

June 9, 2022  
Project No. 621092

Gabe Osburn  
City of Santa Rosa  
Acting Director – Transportation and Public Works  
69 Stony Circle  
Santa Rosa, CA 95401  
T: 707-543-3853  
E: gosburn@srcity.org

**RE: 701 WILSON STREET (PULLMAN LOFTS PHASE 2)  
PRELIMINARY STORMWATER LOW IMPACT DEVELOPMENT SUBMITTAL (SWLIDS)  
SANTA ROSA, CA**

Dear Gabe,

The below memo documents our compliance with the City of Santa Rosa Stormwater Low Impact Development Requirements for the Phase 2 portion of the Pullman Lofts project located at 701 Wilson Street in Santa Rosa.

### **INTRODUCTION/ PROJECT DESCRIPTION**

The Pullman Lofts project is a multi-phased residential development located along Wilson Street between 8<sup>th</sup> and 9<sup>th</sup> Streets in Santa Rosa. Phase 1 of the project has been designed and permitted and is currently under construction. Phase 2 of the project intends to demolish an existing building and construct a 40-unit residential building along the Wilson/8<sup>th</sup> Street Frontages, with a fire access lane along the western edge of the site.

The Phase 2 land use and site layout differ from what was proposed in the original entitlements and permits; therefore the Phase 2 project is required to resubmit for both, and comply with current code requirements. Phase 2 is, however, still considered part of the overall original project from a stormwater calculation perspective. Because of this, Phase 2 needs to comply with the original project requirements as defined in the Final Stormwater Mitigation Plan – Pullman Lots, revised March 2021 (March 2021 report) prepared by Civil Design Consultants. The following memo refers to the March 2021 report where no changes are required and notes the specific changes when the Phase 2 design differs from what was included in the original report.

### **DETERMINATION WORKSHEET**

- The Determination Worksheet, included in the attached March 2021 report, for the entire project site remains unchanged by the new improvements for Phase 2 of this development.

### **BMP SELECTION AND SIZING**

- Bioretention planters are selected for Phase 2 improvements to remove pollutants and provide stormwater storage for this watershed. As shown in the attached BMP Selection Table, Phase 2 will provide two types of Priority 2 bioretention planters. The same bioretention detail (Detail 2 on Sheet 2 of the original BMP Details) from the March 2021 report will be used for Phase 2.
- The bioretention BMPs designed to treat the Phase 2 improvements are located in the attached Stormwater Management Plan, and sizing described in the attached Stormwater Calculator Results.

- The Stormwater Management Plan shows the proposed site plan, BMPs and new building ground floor. This defers from the March 2021 report which represents the Phase 2 development area as the “Historical Building Tributary”. The attached Stormwater Management Plan replaces the initial stormwater strategy, which used a permeable gutter, with new bioretention planters.
- The Stormwater Calculator Results show how the Phase 2 BMPs achieve the goal of 100% Volume Capture. The results do note that “treatment only” is required for Phase 2 improvements given the total post-project impervious area is less than pre-project impervious area. However, to match the same 100% Volume Capture goal set by the March 2021 report, Phase 2 BMPs are designed to capture 100% of runoff generated by the 85<sup>th</sup> percentile 24 hour storm in the void space below the perforated underdrain.

### **BMP MAINTENANCE PROCEDURES**

- The BMP inspection/maintenance checklist and procedures, included in the attached March 2021 report, apply to the proposed bioretention planters for the Phase 2 development.

Should you have any questions about the contents of this report, please feel free to contact me.

Regards,

**SANDIS**



Ron Sanzo, PE, TE, PTOE  
Director of Engineering | Associate Principal

### **ATTACHMENTS:**

- Final Storm Water Mitigation Plan Pullman Lofts\_revised March 2021.pdf
- BMP Selection Table.pdf
- Stormwater Management Plan.pdf
- Stormwater Calculator Results.pdf

### BMP Selection Table

|  | Best Management Practice (BMP) |              |   | Evaluation Criteria |                   |               |                   |             |           |                |                      |        |                                | Explanation of selection | Other notes: |     |
|--|--------------------------------|--------------|---|---------------------|-------------------|---------------|-------------------|-------------|-----------|----------------|----------------------|--------|--------------------------------|--------------------------|--------------|-----|
|  | Practice (BMP)                 | Detail Sheet | Detail Title                                  | Can be used with... | High Ground Water | Contamination | Slope Constraints | Achieves... | Treatment | Volume Capture | Pollution Prevention | Credit | BMP in this priority selected? |                          |              | Yes |
| <b>Priority 2 BMPs- with subsurface drains installed above the capture volume.</b> | Rain Garden                    | P2-01        | Rain Garden                                   |                     |                   |               |                   | x           | x         |                |                      |        |                                |                          |              |     |
|  | Roadside 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         |                |                      |        |                                | ✓                        |              |     |
|  | Pervious Pavement              | P2-06        | Vegetated Buffer Strip                        |                     |                   |               |                   | x           | x         |                |                      |        |                                | ✓                        |              |     |
|  | Constructed Wetlands           | N/A          | N/A   |                     |                   |               |                   | x           | x         |                |                      |        |                                |                          |              |     |



# STORM WATER CALCULATOR

|                                 |  |                 |                       |
|---------------------------------|--|-----------------|-----------------------|
| <b>BMP Tributary Parameters</b> |  | Project Name:   | Pullman Lofts Phase 2 |
| BMP ID:                         | 1  |                 |                       |
| BMP Design Criteria:            | <del>Treatment Only</del> 100% Volume Capture                |                 |                       |
| Type of BMP Design:             | Priority 2: P2-05 Roadside Bioretention - No Curb AND Gutter |                 |                       |
| BMP's Physical Tributary Area:  | 3,786.0  | ft <sup>2</sup> |                       |
| Description/Notes:              |  |                 |                       |

|  |   |                  |        |                 |
|--|---|------------------|--------|-----------------|
| <b>Hydromodification Requirement: 100% Volume Capture; <math>V_{HYDROMOD}</math></b> |   | $V_{HYDROMOD} =$ | 142.05 | ft <sup>3</sup> |
| Post development hydrologic soil type within tributary area:                         | B: 0.15 - 0.30 in/hr infiltration (transmission) rate |                  |        |                 |
| Post development ground cover description:   | Urban districts - Commercial and business             |                  |        |                 |
| CN <sub>POST</sub> :   |   |                  |        |                 |
| User Composite post development CN:  | 93.0  |                  |        |                 |

|   |                                |                            |                                  |                      |
|---|--------------------------------|----------------------------|----------------------------------|----------------------|
| <b>BMP Sizing Tool: Hydromodification Requirement</b> |                                | Percent of Goal Achieved = | 101.71                           | %                    |
|   | <b>BMP Volume Below Ground</b> |                            | <b>Ponded Water Above Ground</b> |                      |
| Porosity:   | 0.30                           |                            | Depth:                           | 0.00 ft              |
| Depth below perforated pipe if present:               | 3.20 ft                        |                            | Width:                           | 0.00 ft              |
| Width:  | 3.50 ft                        |                            | Length:                          | 0.00 ft              |
| Length:   | 43.00 ft                       |                            | Area:                            | 0.00 ft <sup>2</sup> |
| Area:   | 0.00 ft <sup>2</sup>           |                            |                                  |                      |



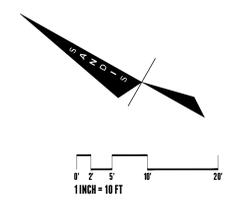
# STORM WATER CALCULATOR

|                                 |  |                 |                       |
|---------------------------------|--|-----------------|-----------------------|
| <b>BMP Tributary Parameters</b> |  | Project Name:   | Pullman Lofts Phase 2 |
| BMP ID:                         | 2  |                 |                       |
| BMP Design Criteria:            | <del>Treatment Only</del> 100% Volume Capture          |                 |                       |
| Type of BMP Design:             | Priority 2: P2-04 Roadside Bioretention - Curb Opening |                 |                       |
| BMP's Physical Tributary Area:  | 5,120.0  | ft <sup>2</sup> |                       |
| Description/Notes:              |  |                 |                       |

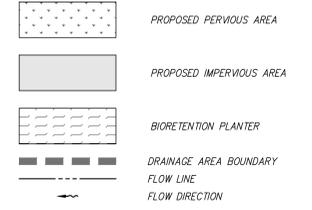
|   |   |                         |        |                 |
|---|---|-------------------------|--------|-----------------|
| <b>Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub></b> |   | V <sub>HYDROMOD</sub> = | 192.10 | ft <sup>3</sup> |
| Post development hydrologic soil type within tributary area:                    | B: 0.15 - 0.30 in/hr infiltration (transmission) rate |                         |        |                 |
| Post development ground cover description:                                      | Urban districts - Commercial and business             |                         |        |                 |
| CN <sub>POST</sub> :  |   |                         |        |                 |
| User Composite post development CN:   | 93.0  |                         |        |                 |

|   |                                |                            |                                  |                      |
|---|--------------------------------|----------------------------|----------------------------------|----------------------|
| <b>BMP Sizing Tool: Hydromodification Requirement</b> |                                | Percent of Goal Achieved = | 100.49                           | %                    |
|   | <b>BMP Volume Below Ground</b> |                            | <b>Ponded Water Above Ground</b> |                      |
| Porosity:   | 0.30                           |                            | Depth:                           | 0.00 ft              |
| Depth below perforated pipe if present:               | 3.90 ft                        |                            | Width:                           | 0.00 ft              |
| Width:  | 0.00 ft                        |                            | Length:                          | 0.00 ft              |
| Length:   | 0.00 ft                        |                            | Area:                            | 0.00 ft <sup>2</sup> |
| Area:   | 165.00 ft <sup>2</sup>         |                            |                                  |                      |

BLOCK 7  
CLARKE ADDITION TO SANTA ROSA  
1 MAPS 4  
RECORD OF SURVEY  
333 MAPS 47



**STORMWATER MANAGEMENT PLAN LEGEND**



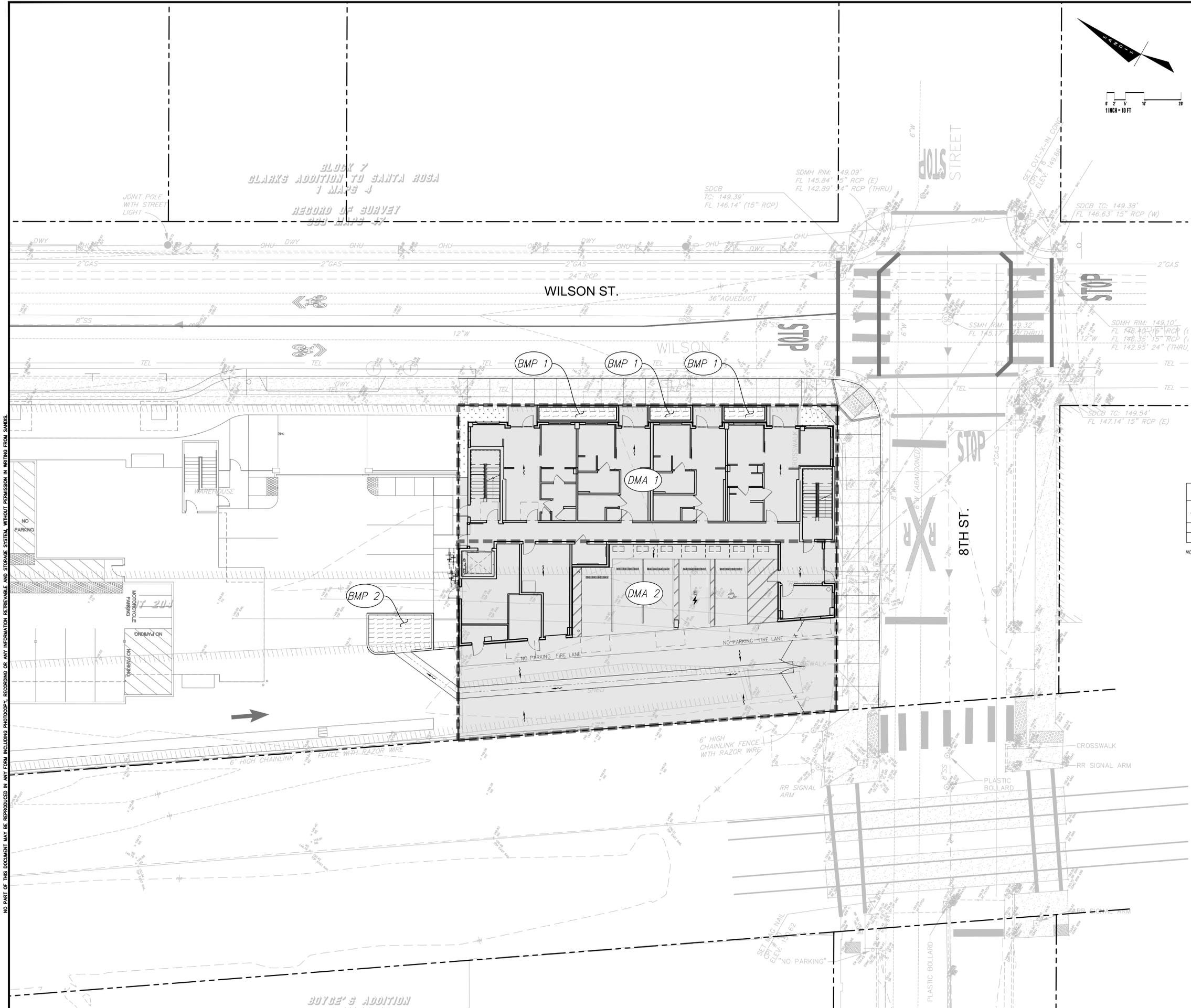
**STORMWATER MANAGEMENT NOTES:**

1. THIS PLAN PRESENTS METHODS AND CALCULATIONS FOR COMPLYING WITH THE REQUIREMENTS OF ORDER NO. R1-2015-0039 IN ACCORDANCE WITH SANTA ROSA'S 2020 STORM WATER LOW IMPACT DEVELOPMENT TECHNICAL DESIGN MANUAL.
2. THE FOLLOWING TREATMENT MEASURES ARE PROPOSED TO REGULATE THE QUALITY AND VOLUME OF STORM WATER LEAVING THE SITE:
  - 2.1. BIORETENTION PLANTER - RUNOFF FROM ROOFTOPS AND PAVEMENT IS DIRECTED TO BIORETENTION PLANTERS TYPICALLY LOCATED NEAR BUILDINGS OR COMMON OPEN AREAS. THESE PLANTERS FUNCTION AS A SOIL AND PLANT-BASED FILTRATION SYSTEM WHICH REMOVES POLLUTANTS THROUGH PHYSICAL, BIOLOGICAL, AND CHEMICAL TREATMENT PROCESSES.

**STORMWATER TREATMENT MEASURES**

| AREA ID | IMPERVIOUS AREA (SF) | PERVIOUS AREA (SF) | TOTAL AREA (SF) | BMP TYPE             | BMP ID | BMP AREA (SF) | STRUCTURAL SOIL DEPTH (FT) |
|---------|----------------------|--------------------|-----------------|----------------------|--------|---------------|----------------------------|
| DMA-1   | 3,503                | 233                | 3,786           | BIORETENTION PLANTER | 1      | 150.5         | 3.2                        |
| DMA-2   | 5,120                | 0                  | 5,120           | BIORETENTION PLANTER | 2      | 165           | 3.9                        |

NOTES: SEE CITY OF SANTA ROSA STORMWATER CALCULATOR RESULTS FOR FURTHER BMP SIZING INFORMATION.



NO PART OF THIS DOCUMENT MAY BE REPRODUCED IN ANY FORM INCLUDING PHOTOCOPY, RECORDING OR ANY INFORMATION RETRIEVABLE AND STORAGE SYSTEM, WITHOUT PERMISSION IN WRITING FROM SANDIS.



**BUILD ON.**  
SANDIS.NET

DATE: 11-23-2021  
SCALE: 1"=10'  
PROJECT No.:  
**621092**

| No. | REVISION          | DATE     | BY  |
|-----|-------------------|----------|-----|
| 1   | ISSUED FOR PERMIT | 04/08/22 | RES |

**PULLMAN LOFTS - PHASE II  
BUILDING C**

SANTA ROSA

CALIFORNIA

**STORMWATER MANAGEMENT PLAN**

SHEET  
**C5.0**



3-30-21

FINAL STORM WATER MITIGATION PLAN  
**THE PULLMAN LOFTS**

OCTOBER 2018  
(REVISED MARCH 2021)

CIVIL DESIGN CONSULTANTS, INC.  
2200 Range Avenue, Suite 204  
Santa Rosa, CA 95403  
(707) 542-4820



**FINAL  
STORM WATER MITIGATION PLAN**

FOR  
*THE PULLMAN LOFTS*

*Location*

*701 Wilson St  
Santa Rosa, CA*

*APN 010-091-005*

Prepared for

Phoenix Development Company  
1620 Olivet Road  
Santa Rosa, CA 95401

October 2018  
(Revised March 2021)

Prepared by

*CIVIL DESIGN CONSULTANTS, INC.  
2200 RANGE AVENUE, SUITE 204  
SANTA ROSA, CA 95403*

## **CONTENTS**

- 1 INTRODUCTION**
- 2 PROJECT DESCRIPTION**
- 3 POLLUTION PREVENTION MEASURES**
- 4 TYPES OF BMP'S SELECTED TO MITIGATE POLLUTANTS AND PROVIDE VOLUME CAPTURE**
- 5 RESPONSIBILITY FOR BMP MAINTENANCE**

## **ATTACHMENTS**

**Determination Worksheet**  
**Pre/Post Project Exhibits**  
**FSWMP Hydrology Map**  
**BMP Details**  
**Stormwater Calculator Spreadsheet**  
**Runoff Curve Number Worksheet**  
**Soils Analysis**  
**BMP Selection Tables**  
**Maintenance Checklists**  
**Standard Maintenance/Monitoring Agreement**

## 1 INTRODUCTION

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The Pullman Lofts project site is within the permit boundary of the recently adopted NPDES MS4 Storm Water Permit which regulates discharges into the watershed with the intent to reduce storm water pollution and protect the water quality of our local creeks and waterways and continue to promote groundwater recharge. The City of Santa Rosa and the County of Sonoma have adopted the Storm Water Low Impact Development (LID) Technical Design Manual. This Final Storm Water Mitigation Plan (FSWMP) was developed to show compliance with its requirements.

SUSMP requirements are part of the Storm Water Management Plan that is an enforceable part of the reissued municipal storm water National Pollutant Discharge Elimination System (NPDES) permit for the City of Santa Rosa, the County of Sonoma and the Sonoma County Water Agency. Satisfying the SUSMP and the NPDES Permit will require meeting the following goals to the maximum extent practicable:

1. Prevent pollutants generated at the site from leaving the site.
2. Prevent increases in Storm Water runoff for the 85<sup>th</sup> percentile 24-hour storm.
3. Strive to maximize the amount of land left in a natural undisturbed condition.

This FSWMP will provide the following information:

- Project Description
- Pollution Prevention Measures
- Types of BMP selected to mitigate pollutants and provide volume capture.
- Responsibility for BMP maintenance
- Location and design of BMP (on project drawings)

## 2 PROJECT DESCRIPTION

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The Pullman Lofts project site is located within the Historic Railroad Square Area in the northwest quadrant of the City of Santa Rosa. The property address is 701 Wilson Street.

The Pullman Lofts property has a total area of 1.84 acres and is contained within a single assessor parcel, APN 010-091-005. The site is primarily developed for industrial use and contains a number of warehouses and shed type structures, along with a historic building.

The project is proposed by the Phoenix Development Company as a single, non-phased project. The project proposes to construct 72 apartment units within two buildings with associated parking and site amenities on 1.63 acres, and the historic building mentioned previously with an emergency fire access on the remaining 0.21 acres. There will also be some widening of the existing public streets along the project frontage bringing the total project area to 2.04 acres.

The project will collect overland flow and route it to a series of proposed bio-retention beds and permeable pavement with volume capture before entering the underground drainage system. These pre-treatment design features shall not only remove pollutants, but also will reduce the amount of runoff by capturing and infiltrating storm water onsite. The bio-retention beds and permeable pavement sections are proposed throughout the project site, providing treatment for each of the site tributaries. The purpose of these devices and their effect on the quality and quantity of runoff leaving the developed site will be further explained throughout this report.

The attached plan titled "FSWMP Hydrology Map" shows the proposed grading pattern for the project along with the drainage tributary areas and proposed bio-retention beds and permeable pavement sections with volume capture. Also shown on the plan are the BMP details showing volume capture designed to meet the delta volume capture goal.

### **3 POLLUTION PREVENTION MEASURES**

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The roof drains of the apartment complex will be disconnected from the storm drain system. Splash blocks will be used at roof leader locations, dissipating and directing rooftop drainage to one of the proposed vegetated swales. Drainage will then be directed to a mitered drain inlet where it can be transported via storm drain pipe to gutter flow and into one of the proposed BMP features.

A percentage of the onsite parking and gutter pan area will be constructed using permeable pavement. Additionally, this pollution prevention measure will incorporate a volume capture area beneath its limits.

The project will incorporate a robust Landscape plan including interceptor trees that will be planted throughout the common area and in tree wells along the frontage to the existing streets.

The total tributary area used for volume capture calculations has been reduced by taking credit for these measures.

#### **4 TYPES OF BMP'S SELECTED TO MITIGATE POLLUTANTS AND PROVIDE VOLUME CAPTURE**

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Best Management Practices (BMP's) are design features that address the quality and quantity of the storm waters that flow from a development. In most cases, these BMP's are used to mitigate a development's impact on the quality of storm water by treating or cleaning the storm water. Some controls have dual treatment control measure capabilities, not only treating, but also containing a required volume of storm water. The Pullman Lofts project will implement bio-retention beds and permeable pavement to mitigate pollutants and provide volume capture for the 85<sup>th</sup> percentile 24-hour storm. Volume capture is accomplished by incorporating an area for storm water storage beneath the bio-retention beds and permeable pavement.

Bio-retention beds have been selected for this project because of their ability to remove pollutants through a variety of natural physical, biological and chemical treatment processes. These BMP's are considered a Low Impact Development (LID) device for treatment control. They have also been selected because they provide an excellent opportunity for the runoff to settle any suspended solids and remove hydrocarbons. Both of which have been identified as pollutants that can degrade the downstream receiving waters of the project. Compared to pipe networks, bio-retention beds with gravel storage areas will reduce runoff from the site and provide ground water recharge. For this project we have selected structural soil consisting of ¾ inch to 1-½ inch aggregate for the storage area which has a porosity of 30%. The structural soil will also provide an environment for landscaping to thrive. This provides the opportunity to reduce the peak flow in a basin.

Permeable pavement has been selected for this project in order to satisfy Cal Green requirements, which indicate a certain percentage of hardscape areas must be permeable. The permeable pavement section requires 12" of ¾ inch to 1-½ inch drain rock – which has a porosity of 40% – beneath a perforated pipe for structural stability.

This project meets the design goal by achieving the 100% volume capture goal.

## **5 RESPONSIBILITY FOR BMP MAINTENANCE**

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The property owner will be responsible for the surface and sub-surface oversight and maintenance of the private BMPs located on the project.

Attached is a Draft of the Declaration of Covenants Regarding Maintenance of Storm Water BMP Facilities.



**FOR OFFICE USE ONLY:**  
 Does Project require permanent storm water BMP's?  
 Y  N   
 Review Fee Paid?  
 Y  N

## DETERMINATION WORKSHEET

**PURPOSE:** Use this form to determine whether or not this project will need to incorporate permanent Storm Water Best Management Practices (BMP's) and submit a Standard Urban Storm Water Mitigation Plan (SUSMP).

**APPLICABILITY:** Required with all entitlement application packages, improvement plans and building permit applications. Information presented on this worksheet must reflect the final development condition.

### Part 1: Information

Project Name

\*Applicant Name

Site Address

Mailing Address

City/Zip

City/State/Zip

Permit Number(s) - if applicable

Phone/Email/Fax

Engineer Name

Mailing Address

City/State/Zip

Phone/Email

### Type of Application/Project:

- Subdivision     Grading Permit     Building Permit  
 Design Review     Use Permit     Other

\*Applicant is the owner or developer.

## Determination Worksheet

**Part 2: Other Regulatory Determinations**Initial Determination:

1. Does this Project create or replace 10,000 sq ft or more of impervious surface?

**YES:** Complete the remainder of this worksheet.

**NO:** Continue with this worksheet.

CALGREEN:

2. Does this Project require a non-residential building permit for a newly constructed building without sleeping accommodations? <sup>1</sup>

**YES:** this project must implement permanent Storm Water BMP's and be designed in accordance with the Storm Water Low Impact Development (LID) Technical Design Manual due to CALGreen requirements. **Skip to page 6 and sign the "acknowledgement signature section."**

**NO:** Complete the remainder of the worksheet.

Section 401:

3. Does this Project require a section 401 permit? <sup>2</sup>

Yes  No

3A. if YES, are any of the following a component of this project? (Check all that apply)

Disturbance of 1 acre or more of soil

New Outfall

Any new impervious surface

**If you checked any of the boxes in section 3A, please be advised that this Project will require North Coast Regional Water Quality Control Board review and permanent Storm Water BMP's designed in accordance with the Low Impact Development (LID) Technical Design Manual. Skip to page six and sign the "acknowledgement signature section."**

1. Additions, alterations, repairs and existing structures are not subject to the requirements of CALGreen. For further information on determining building permit requirements, contact the governing agency's building department.

2. A 401 permit is required from the North Coast Regional Water Quality Control Board (NCRWQCB) if any part of this project is located within or adjacent to "waters of the State" which can be a creek, drainage ditch, wetland or any seasonal waterway. For further information on determining 401 Permit requirements, contact the North Coast Regional Water Quality Control Board.

## Determination Worksheet

**PART 3: Exemptions**

1. Is this a ***routine maintenance activity***<sup>3</sup> 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

2. Is this an ***emergency redevelopment activity***<sup>4</sup> required to protect public health and safety?

Yes  No

3. Is this a project undertaken solely to install or reinstall ***public utilities*** (such as sewer or water lines) that does not include any additional street or road development or development activities?

Yes  No

4. Is this a ***reconstruction project***, undertaken by a ***public agency***<sup>5</sup>, of street or roads remaining within the original footprint and less than 48 feet wide?

Yes  No

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

Yes  No

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

**YES: Stop.** This project is exempt and will not need to incorporate permanent storm water Best Management Practices. **Please go to Page 6 and complete the exemption signature section.**

**NO:** Proceed to Part 4 below to see if this project will need to incorporate permanent Storm Water BMP's.

**Part 4: 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 SUSMP.

1. Does this ***development or redevelopment project*** create or replace a combined total of 1.0 acres or more of impervious surface<sup>6</sup>? Yes  No

<sup>3</sup>***Routine Maintenance Activity***- This exemption includes activities such as overlays and/or resurfacing of existing roads or parking lots as well as trenching and patching activities and reroofing activities.

<sup>4</sup>***Emergency Redevelopment***- The Regional Water Quality Control Board must agree that the activities are needed to protect public health and safety to qualify for this exemption.

<sup>5</sup>***Reconstruction*** is defined as work that replaces surfaces down to subgrade. Street width is measured from face-of-curb to face-of-curb. Overlays, resurfacing, trenching, and patching are considered maintenance activities and are exempt.

<sup>6</sup>***Impervious Surface*** is defined as an area that has been modified to reduce storm water runoff capture and percolation into underlying soils. Such surfaces include rooftops, walkways, and parking areas. Permeable pavements shall be considered impervious for this section if they have subdrains to preclude infiltration into underlying soils.

## Determination Worksheet

2. Does this project create or replace a combined total of 10,000 ft<sup>2</sup> or more of **impervious street, roads, highways, or freeway construction or reconstruction**? Yes  No
3. Does this project include **four or more new homes**? Yes  No
4. Is this project an **industrial park**<sup>7</sup> creating or replacing a combined total of 10,000 ft<sup>2</sup> or more of impervious surface<sup>6</sup>? Yes  No
5. Is this project a **Commercial strip mall**<sup>8</sup> creating or replacing a combined total of 10,000 ft<sup>2</sup> or more of impervious surface<sup>6</sup>? Yes  No
6. Is this project a **retail gasoline outlet** creating or replacing a combined total of 10,000 ft<sup>2</sup> of more or impervious surface<sup>6</sup>? Yes  No
7. Is this project a **restaurant** creating or replacing a combined total of 10,000 ft<sup>2</sup> or more of impervious surface<sup>6</sup>? Yes  No
8. Is this project a **parking lot** (not included as part of a project type listed above) creating or replacing a combined total of 10,000 ft<sup>2</sup> or more or impervious surface or with 25 or more parking spaces? Yes  No
9. Is this project an **automotive service facility** creating or replacing a combined total of 10,000 ft<sup>2</sup> or more or impervious surface<sup>6</sup>? Yes  No

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

**YES:** The project must implement permanent Storm Water BMP's and be designed in accordance with the Storm Water LID Technical Design Manual. Please complete the remainder of this worksheet. sign under the "Acknowledgment Section" on page 6.

**NO: Stop.** The project will **not** need to incorporate permanent Storm Water BMP's. Please continue to Page 6 and complete the exemption signature section.

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<sup>7</sup> "**Industrial Park**" is defined as industrial facility or building and associated impervious surface on a site zoned or planned to allow industrial or commercial development (planning for mixed-use residential, industrial or commercial development and redevelopment is included).

<sup>8</sup> "**Commercial Strip Mall**" is defined as commercial facility or impervious surface on a site zoned or planned to allow commercial or industrial use (planning for mixed-use residential, industrial or commercial development and redevelopment is included) with street access and onsite parking.

## Determination Worksheet

**Part 5: Project Description**

1. Total Project area:  Square feet or  acres.

2. Existing land use(s): (check all that apply)

Commercial  Industrial  Residential  Public Other

Description of buildings, significant site features , etc.:

The site currently contains several warehouse/barn type structures, including a historic building that will remain and be converted into a retail outlet. The site also includes a gravel parking lot, rail road tracks, and a residential lot on the north side.

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

4. Proposed Land Use (s): (check all that apply)

Commercial  Industrial  Residential  Public Other

Description of buildings, significant site features, etc.:

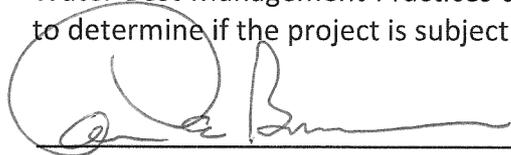
The proposed site will contain an apartment complex with associated parking and site amenities. Public streets will be slightly widened along the project frontage. A new parking lot is also proposed to serve the existing historic building, which will be renovated to support a retail outlet. +

## Determination Worksheet

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### 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 the submittal of a SUSMP. Any unknown responses must be resolved to determine if the project is subject to these requirements.



\_\_\_\_\_  
Signature of Property Owner or Developer

9-15-15

\_\_\_\_\_  
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 SUSMP. I understand that redesign may require submittal of a new Determination Worksheet and may require permanent Storm Water BMP's .

\_\_\_\_\_  
Signature of Property Owner or Developer

\_\_\_\_\_  
Date

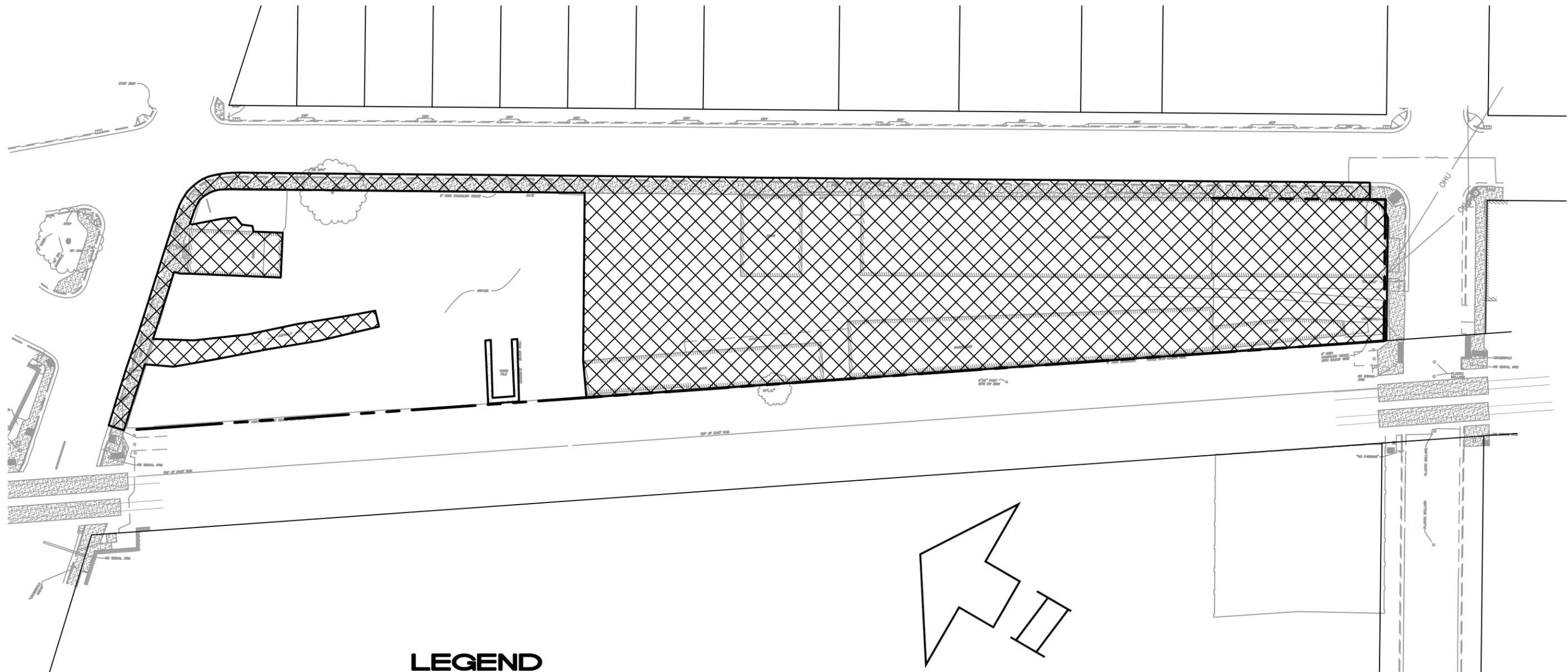
**Implementation Requirements:** All calculations shall be completed using the "Storm Water Calculator" available at: [www.srcity.org/stormwaterLID](http://www.srcity.org/stormwaterLID)

**Design Goal:** Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual. 100% volume capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 2 and 3 of this calculator do not need to be completed. This is a retention requirement.

**Design Requirements:** If the Design Goal of 100% volume capture is not achieved; then both Requirement 1-100% Treatment AND Requirement 2- Volume Capture must be achieved.

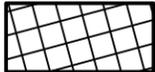
**Requirement 1:** Treatment of 100% of the flow generated by the 85th percentile 24 hour storm event, as calculated using the Rational Method and a known intensity of 0.20 inches per hour.

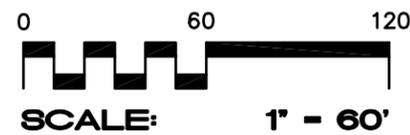
**Requirement 2:** Capture (infiltration and/or reuse) of the increase in volume of storm water due to development generated by the 85th percentile 24 hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual. This is a retention requirement.



TOTAL AREA = 2.04 AC (89,023 SF)  
 IMPERVIOUS AREA = 1.37 AC (59,913 SF)  
 PERVIOUS AREA = 0.67 AC (29,110 SF)

**LEGEND**

 PRE-PROJECT IMPERVIOUS AREAS



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PRE-PROJECT IMPERVIOUS AREA  
 THE PULLMAN LOFTS

SANTA ROSA, CALIFORNIA

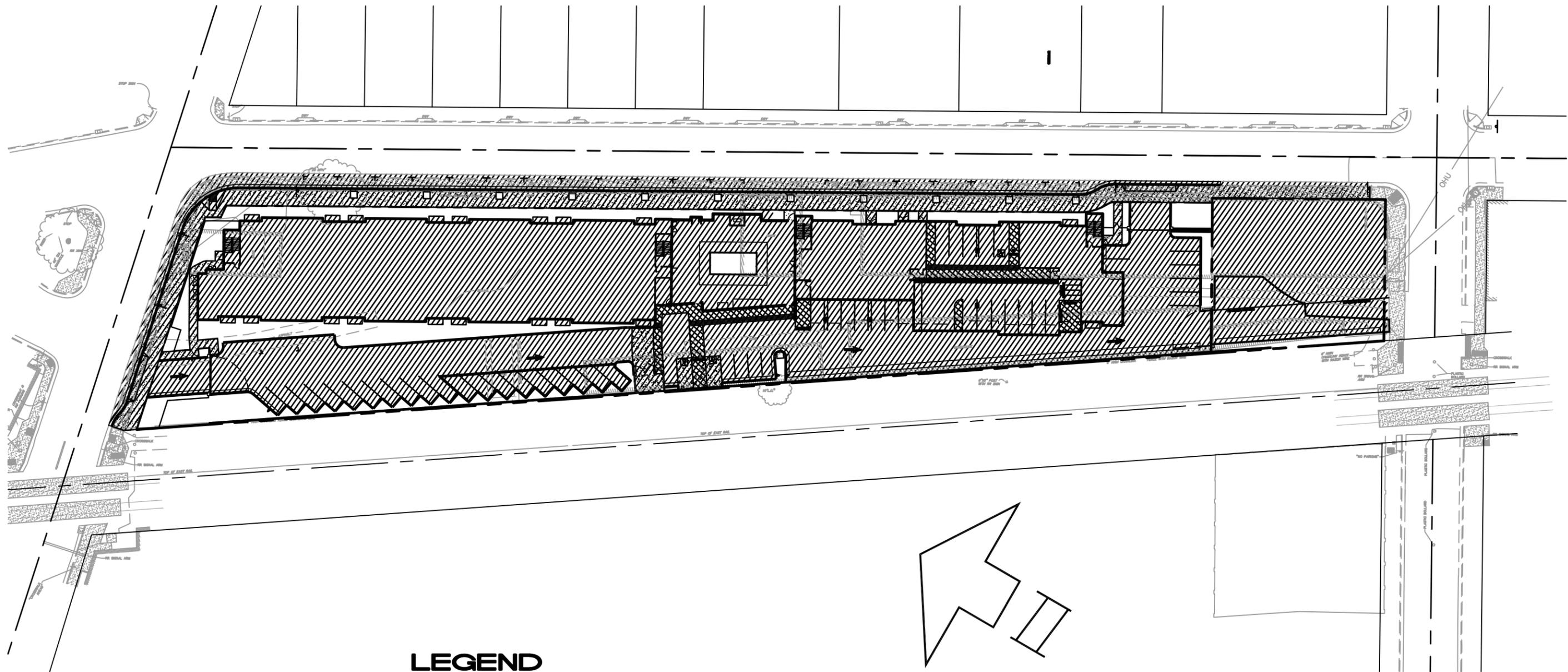
SEPTEMBER 2018

JOB NO.  
14-107

SHEET NO.

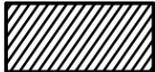
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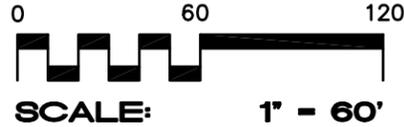
OF 1 SHEET



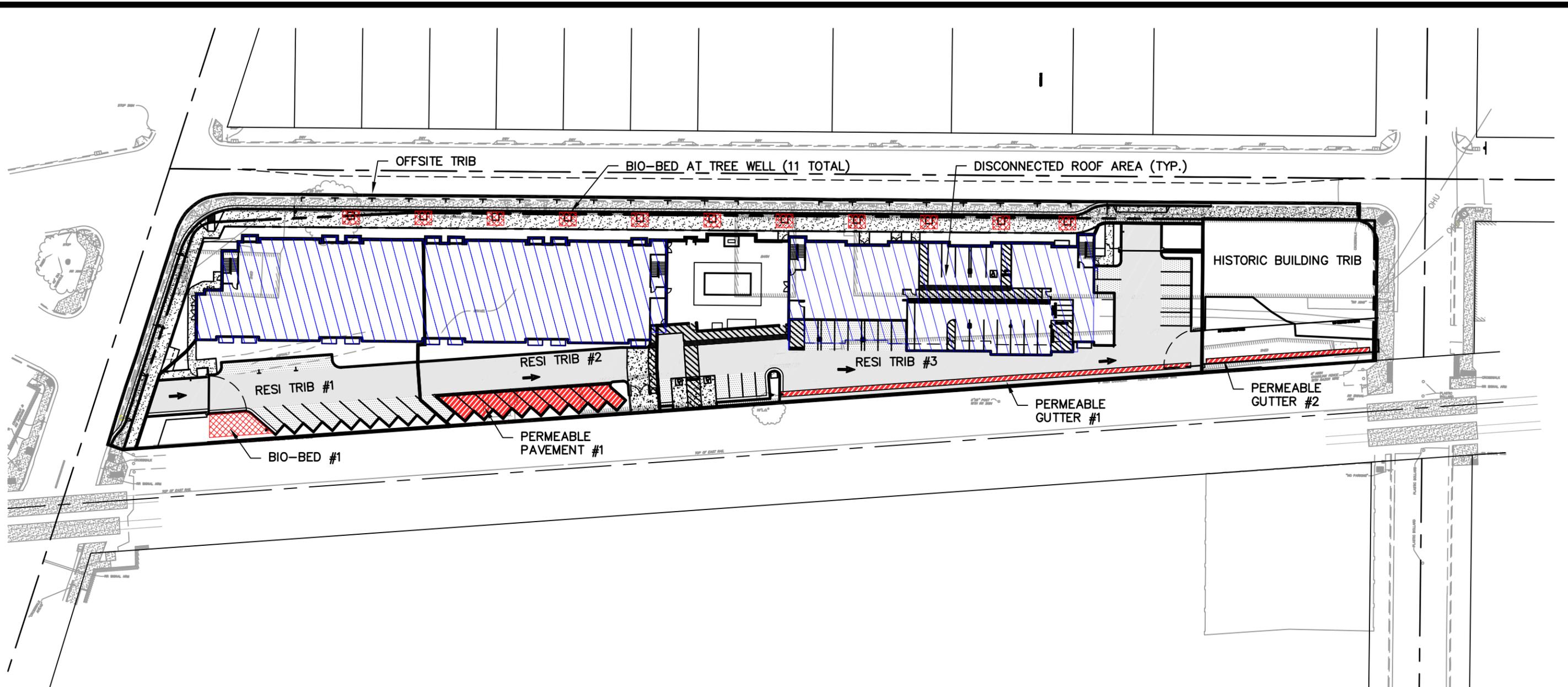
**LEGEND**

TOTAL AREA = 2.04 AC (89,023 SF)  
 IMPERVIOUS AREA = 1.79 AC (77,905 SF)  
 PERVIOUS AREA = 0.25 AC (11,118 SF)

 POST-PROJECT IMPERVIOUS AREAS



|  |   |   |            |                       |
|--|---|---|------------|-----------------------|
| CIVIL DESIGN CONSULTANTS, INC.<br>2200 Range Avenue, Suite 204<br>Santa Rosa, CA 95403<br>(707) 542-4820 |  | POST-PROJECT IMPERVIOUS AREA<br>THE PULLMAN LOFTS |            | JOB NO.<br>14-107     |
|  |   | SANTA ROSA, CALIFORNIA                            |            | SHEET NO.<br><b>1</b> |
|  |   |   | MARCH 2021 | OF 1 SHEET            |



| VOLUME CAPTURE RESIDENTIAL #1 |           |
|-------------------------------|-----------|
| VOLUME CAPTURE                | AREA (SF) |
| BIO-BED #1                    | 408       |

| VOLUME CAPTURE RESIDENTIAL #3 |            |
|-------------------------------|------------|
| VOLUME CAPTURE                | AREA (SF)  |
| PERMEABLE GUTTER #1           | 736        |
| <b>TOTAL</b>                  | <b>736</b> |

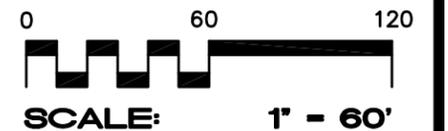
| VOLUME CAPTURE HISTORIC BUILDING |            |
|----------------------------------|------------|
| VOLUME CAPTURE                   | AREA (SF)  |
| PERMEABLE GUTTER #2              | 293        |
| <b>TOTAL</b>                     | <b>293</b> |

| VOLUME CAPTURE OFFSITE |            |
|------------------------|------------|
| VOLUME CAPTURE         | AREA (SF)  |
| TREE WELL              | 80         |
| <b>TOTAL</b>           | <b>880</b> |

| VOLUME CAPTURE RESIDENTIAL #2 |           |
|-------------------------------|-----------|
| VOLUME CAPTURE                | AREA (SF) |
| PERMEABLE PAVEMENT #1         | 1,352     |

### LEGEND

-  BIO-RETENTION BED
-  PERMEABLE PAVEMENT / GUTTER PAN
-  DISCONNECTED ROOF AREA
-  TRIBUTARY BOUNDARY



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**FSWMP HYDROLOGY MAP  
 THE PULLMAN LOFTS**

SANTA ROSA, CALIFORNIA

MARCH 2021

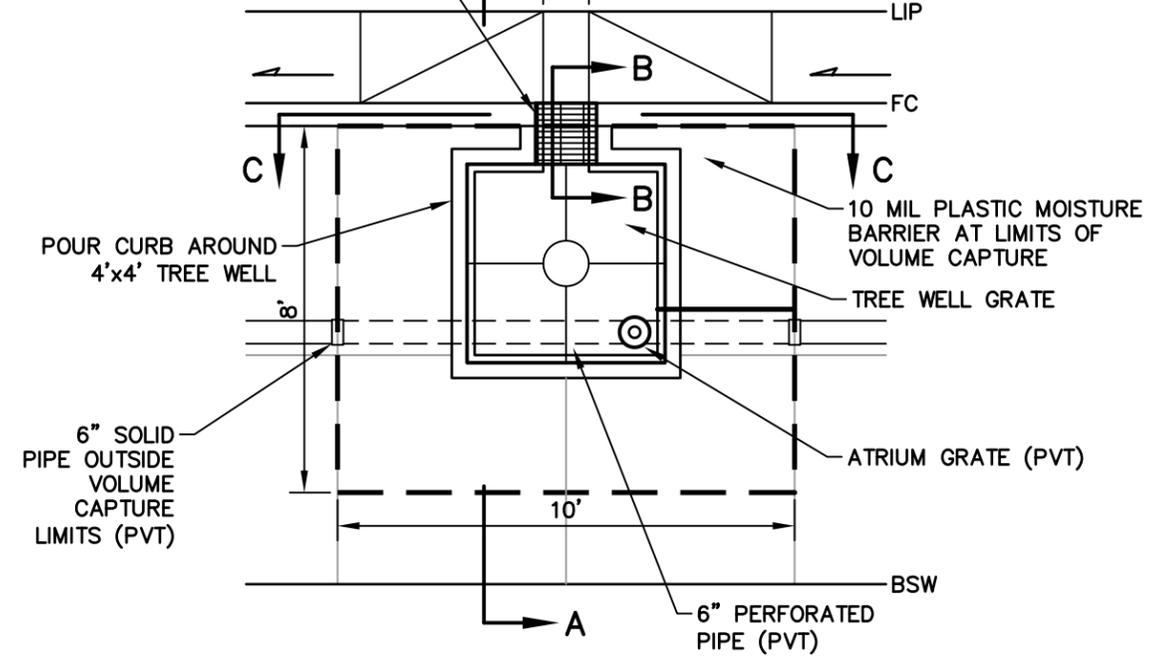
JOB NO.  
14-107

SHEET NO.

**1**

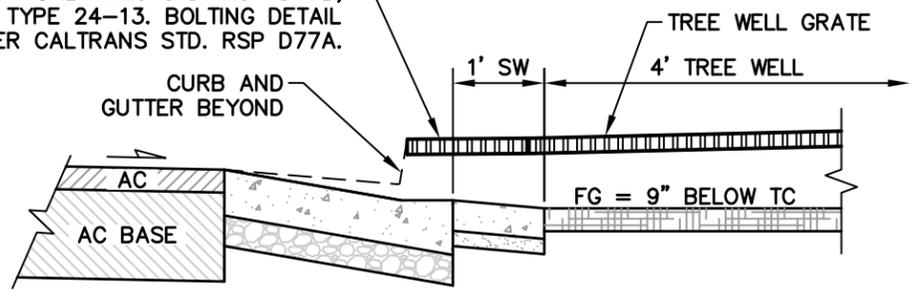
OF 1 SHEET

BOLT DOWN GRATE SIMILAR TO CALTRANS STD. RSP D77B, TYPE 24-13. BOLTING DETAIL PER CALTRANS STD. RSP D77A.



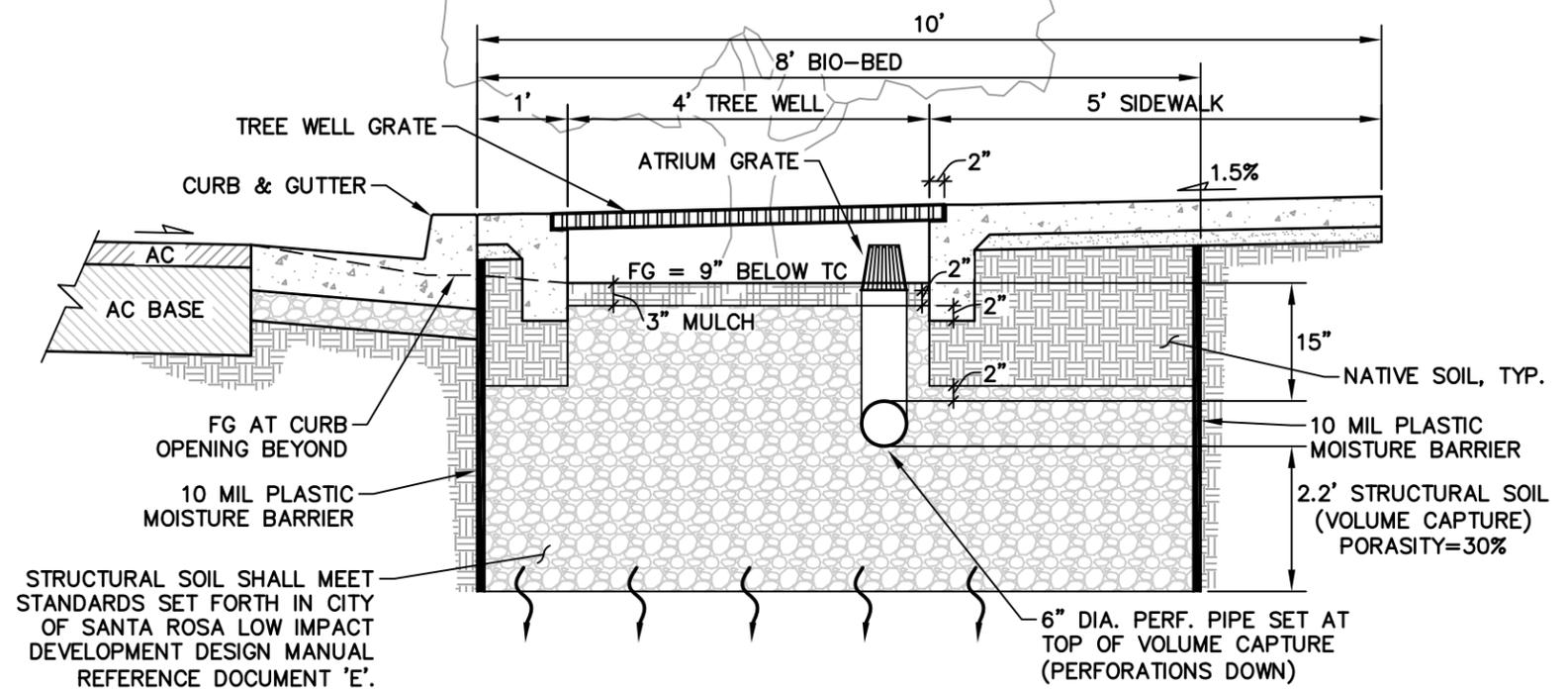
PLAN

BOLT DOWN GRATE SIMILAR TO CALTRANS STD. RSP D77B, TYPE 24-13. BOLTING DETAIL PER CALTRANS STD. RSP D77A.



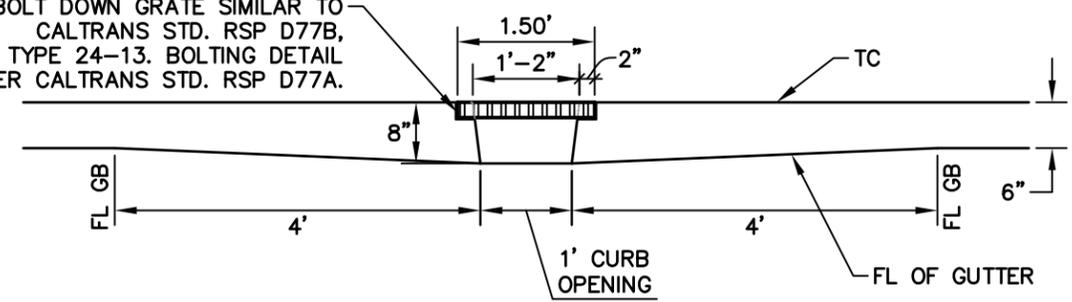
SECTION B - B

STREET TREE SELECTION SHALL COMPLY WITH CITY STREET TREE LIST



SECTION A - A

BOLT DOWN GRATE SIMILAR TO CALTRANS STD. RSP D77B, TYPE 24-13. BOLTING DETAIL PER CALTRANS STD. RSP D77A.



SECTION C - C

**1 TREE WELL WITH VOLUME CAPTURE DETAIL**

NO SCALE

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BMP DETAILS  
THE PULLMAN LOFTS

SANTA ROSA, CALIFORNIA

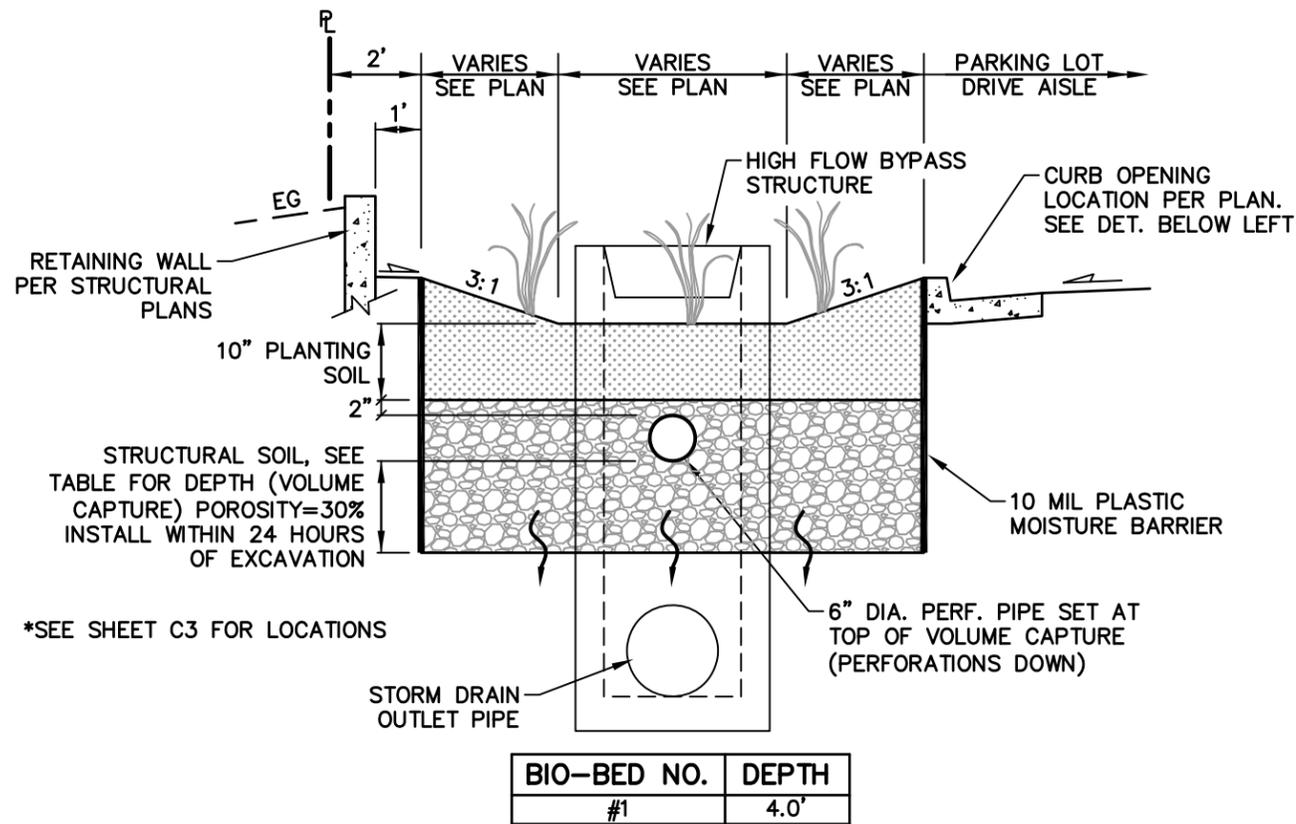
MARCH 2021

JOB NO.  
14-107

SHEET NO.

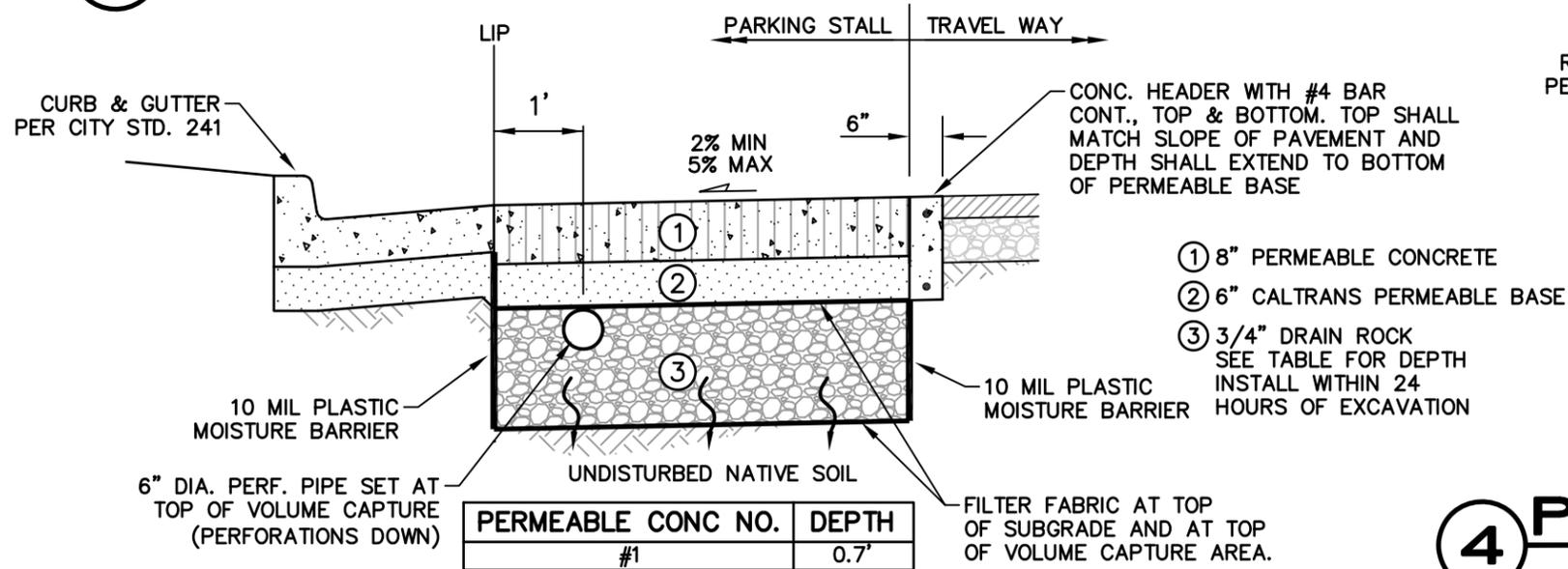
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OF 2 SHEET



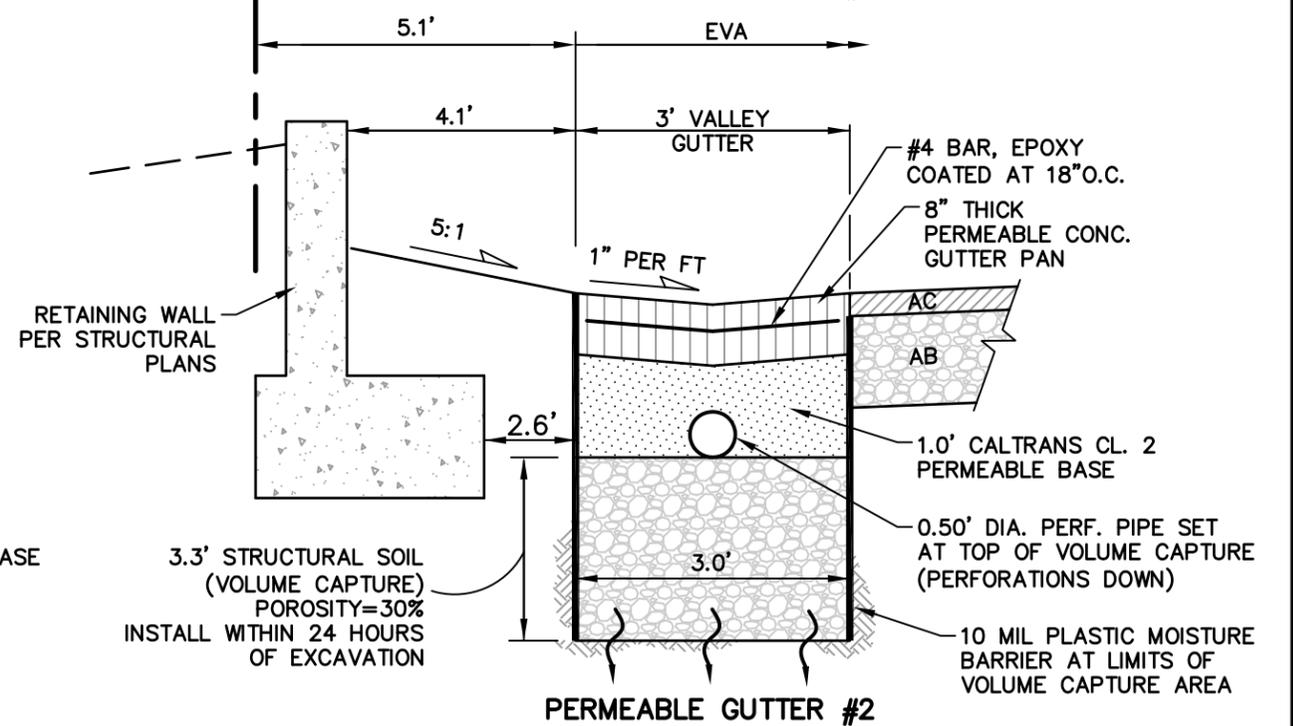
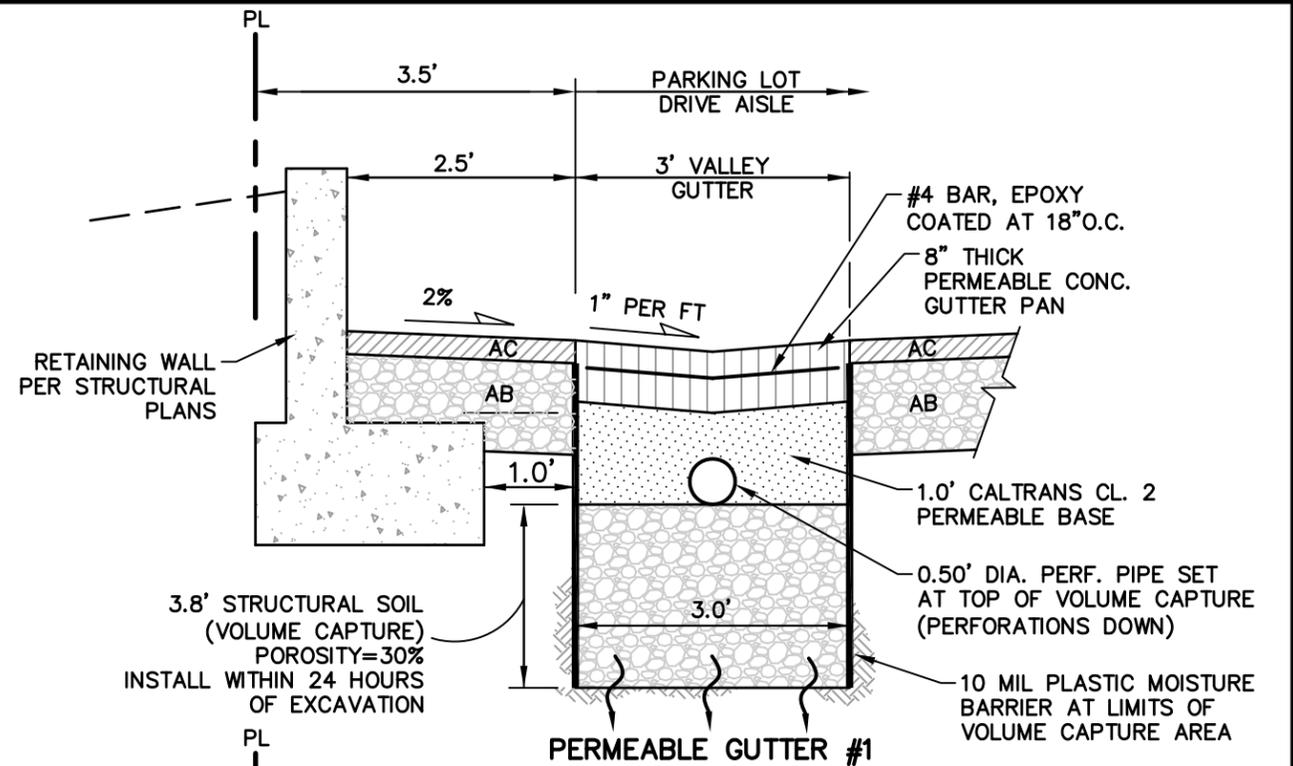
## 2 BIORETENTION DETAIL

NO SCALE



## 3 PERMEABLE CONCRETE PARKING

NO SCALE



## 4 PERMEABLE GUTTER

NO SCALE

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BMP DETAILS  
THE PULLMAN LOFTS

SANTA ROSA, CALIFORNIA

MARCH 2021

JOB NO.  
14-107

SHEET NO.

2

OF 2 SHEET

**STORM WATER CALCULATOR\***

\*For example only, go to [www.srcity.org/stormwaterlid](http://www.srcity.org/stormwaterlid) for the latest version of the calculator

Project:   
 Address/Location:   
 Designer:   
 Date:   
 Inlet Number/Tributary Area/BMP:

**NOTE:** In order for this calculator to function properly macros must be enabled.

Physical Tributary Area that drains to Inlet/BMP =  ft<sup>2</sup>

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

**Disconnected Roof Drains**<sup>[1]</sup>

**Input:**

Select disconnection condition:   
 Condition Factor =

**Method 1: Based on the total rooftop drainage area-** to be used if rooftop information is known.

**Input:**

Enter amount of rooftop area that drain to disconnected downspouts =  ft<sup>2</sup>  
 Rooftop Area Factor =  Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)  
 (18,679 x 0.25 x 0.00) =  ft<sup>2</sup> **Rooftop Drainage Area Reduction**

**Method 2: Based on density (units per acre)-** to be used if rooftop information is unknown.

**Input:**

Enter percent of rooftop area to be disconnected from downspouts:  %  
 Select Density:  Units per Acre  
 Density Reduction Factor =

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)  
 (18,679 x 0.25 x 0.00 x 0.19) =  ft<sup>2</sup> **Density Reduction**

**NOTE:**  
 Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[1] See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

[4] Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.

[5] Per the "Urban Hydrology For Small Watersheds" TR-55 manual.

[6] Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

[7] From Sonoma County Water Agency Flood Control Design Criteria.

[8] Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.

[9] Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

**Paved Area Disconnection**<sup>[1]</sup>

Paved Area Type (select from drop down list):

Multiplier =

Enter area of alternatively designed paved area:  ft<sup>2</sup>

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

**Interceptor Trees**<sup>[2]</sup>

Number of new **Evergreen Trees** that qualify as interceptor trees =

**New Evergreen Trees**

Area Reduction due to new Evergreen Trees =  ft<sup>2</sup> (200 ft<sup>2</sup>/tree)

Number of new **Deciduous Trees** that qualify as interceptor trees =

**New Deciduous Trees**

Area Reduction due to new Deciduous Trees =  ft<sup>2</sup> (100 ft<sup>2</sup>/tree)

Enter square footage of qualifying existing tree canopy =

**Existing Tree Canopy**

Allowed reduction credit for existing tree canopy =  ft<sup>2</sup> Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction =  ft<sup>2</sup> = Sum of areas managed by evergreen + deciduous + existing canopy

**NOTE:**

*Total Interceptor Area Reduction is limited to 50% of the physical tributary area.*

**INSTRUCTIONS:**

Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

**Buffer Strips & Bovine Terraces**<sup>[3]</sup>

Enter area draining to a Buffer Strip or Bovine Terrace =  ft<sup>2</sup>

Buffer Factor =

**Solution:**

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

**Revised Tributary Area due to Pollution Prevention Measures**

Physical Tributary Area =  ft<sup>2</sup>

Tributary Area Reduction due to Pollution Prevention Measures<sup>(4)</sup> =  ft<sup>2</sup>

Reduced Tributary Area to be used for Calculations =  ft<sup>2</sup>

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

**Design Goal: 100% Volume Capture**

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

**Formulas:**

$$S = \frac{1000}{CN} - 10$$

Where:

S= Potential maximum retention after runoff (in)<sup>[5]</sup>  
CN= Curve Number <sup>[5]</sup>

$$Q = \frac{[(P+K)-(0.2 \cdot S)]^2}{[(P+K)+(0.8 \cdot S)]} \times \frac{1\text{ft}}{12\text{in}}$$

Where:

Q= Runoff depth (ft) <sup>[6]</sup>  
P= Precipitation (in) = **0.92**  
K= Seasonal Precipitation Factor <sup>[7]</sup>

*0.92 inches in the Santa Rosa area, based on local historical data.*

$$V = (Q)(A_r)$$

Where:

V= Volume of Storm Water to be Retained (ft<sup>3</sup>)  
A<sub>r</sub>= Reduced Tributary Area including credit for Pollution Prevention Measures (ft<sup>2</sup>)

**Input:** (Pick data from drop down lists or enter calculated values)

A<sub>r</sub> =  ft<sup>2</sup>  
K <sup>[7]</sup> =

**Drop down Lists**

Select post development hydrologic soil type within tributary area <sup>[8]</sup> =   
Select post development ground cover description <sup>[5]</sup> =

CN<sub>POST</sub> =   
**OR:** Composite post development CN <sup>[9]</sup> =

**NOTE:**  
*Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.*

**Solution:**

**Volume of storm water - Post Development**

S<sub>POST</sub> =  in

$$S_{POST} = \frac{1000}{93} - 10$$

Where:

S<sub>POST</sub>= Post development potential maximum retention after runoff (in).

Q<sub>POST</sub> =  ft

$$Q_{POST} = \frac{[(0.92 \cdot 1.00)-(0.2 \cdot 0.75)]^2}{[(0.92 \cdot 1.00)+(0.8 \cdot 0.75)]} \times \frac{1\text{ft}}{12\text{in}}$$

Q<sub>POST</sub>= Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

V<sub>GOAL</sub> =  ft<sup>3</sup>

$$V_{GOAL} = (0.03251)(17,579)$$

V<sub>GOAL</sub>= Post Development Volume of Storm Water to be Retained (ft<sup>3</sup>)

**INSTRUCTIONS:**

This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

**NOTE:**

If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

**LID BMP Sizing Tool: 100% Volume Capture Goal:  $V_{GOAL}$**

**Formulas:**

$$V_{LID\ GOAL} = (V_{GOAL}) / (P) = 1904.98 \text{ ft}^3$$

$$A_{LID\ GOAL} = (W)(L) = 880.00 \text{ ft}^2$$

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

**Input:**

P =  as a decimal  
 D =  ft Below perforated pipe if present  
 W =  ft  
 L =  ft

**Solution:**

$$\text{Percent of Goal Achieved} = 101.63\% = [(2.2 \times 880) / 1,905] \times 100$$

**NOTE:**

*LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.*

**INSTRUCTIONS:**

The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe ( if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

**STORM WATER CALCULATOR\***

\*For example only, go to [www.srcity.org/stormwaterlid](http://www.srcity.org/stormwaterlid) for the latest version of the calculator

Project:   
 Address/Location:   
 Designer:   
 Date:   
 Inlet Number/Tributary Area/BMP:

**NOTE:** In order for this calculator to function properly macros must be enabled.

Physical Tributary Area that drains to Inlet/BMP =  ft<sup>2</sup>

[1] See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

**Disconnected Roof Drains**<sup>[1]</sup>

**Input:**

Select disconnection condition:   
 Condition Factor =

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

**Method 1: Based on the total rooftop drainage area-** to be used if rooftop information is known.

**Input:**

Enter amount of rooftop area that drain to disconnected downspouts =  ft<sup>2</sup>  
 Rooftop Area Factor =  Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

[4] Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.

[5] Per the "Urban Hydrology For Small Watersheds" TR-55 manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

$(16,802 \times 0.25 \times 0.48) =$   ft<sup>2</sup> **Rooftop Drainage Area Reduction**

[6] Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

[7] From Sonoma County Water Agency Flood Control Design Criteria.

**Method 2: Based on density (units per acre)-** to be used if rooftop information is unknown.

**Input:**

Enter percent of rooftop area to be disconnected from downspouts:  %  
 Select Density:  Units per Acre  
 Density Reduction Factor =

**NOTE:**  
 Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[8] Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.

[9] Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

$(16,802 \times 0.25 \times 0.00 \times 0.19) =$   ft<sup>2</sup> **Density Reduction**

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

**Paved Area Disconnection**<sup>[1]</sup>

Paved Area Type (select from drop down list):

Multiplier =

Enter area of alternatively designed paved area:  ft<sup>2</sup>

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

**Interceptor Trees**<sup>[2]</sup>

Number of new **Evergreen Trees** that qualify as interceptor trees =

**New Evergreen Trees**

Area Reduction due to new Evergreen Trees =  ft<sup>2</sup> (200 ft<sup>2</sup>/tree)

Number of new **Deciduous Trees** that qualify as interceptor trees =

**New Deciduous Trees**

Area Reduction due to new Deciduous Trees =  ft<sup>2</sup> (100 ft<sup>2</sup>/tree)

Enter square footage of qualifying existing tree canopy =

**Existing Tree Canopy**

Allowed reduction credit for existing tree canopy =  ft<sup>2</sup> Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction =  ft<sup>2</sup> = Sum of areas managed by evergreen + deciduous + existing canopy

**NOTE:**

*Total Interceptor Area Reduction is limited to 50% of the physical tributary area.*

**INSTRUCTIONS:**

Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

**Buffer Strips & Bovine Terraces**<sup>[3]</sup>

Enter area draining to a Buffer Strip or Bovine Terrace =  ft<sup>2</sup>

Buffer Factor =

**Solution:**

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

**Revised Tributary Area due to Pollution Prevention Measures**

Physical Tributary Area =  ft<sup>2</sup>

Tributary Area Reduction due to Pollution Prevention Measures<sup>(4)</sup> =  ft<sup>2</sup>

Reduced Tributary Area to be used for Calculations =  ft<sup>2</sup>

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

**Design Goal: 100% Volume Capture**

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

**Formulas:**

$$S = \frac{1000}{CN} - 10$$

Where:

S= Potential maximum retention after runoff (in)<sup>(5)</sup>  
CN= Curve Number <sup>(5)</sup>

$$Q = \frac{[(P+K)-(0.2 \cdot S)]^2}{[(P+K)+(0.8 \cdot S)]} \times \frac{1\text{ft}}{12\text{in}}$$

Where:

Q= Runoff depth (ft) <sup>(6)</sup>  
P= Precipitation (in) = **0.92**  
K= Seasonal Precipitation Factor <sup>(7)</sup>

*0.92 inches in the Santa Rosa area, based on local historical data.*

$$V = (Q)(A_r)$$

Where:

V= Volume of Storm Water to be Retained (ft<sup>3</sup>)  
A<sub>r</sub>= Reduced Tributary Area including credit for Pollution Prevention Measures (ft<sup>2</sup>)

**Input:** (Pick data from drop down lists or enter calculated values)

A<sub>r</sub> =  ft<sup>2</sup>  
K <sup>(7)</sup> =

**Drop down Lists**

Select post development hydrologic soil type within tributary area <sup>(8)</sup> =   
Select post development ground cover description <sup>(5)</sup> =

CN<sub>POST</sub> =   
**OR:** Composite post development CN <sup>(9)</sup> =

**NOTE:**  
*Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.*

**Solution:**

**Volume of storm water - Post Development**

S<sub>POST</sub> =  in

$$S_{POST} = \frac{1000}{93} - 10$$

Where:

S<sub>POST</sub>= Post development potential maximum retention after runoff (in).

Q<sub>POST</sub> =  ft

$$Q_{POST} = \frac{[(0.92 \cdot 1.00)-(0.2 \cdot 0.75)]^2}{[(0.92 \cdot 1.00)+(0.8 \cdot 0.75)]} \times \frac{1\text{ft}}{12\text{in}}$$

Q<sub>POST</sub>= Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

V<sub>GOAL</sub> =  ft<sup>3</sup>

$$V_{GOAL} = (0.03251)(14,769)$$

V<sub>GOAL</sub>= Post Development Volume of Storm Water to be Retained (ft<sup>3</sup>)

**INSTRUCTIONS:**

This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

**NOTE:**

If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

**LID BMP Sizing Tool: 100% Volume Capture Goal:  $V_{GOAL}$**

**Formulas:**

$$V_{LID\ GOAL} = (V_{GOAL}) / (P) = 1600.47 \text{ ft}^3$$

$$A_{LID\ GOAL} = (W)(L) = 408.00 \text{ ft}^2$$

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

**Input:**

P = 0.3 as a decimal  
 D = 4.0 ft Below perforated pipe if present  
 W = 1.0 ft  
 L = 408.0 ft

**Solution:**

$$\text{Percent of Goal Achieved} = 101.97\% = [(4.0 \times 408) / 1,600] \times 100$$

**NOTE:**

*LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.*

**INSTRUCTIONS:**

The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe ( if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

**STORM WATER CALCULATOR\***

\*For example only, go to [www.srcity.org/stormwaterlid](http://www.srcity.org/stormwaterlid) for the latest version of the calculator

Project:   
 Address/Location:   
 Designer:   
 Date:   
 Inlet Number/Tributary Area/BMP:

**NOTE:** In order for this calculator to function properly macros must be enabled.

Physical Tributary Area that drains to Inlet/BMP =  ft<sup>2</sup>

[1] See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

**Disconnected Roof Drains**<sup>[1]</sup>

**Input:**

Select disconnection condition:   
 Condition Factor =

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

**Method 1: Based on the total rooftop drainage area-** to be used if rooftop information is known.

**Input:**

Enter amount of rooftop area that drain to disconnected downspouts =  ft<sup>2</sup>  
 Rooftop Area Factor =  Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

[4] Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.

[5] Per the "Urban Hydrology For Small Watersheds" TR-55 manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

$(15,072 \times 0.25 \times 0.62) = \text{2345.25 ft}^2$  **Rooftop Drainage Area Reduction**

[6] Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

[7] From Sonoma County Water Agency Flood Control Design Criteria.

**Method 2: Based on density (units per acre)-** to be used if rooftop information is unknown.

**Input:**

Enter percent of rooftop area to be disconnected from downspouts:  %  
 Select Density:  Units per Acre  
 Density Reduction Factor =

**NOTE:**  
 Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[8] Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.

[9] Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

$(15,072 \times 0.25 \times 0.00 \times 0.19) = \text{0.00 ft}^2$  **Density Reduction**

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

**Paved Area Disconnection**<sup>[1]</sup>

Paved Area Type (select from drop down list):

Multiplier =

Enter area of alternatively designed paved area:  ft<sup>2</sup>

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

**Interceptor Trees**<sup>[2]</sup>

Number of new **Evergreen Trees** that qualify as interceptor trees =

New Evergreen Trees

Area Reduction due to new Evergreen Trees =  ft<sup>2</sup> (200 ft<sup>2</sup>/tree)

Number of new **Deciduous Trees** that qualify as interceptor trees =

New Deciduous Trees

Area Reduction due to new Deciduous Trees =  ft<sup>2</sup> (100 ft<sup>2</sup>/tree)

Enter square footage of qualifying existing tree canopy =

Existing Tree Canopy

Allowed reduction credit for existing tree canopy =  ft<sup>2</sup> Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction =  ft<sup>2</sup> = Sum of areas managed by evergreen + deciduous + existing canopy

**NOTE:**  
Total Interceptor Area  
Reduction is limited to 50% of  
the physical tributary area.

**INSTRUCTIONS:**

Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

**Buffer Strips & Bovine Terraces**<sup>[3]</sup>

Enter area draining to a Buffer Strip or Bovine Terrace =  ft<sup>2</sup>

Buffer Factor =

**Solution:**

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

**Revised Tributary Area due to Pollution Prevention Measures**

Physical Tributary Area =  ft<sup>2</sup>

Tributary Area Reduction due to Pollution Prevention Measures<sup>(4)</sup> =  ft<sup>2</sup>

Reduced Tributary Area to be used for Calculations =  ft<sup>2</sup>

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

**Design Goal: 100% Volume Capture**

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

**Formulas:**

$$S = \frac{1000}{CN} - 10$$

Where:

S= Potential maximum retention after runoff (in)<sup>[5]</sup>  
CN= Curve Number <sup>[5]</sup>

$$Q = \frac{[(P+K)-(0.2 * S)]^2}{[(P+K)+(0.8 * S)]} \times \frac{1\text{ft}}{12\text{in}}$$

Where:

Q= Runoff depth (ft) <sup>[6]</sup>  
P= Precipitation (in) = **0.92**  
K= Seasonal Precipitation Factor <sup>[7]</sup>

*0.92 inches in the Santa Rosa area, based on local historical data.*

$$V = (Q)(A_r)$$

Where:

V= Volume of Storm Water to be Retained (ft<sup>3</sup>)  
A<sub>r</sub>= Reduced Tributary Area including credit for Pollution Prevention Measures (ft<sup>2</sup>)

**Input:** (Pick data from drop down lists or enter calculated values)

A<sub>r</sub> =  ft<sup>2</sup>  
K <sup>[7]</sup> =

**Drop down Lists**

Select post development hydrologic soil type within tributary area <sup>[8]</sup> =   
Select post development ground cover description <sup>[5]</sup> =

CN<sub>POST</sub> =   
**OR:** Composite post development CN <sup>[9]</sup> =

**NOTE:**  
*Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.*

**Solution:**

**Volume of storm water - Post Development**

S<sub>POST</sub> =  in

$$S_{POST} = \frac{1000}{93} - 10$$

Where:

S<sub>POST</sub>= Post development potential maximum retention after runoff (in).

Q<sub>POST</sub> =  ft

$$Q_{POST} = \frac{[(0.92 * 1.00) - (0.2 * 0.75)]^2}{[(0.92 * 1.00) + (0.8 * 0.75)]} \times \frac{1\text{ft}}{12\text{in}}$$

Q<sub>POST</sub>= Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

V<sub>GOAL</sub> =  ft<sup>3</sup>

$$V_{GOAL} = (0.03251)(11,375)$$

V<sub>GOAL</sub>= Post Development Volume of Storm Water to be Retained (ft<sup>3</sup>)

**INSTRUCTIONS:**

This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

**NOTE:**

If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

**LID BMP Sizing Tool: 100% Volume Capture Goal:  $V_{GOAL}$**

**Formulas:**

$$V_{LID\ GOAL} = (V_{GOAL}) / (P) = 924.50 \text{ ft}^3$$

$$A_{LID\ GOAL} = (W)(L) = 1352.00 \text{ ft}^2$$

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

**Input:**

- P = 0.4 as a decimal
- D = 0.7 ft Below perforated pipe if present
- W = 1.0 ft
- L = 1,352.0 ft

**Solution:**

$$\text{Percent of Goal Achieved} = 102.37\% = [(0.7 \times 1,352) / 925] \times 100$$

**NOTE:**

*LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.*

**INSTRUCTIONS:**

The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe ( if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

**STORM WATER CALCULATOR\***

\*For example only, go to [www.srcity.org/stormwaterlid](http://www.srcity.org/stormwaterlid) for the latest version of the calculator

Project:   
 Address/Location:   
 Designer:   
 Date:   
 Inlet Number/Tributary Area/BMP:

**NOTE:** In order for this calculator to function properly macros must be enabled.

Physical Tributary Area that drains to Inlet/BMP =  ft<sup>2</sup>

[1] See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

**Disconnected Roof Drains**<sup>[1]</sup>

**Input:**

Select disconnection condition:   
 Condition Factor =

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

**Method 1: Based on the total rooftop drainage area-** to be used if rooftop information is known.

**Input:**

Enter amount of rooftop area that drain to disconnected downspouts =  ft<sup>2</sup>  
 Rooftop Area Factor =  Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

[4] Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.

[5] Per the "Urban Hydrology For Small Watersheds" TR-55 manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(29,450 x 0.25 x 0.41) =  ft<sup>2</sup> **Rooftop Drainage Area Reduction**

[6] Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

[7] From Sonoma County Water Agency Flood Control Design Criteria.

**Method 2: Based on density (units per acre)-** to be used if rooftop information is unknown.

**Input:**

Enter percent of rooftop area to be disconnected from downspouts:  %  
 Select Density:  Units per Acre  
 Density Reduction Factor =

**NOTE:**  
 Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[8] Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(29,450 x 0.25 x 0.00 x 0.19) =  ft<sup>2</sup> **Density Reduction**

[9] Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

**Paved Area Disconnection**<sup>[1]</sup>

Paved Area Type (select from drop down list):

Multiplier =

Enter area of alternatively designed paved area:  ft<sup>2</sup>

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

**Interceptor Trees**<sup>[2]</sup>

Number of new **Evergreen Trees** that qualify as interceptor trees =

**New Evergreen Trees**

Area Reduction due to new Evergreen Trees =  ft<sup>2</sup> (200 ft<sup>2</sup>/tree)

Number of new **Deciduous Trees** that qualify as interceptor trees =

**New Deciduous Trees**

Area Reduction due to new Deciduous Trees =  ft<sup>2</sup> (100 ft<sup>2</sup>/tree)

Enter square footage of qualifying existing tree canopy =

**Existing Tree Canopy**

Allowed reduction credit for existing tree canopy =  ft<sup>2</sup> Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction =  ft<sup>2</sup> = Sum of areas managed by evergreen + deciduous + existing canopy

**NOTE:**

*Total Interceptor Area Reduction is limited to 50% of the physical tributary area.*

**INSTRUCTIONS:**

Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

**Buffer Strips & Bovine Terraces**<sup>[3]</sup>

Enter area draining to a Buffer Strip or Bovine Terrace =  ft<sup>2</sup>

Buffer Factor =

**Solution:**

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

**Revised Tributary Area due to Pollution Prevention Measures**

Physical Tributary Area =  ft<sup>2</sup>

Tributary Area Reduction due to Pollution Prevention Measures<sup>(4)</sup> =  ft<sup>2</sup>

Reduced Tributary Area to be used for Calculations =  ft<sup>2</sup>

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

**Design Goal: 100% Volume Capture**

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

**Formulas:**

$$S = \frac{1000}{CN} - 10$$

Where:

S= Potential maximum retention after runoff (in)<sup>(5)</sup>  
CN= Curve Number <sup>(5)</sup>

$$Q = \frac{[(P+K)-(0.2 \cdot S)]^2}{[(P+K)+(0.8 \cdot S)]} \times \frac{1\text{ft}}{12\text{in}}$$

Where:

Q= Runoff depth (ft) <sup>(6)</sup>  
P= Precipitation (in) = **0.92**  
K= Seasonal Precipitation Factor <sup>(7)</sup>

*0.92 inches in the Santa Rosa area, based on local historical data.*

$$V = Q(A_r)$$

Where:

V= Volume of Storm Water to be Retained (ft<sup>3</sup>)  
A<sub>r</sub>= Reduced Tributary Area including credit for Pollution Prevention Measures (ft<sup>2</sup>)

**Input:** (Pick data from drop down lists or enter calculated values)

A<sub>r</sub> =  ft<sup>2</sup>  
K <sup>(7)</sup> =

**Drop down Lists**

Select post development hydrologic soil type within tributary area <sup>(8)</sup> =   
Select post development ground cover description <sup>(5)</sup> =

CN<sub>POST</sub> =   
**OR:** Composite post development CN <sup>(9)</sup> =

**NOTE:**  
*Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.*

**Solution:**

**Volume of storm water - Post Development**

S<sub>POST</sub> =  in

$$S_{POST} = \frac{1000}{93} - 10$$

Where:

S<sub>POST</sub>= Post development potential maximum retention after runoff (in).

Q<sub>POST</sub> =  ft

$$Q_{POST} = \frac{[(0.92 \cdot 1.00)-(0.2 \cdot 0.75)]^2}{[(0.92 \cdot 1.00)+(0.8 \cdot 0.75)]} \times \frac{1\text{ft}}{12\text{in}}$$

Q<sub>POST</sub>= Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

V<sub>GOAL</sub> =  ft<sup>3</sup>

$$V_{GOAL} = (0.03251)(25,693)$$

V<sub>GOAL</sub>= Post Development Volume of Storm Water to be Retained (ft<sup>3</sup>)

**INSTRUCTIONS:**

This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

**NOTE:**

If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

**LID BMP Sizing Tool: 100% Volume Capture Goal:  $V_{GOAL}$**

**Formulas:**

$$V_{LID\ GOAL} = (V_{GOAL}) / (P) = 2784.26 \text{ ft}^3$$

$$A_{LID\ GOAL} = (W)(L) = 736.00 \text{ ft}^2$$

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

**Input:**

P =  as a decimal  
 D =  ft Below perforated pipe if present  
 W =  ft  
 L =  ft

**Solution:**

$$\text{Percent of Goal Achieved} = 100.45\% = [(3.8 \times 736) / 2,784] \times 100$$

**NOTE:**

*LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.*

**INSTRUCTIONS:**

The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe ( if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

**STORM WATER CALCULATOR\***

\*For example only, go to [www.srcity.org/stormwaterlid](http://www.srcity.org/stormwaterlid) for the latest version of the calculator

Project:   
 Address/Location:   
 Designer:   
 Date:   
 Inlet Number/Tributary Area/BMP:

**NOTE:** In order for this calculator to function properly macros must be enabled.

Physical Tributary Area that drains to Inlet/BMP =  ft<sup>2</sup>

This portion of the Storm water Calculator is designed to account for pollution prevention measures implemented on site. Additional information and description of these measures can be found in the Fact Sheets in Appendix F and in Chapter 4 of the narrative.

[1] See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.

**Disconnected Roof Drains**<sup>[1]</sup>

**Input:**

Select disconnection condition:   
 Condition Factor =

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

**Method 1: Based on the total rooftop drainage area-** to be used if rooftop information is known.

**Input:**

Enter amount of rooftop area that drain to disconnected downspouts =  ft<sup>2</sup>  
 Rooftop Area Factor =  Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

[4] Total area reductions due to pollution Prevention Measures cannot exceed 50% of the physical Tributary Area.

[5] Per the "Urban Hydrology For Small Watersheds" TR-55 manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

$(9,019 \times 0.25 \times 0.00) =$   ft<sup>2</sup> **Rooftop Drainage Area Reduction**

[6] Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

[7] From Sonoma County Water Agency Flood Control Design Criteria.

**Method 2: Based on density (units per acre)-** to be used if rooftop information is unknown.

**Input:**

Enter percent of rooftop area to be disconnected from downspouts:  %  
 Select Density:  Units per Acre  
 Density Reduction Factor =

**NOTE:**  
 Either Method 1 (rooftop area) or Method 2 (density) can be used. Providing input for both methods will cause an error. If rooftop area information is available, Method 1 should be used.

[8] Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.

[9] Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.

**Solution:**

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

$(9,019 \times 0.25 \times 0.00 \times 0.19) =$   ft<sup>2</sup> **Density Reduction**

[10] From "Using Site Design to Meet Development Standards For Storm water Quality" by the Bay Area Storm water Management Agencies Association (BASMAA).

**Paved Area Disconnection**<sup>[1]</sup>

Paved Area Type (select from drop down list):

Multiplier =

Enter area of alternatively designed paved area:  ft<sup>2</sup>

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit for driveways designed to minimize runoff. Enter type and area of alternate design.

**Interceptor Trees**<sup>[2]</sup>

Number of new **Evergreen Trees** that qualify as interceptor trees =

**New Evergreen Trees**

Area Reduction due to new Evergreen Trees =  ft<sup>2</sup> (200 ft<sup>2</sup>/tree)

Number of new **Deciduous Trees** that qualify as interceptor trees =

**New Deciduous Trees**

Area Reduction due to new Deciduous Trees =  ft<sup>2</sup> (100 ft<sup>2</sup>/tree)

Enter square footage of qualifying existing tree canopy =

**Existing Tree Canopy**

Allowed reduction credit for existing tree canopy =  ft<sup>2</sup> Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Area Reduction =  ft<sup>2</sup> = Sum of areas managed by evergreen + deciduous + existing canopy

**NOTE:**  
*Total Interceptor Area Reduction is limited to 50% of the physical tributary area.*

**INSTRUCTIONS:**

Calculates the area reductions credit due to interceptor trees. Includes both new and existing trees. Enter the number of new deciduous and evergreen trees and the canopy area of existing trees.

**Buffer Strips & Bovine Terraces**<sup>[3]</sup>

Enter area draining to a Buffer Strip or Bovine Terrace =  ft<sup>2</sup>

Buffer Factor =

**Solution:**

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction =  ft<sup>2</sup>

**INSTRUCTIONS:**

Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

**Revised Tributary Area due to Pollution Prevention Measures**

Physical Tributary Area =  ft<sup>2</sup>

Tributary Area Reduction due to Pollution Prevention Measures<sup>(4)</sup> =  ft<sup>2</sup>

Reduced Tributary Area to be used for Calculations =  ft<sup>2</sup>

This worksheet calculates the quantity of storm water that needs to be addressed (captured and/or treated) to comply with the NPDES Storm Water Permit issued to the City of Santa Rosa and County of Sonoma by the North Coast Regional Water Quality Control Board.

**Design Goal: 100% Volume Capture**

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.

**Formulas:**

$$S = \frac{1000}{CN} - 10$$

Where:

S= Potential maximum retention after runoff (in)<sup>(5)</sup>  
CN= Curve Number <sup>(5)</sup>

$$Q = \frac{[(P+K)-(0.2 \cdot S)]^2}{[(P+K)+(0.8 \cdot S)]} \times \frac{1\text{ft}}{12\text{in}}$$

Where:

Q= Runoff depth (ft) <sup>(6)</sup>  
P= Precipitation (in) = **0.92**  
K= Seasonal Precipitation Factor <sup>(7)</sup>

*0.92 inches in the Santa Rosa area, based on local historical data.*

$$V = (Q)(A_r)$$

Where:

V= Volume of Storm Water to be Retained (ft<sup>3</sup>)  
A<sub>r</sub>= Reduced Tributary Area including credit for Pollution Prevention Measures (ft<sup>2</sup>)

**Input:** (Pick data from drop down lists or enter calculated values)

A<sub>r</sub> =  ft<sup>2</sup>  
K <sup>(7)</sup> =

**Drop down Lists**

Select post development hydrologic soil type within tributary area <sup>(8)</sup> =   
Select post development ground cover description <sup>(5)</sup> =

CN<sub>POST</sub> =   
**OR:** Composite post development CN <sup>(9)</sup> =

**NOTE:**  
*Entering a calculated composite CN will override selections made from the pull down menu above. Calculation worksheet should be used for all composite calculations and included with submittal.*

**Solution:**

**Volume of storm water - Post Development**

S<sub>POST</sub> =  in

S<sub>POST</sub> =  $\frac{1000}{93} - 10$

Where:

S<sub>POST</sub>= Post development potential maximum retention after runoff (in).

Q<sub>POST</sub> =  ft

Q<sub>POST</sub> =  $\frac{[(0.92 \cdot 1.00)-(0.2 \cdot 0.75)]^2}{[(0.92 \cdot 1.00)+(0.8 \cdot 0.75)]} \times \frac{1\text{ft}}{12\text{in}}$

Q<sub>POST</sub>= Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

V<sub>GOAL</sub> =  ft<sup>3</sup>

V<sub>GOAL</sub> = (0.03251)(8,726)

V<sub>GOAL</sub>= Post Development Volume of Storm Water to be Retained (ft<sup>3</sup>)

**INSTRUCTIONS:**

This Design Goal of 100% Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required and pages 4 and 5 of this calculator do not need to be completed.

**NOTE:**

If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

**LID BMP Sizing Tool: 100% Volume Capture Goal:  $V_{GOAL}$**

**Formulas:**

$$V_{LID\ GOAL} = (V_{GOAL}) / (P) = 945.61 \text{ ft}^3$$

$$A_{LID\ GOAL} = (W)(L) = 293.00 \text{ ft}^2$$

$$\text{Percent of Goal Achieved} = \frac{(D)(A_{LID\ GOAL})}{V_{LID\ GOAL}} \times 100$$

**Input:**

- P = 0.3 as a decimal
- D = 3.3 ft Below perforated pipe if present
- W = 1.0 ft
- L = 293.0 ft

**Solution:**

$$\text{Percent of Goal Achieved} = 102.25\% = [(3.3 \times 293) / 946] \times 100$$

**NOTE:**

*LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.*

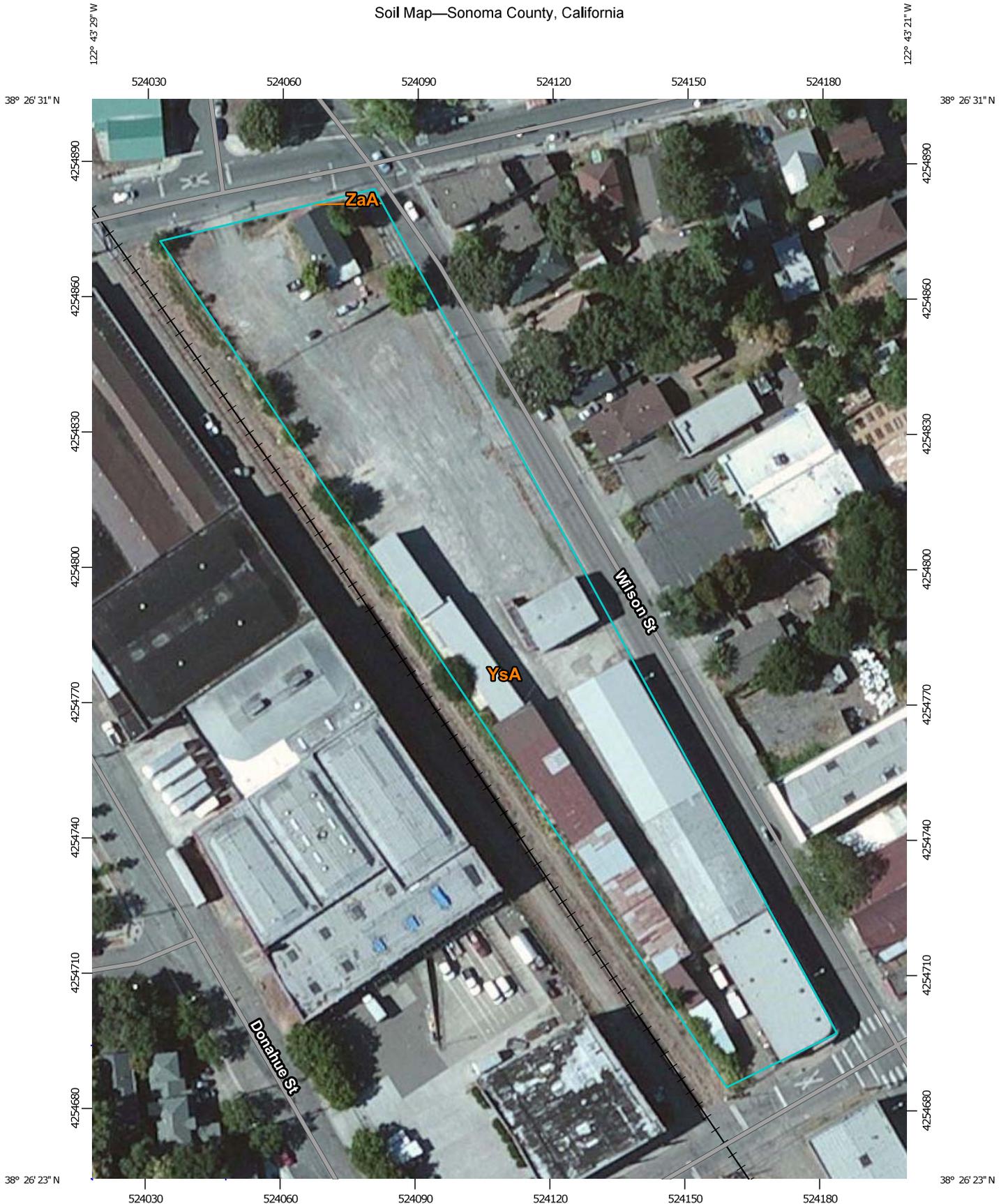
**INSTRUCTIONS:**

The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition. Enter the percent porosity of the specified soil and depth below perforated pipe ( if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.

## Worksheet 2: Runoff curve number and runoff

| Project<br>THE PULLMAN LOFTS  |   | By<br>ML         |            | Date<br>3/30/21 |   |                      |
|---|---|------------------|------------|-----------------|---|----------------------|
| Location<br>TOTAL SITE  |   | Checked<br>AB    |            | Date<br>3/30/21 |   |                      |
| Check One: <input type="checkbox"/> Present <input checked="" type="checkbox"/> Developed   |   |                  |            |                 |   |                      |
| <b>1. Runoff curve number</b>   |   |                  |            |                 |   |                      |
| Soil Name and hydrologic group<br>(appendix A)  | Cover Description<br>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio) | CN <sup>1/</sup> |            |                 | Area<br><input type="checkbox"/> acres<br><input type="checkbox"/> sf<br><input type="checkbox"/> % | Product of CN x area |
|   |   | Table 2-2        | Figure 2-3 | Figure 2-4      |   |                      |
| B   | ROOF, PARKING LOT, HARDSCAPE  | 98               |            |                 | 1.790   | 175.42               |
| B   | LANDSCAPE   | 61               |            |                 | 0.250   | 15.25                |
|   |   |                  |            |                 |   |                      |
|   |   |                  |            |                 |   |                      |
|   |   |                  |            |                 |   |                      |
|   |   |                  |            |                 |   |                      |
|   |   |                  |            |                 |   |                      |
| <sup>1/</sup> Use only one CN source per line<br>CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{190.67}{2.04}$ |   |                  |            |                 | 2.04  | 190.67               |
|   |   |                  |            |                 | <b>Totals ►</b>   |                      |
|   |   |                  |            |                 | <b>Use CN ►</b>   | <b>93</b>            |

Soil Map—Sonoma County, California



Map Scale: 1:1,170 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

## MAP LEGEND

- Area of Interest (AOI)
- Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points
- Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features
- 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: <http://websoilsurvey.nrcs.usda.gov>  
 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 8, Sep 25, 2014

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

Date(s) aerial images were photographed: Aug 14, 2011—Aug 15, 2011

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.

## Map Unit Legend

| Sonoma County, California (CA097)  |   |              |                |
|------------------------------------|---|--------------|----------------|
| Map Unit Symbol                    | Map Unit Name                                 | Acres in AOI | Percent of AOI |
| YsA                                | Yolo silt loam, 0 to 2 percent slopes         | 2.0          | 99.7%          |
| ZaA                                | Zamora silty clay loam, 0 to 2 percent slopes | 0.0          | 0.3%           |
| <b>Totals for Area of Interest</b> |   | <b>2.0</b>   | <b>100.0%</b>  |

## Sonoma County, California

### YsA—Yolo silt loam, 0 to 2 percent slopes

#### Map Unit Setting

*National map unit symbol:* hfkw

*Elevation:* 30 to 400 feet

*Mean annual precipitation:* 16 to 22 inches

*Mean annual air temperature:* 61 degrees F

*Frost-free period:* 240 to 260 days

*Farmland classification:* Prime farmland if irrigated

#### Map Unit Composition

*Yolo and similar soils:* 85 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Yolo

##### Setting

*Landform:* Alluvial fans

*Landform position (two-dimensional):* Backslope

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from sedimentary rock

##### Typical profile

*H1 - 0 to 8 inches:* silt loam

*H2 - 8 to 60 inches:* silt loam

##### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):*

Moderately high to high (0.57 to 1.98 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

*Available water storage in profile:* High (about 10.6 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 1

*Land capability classification (nonirrigated):* 3c

*Hydrologic Soil Group:* B

### **Minor Components**

#### **Unnamed**

*Percent of map unit:* 15 percent

### **Data Source Information**

Soil Survey Area: Sonoma County, California

Survey Area Data: Version 8, Sep 25, 2014

BMP Selection Table

| Management Practice (BMP)  | Detail Sheet           | Detail Title | Can be used with...    |    | High Ground Water | Contamination | Slope Constrains | Achieves... | Treatment | Volume Capture | Pollution Prevention | BMP in priority selected? |    | Explanation of selection | Other notes: |
|--|------------------------|--------------|------------------------|----|-------------------|---------------|------------------|-------------|-----------|----------------|----------------------|---------------------------|----|--------------------------|--------------|
|  |                        |              | Yes                    | No |                   |               |                  |             |           |                |                      | Yes                       | No |                          |              |
| <b>Universal LID Features-</b> to be considered on all projects. | Living Roof            | N/A          | N/A                    | x  | x                 | x             | x                | x           | x         | x              |                      |                           |    |                          |              |
|  | Rainwater Harvesting   | N/A          | N/A                    | x  | x                 | x             | x                | x           | x         |                |                      |                           |    |                          |              |
|  | Interceptor Trees      | N/A          | N/A                    | x  | x                 | x             | x                | x           |           | x              |                      |                           |    |                          |              |
|  | Vegetated Buffer Strip | UN-01        | Vegetated Buffer Strip |    |                   |               |                  |             |           |                | x                    |                           |    |                          |              |
|  | Bovine Terrace         | UN-02        | Bovine Terrace         | x  |                   |               |                  |             |           |                | x                    |                           |    |                          |              |
| Impervious Area Disconnection                                    | N/A                    | N/A          |                        | x  | x                 |               |                  |             |           |                | x                    |                           |    |                          |              |

**BMP Selection Table**

| Best Management Practice (BMP)   | Detail Sheet                         | Detail Title | Can be used with...<br>High Ground Water | Comamination | Slope Constraints | Achieves...<br>Treatment | Volume Capture | Pollution Prevention Credit | BMP in this priority selected? |    | Explanation of selection | Other notes: |
|--|--------------------------------------|--------------|--|--------------|-------------------|--------------------------|----------------|-----------------------------|--------------------------------|----|--------------------------|--------------|
|  |                                      |              |  |              |                   |                          |                |                             | Yes                            | No |                          |              |
| <b>Priority 2 BMPs- with subsurface drains installed above the capture volume.</b> | Rain Garden                          | P2-01        | Rain Garden                              |              |                   | X                        | X              |                             |                                |    |                          |              |
|  | Roadside Bioretention - Flush Design | P2-02        | Roadside Bioretention - Flush Design     |              |                   | X                        | X              |                             | ✓                              |    |                          |              |
|  | Roadside Bioretention- Contiguous SW | P2-03        | Roadside Bioretention- Contiguous SW     |              |                   | X                        | X              |                             |                                |    |                          |              |
|  | Roadside Bioretention- Curb Opening  | P2-04        | Roadside Bioretention- Curb Opening      |              |                   | X                        | X              |                             |                                |    |                          |              |
|  | Roadside Bioretention- No C & G      | P2-05        | Roadside Bioretention- No C & G          |              |                   | X                        | X              |                             |                                |    |                          |              |
|  | Pervious Pavement                    | P2-06        | Vegetated Buffer Strip                   |              |                   | X                        | X              |                             |                                | ✓  |                          |              |
| Constructed Wetlands   | N/A                                  | N/A          |  |              | X                 | X                        |                |                             |                                |    |                          |              |

# 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) |
|---------------------|------------------|--|-----------------------|--|--|
| <b>Drainage</b>     | RS               | Is there standing or pooling of water in the Bioretention area after 3 days of dry weather?    |                       | <ul style="list-style-type: none"> <li>• Check perforated pipe outlet for obstruction or damage. *</li> <li>• Flush perforated pipe to remove obstructions/sediment. *</li> <li>• Remove and replace the first few inches of topsoil.</li> <li>• Remove soil and inspect perforated pipe. Repair or replace perforated pipe, replace with new soil and regrade.</li> </ul> |  |
|                     |                  | Is water not draining into catch basin from the overflow pipe during a high intensity storm? * |                       |  |  |
|                     | PRS<br>RS<br>ARS | Is there sediment visible in the gutter?   |                       | <ul style="list-style-type: none"> <li>• In dry weather, use a mechanical sweeper or a Vactor truck to clean gutter pan.</li> </ul>  |  |
|                     | RS               | Is there water flowing in the pervious concrete gutter section during a low intensity storm? * |                       | <ul style="list-style-type: none"> <li>• In wet weather, use a Vactor truck to clean gutter pan.</li> </ul>  |  |

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

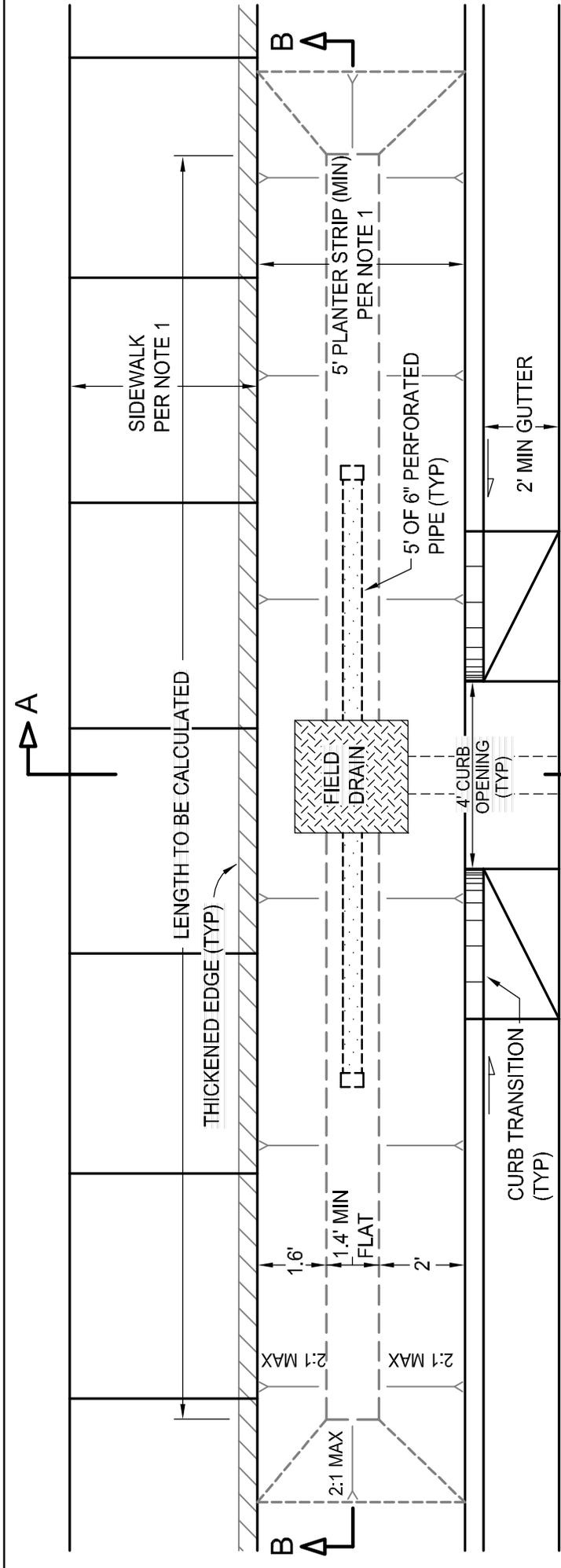
\* If perforated pipe is present.

# 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<br>RS<br>ARS | Is the vegetation clogging the inlet flow areas?                     |                       | <ul style="list-style-type: none"> <li>Trim and/or remove the excess vegetation.</li> </ul>   |  |
|                     | PRS<br>RS<br>ARS | Is the mulch distributed evenly throughout the planter area?         |                       | <ul style="list-style-type: none"> <li>Redistribute and add additional mulch if needed.</li> <li>Regrade planter area.</li> </ul>   |  |
|                     | PRS<br>RS<br>ARS | Are there dead or dry plants/weeds?<br>Is the vegetation over grown? |                       | <ul style="list-style-type: none"> <li>Remove dead and/or dry vegetation. Replace as needed.</li> <li>Remove or trim any vegetation that is causing a visual barrier, trip, and or obstruction hazard.</li> </ul> |  |

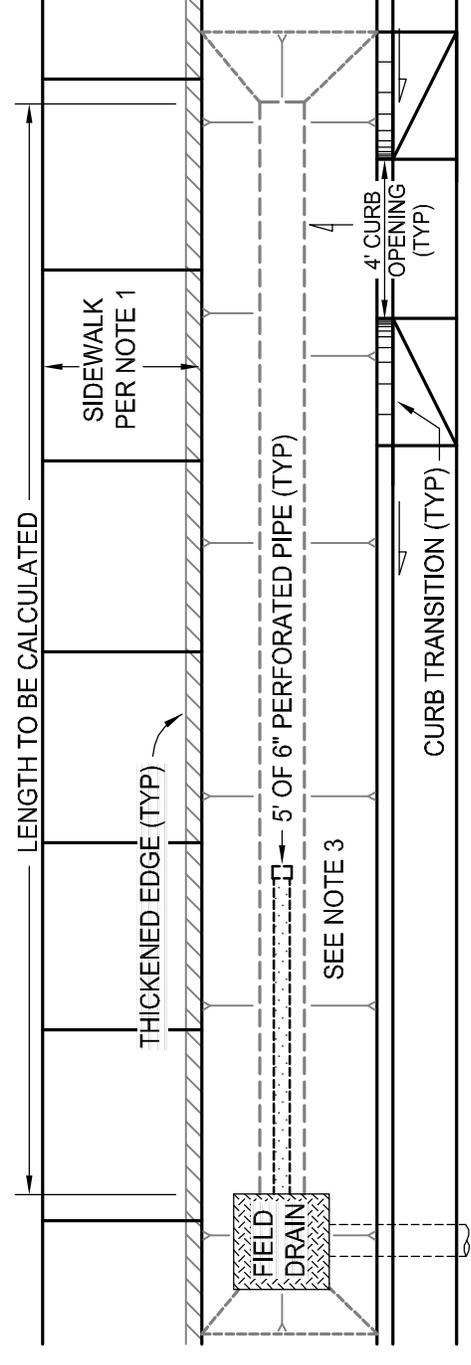
# PLANTER STRIP BIORETENTION- CHECKLIST

| 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) |
|---------------------|------------------|---|-----------------------|---|--|
| <b>BMP General</b>  | PRS<br>RS<br>ARS | Is there debris/trash in the planter area?  |                       | <ul style="list-style-type: none"> <li>● Remove all trash and debris.</li> </ul>  |  |
|                     | PRS<br>RS<br>ARS | Is graffiti present?  |                       | <ul style="list-style-type: none"> <li>● Remove all graffiti from the area.</li> </ul>  |  |
|                     | PRS<br>RS<br>ARS | Are there missing or disturbed aesthetics features?                                     |                       | <ul style="list-style-type: none"> <li>● Replace and/or reposition aesthetics features to original placement.</li> <li>● Placement should not disrupt flow characteristics/design.</li> </ul> |  |
|                     | PRS<br>RS<br>ARS | Is the vegetation irrigation functional?  |                       | <ul style="list-style-type: none"> <li>● Repaired broken missing spray/drip emitters.</li> <li>● Reposition and/or adjust to eliminate over spray and/or over watering.</li> </ul>            |  |
|                     | PRS<br>RS<br>ARS | Are the aesthetic features firmly secured in placed?                                    |                       | <ul style="list-style-type: none"> <li>● Repair and/or replace loose or damage features.</li> </ul>   |  |
|                     | PRS<br>RS<br>ARS | Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling. |                       | <ul style="list-style-type: none"> <li>● Remove and replace damaged areas.</li> </ul>   |  |



PLAN  
TYPE A - CURB OPENING AT LOW POINT

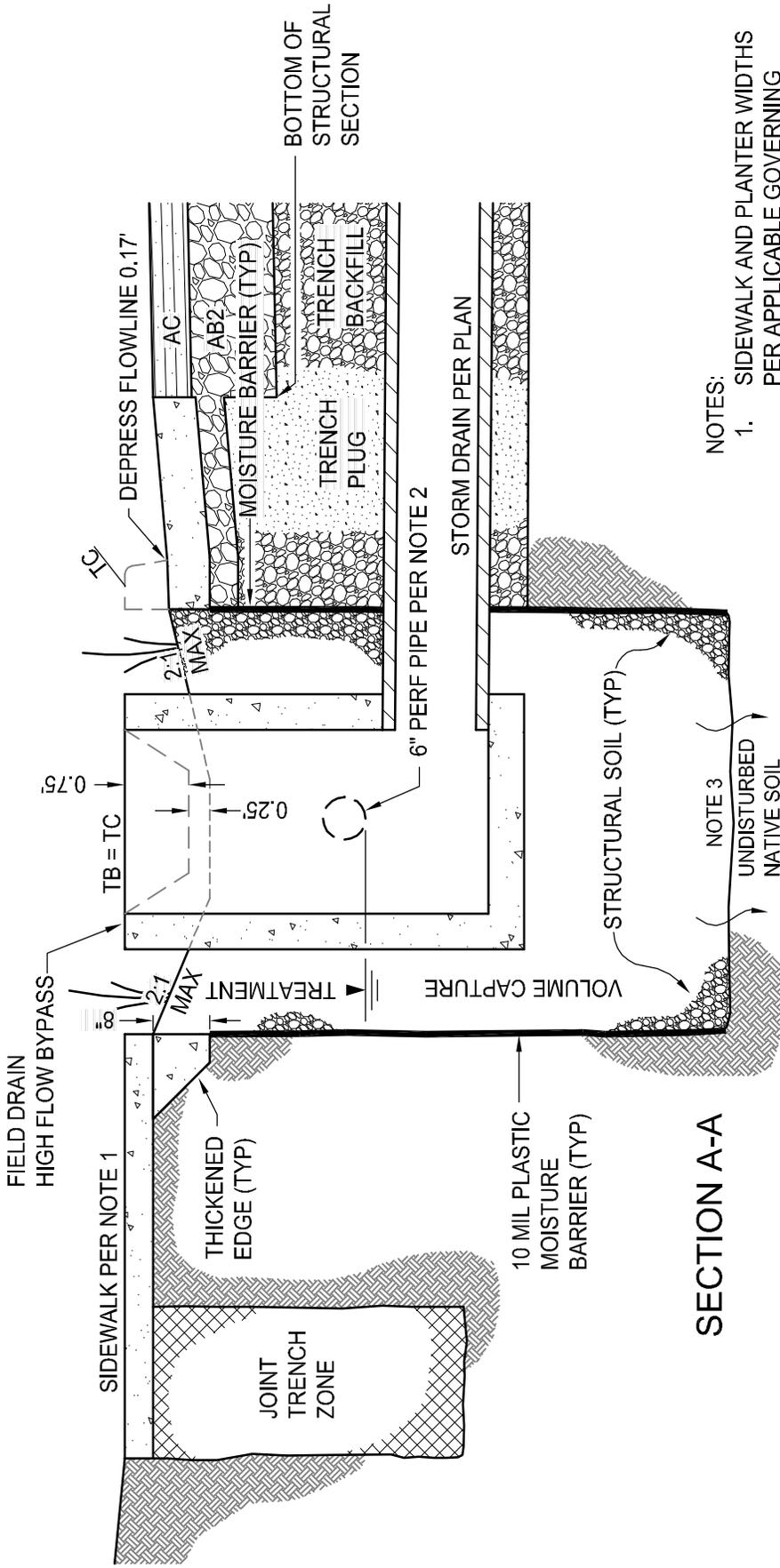
- NOTE:
1. SIDEWALK AND PLANTER WIDTHS PER APPLICABLE MUNICIPAL STANDARDS (TYP).
  2. TOP OF 6" PERFORATED PIPE TO BE SET 6" BELOW ROAD STRUCTURAL SECTION.
  3. TYPE A MINIMUM DIMENSIONS AND GRADES APPLY TO TYPE B.
  4. BIORETENTION AREA PLANTS TO BE SELECTED FROM APPROVED PLANT LIST.



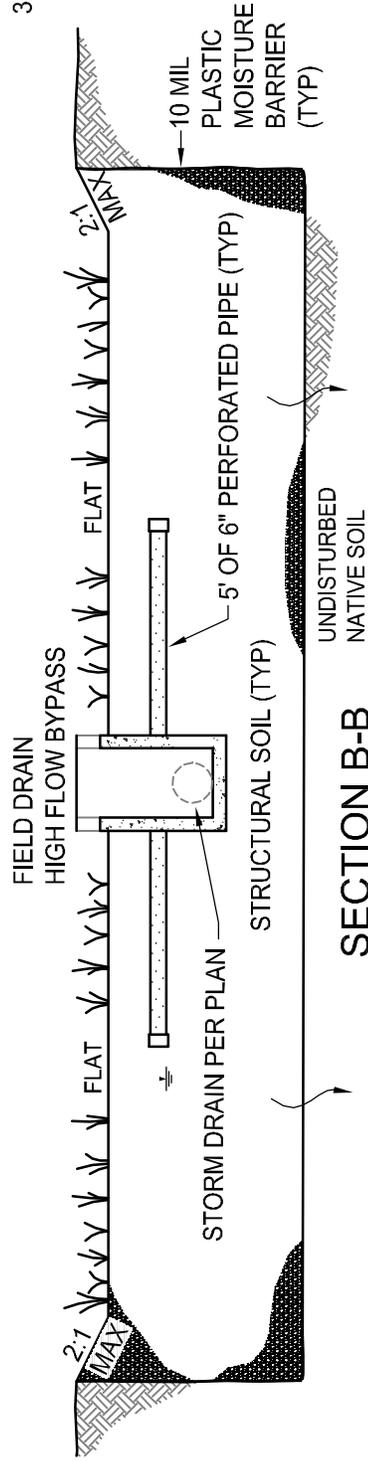
TYPE B - CURB OPENING ALONG A SLOPE

|   |                |
|---|----------------|
| <b>PRIORITY 2</b>                               |                |
| <b>ROADSIDE BIORETENTION<br/>- CURB OPENING</b> |                |
| SCALE: NONE                                     | DATE: 05/10/11 |
| DWN. DIT  | SHEET 1 of 2   |
| CHK. HH   | P2-04          |

Not to Scale



**SECTION A-A**



**SECTION B-B**

**NOTES:**

1. SIDEWALK AND PLANTER WIDTHS PER APPLICABLE GOVERNING AGENCY STANDARDS (TYP).
2. TOP OF 6" PERFORATED PIPE TO BE SET 6" BELOW BOTTOM OF ROAD STRUCTURAL SECTION.
3. BOTTOM OPEN TO ALLOW INFILTRATION INTO NATIVE SOIL.

|   |                |
|---|----------------|
| <b>PRIORITY 2</b>                           |                |
| <b>ROADSIDE BIORETENTION - CURB OPENING</b> |                |
| <b>SECTION A-A &amp; B-B</b>                |                |
| SCALE: NONE                                 | DATE: 05/10/11 |
| DWN. DIT                                    | SHEET 2 of 2   |
| CHK. HH                                     | P2-04          |

Not to Scale

# POROUS PAVEMENT- CHECKLIST

## Porous Pavement

### Inspection and Maintenance Checklist

(aka: Unit Pavers, Porous Concrete)

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) |
|---------------------|------------------|---|-----------------------|---|--|
| <b>Drainage</b>     | RS               | Is there standing or pooling of water?  |                       | <ul style="list-style-type: none"> <li>• Check perforated pipe outlet for obstruction or damage. *</li> <li>• Flush perforated pipe to remove obstructions/sediment. *</li> <li>• Repair or replace perforated pipe, replace with new soil and regrade.</li> <li>• Subsurface layers may need cleaning and/or replacing.</li> <li>• In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>• In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul> |  |
|                     |                  | Is there visible water flowing over the surface of the pervious concrete/pavers during a low intensity storm? |                       |   |  |
|                     | PRS<br>RS<br>ARS | Is there sediment visible on the surface of the pervious concrete/pavers?                                     |                       | <ul style="list-style-type: none"> <li>• In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> </ul>  |  |

\* If perforated pipe is present.

# POROUS PAVEMENT- 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) |
|---------------------|------------------|---|-----------------------|---|--|
| <b>Erosion</b>      | RS<br>ARS        | Is there under cutting or washouts along the sidewalks and/or curbs abutting a planter strip?   |                       | <ul style="list-style-type: none"> <li>• Fill in eroded areas and regrade.</li> </ul>   |  |
|                     | PRS<br>RS<br>ARS | <p>Are there cracks, uplifts, slumps, missing pavers, and/or pot holes present?</p> <p>Is there sediment present in the catch basin and in the overflow pipe?</p> |                       | <ul style="list-style-type: none"> <li>• Check perforated pipe outlet for damage. *</li> <li>• Repair or replace perforated pipe, replace with new soil and regrade.*</li> <li>• Subsurface layers may need cleaning and/or replacing.</li> <li>• Replace or repair damaged areas.</li> </ul> |  |

\* If perforated pipe is present.

# POROUS PAVEMENT- CHECKLIST

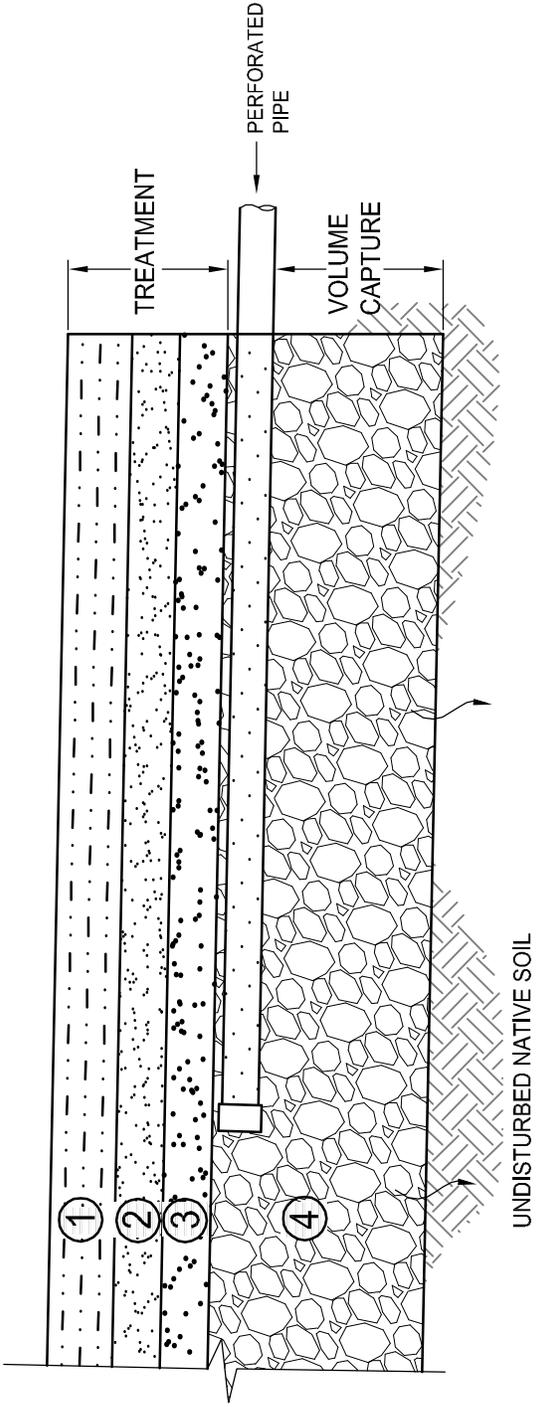
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| Inspection Category | When to Inspect  | Maintenance Issue   | Is the Issue Present? | Require Maintenance  | Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done) |
|---------------------|------------------|---|-----------------------|--|--|
| <b>Vegetation</b>   | PRS<br>RS<br>ARS | Is the vegetation clogging the inlet flow areas?                                |                       | <ul style="list-style-type: none"> <li>● Trim and/or remove the excess vegetation.</li> </ul>  |  |
|                     | PRS<br>RS<br>ARS | Is there vegetation growing in the cracks, stress lines, and/or abutment areas? |                       | <ul style="list-style-type: none"> <li>● Remove vegetation.</li> <li>● In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>● In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul> |  |
|                     | PRS<br>RS<br>ARS | Is algae present?   |                       | <ul style="list-style-type: none"> <li>● In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>● In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul>                               |  |

# POROUS PAVEMENT- 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) |
|---------------------|------------------|---|-----------------------|--|--|
| <b>BMP General</b>  | PRS<br>RS<br>ARS | Is there debris/trash area?   |                       | <ul style="list-style-type: none"> <li>● Remove all trash and debris.</li> </ul>   |  |
|                     | PRS<br>RS<br>ARS | Is there gum or other material stuck to the pervious surface?                           |                       | <ul style="list-style-type: none"> <li>● In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>● In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul> |  |
|                     | PRS<br>RS<br>ARS | Is graffiti present?  |                       | <ul style="list-style-type: none"> <li>● Remove all graffiti from the area.</li> </ul>   |  |
|                     | PRS<br>RS<br>ARS | Are there missing or disturbed aesthetics features?                                     |                       | <ul style="list-style-type: none"> <li>● Replace and/or reposition aesthetics features to original placement.</li> <li>● Placement should not disrupt flow characteristics/design.</li> </ul>                            |  |
|                     | PRS<br>RS<br>ARS | Are the aesthetic features firmly secured in placed?                                    |                       | <ul style="list-style-type: none"> <li>● Repair and/or replace loose or damaged features.</li> </ul>   |  |
|                     | PRS<br>RS<br>ARS | Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling. |                       | <ul style="list-style-type: none"> <li>● Remove and replace damaged areas.</li> </ul>  |  |

- ① PERMEABLE PAVEMENT OR SURFACE PER GOVERNING AGENCY STANDARDS
- ② SAND LAYER (FINE SAND)
- ③ TRANSITION LAYER (COARSE SAND) AS NEEDED FOR CONVEYANCE AND TREATMENT
- ④ STRUCTURAL SOIL OR DRAIN ROCK



PRIORITY 2  
PERMEABLE PAVEMENT

|             |                |
|-------------|----------------|
| SCALE: NONE | DATE: 05/10/11 |
| DWN. DIT    | P2-06          |
| CHK. HH     |                |

Not to Scale

RECORDING REQUESTED BY  
AND WHEN RECORDED MAIL TO: \_\_\_\_\_

City of Santa Rosa- Utilities Department  
Storm Water & Creeks Section- Supervising Engineer  
69 Stony Circle  
Santa Rosa CA 95401

Project/Property: Pullman Lofts - 701 Wilson Street  
APN(s): 010-091-005

Santa Rosa, California

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**DECLARATION OF COVENANTS REGARDING MAINTENANCE OF  
STORM WATER BMP FACILITIES**

This Declaration of Covenants Regarding Maintenance of Storm Water BMP Facilities (“Agreement”) is made on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_ (“Landowner”) \_\_\_\_\_ [if business entity, ADD type].

RECITALS

- A. Landowner is the fee simple owner of certain real property located in the City of Santa Rosa (“City”), Sonoma County, California, [INSERT lot numbers, and development description; APN numbers] and more fully described in Exhibit A to this Agreement (“Property”).
- B. The City’s National Pollutant Discharge Elimination System (“NPDES”) Municipal Separate Storm Sewer System (“MS4”) Permit, Order number R1-2009-0050, issued by the North Coast Regional Water Quality Control Board, requires the City to implement and enforce specific requirements for the construction and maintenance of onsite storm water management facilities/best management practices (collectively, “BMP”) for development, redevelopment, and other applicable projects with the goal of mitigating impacts to storm water quality and runoff volume discharges into the MS4.
- C. Provisions of Chapter 17-12 and other applicable sections of the Santa Rosa City Code shall apply to the construction, inspection and maintenance of BMP facilities and the enforcement of MS4 Permit requirements.

D. On \_\_\_\_\_, \_\_\_\_\_ [INSERT DATE and WHO (City Engineer OR Chief Building Official)] approved Landowner's [Improvement Plans OR Building Permit Site Plan] ("Plan") \_\_\_\_\_ [INSERT Plan or Permit Number] and a Final Standard Urban Stormwater Mitigation Plan ("SUSMP") for the Property which include provisions for the construction and maintenance of BMP facilities on the Property (the "BMP Facilities") by Landowner. The BMP Facilities required under the SUSMP may include both built and landscaping features. The \_\_\_\_\_ [Plan, SUSMP,] may be inspected at the City of Santa Rosa, Department of Utilities, Storm Water & Creeks Section, 69 Stony Circle upon appointment.

E. The \_\_\_\_ [Plan, SUSMP] requires that Landowner enter into this Agreement.

### AGREEMENT

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

1. Landowner shall, at its sole cost and expense, construct, inspect, and maintain the BMP Facilities in accordance with the Plan and the SUSMP.
2. In the event Landowner fails to maintain the BMP Facilities in good working condition as solely determined by the City, the City may enter upon the Property and take whatever steps it deems reasonably necessary to maintain and/or make in good working condition, such BMP Facilities. It is expressly understood that the City is under no obligation to maintain or repair the BMP Facilities, and in no event shall this Agreement be construed to impose such an obligation on the City.
3. In the event that the City 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 Agreement, as solely determined by City, Landowner shall reimburse the City within 60 days of receipt of notice for all costs incurred by the City 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.
4. Any violation of the Plan or SUSMP by Landowner shall be deemed a public nuisance under Chapter 1-30 of the Santa Rosa City Code and City shall be entitled to the remedies available to it under Chapter 1-30 in addition to those available to it under Chapter 17-12. The remedies identified herein shall be in addition to and cumulative of all other remedies, criminal or civil, which may be pursued by the City.

5. Landowner shall indemnify, defend and hold harmless the City and its employees, officials, and agents, from and against any liability, (including liability for claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, 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 BMP Facilities on the Property or the performance of this Agreement by Landowner, its officers, employees, agents, contractors or sub-contractors, excepting only that resulting from the sole, active negligence or intentional misconduct of the City, its employees, officials, or agents. This indemnification obligation is not limited in any way by any limitation on the 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 City, its officials, agents, or employees, shall be entered, Landowner shall pay all cost and expenses in connection therewith.
6. If any provisions of this Agreement 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.
7. This Agreement 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 Agreement shall be brought exclusively and solely in Sonoma County, California.
8. Landowner shall not assign this Agreement to a third party without the express prior written consent of the City, provided that such consent will not be unreasonably withheld and that such consent shall not be required for Landowner to sell or lease the property to a third party.
9. Landowner binds itself, its partners, successors, legal representatives and assigns to the City, and to the partners, successors, legal representatives and assigns of the City with respect to all promises and agreements contained herein.
10. This Agreement 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, 3) benefit the City of Santa Rosa, its successors, and assigns. Any breach of this Agreement shall render Landowner or Landowner's heirs, successors or assigns liable pursuant to the provisions of the Santa Rosa City Code.
11. Any notice, submittal or communication required or permitted to be served on Landowner or City 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:

City Representative:

Landowner or Landowner Representative:

City of Santa Rosa  
Utilities Department  
Storm Water & Creeks Section  
Supervising Engineer  
69 Stony Circle  
Santa Rosa CA 95401

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Executed as of the day and year first above stated.

**LANDOWNER:**

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

*Signatures of Authorized Persons:*

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

**ATTACHMENTS:**

Exhibit A- Property Description  
Notary Acknowledgment