

Example
Stormwater Control Plan
For a Residential Subdivision Project

Whispering Pines Lane
Anytown, USA

February 21, 2018

XYZ Corporation
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This example prepared by Dan Cloak Environmental Consulting
to assist users of the Contra Costa Clean Water Program's
Stormwater C.3 Guidebook

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This Stormwater Control Plan was prepared using the template dated February 2018.

I. PROJECT DATA

Table 1. Project Data

Project Name/Number	Example for a Small Residential Subdivision
Application Submittal Date	December 1, 2017
Project Location	Whispering Pines Lane, Anytown
Name of Developer	XYZ Corporation
Project Phase No.	Not applicable
Project Type and Description	Nine single family homes with public street and associated infrastructure
Project Watershed	Pristine Creek
Total Project Site Area (acres)	3.0 acres
Total Area of Land Disturbed (acres)	3.0 acres
Total New Impervious Surface Area (sq. ft.)	60,054 SF
Total Replaced Impervious Surface Area	0 SF
Total Pre-Project Impervious Surface Area	0 SF
Total Post-Project Impervious Surface Area	60,054 SF
50% Rule	Does not apply
Project Density	FAR = 0.0
Applicable Special Project Categories	None
Percent LID and non-LID treatment	100% LID
HMP Compliance	Applies

II. SETTING

II.A. Project Location and Description

The project consists of nine single family homes, a new street with a cul-de-sac, and sidewalks. The site is a 3-acre parcel on Arterial Road, a quarter mile west of Major Highway. See Figure 1.

II.B. Existing Site Features and Conditions

The 3-acre undeveloped infill site is nearly flat, sloping only 0.15% toward Arterial Road. The site was formerly agricultural, and there are no significant trees. See Figure 2. Soils are silty clays typical of the area (Hydrologic Soil Group “D”). Groundwater depths are 10 feet or more. There are no swales or other natural drainage features, and there are no storm drains on site. A municipal storm drain exists in Arterial Road bordering the site.



Figure 1. Location of Whispering Pines Lane, Anytown.

II.C. Opportunities and Constraints for Stormwater Control

Disposal of runoff to deep infiltration is not feasible on this site due to the low permeability of the clay soils.

The planned development includes large front yards and rear yards, allowing runoff from some impervious areas to be managed by dispersal to landscaping.

There is a storm drain in Arterial Road; however, it is at a shallow depth, limiting the potential for connecting underdrains from bioretention facilities located more than a short distance from Arterial Road.

III. LOW IMPACT DEVELOPMENT DESIGN STRATEGIES

III.A. Optimization of Site Layout

The site is infill within the existing urbanized area. Density reflects that of surrounding developments and is consistent with zoning.

To minimize street length and pavement area, the street is double loaded (driveways on each side). Street widths, sidewalk widths, and the radius of the cul-de-sac (with mountable curbs) are the minimum allowable consistent with City public works standards and fire district requirements.

The planned location of bioretention facilities along Arterial Road provides a buffer between the residences and the street.

III.B. Use of Permeable Pavements

Conventional concrete and conventional asphalt are to be used to construct the street, sidewalks, and driveways. Permeable pavements are not cost-effective for this site, in part because the pavements overlie expansive clay soils. This condition would necessitate a very deep gravel base course, which would, in turn, require large quantities of excavation and off-haul.

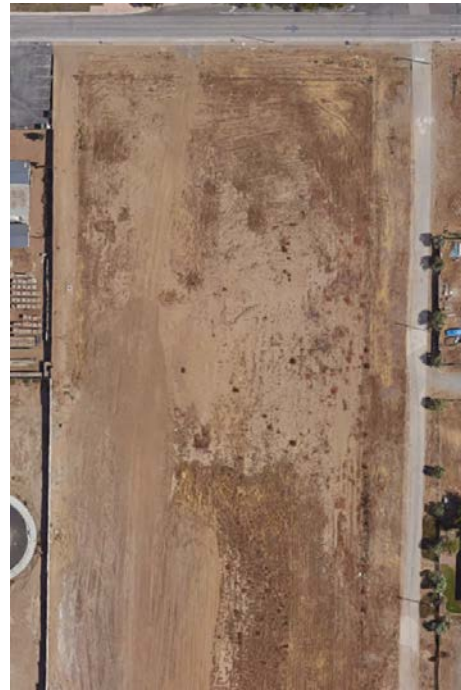


Figure 2. Existing Site Conditions.

III.C. Dispersal of Runoff to Pervious Areas

Runoff from the rear portion of each house (about 50% of roof area) will be dispersed to rear yards. In addition, the landscaped front yards will be graded to retain runoff. The mild concave grading will not interfere with flood flow paths directing runoff around building pads and out to the street.

III.D. Bioretention or other Integrated Management Practices

Runoff from the front portion of each house roof and from driveways will be routed to the street gutters. The combined runoff from lots and streets will be routed to two bioretention facilities located in separate parcels along Arterial Road. See Exhibit.

IV. DOCUMENTATION OF DRAINAGE DESIGN

IV.A. Descriptions of each Drainage Management Area

IV.A.1. Table of Drainage Management Areas

	<i>DMA ID</i>	<i>Area (SF)</i>	<i>Surface Type</i>	<i>Description</i>	<i>DMA Type/Drains to</i>
Lot 1	1-RF	1846	Roof	Roof, front	Drains to IMP (Facility #1)
	1-RR	1388	Roof	Roof, rear	Drains to Self-Retaining Area
	1-DW	805	Paved	Driveway	Drains to IMP (Facility #1)
	1-FY-1	780	Landscaped	Front Yard	Self-Retaining
	1-FY-2	1725	Landscaped	Front Yard	Self-Retaining
	1-RY	5210	Landscaped	Rear Yard	Self-Retaining
Lot 2	2-RF	2204	Roof	Roof, front	Drains to IMP (Facility #1)
	2-RR	2550	Roof	Roof, rear	Drains to Self-Retaining Area
	2-DW	400	Paved	Driveway	Drains to IMP (Facility #1)
	2-FY-1	1620	Landscaped	Front Yard	Self-Retaining
	2-FY-2	370	Landscaped	Front Yard	Self-Retaining
	2-RY	3580	Landscaped	Rear Yard	Self-Retaining
Lot 3	3-RF	1846	Roof	Roof, front	Drains to IMP (Facility #1)
	3-RR	1388	Roof	Roof, rear	Drains to Self-Retaining Area
	3-DW	1000	Paved	Driveway	Drains to IMP (Facility #1)
	3-FY-1	1145	Landscaped	Front Yard	Self-Retaining
	3-FY-2	1665	Landscaped	Front Yard	Self-Retaining
	3-RY	3775	Landscaped	Rear Yard	Self-Retaining

Lot 4	4-RF	1792	Roof	Roof, front	Drains to IMP (Facility #1)
	4-RR	1753	Roof	Roof, rear	Drains to Self-Retaining Area
	4-DW	520	Paved	Driveway	Drains to IMP (Facility #1)
	4-FY-1	730	Landscaped	Front Yard	Self-Retaining
	4-FY-2	1575	Landscaped	Front Yard	Self-Retaining
	4-RY	8045	Landscaped	Rear Yard	Self-Retaining
Lot 5	5-RF	1846	Roof	Roof, front	Drains to IMP (Facility #2)
	5-RR	1388	Roof	Roof, rear	Drains to Self-Retaining Area
	5-DW	955	Paved	Driveway	Drains to IMP (Facility #2)
	5-FY-1	1045	Landscaped	Front Yard	Self-Retaining
	5-FY-2	1790	Landscaped	Front Yard	Self-Retaining
	5-RY	5390	Landscaped	Rear Yard	Self-Retaining
Lot 6	6-RF	1792	Roof	Roof, front	Drains to IMP (Facility #2)
	6-RR	1753	Roof	Roof, rear	Drains to Self-Retaining Area
	6-DW	555	Paved	Driveway	Drains to IMP (Facility #2)
	6-FY-1	1615	Landscaped	Front Yard	Self-Retaining
	6-FY-2	615	Landscaped	Front Yard	Self-Retaining
	6-RY	8235	Landscaped	Rear Yard	Self-Retaining
Lot 7	7-RF	2204	Roof	Roof, front	Drains to IMP (Facility #2)
	7-RR	2550	Roof	Roof, rear	Drains to Self-Retaining Area
	7-DW	670	Paved	Driveway	Drains to IMP (Facility #2)
	7-FY-1	1845	Landscaped	Front Yard	Self-Retaining
	7-FY-2	920	Landscaped	Front Yard	Self-Retaining
	7-RY	2760	Landscaped	Rear Yard	Self-Retaining
Lot 8	8-RF	1792	Roof	Roof, front	Drains to IMP (Facility #2)
	8-RR	1753	Roof	Roof, rear	Drains to Self-Retaining Area
	8-DW	480	Paved	Driveway	Drains to IMP (Facility #2)
	8-FY-1	870	Landscaped	Front Yard	Self-Retaining

	8-FY-2	1715	Landscaped	Front Yard	Self-Retaining
	8-RY	4190	Landscaped	Rear Yard	Self-Retaining
Lot 9	9-RF	2204	Roof	Roof, front	Drains to IMP (Facility #2)
	9-RR	2550	Roof	Roof, rear	Drains to Self-Retaining Area
	9-DW	370	Paved	Driveway	Drains to IMP (Facility #2)
	9-FY-1	460	Landscaped	Front Yard	Self-Retaining
	9-FY-2	1820	Landscaped	Front Yard	Self-Retaining
	9-RY	4350	Landscaped	Rear Yard	Self-Retaining
Street	S-1	9330	Paved	Street	Drains to IMP (Facility #1)
	S-2	10370	Paved	Street	Drains to IMP (Facility #2)

IV.A.2. Drainage Management Area Descriptions

Front Roofs (DMAs 1-RF, 2-RF, 3-RF, 4-RF, 5-RF, 6-RF, 7-RF, 8-RF, and 9-RF, totaling 17,526 square feet), drain via gutters to driveways or swales adjacent to the driveways and from there to the street gutters, which drain to Bioretention Facilities 1 and 2.

Driveways (DMAs 1-DW, 2-DW, 3-DW, 4-DW, 5-DW, 6-DW, 7-DW, 8-DW, and 9-DW, totaling 5,755 square feet, drain to the street gutters, which drain to Bioretention Facilities 1 and 2.

Sidewalks and Whispering Pines Lane, (DMAs S-1 and S-2, totaling 19,700 square feet) drain to Bioretention Facilities 1 and 2, respectively.

Rear Roofs (DMAs 1-RR, 2-RR, 3-RR, 4-RR, 5-RR, 6-RR, 7-RR, 8-RR, and 9-RR totaling 17,073 square feet), each drain to the associated rear yards.

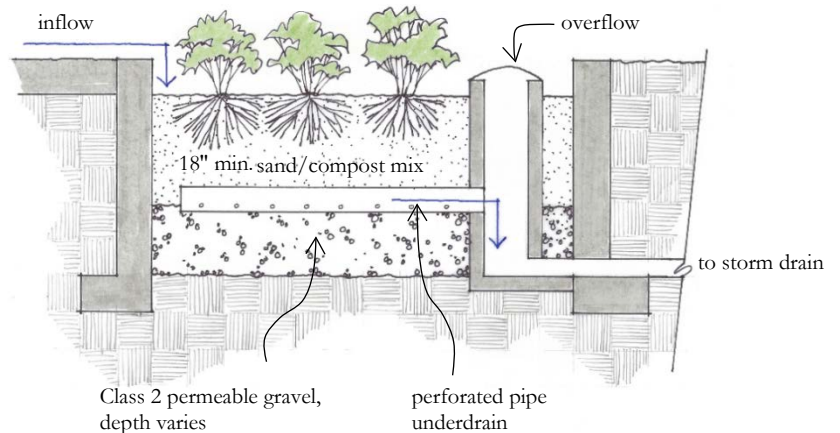
Rear Yards (DMAs 1-RY, 2-RY, 3-RY, 4-RY, 5-RY, 6-RY, 7-RY, 8-RY, and 9-RY totaling 45,535 square feet) will be graded slightly concave to promote runoff retention. Each will receive runoff from rear roofs on the same lot.

Front Yards (DMAs 1-FY-1, 1-FY-2, 2-FY-1, 2-FY-2, 3-FY-1, 3-FY-2, 4-FY-1, 4-FY-2, 5-FY-1, 5-FY-2, 6-FY-1, 6-FY-2, 7-FY-1, 7-FY-2, 8-FY-1, 8-FY-2, and 9-FY-1 and 9-FY-2, totaling 22,305 square feet will be graded slightly concave to promote runoff retention.

IV.B. Integrated Management Practices

Runoff from the front portion of each house roof and from driveways will be routed to the street gutters. The combined runoff from lots and streets will be routed to two bioretention facilities located in separate parcels along Arterial Road. See Exhibit.

Bioretention Facilities #1 and #2 will be located adjacent to Arterial Road on the north end of the site, one on each side of the newly constructed Whispering Pines Lane.



Each of the facilities will be designed and constructed to the criteria in the *Stormwater C.3 Guidebook*, 7th Edition, including the following features:

- Surrounded by a concrete curb.
- Each layer built flat, level, and to the elevations specified in the plans:
 - Bottom of Gravel Layer (BGL)
 - Top of Gravel Layer (TGL)
 - Top of Soil Layer (TSL)
 - Overflow Grate
 - Facility Rim
- 30 inches Class 2 permeable, Caltrans specification 68-2.02F(3).
- 18 inches sand/compost mix meeting the specifications approved by the Regional Water Quality Control Board in April 2016.
- 4 in. dia. PVC SDR 35 perforated pipe underdrain, installed with the invert at the top of the Class 2 permeable layer with holes facing down, and connected to the overflow structure at that same elevation
- 12-inch-deep reservoir between top of soil elevation and overflow grate elevation
- Concrete drop inlet with frame overflow structure, with grate set to specified elevation, connected to storm drain in Arterial Road
- Plantings selected for water conservation
- Irrigation system with drip emitters and “smart” irrigation controllers

IV.C. Tabulation and Sizing Calculations

See Attachment 1, Output from the IMP Sizing Calculator

V. SOURCE CONTROL MEASURES

V.A. Site activities and potential sources of pollutants

On-site activities that could potentially produce stormwater pollutants include:

- Indoor and structural pest control
- Landscape maintenance

V.B. Source Control Table

Table 3. Source Control Table

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
Indoor and structural pest control	New construction minimizes potential for pest entry.	IPM information will be provided to new homeowners.
Landscape maintenance	Developer-installed landscaping will minimize irrigation and runoff and be selected for pest resistance, and will minimize the need for fertilizers and pesticides. Plants will be selected appropriate to site soils, slopes, climate, sun, wind rain, land use, air movement, ecological consistency, and plant interactions.	IPM information will be provided to new homeowners. Landscaping will be maintainable using minimum or no pesticides.

VI. STORMWATER FACILITY MAINTENANCE

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

The two bioretention facilities will each be located on a jointly owned parcel, with easy access to the public street. Owners of parcels 1, 2, 3, and 4 will jointly own the parcel on which Bioretention Facility 1 is located, and will be jointly responsible for the maintenance of that facility, subject to provisions in the subdivision map and Conditions, Covenants, and Restrictions (CC&Rs) recorded against the subdivision. Similarly, owners of parcels 5, 6, 7, 8, and 9 will jointly own the parcel on which Bioretention Facility 2 is located, and will be jointly responsible for the maintenance of that facility. The applicant has reviewed the map provisions and CC&Rs provided by Anytown, USA, for applicant’s review, and commits to execute any additional agreements necessary to ensure uninterrupted maintenance of the facilities. Applicant accepts responsibility for interim operation and maintenance of stormwater treatment and flow-control facilities until this responsibility is formally transferred to subsequent owners.

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

The two bioretention facilities will be maintained on the following schedule at a minimum. Details of maintenance responsibilities and procedures will be included in a Stormwater Facility Operation and Maintenance Plan to be submitted for approval as required in the conditions of approval.

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.

Weekly: The facilities will be examined for visible trash during regular policing of the site, and trash will be removed. The facility, and the facility sign, will be inspected for graffiti or vandalism and any problems corrected.

After Significant Rain Events: A significant rain event is 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.
- The surface of the mulch layer will be inspected for movement of material. Mulch will be replaced and raked smooth if needed.

Prior to the Start of the Rainy Season: In September or each year, the facility will be inspected to confirm there is no accumulation of debris that would block flow, and that growth and spread of plantings does not block inlets or the movement of runoff across the surface of the facility.

Annual Landscape Maintenance: 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 12-inch reservoir depth.

VII. CONSTRUCTION PLAN C.3 CHECKLIST

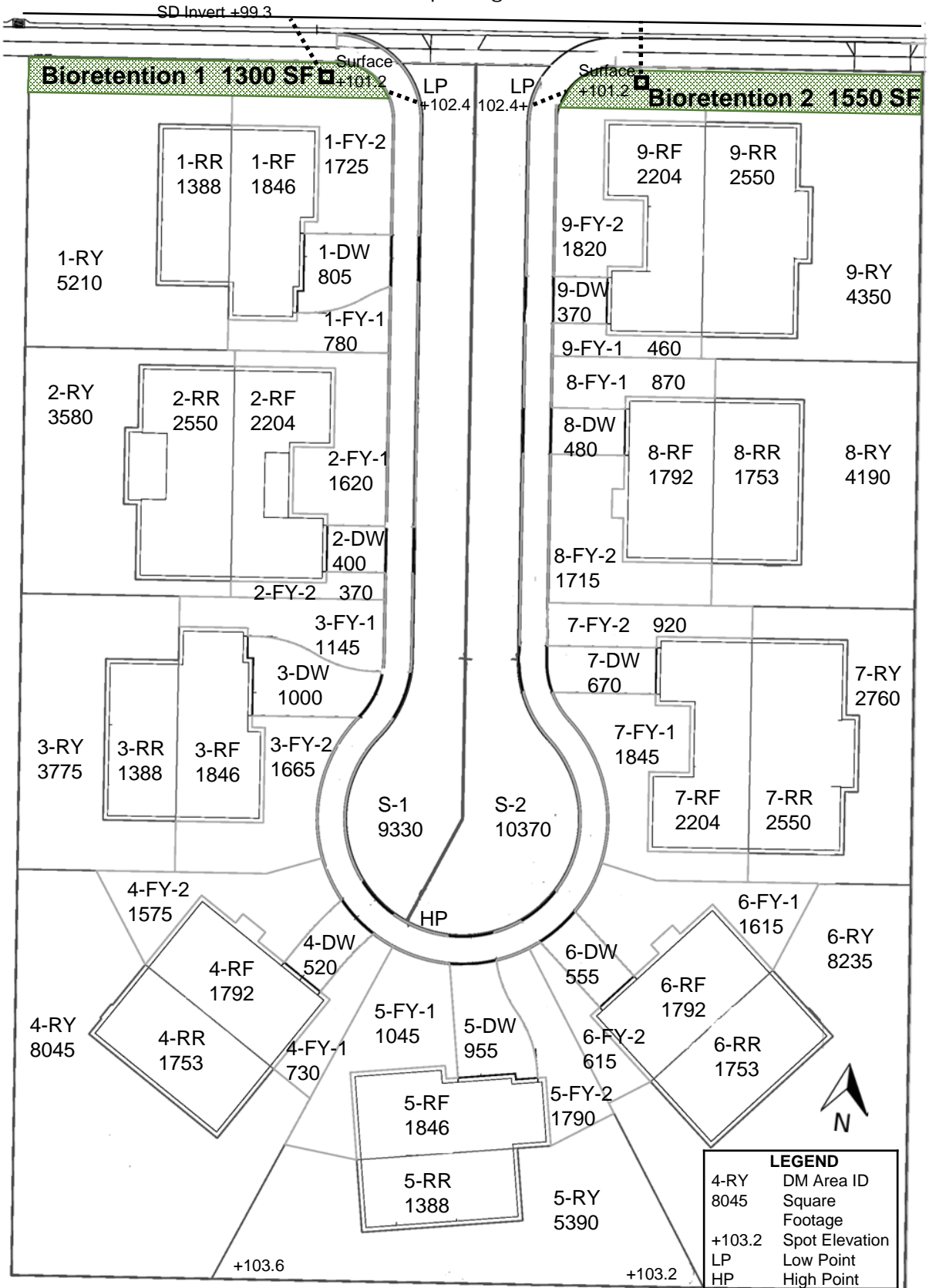
Table 4. Construction Plan C.3 Checklist

<i>Stormwater Control Plan Page #</i>	<i>BMP Description</i>	<i>See Plan Sheet #s</i>
4 and Exhibit	Drainage from DMAs 4, 5, 6, and 7 is retained by surrounding curbs.	
p.2 and Exhibit	Drainage from rear roofs is directed and dispersed to rear yards	
p.2 and Exhibit	Rear yards are graded concave	
p.2 and Exhibit	Front yards are graded concave	
p.2 and Exhibit	Front roofs and driveways drain to street	
p. 2 and Exhibit	Street drains to bioretention facilities. High point/grade break as shown on Exhibit	
pp. 2-3 and Exhibit	Bioretention facilities are constructed per criteria in the <i>Stormwater C.3 Guidebook</i>	

VIII. CERTIFICATIONS

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.

Stormwater Control Plan Exhibit Whispering Pines Lane



50 feet

						ft) [B]	
1-RR	1388	Conventional Roof	1.0	1,388.0	1-RY	5,210	0.27
2-RR	2550	Conventional Roof	1.0	2,550.0	2-RY	3,580	0.71
3-RR	1388	Conventional Roof	1.0	1,388.0	3-RY	3,775	0.37
4-RR	1753	Conventional Roof	1.0	1,753.0	4-RY	8,045	0.22
5-RR	1388	Conventional Roof	1.0	1,388.0	5-RY	5,390	0.26
6-RR	1753	Conventional Roof	1.0	1,753.0	6-RY	8,235	0.21
7-RR	2550	Conventional Roof	1.0	2,550.0	7-RY	2,760	0.92
8-RR	1753	Conventional Roof	1.0	1,753.0	8-RY	4,190	0.42
9-RR	2550	Conventional Roof	1.0	2,550.0	9-RY	4,350	0.59

IV. Areas Draining to IMPs

IMP Name: Bioretention-1

IMP Type: Bioretention Facility

Soil Group: Bioretention-1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
1-RF	1,846	Conventional Roof	1.00	1,846				
1-DW	805	Concrete or Asphalt	1.00	805				
2-RF	2,204	Conventional Roof	1.00	2,204				
2-DW	400	Concrete or Asphalt	1.00	400				
3-RF	1,846	Conventional Roof	1.00	1,846				
3-DW	1,000	Concrete or Asphalt	1.00	1,000				
4-RF	1,792	Conventional Roof	1.00	1,792				
4-DW	520	Concrete or Asphalt	1.00	520				
S-1	9,330	Concrete or Asphalt	1.00	9,330				
Total				19,743				
				Area	0.050	1.317	1,300	1,300
				Surface Volume	0.042	1.317	1,092	1,100
				Subsurface Volume	0.055	1.317	1,430	1,450
							Maximum Underdrain Flow (cfs)	0.02

Orifice Diameter (in) 0.89

IMP Name: Bioretention-2
IMP Type: Bioretention Facility
Soil Group: Bioretention-2

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
5-RF	1,846	Conventional Roof	1.00	1,846					
5-DW	955	Concrete or Asphalt	1.00	955					
6-RF	1,792	Conventional Roof	1.00	1,792					
6-DW	555	Concrete or Asphalt	1.00	555					
7-RF	2,204	Conventional Roof	1.00	2,204					
7-DW	670	Concrete or Asphalt	1.00	670					
8-RF	1,792	Conventional Roof	1.00	1,792					
8-DW	480	Concrete or Asphalt	1.00	480					
9-RF	2,204	Conventional Roof	1.00	2,204					
9-DW	370	Concrete or Asphalt	1.00	370					
S-2	10,370	Concrete or Asphalt	1.00	10,370					
Total				23,238					
					Area	0.050	1.317	1,530	1,550
					Surface Volume	0.042	1.317	1,285	1,300
					Subsurface Volume	0.055	1.317	1,683	1,683
								Maximum Underdrain Flow (cfs)	0.02
								Orifice Diameter (in)	0.97