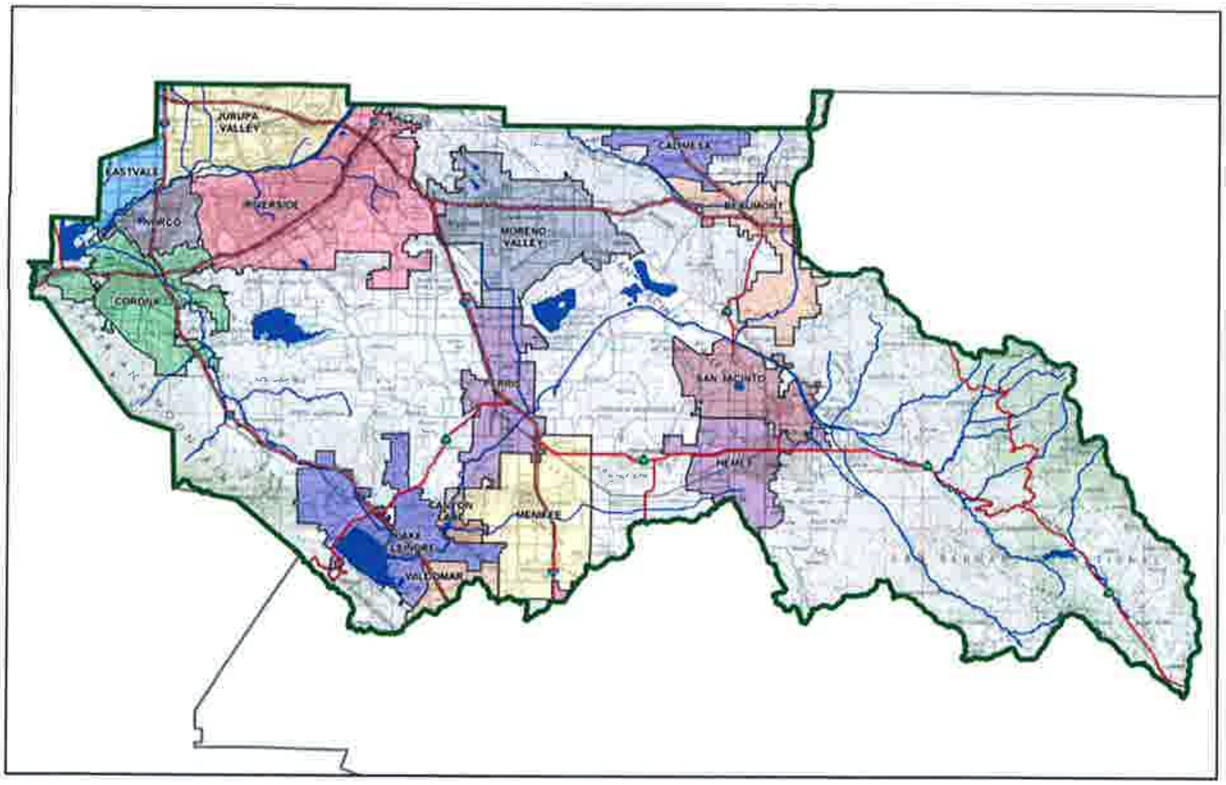
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: LAKEPOINTE APARTMENTS

Development No: ___

Design Review/Case No: RDR 14-05/APN 379-090-022



Contact Information:

Prepared for:
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☒ **Preliminary**
☐ **Final**

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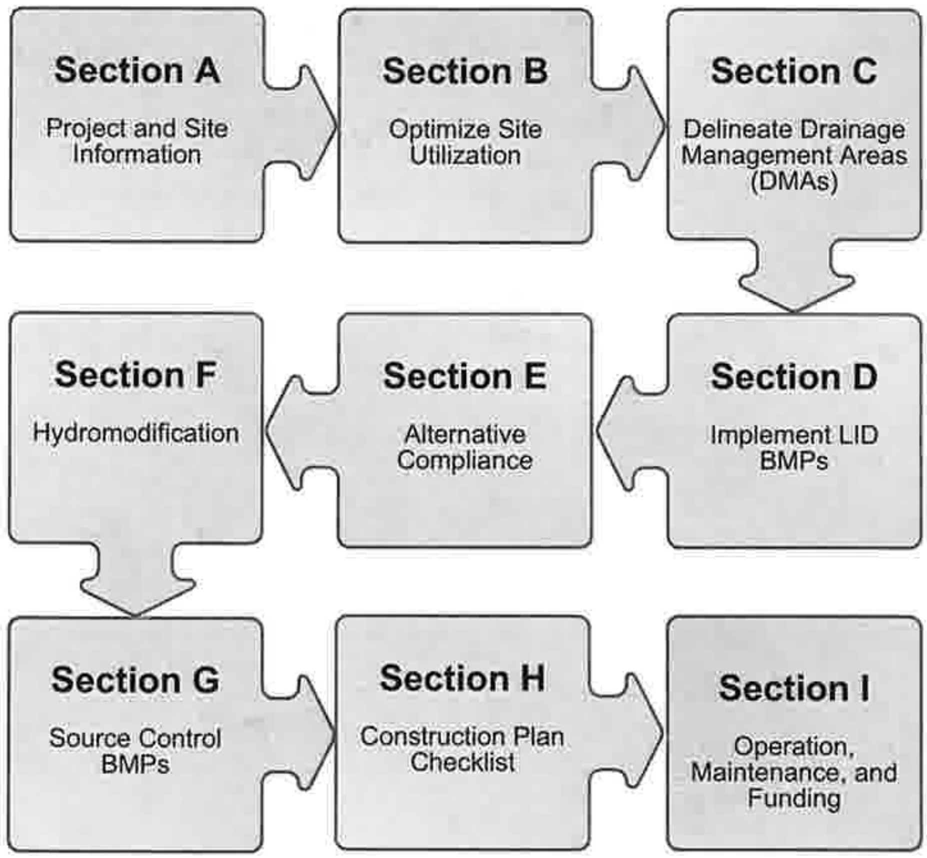
Original Date Prepared: 1/12/2016

Revision Date(s): ___

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **Diamond Construction** by **MLB Engineering** for the **LAKEPOINTE APARTMENTS** project.

This WQMP is intended to comply with the requirements of Lake Elsinore for ______ which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under Lake Elsinore Water Quality Ordinance (Municipal Code Section 14.08).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature	Date
Michael L. Benesh Preparer's Printed Name	Civil Engineer Preparer's Title/Position

Preparer's Licensure: RCE 37893

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List of Appendices

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Residential (Apartments)
Planning Area:	______
Community Name:	Lake Elsinore
Development Name:	LAKEPOINTE APARTMENTS
PROJECT LOCATION	
Latitude & Longitude (DMS): N 33° 40' 18.463" W 117° 22' 48.0785"	
Project Watershed and Sub-Watershed: Insert text here	
APN(s): Insert text here	
Map Book and Page No.: Insert text here	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Attached Residential
Proposed or Potential SIC Code(s)	6513
Area of Impervious Project Footprint (SF)	Insert text here
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	Insert text here
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☐ Y ☒ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	Type B (Plate C-1.40)
What is the Water Quality Design Storm Depth for the project?	0.90"

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Lake Elsinore	Nutrients	a. Water contact recreation, b. Non-contact water recreation, c. Warm freshwater habitat, and d. Wildlife habitat.	5+ Miles (Temescal Creek Reach 5)

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*	☐ Y	☒ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Yes. The existing drainage pattern is surface flow across the site from west to the east towards Riverside Drive. The proposed development will maintain the drainage pattern by directing the drainage from the site to Riverside Drive.

Did you identify and protect existing vegetation? If so, how? If not, why?

No. There was no significant existing vegetation on site.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Yes. BMP's that mimic natural infiltration will be used on the site, including pervious pavements and underground infiltration.

Did you identify and minimize impervious area? If so, how? If not, why?

Yes. Pervious pavements were used on the site as well as the minimum number of parking spaces. Parking and drive aisles were centralized and optimized to reduce the amount of impervious area.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes. Runoff from walkways & roof drains will be directed to landscaped areas prior to entering the drainage system.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DMA-1	POUROUS ASPHALT	1250	B
DMA-2	POUROUS ASPHALT	9970	B
DMA-3	POUROUS ASPHALT	1193	B
DMA-4	POUROUS ASPHALT	9623	B
DMA-5	POUROUS ASPHALT	1115	B
DMA-6	POUROUS ASPHALT	886	B
DMA-7	POUROUS ASPHALT	6735	B
DMA-8	POUROUS ASPHALT	899	B
DMA-9	POUROUS ASPHALT	523	B
DMA-10	CONCRETE	367	C
DMA-11	CONCRETE	3110	C
DMA-12	CONCRETE	3299	C
DMA-13	CONCRETE	285	C
DMA-14	CONCRETE	2271	C
DMA-15	CONCRETE	233	C
DMA-16	ASPHALT	103064	D
DMA-17	LANDSCAPE	9266	D
DMA-18	TOT LOT	3560	B
DMA-19	75% CONC/25% L.S.	12022	D
DMA-20	50% ROOF/50% L.S.	2342	D
DMA-21	75% ROOF/25% L.S.	3188	D
DMA-22	50% ROOF/50% L.S.	2433	D
DMA-23	60% ROOF/40% L.S.	7690	D
DMA-24	55% ROOF/45% L.S.	8589	D
DMA-25	40% ROOF/60% L.S.	3221	D
DMA-26	50% ROOF/50% L.S.	2590	D
DMA-27	55% ROOF/45% L.S.	6414	D
DMA-28	55% ROOF/45% L.S.	2174	D
DMA-29	50% ROOF/50% L.S.	2354	D
DMA-30	75% ROOF/25% L.S.	2639	D
DMA-31	50% ROOF/50% L.S.	2521	D
DMA-32	55% ROOF/45% L.S.	4313	D
DMA-33	40% ROOF/60% L.S.	3562	D
DMA-34	50% ROOF/50% L.S.	2464	D
DMA-35	55% ROOF/45% L.S.	4281	D
DMA-36	40% ROOF/60% L.S.	2979	D

DMA-37	50% ROOF/50% L.S.	2353	D
DMA-38	55% ROOF/45% L.S.	4280	D
DMA-39	40% ROOF/60% L.S.	2853	D
DMA-40	55% ROOF/45% L.S.	2131	D
DMA-41	60% ROOF/40% L.S.	1963	D
DMA-42	45% ROOF/55% L.S.	2702	D
DMA-43	45% ROOF/55% L.S.	2176	D
DMA-44	60% ROOF/40% L.S.	1822	D
DMA-45	55% ROOF/45% L.S.	1870	D
DMA-46	60% ROOF/40% L.S.	3317	D
DMA-47	50% ROOF/50% L.S.	2410	D
DMA-48	60% ROOF/40% L.S.	1969	D
DMA-49	60% ROOF/40% L.S.	1856	D
DMA-50	45% ROOF/55% L.S.	2668	D
DMA-51	45% ROOF/55% L.S.	1768	D
DMA-52	60% ROOF/40% L.S.	7908	D
DMA-53	60% ROOF/40% L.S.	1807	D
DMA-54	55% ROOF/45% L.S.	2240	D
DMA-55	45% ROOF/55% L.S.	2663	D
DMA-56	45% ROOF/55% L.S.	2597	D
DMA-57	60% ROOF/40% L.S.	1966	D
DMA-58	45% ROOF/55% L.S.	2662	D
DMA-59	50% ROOF/50% L.S.	2360	D
DMA-60	50% ROOF/50% L.S.	2350	D
DMA-61	60% ROOF/40% L.S.	3934	D
DMA-62	60% ROOF/40% L.S.	8246	D
DMA-63	60% ROOF/40% L.S.	8088	D

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet)	Storm Depth (inches)	DMA Name / ID	[C] from Table C.4 =	Required Retention Depth (inches)
		[A]	[B]		[C]	[D]
DMA-1	POROUS AC	1250	0.9	DMA-10	367	1.2
DMA-2	POROUS AC	9970	0.9	DMA-11	3110	1.2

DMA-3	POROUS AC	1193	0.9	NONE		0.9
DMA-4	POROUS AC	9623	0.9	DMA-12	3299	1.2
DMA-5	POROUS AC	1115	0.9	DMA-13	285	1.1
DMA-6	POROUS AC	886	0.9	NONE		0.9
DMA-7	POROUS AC	6735	0.9	DMA-14	2271	1.2
DMA-8	POROUS AC	899	0.9	DMA-15	233	1.1
DMA-9	POROUS AC	523	0.9	NONE		0.9
DMA-18	TOT-LOT	3560	0.9	NONE		0.9

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					**Receiving Self-Retaining DMA**		
DMA Name/ ID	Area (square feet)	Post-project surface type	Runoff factor	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]
DMA-10	367	CONC	1.0	367	DMA-1	1250	0.29
DMA-11	3110	CONC	1.0	3110	DMA-2	9970	0.31
DMA-12	3299	CONC	1.0	3299	DMA-4	9623	0.34
DMA-13	285	CONC	1.0	285	DMA-5	1115	0.26
DMA-14	2271	CONC	1.0	2271	DMA-7	6735	0.34
DMA-15	233	CONC	1.0	233	DMA-8	899	0.26

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
DMA-16	BMP-1
DMA-17	BMP-1
DMA-19	BMP-103
DMA-20	BMP-71
DMA-21	BMP-72
DMA-22	BMP-73
DMA-23	BMP-61

DMA-24	BMP-51
DMA-25	BMP-41
DMA-26	BMP-42
DMA-27	BMP-43
DMA-28	BMP-44
DMA-29	BMP-31
DMA-30	BMP-32
DMA-31	BMP-74
DMA-32	BMP-75
DMA-33	BMP-76
DMA-34	BMP-62
DMA-35	BMP-63
DMA-36	BMP-64
DMA-37	BMP-52
DMA-38	BMP-53
DMA-39	BMP-54
DMA-40	BMP-86
DMA-41	BMP-81
DMA-42	BMP-82
DMA-43	BMP-83
DMA-44	BMP-101
DMA-45	BMP-91
DMA-46	BMP-92
DMA-47	BMP-93
DMA-48	BMP-102
DMA-49	BMP-103
DMA-50	BMP-85
DMA-51	BMP-84
DMA-52	BMP-94
DMA-53	BMP-104
DMA-54	BMP-11
DMA-55	BMP-12
DMA-56	BMP-13
DMA-57	BMP-21
DMA-58	BMP-22
DMA-59	BMP-33
DMA-60	BMP-23
DMA-61	BMP-34
DMA-62	BMP-14
DMA-63	BMP-24

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☒ Y ☐ N

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

The site drains via a short storm drain system to Lake Elsinore.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☐ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	**YES**	**NO**
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies:

☐Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☐The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 2.05

Type of Landscaping (Conservation Design or Active Turf): Conserrvation Design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 6.62

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: 2.38

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 15.76

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
15.76	2.05

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 456

Project Type: Residential

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 6.62

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 145

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: 960

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
960	456

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: Projected Average Daily Use (gpd)

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3: Enter Value

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	Projected average daily use (Step 1)
Minimum use required (gpd)	Projected Average Daily Use (gpd)

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☒ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA-16	☐	☐	☐	☒	☐
DMA-17	☐	☐	☐	☒	☐
DMA-19	☐	☐	☒	☐	☐
DMA-20	☐	☐	☒	☐	☐
DMA-21	☐	☐	☒	☐	☐
DMA-22	☐	☐	☒	☐	☐
DMA-23	☐	☐	☒	☐	☐
DMA-24	☐	☐	☒	☐	☐
DMA-25	☐	☐	☒	☐	☐
DMA-26	☐	☐	☒	☐	☐
DMA-27	☐	☐	☒	☐	☐
DMA-28	☐	☐	☒	☐	☐
DMA-29	☐	☐	☒	☐	☐
DMA-30	☐	☐	☒	☐	☐
DMA-31	☐	☐	☒	☐	☐
DMA-32	☐	☐	☒	☐	☐
DMA-33	☐	☐	☒	☐	☐
DMA-34	☐	☐	☒	☐	☐
DMA-35	☐	☐	☒	☐	☐
DMA-36	☐	☐	☒	☐	☐
DMA-37	☐	☐	☒	☐	☐
DMA-38	☐	☐	☒	☐	☐
DMA-39	☐	☐	☒	☐	☐
DMA-40	☐	☐	☒	☐	☐
DMA-41	☐	☐	☒	☐	☐
DMA-42	☐	☐	☒	☐	☐
DMA-43	☐	☐	☒	☐	☐
DMA-44	☐	☐	☒	☐	☐
DMA-45	☐	☐	☒	☐	☐
DMA-46	☐	☐	☒	☐	☐
DMA-47	☐	☐	☒	☐	☐
DMA-48	☐	☐	☒	☐	☐
DMA-49	☐	☐	☒	☐	☐
DMA-50	☐	☐	☒	☐	☐
DMA-51	☐	☐	☒	☐	☐
DMA-52	☐	☐	☒	☐	☐
DMA-53	☐	☐	☒	☐	☐
DMA-54	☐	☐	☒	☐	☐
DMA-55	☐	☐	☒	☐	☐

DMA-56	☐	☐	☒	☐	☐
DMA-57	☐	☐	☒	☐	☐
DMA-58	☐	☐	☒	☐	☐
DMA-59	☐	☐	☒	☐	☐
DMA-60	☐	☐	☒	☐	☐
DMA-61	☐	☐	☒	☐	☐
DMA-62	☐	☐	☒	☐	☐
DMA-63	☐	☐	☒	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

N/A

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First, calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-1 (LARGE BASIN)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-16	*103216*	*ASPHALT*	*1.00*	*0.89*	*91862*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-17	*9266*	*L.S.*	*0.10*	*0.11*	*1019*			
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	112482				92881	0.9	6966	7400

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.4 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-11(BLDG 1)		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
DMA-54	2248	55/45	0.60	0.41	922			
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2248				922	0.9	69	70

Table D.5 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-12(BLDG 1)		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (FT^3)
DMA-55	2663	45/55	0.50	0.34	905			
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2663				905	0.9	68	70

Table D.6 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-13(BLDG 1)		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (FT^3)
DMA-56	2597	45/55	0.50	0.34	883			
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2597				883	0.9	66	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.7 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-14(BLDG 1)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-62	*8260*	*60/40*	*0.65*	*0.45*	*3717*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	8260				3717	0.9	279	280

Table D.8 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-21(BLDG 2)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-57	*1966*	*60/40*	*0.65*	*0.45*	*885*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans* *(FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1966				885	0.9	66	70

Table D.9 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-22(BLDG 2)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-58	*2662*	*45/55*	*0.50*	*0.34*	*905*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans* *(FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2662				905	0.9	68	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.10 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-23(BLDG 2)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-60	*2350*	*50/50*	*0.55*	*0.37*	*870*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D] \times [E]}{12}$	[G]
	2350				870	0.9	65	70

Table D.11 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-24(BLDG 2)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-63	*8088*	*60/40*	*0.64*	*0.44*	*3559*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D] \times [E]}{12}$	[G]
	8088				3559	0.9	267	280

Table D.12 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-31(BLDG 3)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-29	*2354*	*50/50*	*0.55*	*0.37*	*871*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D] \times [E]}{12}$	[G]
	2354				871	0.9	65	70

Table D.13 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-32(BLDG 3)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-30	*2639*	*75/25*	*0.78*	*0.58*	*1531*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2639				1531	0.9	115	120

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.14 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-33(BLDG 3)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-59	*2360*	*50/50*	*0.55*	*0.37*	*873*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2360				873	0.9	65	70

Table D.15 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-34(BLDG 3)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-61	*3934*	*60/40*	*0.64*	*0.44*	*1731*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	3934				1731	0.9	130	140

Table D.16 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-41(BLDG 4)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-25	*3221*	*40/60*	*0.46*	*0.31*	*999*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	3221				999	0.9	75	80

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.17 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-42(BLDG 4)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-26	*2590*	*50/50*	*0.55*	*0.37*	*958*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2590				958	0.9	72	80

Table D.18 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-43(BLDG 4)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-27	*6414*	*55/45*	*0.60*	*0.41*	*2630*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	6414				2630	0.9	197	220

Table D.19 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-44(BLDG 4)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-28	*2174*	*55/45*	*0.60*	*0.41*	*891*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2174				891	0.9	67	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.20 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-51(BLDG 5)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-24	*8589*	*55/45*	*0.60*	*0.41*	*3521*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (FT³)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	8589				3521	0.9	264	280

Table D.21 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-52(BLDG 5)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-37	*2353*	*50/50*	*0.55*	*0.37*	*871*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (FT³)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2353				871	0.9	65	70

Table D.22 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-53(BLDG 5)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-38	*4280*	*55/45*	*0.60*	*0.41*	*1755*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	4280				1755	0.9	132	140

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.23 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-54(BLDG 5)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-39	*2853*	*40/60*	*0.46*	*0.31*	*884*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2853				884	0.9	66	70

Table D.24 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-61(BLDG 6)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-23	*7690*	*60/40*	*0.64*	*0.44*	*3384*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	7690				3384	0.9	254	260

Table D.25 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	***BMP-62(BLDG 6)***		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-34	*2464*	*50/50*	*0.55*	*0.37*	*3711*			
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2464				912	0.9	68	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.26 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	***BMP-63(BLDG 6)***		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
DMA-35	*4281*	*55/45*	*0.60*	*0.41*	*1755*			
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	4281				1755	0.9	132	140

Table D.27 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	***BMP-64(BLDG 6)***		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
DMA-36	*2979*	*40/60*	*0.46*	*0.31*	*923*			
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2979				923	0.9	69	70

Table D.28 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-71(BLDG 7)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-20	*2342*	*50/50*	*0.55*	*0.37*	*867*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2342				867	0.9	65	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.29 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-72(BLDG 7)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-21	*3188*	*75/25*	*0.78*	*0.58*	*1817*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	3188				1817	0.9	136	140

Table D.30 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-73(BLDG 7)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-22	*2433*	*50/50*	*0.55*	*0.37*	*900*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2433				900	0.9	68	70

Table D.31 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-74(BLDG 7)		
	[A]		[B]	[C]	[A] x [C]			
DMA-31	*2521*	*50/50*	*0.55*	*0.37*	*933*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
COPY								
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2521				933	0.9	70	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.32 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-75(BLDG 7)		
	[A]		[B]	[C]	[A] x [C]			
DMA-32	*4313*	*55/45*	*0.60*	*0.41*	*1768*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	4313				1768	0.9	133	140

Table D.33 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-76(BLDG 7)		
	[A]		[B]	[C]	[A] x [C]			
DMA-33	*3562*	*40/60*	*0.46*	*0.31*	*1104*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	3562				1104	0.9	83	90

Table D.34 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-81(BLDG 8)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-41	*1963*	*60/40*	*0.65*	*0.45*	*883*	*Design Storm Depth (in)*	*Design Capture Volume, **V_{BMP}** (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1963				883	0.9	66	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.35 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-82(BLDG 8)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-42	*2702*	*45/55*	*0.51*	*0.35*	*946*	*Design Storm Depth (in)*	*Design Capture Volume, **V_{BMP}** (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2702				946	0.9	71	80

Table D.36 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-83(BLDG 8)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-43	*2176*	*45/55*	*0.51*	*0.35*	*762*	*Design Storm Depth (in)*	*Design Capture Volume, **V_{BMP}** (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2176				762	0.9	57	70

Table D.37 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-84(BLDG 8)		
	[A]		[B]	[C]	[A] x [C]			
DMA-51	*1768*	*45/55*	*0.51*	*0.35*	*619*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1768				619	0.9	46	80

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.38 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-85(BLDG 8)		
	[A]		[B]	[C]	[A] x [C]			
DMA-50	*2668*	*45/55*	*0.51*	*0.35*	*934*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2668				934	0.9	70	70

Table D.39 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	BMP-86(BLDG 8)		
	[A]		[B]	[C]	[A] x [C]			
DMA-40	*2131*	*55/45*	*0.60*	*0.41*	*874*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2131				874	0.9	66	70

Table D.40 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-91(BLDG 9)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-45	*1870*	*55/45*	*0.60*	*0.41*	*777*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1870				777	0.9	58	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.41 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-92(BLDG 9)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-46	*3317*	*60/40*	*0.65*	*0.45*	*1493*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	3317				1493	0.9	112	120

Table D.42 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-93(BLDG 9)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-47	*2410*	*50/50*	*0.55*	*0.37*	*892*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma= [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	2410				892	0.9	67	70

Table D.43 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-94(BLDG 9)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-52	*7623*	*60/40*	*0.65*	*0.45*	*3430*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	7623				3430	0.9	257	280

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.44 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-101(BLDG 10)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-44	*1822*	*60/40*	*0.65*	*0.45*	*820*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1822				820	0.9	62	70

Table D.45 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-102(BLDG 10)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-48	*1969*	*60/40*	*0.65*	*0.45*	*886*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1969				886	0.9	66	70

Table D.46 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-103(BLDG 10)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-49	*1856*	*60/40*	*0.65*	*0.45*	*835*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1856				835	0.9	63	70

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.47 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-104(BLDG 10)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-53	*1807*	*60/40*	*0.65*	*0.45*	*813*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	1807				813	0.9	61	70

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-110(REC AREA)*		
	[A]		[B]	[C]	[A] x [C]			
DMA-19	*12022*	*75/25*	*0.78*	*0.58*	*6973*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (FT^3)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	12022				6973	0.9	523	530

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

N/A

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	**General Pollutant Categories**							
	Bacterial Indicators	**Metals**	**Nutrients**	**Pesticides**	**Toxic Organic Compounds**	**Sediments**	**Trash & Debris**	**Oil & Grease**
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☒ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☐ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☐	☐	☒	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1]Cannot Exceed 50%
[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A		

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	INSERT VALUE	INSERT VALUE	INSERT VALUE
Volume (Cubic Feet)	INSERT VALUE	INSERT VALUE	INSERT VALUE

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☒ Y ☐ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

The site drains directly to a city storm drain in Riverside Drive which outlets to an energy dissipation structure directly across Riverside Drive from the project. The storm runoff flows are then conveyed by a paved v-ditch (roadway) to Lake Elsinore. See pictures below.

Figure 1: Energy Dissipation Structure (Site is across Riverside Drive)

Figure 2: Paved road section draining to the Lake.

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources***: Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit***: Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative***: Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."

D2. Landscape/Outdoor Pesticide Use	Final Landscape Plans will accomplish all of the following: Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in "What you should know for Landscape and Gardening" at http://rcflood.org/stormwater Provide IPM information to new owners, lessees and operators.
E. Pools, spas, ponds, decorative fountains, and other water features.		See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
O. Miscellaneous Drain or Wash Water or Other Sources: Roofing, gutters, and trim.	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: Property Owner/Manager

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

Appendix 2: Construction Plans

Grading and Drainage Plans

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Bioretention Facility - Design Procedure	BMP ID BMP-1	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	2.58	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	6,966	ft^3

Type of Bioretention Facility Design

- (●) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	70.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.34	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	5,199	ft^2
Proposed Surface Area	A=	5,400	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-11	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.05	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	69	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	52	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	5.2	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-12	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.06	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	68	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	51	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	5.1	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-13	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.06	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	66	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	49	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	4.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-14	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.19	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	279	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	207	ft^2
Proposed Surface Area	A=	210	ft^2
Minimum Required Length of Bioretention Facility, L	L =	20.7	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-21	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.05 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 66 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 49 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 4.9 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-22	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.06 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 68 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 51 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 5.1 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-23	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.05 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 65 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 49 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 4.9 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-24	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.19	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	267	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	198	ft^2
Proposed Surface Area	A=	208	ft^2
Minimum Required Length of Bioretention Facility, L	L =	19.8	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-31	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	$A_T=$	0.05	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	$V_{BMP}=$	65	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	$d_S=$	1.5	ft
Top Width of Bioretention Facility, excluding curb	$w_T=$	10.0	ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

$d_E=$ 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

$A_M=$ 49 ft^2

Proposed Surface Area	$A=$	52	ft^2
Minimum Required Length of Bioretention Facility, L	$L=$	4.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	$z=$	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-32	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.06	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	115	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 86 ft^2

Proposed Surface Area	A=	90	ft^2
Minimum Required Length of Bioretention Facility, L	L =	8.6	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation: ________

Notes: ________

Bioretention Facility - Design Procedure	BMP ID BMP-33	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.05	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	65	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$	A_M =	49	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	4.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation: ____________

Notes: ____________

Bioretention Facility - Design Procedure	BMP ID BMP-34	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.09 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 130 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 97 ft^2

Proposed Surface Area — A= 105 ft^2

Minimum Required Length of Bioretention Facility, L — L = 9.7 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-41	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.07 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 75 ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 56 ft^2

Proposed Surface Area — A= 60 ft^2

Minimum Required Length of Bioretention Facility, L — L = 5.6 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-42	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.06 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 72 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 54 ft^2

Proposed Surface Area — A= 60 ft^2

Minimum Required Length of Bioretention Facility, L — L = 5.4 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-43	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.15 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 197 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 146 ft^2

Proposed Surface Area — A= 165 ft^2

Minimum Required Length of Bioretention Facility, L — L = 14.6 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-44	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.05	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	67	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E $d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	50	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	5.0	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-51	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.2	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	264	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	196	ft^2
Proposed Surface Area	A=	210	ft^2
Minimum Required Length of Bioretention Facility, L	L =	19.6	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-52	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.05	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	65	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	49	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	4.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-53	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.1	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	132	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 98 ft^2

Proposed Surface Area	A=	105	ft^2
Minimum Required Length of Bioretention Facility, L	L =	9.8	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID: BMP-54	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	$A_T=$	0.07	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	$V_{BMP}=$	66	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	$d_S=$	1.5	ft
Top Width of Bioretention Facility, excluding curb	$w_T=$	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	$d_E=$	1.35	ft
Minimum Surface Area, A_m: $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	$A_M=$	49	ft^2
Proposed Surface Area	$A=$	52	ft^2
Minimum Required Length of Bioretention Facility, L	$L=$	4.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	$z=$	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-61	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.18	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	254	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	189	ft^2
Proposed Surface Area	A=	195	ft^2
Minimum Required Length of Bioretention Facility, L	L =	18.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-62	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.06 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 68 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 51 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 5.1 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-63	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T = 0.1 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 132 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 98 ft^2

Proposed Surface Area — A= 105 ft^2

Minimum Required Length of Bioretention Facility, L — L = 9.8 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-63	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T = 0.07 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 69 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 52 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 5.2 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-71	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T = 0.05 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 65 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 49 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 4.9 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-72	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering   Date: 1/12/2016

Designed by: MLB   County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.07	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	136	ft^3

Type of Bioretention Facility Design

◯ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 101 ft^2

Proposed Surface Area	A=	105	ft^2
Minimum Required Length of Bioretention Facility, L	L =	10.1	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-73	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	$A_T=$	0.06	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	$V_{BMP}=$	68	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	$d_S=$	1.5	ft
Top Width of Bioretention Facility, excluding curb	$w_T=$	10.0	ft
Total Effective Depth, d_E $d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	$d_E=$	1.35	ft
Minimum Surface Area, A_m $A_M(ft^2) = \frac{V_{BMP}(ft^3)}{d_E(ft)}$	$A_M=$	51	ft^2
Proposed Surface Area	$A=$	52	ft^2
Minimum Required Length of Bioretention Facility, L	$L=$	5.1	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	$z=$	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-74	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	$A_T=$	0.06	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	$V_{BMP}=$	70	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	$d_S=$	1.5	ft
Top Width of Bioretention Facility, excluding curb	$w_T=$	10.0	ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

$d_E=$ 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

$A_M=$ 52 ft^2

Proposed Surface Area	$A=$	52	ft^2
Minimum Required Length of Bioretention Facility, L	$L=$	5.2	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	$z=$	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-75	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.1	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	133	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	99	ft^2
Proposed Surface Area	A=	105	ft^2
Minimum Required Length of Bioretention Facility, L	L =	9.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-76	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.08	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	83	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m — $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	62	ft^2
Proposed Surface Area	A=	67	ft^2
Minimum Required Length of Bioretention Facility, L	L =	6.2	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-81	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.05	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	66	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	49	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	4.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-82	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering Date: 1/12/2016

Designed by: MLB County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.06	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	71	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	53	ft^2
Proposed Surface Area	A=	60	ft^2
Minimum Required Length of Bioretention Facility, L	L =	5.3	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-83	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.05 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 57 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 43 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 4.3 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-84	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	$A_T=$	0.04	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	$V_{BMP}=$	46	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	$d_S=$	1.5	ft
Top Width of Bioretention Facility, excluding curb	$w_T=$	10.0	ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — $d_E=$ 1.35 ft

Minimum Surface Area, A_m

$$A_M(ft^2) = \frac{V_{BMP}(ft^3)}{d_E(ft)}$$

$A_M=$ 35 ft^2

Proposed Surface Area	$A=$	60	ft^2
Minimum Required Length of Bioretention Facility, L	$L=$	3.5	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	$z=$	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-85	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.06 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 70 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 52 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 5.2 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-86	Legend:	Required Entries
			Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T = 0.05 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 66 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

● No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 49 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 4.9 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-91	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	$A_T=$	0.04	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	$V_{BMP}=$	52	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	$d_S =$	1.5	ft
Top Width of Bioretention Facility, excluding curb	$w_T =$	10.0	ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

$d_E =$ 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

$A_M =$ 39 ft^2

Proposed Surface Area	$A=$	52	ft^2
Minimum Required Length of Bioretention Facility, L	$L =$	3.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	$z =$	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-92	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.08	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	112	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 83 ft^2

Proposed Surface Area	A=	90	ft^2
Minimum Required Length of Bioretention Facility, L	L =	8.3	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-93	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.06	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	67	ft^3

Type of Bioretention Facility Design

◯ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 50 ft^2

Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	5.0	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-94	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.18	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	257	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E $d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	191	ft^2
Proposed Surface Area	A=	210	ft^2
Minimum Required Length of Bioretention Facility, L	L =	19.1	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-101	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature — A_T= 0.04 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 62 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$ — d_E = 1.35 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 46 ft^2

Proposed Surface Area — A= 52 ft^2

Minimum Required Length of Bioretention Facility, L — L = 4.6 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 0 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-102	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.05	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	66	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	49	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	4.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-103	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.04	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	63	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	47	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	4.7	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID BMP-104	Legend:	Required Entries Calculated Cells

Company Name: MLB Engineering — Date: 1/12/2016

Designed by: MLB — County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	A_T=	0.04	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	61	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$	A_M =	46	ft^2
Proposed Surface Area	A=	52	ft^2
Minimum Required Length of Bioretention Facility, L	L =	4.6	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation: __________

Notes: __________

Bioretention Facility - Design Procedure	BMP ID BMP-110	Legend:	Required Entries / Calculated Cells

Company Name: MLB Engineering   Date: 1/12/2016

Designed by: MLB   County/City Case No.: RDR 14/05

Design Volume

Enter the area tributary to this feature	$A_T=$	0.28	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	$V_{BMP}=$	523	ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	$d_S=$	1.5	ft
Top Width of Bioretention Facility, excluding curb	$w_T=$	10.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	$d_E=$	1.35	ft
Minimum Surface Area, A_m $$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$	$A_M=$	388	ft^2
Proposed Surface Area	$A=$	400	ft^2
Minimum Required Length of Bioretention Facility, L	$L=$	38.8	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	$z=$	0	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

3.5 Bioretention Facility

Type of BMP	LID – Bioretention
Treatment Mechanisms	Infiltration, Evapotranspiration, Evaporation, Biofiltration
Maximum Drainage Area	This BMP is intended to be integrated into a project's landscaped area in a distributed manner. Typically, contributing drainage areas to Bioretention Facilities range from less than 1 acre to a maximum of around 10 acres.
Other Names	Rain Garden, Bioretention Cell, Bioretention Basin, Biofiltration Basin, Landscaped Filter Basin, Porous Landscape Detention

Description

Bioretention Facilities are shallow, vegetated basins underlain by an engineered soil media. Healthy plant and biological activity in the root zone maintain and renew the macro-pore space in the soil and maximize plant uptake of pollutants and runoff. This keeps the Best Management Practice (BMP) from becoming clogged and allows more of the soil column to function as both a sponge (retaining water) and a highly effective and self-maintaining biofilter. In most cases, the bottom of a Bioretention Facility is unlined, which also provides an opportunity for infiltration to the extent the underlying onsite soil can accommodate. When the infiltration rate of the underlying soil is exceeded, fully biotreated flows are discharged via underdrains. Bioretention Facilities therefore will inherently achieve the maximum feasible level of infiltration and evapotranspiration and achieve the minimum feasible (but highly biotreated) discharge to the storm drain system.

Siting Considerations

These facilities work best when they are designed in a relatively level area. Unlike other BMPs, Bioretention Facilities can be used in smaller landscaped spaces on the site, such as:

- ✓ Parking islands
- ✓ Medians
- ✓ Site entrances

Landscaped areas on the site (such as may otherwise be required through minimum landscaping ordinances), can often be designed as Bioretention Facilities. This can be accomplished by:

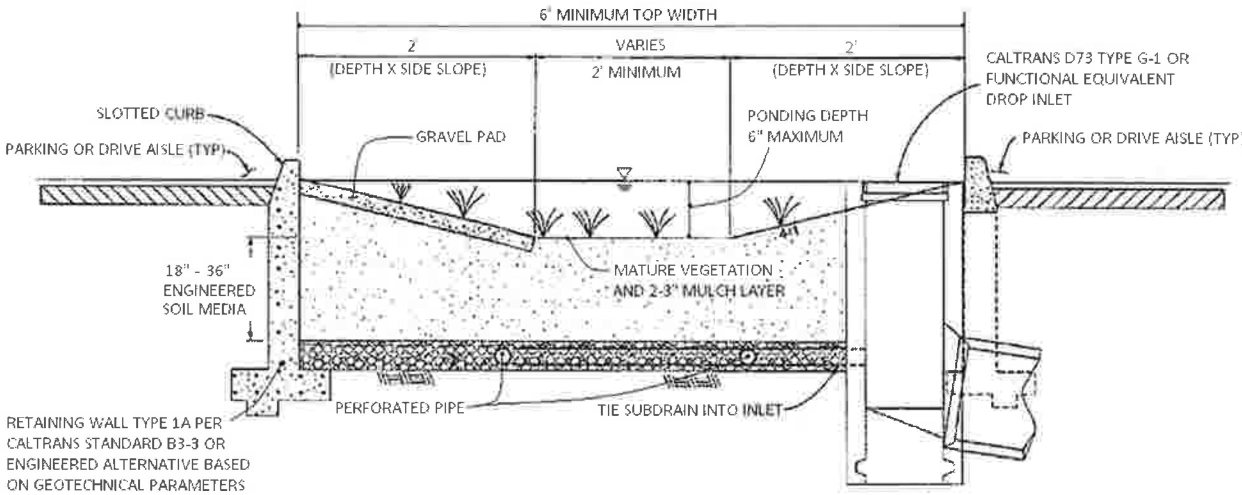
- *Depressing* landscaped areas below adjacent impervious surfaces, rather than elevating those areas
- Grading the site to direct runoff from those impervious surfaces *into* the Bioretention Facility, rather than away from the landscaping
- Sizing and designing the depressed landscaped area as a Bioretention Facility as described in this Fact Sheet

Bioretention Facilities should however not be used downstream of areas where large amounts of sediment can clog the system. Placing a Bioretention Facility at the toe of a steep slope should also be avoided due to the potential for clogging the engineered soil media with erosion from the slope, as well as the potential for damaging the vegetation.

Design and Sizing Criteria

The recommended cross section necessary for a Bioretention Facility includes:

- Vegetated area
- 18' minimum depth of engineered soil media
- 12' minimum gravel layer depth with 6' perforated pipes (added flow control features such as orifice plates may be required to mitigate for HCOC conditions)



While the 18-inch minimum engineered soil media depth can be used in some cases, it is recommended to use 24 inches or a preferred 36 inches to provide an adequate root zone for the chosen plant palate. Such a design also provides for improved removal effectiveness for nutrients. The recommended ponding depth inside of a Bioretention Facility is 6 inches; measured from the flat bottom surface to the top of the water surface as shown in Figure 1.

Because this BMP is filled with an engineered soil media, pore space in the soil and gravel layer is assumed to provide storage volume. However, several considerations must be noted:

- Surcharge storage above the soil surface (6 inches) is important to assure that design flows do not bypass the BMP when runoff exceeds the soil's absorption rate.
- In cases where the Bioretention Facility contains engineered soil media deeper than 36 inches, the pore space within the engineered soil media can only be counted to the 36-inch depth.
- A maximum of 30 percent pore space can be used for the soil media whereas a maximum of 40 percent pore space can be use for the gravel layer.

Figure 1: Standard Layout for a Bioretention Facility

Engineered Soil Media Requirements

The engineered soil media shall be comprised of 85 percent mineral component and 15 percent organic component, by volume, drum mixed prior to placement. The mineral component shall be a Class A sandy loam topsoil that meets the range specified in Table 1 below. The organic component shall be nitrogen stabilized compost.

Table 1: Mineral Component Range Requirements

Percent Range	Component
70-80	Sand
15-20	Silt
5-10	Clay

The trip ticket, or certificate of compliance, shall be made available to the inspector to prove the engineered mix meets this specification.

Vegetation Requirements

Vegetative cover is important to minimize erosion and ensure that treatment occurs in the Bioretention Facility. The area should be designed for at least 70 percent mature coverage throughout the Bioretention Facility. To prevent the BMP from being used as walkways, Bioretention Facilities shall be planted with a combination of small trees, densely planted shrubs, and natural grasses. Grasses shall be native or ornamental; preferably ones that do not need to be mowed. The application of fertilizers and pesticides should be minimal. To maintain oxygen levels for the vegetation and promote biodegradation, it is important that vegetation not be completely submerged for any extended period of time. Therefore, a maximum of 6 inches of ponded water shall be used in the design to ensure that plants within the Bioretention Facility remain healthy.

A 2 to 3-inch layer of standard shredded aged hardwood mulch shall be placed as the top layer inside the Bioretention Facility. The 6-inch ponding depth shown in Figure 1 above shall be measured from the top surface of the 2 to 3-inch mulch layer.

Curb Cuts

To allow water to flow into the Bioretention Facility, 1-foot-wide (minimum) curb cuts should be placed approximately every 10 feet around the perimeter of the Bioretention Facility. Figure 2 shows a curb cut in a Bioretention Facility. Curb cut flow lines must be at or above the V_{BMP} water surface level.

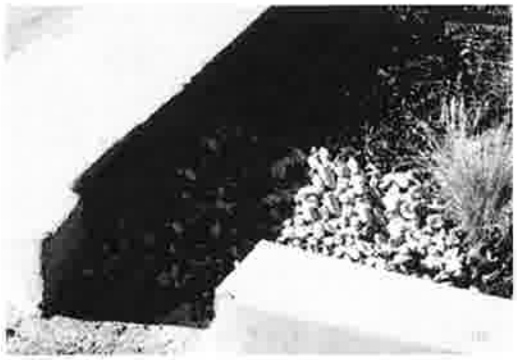
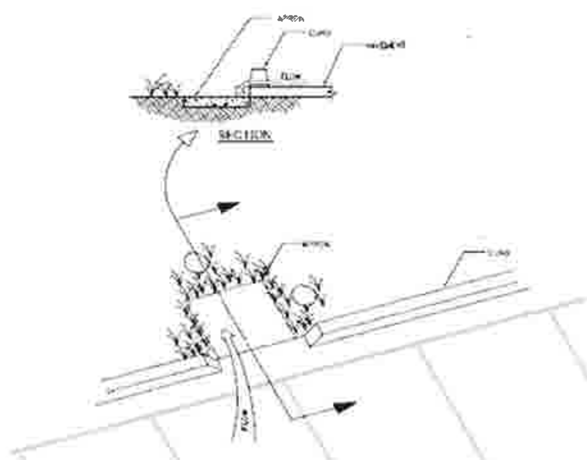


Figure 2: Curb Cut located in a Bioretention Facility

To reduce erosion, a gravel pad shall be placed at each inlet point to the Bioretention Facility. The gravel should be 1- to 1.5-inch diameter in size. The gravel should overlap the curb cut opening a minimum of 6 inches. The gravel pad inside the Bioretention Facility should be flush with the finished surface at the curb cut and extend to the bottom of the slope.

In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet. See Figure 3.



cility

Terracing the Landscaped Filter Basin

It is recommended that Bioretention Facilities be level. In the event the facility site slopes and lacks proper design, water would fill the lowest point of the BMP and then discharge from the basin without being treated. To ensure that the water will be held within the Bioretention Facility on sloped sites, the BMP must be terraced with nonporous check dams to provide the required storage and treatment capacity.

The terraced version of this BMP shall be used on non-flat sites with no more than a 3 percent slope. The surcharge depth cannot exceed 0.5 feet, and side slopes shall not exceed 4:1. Table 2 below shows the spacing of the check dams, and slopes shall be rounded up (i.e., 2.5 percent slope shall use 10' spacing for check dams).

Table 2: Check Dam Spacing

6" Check Dam Spacing	
Slope	**Spacing**
1%	*25'*
2%	*15'*
3%	*10'*

Roof Runoff

Roof downspouts may be directed towards Bioretention Facilities. However, the downspouts must discharge onto a concrete splash block to protect the Bioretention Facility from erosion.

Retaining Walls

It is recommended that Retaining Wall Type 1A, per Caltrans Standard B3-3 or equivalent, be constructed around the entire perimeter of the Bioretention Facility. This practice will protect the sides of the Bioretention Facility from collapsing during construction and maintenance or from high service loads adjacent to the BMP. Where such service loads would not exist adjacent to the BMP, an engineered alternative may be used if signed by a licensed civil engineer.

Side Slope Requirements

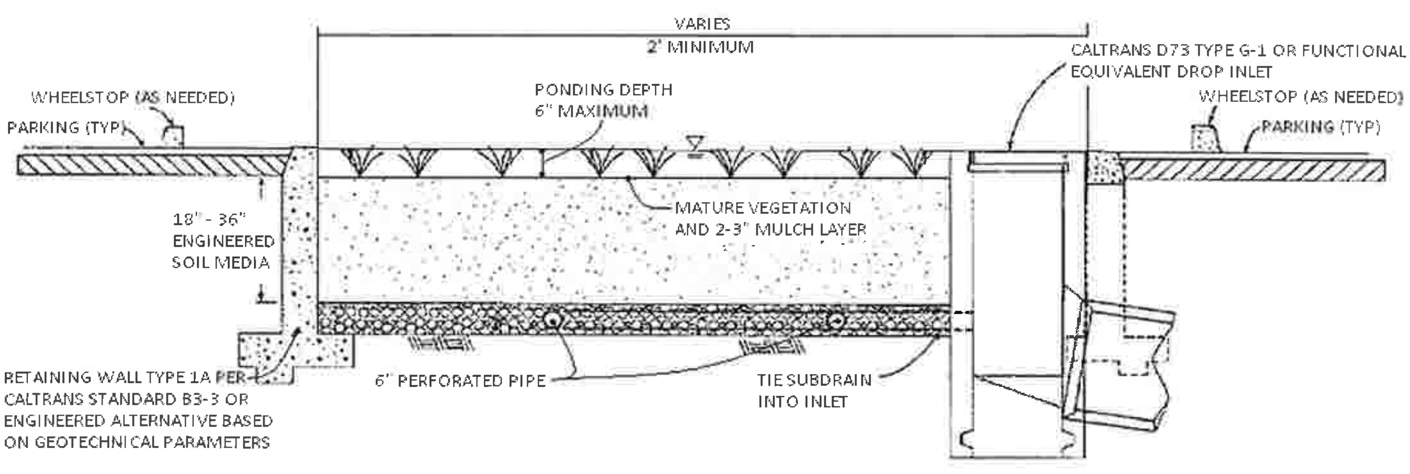
Bioretention Facilities Requiring Side Slopes

The design should assure that the Bioretention Facility does not present a tripping hazard. Bioretention Facilities proposed near pedestrian areas, such as areas parallel to parking spaces or along a walkway, must have a gentle slope to the bottom of the facility. Side slopes inside of a Bioretention Facility shall be 4:1. A typical cross section for the Bioretention Facility is shown in Figure 1.

Bioretention Facilities Not Requiring Side Slopes

Where cars park perpendicular to the Bioretention Facility, side slopes are not required. A 6-inch maximum drop may be used, and the Bioretention Facility must be planted with trees and shrubs to prevent pedestrian access. In this case, a curb is not placed around the Bioretention Facility,

but wheel stops shall be used to prevent vehicles from entering the Bioretention Facility, as shown in Figure 4.



Planter Boxes

Bioretention Facilities can also be placed above ground as planter boxes. Planter boxes must have a minimum width of 2 feet, a maximum surcharge depth of 6 inches, and no side slopes are necessary. Planter boxes must be constructed so as to ensure that the top surface of the engineered soil media will remain level. This option may be constructed of concrete, brick, stone or other stable materials that will not warp or bend. Chemically treated wood or galvanized steel, which has the ability to contaminate stormwater, should not be used. Planter boxes must be lined with an impermeable liner on all sides, including the bottom. Due to the impermeable liner, the inside bottom of the planter box shall be designed and constructed with a cross fall, directing treated flows within the subdrain layer toward the point where subdrain exits the planter box, and subdrains shall be oriented with drain holes oriented down. These provisions will help avoid excessive stagnant water within the gravel underdrain layer. Similar to the in-ground Bioretention Facility versions, this BMP benefits from healthy plants and biological activity in the root zone. Planter boxes should be planted with appropriately selected vegetation.

Figure 5: Planter Box
Source: LA Team Effort

Overflow

An overflow route is needed in the Bioretention Facility design to bypass stored runoff from storm events larger than V_{BMP} or in the event of facility or subdrain clogging. Overflow systems must connect to an acceptable discharge point, such as a downstream conveyance system as shown in Figure 1 and Figure 4. The inlet to the overflow structure shall be elevated inside the Bioretention Facility to be flush with the ponding surface for the design capture volume (V_{BMP}) as shown in Figure 4. This will allow the design capture volume to be fully treated by the Bioretention Facility, and for larger events to safely be conveyed to downstream systems. The overflow inlet shall **<u>not</u>** be located in the entrance of a Bioretention Facility, as shown in Figure 6.

Underdrain Gravel and Pipes
An underdrain gravel layer and pipes shall be provided in accordance with Appendix B – Underdrains.

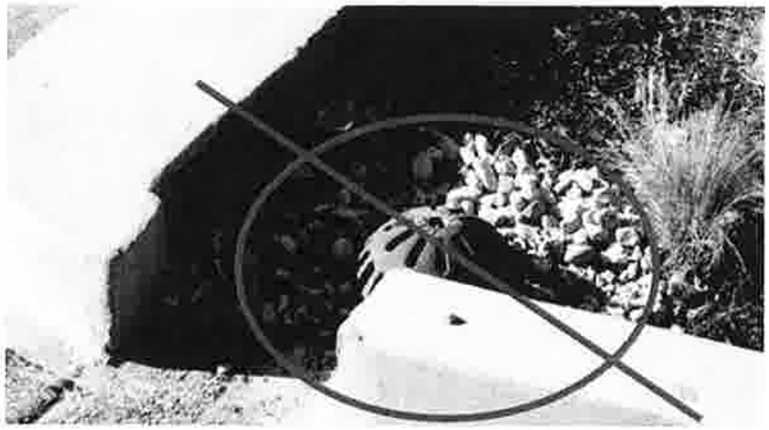


Figure 6: Incorrect Placement of an Overflow Inlet.

Inspection and Maintenance Schedule

The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Bioretention Facility should be minimized.

Schedule	Activity
Ongoing	• Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities. • Remove trash and debris • Replace damaged grass and/or plants • Replace surface mulch layer as needed to maintain a 2-3 inch soil cover.
After storm events	• Inspect areas for ponding
Annually	• Inspect/clean inlets and outlets

Bioretention Facility Design Procedure

1) Enter the area tributary, A_T, to the Bioretention Facility.

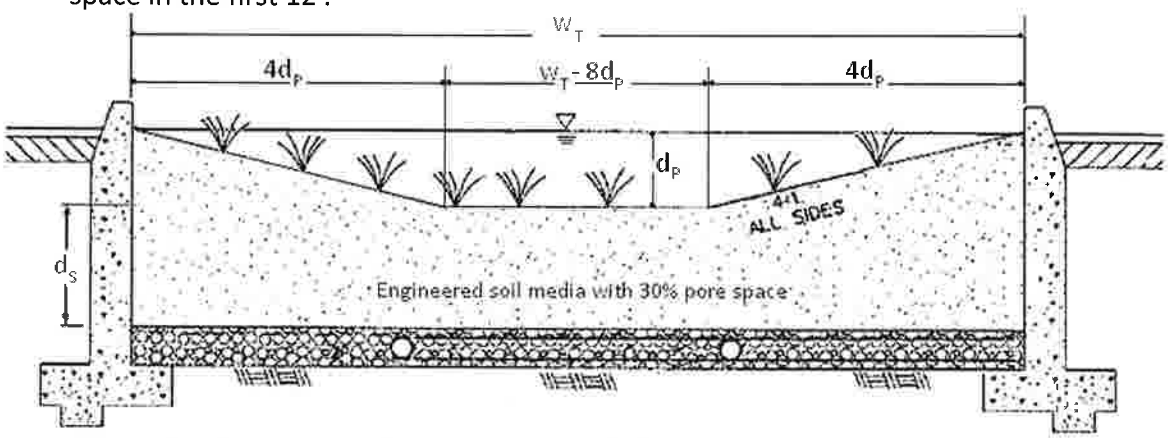
2) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.

3) Select the type of design used. There are two types of Bioretention Facility designs: the standard design used for most project sites that include side slopes, and the modified design used when the BMP is located perpendicular to the parking spaces or with planter boxes that do not use side slopes.

4) Enter the depth of the engineered soil media, d_S. The minimum depth for the engineered soil media can be 18' in limited cases, but it is recommended to use 24' or a preferred 36' to provide an adequate root zone for the chosen plant palette. Engineered soil media deeper than 36' will only get credit for the pore space in the first 36'.

5) Enter the top width of the Bioretention Facility.

6) Calculate the total effective depth, d_E, within the Bioretention Facility. The maximum allowable pore space of the soil media is 30% while the maximum allowable pore space for the gravel layer is 40%. Gravel layer deeper than 12' will only get credit for the pore space in the first 12'.



a. For the design with side slopes the following equation shall be used to determine the total effective depth. Where, d_P is the depth of ponding within the basin.

$$d_E(\text{ft}) = \frac{0.3 \times \left[\left(w_T(\text{ft}) \times d_S(\text{ft})\right) + 4\left(d_P(\text{ft})\right)^2\right] + 0.4 \times 1(\text{ft}) + d_P(\text{ft})\left[4d_P(\text{ft}) + \left(w_T(\text{ft}) - 8d_P(\text{ft})\right)\right]}{w_T(\text{ft})}$$

This above equation can be simplified if the maximum ponding depth of 0.5' is used. The equation below is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$d_E(\text{ft}) = (0.3 \times d_S(\text{ft}) + 0.4 \text{ x } 1(\text{ft})) - \left(\frac{0.7\ (\text{ft}^2)}{w_T(\text{ft})}\right) + 0.5(\text{ft})$$

b. For the design without side slopes the following equation shall be used to determine the total effective depth:

$$d_E(\text{ft}) = d_P(\text{ft}) + [(0.3) \times d_S(\text{ft}) + (0.4) \times 1(\text{ft})]$$

The equation below, using the maximum ponding depth of 0.5', is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$d_E(\text{ft}) = 0.5\ (\text{ft}) + [(0.3) \times d_S(\text{ft}) + (0.4) \times 1(\text{ft})]$$

7) Calculate the minimum surface area, A_M, required for the Bioretention Facility. This does not include the curb surrounding the Bioretention Facility or side slopes.

$$A_M(\text{ft}^2) = \frac{V_{BMP}(\text{ft}^3)}{d_E\ (\text{ft})}$$

8) Enter the proposed surface area. This area shall not be less than the minimum required surface area.

9) Verify that side slopes are no steeper than 4:1 in the standard design, and are not required in the modified design.

10) Provide the diameter, minimum 6 inches, of the perforated underdrain used in the Bioretention Facility. See Appendix B for specific information regarding perforated pipes.

11) Provide the slope of the site around the Bioretention Facility, if used. The maximum slope is 3 percent for a standard design.

12) Provide the check dam spacing, if the site around the Bioretention Facility is sloped.

13) Describe the vegetation used within the Bioretention Facility.

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Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

The project site discharges either directly to a city owned storm drain system in Riverside Drive or to Riverside Drive where the runoff enters a catch basin connected to the city owned storm drain. The storm drain is connected to an energy dissipation structure directly across the street from the southeast corner of the site. From there the runoff runs down a paved roadway constructed in a v-shape to a boat ramp into Lake Elsinore. The entire flow path between the site are maintained to ensure design flow capacity and no sensitive stream habitat areas will be adversely affected by the runoff from the site.

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information