

Appendix F: Hydrology and Water Quality Supporting Information

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STORM WATER MITIGATION PLAN

FOR

SHILOH AND SKYLANE MIXED USE

Town of Windsor, CA

APN 164-150-064

July 30, 2019

APPLICANT/OWNER

As the Applicant/Owner, I declare that permanent storm water Best Management Practices will be installed and maintained in accordance with this document and municipal regulations.

CIVIL ENGINEER

This document was prepared by BKF Engineers to summarize storm water Best Management Practices proposed with this development. Storm water elements reflected in this document have been designed using sound engineering principals in general conformance with the municipality's guidelines.

PRELIMINARY

RICHARD CARLILE PE
NO. 57885

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GENERAL INFORMATION REGARDING THE PURPOSE OF STORM WATER BMPs

Storm water runoff Best Management Practices (BMPs) are programs, processes or engineered systems designed to reduce pollutants in storm water. Temporary Best Management Practices such as straw wattle and silt fence are used to reduce pollutants in storm water during construction while permanent storm water Best Management Practices are intended to reduce pollutants in storm water for the life of the development following construction.

Studies suggest that approximately 85% of our annual rainfall volume is produced from the predominant population of smaller storms. Therefore, in an effort to treat storm water in a cost effective manner, storm water quality management is typically designed to target these smaller events.

The Low Impact Development Technical Design Manual

The Low Impact Development (LID) Technical Design Manual is a set of guidelines established for the Santa Rosa area and unincorporated areas around Sonoma County which requires certain projects to incorporate sustainable LID strategies that encourage infiltration and minimize the introduction of pollutants into downstream receiving waters. The manual requires that a “Determination Worksheet” be prepared by the Applicant to evaluate whether or not storm water BMPs are required with each development. Developments which require BMPs that are subject to planning review through the municipality must include a “Preliminary Storm Water Mitigation Plan”. The purpose of this plan is to:

- Summarize the existing site condition and the proposed development.
- Describe storm water BMPs being incorporated into the development.
- Demonstrate by computation that the proposed measures are appropriately sized.
- Describe maintenance and funding for the BMPs.

Developments which require BMPs are required to include a “Final Storm Water Mitigation Plan” with ministerial permit submittals such as grading, building and encroachment permits. The “Final Storm Water Mitigation Plan” includes all of the elements required in the “Preliminary Storm Water Mitigation Plan” and a maintenance agreement between the municipality and owner which assigns the responsibility for maintaining BMPs. The agreement is recorded as a covenant, runs with the land and passes with Title.

Permanent storm water Best Management Practices are categorized in the LID Technical Design Manual as being Pollution Prevention Measures, Volume Control Measures or Treatment Control Measures which are described in the following sections of this document.

Storm Water Pollution Prevention Measures

Pollution Prevention Measures, sometimes referred to as Source Control Measures, are practices such as street sweeping which help keep pollutants from coming into contact with storm water rather than attempting to remove pollutants after they have interacted with storm water. Educational outreach programs and stenciling storm water inlets with graphics which inform people that the storm water drains to the creek are effective Pollution Prevention Measures. Trees are another effective Pollution Prevention Measure and provide several storm water management benefits. They hold water on leaves / branches and allow water to evaporate, retaining flow and dissipating the energy of runoff. Trees also reduce the amount of water coming into contact with other impervious surfaces such as parking lots, which minimizes pollution in downstream water bodies

Our local municipalities recognize the environmental benefit to incorporating Pollution Prevention Measures into designs and allow area offset credits with the implementation of trees which intercept

falling precipitation, pervious pavements which encourage infiltration and storm water discharge through landscape areas as a pre-treatment measure. The pollution prevention credits reduce the size of required Volume and Treatment Control Measures.

Storm Water Volume Control Measures

Increasing the amount of impervious surface area with the development of bare land generally increases the rate which storm water flows across a site. While the impact of increasing the impervious area for a single site is often insignificant, the cumulative impact of increasing the impervious area for multiple sites may have an adverse affect on downstream facilities, because the cumulative increase has the potential to increase runoff causing downstream erosion and sediment load in the storm water conveyance system.

In order to minimize downstream erosion and protect stream habitat, the Storm Water LID Technical Design Manual prioritizes BMPs and requires that the designer first consider measures which capture storm water runoff from impervious surfaces and encourage infiltration. If this is impractical, then BMPs may be proposed which capture the difference in storm water runoff between the predevelopment and post development conditions, provided that all water discharged from impervious surfaces for the selected rainfall event is treated. Developments in areas subject to contaminated soil or high ground water are discouraged from integrating measures which infiltrate storm water, but they are required to incorporate alternative designs which harvest storm water and treat runoff from impervious surfaces. If volume control measures are not feasible at the project site, then the municipality will consider offset projects at a different location which accomplish this requirement. In some situations, payment of an offset cost may be allowed. Redevelopment projects which propose to decrease the amount of impervious surface are not required to integrate volume control measures, because decreasing the amount of impervious surface generally decreases the amount of storm water runoff.

Storm Water Treatment Control Measures

Treatment Control BMPs are engineered systems that are designed to remove pollutants from storm water and are often categorized as being landscape-based or mechanical. These types of BMPs are required whenever a development proposes to infiltrate less water than is discharged from new or redeveloped impervious surfaces during the target storm event.

Landscape-based treatment controls are required by most municipalities and include measures such as vegetated swales and bioretention systems. Mechanical treatment controls such as subsurface vaults that filter storm water through sand or engineered media are generally only allowed when used in conjunction with other landscape based BMPs.

PROJECT DESCRIPTION

The project proposes to take the two parcels on the southwest corner of Shiloh and Skylane (ANPs 164-150-012 & 064) and develop them into a single mixed use commercial/residential property. The parcels are located west of US Hwy 101 just past the SMART railroad tracks just south of Windsor Golf Club and WorldMark Windsor Condo Resort. The project will be comprised of three buildings, consisting of 10 residential units and office space, above ground floor retail space, and associated parking for residents, their visitors, and patrons of the retail area. The improvement will also include construction of new sidewalk, curb and gutter along Shiloh to conform to existing sidewalk and curb ramp area.

The immediate project proposes to remove existing buildings and grade the proposed lots. Further development will include the installation of infrastructure components and their connection to town utilities. Both construction and final vehicle access to the project will be provided along both Shiloh and Skylane at the northwest and southeast sides of the site.

Permanent Stormwater Best Management Practices are required with this development because the project proposes to replace more than 10,000sf of impervious surface area. Since the project includes the removal and replacement of greater than 1 acre of impervious surface area the project requires hydromodification control measures which will capture and treat 100% of the 1" storm event in accordance with the City's LID Technical Design Manual. All drainage areas on site are conveyed to vegetated areas and bioretention prior to the storm drain system which satisfies the 100% trash capture design requirement.

There are no existing sensitive features such as creeks or wetlands on this site that we are aware of and the project does not propose work offsite in environmentally sensitive areas. Therefore, the project is not anticipated to need a "Clean Water Certification" from the Regional Water Quality Control Board.

The majority of the existing site drainage sheet flows north to Shiloh Road and into an existing catch basin just off the north side of the vacant lot with a small amount draining east to Skylane which makes its way to the catch basin on Shiloh Road. A small amount drains offsite to the adjacent lot to the southwest.

The majority of drainage from the proposed buildings, AC parking and concrete walkways is designed to sheet flow across the AC parking area and across permeable pavers or flow into concrete curb cuts where it will infiltrate the storage medium in accordance with Priority 2 objectives of the City's LID Technical Design Manual. Once the treatment medium is fully saturated the drainage will flow into inlets and utilize the city's storm drain system. These BMP measures are in place to offset the net increase in impervious surface. Storm water for larger events utilize the proposed storm drain system directly. In the event the system becomes overburdened flow will have overland relief over the swales and is anticipated to drain similar to the current condition, utilizing the existing established storm drain system along Shiloh Road and discharge to Airport Creek. The portions of the site which are to be developed utilize the LID retention measure and the proposed storm drain system to connect to the existing storm drain system and is not anticipated to significantly alter the drainage.

The site has been designed to have positive gradients within the site and utilizes overland relief. The drainage basins proposed with this development are being installed as a matter of convenience to rout excess storm water from the proposed LID features to the existing storm drain network. If the existing storm drain system becomes overburdened during larger storm events, storm water which falls on the site will run overland to the town's existing storm drain system and Airport Creek similar to the existing condition.

STORM WATER BMPS SELECTED FOR THIS SITE

Temporary, pollution prevention and permanent storm water Best Management Practices will be designed to minimize the introduction of pollutants in downstream water bodies following the Entitlement of this development,

Temporary Measures

A "Sediment Control Plan" will be prepared and included with the construction drawings requiring the contractor to implement temporary storm water BMPs. The contractor will be required to use filter fabric, gravel bags, straw wattles or similar measures to collect sediment and filter water before allowing its discharge to downstream facilities. Construction entrances/exits will be designated on the drawings as having a blanket of rock, where applicable, to assist with removing dirt from trucks to minimize soil tracked into the public street during the early stages of construction. This drawing will also require that disturbed areas be seeded to help stabilize un-vegetated areas. The project is anticipated to disturb less than 1-acre with construction. A Storm Water Pollution Prevention Plan will be prepared which more precisely identifies temporary storm water BMPs required during different phases of construction.

Pollution Prevention Measures

As part of this project, storm water inlets will be stenciled with graphics which identify that the inlets drain to the creek. The building is anticipated to have a slab on grade design which discourages pest entry. The trash enclosure will be roofed. Irrigation systems will be designed to minimize overspray.

Pollution Prevention Credits

As was discussed earlier in this report, the LID Technical Design Manual allows area offset credits with the implementation of certain Pollution Prevention Measures. Although new trees will be planted with this development creating an opportunity to intercept precipitation falling on impervious surfaces beneath them, area reduction credits were not used when assessing the size of BMP areas with the final plan. In addition, the large existing trees which are to remain on site shall be evaluated to determine if they qualify as existing interceptors to offset BMP sizing.

Permanent Treatment Control Measures

A series of volume capture sections have been incorporated into the site to retain storm water during light precipitation events and promote infiltration for the life of the development. The proposed storm water measures include engineered soil and open sided storage structures which are anticipated to encourage storage and infiltration.

The storm water LID technical Design Manual requires that measures be incorporated into each site which captures storm water runoff from impervious surfaces and encourages infiltration for the life of the development following construction. The Low percolation rate of Sonoma County soils does make infiltration a challenging objective. The LID manual acknowledges this, suggesting that designs incorporate engineered media and similar mechanisms which create void space to store water and allow infiltration over time. Volume control measures are generally integrated into projects to mitigate the effect of increased storm water runoff that frequently occurs with development. They are used to help emulate the predevelopment conditions and are particularly useful when the amount of impervious surface is increased with development.

A geotechnical report has yet to be prepared for these site improvements. According to the USGS Web Soil Survey the site is primarily "Huichica Loam" which is typically classified as a class "D" hydrologic soil having an infiltration rate ~0.00in/hr to ~0.05in/hr. According to the same geotechnical research, the water table is estimated to be 200cm (6.5- feet) below the surface and is subject to seasonal rainfall influence.

The "State Water Resources Control Board's" "GeoTracker" system was observed and does not report groundwater contamination within 50ft of proposed storm water treatment areas.

These measures were selected because they are the highest priority measures included in the LID Technical Design Manual which accomplishes the objectives of the manual and they can be reasonably incorporated into the site. An exhibit has been included in the Appendix of this report which reflects the proposed geometry and which identifies the location(s) of these elements.

DESCRIPTION OF COMPUTATION METHODS USED TO SIZE BMPS

Treatment Control Calculations

Computations were prepared to size each Bioretention Area using the municipality's storm water calculator to assess the post development storm water runoff volume. The preliminary civil drawings recommend that Bioswale Media Mix having a porosity of at least 60% be used throughout the Bioretention Areas to achieve the required capture volume. A material data sheet has been included with the calculations which suggest that this material is available having a porosity of nearly 65%. A porosity of 50% was used to conservatively assess the required capture volume and slightly increase storage to accommodate sediment accumulation. Computations are shown in the Appendix of this document and reflect that the void space in the proposed measures exceeds the required storm water capture volume.

The treatment measures designed for this site have achieved the 100% volume capture for the 85th percentile precipitation event in accordance with the Priority 1 objective of the City's LID Technical Design Manual.

MAINTENANCE OF THE SELECTED PERMANENT STORM WATER BMPS

Maintenance of permanent storm water Best Management Practices is essential to ensure that the BMPs continue to function effectively and that they do not become a nuisance. An exhibit has been included in the body of this report which identifies the locations of the permanent storm water BMPs referred to in this report which will require inspection and maintenance. It is the responsibility of the Applicant/Owner to ensure that permanent storm water BMPs are installed and maintained in accordance with municipal policy until this responsibility is legally transferred.

The Regional Water Quality Control Board requires the legally responsible party to inspect and maintain permanent storm water BMPs at least once a year. A sample inspection and reporting template has been included in the Appendix of this document for reference. Reports which document maintenance activities should be completed when maintenance is performed and kept on file for a period of at least five years. These reports shall be made available to City staff and the Regional Water Quality Control Board staff upon request.

The maintenance of permanent storm water Best Management Practices will be performed by the property owner and includes things such as pruning, weeding, mowing, trash/sediment removal, and the inspection/replacement of plants and media. The LID Technical Design Manual requires that the owner enter into a signed agreement and that this agreement be recorded as a perpetual covenant which runs with the land. A draft maintenance agreement has been included in the Appendix of this document for reference.

Every site requires some level of maintenance such as sweeping, restriping, pavement replacement, irrigation repair and replanting. The following inspection and maintenance activities are additional measures which are necessary with this development as a result of the required permanent storm water BMPs:

- Drainage inlets will be stenciled with verbiage or a graphic which suggests that the storm water system drains to a creek. Stenciling should be refreshed every 5 years. If the BMP has been removed or has experienced significant fading, then the BMP should be replaced.
- The surface of volume capture areas should be inspected on a quarterly basis, and following larger storm events for signs of erosion, damage to vegetation, foreign debris and sediment accumulation. The BMP should be repaired to maintain its character and function in substantial conformance with the original design.
- Additional information has been included in the Appendix of this report which describes the function and recommended maintenance of measures proposed in this report.

Although the proposed BMPs are anticipated to provide effective treatment for more than 10-years, their life will depend on the quality of water draining to them and how well these areas are maintained. BMP maintenance and replacement should be conducted as required to ensure that their character and function are in substantial conformance with the original design.

Approximate anticipated average annual costs are summarized below to assist the Owner(s) in budgeting for BMP inspection and maintenance activities. The costs reported are predicated on these activities being conducted while performing other routine maintenance which would ordinarily be performed on site.

Approximate Average Annual Inspection and Maintenance Costs

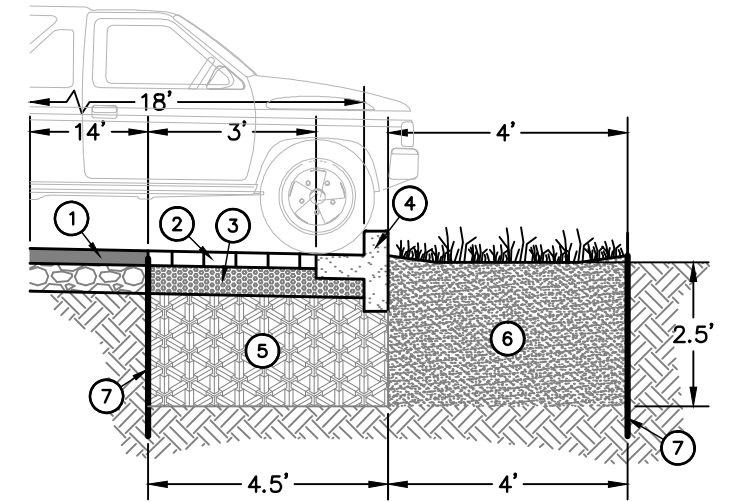
Inspections and Associated Paperwork	\$
Stenciling Inlets	\$
Sediment Removal/Erosion Repair	\$
Bioretention Area/ Flow Thought Planter Replacement	\$

APPENDIX “A”

SWMP SITE EXHIBIT

SHILOH ROAD

SKYLANE BLVD.

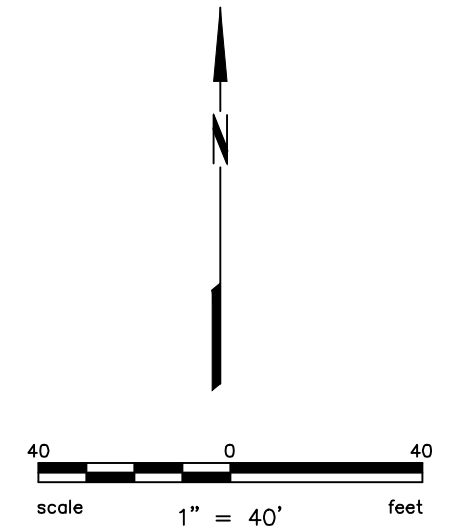


- 1 AC Pavement
- 2 Permeable Pavers
- 3 Permeable Class 2 AB
- 4 Curb and Gutter w/ Openings
- 5 ACO Storm Brixx (95% Porosity)
- 6 Bio-Soil (50% Porosity)
- 7 Moisture Barrier

BIO-RETENTION AND STORAGE
NO SCALE

LEGEND

- Roof
- Parking/Trash Shelter
- Concrete
- Pavement
- Permeable Pavers
- Landscape
- Bio-Retention

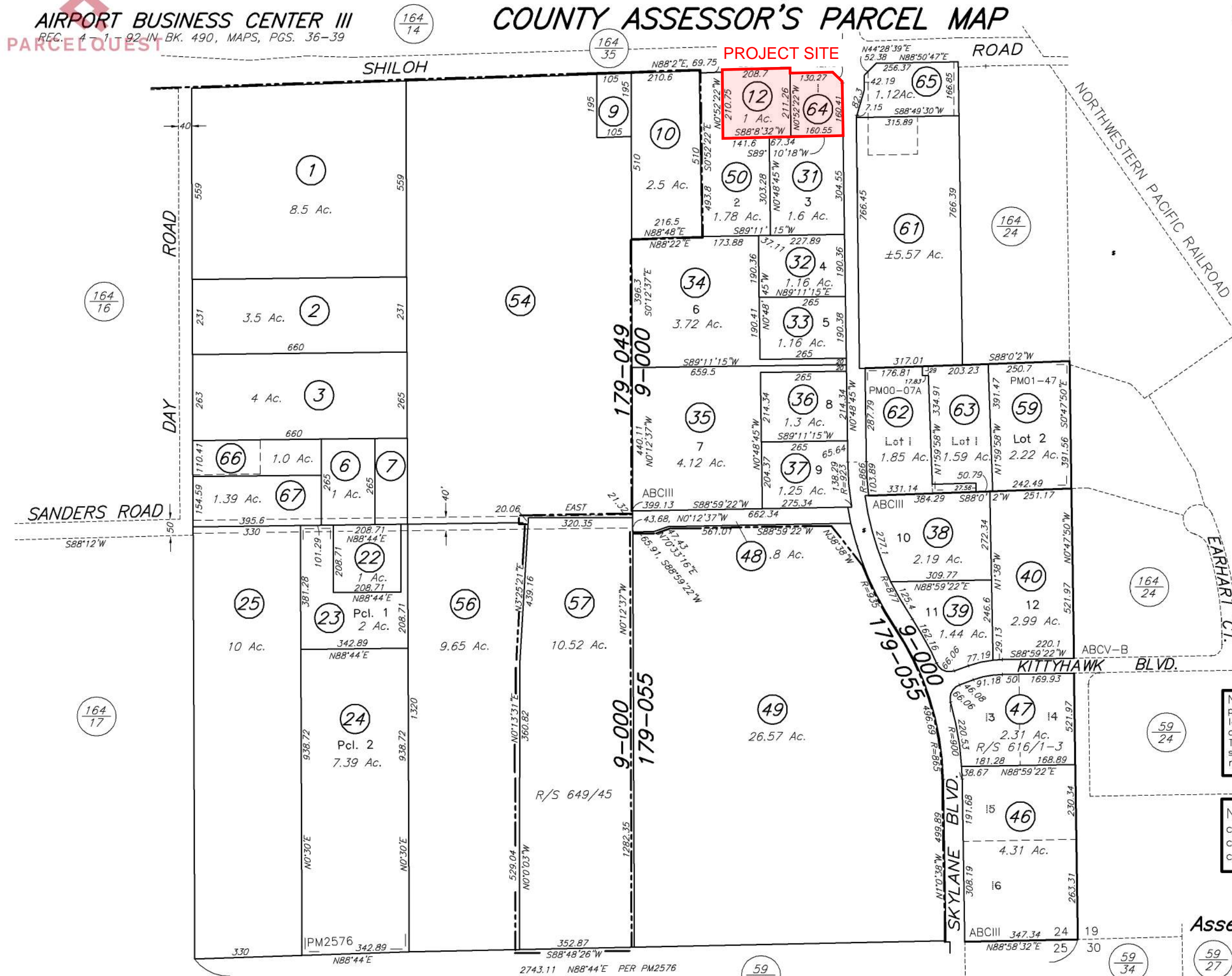


DRAINAGE AREAS							
Tributary Area	Roof 98	Shelter 98	Concrete 98	Pavement 98	Pavers 98	Planter 89	Total Area (ft ²)
1	8,804	5,940	5,825	24,295	572	12,050	57,486
2	2,823	-	1,306	-	-	1,816	5,945
3	-	179	993	804	-	1,190	3,166

BIO-SWALE						ACO STORM BRIXX					TOTAL WATER STORAGE PROVIDED (ft ³)
Area (ft ²)	Depth (ft)	Volume Soil (ft ³)	Porosity %	Volume Water Storage (ft ³)		Area (ft ²)	Depth (ft)	Volume (ft ³)	Porosity %	Volume Water Storage (ft ³)	
1,321	2.5	3303	50%	1651		1,152	2	2304	95%	2189	3840
239	2.5	598	50%	299		-	-	0	95%	0	299
120	2.5	300	50%	150		-	-	0	95%	0	150

LID EXHIBIT
SHILOH ROAD MIXED USE
TOWN OF WINDSOR, CALIFORNIA
JULY 29, 2019





SCALE: 1" = 300'

Parcel Map No. 2576

REC. 10-04-71 IN BK. 161, MAPS, PGS. 46-00

Parcel Map No. 00-07A

REC. 8-28-01 IN BK. 625, MAPS, PGS. 15-17

Parcel Map No. 01-47

REC. 2-20-02 IN BK. 630, MAPS, PGS. 47-49

REVISÉD

04-01-04=TRA RL

02-01-05=cor-LSL

11-13-08-67-KB

11-25-08-Cor-KB

NOTE: This map was prepared for Assessment purposes only and does not indicate either parcel legality or a valid building site. No liability is assumed for the accuracy of the data delineated. The acreages are based on the information supplied to the Assessor (i.e. recorded survey maps, recorded deeds, prior assessment maps, etc.)

NOTE: Assessor's parcels do not necessarily constitute legal lots. To verify legal parcel status, check with the appropriate city or county community development or planning division.

Assessor's Map Bk. 164, Pg. 15

Sonoma County, Calif. (ACAD)

KEY 4-29-02=57 LSL

APPENDIX “B”

VOLUME CAPTURE CALCULATIONS

C-FACTOR



STORM WATER CALCULATOR

LID BMP Summary Page & Site Global Values

Project Information: Project Name: Shiloh Road Mixed Use Address/Location: 1200 Shiloh Rd & 5823 Skylane Blvd, Windsor, CA Designer: BKF Engineers Date: 7/30/2019	Site Information: Mean Seasonal Precipitation (MSP) of Project Site: 30.00 (inches) K=MSP/3(K= 1.00 Impervious area - pre development: 2,145.0 ft ² Impervious area - post development: 50,969.0 ft ²	Based upon the pre and post development impervious area, the post construction BMP requirement is: 100% Capture & Treatment
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Summary of Saved BMP Results:

BMP ID:	Tributary Area		Requirements				BMP Design Results					
	Tributary Area (ft².)	Runoff Reduction Measures (Y/N)	Type of Requirement Met	Type of BMP Design	Percent Achieved	Hydromodification Control		Flow Base Treatment		Delta Volume Capture		
						Required V _{Hydromod} (ft³)	Achieved (ft³)	Required Q Treatment (cfs)	Achieved (ft³)	Required Vdelta (ft³)	Achieved (ft³)	
1	Area 1	57,486	Yes	Hydromod Volume Capture	Priority 2: P2-04 Roadside Bioretention - Curb Opening	128.3	2993.8125	3840.0021				
2	Area 2	5,945	No	Hydromod Volume Capture	Priority 2: P2-04 Roadside Bioretention - Curb Opening	103.5	288.6892	298.7500				
3	Area 3	3,166	No	Hydromod Volume Capture	Priority 2: P2-04 Roadside Bioretention - Curb Opening	105.6	142.0901	150.0000				
4												
5												
6												
7												
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STORM WATER CALCULATOR

BMP Tributary Parameters

Project Name: **Shiloh Road Mixed Use**

BMP ID: **Area 1**
BMP Design Criteria: **100% Capture & Treatment**
Type of BMP Design: **Priority 2: P2-04 Roadside Bioretention - Curb Opening**
BMP's Physical Tributary Area: **57,486.0** ft²
Description/Notes: See exhibit for storage volumes.

Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **57,025.2** ft²Total Runoff Reduction Measures = **460.8** ft²

Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**
Number of **new** interceptor **Deciduous Trees**: **0**
Square footage of qualifying **existing tree canopy**: **0.0** ft²
Total Number of **New** trees in BMP Tributary Area: **0**

Disconnected Roof Drains

Select disconnection condition: **Select disconnection condition**

Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **0** ft²

Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %
Select Density: **1** Units per Acre

Paved Area Disconnection

Paved Area Type: **Cobblestone/pavers/block**
Alternatively designed paved area: **1,152.0** ft²

Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft²

Hydromodification Requirement: 100% Volume Capture; V_{HYDROMOD}

V_{HYDROMOD} = **2,993.81** ft³

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**
Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**
CN_{POST}:
User Composite post development CN: **96.0**

BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **128.26** %

BMP Volume Below Ground
Porosity: **0.99**
Depth below perforated pipe if present: **2.50** ft
Width: **0.00** ft
Length: **0.00** ft
Area: **1,551.52** ft²

Ponded Water Above Ground
Depth: **0.00** ft
Width: **0.00** ft
Length: **0.00** ft
Area: **0.00** ft²



STORM WATER CALCULATOR

A Person
Some Day

CN Composite Work Sheet

Project: Shiloh Road Mixed Use
Address/Location: 1200 Shiloh Rd & 5823 Skylane Blvd, Windsor, CA
Designer: BKF Engineers
Date: July 30, 2019

Inlet Number/Tributary Area/BMP: Area 1

INSTRUCTIONS: Please refer to the "Urban Hydrology for Small Watersheds" (TR-55 manual).

Soil Type (Infiltration Rate)	Cover Description	CN	Area ft ²	Product of CN x Area
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	8804	862,792.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	5940	582,120.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	5825	570,850.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	24295	2,380,910.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	572	56,056.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)	89	12050	1,072,450.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
Totals =			57486	5,525,178.0

$$CN_{COMPOSIT} = \frac{(CN \times Area) + (CN \times Area) + (CN \times Area) + (CN \times Area) \dots}{Total \text{ Tributary Area}} = \text{Use this } CN_{COMPOSIT} = 96.1$$



STORM WATER CALCULATOR

BMP Tributary Parameters

Project Name: **Shiloh Road Mixed Use**

BMP ID: **Area 2**
BMP Design Criteria: **100% Capture & Treatment**
Type of BMP Design: **Priority 2: P2-04 Roadside Bioretention - Curb Opening**
BMP's Physical Tributary Area: **5,945.0** ft²
Description/Notes:

Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

$V_{HYDROMOD}$ = **288.69** ft³

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**
Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**
CN_{POST}:
User Composite post development CN: **95.0**

BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **103.48** %

BMP Volume Below Ground
Porosity: **0.50**
Depth below perforated pipe if present: **2.50** ft
Width: **0.00** ft
Length: **0.00** ft
Area: **239.00** ft²

Ponded Water Above Ground
Depth: **0.00** ft
Width: **0.00** ft
Length: **0.00** ft
Area: **0.00** ft²



STORM WATER CALCULATOR

CN Composite Work Sheet

Project:

Address/Location:

Designer:

Date:

Shiloh Road Mixed Use

1200 Shiloh Rd & 5823 Skylane Blvd, Windsor, CA

BKF Engineers

July 30, 2019

Inlet Number/Tributary Area/BMP:

Area 2

INSTRUCTIONS: Please refer to the "Urban Hydrology for Small Watersheds" (TR-55 manual).

Soil Type (Infiltration Rate)	Cover Description	CN	Area ft ²	Product of CN x Area
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	2823	276,654.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	1306	127,988.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)	89	1816	161,624.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
Totals		=	5945	566,266.0

CN_{COMPOSIT} =

(CN x Area) +(CN x Area) + (CN x Area) + (CN x Area) ...

Total Tributary Area

=

Use this CN_{COMPOSIT} =

95.3



STORM WATER CALCULATOR

BMP Tributary Parameters

Project Name: **Shiloh Road Mixed Use**

BMP ID: **Area 3**
BMP Design Criteria: **100% Capture & Treatment**
Type of BMP Design: **Priority 2: P2-04 Roadside Bioretention - Curb Opening**
BMP's Physical Tributary Area: **3,166.0** ft²
Description/Notes:

Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

$V_{HYDROMOD}$ = **142.09** ft³

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**
Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**
CN_{POST}:
User Composite post development CN: **95.0**

BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **105.57** %

BMP Volume Below Ground
Porosity: **0.50**
Depth below perforated pipe if present: **2.50** ft
Width: **0.00** ft
Length: **0.00** ft
Area: **120.00** ft²

Ponded Water Above Ground
Depth: **0.00** ft
Width: **0.00** ft
Length: **0.00** ft
Area: **0.00** ft²



STORM WATER CALCULATOR

BKF Engineers
July 30, 2019

CN Composite Work Sheet

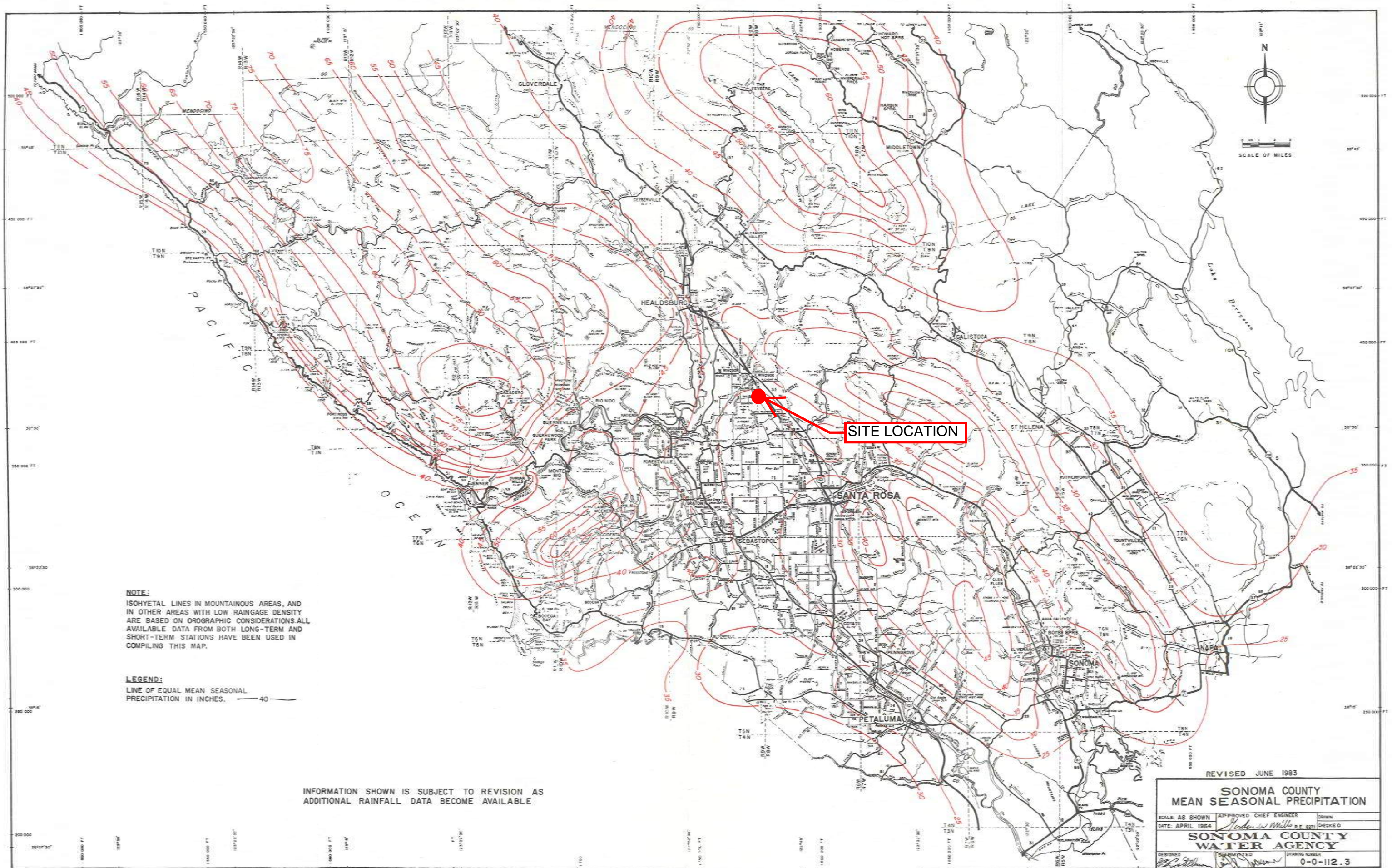
Project: Shiloh Road Mixed Use
Address/Location: 1200 Shiloh Rd & 5823 Skylane Blvd, Windsor, CA
Designer: BKF Engineers
Date: July 30, 2019

Inlet Number/Tributary Area/BMP: Area 3

INSTRUCTIONS: Please refer to the "Urban Hydrology for Small Watersheds" (TR-55 manual).

Soil Type (Infiltration Rate)	Cover Description	CN	Area ft ²	Product of CN x Area
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	179	17,542.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	993	97,314.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Impervious - Paved Parking, Rooftop, Driveways	98	804	78,792.0
D: 0 - 0.05 in/hr infiltration (transmission) rate	Open Space (lawns, parks, golf courses, cemeteries, etc.) - Poor (<50% grass cover)	89	1190	105,910.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
No Entry	No Entry	0	0	0.0
Totals		=	3166	299,558.0

$$CN_{COMPOSIT} = \frac{(CN \times Area) + (CN \times Area) + (CN \times Area) + (CN \times Area) \dots}{Total \text{ Tributary Area}} = \text{Use this } CN_{COMPOSIT} = 94.6$$



NOTE:
ISOHYETAL LINES IN MOUNTAINOUS AREAS, AND
IN OTHER AREAS WITH LOW RAINFALL DENSITY
ARE BASED ON OROGRAPHIC CONSIDERATIONS. ALL
AVAILABLE DATA FROM BOTH LONG-TERM AND
SHORT-TERM STATIONS HAVE BEEN USED IN
COMPILING THIS MAP.

LEGEND:
LINE OF EQUAL MEAN SEASONAL
PRECIPITATION IN INCHES. — 40 —

INFORMATION SHOWN IS SUBJECT TO REVISION AS
ADDITIONAL RAINFALL DATA BECOME AVAILABLE

REVISED JUNE 1983			
SONOMA COUNTY MEAN SEASONAL PRECIPITATION			
SCALE: AS SHOWN	APPROVED CHIEF ENGINEER	DRAWN	
DATE: APRIL 1964	<i>Robert W. Mills</i> R.E. 827	CHECKED	
SONOMA COUNTY WATER AGENCY			
DESIGNED	ENGINEERED	DRAWING NUMBER	
<i>Robert W. Mills</i>	<i>Robert W. Mills</i>	0-0-112.3	

K FACTOR

K FACTOR

vs.

MEAN SEASONAL PRECIPITATION

MEAN SEASONAL PRECIPITATION - INCHES

$K=1.167$

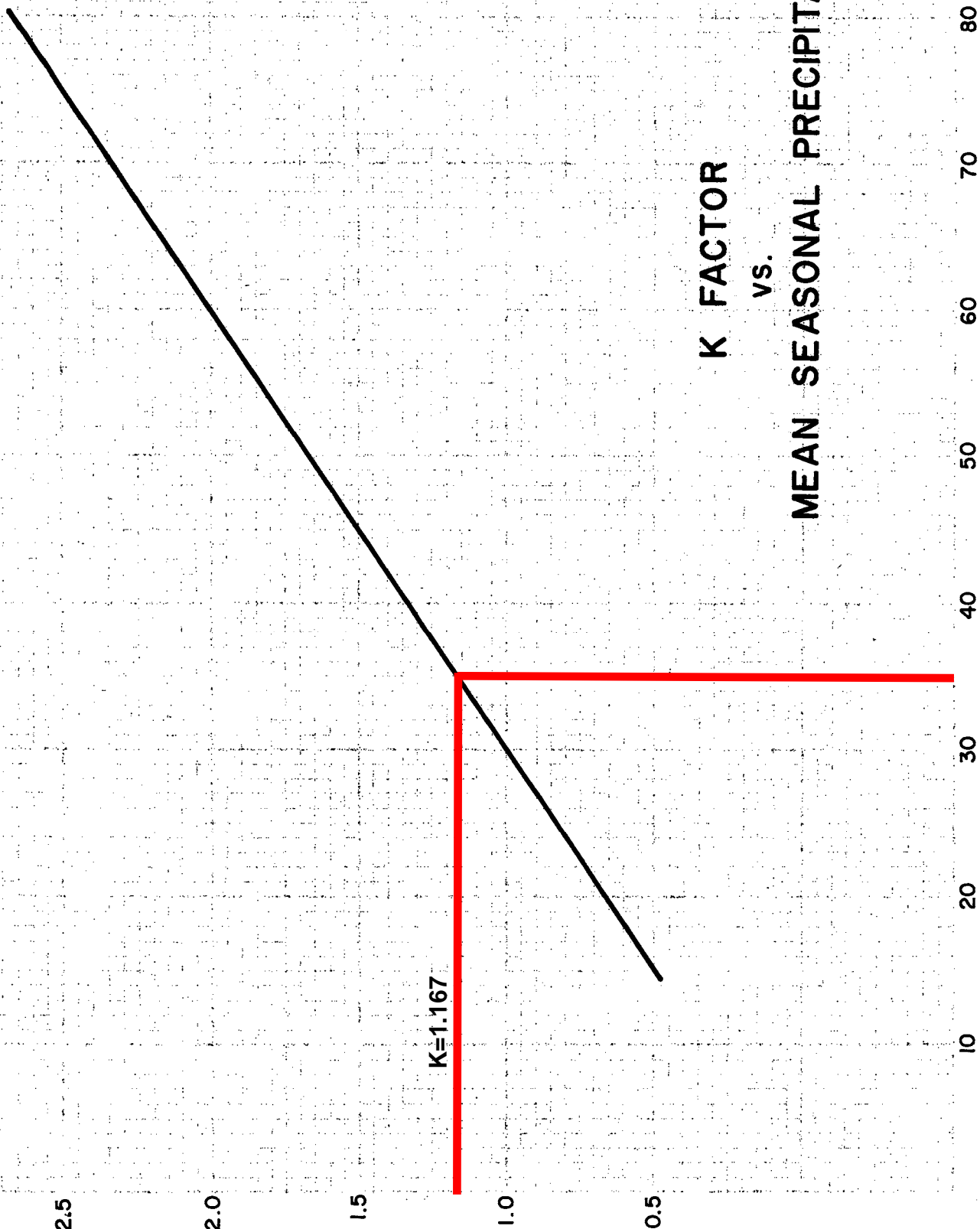


Table 2-2a Runoff curve numbers for urban areas ^{1/}

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area ^{2/}	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) ^{3/} :					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ^{4/}		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas					
(pervious areas only, no vegetation) ^{5/}		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

¹ Average runoff condition, and $I_a = 0.2S$.² The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.³ CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.⁴ Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.⁵ Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands ^{1/}

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment ^{2/}	Hydrologic condition ^{3/}	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded or broadcast legumes or rotation meadow	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

¹ Average runoff condition, and $I_a=0.2S$ ² Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.³ Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good $\geq 20\%$), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands ^{1/}

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. ^{2/}	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. ^{3/}	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 ^{4/}	48	65	73
Woods—grass combination (orchard or tree farm). ^{5/}	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. ^{6/}	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 ^{4/}	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

¹ Average runoff condition, and $I_a = 0.2S$.² **Poor:** <50% ground cover or heavily grazed with no mulch.**Fair:** 50 to 75% ground cover and not heavily grazed.**Good:** > 75% ground cover and lightly or only occasionally grazed.³ **Poor:** <50% ground cover.**Fair:** 50 to 75% ground cover.**Good:** >75% ground cover.⁴ Actual curve number is less than 30; use CN = 30 for runoff computations.⁵ CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.⁶ **Poor:** Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.**Fair:** Woods are grazed but not burned, and some forest litter covers the soil.**Good:** Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2d Runoff curve numbers for arid and semiarid rangelands ^{1/}

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition ^{2/}	A ^{3/}	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹ Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.² Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

³ Curve numbers for group A have been developed only for desert shrub.










6 Runoff Reduction Areas

6.1 Design Philosophy

Using alternative surfaces with a lower coefficient of runoff or “C-Factor” helps reduce runoff from developed areas. The C-Factor is a representation of a surface’s ability to produce runoff. Surfaces that produce higher volumes of runoff are represented by higher C-Factors, such as impervious surfaces. Surfaces that produce smaller volumes of runoff are represented by lower C-Factors, such as more pervious surfaces. See Table 6-1 for typical C-Factor values for various surfaces during small storms.

Table 6-2 compares the C-Factors of conventional paving surfaces to alternative, lower C-Factor paving surfaces. By incorporating more pervious, lower C-Factor surfaces into a development, lower volumes of runoff are produced. Lower volumes and rates of runoff translate directly to lower treatment requirements.

Site design techniques may be used to reduce the C-Factor of a developed area, reducing the amount of runoff requiring treatment, including:

-  ~~P~~ervious Concrete
-  ~~P~~ervious Asphalt
-  ~~T~~urf Block
-  ~~B~~rick (un-grouted)
-  ~~N~~atural Stone
-  ~~C~~oncrete Unit Pavers
-  ~~C~~rushed Aggregate
-  ~~C~~obbles
-  ~~W~~ood Mulch

Other site design techniques such as disconnecting impervious areas, preservation of natural areas, and designing concave medians may be used to reduce the overall C-Factor of development areas.

Table 6-1
Estimated C-Factors for Various Surfaces During Small Storms

<i>Paving Surface</i>	<i>C-Factor</i>
Concrete	0.80
Asphalt	0.70
Pervious Concrete	0.60
Cobbles	0.60
Pervious Asphalt	0.55
Natural Stone without Grout	0.25
Turf Block	0.15
Brick without Grout	0.13
Unit Pavers on Sand	0.10
Crushed Aggregate	0.10
Grass	0.10
Grass Over Porous Plastic	0.05
Gravel Over Porous Plastic	0.05

Note: C-Factors for frequent small storms used to size water quality BMPs are likely to differ (be lower) than C-Factors developed for infrequent, large storms used to size flood control facilities. The above C-Factors were produced by selecting the lower end of the best available C-Factor range for each paving surface. These C-Factors are only appropriate for small storm treatment design, and should not be used for flood control sizing. Where available, locally developed small storm C-Factors for various surfaces should be utilized.



ETS
975 Transport Way, Suite 2
Petaluma, CA 94954
(707) 778-9605 / FAX 778-9612
e-mail: entech@pacbell.net

**Environmental
 Technical Services**

-Soil, Water & Air Testing & Monitoring
 -Analytical Labs
 -Technical Support

**Serving people and the environment
 so that both benefit.**

CLIENT: Soiland Company, 7171 Stony Point Road, Cotati, CA 94931	DATE COLLECTED 8/3/17	DATE RECEIVED 8/3/17	DATE REPORT 8/10/17
ATTN: Tom Shearer			
PROJECT: high porosity/high OM growth media			

MOISTURE, DENSITY, SPECIFIC GRAVITY & POROSITY TEST RESULTS												
SAMPLE NUMBER & ID	BORING/ SAMPLE ID	TEST MASS gm	BULK DENSITY lbs/cuft	% MOISTURE Dry Weight/ Wet Weight	SPECIFIC GRAVITY gm/cc	TOTAL TEST VOLUME cc	VOLUME SLDS/VOID cc	VOID VOLUMES		SATURATION PERCENT % of pore vol.	POROSITY (pore volume) PERCENT	SOIL/SEDIMENT GROSS TEXTURE
								AIR FILLED vol %	WATER FILLED vol %			
07456-1 GMM1/SGR	Bulk Sample #1	201.1	64.6	17.63 14.99	2.60 (2.01)	194.4	77.38 117.06	44.70	15.50	25.75	60.20	Dk Brn Sand w/ OM
07456-2 GMM2/SGR	Bulk Sample #2	179.6	57.7	18.57 15.66	2.60 (1.90)	194.4	69.11 125.34	49.99	14.46	22.44	64.46	Dk Brn Sand w/ OM

NOTE:												
	Sample #1		Sample #2									
Specs/Smpl ID	GMM1/SGR		GMM2/SGR									
Volume (Q) [cm3]:	194.444		194.444									
Diameter (d) [cm]:	5.70		5.70									
Length (L) [cm]:	7.62		7.62									
Area (A) [cm2]:	25.518		25.518									
Sample Description	Dk Brn Sand w/ OM		Dk Brn Sand w/ OM									

COMMENTS/NOTES: These two samples both have very high proportions of organic matter matter including significant amounts of large organic particles as well as very fine sand-sized to silt-sized organic matter particles as well. As a result, the actual and functional porosities are very high in both samples, although there is a 4%-5% difference between the two samples. This difference could be result of either differences in amounts of actual OM materials in the two; or could be due to sampling bias; or could be due to sampling bias; or could be due to test aliquot bias. This cannot be know unless a statistical analysis is undertaken. In any case, the difference between the two is not really significant in the absence of more information and/or a statistical work up. Both the mineral component, i.e., the sand specific gravity and a material bulk specific gravity are recorded, but only the former is used for calculations as only that result yields porosity results consistent with the type of mix and its appearance.

NOTES: Testing follows methodology as defined by the American Society for Testing and Materials (ASTM) protocols, State of California Department of Transportation (CalTrans) protocols, or other entities as follows: ASTM D2937 Test Method for Density of Soil in Place by Drive-Cylinder - moisture and density (dry bulk & native densities), or Cal Tests 203/226, Analysis of Soil/Moisture; and Specific Gravity - ASTM D-854 Test Method for Specific Gravity of Soils, or Cal Test 207, Specific Gravity of Soils and Sediments.

APPENDIX “C”

DETERMINATION WORKSHEET

SUSMP SUBMITTAL GUIDE CHECKLIST

BMP SELECTION TABLES

FOR OFFICE USE ONLY:

Does this project require permanent storm water BMP's?

Y N

Date Submitted: _____



File No:	Quadrant
Related Files:	
Set:	
Department Use Only	

2017 Storm Water LID Determination Worksheet

PURPOSE AND APPLICABILITY: This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.

Part 1: Project Information

Project Name Applicant (owner or developer) Name

Project Site Address Applicant Mailing Address

Project City/State/Zip Applicant City/State/Zip

Permit Number(s) - (if applicable) Applicant Phone/Email/Fax

Designer Name Designer Mailing Address

Designer City/State/Zip Designer Phone/Email

Type of Application/Project:

Subdivision Grading Permit Building Permit Hillside Development
 Design Review Use Permit Encroachment Time Extensions Other : _____

PART 2: Project Exemptions

1. Is this a project that creates or replaces *less than* 10,000 square feet of impervious surface¹, including all project phases and off-site improvements?

Yes No

¹ Impervious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintenance activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacing, trenching and patching are defined as maintenance activities per section VI.D.2.b.

2017 Storm Water LID Determination Worksheet

2. Is this project a routine maintenance activity² that is being conducted to maintain original line and grade, hydraulic capacity, and original purpose of facility such as resurfacing existing roads and parking lots?

Yes No

3. Is this project a stand alone pedestrian pathway, trail or off-street bike lane?

Yes No

4. **Did you answer "YES" to any of the questions in Part 2?**

YES: This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete the "Exemption Signature Section" on Page 4.**

NO: Please complete the remainder of this worksheet.

Part 3: Project Triggers**Projects that Trigger Requirements:**

Please answer the following questions to determine whether this project requires permanent Storm Water BMP's and the submittal of a SW LIDs as required by the NPDES MS4 Permit order No. R1-2015-0030.

1. Does this project create or replace a combined total of 10,000 square feet or more of impervious surface¹ including all project phases and off-site improvements?

Yes No

2. Does this project create or replace a combined total or 10,000 square feet or more of impervious streets, roads, highways, or freeway construction or reconstruction³? Yes No

3. Does this project create or replace a combined total of 1.0 acre or more of impervious surface¹ including all project phases and off-site improvements? Yes No

4. **Did you answer "YES" to any of the above questions in Part 3?**

YES: This project will need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete remainder of worksheet and sign the "Acknowledgement Signature Section" on Page 4.**

NO: This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 permit. **Please complete the "Exemption Signature Section" on Page 4.**

1 Impervious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintenance activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacing, trenching and patching are defined as maintenance activities per section VI.D.2.b.

2 "Routine Maintenance Activity" includes activities such as overlays and/or resurfacing of existing roads or parking lots as well as trenching and patching activities and reroofing activities per section VI.D.2.b.

3 "Reconstruction" is defined as work that extends into the subgrade of a pavement per section VI.D.2.b.

1. Total Project area: square feet
acres

Commercial Industrial Residential Public Other

3. Existing impervious surface area: _____ square feet
_____ acres

Commercial Industrial Residential Public Other

5. Existing impervious surface area: square feet
acres

2017 Storm Water LID Determination Worksheet

Acknowledgment Signature Section:

As the property owner or developer, I understand that this project is required to implement permanent Storm Water Best Management Practices and provide a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit Order No. R1-2015-0030. *Any unknown responses must be resolved to determine if the project is subject to these requirements.

Applicant Signature

Date**Exemption Signature Section:**

As the property owner or developer, I understand that this project as currently designed does not require permanent Storm Water BMP's nor the submittal of a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit*. I understand that redesign may require submittal of a new Determination Worksheet and may require permanent Storm Water BMP's.

Applicant Signature

Date

* This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.

Implementation Requirements: All calculations shall be completed using the "Storm Water Calculator" available at: www.srcity.org/stormwaterLID

Hydromodification Control/100% Volume Capture: Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.

Treatment Requirement: Treatment of 100% of the flow calculated using the modified Rational Method and a known intensity of 0.20 inches per hour.

Delta Volume Capture Requirement: Capture (infiltration and/or reuse) of the increase in volume of storm water due to development generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.



Storm Water Low Impact Development Submittal Coversheet

****To be submitted with all SW LID submittals**

1. Submittal Information:

Submittal Date: _____

Initial SW LIDS ☒ Final SW LIDS ☐

2. Applicant Information:

Applicant Name (Owner or Developer): Mangal & Harmon Dhillon

Mailing Address: 3343 Industrial Dr. Unit #9

City/State/Zip: Santa Rosa/CA/95403

Phone/Email/Fax: (707)-540-1309/hdhillon707@gmail.com

3. Project Information:

Project Name: Shiloh and Skylane Mixed Use

Site Address: 1200 Shiloh Road

City/State/Zip: Windsor/CA/95492

APN (s): _____

Permit # (s): _____

Project Name: _____

Date: _____



Storm Water Low Impact Development Submittal Coversheet

Designer Information:

Design Manuel Used for design:



2005 Standard Urban Storm Water Mitigation Plan



2011 Storm Water Low Impact Development Technical Design Manuel



2017 Storm Water Low Impact Development Technical Design Manuel

☐ Subdivision

☐ Grading Permit

☒ Building Permit

☒ Design Review

☐ Use Permit

☐ Other _____

☐ Hillside Development

☐ Encroachment

☐ Time Extension

Engineer Name: Rick Carlile, BKF Engineers

Mailing Address: 200 4th Street, Suite 300

City/State/Zip: Santa Rosa/CA/95401

Phone/Email/Fax: (707)583-8533/rcarlile@bkf.com

Type of Application/Project:



Initial SW LIDS Coversheet

Narrative:

Project Description

- ☒ Description of proposed project type, size, location, and any specific uses or features.
- ☒ Description of any sensitive features (creeks, wetlands, trees, etc.) and whether they are going to be preserved, removed or altered.
- ☒ Description of the existing site.
- ☒ Description of how this project triggers these requirements (impervious area, CALGreen, 401 Permit, etc.).
- ☒ Describe any "on-site offset" used.

Pollution Prevention and Runoff Reduction Measures

- ☒ Description of all proposed pollution prevention measures (street sweeping, covered trash enclosures, indoor uses, etc).
- ☒ Description of all Runoff Reduction Measures (Interceptor Trees, Impervious Area Disconnection, and/or Alternative Driveway Design).

Type of BMPs Proposed

- ☒ Description of the types of BMPs selected including priority group that each is in.
- ☒ Description of level of treatment and volume capture achieved for each BMP.

Maintenance

- ☒ Description of maintenance for each type of BMP.
- ☒ Description of funding mechanism.
- ☒ Designation of Responsible Party.

EXHIBITS:

Proposed SUSMP Exhibit

- ☒ Exhibit should include: street names, property lines, storm drainage system, waterways, title block, scale, and north arrow.
- ☒ Tributary areas shown for all inlets (including offsite drainage areas).
- ☒ C value for each tributary area.
- ☒ Soil Type of existing site.
- ☒ New or replaced impervious area shown.
- ☒ All inlets and BMP, shown (including unique identifier).
- ☒ All interceptor trees shown.
- ☒ All proposed BMPs shown including dimensions.

Existing Condition Exhibit

- ☒ Exhibit should include: street names, property lines, proposed storm drainage system, waterways, title block, scale, and north arrow.
- ☒ Soil Type of existing site.
- ☒ Proposed tributary areas shown for all proposed inlets (including offsite drainage areas). Existing impervious areas.
- ☒ Existing impervious area.

BMP Details:

- ☒ Preliminary detail for each type of BMP selected- provide a preliminary 8.5"x11" detail for each BMP type or include on submitted drawings. These can be taken straight from the Fact Sheets if no significant changes are proposed.

On Plans:

- ☒ Show all applicable elements of the selected BMPs on the appropriate plan sheets.

Calculations:

- ☒ Storm Water calculator summary sheet.
- ☒ Supplemental or supporting calculation if applicable.
- ☒ Calculations; from the "storm water calculator" for each inlet.

Project Name: The Arbor Subdevelopment

Project Name	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...										Achieves...		Treatment		Volume Capture		Runoff Reduction Measure		BMP in priority selected?		Unique Identifier of BMP per planes	Explanation of selection	Other notes.
				High Ground Water	Contamination	Slope Constraints	Treatment	Volume Capture	Runoff Reduction Measure	Yes	No															
Universal BMP- to be considered on all projects.	Living Roof	N/A	N/A		X	X	X		X	X																
	Rainwater Harvesting	N/A	N/A		X	X	X			X																
Runoff Reduction Measures	Interceptor Trees	N/A	N/A		X	X	X				X															
	Bovine Terrace	RRM-01	Bovine Terrace		X						X															
	Vegetated Buffer Strip	RRM-02	Vegetated Buffer Strip								X															
	Impervious Area Disconnection	N/A	N/A		X	X	X				X															
Priority 1- to be installed with no underdrains or liners. Must drain all staging water within 72 hours.	Bioretention	P1-02	Roadside Bioretention - no C & G						X	X																
	Vegetated Swale-with Bioretention	P1-06	Swale with Bioretention						X	X																
	Constructed Wetlands	N/A	N/A						X	X																
Priority 2 BMPs- with subsurface drains installed above the capture volume.	Bioretention	P2-02	Roadside Bioretention - Flush Design Roadside						X	X																
		P2-03	Roadside Bioretention-Contiguous SW						X	X																
		P2-04	Roadside Bioretention-Curb Opening						X	X																
		P2-05	Roadside Bioretention- No C & G						X	X																
	Constructed Wetlands	N/A	N/A						X	X																

Date: _____

Page ____ of ____

Best Management Practice (BMP)	Detail Sheet	Detail Title		Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Runoff Reduction Measure	BMP in priority selected?	Yes	No	Unique Identifier of BMP per planes	Explanation of selection	Other notes:
Priority 3 BMPs- installed with subdrains and/or impermeable liner. Does not achieve volume capture and must be used as part of a treatment train.	Bioretention	P3-02	Roadside Bioretention - Flush Design Roadside		X	X	X		X								
		P3-03	Roadside Bioretention- Contiguous SW		X	X	X		X								
		P3-04	Roadside Bioretention- Curb Opening		X	X	X		X								
	Flow Through Planters	P3-05	Flow Through Planters		X	X	X		X								
	Vegetated Swale	P3-06	With Bioretention		X	X	X		X	X							
		P3-07	Vegetated Swale		X	X	X		X								
Priority 4 BMPs- does not achieve volume capture and must be used as part of a	Tree Filter Unit				X	X	X		X								
	Modular Bioretention				X	X	X		X								
Priority 5 BMPs- does not achieve volume capture and must be used as part of a treatment train.	Chambered Separator Units				X	X	X		X								
	Centrifugal Separator Units				X	X	X		X								
	Trash Excluders				X	X	X		X								
	Filter Inserts				X	X	X		X								
Priority 6 BMPs- see the "Offset Program" chapter for details.	Offset Program								N/A	N/A	N/A						
Other	Detention				X												

APPENDIX “D”

BIORETENTION AREA FACT SHEET

USGS WEB SOIL SURVEY

GEO TRACKER

FACT SHEET- BIORETENTION

BIORETENTION

Also known as: Rain garden, roadside bioretention, and bioretention cell



DESCRIPTION

The bioretention area best management practice (BMP) functions as a soil and plant-based filtration and infiltration feature that removes pollutants through a variety of natural physical, biological, and chemical treatment processes.

ADVANTAGES

- Can be designed to achieve Treatment, Delta Volume Capture, or Hydromodification requirements.
- Enhances water quality of downstream water bodies through natural processes.
- Aesthetically pleasing.
- The vegetation can provide shade and wind breaks, absorbs noise, reduces heat island effects and improves an area's landscape.
- Provides habitat for birds and attracts other pollinators like butterflies and bees.
- Does not interrupt utility installation.
- Does not interfere with tree planting.

FACT SHEET- BIORETENTION

LIMITATIONS

- Specialized design is required for areas where street slopes exceed 10%.
- Should not be used in areas of known contamination. If soil and/or groundwater contamination is present on the site or within a 100' radius of the proposed BMP location, the North Coast Regional Water Quality Control Board will need to be contacted and the site reviewed.
- Should not be used in areas of high groundwater. In general a minimum of 2' of clearance should be provided between the bottom of the bioretention cell and seasonal high groundwater.
- Should not be used in areas of slope instability where infiltrated storm water may cause failure. Slope stability should be determined by a licensed geotechnical engineer.
- Do not use in locations that can negatively impact building foundation or footings. Location shall be approved by a licensed Geotechnical Engineer.

KEY DESIGN FEATURES

ALL BIORETENTION

- Structural soil should be used within the bioretention area requiring load bearing capacity (adjacent to roadways and/or buildings).
- Structural soil, if used, shall be installed as described in Appendix E.
- Some BMPs may not require the use of structural soil and a more organic type planting soil and/or treatment media may be used in its place. It may be possible in some cases to use native soil or to amend the native soil so that it is suitable. Use of non-structural soil will depend on evaluation of the criteria in "Chapter 4-Site Assessment" as well as consideration of structural needs and may require evaluation by a licensed Geotechnical Engineer.
- Underlining native soil should remain un-compacted to preserve infiltration capacity. Fence off the area during construction to protect it from compaction.
- Bottom of bioretention should be un-lined to allow infiltration into native soil.
- Moisture barrier must be installed vertically to protect road sub-base and any trenches adjacent to the bioretention area.
- If used, pervious concrete shall be designed and installed as described in Appendix E and protected during construction to prevent sediment loading.
- If the porous gutter design option is used additional trash and sediment capture BMPs is required.
- A curb opening type design may be used in place of a porous gutter if appropriate for the project and does not require additional trash capture.
- Bioretention areas shall be planted with plants from the approved **Plant List** and **Tree List** included in Appendix F and shall be planted to achieve 51% cover.
- All bioretention areas shall be designed with a designated high flow bypass inlet for storms larger than the design storm.

FACT SHEET- BIORETENTION

- For designs that include perforated pipe, the 6" perforated pipe must be installed a minimum of 6" below the adjacent road structural section.
- Perforated pipe shall be installed in straight runs only.
- The volume below the perforated pipe must be sufficient to hold and infiltrate the design volume.

SIZING DESIGN- GOAL AND REQUIREMENTS

- **For all projects:** The treatment component requires that all of the runoff generated by this water quality design storm from impermeable surfaces must be treated on site for the pollutants of concern.
- ***For projects that increase the amount of impervious surface, but create or replace less than a total of one acre:*** The **Delta Volume Capture** component requires that any increase in volume due to development for the water quality design storm must be infiltrated and/or reused on site. Further discussion of the Treatment and Delta Volume Capture requirements and the accompanying formulas can be found in Chapter 6.
- ***For projects that create or replace one acre or more of impervious surface:*** These larger projects must mitigate their impacts by meeting the **Hydromodification Requirement** by capturing 100% of the post development volume generated by the water quality rain event.
- All calculations shall be completed using the "Storm Water Calculator" available at www.srcity.org/stormwaterLID.

INSPECTION AND MAINTENANCE REQUIREMENTS

A maintenance plan shall be provided with the Final SWLID Submittal. The maintenance plan shall include recommended maintenance practices, state the parties responsible for maintenance and upkeep, specify the funding source for ongoing maintenance with provisions for full replacement when necessary and provide site specific inspection checklist.

At a minimum maintenance shall include the following:

- Dry street sweeping upon completion of construction
- Dry street sweeping annually, and
 - When water is observed flowing in the gutter during a low intensity storm.
 - Algae is observed in the gutter.
 - Sediment/debris covers 1/3 of the gutter width or more.
- Inspect twice annually for sedimentation and trash accumulation in the gutter. Obstructions and trash shall be removed and properly disposed of.
- Inspect twice during the rainy season for ponded water.
- Pesticides and fertilizers shall not be used in the bioretention area.
- Plants should be pruned, weeds pulled and dead plants replaced as needed.

122° 48' 7" W

122° 47' 59" W

38° 31' 33" N

38° 31' 33" N



38° 31' 29" N

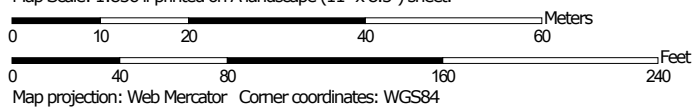
38° 31' 29" N

122° 48' 7" W

122° 47' 59" W



Map Scale: 1:856 if printed on A landscape (11" x 8.5") sheet.




MAP LEGEND

Area of Interest (AOI)









Area of Interest (AOI)

Soils

Soil Rating Polygons





-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

Soil Rating Lines


-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

Soil Rating Points






-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available

Water Features

-  Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

-  Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sonoma County, California

Survey Area Data: Version 12, Sep 13, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 1, 2018—Jul 31, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HwB	Huichica loam, shallow, ponded, 0 to 5 percent slopes	D	3.8	100.0%
Totals for Area of Interest			3.8	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

The screenshot displays the GeoTracker application interface, which is used for managing and tracking sites and facilities. The interface is divided into two main sections: a left sidebar for filtering and a right pane for the map.

Left Sidebar - Filters:

- Sites and Facilities - INFO**
 - Cleanup Sites**
 - ☒ LUST Cleanup Sites
 - ☒ Cleanup Program Sites
 - ☒ Military Cleanup Sites
 - ☐ DTSC Cleanup Sites
 - Permitted Facilities**
 - ☒ Waste Discharge Requirements (WDR) Sites
 - ☐ Permitted USTs - INFO
 - ☐ DTSC Hazardous Waste Sites
 - ☐ Land Disposal Sites
 - ☒ Irrigated Lands Regulatory Program Sites
 - ☐ Oil / Gas Sites
 - ☒ Confined Animal Sites
 - Other Sites**
 - ☐ Project Sites
 - ☐ Non-Case Information Sites
 - ☐ Sampling Points - Public
 - ☐ Field Points
- Legend:** ☒ SIGNIFIES A CLOSED SITE
- Tools** (+ icon)
- Map Coverages** (+ icon)
- [TAKE A TOUR](#)
- [VIEW ON GAMA](#)

Right Pane - Map View:

- A search bar at the top contains the address "1200 Shiloh road windsor". Below it is a label "Map Address".
- The map shows a street grid in Windsor, Ontario, Canada, centered around Shiloh Rd and Conde Ln.
- A large red circle highlights a specific area on the map, likely indicating a selected site or facility.
- Various points of interest are visible on the map, including "Dumol Winery", "Tractor Supply Co", "Marcassin Wine", "WorldMark Windsor", "Weinstein Security", "Alexander Valley Cellars", "Redwood Empire Schools Insurance Group", and "Mt Storm Forest Products, Inc".
- A small inset map in the top right corner shows the location relative to the surrounding area.

APPENDIX “E”

SAMPLE OPERATION AND MAINTENANCE INSPECTION CHECKLISTS

PLANTER STRIP BIORETENTION- CHECKLIST

Planter Strip Bioretention

Inspection and Maintenance Checklist

(aka: Street Rain Garden, Roadside Bioretention, Bioretention Cell)

Date of Inspection: _____
Inspector(s): _____
BMP ID #: _____
Property Owner: _____

Location Description: _____

Type of Inspection: ☐ Pre-rainy Season (PRS) ☐ Rainy Season (RS) ☐ After-rainy Season (ARS)

This Inspection and Maintenance Checklist is to be used in conjunction with its corresponding LID Factsheet and Maintenance Plan. Please review these documents before performing the field inspection.

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Drainage	RS	Is there standing or pooling of water in the Bioretention area after 3 days of dry weather?		<ul style="list-style-type: none">• Check perforated pipe outlet for obstruction or damage. *• Flush perforated pipe to remove obstructions/sediment. *• Remove and replace the first few inches of topsoil.• Remove soil and inspect perforated pipe. Repair or replace perforated pipe, replace with new soil and regrade.	
		Is water not draining into catch basin from the overflow pipe during a high intensity storm? *			
	PRS RS ARS	Is there sediment visible in the gutter?		<ul style="list-style-type: none">• In dry weather, use a mechanical sweeper or a Vactor truck to clean gutter pan.	
	RS	Is there water flowing in the pervious concrete gutter section during a low intensity storm? *		<ul style="list-style-type: none">• In wet weather, use a Vactor truck to clean gutter pan.	

* If perforated pipe is present.

PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Erosion	RS ARS	Is there under cutting or washouts along the sidewalks and/or curbs abutting the planter strip?		<ul style="list-style-type: none"> Fill in eroded areas and regrade. 	
	RS ARS	Is there channelization (gully) forming along the length of the planter area?		<ul style="list-style-type: none"> Fill in eroded areas and regrade. 	
	RS ARS	Is there accumulation of sediment (sand, dirt, mud) in the planter?		<ul style="list-style-type: none"> Remove sediment and check the grading. Add replacement soil and/or mulch. 	
	PRS RS ARS	Is the mulch unevenly distributed in the planter area?		<ul style="list-style-type: none"> Redistribute and add additional mulch if needed. Regrade planter area. 	
	PRS RS ARS	Are there voids or deep holes present? Is there sediment present in the catch basin and in the overflow pipe?		<ul style="list-style-type: none"> Check the perforated pipe for damage.* 	
	PRS RS ARS	Is there evidence of animal activity such as holes or dirt mounds from digging or borrowing?		<ul style="list-style-type: none"> Repair and fill in damage areas. Rodent control activities must be in accordance with applicable laws and do not affect any protected species. 	

* If perforated pipe is present.

PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Vegetation	PRS RS ARS	Is the vegetation clogging the inlet flow areas?		<ul style="list-style-type: none">Trim and/or remove the excess vegetation.	
	PRS RS ARS	Is the mulch distributed evenly throughout the planter area?		<ul style="list-style-type: none">Redistribute and add additional mulch if needed.Regrade planter area.	
	PRS RS ARS	Are there dead or dry plants/weeds? Is the vegetation over grown?		<ul style="list-style-type: none">Remove dead and/or dry vegetation. Replace as needed.Remove or trim any vegetation that is causing a visual barrier, trip, and or obstruction hazard.	

PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
BMP General	PRS RS ARS	Is there debris/trash in the planter area?		<ul style="list-style-type: none"> Remove all trash and debris. 	
	PRS RS ARS	Is graffiti present?		<ul style="list-style-type: none"> Remove all graffiti from the area. 	
	PRS RS ARS	Are there missing or disturbed aesthetics features?		<ul style="list-style-type: none"> Replace and/or reposition aesthetics features to original placement. Placement should not disrupt flow characteristics/design. 	
	PRS RS ARS	Is the vegetation irrigation functional?		<ul style="list-style-type: none"> Repaired broken missing spray/drip emitters. Reposition and/or adjust to eliminate over spray and/or over watering. 	
	PRS RS ARS	Are the aesthetic features firmly secured in placed?		<ul style="list-style-type: none"> Repair and/or replace loose or damage features. 	
	PRS RS ARS	Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling.		<ul style="list-style-type: none"> Remove and replace damaged areas. 	

APPENDIX “F”

MAINTENANCE DECLARATION

RECORDING REQUESTED BY:
TOWN ENGINEER

WHEN RECORDED RETURN TO:
Town Engineer
Town of Windsor
P. O. Box 100
Windsor, CA 95492-0100

File No: _____

SPACE ABOVE THIS LINE FOR RECORDER'S USE

Project/Property:
Address:
APN:
Windsor, California

**DECLARATION OF COVENANTS
RELATED TO MAINTENANCE OF
STORM WATER LID BMPS**

This Declaration of Covenants Related to Maintenance of permanent Storm Water Low Impact Design Best Management Practices (LID BMPS) ("Declaration") is made on this _____ day of _____, 20____, by, _____ ("Landowner").

RECITALS

- A. Landowner is the fee simple owner of certain real property located in the Town of Windsor ("Town"), Sonoma County, California, at the address of: _____; and APN _____ more fully described as _____ and Exhibit A to this Declaration ("Property"). The property is part of a larger development referred to herein as the "Project."
- B. The Town's National Pollutant Discharge Elimination System ("NPDES") Municipal Separate Storm Sewer System ("MS4") Permit, issued by the North Coast Regional Water Quality Control Board, requires the Town to implement and enforce specific requirements for the construction and maintenance of onsite storm water management Low Impact Design best management practices (collectively, "LID BMPS") for development, redevelopment, and other applicable projects with the goal of mitigating impacts to storm water quality and runoff volume discharges to the Town's storm drain system (MS4) and/or waters of the State of California. Provisions of Town Municipal Code Title IX, Chapter 4 and other applicable sections of the Town Municipal Code shall apply to the construction, inspection and maintenance of LID BMPS and the enforcement of MS4 Permit requirements.
- C. Provisions of Title IX, Chapter 4 and other applicable sections of the Town Code shall apply to the construction, inspection, and maintenance of LID BMPS on the property and the enforcement of MS4 Permit requirements.
- D. On _____, the Town Engineer approved Improvement Plans titled: _____ ("Plans") including a Final Storm Water LID Plan ("F-SWLID") and Maintenance Plan for the Property which requires the construction and maintenance of LID BMPS on the Property by Landowner. The LID BMPS required under the F-SWLID may include

both built and landscaping features. The F-SWLID and Maintenance Plan may be inspected by the public, upon appointment, at the Town of Windsor, Public Works Department, 8400 Windsor Road.

- E. The Town's MS4 Permit and/or the F-SWLID requires that Landowner make and execute this Declaration.

DECLARATION OF COVENANTS

NOW, THEREFORE, in consideration of the foregoing recitals, Landowner hereby covenants, agrees and declares as follows:

1. Landowner shall, at Landowner's sole cost and expense, construct, inspect and maintain such LID BMPs on the Property in perpetuity, all in accordance with the Plans and the F-SWLID and Maintenance Plan. Landowner shall ensure that all LID BMPs on the Property remain fully functional and that all areas identified in the Plans and F-SWLID for treatment and/or volume capture discharge to the specified BMP Facility as designed. Landowner and/or any entity designated in writing by **Landowner and approved by the Town, assume all responsibility for conducting a maintenance inspection of the BMPs on the Property at least annually and shall submit an annual inspection report to the Town no later than September 1st of each year.** The Owner shall ensure that the LID BMPs on the Property will be maintained and fully functional until such time that the responsibility is legally transferred to an entity designated and trained to take over permanent responsibility for BMP Feature maintenance.
2. Landowner shall keep all records related to annual inspections of LID BMPs on the property and all records related to LID BMPs maintenance by landowner for a period of at least five (5) years. The records shall include all corrections, repairs, and replacements of all LID BMPs on the Property. Landowner shall make these records available to the Town upon request.
3. In the event Landowner fails to maintain the LID BMPs on the Property in good working condition as solely determined by the Town, in the exercise of its reasonable discretion, and fails to repair within thirty (30) days following Town's written notice thereof to Landowner, the Town may enter upon the Property and take whatever steps it deems reasonably necessary to maintain and/or place in good working condition such LID BMPs; provided, however, that such notice and opportunity to repair shall not be required when, in the Town's sole determination in the exercise of its reasonable discretion, the Town's immediate entry and repair are required in the interest of the public health, safety and welfare. It is expressly understood that the Town is under no obligation to maintain or repair the LID BMPs on the Property, and in no event shall this Declaration be construed to impose such an obligation on the Town. Landowner has no obligation with respect to any public LID BMPs which are annexed into the Town's 1982 Act Benefit Assessment District.
4. In the event that the Town performs work of any nature, or expends any funds in the performance of such work for labor, use of equipment, supplies, materials, or the like, due to failure of the Landowner to perform its maintenance obligations under this Declaration, as solely determined by Town, in the exercise of its reasonable discretion, Landowner shall reimburse the Town within sixty (60) days of receipt of notice for all costs incurred by the Town to undertake such work. Costs shall include, but are not limited to, the actual cost of construction, maintenance and/or repair, and administrative costs directly related to such work.
5. Any violation of the Plans or F-SWLID and Maintenance Plan by Landowner shall be deemed a public nuisance and the Town shall be entitled to the remedies available to it under Town Municipal Code Title IX, Chapter 4. The remedies identified herein shall be in addition to and cumulative of all other remedies, criminal or civil, which may be pursued by the Town.
6. Landowner shall indemnify, defend and hold harmless the Town and its employees, officials, and agents,

from and against any liability, (including liability for claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, related expenses or costs of any kind, whether actual, alleged or threatened, interest, defense costs, and expert witness fees), where the same relates to, or arises out of, the construction, presence, existence, inspection, or maintenance of LID BMPs on the Property or the performance of the covenants contained in or arising from this Declaration by Landowner, its officers, employees, agents, contractors or subcontractors, excepting only that resulting from the sole, active negligence or intentional misconduct of the Town, its employees, officials, or agents. This indemnification obligation is not restricted in any way by any limitation on amount or type of damages or compensation payable to or for the Landowner or its agents under workers' compensation acts, disability benefits acts or other employees' benefits acts. If any judgment or claim against the Town, its officials, agents, or employees, shall be entered, Landowner shall pay all cost and expenses in connection therewith, subject to the aforementioned exception for cost resulting from the sole, active negligence or intentional misconduct of the Town.

7. If any provisions of this Declaration shall be held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.
8. This Declaration shall be governed according to the laws of the State of California. The parties hereto agree that the forum for the adjudication of any dispute related to this Declaration shall be brought exclusively and solely in Sonoma County, California.
9. Landowner shall not assign this Declaration to a third party without the express prior written consent of the Town, provided that such consent will not be unreasonably withheld. However, such consent shall not be required for Landowner to sell or lease the property to a third party who expressly assumes Landowner's obligations hereunder pursuant to an Assignment and Assumption Agreement or similar document between Landowner and the third party, in a form reasonably acceptable to the Town.
10. Landowner binds itself, its partners, successors, legal representatives and assigns of the Town with respect to all promises and agreements of Landowner contained herein.
11. This Declaration shall be recorded by Landowner, and shall: (a) constitute a covenant running with the land; (b) be binding upon Landowner and Landowner's successors, heirs, and assigns in perpetuity; and, (c) benefit the Town of Windsor, its successors, and assigns. Any breach of this Declaration by Landowner shall render Landowner or Landowner's heirs, successors or assigns liable pursuant to the provisions of the Town Municipal Code. Upon a valid transfer of title to the Property from Landowner to a third party and Town's approval of an Assignment and Assumption Agreement or similar document between Landowner and the third party, Landowner shall be released from all responsibility under this Declaration.
12. Any notice, submittal or communication required or permitted to be served on Landowner or Town may be served by personal delivery to the person or the office of the person identified below. Service may also be made by mail, by placing first-class postage, and addressed as indicated below, and depositing in the United States mail to:

To Landowner:

Attention: _____

To Town:

Town of Windsor
P.O. Box 100
Windsor, CA 95492-0100
Attention: Town Engineer

Executed as of the day and year first above stated.

LANDOWNER:

Name: _____

Address: _____

By: _____

By: _____

Signatures of Authorized Persons:

Name: _____

Name: _____

Title: _____

Title: _____

ATTACHMENTS:

- (1) Exhibit A- Legal Property Description
- (2) Exhibit B - Plat (Map) showing all storm water LID BMPs – numbered and in color
- (3) Exhibit C- Final Storm Water LID Maintenance Plan with the following included:
 - a) Maintenance Requirements
 - b) Inspection Forms
 - c) Individual Parcel Maps with LID BMPs (Public and Private Separated)
 - d) Detail sheets of each type of LID BMP
 - e) Table of number and types of LID BMPs in entire project

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT**CIVIL CODE § 1189**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)

County of _____)

On _____ before me, _____,
Date Here Insert Name and Title of the Officerpersonally appeared _____
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____ Document Date: _____

Number of Pages: _____ Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____

☐ Corporate Officer — Title(s): _____☐ Partner — ☐ Limited ☐ General☐ Individual ☐ Attorney in Fact☐ Trustee ☐ Guardian or Conservator☐ Other: _____

Signer Is Representing: _____

Signer's Name: _____

☐ Corporate Officer — Title(s): _____☐ Partner — ☐ Limited ☐ General☐ Individual ☐ Attorney in Fact☐ Trustee ☐ Guardian or Conservator☐ Other: _____

Signer Is Representing: _____

EXHIBIT “A”

Legal Property Description

EXHIBIT “B”

Plat (Map) showing all storm water LID BMPs

EXHIBIT “C”

Final Storm Water LID Maintenance Plan

FACT SHEET- BIORETENTION

BIORETENTION

Also known as: Rain garden, roadside bioretention, and bioretention cell



DESCRIPTION

The bioretention area best management practice (BMP) functions as a soil and plant-based filtration and infiltration feature that removes pollutants through a variety of natural physical, biological, and chemical treatment processes.

ADVANTAGES

- Can be designed to achieve Treatment, Delta Volume Capture, or Hydromodification requirements.
- Enhances water quality of downstream water bodies through natural processes.
- Aesthetically pleasing.
- The vegetation can provide shade and wind breaks, absorbs noise, reduces heat island effects and improves an area's landscape.
- Provides habitat for birds and attracts other pollinators like butterflies and bees.
- Does not interrupt utility installation.
- Does not interfere with tree planting.

FACT SHEET- BIORETENTION

LIMITATIONS

- Specialized design is required for areas where street slopes exceed 10%.
- Should not be used in areas of known contamination. If soil and/or groundwater contamination is present on the site or within a 100' radius of the proposed BMP location, the North Coast Regional Water Quality Control Board will need to be contacted and the site reviewed.
- Should not be used in areas of high groundwater. In general a minimum of 2' of clearance should be provided between the bottom of the bioretention cell and seasonal high groundwater.
- Should not be used in areas of slope instability where infiltrated storm water may cause failure. Slope stability should be determined by a licensed geotechnical engineer.
- Do not use in locations that can negatively impact building foundation or footings. Location shall be approved by a licensed Geotechnical Engineer.

KEY DESIGN FEATURES

ALL BIORETENTION

- Structural soil should be used within the bioretention area requiring load bearing capacity (adjacent to roadways and/or buildings).
- Structural soil, if used, shall be installed as described in Appendix E.
- Some BMPs may not require the use of structural soil and a more organic type planting soil and/or treatment media may be used in its place. It may be possible in some cases to use native soil or to amend the native soil so that it is suitable. Use of non-structural soil will depend on evaluation of the criteria in "Chapter 4-Site Assessment" as well as consideration of structural needs and may require evaluation by a licensed Geotechnical Engineer.
- Underlining native soil should remain un-compacted to preserve infiltration capacity. Fence off the area during construction to protect it from compaction.
- Bottom of bioretention should be un-lined to allow infiltration into native soil.
- Moisture barrier must be installed vertically to protect road sub-base and any trenches adjacent to the bioretention area.
- If used, pervious concrete shall be designed and installed as described in Appendix E and protected during construction to prevent sediment loading.
- If the porous gutter design option is used additional trash and sediment capture BMPs is required.
- A curb opening type design may be used in place of a porous gutter if appropriate for the project and does not require additional trash capture.
- Bioretention areas shall be planted with plants from the approved **Plant List** and **Tree List** included in Appendix F and shall be planted to achieve 51% cover.
- All bioretention areas shall be designed with a designated high flow bypass inlet for storms larger than the design storm.

FACT SHEET- BIORETENTION

- For designs that include perforated pipe, the 6" perforated pipe must be installed a minimum of 6" below the adjacent road structural section.
- Perforated pipe shall be installed in straight runs only.
- The volume below the perforated pipe must be sufficient to hold and infiltrate the design volume.

SIZING DESIGN- GOAL AND REQUIREMENTS

- **For all projects:** The treatment component requires that all of the runoff generated by this water quality design storm from impermeable surfaces must be treated on site for the pollutants of concern.
- ***For projects that increase the amount of impervious surface, but create or replace less than a total of one acre:*** The **Delta Volume Capture** component requires that any increase in volume due to development for the water quality design storm must be infiltrated and/or reused on site. Further discussion of the Treatment and Delta Volume Capture requirements and the accompanying formulas can be found in Chapter 6.
- ***For projects that create or replace one acre or more of impervious surface:*** These larger projects must mitigate their impacts by meeting the **Hydromodification Requirement** by capturing 100% of the post development volume generated by the water quality rain event.
- All calculations shall be completed using the "Storm Water Calculator" available at www.srcity.org/stormwaterLID.

INSPECTION AND MAINTENANCE REQUIREMENTS

A maintenance plan shall be provided with the Final SWLID Submittal. The maintenance plan shall include recommended maintenance practices, state the parties responsible for maintenance and upkeep, specify the funding source for ongoing maintenance with provisions for full replacement when necessary and provide site specific inspection checklist.

At a minimum maintenance shall include the following:

- Dry street sweeping upon completion of construction
- Dry street sweeping annually, and
 - When water is observed flowing in the gutter during a low intensity storm.
 - Algae is observed in the gutter.
 - Sediment/debris covers 1/3 of the gutter width or more.
- Inspect twice annually for sedimentation and trash accumulation in the gutter. Obstructions and trash shall be removed and properly disposed of.
- Inspect twice during the rainy season for ponded water.
- Pesticides and fertilizers shall not be used in the bioretention area.
- Plants should be pruned, weeds pulled and dead plants replaced as needed.

- Standard Conditions -

Inspector: _____

Project: _____

Address: _____

Inspection Status Codes:

* = Refer to Form B (Specials)
and/or Form C (Notes).

Are there any special conditions and/or maintenance requirements noted for BMP(s)? Y N (circle one)

If Yes, attach Form B for Project.

[illegible]

Office Use: Complete: _____ Issues Corrective Action: _____ Re-Inspection Required: _____

Page _____ of _____

Storm Water Quality Special Feature Maintenance Check List

Date: _____
Start Time: _____
Stop Time: _____

Inspector: _____
Project: _____
Address: _____

Inspection Status Codes:
S = Satisfactory * - See Notes on Form C
D = Deficient

Special Feature or Conditions											
Reference code	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
Additional Special Maintenance Inspection Criteria	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.
BMP ID:											

Office Use:
Complete: _____ Issues Corrective Action: _____ Re-Inspection Required: _____

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