is any difference in level from watermark in inches.

- NOTE: During the first few storms the water level in the outflow chamber should be observed and a 6” long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where a line should be drawn. This line is a reference point for future inspections of the system:





Using a permanent marker draw a 6 inch long horizontal line, as shown, at the higher water level in the MWS Linear discharge chamber.

- Water level in the discharge chamber is a function of flow rate and pipe size. Observation of water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when system is at 100% capacity (water level at maximum level in pre-treatment chamber). If future water levels are below this mark when system is at 100% capacity this is an indicator that maintenance to the pre-filter cartridges may be needed.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatables in the pre-treatment chamber in which the length and width of the chamber is fully impacted more than 18”.

- Excessive accumulation of sediment in the pre-treatment chamber of more than 6” in depth.

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pre-filter cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged replacement is required.

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter. The following photos show of the condition of the BioMediaGREEN contained within the drain down filter. When media is more than 85% clogged replacement is required.

- Overgrown vegetation.

- Water level in discharge chamber during 100% operating capacity (pre-treatment chamber water level at max height) is lower than the watermark by 20%.

Inspection Notes

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

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

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

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

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

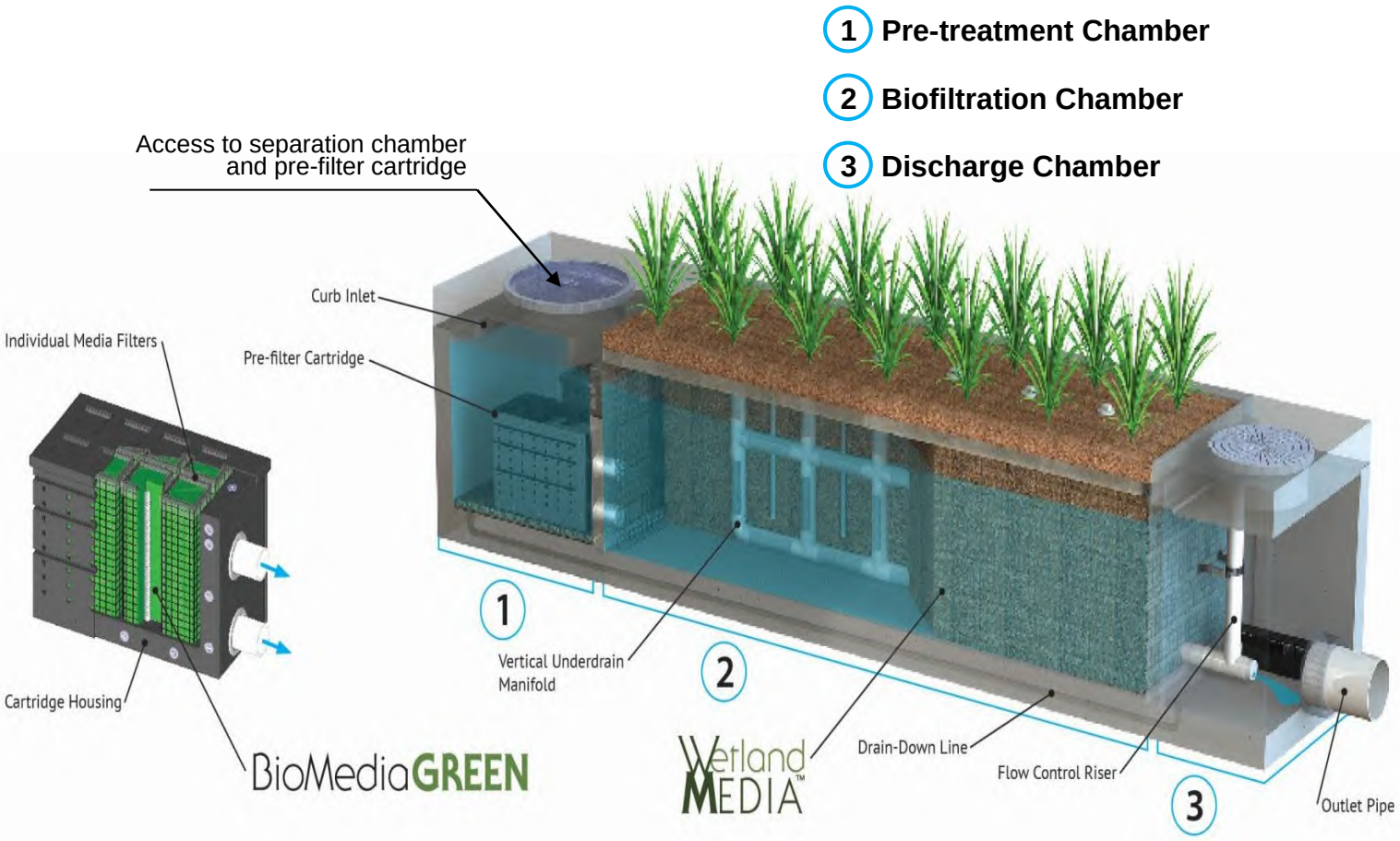
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Sediment from Pre-Treatment Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Pre-Filter Cartridge Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Overview

The time has come to maintain your Modular Wetland System Linear (MWS Linear). To ensure successful and efficient maintenance on the system we recommend the following. The MWS Linear can be maintained by removing the access hatches over the systems various chambers. All necessary pre-maintenance steps must be carried out before maintenance occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once traffic control has been set up per local and state regulations and access covers have been safely opened the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepare a pre-checks (OSHA, safety, confined space entry) are performed.

Maintenance Equipment

Following is a list of equipment required for maintenance of the MWS Linear:

- Modular Wetland Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight and eye protection.
- 7/16” open or closed ended wrench.
- Vacuum assisted truck with pressure washer.
- Replacement BioMediaGREEN for Pre-Filter Cartridges if required (order from manufacturer).

Maintenance Steps

1. Pre-treatment Chamber (bottom of chamber)

   A. Remove access hatch or manhole cover over pre-treatment chamber and position vacuum truck accordingly.
   B. With a pressure washer spray down pollutants accumulated on walls and pre-filter cartridges.
   C. Vacuum out Pre-Treatment Chamber and remove all accumulated pollutants including trash, debris and sediments. Be sure to vacuum the floor until pervious pavers are visible and clean.
   D. If Pre-Filter Cartridges require media replacement move onto step 2. If not, replace access hatch or manhole cover.

Removal of access hatch to gain access below.

Insertion of vacuum hose into separation chamber.

Removal of trash, sediment and debris.

Fully cleaned separation chamber.

2. Pre-Filter Cartridges (attached to wall of pre-treatment chamber)

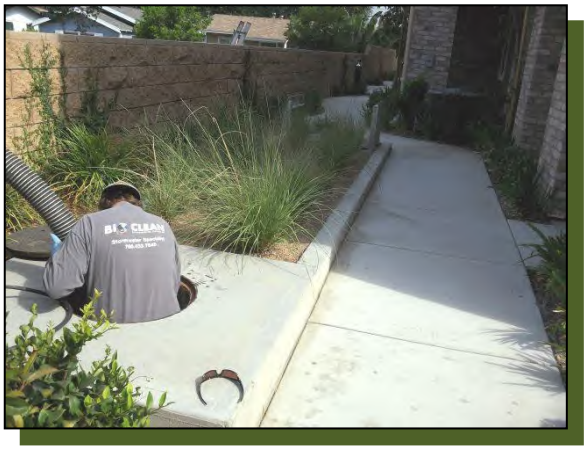
A. After finishing step 1 enter pre-treatment chamber.

B. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.

Pre-filter cartridges with tops on.

Inside cartridges showing media filters ready for replacement.

C. Place the vacuum hose over each individual media filter to suck out filter media.



Vacuuming out of media filters.

D. Once filter media has been sucked use a pressure washer to spray down inside of the cartridge and it's containing media cages. Remove cleaned media cages and place to the side. Once removed the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.

E. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture provided refilling trey and place on top of cartridge. Fill trey with new bulk media and shake down into place. Using your hands slightly compact media into each filter cage. Once cages are full removed refilling trey and replace cartridge top ensuring bolts are properly tightened.

Refilling trey for media replacement.

Refilling trey on cartridge with bulk media.

F. Exit pre-treatment chamber. Replace access hatch or manhole cover.

3. Biofiltration Chamber (middle vegetated chamber)

A. In general, the biofiltration chamber is maintenance free with the exception of maintaining the vegetation. Using standard gardening tools properly trim back the vegetation to healthy levels. The MWS Linear utilizes vegetation similar to surrounding landscape areas therefore trim vegetation to match surrounding vegetation. If any plants have died replace plants with new ones:

4. Discharge Chamber (contains drain down cartridge & connected to pipe)

A. Remove access hatch or manhole cover over discharge chamber.

B. Enter chamber to gain access to the drain down filter. Unlock the locking mechanism and left up drain down filter housing to remove used BioMediaGREEN filter block as shown below:

C. Insert new BioMediaGREEN filter block and lock drain down filter housing back in place. Replace access hatch or manhole cover over discharge chamber.

Inspection Notes

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

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

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

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

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

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

Inspection Form

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

www.modularwetlands.com

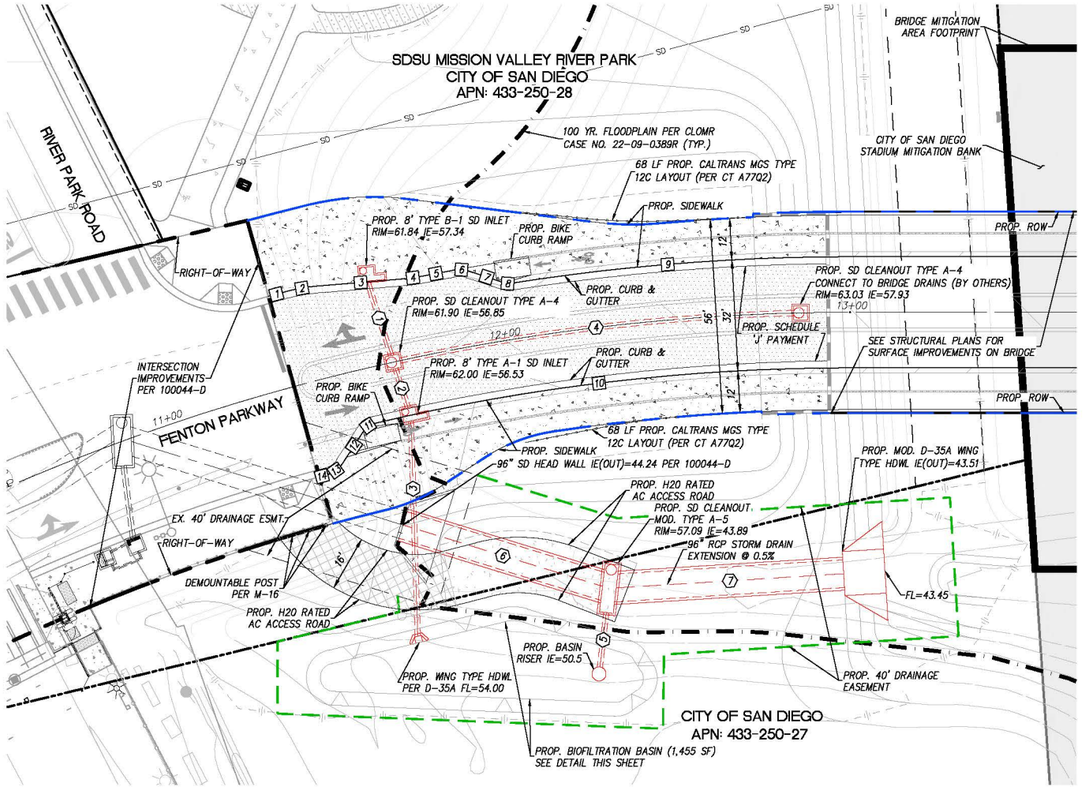
Maintenance Report

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

www.modularwetlands.com

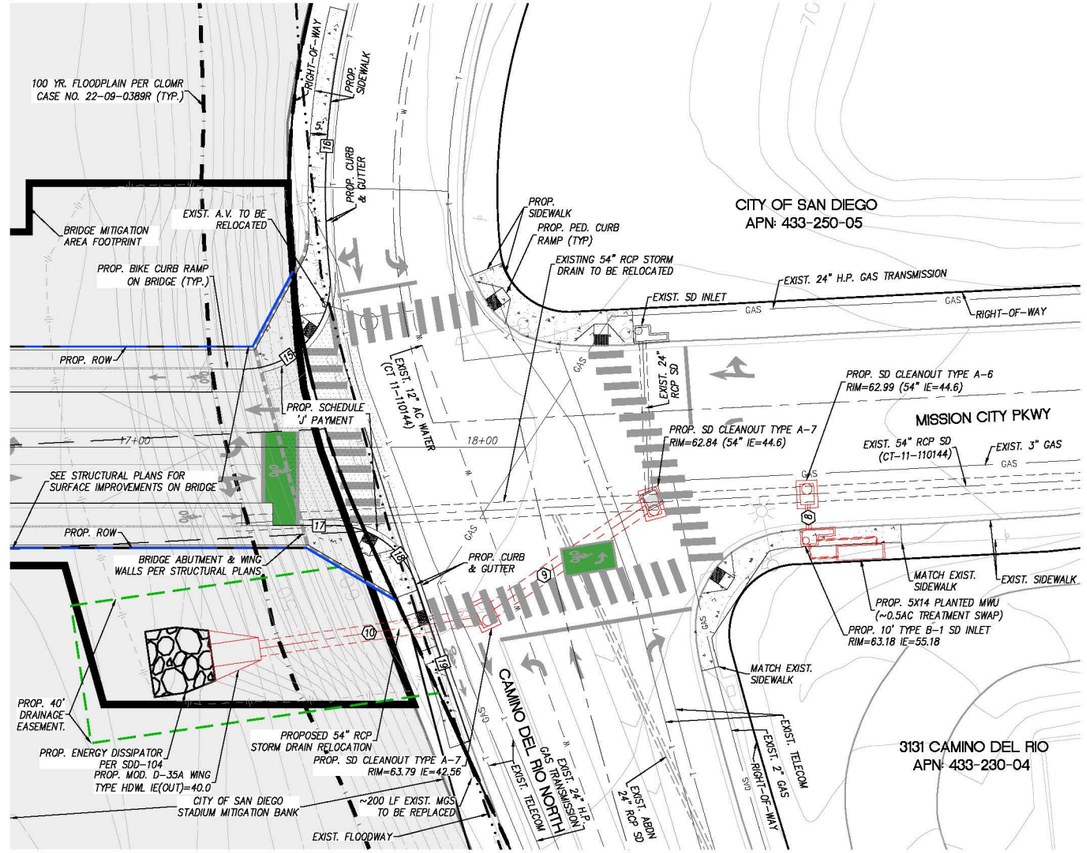
Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.



PLAN: FENTON PARKWAY (NORTH)

SCALE: 1" = 20'



PLAN: FENTON PARKWAY (SOUTH)

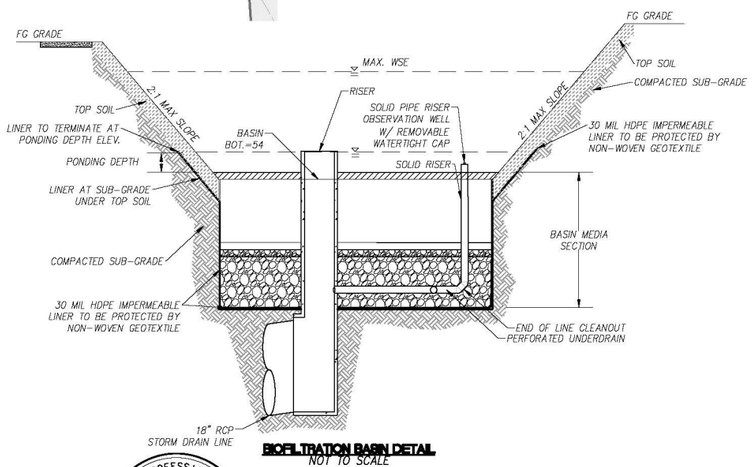
SCALE: 1" = 20'

STORM DRAIN DATA				
NO	BEARING/DELTA	RADIUS	LENGTH	NOTE
1	N 53°07'36" E	--	22.51'	18" RCP
2	N 53°07'36" E	--	11.80'	18" RCP
3	N 69°05'47" E	--	61.90'	18" RCP
4	Δ=10°44'16"	610.00'	114.32'	18" RCP
5	N 77°40'44" E	--	15.85'	18" RCP
6	N 01°59'27" W	--	60.04'	96" RCP
7	N 22°40'37" W	--	65.60'	96" RCP
8	N 68°00'00" E	--	7.37'	18" RCP
9	N 53°29'54" W	--	53.82'	54" RCP
10	N 27°16'38" W	--	63.66'	54" RCP

CURB DATA				
NO	BEARING/DELTA	RADIUS	LENGTH	REMARKS
1	Δ=00°25'00"	637.00'	4.63'	6" TYPE "H" C&G
2	Δ=09°58'38"	60.00'	10.45'	6" TYPE "H" C&G
3	N 23°55'07" W	--	23.58'	6" TYPE "H" C&G
4	Δ=06°19'59"	60.00'	6.63'	6" TYPE "H" C&G
5	Δ=00°36'43"	632.50'	6.76'	6" TYPE "H" C&G
6	Δ=28°27'05"	8.00'	3.97'	6" TYPE "H" C&G
7	N 00°59'51" W	--	11.24'	6" TYPE "H" C&G
8	Δ=27°04'24"	3.00'	1.42'	6" TYPE "H" C&G
9	Δ=08°21'49"	626.00'	91.38'	6" TYPE "H" C&G
10	Δ=12°43'07"	594.00'	131.86'	6" TYPE "H" C&G
11	Δ=42°51'55"	3.00'	2.24'	6" TYPE "H" C&G
12	N 75°56'58" W	--	11.93'	6" TYPE "H" C&G
13	Δ=41°53'31"	8.00'	5.85'	6" TYPE "H" C&G
14	Δ=00°16'43"	583.00'	2.84'	6" TYPE "H" C&G
15	Δ=83°45'54"	25.00'	36.55'	6" TYPE "H" C&G
16	Δ=23°45'50"	221.09'	76.03'	6" TYPE "H" C&G
17	N 19°04'34" W	--	8.56'	6" TYPE "H" C&G
18	Δ=71°10'52"	25.00'	31.06'	6" TYPE "H" C&G
19	N 52°06'18" E	--	47.80'	6" TYPE "H" C&G

20 10 0 20 40 60

SCALE: 1"=20'



BIOFILTRATION BASIN DETAIL
NOT TO SCALE

NOTE:
FOR PROPOSED SIGNING AND STRIPING, SEE FENTON PARKWAY BRIDGE STRIPING CONCEPT.

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

REGISTERED PROFESSIONAL ENGINEER
MARTIN J. JONES
No. 78492
CIVIL
STATE OF CALIFORNIA

MARTIN J. JONES, R.C.E. 78492 DATE

DESIGNED BY: TAA

PRIVATE CONTRACT

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

IMPROVEMENT PLAN FOR:

FENTON PARKWAY BRIDGE OVER SAN DIEGO RIVER

FENTON PARKWAY BETWEEN RIVER PARK RD & CAMINO DEL RIO NORTH

DEVELOPMENT SERVICES DEPARTMENT
SHEET XX OF XX SHEETS

PMT NO.

APPROVED:
FOR CITY ENGINEER DATE

PRJ NO. XXXXXXX

DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	PDC		

XXXX-XXXX
NAD83 COORDINATES

XXX-XXXX
LAMBERT COORDINATES

AS BUILTS

CONTRACTOR DATE STARTED
INSPECTOR DATE COMPLETED

DRAWING NO. XXXXXX-XX-D C3

30% PLAN(S) - NOT FOR CONSTRUCTION

File Name P:\4497.00\Engr\Exhibits\Prelim Fenton Bridge\Fenton Bridge_Prelim.dwg, Date Last Saved 5/16/2023 10:40:37 AM, Date Plotted Last 5/16/2023 10:49:31 AM

Project Name: Fenton Parkway Bridge

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. Broucher photocopies are not allowed.

Attachment 5
Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

PRELIMINARY DRAINAGE REPORT
Fenton Parkway Bridge
City of San Diego, CA
~~March 23, 2023~~
June 19, 2024
PRJ#~~XXXXXX~~RD3200

Prepared For:

Robert Schultz
5500 Campanile Drive
San Diego, CA 92182
Phone: 619-594-6017

Prepared By:

PROJECT DESIGN CONSULTANTS
a Bowman company

701 B Street, Suite 800
San Diego, CA 92101
619.235.6471

PDC Job No. 4497

Prepared by: J. Maynard
Under the supervision of

_____
Chelisa Pack, PE RCE 71026
Registration Expires 06/30/25

TABLE OF CONTENTS

TABLES

APPENDICES

1. INTRODUCTION

This preliminary drainage report has been prepared in support of the preliminary 30% design submittal for the Fenton Parkway Bridge development (the Project), which is located in the City of San Diego, California. The purpose of this report is to determine the hydrologic impact, if any, to the existing storm drain facilities or natural drainage, and to provide peak 100-year discharge values for the project.

The drainage analysis presented herein reflects a preliminary 30% design level-of-effort, which includes peak 100-year storm event hydrologic analyses using preliminary grades. Hydraulic analyses for inlets, pipe sizes and inverts, and HGL's will be provided during final engineering. Therefore, the purpose of this report submittal is to acquire from the City of San Diego: 1) concept approval of the proposed storm drain layout, 2) approval of the methodology used in the evaluation of the project storm drain system hydrology, and 3) identification of critical path drainage issues that need to be addressed during final engineering.

The Fenton Parkway Bridge Project is a bridge proposed to connect Fenton Parkway, which currently terminates north of the river channel, with Camino del Rio North, south of the river channel. The Fenton Parkway bridge (bridge) would span the San Diego River (river) in the Mission Valley community of the City of San Diego (City). The proposed bridge will be constructed on real property owned by the City of San Diego and upon the completion of construction, the City of San Diego will own, operate, and maintain the proposed bridge.

The proposed bridge is located in the northeast portion of the Mission Valley Community, in the central portion of the City of San Diego metropolitan area.

The vicinity map is shown in Figure 1.

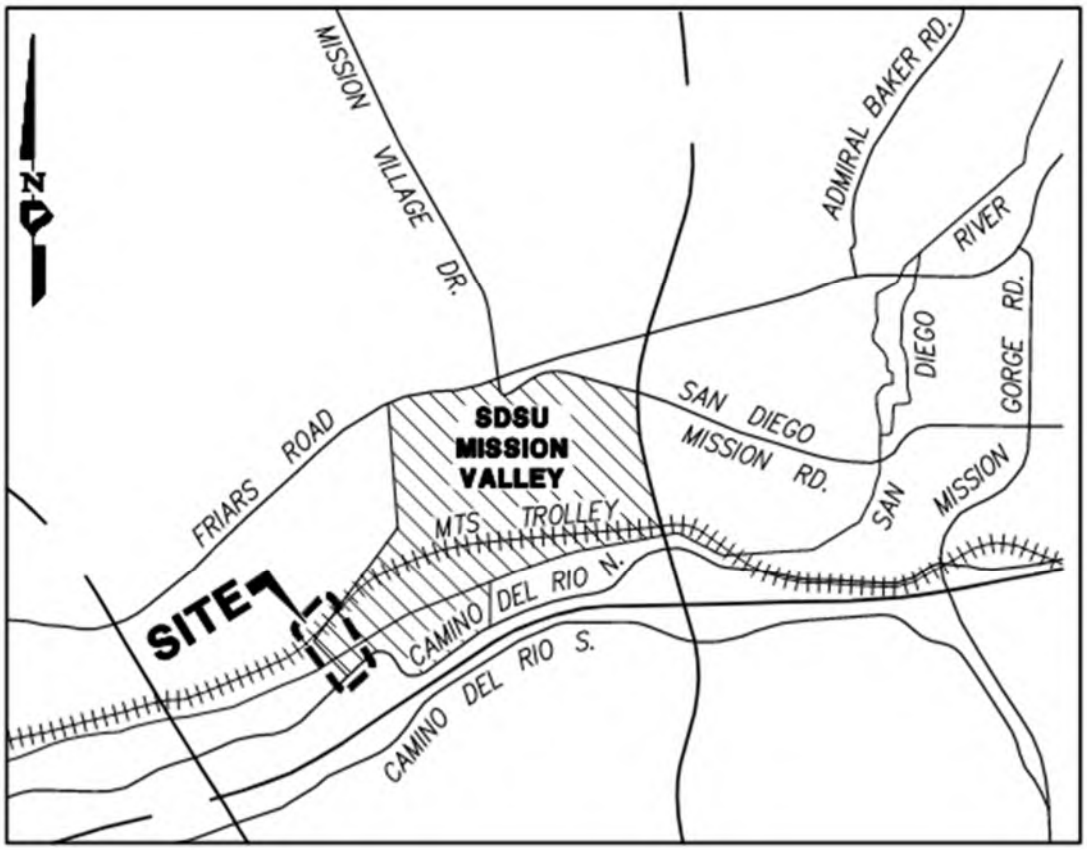


Figure 1: Vicinity Map

Treatment of onsite storm water of the buildings prior to discharging into the downstream systems will be facilitated by a single biofiltration basin and a modular wetland unit. For a detailed discussion of the project's stormwater quality BMPs, refer to the Preliminary Stormwater Quality Management Plan (SWQMP) report. The final post-construction BMP design will be provided during final engineering.

This project is subject to the Clean Water Act (CWA) Sections 401 and 404 since there will be filling of material into an existing riparian streambed which converges with the San Diego River. Drainage from an existing storm drain system along Fenton Parkway and Mission City Parkway discharge into this streambed.

The project's storm drain system will discharge into the San Diego River. Refer to the FEMA Firm Panel in Appendix 1. FEMA shaded Zone AE and Zone X areas exist along the boundary of the project improvements.

2. EXISTING AND PROPOSED DRAINAGE PATTERNS AND IMPROVEMENTS

The following sections provide descriptions of the existing and proposed drainage patterns and improvements for the project.

2.1 Existing Drainage Patterns

There are two discharge locations for this project's drainage which are an existing 8'x7' reinforced concrete box (RCB) which transitions into a 96" reinforced concrete pipe (RCP) on Fenton Parkway that outfalls at the riprap lined streambed. On the the Mission City Parkway side of the San Diego River, the main line is a 54" RCP storm drain that outfall directly into the river.

Runon from Fenton Parkway is as follows:

Within Fenton Parkway, there are two storm drain laterals that connect to the RCB, an 18" RCP and a 36" RCP. Each lateral conveys drainage from a Type A-1 sag inlet. Both laterals have drainage connections that connect to the back of the inlets. In addition to the street drainage, the 18" RCP lateral conveys drainage from the Del Rio apartment complex and the 36" RCP conveys drainage from the Mission Valley Library and the IKEA loading dock entryway (Northside Drive). Furthermore, two modular wetland units collect runon at the intersection of River Park Road and half of Fenton Parkway which connect to the existing 96" RCP storm drain. Fenton Parkway is a crowned road, thus, at the intersection, the other half of the road drains down River Park Road to an existing Biofitration Basin. (See Appendix 4 for more information).

Runon from Mission City Parkway is as follows:

There is an existing high point from the existing bridge south of Mission City Parkway. Mission City Parkway is crowned. One side of the road drains to an existing curb inlet that connects into

an existing 54” RCP storm drain. The other side of the crowned street flows into the intersection of Camino Del Rio North and Mission City Parkway. Water then enters a 54" RCP system that discharges into the San Diego River.

The pre-project conditions for the Fenton Bridge project are represented by the post-project conditions of the Fenton proposed SDSU MISSION VALLEY- FENTON PARKWAY EXTENSION project, which extended Fenton Parkway through the trolley crossing per Public Improvement Plan (PRJ #1040531, DWG#100044-D). For further information about that project, refer to the previous approved drainage study for that project prepared by Project Design Consultants and dated November 15, 2022.

2.2 Proposed Drainage Improvements

The proposed drainage patterns will mimic the existing conditions with exception of more area included due to the addition of the Fenton Parkway Bridge. Under proposed conditions, the proposed bridge has a highpoint near the southern end. Therefore, runoff will be collected on both Mission City Parkway and Fenton Parkway.

Fenton Parkway bridge runoff will mimic the same path of travel with the exception of runoff draining to a biofiltration basin before entering the 96” RCP pipe that will be extended to drain closer to the river.

Mission City Parkway runoff will mimic the existing drainage patterns with the exception of an additional inlet that will be added to the western side of the crowned street. Runoff will then be treated in a proposed modular wetland system before entering the existing 54” RCP storm drain that will be relocated west of the proposed bridge.

The bridge will include deck drains to collect flows on the bridge to minimize gutter flow, but for this drainage study they are deemed insignificant in terms of high flows and due to potential inlet clogging. The proposed gutter flows on the bridge will comply with the City of San Diego flow depth requirements even without deck drains.

3. HYDROLOGY CRITERIA, METHODOLOGY, AND RESULTS

3.1 Hydrology Criteria

Table 1 summarizes the key assumptions and criteria used for the hydrologic modeling. See Table 1 below.

Table 1: Hydrology Criteria

Proposed Hydrology:	100-year storm frequency
Soil Type:	Hydrologic Soil Group D
Land Use / Runoff Coefficients:	Based on criteria presented in the 2017 City of San Diego Drainage Design Manual.
Rainfall intensity:	Based on intensity duration frequency relationships presented in the 2017 City of San Diego Drainage Design Manual

3.2 Hydrologic Methodology

Hydrology calculations were completed for proposed conditions accounting for all areas draining to the onsite storm drain systems. Drainage areas were defined from existing and proposed topographic maps of the area. Hydrologic analysis was completed utilizing the Rational Method, outlined in the 2017 City of San Diego Drainage Design Manual. The goal of the Rational Method analysis was to determine the peak 100-year flow rates for the storm drain pipes by developing a node link model of the contributing drainage area and applying the intensity-duration-frequency (IDF) curve to the areas. See Appendix 1 for the City of San Diego IDF curve.

The project drainage areas are represented with two overall systems draining to the same ultimate outfall area of concern. For the proposed condition, System 1000 represents the project site conveyed to the proposed Biofiltration Basin and System 2000 represents the project site conveyed to the east. (See Exhibits in Appendix 3 for details). Both systems discharge into the San Diego River.

Existing conditions calculations are not included in this report because they are unnecessary in terms of comparison. Comparison is not needed for this project because all runoff still mimics the existing condition of draining into the San Diego River. ~~Thus, any minor increase of flow in the proposed condition is not deemed detrimental to the project.~~

It is essential to understand that the project outfalls are located in the floodplain for the San Diego River. The runoff from the proposed Fenton Parkway Bridge is negligible in size when compared to the flow of the San Diego River. The 100-year San Diego River flow is 36,000 cfs, whereas the areas analyzed in the onsite drainage study total only 8.3 cfs. Thus, any minor increases in flow due to the increase in imperviousness of the proposed bridge are deemed negligible.

Additionally, diversion is not a relevant design constraint, and 100-year detention is not warranted due to the location of the site within the larger San Diego River Watershed. The bridge outfalls are in the floodplain, therefore the option of providing 100-year detention is not relevant because of the high existing tailwater condition. Thus, an existing condition study is not needed.

Rather, for practical purposes, the proposed condition storm drain design will be designed to handle peak flow capacity without causing detrimental downstream effects. Both outfalls will be designed (pipe and riprap) to handle proposed flows.

City of San Diego Drainage Design Manual runoff coefficients, based on land use and anticipated imperviousness for each subarea, were assigned for each drainage sub-basin within CivilD.

3.3 Description of Hydrologic Modeling Software

The Civil-D Rational Method Program was used to perform the Rational Method hydrologic calculations. This section provides a brief explanation of the computational procedure used in the computer model.

The Civil-D Modified Rational Method Hydrology Program is a computer-aided design program where the user develops a node link model of the watershed. Developing independent node link models for each interior watershed and linking these sub-models together at confluence points creates the node link model. The intensity-duration-frequency relationships are applied to each of the drainage areas in the model to get the peak flow rates at each point of interest.

3.4 Hydrology Results

The Rational Method was used to determine the peak 100-year storm flow rates for the design of the proposed onsite storm drain system. Table 2 below summarizes the Rational Method results for the proposed condition.

Table 2: Hydrology Results

PROPOSED CONDITION			
SYSTEM	AREA (ac)	Q100 (cfs)	TC (min)
1000	1.4	3.5	11.2
2000	1.4	4.8	8.6
TOTAL	***2.8***	***8.3***	***19.8***

4. HYDRAULIC ANALYSIS

Hydraulic analyses provided during final engineering will include inlet sizing, HGL determination, spread calculations and riprap sizing.

5. CONCLUSION

This drainage report supports the preliminary 30% design for the proposed Fenton Parkway Bridge development. This report was prepared to provide peak 100-year design flows for the project. The drainage system will be designed appropriately to accommodate the peak-flow conditions for the site.

APPENDIX 1

Intensity Duration Frequency Curve, Runoff Coefficients and FEMA Firmette

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_c for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_c calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

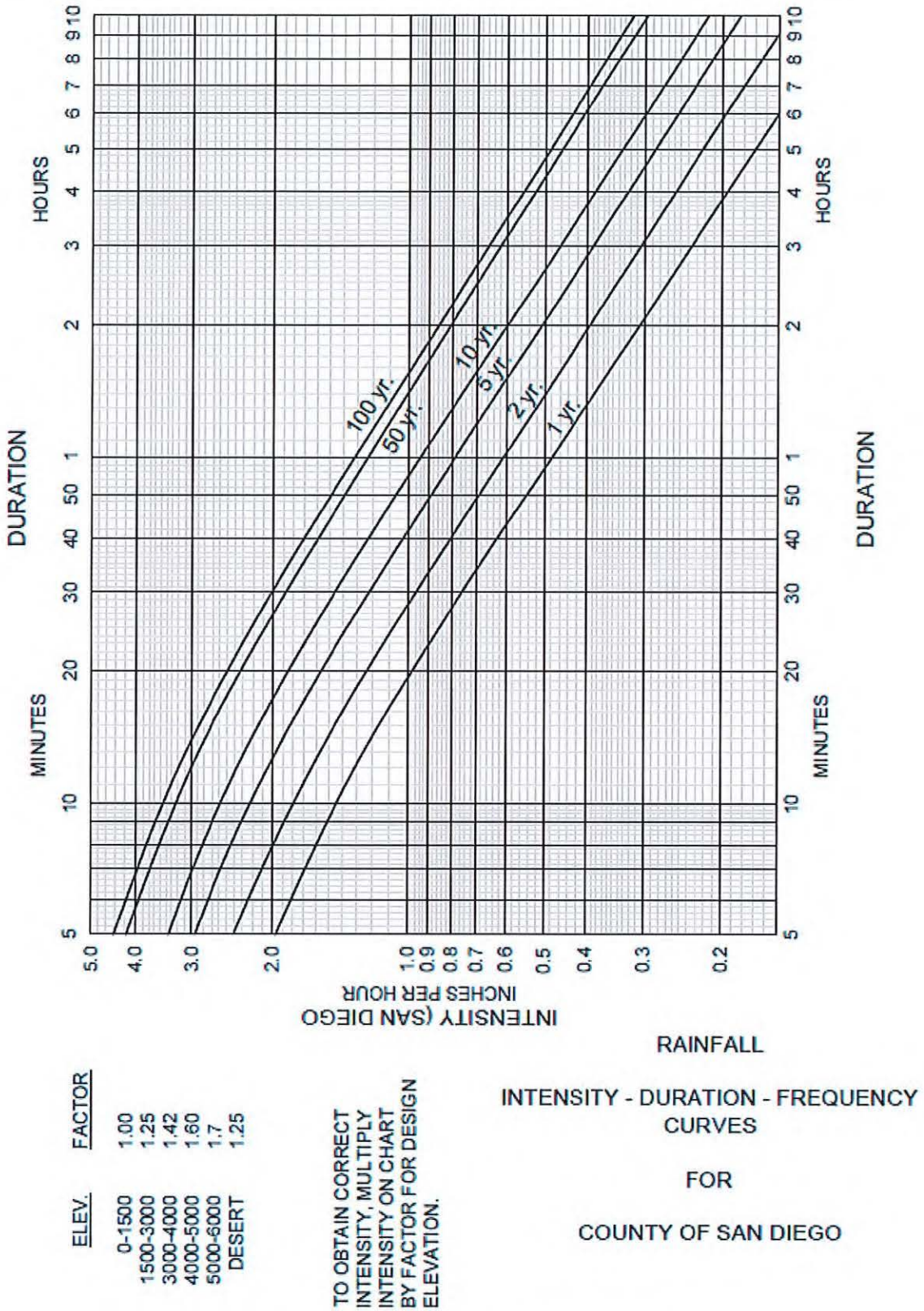


Figure A-1. Intensity-Duration-Frequency Design Chart

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the *Flood Insurance Study report* (which contains *authoritative hydraulic data*) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

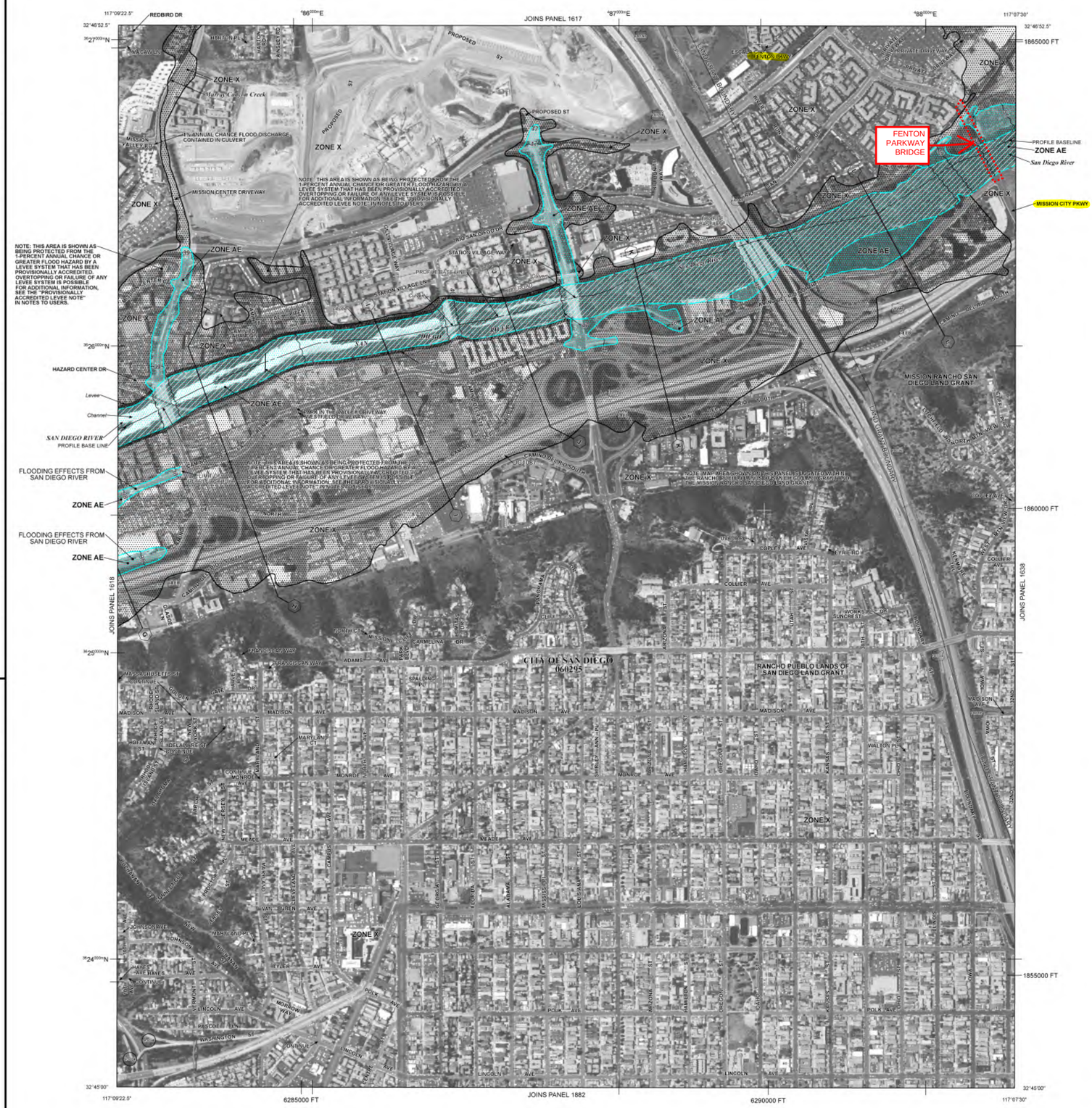
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-877-FEMA MAP (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Provionally Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee systems(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by May 16, 2012. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/business/nfip/index/shtm.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** — No Base Flood Elevations determined.
- **ZONE AE** — Base Flood Elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** — Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** — Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 (EL 987) — Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 6000000 FT — 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1619G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1619 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1619	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1619G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

APPENDIX 2

Proposed Conditions Rational Method Computer Output

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
    Rational Hydrology Study        Date: 05/17/23
--------------------------------------------------------------------------
4497 FENTON BRIDGE
SYSTEM 1000
PROPOSED CONDITIONS
FILE: 1000P100
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1000.000 to Point/Station     1001.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =   97.000(Ft.)
Highest elevation =   66.390(Ft.)
Lowest elevation =   65.450(Ft.)
Elevation difference =    0.940(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.69 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  97.000^.5)/(   0.969^(1/3)]=   2.69
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.250(CFS)
Total initial stream area =        0.060(Ac.)
```



```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1001.000 to Point/Station     1002.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.813(CFS)
Depth of flow =   0.110(Ft.), Average velocity =   1.354(Ft/s)
    ******* Irregular Channel Data ***********
--------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
    1              0.00              3.35
    2              1.00              3.35
    3              1.00              0.68
    4             13.00              0.50
    5             13.17              0.00
    6             29.00              0.16
Manning's 'N' friction factor =   0.015
--------------------------------------------------------------------------
Sub-Channel flow  =      0.813(CFS)
  '     '    flow top width =     10.918(Ft.)
  '     '    velocity=    1.354(Ft/s)
  '     '    area =      0.600(Sq.Ft)
  '     '    Froude number =     1.018

Upstream point elevation =    65.450(Ft.)
Downstream point elevation =    61.840(Ft.)
Flow length =   400.000(Ft.)
Travel time  =    4.92 min.
Time of concentration =    9.92 min.
Depth of flow =   0.110(Ft.)
Average velocity =   1.354(Ft/s)
Total irregular channel flow =     0.813(CFS)
Irregular channel normal depth above invert elev. =   0.110(Ft.)
Average velocity of channel(s) =   1.354(Ft/s)

Sub-Channel No. 1 Critical depth =      0.110(Ft.)
  '     '       '     Critical flow top width =     10.955(Ft.)
  '     '       '     Critical flow velocity=    1.345(Ft/s)
  '     '       '     Critical flow area =      0.604(Sq.Ft)

 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Rainfall intensity =      3.384(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.868(CFS) for    0.270(Ac.)
Total runoff =      1.118(CFS)  Total area =        0.33(Ac.)
```

++
Process from Point/Station 1003.000 to Point/Station 1002.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Time of concentration = 9.92 **min.**
Rainfall intensity = 3.384(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff = 1.061(CFS) for 0.330(Ac.)
Total runoff = 2.179(CFS) Total area = 0.66(Ac.)

++
Process from Point/Station 1002.000 to Point/Station 1004.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 56.530(Ft.)
Downstream point/station elevation = 54.000(Ft.)
Pipe **length** = 73.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.179(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.179(CFS)
Normal flow depth in pipe = 5.59(In.)
Flow top width inside pipe = 8.73(In.)
Critical Depth = 7.97(In.)
Pipe flow velocity = 7.56(Ft/s)
Travel time through pipe = 0.16 **min.**
Time of concentration (TC) = 10.08 **min.**

++
Process from Point/Station 1004.000 to Point/Station 1005.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type]
Time of concentration = 10.08 **min.**
Rainfall intensity = 3.364(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff = 0.259(CFS) for 0.140(Ac.)
Total runoff = 2.438(CFS) Total area = 0.80(Ac.)

++
Process from Point/Station 1007.000 to Point/Station 1007.000

**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Time of concentration = 10.08 **min.**
Rainfall intensity = 3.364(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff = 0.352(CFS) for 0.110(Ac.)
Total runoff = 2.789(CFS) Total area = 0.91(Ac.)

++
Process from Point/Station 1007.000 to Point/Station 1005.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 44.650(Ft.)
Downstream point/station elevation = 43.840(Ft.)
Pipe **length** = 147.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.789(CFS)
Given pipe size = 96.00(In.)
Calculated individual pipe flow = 2.789(CFS)
Normal flow depth in pipe = 4.47(In.)
Flow top width inside pipe = 40.44(In.)
Critical depth could not be calculated.
Pipe flow velocity = 3.30(Ft/s)
Travel time through pipe = 0.74 **min.**
Time of concentration (TC) = 10.83 **min.**

++
Process from Point/Station 1008.000 to Point/Station 1005.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration = 10.83 **min.**
Rainfall intensity = 3.279(In/Hr) for a 100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff = 0.693(CFS) for 0.470(Ac.)
Total runoff = 3.483(CFS) Total area = 1.38(Ac.)

++
Process from Point/Station 1005.000 to Point/Station 1006.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

```
Upstream point/station elevation =    43.840(Ft.)
Downstream point/station elevation =    43.450(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.483(CFS)
Given pipe size =     96.00(In.)
Calculated individual pipe flow  =     3.483(CFS)
Normal flow depth in pipe =    5.07(In.)
Flow top width inside pipe =   42.95(In.)
Critical Depth =    5.32(In.)
Pipe flow velocity =      3.42(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =    11.21 min.
End of computations, total study area =           1.380 (Ac.)
```

```
        San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
    Rational Hydrology Study        Date: 05/17/23
--------------------------------------------------------------------------
4497 FENTON BRIDGE
SYSTEM 2000
PROPOSED CONDITIONS
FILE: 2000P100
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4049

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station     2001.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Initial subarea flow distance  =   69.000(Ft.)
Highest elevation =   87.000(Ft.)
Lowest elevation =   86.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.98 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  69.000^.5)/(   1.449^(1/3)]=   1.98
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.167(CFS)
Total initial stream area =        0.040(Ac.)
```



```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station     2002.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Top of street segment elevation =    86.000(Ft.)
End of street segment elevation =    63.000(Ft.)
Length of street segment  =   538.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      0.203(CFS)
Depth of flow =   0.110(Ft.), Average velocity =   2.800(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   1.500(Ft.)
Flow velocity =   2.80(Ft/s)
Travel time =    3.20 min.     TC =    8.20  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Rainfall intensity =      3.626(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.481(CFS) for    0.430(Ac.)
Total runoff =      1.648(CFS)  Total area =        0.47(Ac.)
Street flow at end of street =      1.648(CFS)
Half street flow at end of street =      1.648(CFS)
Depth of flow =   0.221(Ft.), Average velocity =   3.533(Ft/s)
Flow width (from curb towards crown)=   6.287(Ft.)




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2002.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     8.20 min.
```

```
Rainfall intensity =      3.626(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.343(CFS) for    0.390(Ac.)
Total runoff =      2.992(CFS)  Total area =        0.86(Ac.)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2004.000 to Point/Station     2002.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     8.20 min.
Rainfall intensity =      3.626(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.791(CFS) for    0.520(Ac.)
Total runoff =      4.783(CFS)  Total area =        1.38(Ac.)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2002.000 to Point/Station     2005.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =    44.600(Ft.)
Downstream point/station elevation =    42.000(Ft.)
Pipe length  =   154.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.783(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =     4.783(CFS)
Normal flow depth in pipe =    5.13(In.)
Flow top width inside pipe =   31.66(In.)
Critical depth could not be calculated.
Pipe flow velocity =      6.24(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =     8.61 min.
End of computations, total study area =           1.380 (Ac.)
```

APPENDIX 3

Drainage Exhibits

RIVER PARK ROAD

NORTHSIDE DRIVE (IKEA LOADING DOCK)

MISSION VALLEY LIBRARY

FENTON PARKWAY

EXISTING 96" SD (PER DWG 29247-D)

FENTON PARKWAY EXTENSION

DEL RIO APARTMENT COMPLEX

SAN DIEGO RIVER

SAN DIEGO RIVER

100 YR. FLOODPLAIN PER CLOMR CASE NO. 22-09-0389R (TYP.)

NOTE: RUNOFF WILL CONTINUE DOWN RIVER PARK ROAD AND ENTER EXISTING BIOFILTRATION BASIN BMP #1 ON THE SDSU MV PROJECT. SEE DRAINAGE REPORT FOR REFERENCED SDSDU MV DRAINAGE EXHIBIT.

EXISTING OVERFLOW DRAINAGE CHANNEL

EXISTING FLOODWAY PER CURRENT FEMA PANEL

100 YR. FLOODPLAIN PER CLOMR CASE NO. 22-09-0389R (TYP.)

PROPOSED FENTON PARKWAY BRIDGE

MISSION CITY PARKWAY

APPROXIMATE HIGHPOINT PER CALTRANS DWG 11-110144

EXIST. 54" RCP SD

54" RCP STORM DRAIN

EXIST. FLOODWAY

EXIST. ABDN 24" RCP SD

CAMINO DEL RIO NORTH

EXISTING BROW DITCH WITH PROPOSED TIE-INTO 96" RCP STORM DRAIN

1000	0.06 AC
1001	0.27 AC
1002	0.11 AC
1003	0.33 AC
1004	0.14 AC
1005	
1006	
1007	
1008	0.47 AC
2000	0.04 AC
2001	
2002	0.52 AC
2003	0.39 AC
2004	0.43 AC
2005	

SYSTEM 1000
Q100 FLOW = 3.5 CFS
AREA = 1.4 ACRES

SYSTEM 2000
Q100 FLOW = 4.8 CFS
AREA = 1.4 ACRES

N

50 25 0 50 100 150

SCALE: 1"=50'

LEGEND

- DRAINAGE SUBAREA
- DRAINAGE SYSTEM
- HYDROLOGY NODE — XXXX
- AREA FROM UPSTREAM TO DOWNSTREAM NODE — X.XX AC
- DRAINAGE FLOW ARROW
- SURFACE FLOW
- PIPE FLOW

Last save by JENNIFER MAYNARD, File Name \\projects\p_drive\4497.00\Engr\Reports\Drainage-Prelim\EXH\4497 FENTON BRIDGE POST HYDROLOGY.dwg, Date Last Saved 5/17/2023 3:57:38 PM, Date Plotted Last 5/17/2023 4:05:55 PM

SCALE: 1"=50'
JOB #: 4497.00
CREATED: 5/23/2023

PREPARED BY:

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

CITY OF SAN DIEGO

FENTON PARKWAY BRIDGE

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B

APPENDIX 4

As-Builts and SDSU MV Drainage Report Reference

FOR REFERENCE ONLY

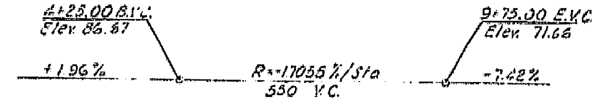
MISSION CITY PARKWAY BRIDGE

AS-BUILT

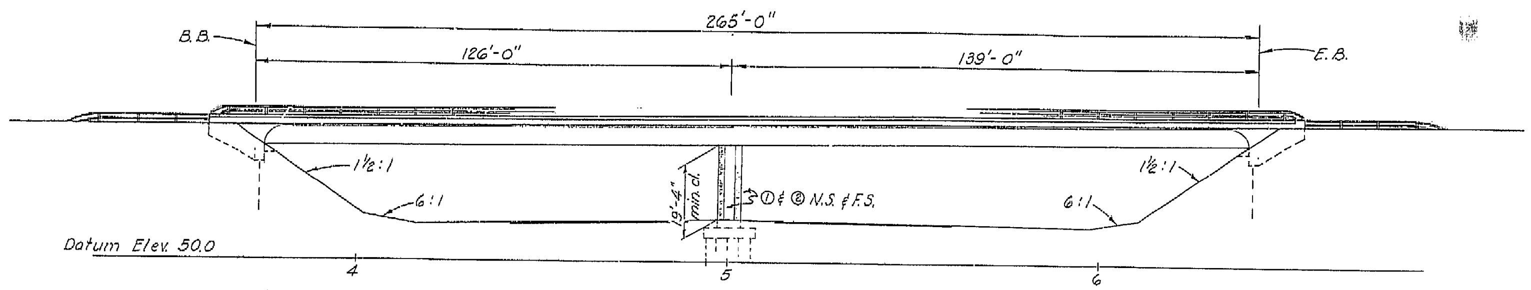
I-805-1(87)18

SHEET	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	805, 8		371	382

DATE APPROVED July 21, 1968



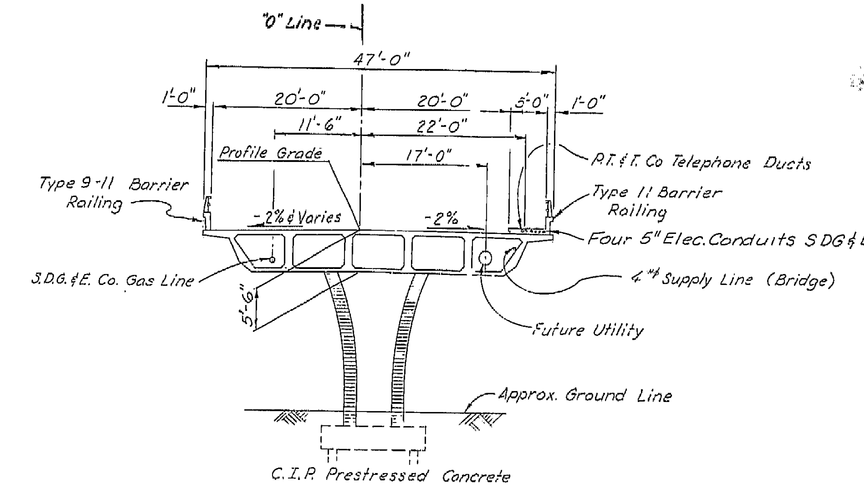
PROFILE GRADE
No Scale



ELEVATION
1" = 20'-0"

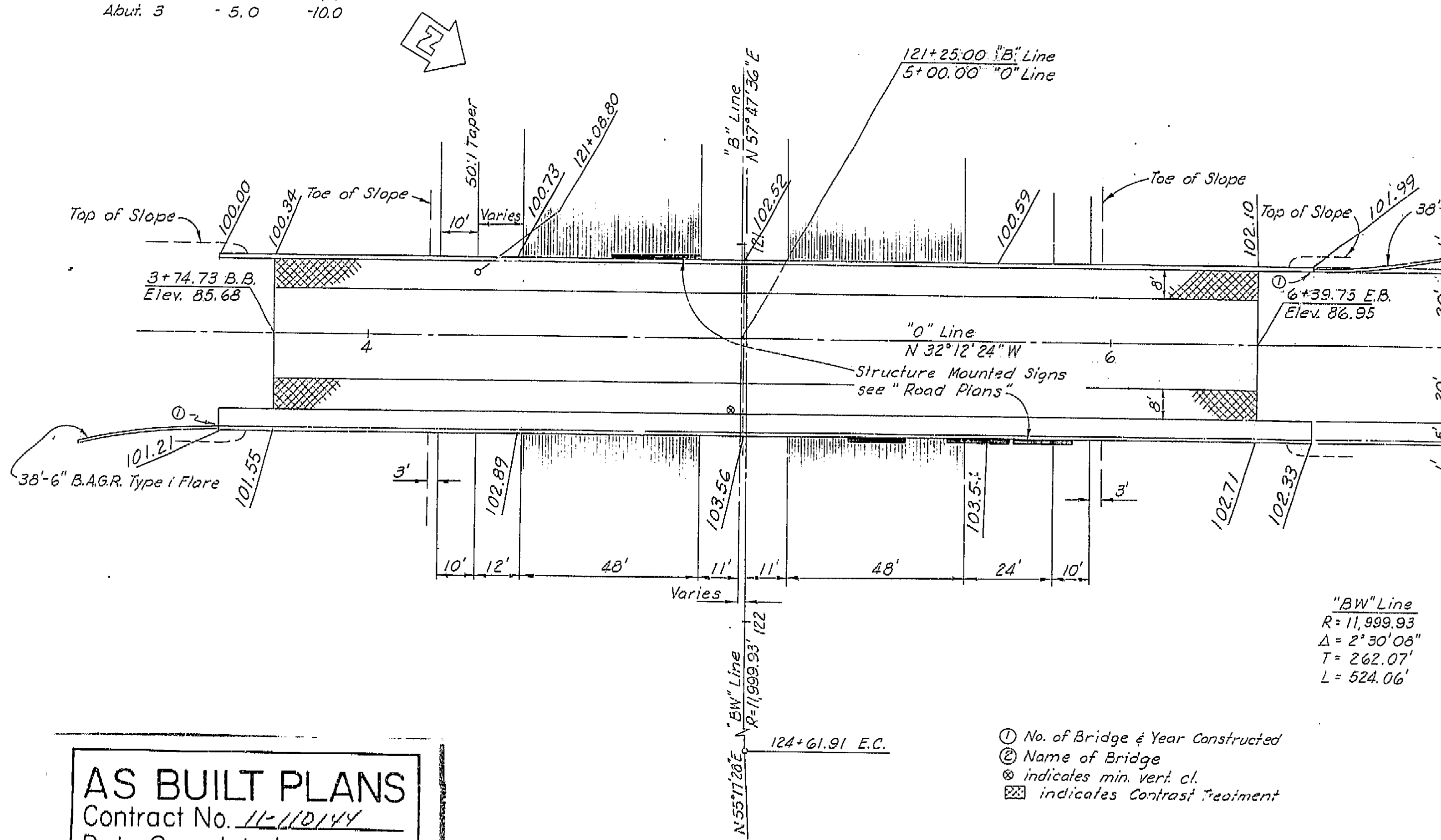
65 Ton 10BP57 Steel H Piles

Location	Spec. Tip	Est. Tip
Abut. 1	+15.0	+10.0
Bent 2	- 5.0	-10.0
Abut. 3	- 5.0	-10.0



TYPICAL SECTION
1" = 10'-0"

AS BUILT
G.C. Smith R.E.
by F. Hearth
11-110144
DATE 6/27/73



PLAN
1" = 20'-0"

① No. of Bridge & Year Constructed
② Name of Bridge
⊗ indicates min. vert. cl.
▨ indicates Contrast Treatment

AS BUILT PLANS
Contract No. 11-110144
Date Completed
Document No. A0002519

For General Notes See "Foundation Plan"

Live Loading HS20-44 and Alternative

INDEX TO PLANS

STANDARD PLANS DATED FEB., 1968

A62-B2	EXCAVATION AND BACKFILL, BRIDGES AND WALLS - LIMITS OF PAYMENT
B7-1	BOX GIRDER DETAILS NO. 1
B11-42	BARRIER RAILING TYPE 11
B11-43	BARRIER RAILING DETAILS - TYPES 9, 10, 11 & 12

APPROXIMATE QUANTITIES

4" SUPPLY LINE (BRIDGE)	300 LF
FURNISHING STEEL PILING (10BP57)	3,450 LF
DRIVING STEEL PILES (10BP57)	49 EA
PRESTRESSING CIP CONCRETE	LUMP SUM
CONTRAST TREATMENT	470 SY
BRIDGE APPROACH GUARD RAILING (TYPE 8)	77 LF
BARRIER RAILING (TYPE 9-11)	298 LF
BARRIER RAILING (TYPE 11)(5')	298 LF

FINAL QUANTITIES

STRUCTURE EXCAVATION (BRIDGE)	260 CY
STRUCTURE BACKFILL (BRIDGE)	125 CY
CLASS "A" CONCRETE (BRIDGE)	170 CY
CIP PRESTRESSED CONCRETE	810 CY
BAR REINFORCING STEEL (BRIDGE)	170,000 LBS

AS BUILT
CORRECTIONS BY
CONTRACT NO.
DATE

BRIDGE DEPARTMENT
*** DESIGN SECTION *** 16
Section Supervisor
Project Designer

	By	Checked
DESIGN		
DETAILS	1/68	
LAYOUT		
QUANTITIES		
SPECIFICATIONS	3-68	4-68

Approval Recommended by 7257

STATE OF CALIFORNIA
HIGHWAY TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

CAMINO DEL RIO OVERCROSSING

LOCATED IN THE CITY OF SAN DIEGO, ALONG ROUTE 8, APPROX. 1/2 MI. E. OF THE ADOPTED ALIGNMENT OF ROUTE 805 IN SAN DIEGO COUNTY

GENERAL PLAN

BRIDGE NO. 57-758 | POST MILE 5.0 | DRAWING NO. 57758-1 | SHEET 1 OF 12

WO 110141
CU 11201

Disregard prints bearing earlier revision dates

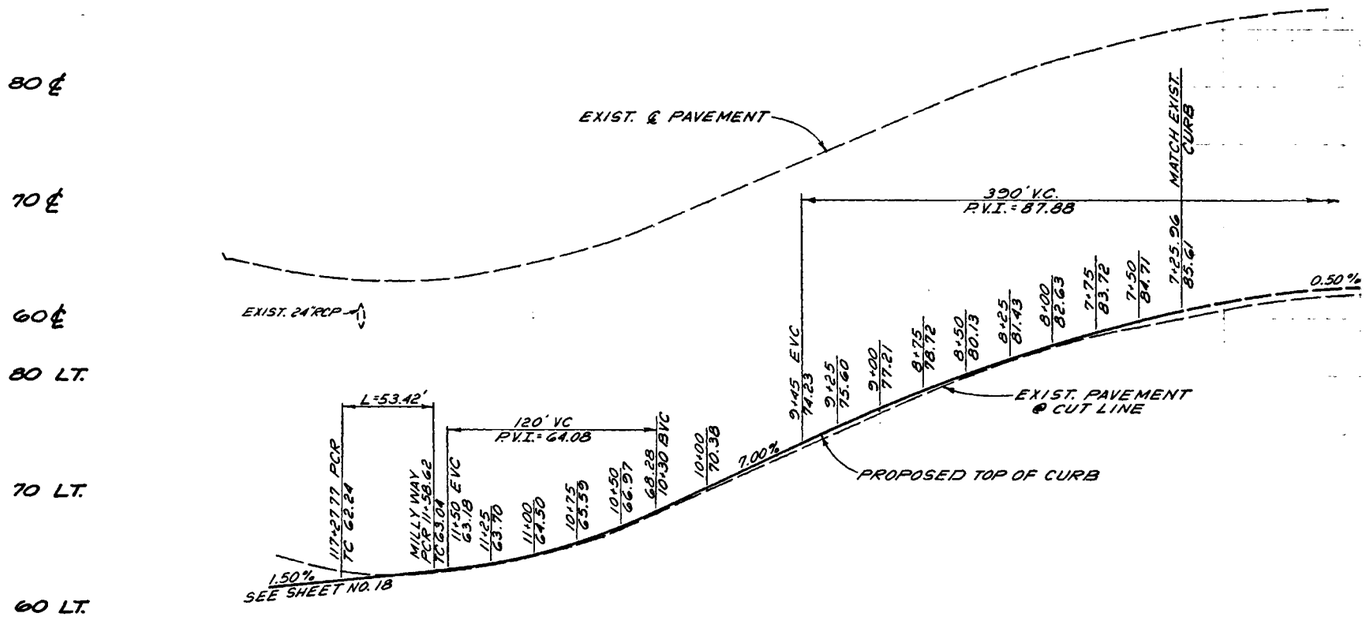
REVISION DATES (PRELIMINARY STAGE ONLY)

371

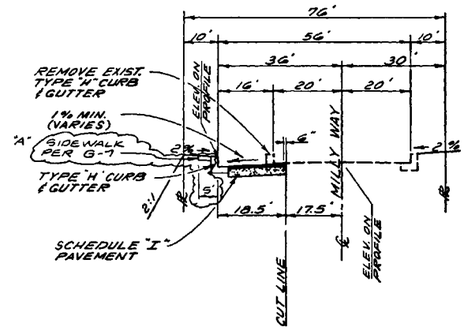
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
8-10-73

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS - MICROFILM

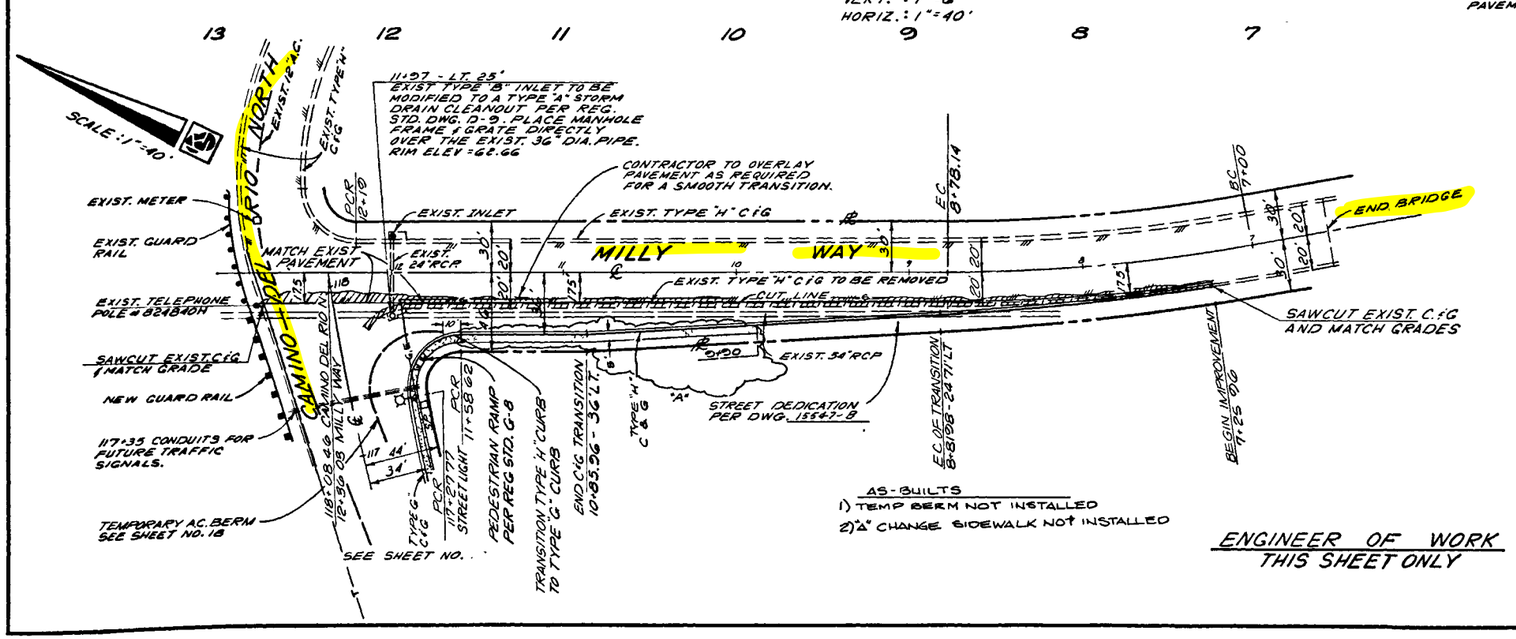
NOTE:
MILLY WAY IS NOW MISSION CITY PARKWAY



MILLY WAY
PROFILE
VERT. : 1"=6'
HORIZ.: 1"=40'



TYPICAL SECTION
W/CURB & GUTTER
STA 7+25.26 TO 11+30.00
(NO SCALE)



AS-BUILTS
1) TEMP BERM NOT INSTALLED
2) "A" CHANGE SIDEWALK NOT INSTALLED

ENGINEER OF WORK
THIS SHEET ONLY

PRIVATE CONTRACT
IMPROVEMENT PLAN FOR:
CENTERSIDE
CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING DEPARTMENT
SHEET 22 OF 26 SHEETS

T.M. 77-259
W.O. NO. 70757

C.R. Hollmund 12-8-81
RCE CITY ENGINEER DATE

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL				
"A" CHANGE	K.G.		1-12-82	
AS-BUILT	K.G.		6-22-82	

BENCH MARK # 122
MISSION VALLEY CNT. FLEMING DAIRY BRASS PLUG IN NORTHERLY HEAD-WALL OF CATTLE UNDERPASS
ELEV. 54.258 DATUM M.S.L.

KLAGGE • STEVENS AND ASSOCIATES, INC.
Civil Engineers And Land Surveyors
520 E. Main St. Suite 200 • El Cajon, Calif. 92020 • (714) 440-8453

DR BY R.A.S. | PROJECT NO 351-818 | SHEET 22 OF 26
CK BY M.A.S.
R.C.E. 25293 DATE 9/29/81

CONTRACTOR GOLDEN DATE STARTED 1-10-82
INSPECTOR SMITH DATE COMPLETED 11-2-82

222-1720
LAMBERT COORDINATES

17936-22-D

"A" CHANGE - ADD CONC. SIDEWALK PER G-7

AS-BUILT

FOR REFERENCE ONLY

SDSU MV

DRAINAGE EXHIBIT
FROM SDSU MISSION VALLEY
DRAINAGE REPORT
DATED MAY 21, 2021
(REDUCED COPY)

MATCH LINE SHEET 1

LOW FLOW SPLITTER

RIPRAP ENERGY DISSIPATOR
PER SDD-104
ROCK CLASS = NO.2
BACKING

BIOFILTRATION
BASIN BMP #1

BIOFILTRATION BASIN
BMP #2

RIPRAP ENERGY DISSIPATOR
PER SDD-104
ROCK CLASS = NO.2
BACKING

BUBBLER OUTLET

EXISTING 36"
OUTFALL TO REMAIN

MATCH LINE SHEET 4

SYSTEM 1000
AREA=11.7 AC
Q(100)= 15.3 CFS
TC(100)= 14.9 MIN
Q(10)=11.1 CFS
TC(10)=15.2 MIN

SYSTEM 2000
AREA=81.9 AC
Q(100)= 202.1 CFS
TC(100)= 18.0 MIN
Q(10)=155.5 CFS
TC(10)=16.8 MIN

NOTE: RUNOFF COEFFICIENT OF FUTURE PADS WAS ASSUMED TO BE 0.85

LEGEND

- PROPERTY BOUNDARY
- DRAINAGE SUBAREA
- DRAINAGE SYSTEM BOUNDARY
- HYDROLOGY NODE (XXXX)
- AREA FROM UPSTREAM TO DOWNSTREAM NODE (X.XX AC)
- BIOFILTRATION BMP

SCALE:	1"=60'
JOB #:	4264.20
CREATED:	07/18/19

PREPARED BY:

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

CITY OF SAN DIEGO
SDSU MISSION VALLEY
DRAINAGE MAP
PROPOSED ULT. CONDITION (PHASE 4)
EXHIBIT B-2

\\PROJECTS_2016\4264.20\DWF\REPORTS\DRAINAGE\DP\4264.20 PROPOSED DRAINAGE EXHIBIT.DWG 1/8/2020 3:24 PM

Attachment 6
Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

WILL PROVIDE IN FINAL ENGINEERING