



**Civil  
Engineering  
Associates**

## STORMWATER MANAGEMENT PLAN

Mixed-Use Development  
530 Front Street  
Santa Cruz, CA 95060

City of Santa Cruz  
Department of Public Works  
809 Center Street, Room 201  
Santa Cruz, CA 95060

Prepared By: CEA, INC  
August 2022



I. TABLE OF CONTENTS

I. Table Of Contents .....2

II. Project Information .....3

III. Project Site Assessment Summary .....4

    A. Site Description

    B. Site Topography

    C. Geology and Soil Types

    D. Ground water

IV. Project Stormwater Performance Criteria and Drainage Management .....5

    A. Development Area and BMP Requirement Tiers

    B. Project Stormwater Tier Exemptions

    C. Drainage Management Areas

V. Site DESIGN and Stormwater Control Measures .....9

    A. Site Design and Runoff Reduction Measures (Tier 1)

    B. Water Quality treatment Measures (Tier 2)

    C. Runoff Retention Measures (Tier 3)

    D. Peak Management Measures (Tier 4)

VI. BMP Operation and Maintenance Plan .....14

    A. Maintenance Objectives

    B. Scheduling of Monitoring and Maintenance

    C. Routine Maintenance of Bio-Filtration Areas

    D. Routine Maintenance of Mechanical Filtration Systems

    E. Fiscal Resources

    F. Certification

VII. Appendices .....17

    Appendix A – Storm Water and Low-Impact Development BMP Requirement Worksheet

    Appendix B – Storm Water Control Plan and Details

    Appendix C – Maintenance Agreement

    Appendix D – Post Construction BMP Maintenance and Source Control Activities Table

    Appendix E – Sample BMP Inspection & Maintenance Form

    Appendix F – Employee Training Program Table

**II. PROJECT INFORMATION**

Project Name	Front/Soquel Mixed Used Project
Application Submittal Date	11/3/2021
Project Location	530 Front Street, Santa Cruz, CA 95060
APN	005-151-037, 044, 045 & 046
Name of Developer	Barry Swenson Builder
Project Type & Description	Mixed Use – Approximately 170 Residential Units & 8 Commercial Units
Project Watershed	San Lorenzo Watershed
Stormwater Tier 1 Runoff Reduction	Required
Stormwater Tier 2 Water Quality	Required
Stormwater Tier 3 Runoff Retention	Required for DMA B
Tier 3 Volume Required for DMA B	1363
Tier 3 Volume Provided for DMA B	1363
Stormwater Tier 4 Peak Management	Exempt
Total Project Site Area	64,126 SF
Total Area of Land Disturbed	64,126 SF
Total New Impervious Surface Area	3,973 SF
Total Replaced Impervious Surface Area	41,608 SF
Total Pre-Project Impervious Surface Area	41,608 SF
Total Post-Project Impervious Surface Area	45,581 SF
Percent LID & Non-LID Treatment	32% LID & 68% Non-LID
HMP Compliance	Hydro-Modification is not required

This Storm Water Management Plan is governed by the Requirements for the Preparation of Hydrology Reports for Projects Creating or Replacing Equal or More than 10,000 Square Feet of Impervious Area. The purpose of this stormwater management plan is to address the water quality impacts from the proposed site improvements. Best Management Practices (BMP's), as recommended by the California Storm Water Quality Association (CASQA), and outlined in the NPDES Permit, will be used to improve storm water quality onsite during construction. Low impact development facilities will be designed and constructed per the Santa Cruz County Stormwater C.3 Guidelines to treat post-construction runoff from impervious surfaces. This stormwater management plan is subject to revisions as needed by the project engineer.

### III. PROJECT SITE ASSESSMENT SUMMARY

#### A. SITE DESCRIPTION

The project site is located at Front Street and Soquel Avenue in Santa Cruz, California. The site is currently occupied by two commercial buildings and parking lots. The site is bounded by Soquel Avenue to the north, Front Street to the west, San Lorenzo River levee to the east, and an existing commercial property to the south.

#### B. SITE TOPOGRAPHY

The proposed site consists of four existing parcels. The project site is relatively level with elevations of approximately 16 to 21 feet above sea level. The surface pavement generally consists of 2 to 3½ inches of asphalt over 2 to 4 inches of aggregate base. The existing pavements are in fair to poor conditions with areas of significant alligator cracking.

#### C. GEOLOGY AND SOIL TYPES

According to the Geotechnical Investigation Report by Cornerstone Earth Group dated November 6, 2017, the site consists of approximately 6½ to 9 feet of undocumented fills consisting of loose poorly graded sands, medium dense clayey sands with gravel, and medium stiff to hard sandy lean clay with varying amounts of sands. Beneath the undocumented fills, Cornerstone Earth Group encountered loose to medium dense sands with varying amounts of silts and clays.

#### D. GROUND WATER

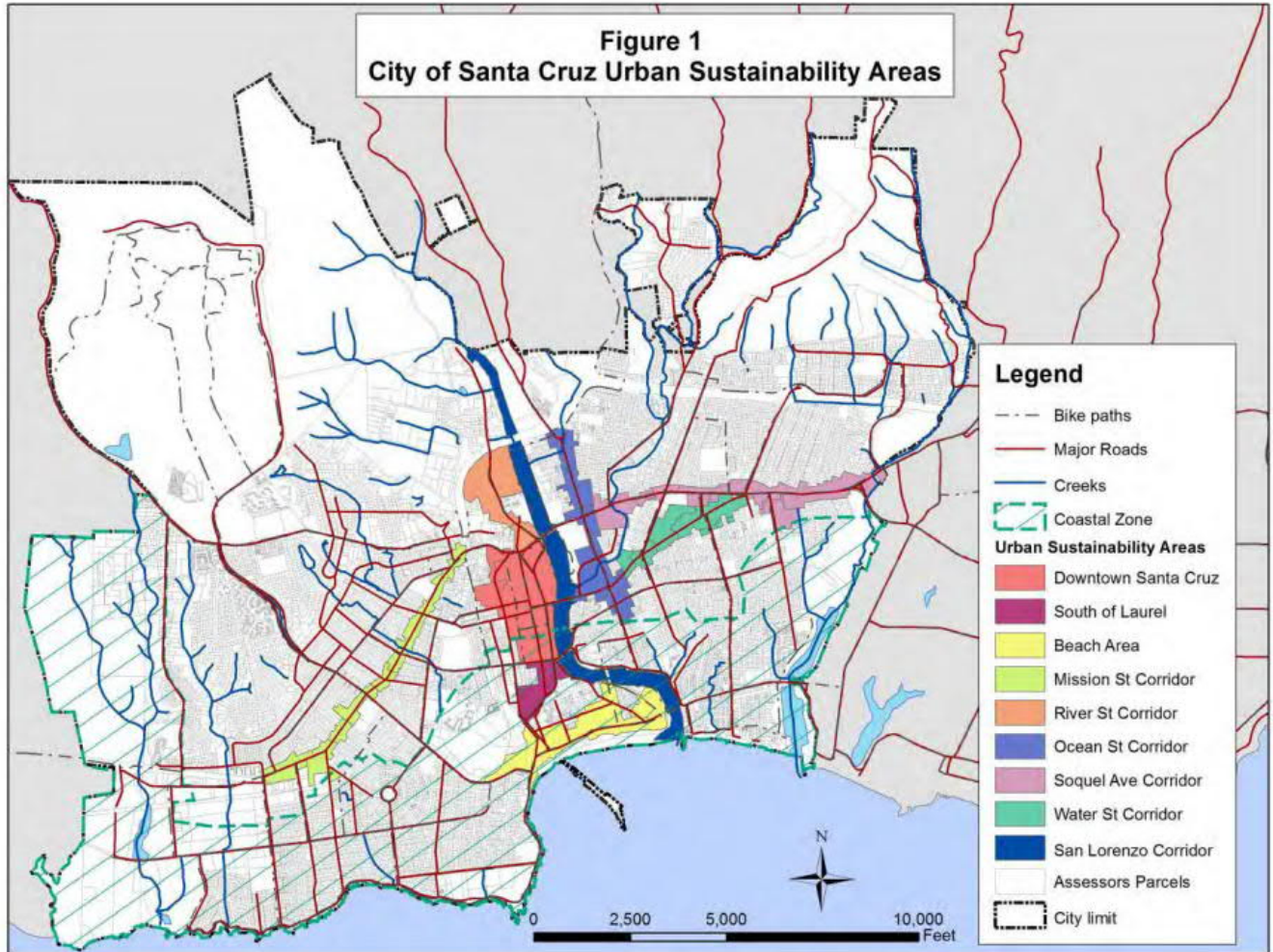
Ground water was estimated at depths of 12 to 16 feet below current grades based on tests performed by Cornerstone Earth Group. Ground water was not available for exploration due to the rotary wash method used.

Ground water data available on Geotracker in the project vicinity is recorded at depths of approximately 7 to 11 feet below existing grades.

**IV. PROJECT STORMWATER PERFORMANCE CRITERIA AND DRAINAGE  
MANAGEMENT**

**A. DEVELOPMENT AREA AND BMP REQUIREMENT TIERS**

The site is approximately 1.47 acres and is located in Downtown Santa Cruz as shown on the City of Santa Cruz urban Sustainability Areas Map.



The Best Management Practice Manual for the City’s Storm Water Management Program, employs 4 tier system with specific requirements for managing storm water runoff for private and public development/redevelopment project. The table below summarizes the post-construction BMP requirements for each Tier:



POST-CONSTRUCTION BMP REQUIREMENT TIERS				
Project Impervious Area	Tier 1 Site Design and Runoff Reduction Requirement (see p 16)	Tier 2 Water Quality Treatment Requirement (see p 18)	Tier 3 Runoff Retention Requirement (see p 23)	Tier 4 Peak Management Requirement (see p 28)
<b>Project Type: Single-Family Homes</b>				
≥ 2,500 SF new and replaced impervious area; < 15,000 SF of net impervious area	Required (see Chapter 6A)	Exempt	Exempt	Exempt
15,000 SF - 22,500 SF of net impervious area	Required	Required	Required	Exempt
≥ 22,500 SF of new and replaced impervious area	Required	Required	Required	Required
<b>Project Type: all other Regulated Projects</b>				
≥ 2,500 SF new and replaced impervious area; < 5,000 SF of net impervious area	Required	Exempt	Exempt	Exempt
5,000 SF net impervious area; < 15,000 SF of new and replaced impervious area	Required	Required	Exempt	Exempt
15,000 SF - 22,500 SF of new and replaced impervious area	Required	Required	Required	Exempt
≥ 22,500 SF of new and replaced impervious area	Required	Required	Required	Required

### Tier 1 Requirements: Site Design and Runoff Reduction

1. Maximize rainfall infiltration
2. Reduce downstream runoff volume and speed
3. Reduce pollutant loading and development impacts to receiving streams
4. Reduced size of downstream storm water treatment Control Measures

### Tier 2 Requirements: Water Quality Treatment

1. Bio-retention basins, mechanical media filters and self-treating areas shall be used to treat stormwater runoff prior to discharging offsite into the municipal storm drain system
2. The minimum area of each storm water control measure shall be four percent of the tributary impervious area that drains to the treatment facility.

### Tier 3 Requirements: Runoff Retention

1. Prevent offsite discharge from events to the 95<sup>th</sup> percentile 24-hour rainfall event

2. Optimize infiltration
3. Compliance must be achieved via storage, rainwater harvesting and/or evapotranspiration

Note: This project qualifies for Tier 3 Special Circumstances Retention Reduction since it is located within the Downtown Urban Sustainability Area, is between 1-2 acres in size, and meets the following City of Santa Cruz Chapter 6B Development BMP Requirements.

- Includes no surface parking
- Includes at least 85% coverage of the entire site
- Is within 0.25 miles of the local transit stop
- Includes a residential density of at least 30 dwelling units/acre

## B. PROJECT STORMWATER TIER EXEMPTIONS

### Tier 4 Requirements: Peak Management

Stormwater runoff from the project is proposed to outfall into the existing 42" storm main at the eastern side of the site then outfall into the San Lorenzo River. Per section 4.4 (Special Projects), the project is exempt from the Peak Management Requirements since runoff discharges to a continuous underground storm drain system that discharges to the San Lorenzo River in the City of Santa Cruz.

## C. DRAINAGE MANAGEMENT AREAS

The site will be divided into Drainage Management Areas (DMA). 8% of the site's storm water runoff will be directed to bio-treatment basins, 68% of the site's runoff will be directed to a mechanical media filter treatment device, 16% of the site's runoff will be self-treating, and 8% of the project site will be an expansion of the adjacent pathway or roadway designated as "Roadway Project".

DMA	DMA Size (sf)	Impervious Area (sf)	Pervious Area (sf)	Proposed Treatment
A	43,530	37,410	6,120	Mechanical Media Filter
B	5,356	4,337	1,019	Bio-Retention Basin
C	393	393	0	N/A
D	4,897	3,020	1,877	N/A
ST-1	782	35	747	Self-Treating
ST-2	9,168	386	8,782	Self-Treating
Total	64,126	45,581	18,545	

DMA	Tier 2 Bio-Retention Area Required (sf)	Tier 2 Bio-Retention Area Provided (sf)	Tier 3 Bio-Retention Volume Required (cf)	Tier 2 Bio-Retention Volume Provided (cf)
B	173	391	1363	1363



## v. SITE DESIGN AND STORMWATER CONTROL MEASURES

### A. SITE DESIGN AND RUNOFF REDUCTION MEASURES (TIER 1)

To meet the tier 1 stormwater requirements, site design measures will be implemented to reduce the amount of runoff and stormwater pollutants by limiting impervious surfaces on the site and therefore reduce the size of stormwater treatment measures that will be required. Any existing sensitive natural resources on the site shall be identified, protected and preserved from development to satisfy local, state and federal laws as applicable. Reuse of existing impervious areas and preserving existing pervious areas can minimize land disturbance. Clustering structures and paved surfaces can also be a useful site design measure.

- Minimize land disturbed
- Minimize impervious surfaces
- Micro-detention in landscape areas
- Self-treating areas
- Preserve open space

The existing site is currently developed and land disturbance will be minimized to the extent feasible. No sensitive natural resources have been identified for the site. The proposed site layout incorporates landscaped areas which will provide incidental treatment.

### B. WATER QUALITY TREATMENT MEASURES (TIER 2)

There is one bio-retention basin located on the east side of the site. The bio-retention basin is approximately 391 square feet and will treat approximately 8% of the site. The runoff will percolate through 24 inches of bio-filtration soil media, removing suspended soils, metals, nutrients, hydrocarbons and other pollutants. The leachate will drain into a minimum of 12 inches of class II permeable rock. Once the class II permeable rock is completely saturated, a perforated underdrain will convey the water to the onsite storm drain system.

There is one media filter treatment device located at the south-east corner of the site. Runoff from the building roof area and podium will be collected and hard piped to the mechanical filtration system. The mechanical filtration system will treat approximately 68% of the site and will be sized based on the manufacturers design criteria.

To reduce the runoff from the building portion of this site directed to this media filter treatment device, we are providing over 6,000 SF of vegetated surface within the building envelope including 1,038 SF of Green Roof and 3,398 SF of rooftop garden as an L.I.D. measure. Additional L.I.D. measures (Biotreatment planters, etc.) couldn't be added to the building portion of the site because of site design constraints including the "Zero" lot line building design, conflicts with structural components of the building, various Utility conflicts and limited surface area within the courtyards with concerns of

encroaching into Emergency Services access pathways and potential flooding & water intrusion into surrounding units.

Drainage Management Area ST-1, and ST-2 will be self-treating. These areas are considered self-treating because infiltration and natural processes that occur in these areas prevent stormwater and pollutants from being discharged. Here is a list of several requirements for an area to be considered self-treating:

- Landscaped areas must be gently sloped at a maximum slope of 4%
- Pervious pavement must have a minimum 12" of drain rock storage
- Pervious pavement must have a slope at the surface of 5% maximum and a slope at the subgrade below the drain rock of 2% maximum
- Over 6,300 SF of pervious pavement has been included in these areas to enhance the LID type treatment and improve infiltration capacity.

### C. RUNOFF RETENTION MEASURES (TIER 3)

This project qualifies for Tier 3 Special Circumstances Retention Reduction and there is no increase in replaced onsite impervious area; however, there is new impervious area in the offsite DMA's and thus retention, per Tier 3, is being provided.

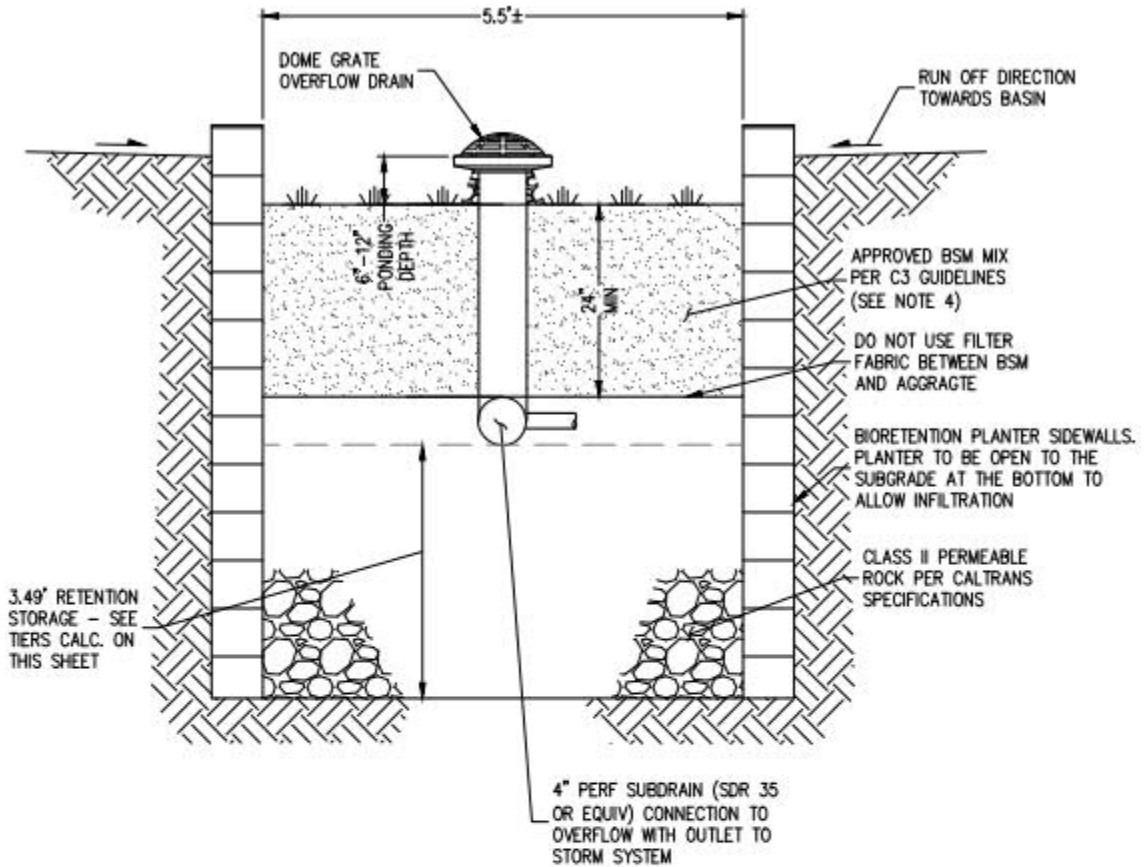
SCM-B, the bio-retention basin located on the east side of the site, was sized using the simple method of chapter 6B of the Best Management Practices Manual for the City's Storm Water Management Program. See the calculations below. The bio-retention basin will have 24" of treatment soil that allows storm water infiltration at a rate of 5 in/hr. and will be planted appropriately. The soil selection will be underlain by a 3.49' drain rock section to capture and store the storm water. The basin will be equipped with a raised inlet structure and under-drain.

A 3.49' drain rock section will be provided to meet the Tier 3 Runoff Retention Requirements. The site is in Watershed Management Zone 1 (WMZ 1) and is required to prevent offsite discharge from events up to the 95<sup>th</sup> percentile 24-hour rainfall event. See the table below for the SCM-B Tier 3 calculations.



TIER 3 SIMPLE METHOD CALCULATION FOR SCM-B		
i	0.810	=(total impervious area)/(total site area)
Runoff Coefficient, C	0.611	=(0.858*i^3)-(0.78*i^2)+(0.774*i)+0.04
Rainfall depth, d (ft)	0.167	=2" Santa Cruz 95th Percentile - WMZ 1, 4 & 10
Tributary Area, A (sf)	5356	=(total site area)
Retention Volume (cf)	545	=C*d*A
Retention Volume - Void Ratio Included (cf)	1363	=Volume/0.4
Area of Basin Required (sf) For Tier 2 Purposes Only	173	=4%(total impervious area)
Area of Basin Provided (sf)	391	≥Area of Required Basin
Depth of Rock (ft)	3.49	=(retention volume)/(area of basin provided)

New Impervious Area=	4337
Replaced Impervious Area=	0
Total Impervious Area=	4337
Total Pervious Area=	1019
Total Site Area=	5356



**BIORETENTION PLANTER DETAIL**  
NOT TO SCALE

NOTES

1. SELECT STORM DRAINS TO OUTFALL INTO BASINS. SEE UTILITY PLAN DRAWINGS FOR REFERENCE.
2. PERFORATION TO BE INSTALLED FACING DOWNWARD.
3. CONTRACTOR TO INSTALL CLASS II PERMEABLE (CALTRANS SPEC.) AGGREGATE IN BOTTOM (12" MIN.) OF TRENCH (TYP.)
4. BIOTREATMENT SOIL MIX (BSM) SHALL CONFORM/COMPLY WITH THE CCRWQCB, REGION 3, POST-CONSTRUCTION REQUIREMENTS. CONTRACTOR TO PROVIDE SUPPLIER CERTIFICATION FORM TO CITY.
5. SOIL MIX: THE SOIL IN BIO-RETENTION AREAS SHALL BE A HOMOGENEOUS MIX OF 60-70% FINE SAND (MEETING ASTM D422 OR CALTRANS TEST METHOD C202) AND 30-40% WEED-FREE, MANURE-FREE, STABLE COMPOST.  
NOTE: ALL SANDS COMPLYING WITH ASTM C33 FOR FINE AGGREGATE COMPLY WITH SIEVE SIZE/ GRADATION REQUIREMENTS. THE SOIL MIX/MEDIA TO BE USED IN BIO-RETENTION/RAIN GARDEN AREAS SHALL HAVE A MINIMUM INFILTRATION RATE OF 5 IN/HR. PREVIOUSLY: ASTM C33 STANDARDS.



D. PEAK MANAGEMENT MEASURES (TIER 4)

As stated in Section 4.B of this report, the Stormwater runoff from the project is proposed to outfall into the existing 42" storm main at the eastern side of the site then outfall into the San Lorenzo River. Per Section 4.4 (Special Circumstances), this project is exempt from Tier 4 requirements for Peak Management since runoff discharges into a continuous underground storm drain system that discharges to the San Lorenzo River in the City of Santa Cruz.

## VI. BMP OPERATION AND MAINTENANCE PLAN

### A. MAINTENANCE OBJECTIVES

A comprehensive monitoring and maintenance program is an essential element of a long-term storm water management plan. The proposed storm water system for the subject project will operate in an automatic reliable manner. However, as with all physical infrastructure, the storm water system will need adequate routine maintenance to function as designed.

### B. SCHEDULING OF MONITORING AND MAINTENANCE

Routine maintenance for the BMPs should be carried out on a schedule similar to the rest of the storm water system. This will typically require a thorough inspection and maintenance visit in late summer or early fall prior to the rainy season. Remedial maintenance will be performed immediately or scheduled to take place within a reasonable time frame.

### C. ROUTINE MAINTENANCE OF BIO-FILTRATION AREAS

Routine maintenance is required to ensure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active. Typical maintenance consists of the following:

- Inspect inlets for channels, exposure of soils, or other evidence of erosion. Clear any obstructions and remove and accumulation of sediment. Examine rock or other material used as a splash pad and replenish if necessary.
- Inspect outlets for erosion or plugging. Inspect side slopes for evidence of instability or erosion and correct as necessary
- Observe soil at the bottom of the swale or filter for uniform percolation throughout. If portions of the swale or filter do not drain within 48 hours after the end of a storm, the soil should be tilled and replanted. Remove any debris or accumulations of sediment.
- Examine the vegetation to ensure that it is healthy and dense enough to provide filtering and to protect soils from erosions. Replenish mulch as necessary, remove fallen leaves and debris, prune large shrubs or tress, and mow turf area. When mowing, remove no more than 1/3 height of grasses. Confirm the irrigation is adequate and not excessive. Replace dead plants and remove noxious and invasive vegetation.

### D. ROUTINE MAINTENANCE OF MECHANICAL FILTRATION SYSTEMS

Mechanical filtration systems shall be maintained per the manufacturer's recommendations outlined in Appendix D. It is required for all stormwater management systems to be inspected on a periodic basis and maintained as necessary to ensure performance and protect downstream receiving waters. The PerKFilter proposed on this project must be inspected typically twice per year, and maintained as



required. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. Typical maintenance consists of the following:

- Remove floating trash, debris and oils from the water surface in the inlet chamber using the extension nozzle on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely dewater the inlet chamber and evacuate all accumulated sediment from the inlet chamber. Some jetting may be required to fully remove sediment. The inlet chamber does not need to be refilled with water after maintenance is complete. The system will fill with water when the next storm event occurs.
- Remove the hold-down strut from each row of filter cartridges and then remove the top of each cartridge (the top is held on by four 9/16" bolts) and use the vacuum truck to evacuate the spent media. When empty, the spent cartridges may be easily lifted off their slip couplers and removed from the vault. The couplers may be left inserted into couplings cast into the false floor to prevent sediment and debris from being washed into the outlet chamber during washdown.
- Once all the spent cartridges have been removed from the structure, the vacuum truck may be used to evacuate all accumulated sediment from the treatment chamber. Some jetting may be required to fully remove sediment. Take care not to wash sediment and debris through the openings in the false floor and into the outlet chamber. All material removed from the PerkFilter during maintenance including the spent media must be disposed of in accordance with local, state, and/or federal regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Place a fresh cartridge in each cartridge position using the existing slip couplers and urethane bottom caps. If the vault is equipped with stacked cartridges, the existing outer and inner interconnector couplers must be used between the stacked cartridges to provide hydraulic connection. Transfer the existing vent tubes from the spent cartridges to the fresh cartridges. Finally, refit the struts to hold the fresh cartridges in place.
- Securely replace access covers, as appropriate.
- Make arrangements to return the empty spent cartridges to Oldcastle Infrastructure.

### E. FISCAL RESOURCES

The funding and execution of LID maintenance for the project will be the responsibility of the owner. The owner will be responsible for maintenance activities as follows: properly disposing of waste material within the project site, maintaining landscaping in a manner that will prevent soil erosion and minimize sediment transport, maintaining drainage facilities in a clean manner and in a flood repair, and properly maintaining all post-construction LIDS (both structural and non-structural) that exist within the project.



It should be noted that maintenance for any of the above mentioned post-construction LID's may be performed through third-party agreements; however, the ultimate responsibility of each facility rests on the owner.

### F. CERTIFICATION

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

VII. APPENDICES

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APPENDIX A – STORM WATER AND LOW-IMPACT DEVELOPMENT BMP REQUIREMENT WORKSHEET

# APPENDIX A

## STORM WATER AND LOW-IMPACT DEVELOPMENT BMP REQUIREMENT WORKSHEET

### How to Use This Worksheet

The City's Storm Water BMP requirements are based on project type, proposed impervious area, and location within the watershed. This worksheet was developed to help permit applicants determine and meet storm water BMP requirements applicable to a proposed development or redevelopment

- 1 - Download this fillable form online at [www.cityofsantacruz.com/LID](http://www.cityofsantacruz.com/LID)
- 2 - Fill out the Worksheet to determine what stormwater BMP requirements apply to a proposed project.
- 3 - Attach Worksheet and additional documentation required as listed in the City Storm Water Best Management Practices for Private and Public Development Projects to plans for review by the Department of Public Works
- 4 - Please contact the Public Works Environmental Project Analyst at 420-5160 if you have any questions on completing the worksheet.

**Project Address:** 530 Front Street      **Bldg Permit #:**  

### A - Project Type

Check project type that applies:

- Single Family Home       Multi-family, Commercial, Industrial, Public facilities

Check development type that applies:

- New Development       Redevelopment / Remodel

### B - Proposed Development Area and Impervious Area:

**Pre-project** impervious surface area: 41608 sq ft

**Post-project** impervious surface area: 47358 sq ft

Amount of impervious surface area that will be **replaced**: 41608 sq ft

Amount of new impervious surface area that will be **created**: 5750 sq ft

Reduced Impervious Area Credit: 0 sq ft

**New and Replaced Impervious Area =** 47358 sq ft

**Net Impervious Area =** 47358 sq ft

(Net Impervious Area = Impervious Area created + Impervious Area replaced - Reduced Impervious Area Credit)

### C - Post-Construction BMP Tier requirement:

Check Project Type and Impervious Area (from calculations above) that applies.

**BMP requirements are cumulative** (e.g. a project subject to BMP Tier 3 is also subject to Tiers 1 and 2), permit review fees are not cumulative.

Projects requiring a Stormwater Control Plan will need to involve a civil engineer.

SINGLE-FAMILY HOMES	BMP TIER	Permit Review Fee	Stormwater Control Plan required?
<input type="checkbox"/> Single-family Home with Net Impervious Area < 15,000 sf, please consult Chapter 6A, BMPs for Single-Family Homes on Small Lots	N/A	\$0	No
<input type="checkbox"/> Net Impervious Area ≥ 15,000 sf; New and replaced impervious area < 22,500 sf	3	\$330	Yes
<input type="checkbox"/> New and replaced impervious area ≥ 22,500 sf	4	\$550	Yes
MULTI-FAMILY, COMMERCIAL, INDUSTRIAL, PUBLIC FACILITIES	BMP TIER	Permit Review Fee	Stormwater Control Plan Required?
<input type="checkbox"/> New and Replaced Impervious Area ≥ 2,500 sf; Net Impervious Area < 5,000 sf	1	\$0	No
<input type="checkbox"/> Net Impervious Area ≥ 5,000 sf; New and Replaced Impervious Area < 15,000 sf	2	\$330	Yes
<input type="checkbox"/> New and Replaced Impervious Area ≥ 15,000 sf but < 22,500 sf	3	\$550	Yes
<input checked="" type="checkbox"/> New and replaced impervious area ≥ 22,500 sf	4	\$550	Yes

**If the proposed project is only subject to BMP Tiers 1 or 2, skip to Step F.**

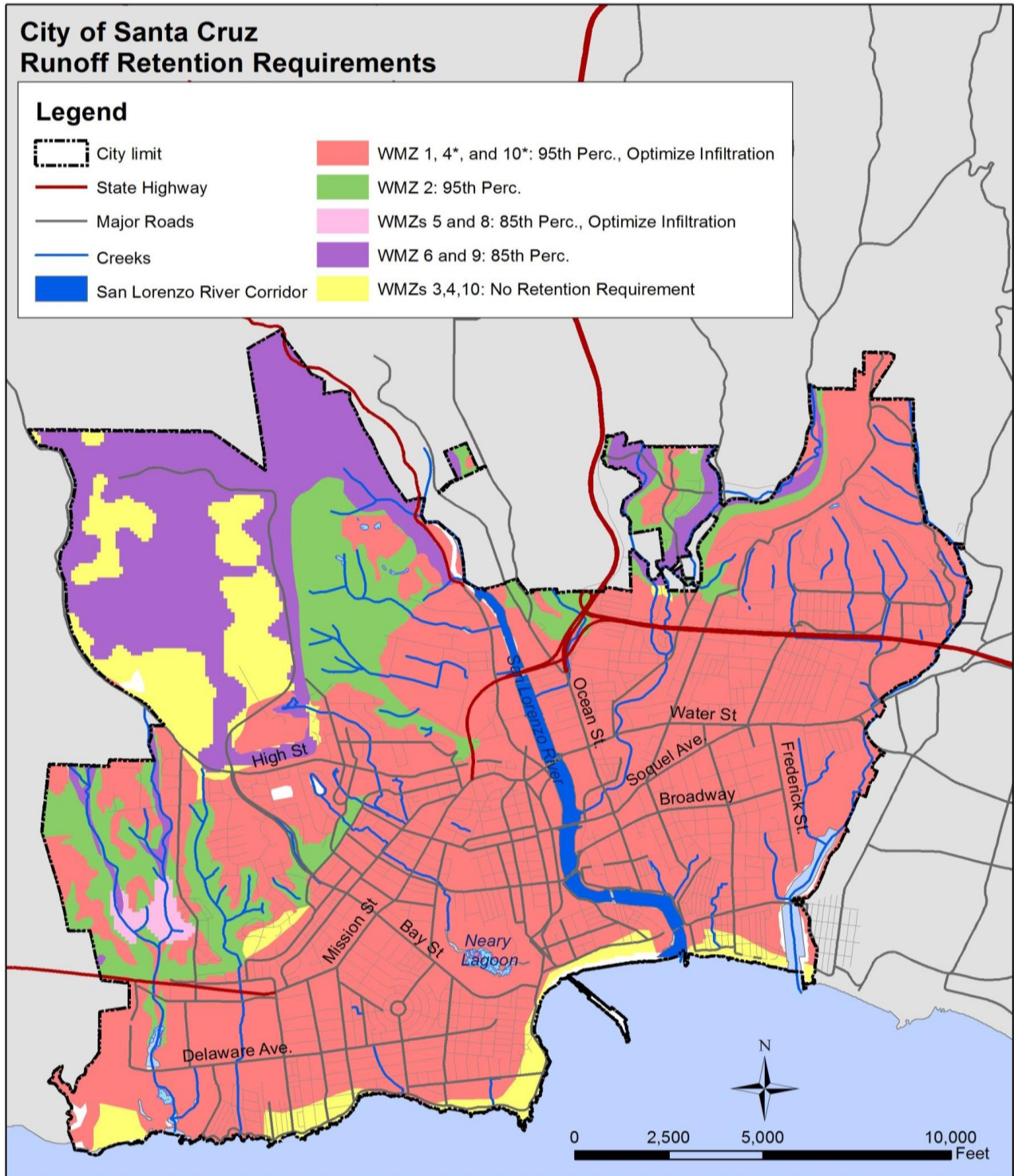
**D - Watershed Management Zones - For projects subject to Tiers 3 Post-Construction BMP requirements only.**

Watershed Management Zones are viewable online on the City of Santa Cruz GIS website at: <http://gis.cityofsantacruz.com/gis/index.html>

**Watershed Management Zones and associated Tier 3 (Runoff Retention) Post-Construction BMP requirements**

If Tier 3 BMP requirements are applicable to the project, check the watershed management zone area where the project is located.

- WMZ 1, and portions of 4, and 10 overlying groundwater basin
- WMZ 2
- WMZ 5 and 8
- WMZ 6 and 9
- WMZ 3, 4 and 10





**E - Special Circumstances - For projects subject to Tiers 3 and 4 Post-Construction BMP requirements only.**

Check if special circumstance applies to the project

- Highly Altered Channel and Intermediate Flow Control Facility
- Urban Sustainability Area

**F - Additional Stormwater BMP Requirements for Multi-family, Commercial and Industrial projects**

Check if additional BMP requirements apply to the project

a) State Construction Activities Storm Water General Permit

- Construction activity resulting in land disturbance of one acre or more, or part of a larger common plan of development

b) Additional Source Control BMP requirements for specific facilities

- Commercial or industrial facility
- Material Storage Areas
- Vehicle fueling, maintenance and wash areas
- Equipment and accessory wash areas
- Interior and parking garage floor drains
- Parking areas
- Pools, spas and other water features
- Trash Storage Areas
- Restaurants and food processing or manufacturing facilities
- Miscellaneous drain or wash water

**G - Complete if your project is only subject to Tier 1 Requirements - Site planning and LID design measures.**

LID design measures shall be clearly marked on site plans

**Check applicable boxes and provide short description of measure and location**

- Conserve natural areas, riparian areas and wetlands  
Description: \_\_\_\_\_
- Concentrate improvements on the least-sensitive portions of the site and minimize grading  
Description: \_\_\_\_\_
- Direct roof runoff into cisterns or rain barrels  
Description: \_\_\_\_\_
- Direct roof downspouts to landscaped areas or rain gardens  
Description: \_\_\_\_\_
- Use pervious pavement (pervious concrete or asphalt, turf block, crushed aggregate, etc.)  
Description: \_\_\_\_\_
- Disperse runoff from paved areas to adjacent pervious areas  
Description: \_\_\_\_\_

APPENDIX B – STORM WATER CONTROL PLAN AND DETAILS



Consultant:



**CIVIL ENGINEERING ASSOCIATES**  
Civil Engineers • Planners • Surveyors  
2055 Gateway Place  
Suite 500  
San Jose, CA 95110  
T: (408) 453-1066

Revision Schedule:

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SWENSON

**FRONT / SOQUEL  
MIXED USED PROJECT  
530 FRONT STREET  
SANTA CRUZ, CA 95060  
STORMWATER MANAGEMENT  
PLAN**



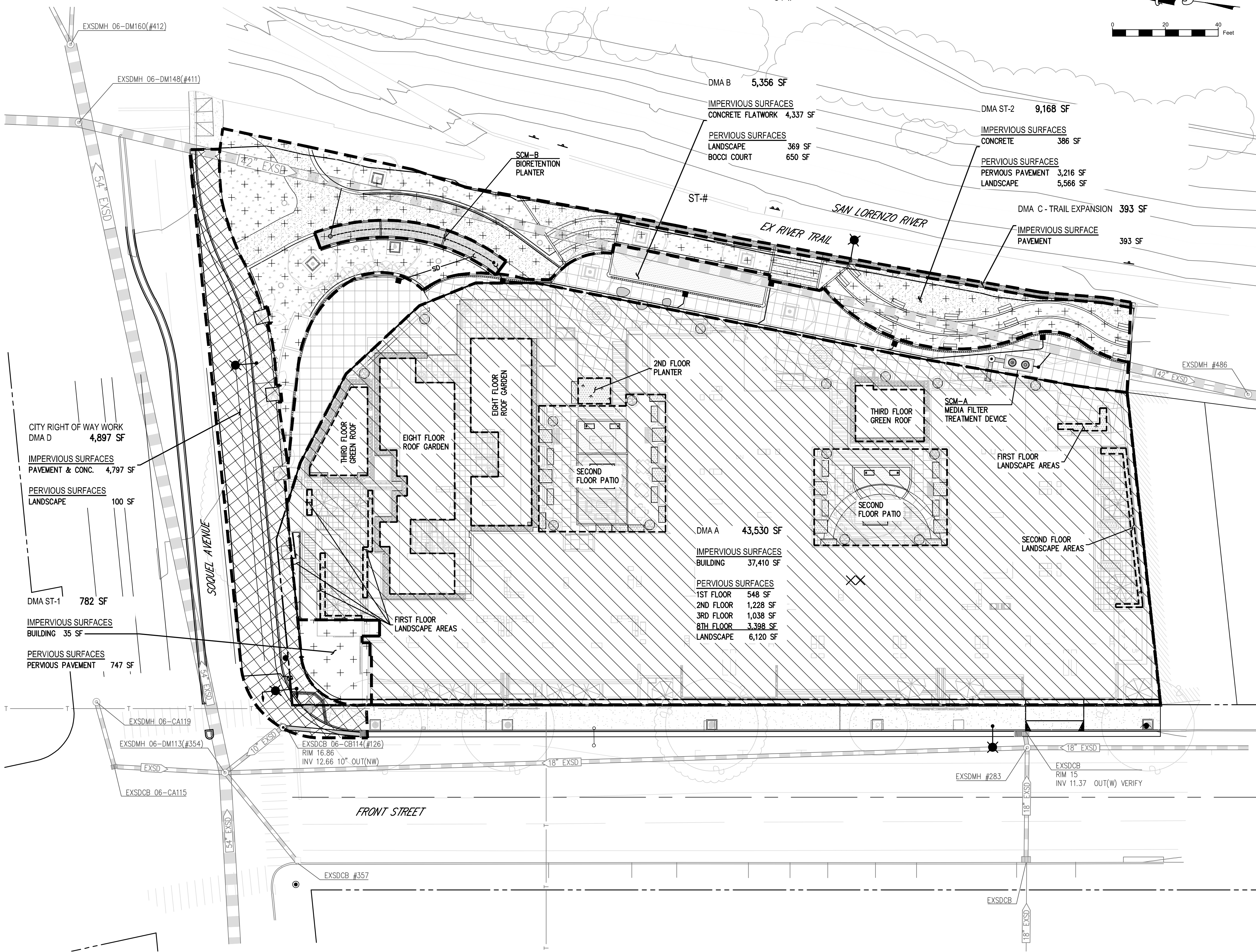
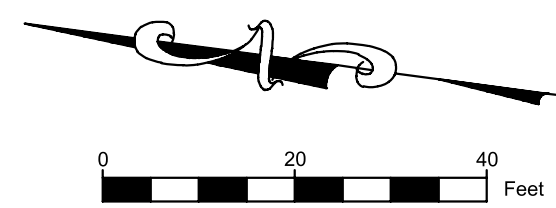
Date: **AUGUST 16, 2022**  
Scale: **1"=20'**  
Engineer: **AT**  
Job #: **19-112**  
Sheet

C5

**LEGEND**

- PERVIOUS PAVEMENT
- LANDSCAPE
- BIOTREATMENT AREAS
- DMA DMA BOUNDARY
- DRAINAGE MANAGEMENT AREA
- TCM TREATMENT CONTROL MEASURE
- AREAS THAT ARE TREATED WITH BIOTENTION DMA B
- AREAS TREATED BY MECHANICAL MEDIA FILTER TREATMENT, DMA A
- AREAS THAT ARE SELF TREATING DMA ST-1 & ST-2
- AREAS REPRESENTING PROPOSED CITY RIGHT OF WAY WORK, DMA D
- AREAS REPRESENTING PROPOSED TRAIL EXPANSION, DMA C

ST-# SELF-TREATING DMA



DMA B 5,356 SF

IMPERVIOUS SURFACES  
CONCRETE FLATWORK 4,337 SF  
PERVIOUS SURFACES  
LANDSCAPE 369 SF  
BOCCI COURT 650 SF

DMA ST-2 9,168 SF

IMPERVIOUS SURFACES  
CONCRETE 386 SF  
PERVIOUS SURFACES  
PERVIOUS PAVEMENT 3,216 SF  
LANDSCAPE 5,566 SF

DMA C - TRAIL EXPANSION 393 SF

IMPERVIOUS SURFACE  
PAVEMENT 393 SF

DMA A 43,530 SF

IMPERVIOUS SURFACES  
BUILDING 37,410 SF

PERVIOUS SURFACES  
1ST FLOOR 548 SF  
2ND FLOOR 1,228 SF  
3RD FLOOR 1,038 SF  
8TH FLOOR 3,398 SF  
LANDSCAPE 6,120 SF

**NOTES**

1. PROPERTY INFORMATION PROJECT SITE PORTION OF RIVER TRAIL & SOQUEL AVENUE TOTAL
2. SITE AREA 44,312 19,814 64,126
3. EXISTING IMPERVIOUS AREA 38,108 3,500 41,608
4. EXISTING PERVIOUS AREA 6,204 16,314 22,518
5. PROPOSED IMPERVIOUS AREA 37,445 8,136 45,581
6. PROPOSED PERVIOUS AREA 6,867 11,678 18,281
7. THERE IS A 6.2% (3,973 SF) DECREASE OF PERVIOUS SURFACE AREA FOR THIS PROJECT.
8. RECEIVING SYSTEM FOR THE STORM WATER: CITY OF SANTA CRUZ STORM WATER COLLECTION SYSTEM AND ULTIMATELY TO THE SAN LORENZO RIVER.
9. ALL 0.123 ACRES (5,356 SF) 8.35% OF THE SITE'S STORM WATER RUNOFF WILL BE DIRECTED TO BIOTREATMENT BASINS FOR TREATMENT.
10. 0.999 ACRES (43,530 SF) 67.88% OF THE PROJECT'S STORM WATER RUNOFF WILL BE DIRECTED TO A MECHANICAL MEDIA FILTER TREATMENT DEVICE (OLD CASTLE PERK FILTER OR EQUAL).
11. 0.228 ACRES (9,950 SF) 15.52% OF THE PROJECT'S STORMWATER RUNOFF WILL BE SELF TREATING.
12. 0.121 ACRES (5,290 SF) 8.25% OF THE PROJECT SITE WILL BE AN EXPANSION OF THE ADJACENT PATHWAY OR ROADWAY DESIGNATED AS "ROADWAY PROJECT"
13. THE OVERALL STORM CONVEYANCE SYSTEM WAS CALCULATED ASSUMING THE 10-YEAR STORM EVENT.
14. POLLUTANTS THAT MAY PRESENT AT THIS SITE AS A RESULT OF THIS DEVELOPMENT INCLUDE: SEDIMENTS, METALS, NUTRIENTS, BACTERIA, OIL, GREASE, AND ORGANIC COMPOUNDS. THE MAJORITY OF THE POLLUTANT SOURCES WILL BE LANDSCAPE AREAS AND ROOF SURFACES. RUNOFF FROM THESE AREAS WILL BE DIRECTED TO EITHER VEGETATED BIOTREATMENT BASINS OR MECHANICAL MEDIA FILTER TREATMENT DEVICES
15. THIS PROJECT IS PROVIDING OVER 6,000 SF OF VEGETATED SURFACE WITHIN THE FOOTPRINT OF THE BUILDING ENVELOPE INCLUDING 1,038 SF OF GREEN ROOF AND 3,398 SF OF ROOFTOP GARDEN AS AN L.I.D. MEASURE TO REDUCE THE STORMWATER RUNOFF TO THE TREATMENT DEVICE (SCM-A).
16. THIS PROJECT IS PROVIDING OVER 6,300 SF OF PERVIOUS PAVEMENT SURFACE AS AN L.I.D. MEASURE TO REDUCE THE STORMWATER RUNOFF.
17. THE FOLLOWING SOURCE CONTROL MEASURES WILL BE IMPLEMENTED WITHIN THE PROJECT SITE TO LIMIT THE GENERATION, DISCHARGE AND RUNOFF OF POLLUTANTS INTO THE STORM COLLECTION SYSTEM.
  - TRASH ENCLOSURE WILL BE COVERED AND WILL BE CONNECTED TO THE SANITARY SEWER SYSTEM
  - BENEFICIAL LANDSCAPING.
  - MAINTENANCE (PAVEMENT SWEEPING, CATCH BASIN CLEANING, GOOD HOUSEKEEPING.
  - STORM DRAIN LABELING.
18. THE FOLLOWING SITE DESIGN MEASURES WILL BE IMPLEMENTED WITHIN THE PROJECT SITE TO LIMIT THE GENERATION, DISCHARGE AND RUNOFF OF POLLUTANTS INTO THE STORM COLLECTION SYSTEM.
  - MINIMIZE IMPERVIOUS SURFACE
19. A SWPPP PERMIT WILL BE REQUIRED FOR THIS PROJECT AS THE AREA OF DISTURBANCE > 1 ACRE. A NOTICE OF INTENT (NOI) WILL BE REQUIRED TO BE FILED WITH THE STATE WATER RESOURCE CONTROL BOARD (SWRCB) TO OBTAIN THE NECESSARY COVERAGE UNDER THE NPDES GENERAL PERMIT PRIOR TO COMMENCING WORK.
20. THE PARTY RESPONSIBLE FOR THE OPERATIONS AND MAINTENANCE OF THE STORMWATER CONTROL PLAN IS: SWENSON 777 FIRST ST. SAN JOSE, CA
21. CALCULATIONS WERE DONE PER CHAPTER 4.3 OF THE BEST MANAGEMENT PRACTICES MANUAL FOR THE CITY OF SANTA CRUZ STORMWATER MANAGEMENT PLAN
22. STORMWATER RUNOFF FROM THE PROJECT IS PROPOSED TO OUTFALL INTO THE EXISTING 42" STORM MAIN AT THE EASTERN SIDE OF THE SITE THEN OUTFALL INTO THE SAN LORENZO RIVER PER SECTION 4.4 (SPECIAL CIRCUMSTANCES), THIS PROJECT IS EXEMPT FROM TIER 4 REQUIREMENTS FOR PEAK MANAGEMENT.
23. MAINTENANCE ACCESS TO SCM-A AND SCM-B WILL OCCUR FROM THE SAN LORENZO RIVER LEVEE TRAIL DRIVEWAY AT SOQUEL AVENUE.
24. SEE THE TIER 3 STORAGE REQUIREMENT CALCULATIONS FOR DMA B ON SHEET C6
25. AREAS DESIGNATED AS SELF-TREATING MUST INCLUDE LANDSCAPED SURFACES THAT ARE SLOPED 4% OR LESS, OR PERVIOUS PAVEMENTS WITH A MINIMUM 12" OF DRAIN ROCK STORAGE AND SLOPED AT 5% OR LESS. THE SUBGRADE BELOW THE DRAIN ROCK SHOULD BE FAIRLY LEVEL (2% MAX) TO ENCOURAGE INFILTRATION AND QUALIFY AS A "SELF-TREATING AREA".



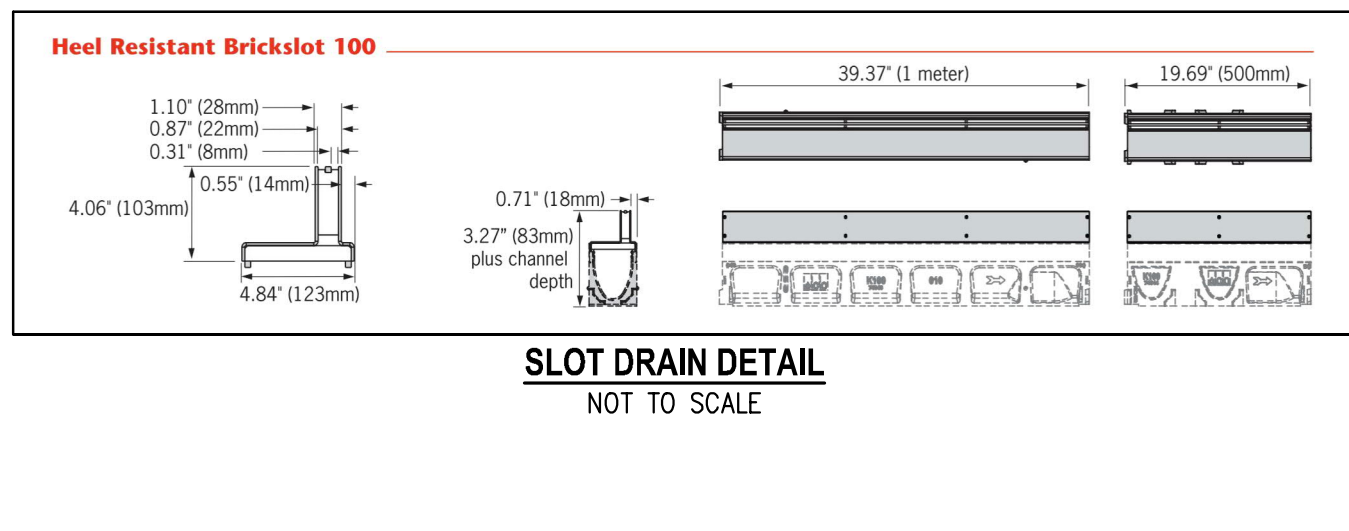
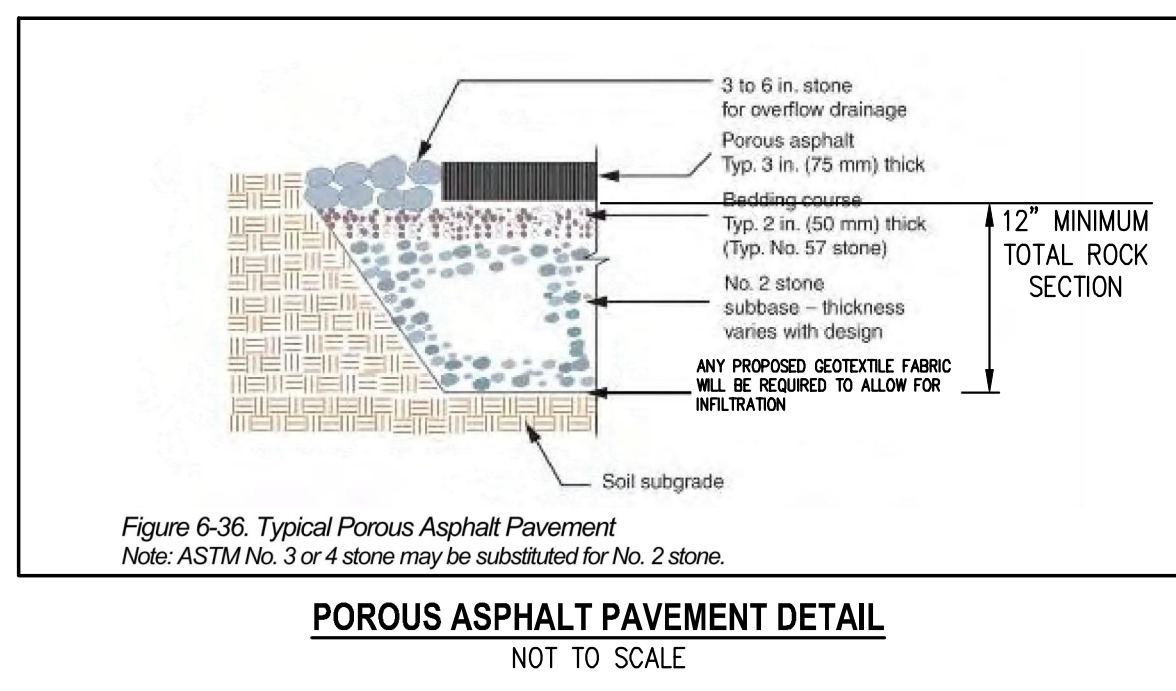
TREATMENT CONTROL MEASURE SUMMARY TABLE																			
DRAINAGE MANAGEMENT AREA	SCM#	DRAINAGE AREA (SF)	BUILDING AREA (SF)	IMPERVIOUS PAVEMENT & CONCRETE AREA (SF)	TOTAL IMPERVIOUS AREA (SF)	PERMEABLE PAVEMENT SURFACE (SF)	LANDSCAPE PVIOUS SURFACE (SF)	TOTAL PVIOUS AREA (SF)	TYPE OF STORMWATER CONTROL MEASURE	SIZING METHOD	TIER 2 BIORETENTION AREA REQUIRED (SF)	TIER 2 BIORETENTION AREA PROVIDED (SF)	TIER 3 VOLUME REQUIRED (CF)	TIER 3 VOLUME PROVIDED (CF)	# CARTRIDGES REQUIRED	# CARTRIDGES PROVIDED	MEDIA TYPE	CARTRIDGE HEIGHT (IN)	COMMENTS
<b>PROJECT SITE</b>																			
A	A	43530	37410	-	37410	-	6120	6120	MEDIA FILTER	FLOW RATE - 0.2 IN/HR	-	-	-	-	6	6	PERKFILTER CARTRIDGE	12	OLD CASTLE
ST-1	N/A	782	35	-	35	747	-	747	SELF-TREATING	-	-	-	-	-	-	-	-	-	AREA IS SELF TREATING AS TOTAL DMA IMPERVIOUS AREA ≤ 5% DMA AREA
SUBTOTAL		44312	37445	-	37445	747	6120	6867	-	-	-	-	-	-	6	6	-	-	-
<b>PORTION OF RIVER TRAIL</b>																			
B	B	5356	-	4337	4337	650	369	1019	BIO-RETENTION PLANTER	FLOW RATE - 4% OF IMPERVIOUS TRIBUTARY	173	391	1363	1363	-	-	-	-	BASIN SIZING EXCEEDS 4% REQUIREMENTS
ST-2	N/A	9168	-	386	386	3216	5566	8782	SELF-TREATING	-	-	-	-	-	-	-	-	-	AREA IS SELF TREATING AS TOTAL DMA IMPERVIOUS AREA ≤ 5% DMA AREA
C	MAINTENANCE	393	-	393	393	-	-	-	MAINTENANCE	-	-	-	-	-	-	-	-	-	-
SUBTOTAL		14917	-	5116	5116	3866	5935	9801	-	-	173	391	1363	1363	-	-	-	-	-
TOTAL		59229	37445	5116	42561	4613	12055	16668	-	-	173	391	1363	1363	6	6	-	-	-

TREATMENT CONTROL MEASURE SUMMARY TABLE FOR CITY ROW WORK																			
D	CITY RIGHT-OF-WAY WORK	4897	-	4797	4797	-	100	100	CITY RIGHT-OF-WAY	-	-	-	-	-	-	-	-	-	-
TOTAL		3,020	-	3,020	1,777	-	100	100	-	-	-	-	-	-	-	-	-	-	-

DMA B - TIER 3 SIMPLE METHOD CALCULATION FOR SCM-B	
i	0.810 = (total impervious area)/(total site area)
Runoff Coefficient, C	0.611 = (0.858*i^3) - (0.78*i^2) + (0.774*i) + 0.04
Rainfall depth, d (ft)	0.167 = 2" - Santa Cruz 95th Percentile - W/MZ 1, 4 & 10
Tributary Area, A (sf)	5356 = (total site area)
Retention Volume (cf)	545 = C*d*A
Retention Volume - Void Ratio Included (cf)	1363 = Volume/0.4
Area of Basin Required (sf) For Tier 2 Purposes Only	173 = 4% (total impervious area)
Area of Basin Provided (sf)	391 = 2 * Area of Required Basin
Depth of Rock (ft)	3.49 = (retention volume)/(area of basin provided)

New Impervious Area=	4337
Replaced Impervious Area=	0
Total Impervious Area=	4337
Total Pervious Area=	1019
Total Site Area=	5356



**TCM A (DMA A) MEDIA-FILTER UNIT SIZING CALCULATIONS**

CALCULATION/ ESTIMATION OF RUNOFF FLOW FROM WATER QUALITY STORM EVENT  
 TRIBUTARY AREA: 43,530 SF / 0.999 AC

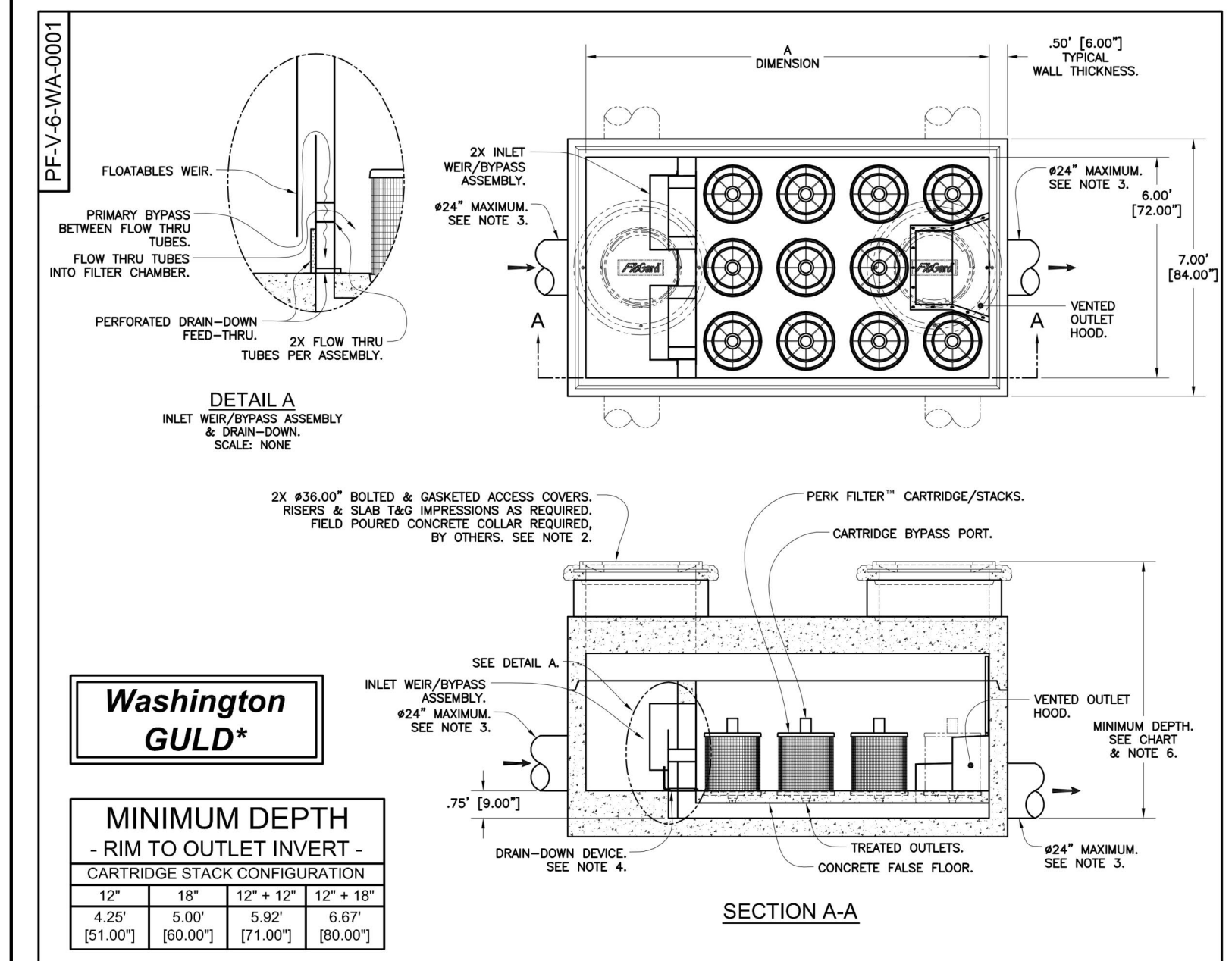
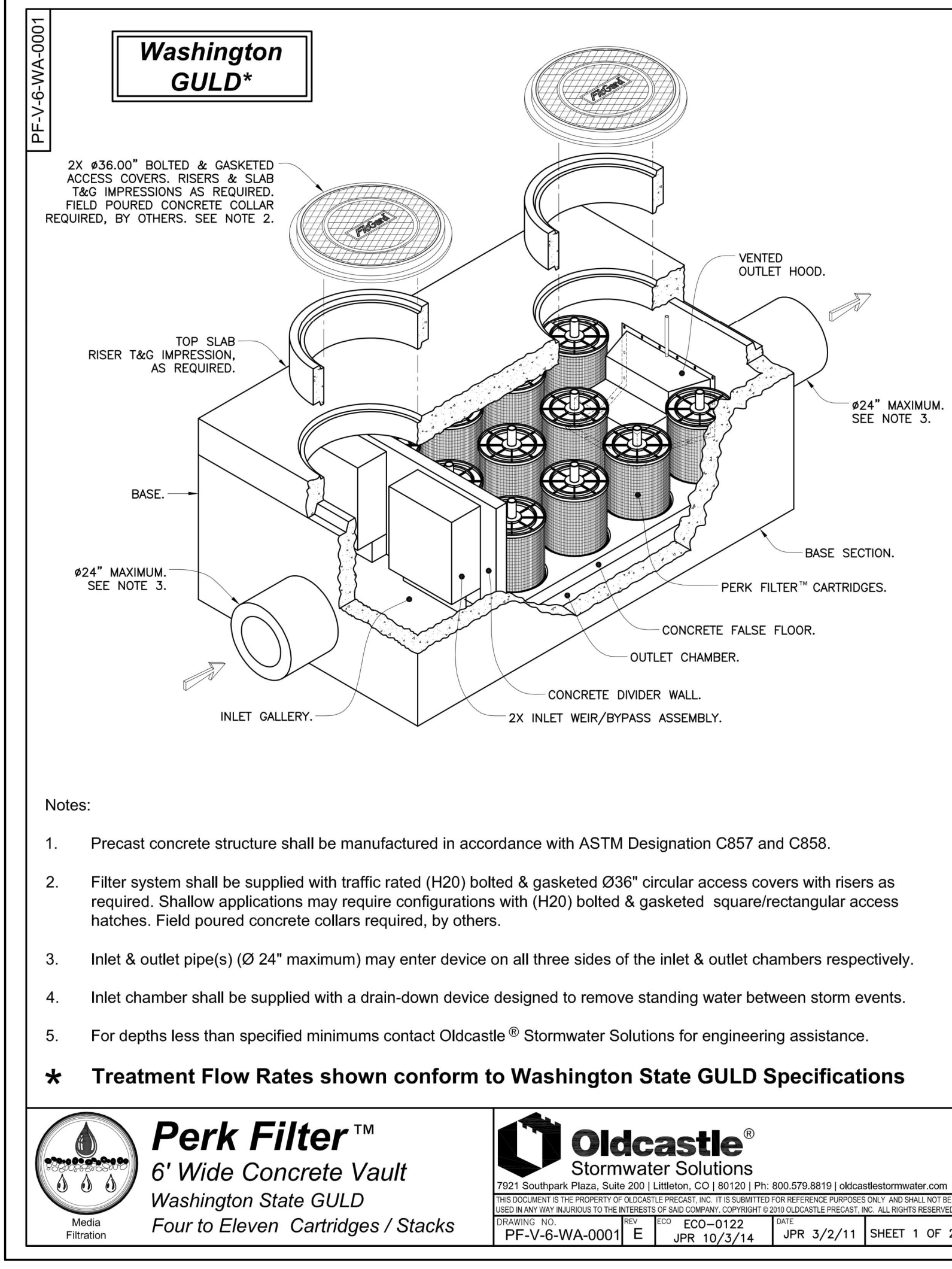
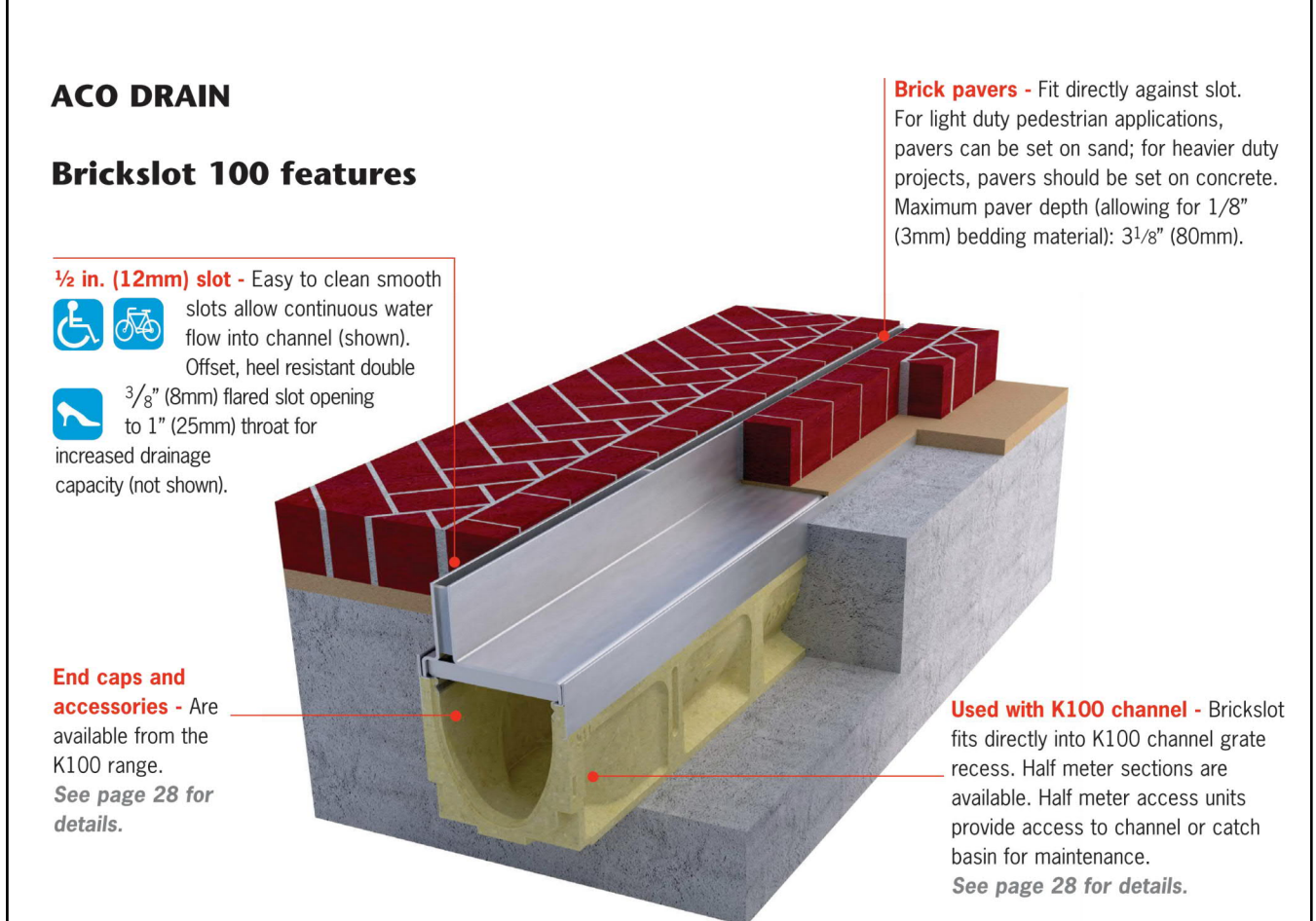
RATIONAL METHOD:  $Q = C \cdot I \cdot A$   
 $Q$  = DISCHARGE FLOW (CFS)  
 $C$  = RUNOFF COEFFICIENT (NON-DIMENSIONAL)  
 $I$  = RAINFALL INTENSITY (0.2 INCHES/HR PER THE CALIFORNIA STORMWATER BMP HANDBOOK FOR NEW DEVELOPMENT)  
 $A$  = CATCHMENT AREA (ACRES)

SITE-SPECIFIC RUNOFF COEFFICIENT AND CATCHMENT AREA SIZE 2-YEAR EVENT

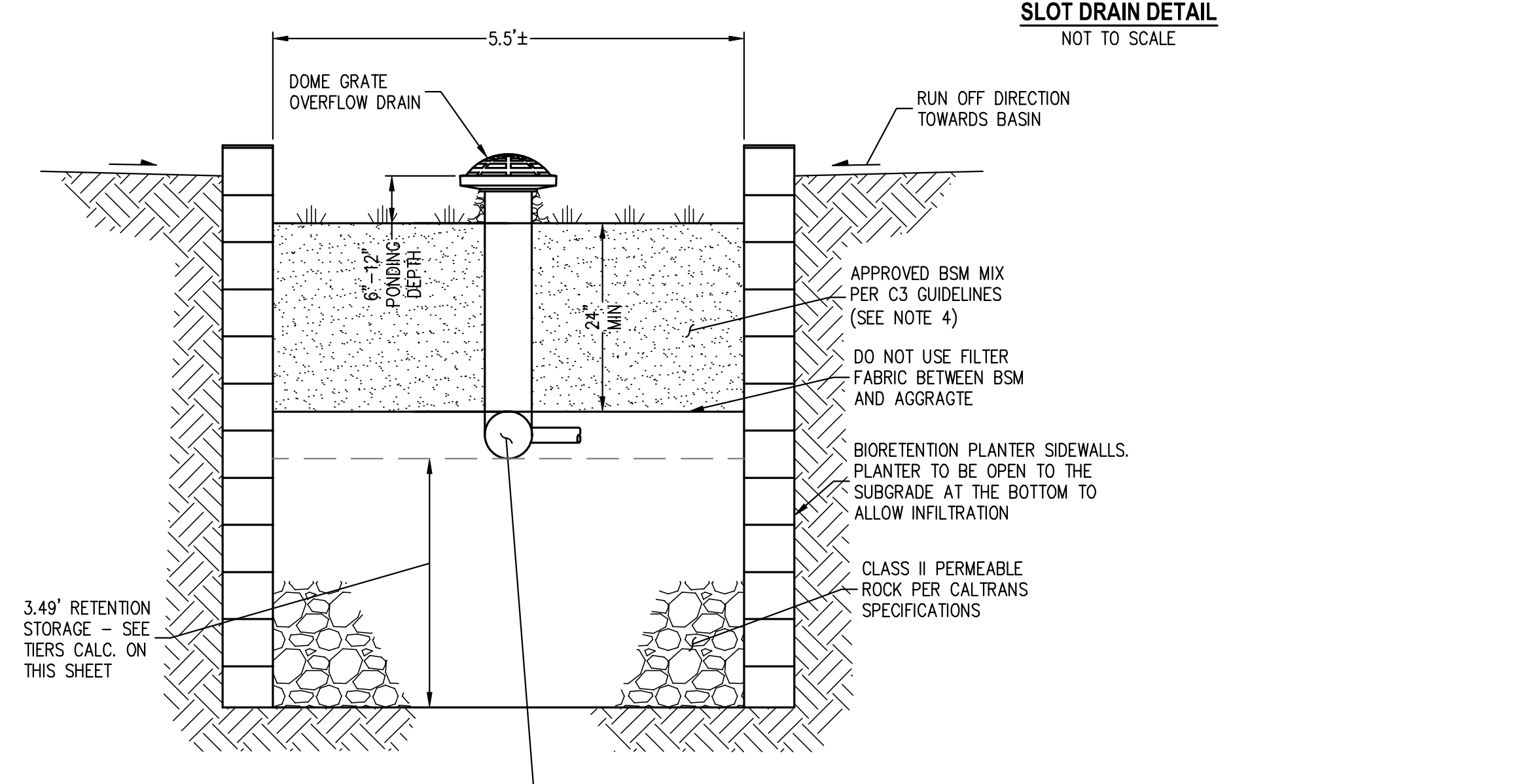
$C = 0.895$   
 $I = 0.2$  IN/HR  
 $A = 0.999$  ACRES, STORM TREATMENT AREA  
 $Q = 0.179$  TOTAL CFS (APPROX. 81 GPM)

SELECTION OF STRUCTURAL STORM WATER TREATMENT DEVICE BY OLD CASTLE STORMWATER SOLUTIONS PERK FILTER WITH 6 EACH 12"x12" CARTRIDGE STACKS

81 GPM  
 13.6 GPM (CAPACITY OF CARTRIDGE STACKS)  
 = 5.96 ≈ 6 (12"x12") CARTRIDGE STACKS



6" VAULT					
CARTRIDGE STACK QUANTITY	DIMENSION - LENGTH - (ID- FEET)	CARTRIDGE STACK CONFIGURATION			
		TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (GPM / CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (GPM / CFS)
4	7'	27.2 / 0.261	5.7	40.8 / 0.091	8.5
5	7'	34.0 / 0.076	5.7	51.0 / 0.114	8.6
6	9'	40.8 / 0.091	5.8	61.2 / 0.136	8.6
7	9'	47.6 / 0.106	5.8	71.4 / 0.159	8.6
8	9'	54.5 / 0.121	5.8	81.6 / 0.182	8.7
9	11'	61.2 / 0.136	5.8	91.8 / 0.205	8.7
10	11'	68.0 / 0.152	5.9	102.0 / 0.227	8.8
11	11'	74.8 / 0.167	5.9	112.2 / 0.250	8.8



**NOTES**

- SELECT STORM DRAINS TO OUTFALL INTO BASINS. SEE UTILITY PLAN DRAWINGS FOR REFERENCE.
- PERFORATION TO BE INSTALLED FACING DOWNWARD.
- CONTRACTOR TO INSTALL CLASS II PERMEABLE (CALTRANS SPEC.) AGGREGATE IN BOTTOM (12" MIN.) OF TRENCH (TYP.)
- BIOTREATMENT SOIL MIX (BSM) SHALL CONFORM/COMPLY WITH THE CCRWQCB, REGION 3, POST-CONSTRUCTION REQUIREMENTS. CONTRACTOR TO PROVIDE SUPPLIER CERTIFICATION FORM TO CITY.
- SOIL MIX: THE SOIL IN BIO-RETENTION AREAS SHALL BE A HOMOGENEOUS MIX OF 60-70% FINE SAND (MEETING ASTM D422 OR CALTRANS TEST METHOD C202) AND 30-40% WEED-FREE, MANURE-FREE, STABLE COMPOST. NOTE: ALL SANDS COMPLYING WITH ASTM C33 FOR FINE AGGREGATE COMPLY WITH SIEVE SIZE / GRADATION REQUIREMENTS. THE SOIL MIX/MEDIA TO BE USED IN BIO-RETENTION/RAIN GARDEN AREAS SHALL HAVE A MINIMUM INFILTRATION RATE OF 5 IN/HR. PREVIOUSLY: ASTM C33 STANDARDS.



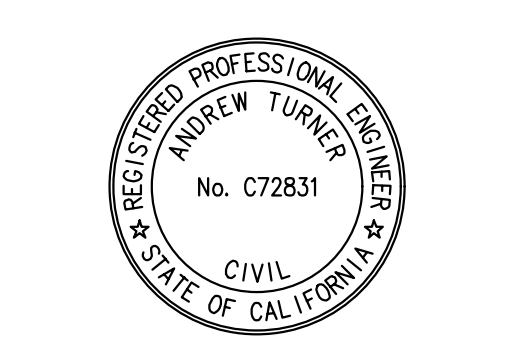
Consultant:

**CIVIL ENGINEERING ASSOCIATES**  
 Civil Engineers • Planners • Surveyors  
 2055 Gateway Place  
 Suite 500  
 San Jose, CA 95110  
 T: (408) 453-1066

Revision Schedule:

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FRONT / SOQUEL  
 MIXED USED PROJECT  
 530 FRONT STREET  
 SANTA CRUZ, CA 95060  
 STORMWATER MANAGEMENT  
 DETAILS



Date: AUGUST 16, 2022  
 Engineer: AT  
 Job #: 19-112  
 Sheet



APPENDIX C – MAINTENANCE AGREEMENT

# Appendix

## Maintenance Agreement Regarding Maintenance of Structural or Treatment Control Best Management Practices (BMPs)

for: Address \_\_\_\_\_ APN# \_\_\_\_\_

I, \_\_\_\_\_, being the owner of the real property, APN No. \_\_\_\_\_, which is located at \_\_\_\_\_, Santa Cruz, California, consent and agree to inspect and maintain any and all structural or treatment control Best Management Practices (BMPs) a minimum of once per year prior to **October 1** on the subject property. The structural or treatment control BMPs on the subject property include(s):

\_\_\_\_\_  
\_\_\_\_\_

**I agree to send a letter that provides proof of inspection and maintenance to the City of Santa Cruz Department of Public Works prior to December 1 of each year.** Proof of inspection and maintenance shall include a log of inspection and maintenance dates for the past year, and receipts if conducted by a hired service. The log should also indicate any significant observations or repairs made. **The proof of inspection and maintenance should be sent to: Environmental Projects Analyst, Department of Public Works, City of Santa Cruz, 809 Center Street, Room 201, Santa Cruz, CA 95060.**

In the event that the property is sold, transferred, or leased, the obligations hereby imposed on the property owner shall be assumed by subsequent property owners and lessees. To this end, property owner, in any deed transferring an ownership interest in the property or in any lease agreement for the property, shall include a term by which the subsequent property owner or lessee acknowledges his or her understanding of the obligations imposed by this agreement and expressly agrees to accept and assume responsibility for complying with all said obligations imposed by this agreement.

In addition, I will provide printed information to the new property owner or lessee regarding proper BMP inspection and maintenance frequency and methods. The information shall accompany the first deed transfer. This information shall include the following:

- (1) a description of any and all storm water structural or treatment control BMPs;
- (2) a map of the property indicating the BMP locations; and
- (3) a description of how inspections and necessary maintenance can be performed.

The transfer of this information shall also be required with any subsequent sale of the property.

Failure to comply with the provisions of this Maintenance Agreement may result in enforcement actions including assessment of civil penalties as allowed by the City's Municipal Code, Chapter 16.19.190 Administrative Remedies.

I have read the above agreement and understand it.

Owner Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Owner Address: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_



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APPENDIX D – POST CONSTRUCTION BMP MAINTENANCE AND SOURCE CONTROL ACTIVITIES TABLE

## Storm Water Treatment Measure Operation and Maintenance Inspection Report

This report and attached Inspection and Maintenance Checklists is conducted for the identified storm water treatment measure(s) subject to the Maintenance Agreement between the City and the property owner during the annual reporting period indicated below.

**I. Property Information:**

Property Address or APN: 530 Front Street, Santa Cruz, CA 95060

Property Owner: \_\_\_\_\_

**II. Contact Information:**

Name of person to contact regarding this report: \_\_\_\_\_

Phone number of contact person: \_\_\_\_\_ Email: \_\_\_\_\_

**III. Reporting Period:**

This report with the attached completed inspection checklists documents the inspections and maintenance of the identified treatment measures during the time period from \_\_\_\_\_ to \_\_\_\_\_.

**IV. Stormwater Treatment Measure Information:**

The following stormwater treatment measures are located on the property identified above and are subject to the Maintenance Agreement:

Treatment Measure	Type of Treatment Measure	Location of Treatment Measure on the Property
TCM A	Media Filter	Southeast corner of site
TCM B	Bio-Treatment Basin	Northeast corner of site

**V. Summary of Inspections and Maintenance:**

Summarize the following information using the attached Inspection and Maintenance Checklists:

Treatment Measure	Date of Inspection	Operation and Maintenance Activities Performed	Additional Comments
TCM A			
TCM B			

**VI. Sediment Removal:**

Total amount of accumulated sediment removed from the stormwater treatment measure(s) during the reporting period: \_\_\_\_\_ cubic yards.

How was sediment disposed?

- landfill
- other location on-site as described in and allowed by the maintenance plan
- other, explain \_\_\_\_\_

**VII. Inspector Information:**

The inspections documented in the attached Inspection and Maintenance Checklists were conducted by the following inspector(s):

Inspector Name and Title	Inspector's Employer and Address

**VIII. Certification:**

I hereby certify, under penalty of perjury, that the information presented in this report and attachments is true and complete:

\_\_\_\_\_  
Signature of Property Owner or Other Responsible Party

\_\_\_\_\_  
Date

\_\_\_\_\_  
Type or Print Name

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
Phone Number

\_\_\_\_\_  
Email



# PERKFILTER™

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## Inspection and Maintenance Guide

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# PerkFilter™ Media Filtration System

## Description

The PerkFilter is a stormwater treatment device used to remove pollutants from urban runoff. Impervious surfaces and other urban and suburban landscapes generate a variety of contaminants that can enter stormwater and pollute downstream receiving waters. The PerkFilter is a media-filled cartridge filtration device designed to capture and retain sediment, gross solids, metals, nutrients, hydrocarbons, and trash and debris. As with any stormwater treatment system, the PerkFilter requires periodic maintenance to sustain optimum system performance.

## Function

The PerkFilter is a water quality treatment system consisting of three chambers: an inlet chamber, a filter cartridge treatment chamber, and an outlet chamber (Figure 1). Stormwater runoff enters the inlet chamber through an inlet pipe, curb opening, or grated inlet. Gross solids are settled out, and floating trash and debris are trapped in the inlet chamber. Pretreated flow is then directed to the treatment chamber through an opening in the baffle wall between the inlet chamber and treatment chamber. The treatment chamber contains media-filled filter cartridges (Figure 2) that use physical and chemical processes to remove pollutants. During a storm event, runoff pools in the treatment chamber before passing radially through the cylindrical cartridges from the outside surface, through the media for treatment, and into the center of the cartridge. At the center of the cartridge is a center tube assembly designed to distribute the hydraulic load evenly across the surface of the filter cartridge and control the treatment flow rate. The center tube assembly discharges treated flow through the false floor and into the outlet chamber. A draindown feature built into each cartridge allows the treatment chamber to dewater between storm events.

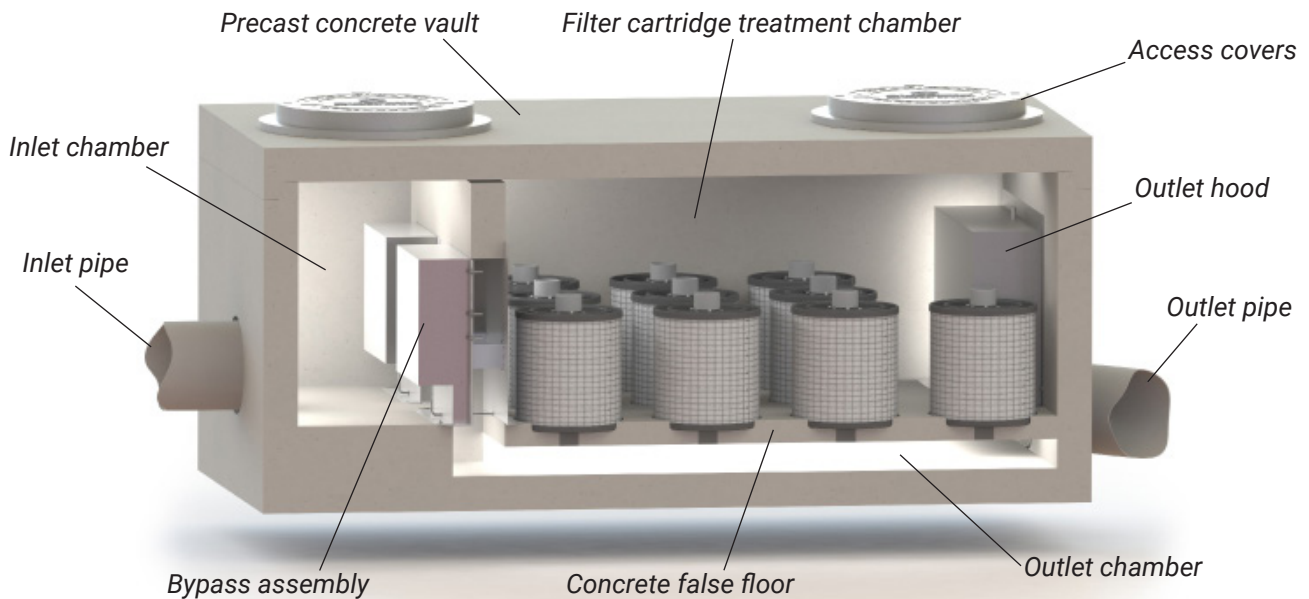
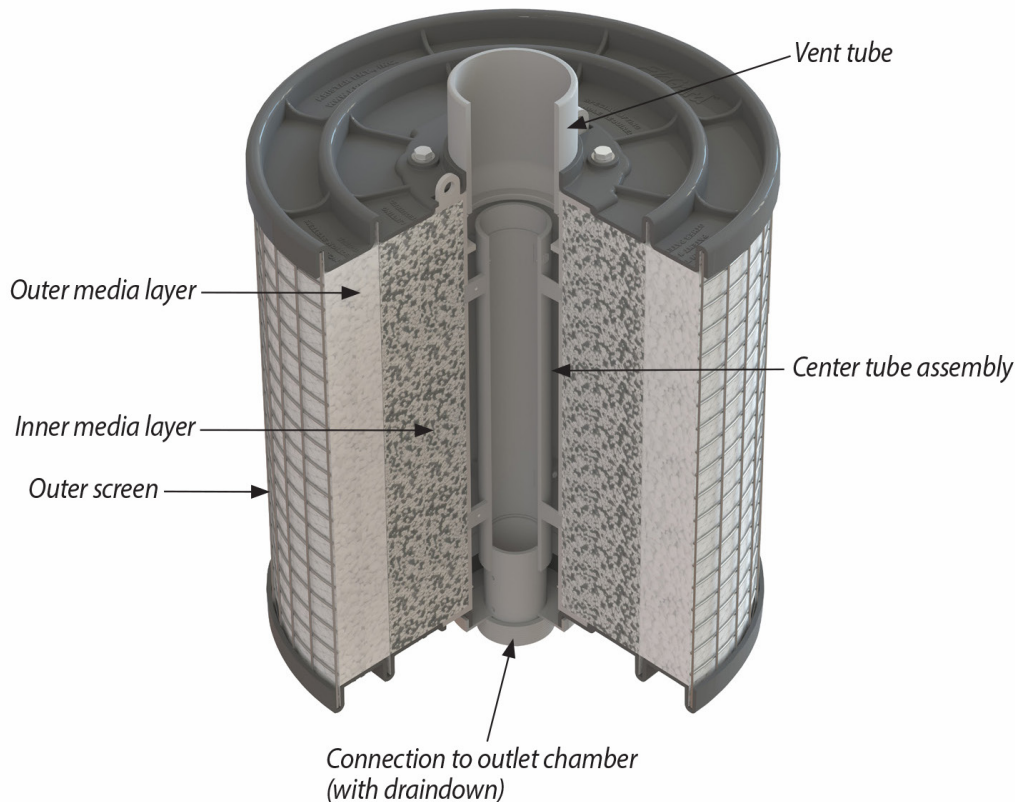


Figure 1. Schematic of the PerkFilter system.

All PerkFilter systems include a high-flow bypass assembly to divert flow exceeding the treatment capacity of the filter cartridges around the treatment chamber. The bypass assembly routes peak flow from the inlet chamber directly to the outlet chamber, bypassing the treatment chamber to prevent sediment and other captured pollutants from being scoured and re-entrained by high flow. Treated flow and bypass flow merge in the outlet chamber for discharge by a single outlet pipe.



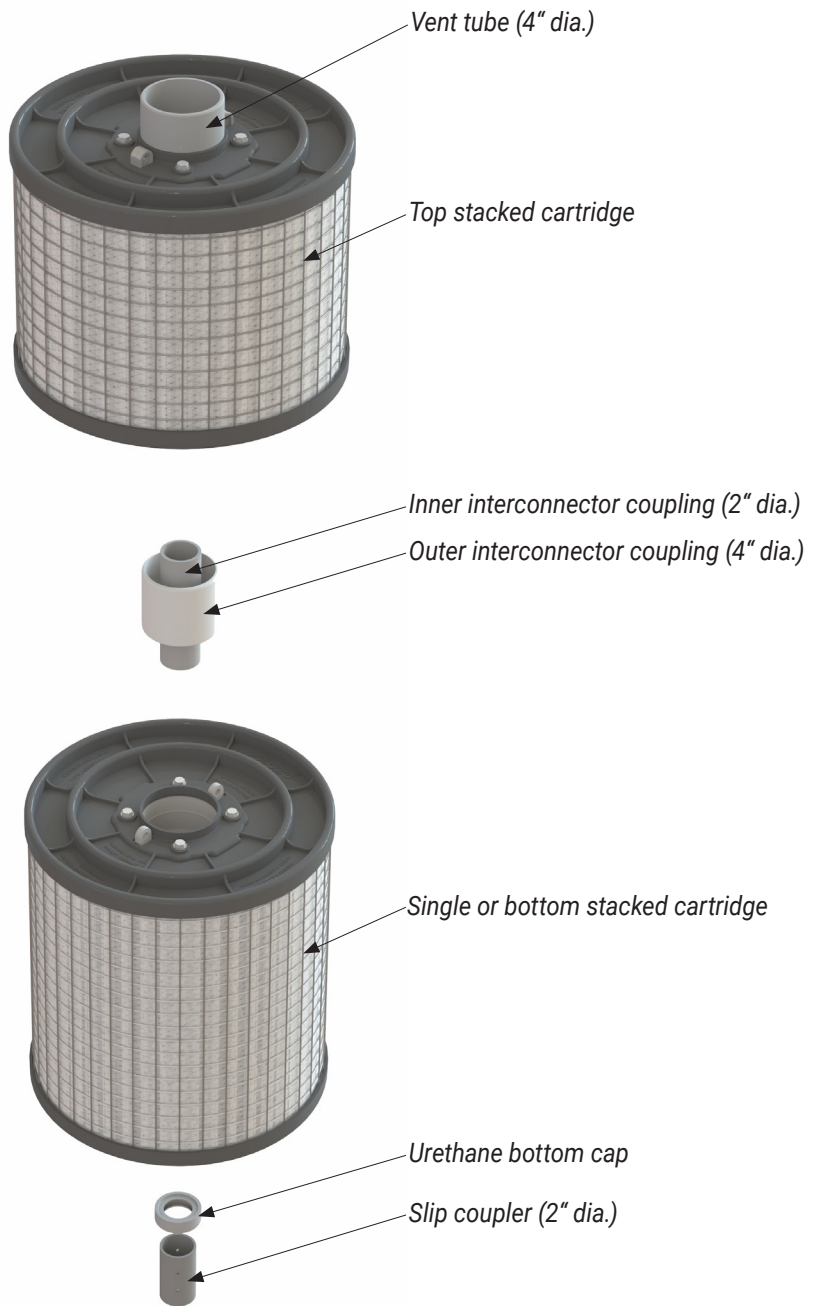
**Figure 2. Schematic of PerkFilter cartridge.**

## **Configuration**

The PerkFilter structure may consist of a vault, manhole, or catch basin configuration. Catch basin units may be fabricated from concrete or steel. Internal components including the PerkFilter cartridges are manufactured from durable plastic and stainless steel components and hardware. All cartridges are 18 inches in diameter and are available in two heights: 12-inch and 18-inch. Cartridges may be used alone or may be stacked (Figure 3) to provide 24-inch and 30-inch combinations. The capacity of each cartridge or cartridge combination is dictated by the allowable operating rate of the media and the outer surface area of the cartridge. Thus, taller cartridges have greater treatment capacity than shorter cartridges, but they also require more hydraulic drop across the system. Cartridges may be filled with a wide variety of media but the standard mix is composed of zeolite, perlite and carbon (ZPC).

Access to an installed PerkFilter system is typically provided by ductile iron castings or hatch covers. The location and number of access appurtenances is dependent on the size and configuration of the system.





**Figure 3. Schematic of stacked cartridges and connector components.**

## Maintenance Overview

State and local regulations require all stormwater management systems to be inspected on a periodic basis and maintained as necessary to ensure performance and protect downstream receiving waters. Maintenance prevents excessive pollutant buildup that can limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

## Inspection and Maintenance Frequency

The PerkFilter should be inspected on a periodic basis, typically twice per year, and maintained as required. Initially, inspections of a new system should be conducted more frequently to help establish an appropriate site-specific inspection frequency. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. In most cases, the optimum maintenance interval will be one to three years. Inspection and maintenance activities should be performed only during dry weather periods.

## Inspection Equipment

The following equipment is helpful when conducting PerkFilter inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

## Inspection Procedures

PerkFilter inspections are visual and may be conducted from the ground surface without entering the unit. To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be checked and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Inspect the internal components and note whether there are any broken or missing parts. In the unlikely event that internal parts are broken or missing, contact Oldcastle Infrastructure at (800) 579-8819 to determine appropriate corrective action.
- Note whether the inlet pipe is blocked or obstructed. The outlet pipe is covered by a removable outlet hood and cannot be observed without entering the unit.
- Observe, quantify and record the accumulation of floating trash and debris in the inlet chamber. The significance of accumulated floating trash and debris is a matter of judgment. A long-handled net may be used to retrieve the bulk of trash and debris at the time of inspection if full maintenance due to accumulation of floating oils or settled sediment is not yet warranted.

- Observe, quantify and record the accumulation of oils in the inlet chamber. The significance of accumulated floating oils is a matter of judgment. However, if there is evidence of an oil or fuel spill, immediate maintenance by appropriate certified personnel is warranted.
- Observe, quantify and record the average accumulation of sediment in the inlet chamber and treatment chamber. A calibrated dipstick, tape measure, or sludge sampler may be used to determine the amount of accumulated sediment in each chamber. The depth of sediment may be determined by calculating the difference between the measurement from the rim of the PerkFilter to the top of the accumulated sediment, and the measurement from the rim of the PerkFilter to the bottom of the PerkFilter structure. Finding the top of the accumulated sediment below standing water takes some practice and a light touch, but increased resistance as the measuring device is lowered toward the bottom of the unit indicates the top of the accumulated sediment.
- Finally, observe, quantify and record the amount of standing water in the treatment chamber around the cartridges. If standing water is present, do not include the depth of sediment that may have settled out below the standing water in the measurement.

## **Maintenance Triggers**

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Internal components are broken or missing.
- Inlet piping is obstructed.
- The accumulation of floating trash and debris that cannot be retrieved with a net and/or oil in the inlet chamber is significant.
- There is more than 6" of accumulated sediment in the inlet chamber.
- There is more than 4" of accumulated sediment in the treatment chamber.
- There is more than 4" of standing water in the treatment chamber more than 24 hours after end of rain event.
- A hazardous material release (e.g. automotive fluids) is observed or reported.
- The system has not been maintained for 3 years (wet climates) to 5 years (dry climates).

## **Maintenance Equipment**

The following equipment is helpful when conducting PerkFilter maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- 9/16" socket and wrench to remove hold-down struts and filter cartridge tops
- Replacement filter cartridges
- Vacuum truck with water supply and water jet

Contact Oldcastle Infrastructure at (800) 579-8819 for replacement filter cartridges. A lead time of four weeks is recommended.

## Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is necessary to maintain vault and manhole PerkFilter configurations. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Confined space entry is not required for catch basin PerkFilter configurations. Once safety measures such as traffic control are deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove floating trash, debris and oils from the water surface in the inlet chamber using the extension nozzle on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely dewater the inlet chamber and evacuate all accumulated sediment from the inlet chamber. Some jetting may be required to fully remove sediment. The inlet chamber does not need to be refilled with water after maintenance is complete. The system will fill with water when the next storm event occurs.
- Remove the hold-down strut from each row of filter cartridges and then remove the top of each cartridge (the top is held on by four 9/16" bolts) and use the vacuum truck to evacuate the spent media. When empty, the spent cartridges may be easily lifted off their slip couplers and removed from the vault. The couplers may be left inserted into couplings cast into the false floor to prevent sediment and debris from being washed into the outlet chamber during washdown.
- Once all the spent cartridges have been removed from the structure, the vacuum truck may be used to evacuate all accumulated sediment from the treatment chamber. Some jetting may be required to fully remove sediment. Take care not to wash sediment and debris through the openings in the false floor and into the outlet chamber. All material removed from the PerkFilter during maintenance including the spent media must be disposed of in accordance with local, state, and/or federal regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Place a fresh cartridge in each cartridge position using the existing slip couplers and urethane bottom caps. If the vault is equipped with stacked cartridges, the existing outer and inner interconnector couplers must be used between the stacked cartridges to provide hydraulic connection. Transfer the existing vent tubes from the spent cartridges to the fresh cartridges. Finally, refit the struts to hold the fresh cartridges in place.
- Securely replace access covers, as appropriate.
- Make arrangements to return the empty spent cartridges to Oldcastle Infrastructure.

# PerkFilter Inspection and Maintenance Log

Location \_\_\_\_\_

**Structure Configuration and Size:**

Inspection Date \_\_\_\_\_

- Vault \_\_\_\_ feet x \_\_\_\_ feet
- Manhole \_\_\_\_ feet diameter
- Catch Basin \_\_\_\_ feet x \_\_\_\_ feet

**Number and Height of Cartridge Stacks:**

**Media Type:**

Count \_\_\_\_ each  12"  18"  24"  30"

ZPC  Perlite  Other \_\_\_\_\_

***Condition of Internal Components***

Notes:

- Good       Damaged       Missing

***Inlet or Outlet Blockage or Obstruction***

Notes:

- Yes       No

***Floating Trash and Debris***

Notes:

- Significant       Not Significant

***Floating Oils***

Notes:

- Significant       Not Significant       Spill

***Sediment Depth in Inlet Chamber***

Notes:

Inches of Sediment: \_\_\_\_\_

***Sediment Depth in Treatment Chamber***

Notes:

Inches of Sediment: \_\_\_\_\_

***Standing Water in Treatment Chamber***

Notes:

Inches of Standing Water: \_\_\_\_\_

***Maintenance Required***

- Yes - Schedule Maintenance       No - Inspect Again in \_\_\_\_\_ Months

# PERKFILTER™

## OUR MARKETS



**BUILDING  
STRUCTURES**



**COMMUNICATIONS**



**WATER**



**ENERGY**



**TRANSPORTATION**

APPENDIX E – SAMPLE BMP INSPECTION & MAINTENANCE FORM



**SAMPLE BMP INSPECTION & MAINTENANCE FORM**

Date: \_\_\_\_\_

Responsible Inspector: \_\_\_\_\_

**LANDSCAPE MAINTENANCE**

<u>Location</u>	<u>Date</u>	<u>Observations</u> Maintenance or Repair Needed? Debris? Erosion Problems?	<u>Action Taken</u>	<u>Date</u> <u>Completed</u>

**STORM DRAINAGE COLLECTION SYSTEM MAINTENANCE**

<u>Location</u>	<u>Date</u>	<u>Observations</u> Debris or Sediment? Silt Accumulation?	<u>Action Taken</u>	<u>Date</u> <u>Complete</u> <u>d</u>

**STORMWATER TREATMENT SYSTEM MAINTENANCE**

<u>Location</u>	<u>Date</u>	<u>Observations</u> Flow Obstructions? Overflow Drain Obstructions? Debris or Sediment? Erosion Problems?	<u>Action Taken</u>	<u>Date</u> <u>Complete</u> <u>d</u>

SAMPLE FORM ONLY  
INSPECTOR/OWNER TO EXPAND AND MODIFY AS NECESSARY

APPENDIX F – EMPLOYEE TRAINING PROGRAM TABLE

## Employee Training Program Table

### Employee Training Program

Name of Responsible Part responsible for training: _____		
Provide the following information:		
Address _____		
Phone _____ Fax _____ E-mail: _____		
Description of Items for Training (e.g. maintenance, inspection, pesticide use, others as applicable to site)	Training Schedule	Employees To Be Trained (Job Category or Title)
Maintenance	Yearly	Property Management
Inspection	Yearly	Property Management