

STORMWATER CONTROL PLAN
for
ANTIOCH RETAIL

10/22/2024



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Malibu, CA 90265

prepared by:

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I. PROJECT DATA

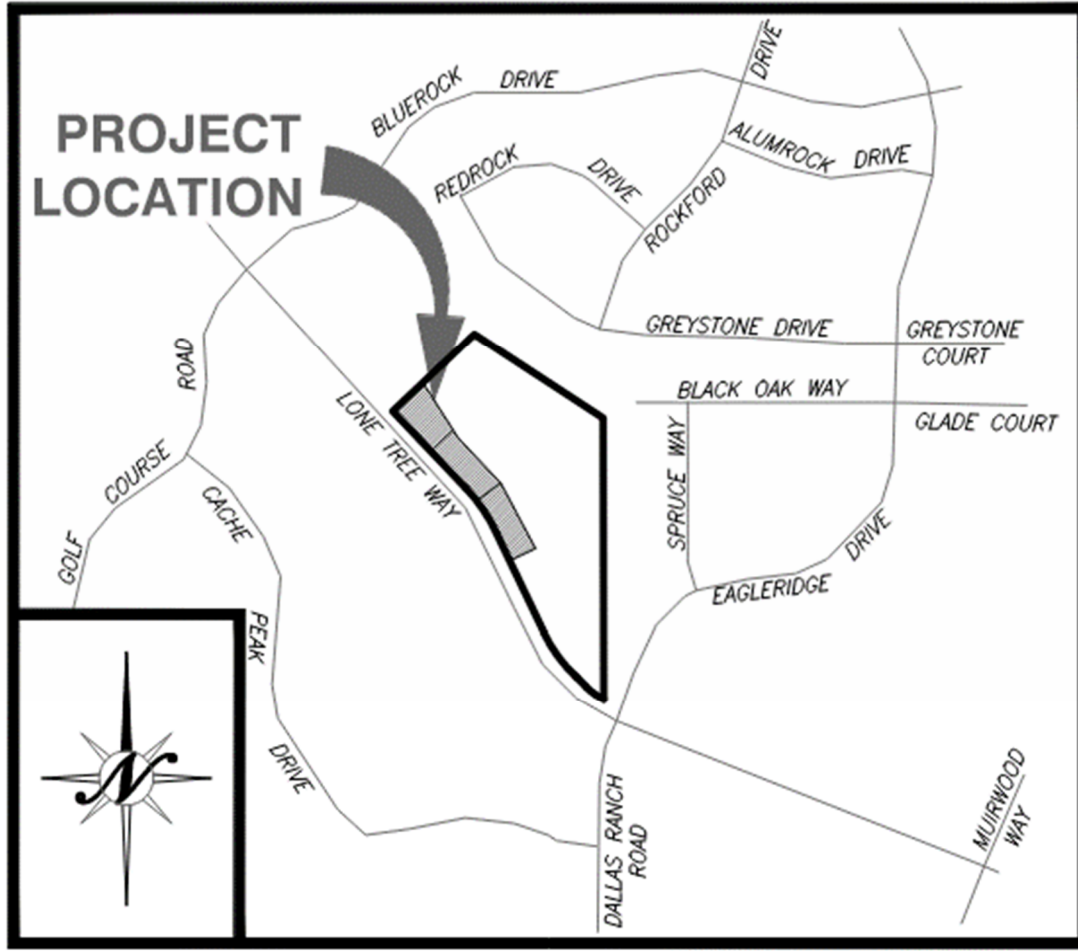
Table 1. Project Data Summary

Project Name/Number	Antioch Retail
Application Submittal Date	02/14/2024
Project Location	Lone Tree Way. Antioch, CA 94531
Name of Developer	Paul Rothbard
Project Phase No.	N/A
Project Type and Description	Commercial Development / Retail
Project Watershed	West Antioch Creek
Total Project Site Area (acres)	3.22 acres
Total Area of Land Disturbed (acres)	2.62 acres
Total New Impervious Surface Area (sq. ft.)	69,654
Total Replaced Impervious Surface Area	9,642
Total Pre-Project Impervious Surface Area	22,697
Total Post-Project Impervious Surface Area	105,792
50% Rule	Applies
Project Density	0.1 : 1 FAR
Applicable Special Project Categories	NA
Percent LID and non-LID treatment	92% LID, 8% non-LID
HM Compliance	Yes

II. SETTING

II.A. Project Location and Description

The site is located at the northwest corner of Lone Tree Way and Eagle Ridge Drive. The project site contains three parcels, E (1.21 acres), F (0.96 acres), and G (1.05 acres). The planned building for parcel E is a car wash facility, F and G are general retail and commercial. All parcels will feature planter boxes, walkways, bioretention facilities, retaining walls, parking amenities for the respective businesses and dumpster enclosures. The total development area is 3.22 acres. The project is planned to be built in a single phase. See the vicinity map below:



VICINITY MAP

NTS

II.B. Existing Site Features and Conditions

The existing site is not developed but includes driveway access to the parcels with drainage facilities. There is a single catch basin on-site to collect drainage. Drainage along the frontage is collected by two catch basins on Lone Tree Way. These two catch basins are connected to each other with an 18” storm drainpipe and connected to the city’s positive storm drain system in the street via a single 24” storm drainpipe. The 24” storm drainpipe extends through the project and will be re-routed due to the developments on parcel E and F and the planned development to the North-East. There are no natural drainage courses on-site, and there is runoff from the adjacent property to the North-East. The existing land use/zoning is PD (Planned Development District); no change in zoning is proposed for parcels F and G, but a change of zoning is required for parcel E as it is a proposed car wash. According to the Web Soil Survey, the Hydrologic Soil Group is C for the project. Groundwater was encountered at a depth of 15’ below the existing ground surface according to a design-level geotechnical report prepared by ENGEO Incorporated dated August 9, 2024.

II.C. Opportunities and Constraints for Stormwater Control

- The site is located in a high-density, urban zoning area, with heavy pedestrian traffic. Thus, the building takes up the entire parcel area, which constrains the locations where LID treatment measures can be placed.
- The soil is highly impermeable, meaning that any proposed bioretention or LID measures will require underdrain.
- Existing utilities in the street frontages limit the areas where LID treatment facilities can be placed along the frontage.
- Existing driveways and improvements that are being retained make it unfeasible to reroute some of the Drainage Management Areas to an LID treatment facility.
- There is an existing storm drain connection from the property to the positive drain system in the street.

II.D. 50% Rule Discussion

Per the Contra Costa Clean Water Program’s C.3 Guidance Manual (hereafter referred to as “Guidance Manual”), projects resulting in the alteration of more than 50% of the impervious surface of a previously existing development, where the previous development was not subject to stormwater treatment measures, then the entire project must be included in the treatment measure design. The existing impervious area within the construction area is 2,478 square feet, 100% of this area is to be removed with the project and replaced with a mix of impervious and pervious areas. Therefore, 100% new impervious surfaces will be installed; thus, the project is subject to the 50% rule and must treat the full project area and not just the added impervious areas. However, existing conditions of driveway access to parcel E and to parcels F and G have existing drainage and it is unfeasible to alter the drainage pattern.

II.E. Special Project Categories

Per Table 3-8 of the Guidance Manual, there are 3 categories of special projects that allow an LID credit for treatment devices. This project does not qualify for the special project categories and is not subject to LID Credit.

III. LOW IMPACT DEVELOPMENT DESIGN STRATEGIES

III.A. Optimization of Site Layout i

III.A.1. Limitation of development envelope

The proposed buildings and parking amenities will occupy a large portion of the parcel. Existing conditions include driveways and pavement that are unfeasible for the development to alter. Site development to the North-East will require a retaining wall between the two properties.

III.A.2. Minimization of imperviousness

Various landscape areas, planters, and bioretention areas are proposed on-site to offset some of the impervious areas. The City of Antioch has requested the building downspouts from the roof be piped directly into the storm drainpipe system which reduces the treatable area.

III.B. Use of Permeable Pavements

No permeable pavements are currently proposed at this stage of design.

III.C. Dispersal of Runoff to Pervious Areas

There are several landscape areas that will collect and retain runoff from adjacent impervious surfaces. Curb through drains allow sheet flow from the impervious parking lot to enter the bioretention facilities.

III.D. Bioretention or other Integrated Management Practices

Bioretention facilities are being proposed throughout the project, see stormwater control plan for specific locations.

III.E. Technical Infeasibility of Implementing LID on the Entire Site

The project's grading characteristics, and property line locations will need to allow certain portions of the site to remain untreated, such as existing driveway and sidewalks. Additionally existing parking that extends into Lot G is going to be retained and is to utilize the existing catch basins and drainage patterns.

III.F. Green Infrastructures

The project is utilizing Green Infrastructures in the form of Bioretention facilities for storm water treatment as well as LID strategies for mitigation.

IV. DOCUMENTATION OF DRAINAGE DESIGN

IV.A. Descriptions of each Drainage Management Area

IV.A.1. Table of Drainage Management Areas

Table 2. Drainage Management Areas

DMA #	DMA Type/Drains to	Surface Type	Area (SF)
E1	Drains to IMP-E1	Concrete/Asphalt	25,830
E2	Self-Treating	Landscaping	26
E3	Self-Treating	Landscaping	889
E4	Self-Treating	Landscaping	270
E5	Self-Treating	Landscaping	470
E6	Self-Treating	Landscaping	125
E7	Self-Treating	Landscaping	225
E8	Un-Treated	Concrete/Asphalt	265
E9	Self-Treating	Landscaping	3,515
E10	Self-Treating	Landscaping	8,088
E11	Un-Treated	Concrete/Asphalt	240
E12	Self-Treating	Landscaping	363
E13	Un-Treated	Concrete/Asphalt	4,332
E14	Drains to IMP-E2	Concrete/Asphalt	1,223
E15	Drains to IMP-E1	Conventional Roof	4,708
F1	Drains to IMP-F1	Concrete/Asphalt	15,587
F2	Self-Treating	Landscaping	137

F3	Un-Treated	Concrete/Asphalt	5,684
F4	Self-Treating	Landscaping	6,138
F5	Self-Treating	Landscaping	1,524
F6	Self-Treating	Landscaping	439
F7	Self-Treating	Landscaping	230
F8	Drains to IMP-F3	Conventional Roof	2,597
F9	Self-Treating	Landscaping	3,610
F10	Drains to IMP-F2	Concrete/Asphalt	1,085
F11	Drains to IMP-F3	Concrete/Asphalt	2,644
G1	Drains to IMP-G2	Concrete/Asphalt	10,817
G2	Drains to IMP-G1	Conventional Roof	3,763
G3	Self-Treating	Landscaping	291
G4	Self-Treating	Landscaping	133
G5	Self-Treating	Landscaping	406
G6	Self-Treating	Landscaping	2,262
G7	Self-Treating	Landscaping	69
G8	Self-Treating	Landscaping	331
G9	Self-Treating	Landscaping	335
G10	Self-Treating	Landscaping	880
G11	Self-Treating	Landscaping	6,097
G12	Drains to IMP-G1	Concrete/Asphalt	2,057
G13	Drains to IMP-G1	Concrete/Asphalt	3,130
G14	Un-Treated	Concrete/Asphalt	3,308
G15	Un-Treated	Concrete/Asphalt	838

IV.A.2. Drainage Management Area Descriptions

DMA E1, totaling 25,830 square feet, pavement and concrete areas. This DMA flows directly into **IMP-E1**.

DMA E2, totaling 26 square feet, landscape area. This DMA is self-treating.

DMA E3, totaling 889 square feet, landscape area. This DMA is self-treating.

DMA E4, totaling 270 square feet, landscape area. This DMA is self-treating.

DMA E5, totaling 470 square feet, landscape area. This DMA is self-treating.

DMA E6, totaling 125 square feet, landscape area. This DMA is self-treating.

DMA E7, totaling 225 square feet, landscape area. This DMA is self-treating.

DMA E8, totaling 265 square feet, pavement area. Per car wash developer, it is a request that the area drains towards the car wash driveway where it will be collected by the re-circulation/treatment system. This DMA is untreated.

DMA E9, totaling 3,515 square feet, landscape area. This DMA is self-treating.

DMA E10, totaling 8,088 square feet, drains the landscape area along the Lone Tree Way frontage. The runoff flows to the existing slope and is collected by the catch basin along Lone Tree Way.

DMA E11, totaling 240 square feet, concrete area. This DMA flows directly into Antioch City's storm drain system as it is unfeasible to collect in a bio-retention facility given the existing grading elevations. This DMA is untreated.

DMA E12, totaling 363 square feet, landscape area. This DMA is self-treating.

DMA E13, totaling 4,332 square feet, existing pavement. This DMA flows directly into Antioch City's storm drain system as it is unfeasible to collect in a bio-retention facility given the existing grading elevations. This DMA is untreated.

DMA E14, totaling 1,223 square feet, pavement and concrete. This DMA flows directly into **IMP-E2**.

DMA E15, totaling 4,708 square feet, building roof area. This DMA flows into **IMP-E1**.

DMA F1, totaling 15,587 square feet, pavement and concrete. This DMA flows directly into **IMP-F1**.

DMA F2, totaling 137 square feet, concrete area. This DMA flows directly into Antioch City's storm drain system as it is unfeasible to collect in a bio-retention facility given the existing grading elevations. This DMA is untreated.

DMA F3, totaling 5,684 square feet, existing pavement. This DMA flows directly into Antioch City's storm drain system as it is unfeasible to collect in a bio-retention facility given the existing grading elevations. This DMA is untreated.

DMA F4, totaling 6,138 square feet, drains the landscape area along the Lone Tree Way frontage. The runoff flows to the existing slope and is collected by the catch basin along Lone Tree Way.

DMA F5, totaling 1,524 square feet, landscape area. This DMA is self-treating.

DMA F6, totaling 439 square feet, landscape area. This DMA is self-treating.

DMA F7, totaling 230 square feet, landscape area. This DMA is self-treating.

DMA F8, totaling 2,597 square feet, building roof area. This DMA flows into **IMP-F3**.

DMA F9, totaling 3610 square feet, landscape area. This DMA is self-treating.

DMA F10, totaling 1,085 square feet, pavement area. This DMA flows directly into **IMP-F2**.

DMA F11, totaling 2,644 square feet, pavement area. This DMA flows directly into **IMP-F3**.

DMA G1, totaling 10,817 square feet, pavement and concrete area. This DMA flows directly into **IMP-G2**.

DMA G2 totaling 3,763 square feet, building roof area. This DMA flows directly into **IMP-G1**.

DMA G3, totaling 291 square feet, landscape area. This DMA is self-treating.

DMA G4, totaling 133 square feet, landscape area. This DMA is self-treating.

DMA G5, totaling 406 square feet, landscape area. This DMA is self-treating.

DMA G6, totaling 2,262 square feet, landscape area. This DMA is self-treating.

DMA G7, totaling 69 square feet, landscape area. This DMA is self-treating.

DMA G8, totaling 331 square feet, landscape area. This DMA is self-treating.

DMA G9, totaling 335 square feet, landscape area. This DMA is self-treating.

DMA G10, totaling 880 square feet, landscape area. This DMA is self-treating.

DMA G11, totaling 6,097 square feet, landscape area. This DMA is self-treating.

DMA G12, totaling 2,057 square feet, pavement area. This DMA flows directly into **IMP-G1**.

DMA G13, totaling 3,130 square feet, pavement area. This DMA flows directly into **IMP-G1**.

DMA G14, totaling 3,308 square feet, existing pavement. This DMA flows directly into Antioch City’s storm drain system as it is unfeasible to collect in a bio-retention facility given the existing grading elevations. This DMA is untreated.

DMA G15, totaling 838 square feet, existing pavement. This DMA flows directly into Antioch City’s storm drain system as it is unfeasible to collect in a bio-retention facility given the existing grading elevations. This DMA is untreated.

See Appendix A for site plans showing the DMAs titled “Storm Water Control Plan Exhibit for Antioch Retail”.

IV.B. Integrated Management Practice Descriptions

7 bioretention areas are proposed for the remainder of the project.

IV.C. Tabulation and Sizing Calculations

IV.C.1. IMP Sizing Calculations

Table 3. IMP Sizing Calculations

IMP #	IMP Type	Tributary DMAs	Total Tributary Area (SF)	Minimum Required IMP area (SF)*	Provided IMP Area (SF)
E1	Bioretention	E1, E15	30,538	1,876	2,109
E2	Bioretention	E14	1,223	75	90
F1	Bioretention	F1	15,587	958	1,100
F2	Bioretention	F10	1,085	67	80
F3	Bioretention	F11, F8	5,241	322	385
G1	Bioretention	G2, G12, & G13	8,950	550	650
G2	Bioretention	G1	10,817	665	750
				Total IMP area:	5,164

*Minimum required IMP area determined by IMP Sizing Calculator. A copy of the results is included in Appendix B.

The bioretention facilities are connected to the storm drainpipe system via inlets located within the bioretention facility themselves. The bioretention areas that do not contain an inlet are connected to one another with perforated pipes allowing them to function together. The bioretention facilities have sufficient head to enter the positive storm drain system for the City of Antioch.

IV.D. Hydraulic Calculations for Discharge Pipe

The area of the project was master planned for commercial development to the North, therefore the existing pipe should be able to handle the stormwater being generated by this project, as well as the proposed adjacent development to the north.

V. SOURCE CONTROL MEASURES

V.A. Site activities and potential sources of pollutants

V.B. Source Control Table

Table 4. Source Controls

<i>Potential source of runoff pollutants</i>	<i>Permanent source control BMPs</i>	<i>Operational source control BMPs</i>
Storm drain inlets	Mark all inlets with the words “No Dumping! Flows to River” or similar.	<p>Maintain and periodically repaint or replace inlet markings.</p> <p>Provide stormwater pollution prevention information to new site owners, lessees, or operators.</p> <p>See applicable operational BMPs in Fact Sheet SC-74, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks</p> <p>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.”</p>
Interior floor drains and elevator shaft sump pumps	Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow
Interior parking garages	Parking garage floor drains will be plumbed to the sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow
Pools, spas, ponds, decorative fountains, and other water features.	Sanitary sewer cleanouts will be provided at pools, spas, ponds, decorative fountains, and other water features.	See applicable operational BMPs in Fact Sheet SC-72, “Fountain and Pool Maintenance,” in the CASQA Stormwater Quality Handbooks
Food service		See the brochure, “Water Pollution Prevention Tips to Protect Water Quality and Keep Your Food Service Facility Clean.” Provide this brochure to new site owners, lessees, and operators

V.C. Features, Materials, and Methods of Construction of Source Control BMPs

City standards and building code standards will be followed for the construction of source control BMPs.

VI. STORMWATER FACILITY MAINTENANCE

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

The owner of the building will have responsibility for maintenance of all aspects of the facility and will need to enter into an Operations and Maintenance Agreement/Right of Entry Agreement with the City of Antioch.

VI.B. Summary of Maintenance Requirements for Each Stormwater Facility

The owner will be responsible for having an operations and maintenance plan. A draft plan can be submitted with construction documents when applying for permits. The O&M plan will need to be finalized before construction is complete. See below an example of maintenance items that can be expected for the proposed treatment facilities:

Table 5. Typical Maintenance Items for Treatment and Source Control Measures

BMP Designation	Responsible Party	Description of Inspection and Maintenance Activity	Frequency of Maintenance
Bioretention	Owner	Remulch void areas	As needed
		Treat diseased trees and shrubs	As needed
		Water plants daily for 2 weeks	At project completion
		Inspect soil and repair eroded areas	Monthly
		Remove litter and debris	Monthly
		Remove and replace dead and diseased vegetation	Bi-annual
		Add additional mulch	Annual
		Replace tree stakes and wire	Annual
Storm Drain Message and Signage	Owner	Inspect storm drain message and signage for legibility.	Bi-annual maintenance
Mosquito Abatement	Owner	Site inspection and control of immature mosquitoes and stagnant water.	Weekly

VII. CONSTRUCTION PLAN C.3 CHECKLIST

Table 6. Construction Plan C.3 Checklist

*Stormwater
Control
Plan
Page #*

BMP Description

See Plan Sheet #s

C4.1-C4.2	Bioretention Areas and drainage patterns	C4.1-C4.2
C5.1-C5.2	Storm Pipe network and Bioretention Areas	C5.1-C5.2

VIII. CERTIFICATIONS

Other than the items identified in this report, there are no other anticipated obstacles or conflicts with codes or requirements to implement the Stormwater Control Plan.

The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan meet the requirements of Regional Water Quality Control Board Order R2-2015-0049.

By

Print Name

IX. ATTACHMENTS/APPENDICES

APPENDIX A. SITE PLANS

STORM WATER CONTROL PLAN (OLD C3 GUIDELINES) EXHIBIT FOR ANTIOCH RETAIL

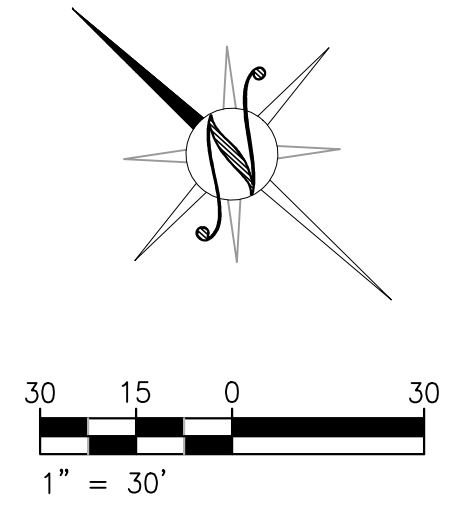
ANTIOCH,

CALIFORNIA



LEGEND:

- BIO-RETENTION FACILITY
- DRAINAGE MANAGEMENT AREA (DMA)
- INTEGRATED MANAGEMENT PRACTICE (IMP)
- PARCEL LINE
- EXISTING IMPERVIOUS AREA. IS NOT A PART OF DEVELOPMENT AND IS NOT INCLUDED INTO THE BIO-RETENTION CALCULATION AND TREATMENT.
- UNTREATED AREA



Project Name: Lone Tree Way Retail
 Type: Treatment, Flow Control, Hydromodification
 Mean Annual Precipitation: 15.0 inches
 Location: Lone Tree Way, Antioch
 Drainage Area: 3.22 Acres
 Soil Group: D

I. Self-Treating Areas

DMA Name	Area (sq ft)
DMA-E2	26
DMA-E3	889
DMA-E4	270
DMA-E5	470
DMA-E6	125
DMA-E7	225
DMA-E9	3515
DMA-E10	8088
DMA-E12	363
DMA-F4	6138
DMA-F5	1524
DMA-F6	439
DMA-F7	230
DMA-F9	3610

II. Untreated Areas

DMA Name	Area (sq ft)
DMA-E8	265
DMA-E11	240
DMA-E13	4332
DMA-F2	137
DMA-F3	5684
DMA-G14	3308
DMA-G15	838

DMA Name	Area (sq ft)
DMA-G3	291
DMA-G4	133
DMA-G5	406
DMA-G6	2262
DMA-G7	69
DMA-G8	331
DMA-G9	335
DMA-G10	880
DMA-G11	6097

IMP Name: IMP-E1 (Soil Type: D) - Bioretention Facility

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor	IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Volume	Proposed Area or Volume	Maximum Release Flowrate (cfs)	Orifice Diameter (IMP Sizing Calculator) (in)
DMA-E1	25,830	Concrete or Asphalt	1	25,830	0.05	1.229	1,876	2,109	0.04	1.24
DMA-E15	4,708	Conventional Roof	1	4,708	0.042	1.229	1,576	1,582		
Total	30,538				0.055	1.229	2,654	2,109		

IMP Name: IMP-E2 (Soil Type: D) - Bioretention Facility

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor	IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Volume	Proposed Area or Volume	Maximum Release Flowrate (cfs)	Orifice Diameter (IMP Sizing Calculator) (in)
DMA-E14	1,223	Concrete or Asphalt	1	1,223	0.05	1.229	75	90	0.00	0.25
Total	1,223				0.042	1.229	63	68		

IMP Name: IMP-F1 (Soil Type: D) - Bioretention Facility

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor	IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Volume	Proposed Area or Volume	Maximum Release Flowrate (cfs)	Orifice Diameter (IMP Sizing Calculator) (in)
DMA-F1	15,587	Concrete or Asphalt	1	15,587	0.05	1.229	958	1,100	0.02	0.89
Total	15,587				0.042	1.229	804	825		

IMP Name: IMP-F2 (Soil Type: D) - Bioretention Facility

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor	IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Volume	Proposed Area or Volume	Maximum Release Flowrate (cfs)	Orifice Diameter (IMP Sizing Calculator) (in)
DMA-F10	1,085	Concrete or Asphalt	1	1,085	0.042	1.229	56	60	0.00	0.23
Total	1,085				0.055	1.229	73	80		

IMP Name: IMP-F3 (Soil Type: D) - Bioretention Facility

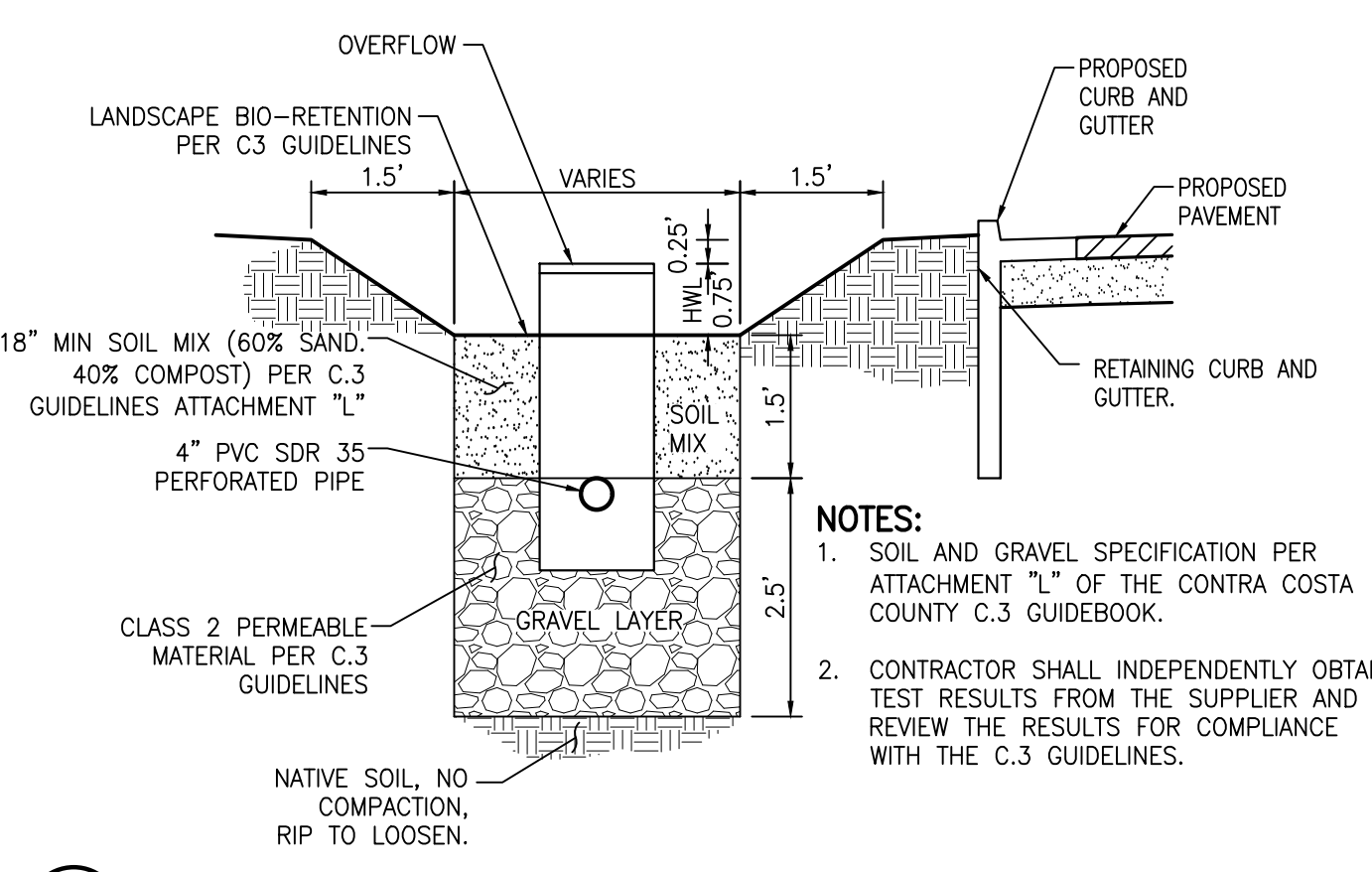
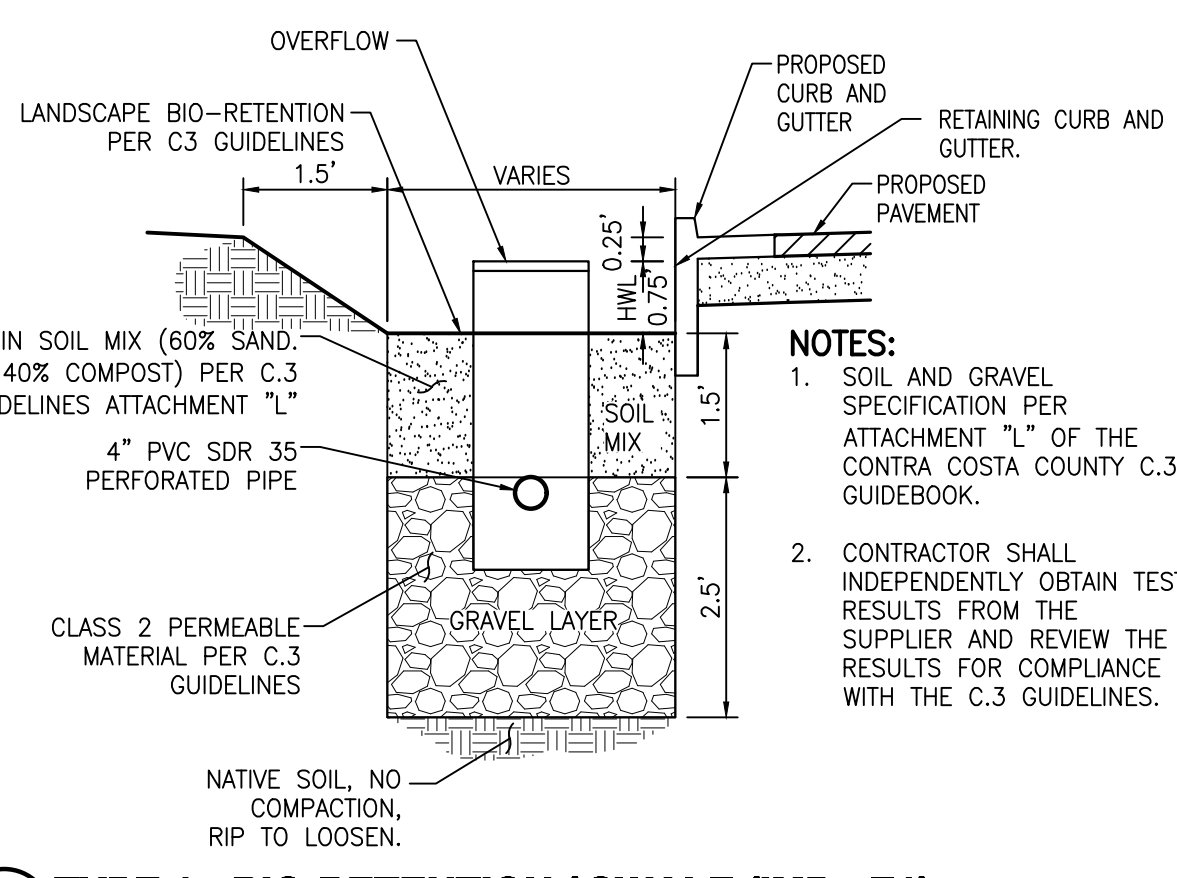
DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor	IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Volume	Proposed Area or Volume	Maximum Release Flowrate (cfs)	Orifice Diameter (IMP Sizing Calculator) (in)
DMA-F8	2,597	Conventional Roof	1	2,597	0.05	1.229	322	385	0.01	0.51
DMA-F11	2,644	Concrete or Asphalt	1	2,644	0.042	1.229	270	289		
Total	5,241				0.055	1.229	354	385		

IMP Name: IMP-G1 (Soil Type: D) - Bioretention Facility

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor	IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Volume	Proposed Area or Volume	Maximum Release Flowrate (cfs)	Orifice Diameter (IMP Sizing Calculator) (in)
DMA-G2	3,763	Conventional Roof	1	3,763	0.05	1.229	550	650	0.01	0.67
DMA-G12	2,057	Concrete or Asphalt	1	2,057	0.042	1.229	462	488		
DMA-G13	3,130	Concrete or Asphalt	1	3,130	0.055	1.229	605	650		
Total	8,950									

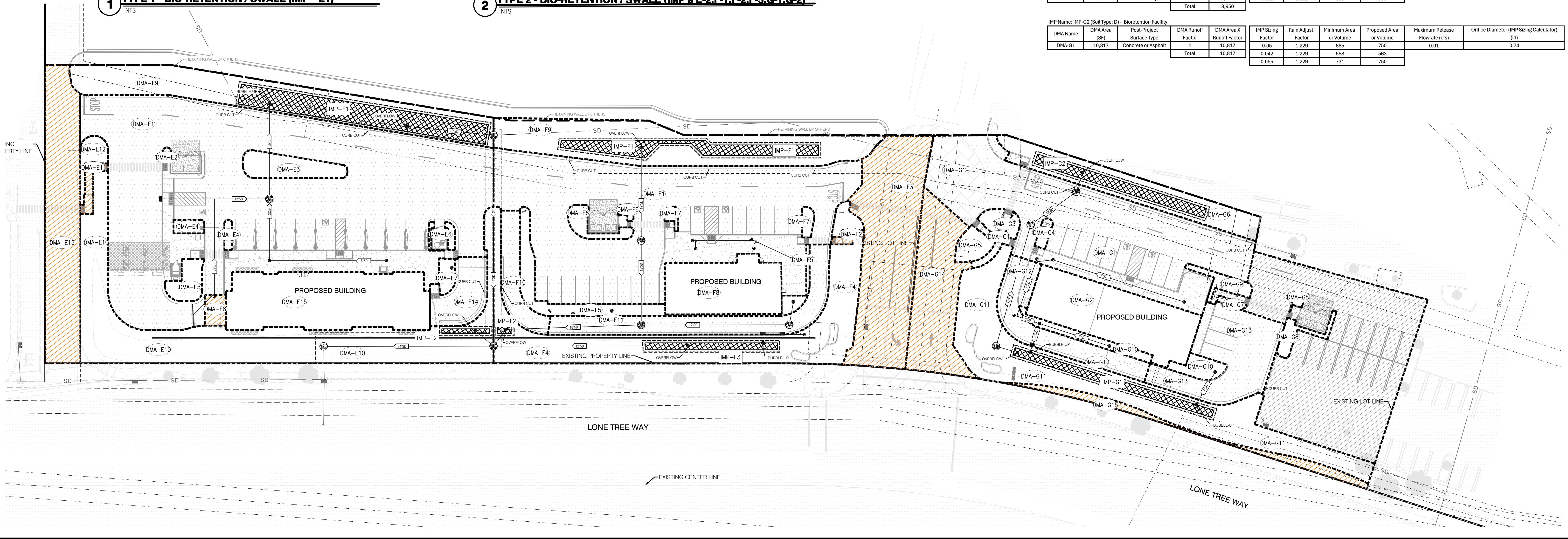
IMP Name: IMP-G2 (Soil Type: D) - Bioretention Facility

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor	IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Volume	Proposed Area or Volume	Maximum Release Flowrate (cfs)	Orifice Diameter (IMP Sizing Calculator) (in)
DMA-G1	10,817	Concrete or Asphalt	1	10,817	0.05	1.229	665	750	0.01	0.74
Total	10,817				0.042	1.229	558	563		



1 TYPE 1 - BIO-RETENTION / SWALE (IMP - E1)

2 TYPE 2 - BIO-RETENTION / SWALE (IMP's E-2, F-1, F-2, F-3, G-1, G-2)



APPENDIX B. IMP SIZING CALCULATOR RESULTS

Project Name: Antioch Retail
Project Type: Treatment and Flow Control
APN: 072-500-005-3
Drainage Area: 47,746
Mean Annual Precipitation: 15.0

Self-Treating DMAs

DMA Name	Area (sq ft)
DMA-E2	26.0
DMA-E3	889.0
DMA-E4	270.0
DMA-E5	470.0
DMA-E6	125.0
DMA-E7	225.0
DMA-E9	3,515.0
DMA-E10	8,088.0
DMA-E12	363.0

IV. Areas Draining to IMPs

IMP Name: IMP-E1
IMP Type: Bioretention Facility
Soil Group: IMP-E1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing			
					IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA-E1	25,830	Concrete or Asphalt	1.00	25,830				
DMA-E15	4,708	Conventional Roof	1.00	4,708				
Total				30,538				
				Area	0.050	1.229	1,876	2,109
				Surface Volume	0.042	1.229	1,576	1,582
				Subsurface Volume	0.055	1.229	2,064	2,109
							Maximum Underdrain Flow (cfs)	0.04
							Orifice Diameter (in)	1.24

IMP Name: IMP-E2
IMP Type: Bioretention Facility
Soil Group: IMP-E2

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing			
DMA-E14	1,223	Concrete or Asphalt	1.00	1,223	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Total				1,223				
Area					0.050	1.229	75	90
Surface Volume					0.042	1.229	63	68
Subsurface Volume					0.055	1.229	83	90
							Maximum Underdrain Flow (cfs) Orifice Diameter (in)	0.00
								0.25

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Project Name: Antioch Retail
Project Type: Treatment and Flow Control
APN: 072-500-005-3
Drainage Area: 35,269
Mean Annual Precipitation: 15.0

Self-Treating DMAs

DMA Name	Area (sq ft)
DMA-F4	6,138.0
DMA-F5	1,524.0
DMA-F6	439.0
DMA-F7	230.0
DMA-F9	3,610.0

IV. Areas Draining to IMPs

IMP Name: IMP-F1
IMP Type: Bioretention Facility
Soil Group: IMP-F1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA-F1	15,587	Concrete or Asphalt	1.00	15,587					
Total				15,587					
				Area	0.050	1.229	958	1,100	
				Surface Volume	0.042	1.229	804	825	
				Subsurface Volume	0.055	1.229	1,053	1,100	
								Maximum Underdrain Flow (cfs)	0.02
								Orifice Diameter (in)	0.89

IMP Name: IMP-F2
IMP Type: Bioretention Facility
Soil Group: IMP-F2

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA10	1,085	Concrete or Asphalt	1.00	1,085					
Total				1,085					

Area	0.050	1.229	67	80
Surface Volume	0.042	1.229	56	60
Subsurface Volume	0.055	1.229	73	80
			Maximum Underdrain Flow (cfs)	0.00
			Orifice Diameter (in)	0.23

IMP Name: IMP-F3

IMP Type: Bioretention Facility

Soil Group: IMP-F3

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing			
					IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA-F8	2,597	Conventional Roof	1.00	2,597				
DMA11	2,644	Concrete or Asphalt	1.00	2,644				
Total				5,241				
				Area	0.050	1.229	322	385
				Surface Volume	0.042	1.229	270	289
				Subsurface Volume	0.055	1.229	354	385
							Maximum Underdrain Flow (cfs)	0.01
							Orifice Diameter (in)	0.51

Project Name: Antioch Retail
Project Type: Treatment and Flow Control
APN: 072-500-006-1
Drainage Area: 31,971
Mean Annual Precipitation: 15.0

Self-Treating DMAs

DMA Name	Area (sq ft)
DMA-G3	291.0
DMA-G4	133.0
DMA-G5	406.0
DMA-G6	2,262.0
DMA-G7	69.0
DMA-G8	331.0
DMA-G9	335.0
DMA-G10	880.0
DMA-G11	6,097.0

IV. Areas Draining to IMPs

IMP Name: IMP-G1
IMP Type: Bioretention Facility
Soil Group: IMP-G1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume	
DMA-G2	3,763	Conventional Roof	1.00	3,763					
DMA-G12	2,057	Concrete or Asphalt	1.00	2,057					
DMA-G13	3,130	Concrete or Asphalt	1.00	3,130					
Total				8,950					
				Area	0.050	1.229	550	650	
				Surface Volume	0.042	1.229	462	488	
				Subsurface Volume	0.055	1.229	605	650	
								Maximum Underdrain Flow (cfs)	0.01
								Orifice Diameter (in)	0.67

IMP Name: IMP-G2
IMP Type: Bioretention Facility

Soil Group: IMP-G2

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing			
DMA-G1	10,817	Concrete or Asphalt	1.00	10,817	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
Total				10,817				
Area					0.050	1.229	665	750
Surface Volume					0.042	1.229	558	563
Subsurface Volume					0.055	1.229	731	750
							Maximum Underdrain Flow (cfs) Orifice Diameter (in)	0.01
								0.74

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APPENDIX C. OPERATIONS AND MAINTENANCE PLAN

STORMWATER FACILITIES OPERATION AND MAINTENANCE PLAN
for
ANTIOCH RETAIL

10/22/2024

Paul Rothbard
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Malibu, CA 90265

prepared by:

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NorthStar Engineering Group, Inc.
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Attachments

1. Stormwater Control Plan for Antioch Retail
2. Stormwater Control Plan Exhibit
3. “As-Built” drawings
4. Manufacturer’s data, manuals, and maintenance requirements for pumps, mechanical and electrical equipment, and proprietary facilities
5. Service agreements

Acronyms and Abbreviations

C.3	Provision C.3 in the Municipal Regional Stormwater Permit issued by the California Regional Water Quality Control Board for the San Francisco Bay Region
IMP	Integrated Management Practice
O&M Plan	Operations and Maintenance Plan

This Stormwater Facilities Operation and Maintenance Plan was prepared using the template dated February 2018.

I. INSPECTION AND MAINTENANCE LOG

Facility Name
Address
Begin Date End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary.

- BMP ID# — Always use ID# from the Operation and Maintenance Manual.
- Inspected by — Note all inspections and maintenance on this form.
- Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.
- Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.
- Comments and actions taken — Describe any maintenance done and need for follow-up.

II. UPDATE TO DESIGNATION OF RESPONSIBLE INDIVIDUALS

** Use this form to update the plan when responsible individuals change. **	
Date Completed	
Facility Name	
Facility Address	
Designated Contact for Operation and Maintenance	
Name:	Title or Position:
Telephone:	Alternate Telephone:
Email:	
Off-Hours or Emergency Contact	
Name:	Title or Position:
Telephone:	Alternate Telephone:
Email:	
Corporate Officer (authorized to execute contracts with the City, Town, or County)	
Name:	Title or Position:
Address:	
Telephone:	Alternate Telephone:
Email:	

III. UPDATES, REVISIONS, AND ERRATA

Date	Num.	Updates, Revisions, or Errata Title	Description/Purpose	By (full name):

I. INTRODUCTION

This plan addresses operation and maintenance of facilities constructed as part of the following development project:

Antioch Retail

The final, approved Stormwater Control Plan for this project is in Appendix A.

I.A. Background

This Stormwater Facilities Operation and Maintenance Plan (O&M Plan) is for facilities (and pervious pavement systems) constructed as part of the development project referenced above. Construction of these facilities was required by Provision C.3 in the Municipal Regional Stormwater Permit issued by the California Regional Water Quality Control Board for the San Francisco Bay Region. Provision C.3. also requires the City of Antioch to verify ongoing operation and maintenance of stormwater treatment and hydromodification management facilities, and certain pervious pavement installations.

I.B. Associated Agreements

This O&M Plan is referenced in an O&M Agreement between the property owner or assignee and the City of Antioch. The agreement also grants access for inspections to the Contra Costa Mosquito and Vector Control District (CCMVCD).

As provided in the O&M Agreement, this O&M Plan may be modified, but only with the review and consent of the City of Antioch Public Works Director/City Engineer. The official O&M Plan is the version which is on file at the City of Antioch Public Works Department. Any modifications made to the O&M Plan with the consent of the Public Works Director/City Engineer must be filed at the Public Works Department.

I.C. Funding for and Organization of Facility Operation and Maintenance

Funding for the facility operation and maintenance will be provided by the project owner or assignee.

I.D. Site Description

Antioch Retail is located at the corner of Lone Tree Way and Eagle Ridge Drive. The site is three parcels, 0.94 acres, 0.95 acres, and 0.93 acres in size, with street-facing plaza seating areas and pedestrian-friendly areas along the Lone Tree Way frontage. The land use/zoning is PD (Planned Development District). Per Web Soil Survey, the Hydrologic Soil Group is C for the project. Groundwater was encountered at a depth of 10' to 16' below the existing ground surface according to a geotechnical report prepared by Kleinfelder dated July 21, 2004. An updated geotechnical report will be prepared for the Civil Improvement Plans..

There are 7 bioretention planters in the proposed project, located along the Lone Tree Way frontage and north of the project site that collect a majority of the runoff from the proposed pavement and send it to an underground collection pipe. All of the treated water is then routed to the city system.

Flows greater than the stormwater quality design flow will bypass the bioretention planters through overflow inlets.

II. DESIGNATION AND TRAINING OF RESPONSIBLE INDIVIDUALS

II.A. Designated Contact for Operation and Maintenance

To be determined.

II.B. Off-Hours or Emergency Contact

To be determined.

II.C. Corporate Officer (authorized to execute agreements with the County)

To be determined.

II.D. Initial Training of Responsible Individuals

Training to include:

- a. Good housekeeping procedures defined in the plan.
- b. Proper maintenance of all pollution mitigation devices.
- c. Identification and cleanup procedures for spills and overflows.
- d. Large-scale spill or hazardous material response.
- e. Safety concerns when maintaining devices and cleaning spills.

II.E. Ongoing Training of Responsible Individuals

Training to include:

- a. Good housekeeping procedures defined in the plan.
- b. Proper maintenance of all pollution mitigation devices.
- c. Identification and cleanup procedures for spills and overflows.
- d. Large-scale spill or hazardous material response.
- e. Safety concerns when maintaining devices and cleaning spills.

III. FACILITIES TO BE MAINTAINED

III.A. Facility Descriptions

III.A.1. Bioretention/flow through planter facilities

See the Stormwater Control Plan for additional details on the bioretention facilities, including size and construction details. Below is a summary table of the bioretention and flow-through planter facilities:

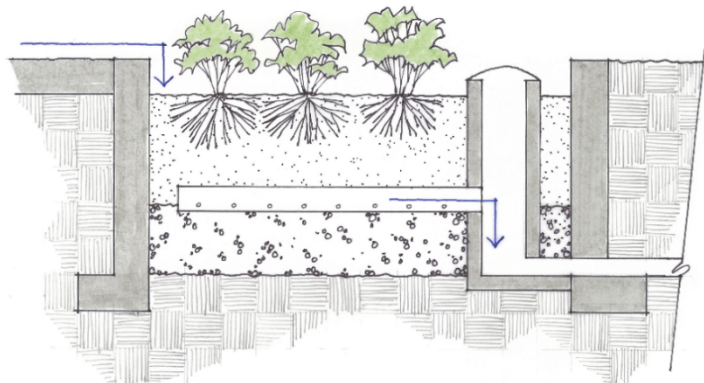


Figure 1. Bioretention Cross-Section (schematic)

IMP #	IMP Type	Tributary DMAs	Total Tributary Area (SF)	Minimum Required IMP area (SF)*	Provided IMP Area (SF)
E1	Bioretention	E1, E15	30,538	1,876	2,109
E2	Bioretention	E14	1,223	75	90
F1	Bioretention	F1	15,587	958	1,100
F2	Bioretention	F10	1,085	67	80
F3	Bioretention	F11, F8	5,241	322	385
G1	Bioretention	G2, G12, & G13	8,950	550	650
G2	Bioretention	G1	10,817	665	750
Total IMP area:					5,164

*Minimum required IMP area determined by IMP Sizing Calculator. A copy of the results is included in Appendix B.

Untreated water sheet flows into each of the bioretention facilities. There are underdrains present in each of the areas that receive treated water and pipe them to the outfall.

III.A.2. Storm Vault

No Storm Vault is being proposed for the project.

MECH #	MECH Type	Tributary DMAs	Total Tributary Area (SF)

IV. MAINTENANCE ACTIVITIES

IV.A. General Maintenance Rules

IV.A.1. Bioretention facilities

At no time will synthetic pesticides or fertilizers be applied, nor will any soil amendments, other than aged compost mulch or sand/compost mix, be introduced. The top of soil surface will be maintained at or near the design elevation throughout. Irrigation systems will be maintained to conserve water while maintaining plant health.

Although it is unlikely to be needed, if plants are not thriving compost tea may be applied at a recommended rate of 5 gallons mixed with 15 gallons of water per acre, up to once per year between March and June. Compost tea will not be applied when temperatures are below 50°F or above 90°F or when rain is forecast within the next 48 hours.

The following may be applied for pest control if needed:

- Beneficial nematodes

- Safer® products
- Neem oil

Plants may need to be replaced with a mix as specified by the landscape architect or with similar plantings appropriate for the unique conditions.

IV.A.2. Storm Vault

No storm vault is being proposed for this project.

IV.B. Maintenance Schedule for Bioretention/Flow-through Planters

The 7 bioretention facilities will be maintained on the following schedule at a minimum:

IV.B.1. Routine Activities

The facilities will be examined daily for visible trash, and trash will be removed. Any graffiti, vandalism, or other damage will be noted and addressed within 48 hours.

The planted areas will be weeded by hand approximately monthly. At this time, plants will be inspected for health and the irrigation system will be turned on manually and checked for any leaks or broken lines, misdirected spray patterns etc. Any dead plants will be replaced.

IV.B.2. Following Significant Rain Events

A significant rain event will be considered to be one that produces approximately a half-inch or more rainfall in a 24-hour period. Within 24 hours after each such event, the following will be conducted:

- The surface of the facility will be observed to confirm there is no ponding.
- Inlets will be inspected, and any accumulations of trash or debris will be removed. Any erosion at inlets should be restored to grade.
- The surface of the mulch layer will be inspected for movement of material. Mulch will be replaced and raked smooth if needed.
- Outlet structure will be inspected for any obstructions to assure that mulch is not washed out.

IV.B.3. Prior to the Start of the Rainy Season

In September of each year, facility inlets and outlets (including flow-control orifices, if any) will be inspected to confirm there is no accumulation of debris that would block flow. Stormwater should drain freely into the bioretention facilities. If not previously addressed during monthly maintenance, any growth and spread of plantings that blocks inlets or the movement of runoff across the surface of the facility will be cut back or removed.

IV.B.4. Annually During Winter

Once, in December – February of each year, vegetation will be cut back as needed, debris removed, and plants and mulch replaced as needed. The concrete work will be inspected for damage. The elevation of the top of soil and mulch layer will be confirmed to be consistent with the 6-inch reservoir depth.

IV.C. Maintenance Schedule for Storm Vault.

No storm vault is being proposed for this project.

