CITY OF FLORENCE
Stormwater Design Manual

A GUIDE TO THE DESIGN AND CONSTRUCTION OF STORMWATER FACILITIES WITHIN THE CITY OF FLORENCE, OR

CITY OF FLORENCE
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1. INTRODUCTION

The purpose of this manual is to provide clear direction to the development community to effectively implement the City's Stormwater Management Policy. Larger Oregon cities such as Portland and Eugene have been mandated for a number of years to implement stormwater management in compliance with the Clean Water Act. However, the city of Florence has chosen to implement stormwater management proactively. The importance of stormwater management in Florence is highlighted by the region's unique hydrology, climate, and geology that call for unique design and construction techniques. This design manual will provide details on how to properly permit, design, and build Stormwater facilities in the City of Florence

What is Stormwater Management?

> **Stomwater Management:** The planning, design, construction, regulation, improvement, repair, maintenance, and operation of facilities and programs relating to flood control, erosion prevention, conservation, and water quality utilizing the construction of facilities or structures to control the quantity and quality of storm water.

Why is stormwater Management important in Florence?

1. *Protect the Aquifer: Stormwater percolates into the Florence Dunal Aquifer, a federally protected sole source aquifer. Stormwater pollutants can directly infiltrate into the city's aquifer threatening the city's only feasible drinking water source.*

2. *Surface Water Quality: Surface runoff generally drains to the Siuslaw River which contains Federally Protected threatened Coho Salmon. Common pollutants found in stormwater are highly toxic to aquatic species.*

3. *Reduce Risk to Public and Private Property: Protection of property, public health and safety. Proper management of stormwater reduces the risks to public and private property. New development implementing Stormwater Best Management Practices*

(BMP's) has a reduced environmental impact and lessens costs to the public to construct and maintain the City's stormwater conveyance system.

4. *Reduce Damage During Flooding Events: Protection of downstream property. Through detention and retention of stormwater pre-development hydrology is mimicked, thus reducing risks of flooding and bank erosion to downstream properties*

5. *Reduce Future Costs: Cooperation with the intent of the Clean Water Act and federal regulation. While stormwater management is yet to be mandated to smaller communities. Federal oversight and regulation continues to develop. Proactively managing stormwater reduces potential future liability and costs to retrofit stormwater treatment systems within the city.*

6. *Livable Community: Everybody benefits from reduced flooding, cleaner waterways, and pure drinking water.*

Background:

The city completed a Stormwater Master Plan in 1999 and implemented a Stormwater Utility in 2006 as recommended in the Master Plan. City Stormwater Code (Title 9, Chapter 5) refers to fees, permits, submittal requirements, and specific stormwater management standards required for all new development. This document provides more detailed guidance on how to meet these standards, as well as additional requirements related to stormwater management.

The city has adopted the 2008 city of Portland Stormwater Management Manual as the design manual of BMP design. The Portland Manual is the result of significant investment, research, and field testing and is a valuable resource for other communities and agencies in the state. All stormwater facilities must be designed and constructed to the standards laid out in the Portland Stormwater Management Manual except as such standards are superseded and amended by this design manual. The intent is to maintain consistency in designing stormwater facilities except where modifications are necessary to adapt to Florence's unique political, geological, hydrological, and environmental aspects.

City Code requires that Stormwater BMP's be used on all projects with over 5,000 ft^2 of new or redeveloped impervious area. 100% of the stormwater runoff from these properties must pass through treatment and retention facilities prior to discharge off-site. Use of vegetated infiltration facilities shall be the BMP of choice and used to the maximum extent practicable. Vegetated BMP's reduce the volume of stormwater flowing off-site by retaining it near the source, and include swales, rain gardens (aka bioinfiltration basins), stormwater planters, and filter strips.

Pervious Pavements can be used to reduce impervious area requiring treatment. Structural detention and treatment facilities may be used when site constraints preclude treatment of all of the sites stormwater with vegetated infiltration facilities.

All new streets and public works project that increase impervious area should incorporate "Green Street" elements to manage stormwater prior to discharge off-site. Green Street elements are BMP's specially suited for being located within the street right-of-way, designed and constructed to address unique challenges present in streetscapes. The Green Street Standards will be evaluated for effectiveness and ease of operation and maintenance with each new project.

Green Street rain gardens and stormwater planters form an interconnected network of shallow, heavily planted landscapes with the purpose of conveying, treating, retaining, and infiltrating stormwater as part of the overall stormwater management system to mimic the natural hydrologic cycle.

In most cases, stormwater piping will be needed to convey excess stormwater from streets and private property to regional conveyance facilities (ditches, swales, pipes, etc). In all cases, emergency overflow will need to be addressed to safely convey storm events in excess of the design storm.

This overall system of private property BMP's and public right-of-way Green Street elements, and regional stormwater conveyance facilities will work as a whole to help ensure that stream systems within the City of Florence remain healthy, do not flood more frequently than before development, and continue to provide sustainable habitat for fish and wildlife.

This design manual is a compilation of the information contained in the City's adopted stormwater design manual, **The City of Portland Stormwater Management Manual, 2008 Version** and unique requirements and considerations for the city of Florence. This document explains what (BMP's) are, how to select appropriate practices for different development scenarios, how to design them, and how they should be maintained to operate effectively. Design requirements are specified regarding triggers for stormwater treatment, sizing criteria, setbacks, minimum and maximum dimensions, and materials. These requirements must be followed by applicants submitting for building and public works permits for construction in the city of Florence.

2. PUBLIC DRAINAGE SYSTEM DESCRIPTION

Florence has very unique hydrologic characteristics. Groundwater and surface runoff are inextricably related. Groundwater in the area fluctuates seasonally and annually. A majority of precipitation on pervious surfaces infiltrates the soil and contributes to the groundwater. During above average rainfall periods elevated groundwater levels near the ground surface greatly increase the rates of surface runoff. Low areas without constructed or natural drainage facilities are often inundated with water much of the year. These areas expose the high groundwater table and create seasonal wetlands.

Most of the water falling on pervious areas soaks into the ground, while most of the water falling on impervious areas quickly runs off into ditches, swales, waterways, or infiltration areas carrying pollutants and sediments with it. Due to the unique infiltration capacity of the soils the city has limited conveyance facilities. The main drainage facilities are located in the downtown area and along Highway 101. Much of the remaining areas are drained by ditches and gullies both natural and manmade.

Developments historically relied upon infiltration for disposal of groundwater with limited piped conveyance systems. Although most of the time infiltration is low cost and effective this method can fail during extended wet periods with high groundwater. While this high groundwater is important for maintaining wetlands and natural areas it can also threaten property, health, and safety. It is therefore important for all stormwater facilities in Florence to balance the recharging of the aquifer and the protection of private and public property from high groundwater and surface flooding.

Rather than being discharged directly to piped collection systems in the streets or infiltrated directly into the sand soil, stormwater runoff from private property shall be directed to on-site BMP's, such as rain gardens or stormwater planters, or reduced with the use of porous pavements. Stormwater runoff from public streets and sidewalks shall be directed to Green Street elements, such as rain gardens or stormwater planters within the public right-of-way, reduced with the use of porous pavements. After filtering through Green Development Practices, excess stormwater shall be directed to release into natural streams and wetlands or infiltrate into the ground.

2.1 Approved Stormwater Destination

Every Stormwater BMP constructed in the city of Florence must discharge to an approved destination for ultimate disposal of stormwater. Depending on the circumstance this may be a stream, channel, pipe, or infiltrated into the ground. If a project has shallow groundwater (see **section 4.6**), infiltration disposal will only be allowed with an approved overflow connection to a conveyance facility. If conveyance facilities are not available then offsite improvements or other protective measures may be required.

3. POLICY AND PERMITTING

3.1 General Regulations

The city of Florence regulates both the quantity and quality of stormwater within the city of Florence. Onsite infiltration is required to the maximum extent feasible. Where complete onsite infiltration is not feasible, vegetated onsite retention facilities are required to the maximum extent feasible. The rules are summarized as follows:

Table 3.1: Summary of Florence Stormwater Regulation.

Stormwater Quantity (Flow Control):	❖ Applies to all development projects (partitioning or subdividing). Also includes non-residential construction projects adding more than 500 square feet of impervious surfaces or disturbing over 10,000 square feet. Individual single family residential construction projects are exempt. ❖ Site runoff must be retained/ detained so that post development runoff matches pre-development runoff for the 2 through 25 yr storms. ❖ Use of stormwater retention and vegetated facilities shall be maximized and pre-developed stormwater volumes should not be exceeded.
Stormwater Quality (Pollution Reduction):	❖ Applies to projects with greater than 5,000 square feet of any combination of new and/or replaced impervious surfaces. ❖ Also applies to projects with greater than 43,560 square feet (1 acre) of contiguous pollution generating pervious surface that will be added and/or modified. ❖ Generally acceptable BMP's and standard design are outlined in this manual. However it may be necessary to reference the Portland SWMM for more detailed information and requirements. ❖ In groundwater protection areas additional measures may be required to protect drinking water.
Erosion Control	❖ No project is exempt from erosion and sediment control requirements. ❖ Projects disturbing over one acre require a DEQ NPES 1200C erosion and sediment control permit. Applicant must demonstrate to the City that a DEQ permit has been obtained for the project prior to permit issuance. For more information on see: http://www.deq.state.or.us/wq/stormwater/constappl.htm ❖ Smaller projects are required to control runoff and wind erosion. A pamphlet is available at the Public Works department to provide additional guidance and is also included in Appendix F.

3.1.1 Referenced Design Manual, Standards, and Specifications

The official stormwater facility design manual is the 2008 edition of the city of Portland Stormwater Management Manual. This manual is available at http://www.portlandonline.com/bes/index.cfm?c=43428. Within the public right of way, improvements must be designed and built in accordance with the current editions of the Oregon Standard Specifications for Construction and the City of Portland Sewer and Drainage Design Manual except as may be superseded or modified by this design manual, city of Florence Standard drawings, or other adopted policy of the city of Florence. Refer to Section 8 of this manual for a more comprehensive list of available resources.

Much time and effort has been invested into the development of Portland's Stormwater Management Manual and is a valuable resource for smaller communities such as Florence. Most of the concepts in the Portland manual are transferable to Florence but some unique considerations are required to apply the manual effectively. This Florence Stormwater Design Manual is not intended to be a comprehensive design guide but rather a resource in understanding and applying Portland's requirements to Florence's unique rules, regulations, and environment.

3.2 Purpose of Stormwater Management

As new homes, buildings, parking lots, and streets are constructed in undeveloped areas, stormwater is typically collected and piped to nearby streams. This change in natural hydrology (increase in stormwater runoff volumes and flow rates) can result in degradation to stream systems in the form of erosion and bank instability. Moreover, pollutants in the runoff washed from roads, parking lots, and rooftops can contaminate habitat for fish and other wildlife. Due to the high permeability of the native sand soil, stormwater allowed to infiltrate without treatment can potentially contaminate the aquifer and the city's sole drinking water source.

Stormwater BMP's can be used to reduce these impacts, helping the overall stormwater system mimic pre-developed hydrology. Runoff from small rainfall events infiltrates into the ground as it does in forested or undeveloped areas, replenishing the groundwater aquifer. Pollutants are filtered out by the top layers of soil where they are biodegraded by resident organisms. Much of the runoff from larger rainfall events is captured and infiltrated, while the excess is directed to the stormwater conveyance system.

This overall system of Stormwater BMP's on private property and Green Street elements in public rights-of-way, will ensure that natural stream systems, ponds, lakes, and groundwater stay healthy and continue to provide habitat for fish and wildlife.

3.3 Flow Control

Urbanization decreases the infiltration capacity and permeability of native soils and increases the amount of impervious area. Combined, these circumstances create increased stormwater flow

rates and volumes. The basic concept for flow control (detention and retention) is that water from developed areas is managed with a variety of techniques and released to downstream conveyance systems at a slower rate and lower volume. Managing flows in this way attempts to mimic the natural rainfall runoff response of the site prior to development, protecting downstream properties, infrastructure, and natural resources from the increases in stormwater runoff peak flow rates and volumes that result from development.

Detention facilities store stormwater and release the water slowly, typically over a number of hours.

Retention facilities also store stormwater. Rather than storing and releasing the entire runoff volume, however, the facility permanently retains a portion of the water onsite. The water infiltrates and recharges the groundwater aquifer and, in the case of surface retention facilities, evaporates or is absorbed and used by vegetation. In this way, retention facilities reduce the total volume of water released downstream.

Florence's hydrology presents unique opportunities and challenges. The high permeability, well drained, fine sand soil is very well suited to on-site retention facilities but seasonally shallow groundwater can simultaneously increase runoff and reduce retention opportunities. In the past, flooding has occurred in areas because of sole reliance on infiltration facilities to dispose of stormwater and underdevelopment of conveyance and detention facilities. Therefore, it is necessary to design retention facilities in high groundwater areas that also function as detention facilities. If infiltration rates slow or stop, the detention facility reduces peak flows to the downstream conveyance or increase downstream erosion.

3.3.1 Flow Control Requirements

To meet flow control requirements, planters, swales, and other vegetated surface facilities are required to the maximum extent feasible. Impervious area reduction techniques, such as pervious pavement, may also be necessary in order to meet flow control requirements. The standard requirement is to maintain peak flow rates at their pre-development levels for the 2- year, 10-year, and 25 year 24-hour runoff events. Note that for redevelopment projects, pre-development condition is defined as conditions in the year prior to application, not pre-human conditions.

3.3.2 Escape Route

All projects must demonstrate that in the event the stormwater facility fails or rainfall exceeds the facility design capacity, that flows will be routed to maintain public safety and avoid property damage. Depending on site conditions, this may include an overflow structure or storage in parking lot, street, or landscaping areas. Applicants must describe where the flow will be routed on a basin site plan to illustrate where flood conditions or ponding is expected to occur.

3.4 Pollution Reduction

Urbanization has serious impacts on the quality of surface water and groundwater. As land is developed, impervious areas contribute pollutants and interfere with the natural biological processes of soil that remove impurities from the water, and also increase stormwater runoff.

Automobiles contribute oil, grease, metals, and other pollutants to traveled ways. Runoff from lawns and other landscaped areas add fertilizer and pesticides to receiving waters. The increased flows pick up pollutants from impervious areas and transport them downstream to receiving waters and the City storm sewer system.

Pollutants of concern include:

- Suspended solids (sediment)
- Heavy metals (dissolved and particulate, such as lead, copper, zinc, and cadmium)
- Nutrients (such as nitrogen and phosphorus)
- Bacteria and viruses
- Organics (such as oil, grease, hydrocarbons, pesticides, and fertilizers)
- Floatable trash and debris

To meet pollution reduction requirements a facility must be able to provide 70 percent total suspended solids removal from 90 percent of the average annual runoff. Facilities designed under the simplified and presumptive approach are assumed to comply with this standard.

3.4.1 Vegetated Facilities

Vegetated facilities designed in accordance with this manual are assumed to meet Florence's pollution reduction requirements. Vegetated facilities filter stormwater, removing pollutants as the water flows through the vegetation and soil. Vegetation may be one of the most cost effective efficient means available to improve water quality. Vegetation shades water courses, which lowers water temperature; captures and absorbs water in leaves and roots, which reduces peak flows; and stabilizes soil by providing cover for disturbed soils. Vegetation also provides wildlife habitat and scenic and aesthetic benefits.

As stormwater enters a vegetated facility, the vegetation slows the water down, allowing sediments to be trapped on the surface of the facility. Typically, the surface area of the facility is designed to allow stormwater to pond and evaporate while sediments settle into a layer of mulch and then soil. The mulch prevents soil erosion and retains moisture for plant roots. It also provides a medium for biological growth and the decomposition or decay of organic matter. The soil stores water and nutrients to support plant life. Bacteria, nematodes, and other soil organisms degrade organic pollutants such as petroleum-based compounds. They also help mix organic material, increase aeration, and improve water infiltration and water-holding capacity.

Vegetated facilities require a specific soil mix to improve plant vigor and increase the filtration capacity of the native sand soils. The planting mix specifies adding compost and loam to native sand soil. The addition of loam increases the clay content of the native soil which is important to improving the cation exchange capacity (CEC). CEC allows more nutrients, minerals, and pollutants to be captured and stored by the soil before infiltrating into the groundwater. The compost and loam are also intended to increase plant vigor as much of the stormwater treatment occurs in the root systems of the vegetation within the treatment facilities. The compost adds organic matter and beneficial soil microbes to improve soil health and treatment capacity.

3.4.2 Relationship to Other Landscape Requirements

When vegetated facilities are integrated into project landscape areas, they can meet many, if not all, of Title 10, Chapter 34, Landscaping, requirements. The benefits of integrated designs include construction cost savings, combined maintenance, aesthetic benefits, and the greater likelihood of maintaining long-term functionality. A well-designed and established landscape will also prevent post-construction soil erosion.

3.4.3 Manufactured Treatment Technology

Where site constraints or unique circumstances make vegetated treatment infeasible, a structural solution may be used. The treatment devices allowed in the city of Florence are those approved by the Washington Department of Ecology Approved Stormwater Treatment Technologies that can be viewed at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html . A connection to an approved disposal point and flow reduction, if applicable, is still required when using Manufactured Treatment Technology.

3.4.4 Required Treatment Percentage

Whereas the City's established goal is to treat all impervious surfaces, it is understood that to get 100% treatment in certain situations creates undo hardship. City reviewers, upon a demonstrated hardship, may waive or lessen requirements for up to 10% of a total site's impervious vehicular traveled surfaces and up to 30% of other impervious surfaces without a formal exception. The applicant must get pre-approval from the City and clearly demonstrate on permit drawings which areas are treated and which areas are untreated. The intent is to provide relief to common difficulties often caused by topographical isolation or connecting to existing infrastructure.

In addition, the goal is to provide 100% of treatment via vegetated facilities. When site constraints create undo hardship, up to 50% of impervious surface runoff may be treated with non-vegetated treatment facilities.

3.5 Projects on Private and Public Property

Stormwater management requirements apply to projects on both private and public property, including all streets, alleys, driveways, and sidewalks. The City will maintain and operate Public Stormwater Facilities as defined in FCC 9-5-1-2 and FCC 9-5-1-6. FCC 9-5-1-2 defines a Public Stormwater Facility as follows: "Drainage and storm water management facilities located within the public right-of-way or easements dedicated to the City and that are owned and maintained by the City." FCC 9-5-1-6 contains the provisions for determination of drainage and stormwater management facilities that are "owned and maintained by the City.

3.6 Permits and Reviews

All development and redevelopment proposals are subject to the requirements of this manual as a supplement to the city's adopted design guide, the 2008 edition of the City of Portland *Stormwater Management Manual*, during a number of review and permit processes. These processes generally include land use reviews and zoning, site development, and building permits. Each development proposal will have a unique set of reviews and permits, based on what is proposed and the location.

The Community Development Department administers the land use review process and permits for private improvements. Public works permits are required for public infrastructure improvements or connections to public infrastructure, which are generally located in the public right-of-way and are administered by the City's Public Works Department.

3.7 Technical Equivalency

Special circumstances on a proposed site may make it impractical to implement onsite pollution reduction or flow control to the standards specified in this manual. If exceptional circumstances create undo hardship complying with stormwater management requirements, then a technical equivalency request can be made. A written Technical Equivalency Request can be made to the City under Florence City Code 9-5-7-1.

To be approved, the proposed technical equivalency shall meet the following conditions:
1. The technical equivalency complies with the development conditions imposed on the project.
2. The granting of a technical equivalency will produce compensating or comparable results that are in the public interest.
3. The granting of a technical equivalency will meet the objectives of safety, function, appearance, environmental protection, and maintainability based on sound engineering judgment.
4. The City shall make written findings supporting the determination of technical equivalency.

4. DESIGN STANDARDS AND METHODOLOGY

4.1 Overview

Stormwater Management in Florence relies primarily on rain gardens, vegetated swales, stormwater planters, porous pavements, and filter strips. All of these techniques retain stormwater close to its source, helping to mimic natural pre-development hydrology. All designs shall be structured to meet the following objectives.

Design Objectives:

1. **Assemble an informed Project team**
2. **Maximize onsite retention/minimize offsite discharges**
3. **Minimize impervious area**
4. **Integrate Stormwater into Overall Design**

10 steps to the Process:

1. **Evaluate the Site**
2. **Confirm Current Requirements**
3. **Characterize Site Drainage Area and Runoff**
4. **Determine Source Control Requirements (See Chapter 7)**
5. **Develop Conceptual Design**
6. **Develop Landscape Plan**
7. **Complete Stormwater Management Plan**
8. **Prepare Operation and Maintenance Plan**
9. **Submit Final Plans and Obtain Permits**
10. **Construct and Inspect**

For detailed information regarding the stormwater design process refer to **Section 2.1** of the **Portland SWMM**.

4.2 Design Methods

The site plans and reports specified in this section meet the requirements for a Drainage Plan in Florence City Code Title 9 Chapter 5. Applicants must select **one** of the following approaches. Each approach has a unique plan review and approval process that establishes a permit track for the project. The final selection of a project design approach is subject to City approval. For every application, the impervious area should include the **total** proposed impervious area, including all streets, tentative driveways plans, redeveloped areas, and tentative building footprints, based on the allowed building coverages and setbacks per the zoning code.

The **Simplified Approach** is available for projects with less than 0.5 acre of total new or redeveloped impervious area, including but not limited to roofs, patios, parking areas, and driveways. This approach is most appropriate for private, small-scale residential development,

typically with limited professional design services available. It is not allowed for use on large, complex projects or on projects that have multiple catchments that, when combined, exceed 0.5 acre of new or redeveloped impervious area. It is not allowed on projects that require a public works permit or include private street improvements.

The **Presumptive Approach** is available for medium- to large-scale residential and commercial projects of any size on either private or public property. Slightly modified requirements apply to streets. This approach is required for projects with new or redeveloped impervious area of 0.5 acre or greater or projects with proposed street improvements. It can also be applied to size facilities on smaller projects where the more detailed hydrologic calculations will allow the applicant to size a facility more accurately by taking more specific design factors into account. This approach requires the assistance of a licensed engineer or qualified design professional.

The **Performance Approach** is available for projects with unique circumstances that require analysis that goes beyond the capabilities or specifications of the Simplified and Presumptive approaches. It may be used to address a range of circumstances, including but not limited to:

- Propose an alternate design methodology or facility specification.
- Address unique site conditions.
- Apply a new or emerging design technology.

The Performance Approach requires the assistance of a licensed engineer or qualified professional. Detailed engineering calculations must be provided as evidence of the proposed design's performance with respect to the stormwater requirements provided in City of Portland Stormwater Management Manual. This approach may require additional review fees to compensate the City for the extra costs for technical review of the application.

4.2.1 Simplified Approach

The Simplified Approach allows small projects (under one-half acre) to use a simple surface area ratio calculation to size stormwater facilities. The applicant quantifies the amount of new or redeveloped impervious area that is proposed and multiplies that area by a sizing factor that varies by facility type. The sizing factors are based on City of Portland sizing standards. The simplified approach allows the applicant to meet both water quality and flow control requirements without a detailed design effort.

Vegetated surface facilities available with the Simplified Approach include swales, planters, basins, and filter strips, all of which are designed to receive and manage stormwater runoff from adjacent impervious surfaces. All vegetated surface facilities designed with the Simplified Approach require an overflow to an approved discharge point. In high groundwater areas, an underdrain connected to an approved discharge point shall also be installed.

Simplified Approach Submittal Requirements

Applicants using the Simplified Approach must submit a completed **Simplified Approach Form** as part of their permit application, along with a complete site plan, construction drawings, and facility details. An **Operations and Maintenance Form** and a copy of the appropriate **Operations and Maintenance Specifications** must also be included. The O&M Form is not required for drywells or soakage trenches that accept only residential roof runoff. On sites with steep slopes or shallow groundwater, City may require a geotechnical report in order to evaluate the suitability of the proposed facility and its location. See **Appendix A** for complete information about the submittal requirements and necessary forms for the Simplified Approach.

4.2.2 Presumptive Approach

The Presumptive Approach allows the designer to factor in site-specific data to determine the size and configuration of the stormwater facility. Like the Simplified Approach, the Presumptive Approach includes impervious area reduction techniques, vegetated surface facilities, and subsurface facilities. See **Section 5** for a complete overview of facility types and **Appendix I** for Stormwater Management Typical Details.

Presumptive Approach Calculations

The following principles apply to design under the Presumptive Approach. The inflow hydrograph generated by the catchment area is routed through the surface infiltration facility modeled as a reservoir, with an infiltration rate of not more than 4 inches per hour. This infiltration rate is the assumed long term infiltration rate for the growing medium (See Appendix B). The model should **not** adjust the infiltration rate as the hydraulic head is increased. When designing swales and basins where some infiltration can be accounted for through the side slopes, the entire area of the facility cannot be assumed to infiltrate. Infiltration through the side slopes is limited to the wetted horizontal area.

When designing a stormwater facility under the presumptive approach, calculations should confirm that the inflow hydrograph of the 25-year, 24-hour storm can be stored and infiltrated without exceeding the maximum depth or storage capacity of the facility. If offline or downstream detention facilities are used in conjunction with treatment facilities to meet flow control requirements the project must be submitted under the performance approach.

Presumptive Approach Required for Green Streets

The Presumptive Approach is required for sizing vegetated stormwater facilities in the public right-of-way and private streets. In addition to the other requirements and specifications provided in **Section 5,** the following apply:

- **Stormwater Management Typical Details** are available specifically for streets (see **Appendix I.3**). Commonly referred to as "Green Street Details," they are tailored to circumstances commonly found in the right–of-way. Vegetated stormwater facilities for streets are affected by street design criteria and are subject to certain design considerations and limitations.

Presumptive Approach Submittal Requirements

A checklist for submittal requirements is included in Appendix A.2. Applicants using the Presumptive Approach must submit a **Stormwater Management Plan** (see Appendix A.3 for details). An **Operations and Maintenance Agreement** (Appendix A.4) and a copy of the site specific **Operations and Maintenance Plan** (Appendix A.5) must also be included.

4.2.3 Performance Approach

Applicants who have developed stormwater management facilities or plans that do not meet the requirements of the Simplified Approach or Presumptive Approach as described above must submit plans under the Performance Approach. Performance Approach submittals may include impervious area reduction techniques, vegetated surface facilities and subsurface facilities that vary from the specified design requirements. Performance Approach submittals will be reviewed by the City Engineer or designee. Applicant shall be responsible for covering costs of the technical review of the application.

The Performance Approach may be used to:

- Propose an alternate design methodology or facility specification.
- Propose the use of an infiltration facility in excess of 4 inches per hour
- Address unique site conditions.
- Apply a new or emerging design technology.
- Provide flow control outside of a treatment facility (detention ponds, detention tanks, soakage trench, etc)

The facility must be sized using SBUH, NRCS TR-55, HEC-1, or SWMM. See Appendix C of the Portland SWMM for more details on performing calculations. If these hydrologic analysis methods are not used, City must pre-approve the alternative method before the plans and calculations are submitted. Regardless of how the hydrologic calculations are performed, all hydrologic submittals must include data necessary to facilitate City's review.

The Presumptive Approach methodology can be used under the Performance Approach, with justification included for sizing variables outside the allowable ranges of the Presumptive Approach. Any facility requiring infiltration rates greater than 4 inches per hour shall provide pre-treatment of runoff from pollution generating surfaces prior to discharge to the infiltration facility. Acceptable pre-treatment shall be double chambered catch basins, manufactured treatment technology, or other pre-approved method. Use of pre-treatment devices for public facilities must be pre-approved.

4.3 Infiltration and Groundwater Protection

According to the city's Drinking Water Protection Plan, groundwater in Florence is highly susceptible to contamination. Highly permeable soils, a shallow unconfined aquifer, and a high

precipitation rate all contribute to the vulnerability of the City's water supply. The entire aquifer has been designated a sole source aquifer by the federal government for additional protection.

Consequently, infiltration facilities within Drinking Water Protection Areas (See Appendix C) must have pre-treatment facilities prior to infiltration facilities. Acceptable pre-treatment shall be double chambered catch basins, manufactured treatment technology, or other pre-approved method. Wellhead protection signs must also be installed at stormwater facilities within Drinking Water Protection Areas.

4.4 Flow Control

Projects designed under the simplified and presumptive approach automatically meet flow control standards and further analysis is not required. However, when designing under the performance approach detailed calculations must be included in the stormwater management plan demonstrating compliance with flow control requirements. The design professional may use SBUH, NRCS TR-55, HEC-1, or SWMM to demonstrate compliance with flow control standards.

Projects subject to flow control standards (See **Section 3.1)** must utilize onsite retention (infiltration) to the maximum extent practicable and detain the remainder so as to not exceed pre-development flow rates. Detention calculations must show pre-developed 2 year, 10 year, and 25 year runoff hydrographs and also post development 2 year, 10 year, and 25 year inflow/outflow hydrographs for the 24 hour storms listed in Table 4.1. Projects with multiple facilities must show calculations for each facility and for the overall site. Additionally, total pre-developed and post developed runoff total volumes (in cubic feet) must be shown in order to demonstrate sufficient stormwater retention.

4.4.1 Flow Control Structures

Section 2.3.3 of the **Portland SWMM** presents the methods and equations for the design of flow restricting control structures, for use with extended wet detention ponds, dry detention ponds, and structural detention facilities. It includes details and equations for the design of orifices, and equations for rectangular sharp crested weirs and v-notch weirs. Detail Drawings of control structures are included in Appendix I.

Detention control structures shall be either weir structures or orifice structures. Weir structures may be enclosed in a catch basin, manhole, or vault, or may be installed in the open, provided they are accessible for maintenance and are not exposed to damage. Riser type restrictor devices also provide some incidental oil/water separation and spill control. Weir structures provide some oil/water separation when fitted with a baffle plate located upstream of the weir.
The minimum allowable diameter for an orifice used to control flows in a public facility is 2 inches. Private facilities may utilize a 1-inch diameter orifice if additional clogging prevention measures are implemented. The orifice diameter shall always be greater than the thickness of the orifice plate. Multiple orifices may be necessary to meet the flood control design storm performance for a detention system.

4.5 Design Rainfall

On average, it rains approximately 60 to 70 inches per year in Florence. Historically, the area cycles through wet and dry cycles. During wet years it can rain 100 inches or more. The rainfall distribution is also unique. Rather than a quick buildup with heavy intensity precipitation, rainfall tends to have broad peaks with several continuous hours of heavy rainfall. The SCS type 1a hyetograph is the most appropriate distribution for the area but can overestimate peak rainfall intensity. The design storms, as listed in the Florence Stormwater Management Plan, are shown in Table 4.1 below.

Table 4.1: City of Florence Design Storms

Return Frequency	24-hr Rainfall Depth (inches)
Water Quality Design Storm	
	0.83
Flow Control (or Flood Control) Storms[1]	
2- year	3.46
10-year	4.48
25-year	5.06
100-year	5.95

For manufactured treatment technologies or other flow rate based treatment facilities the rational method (Q=CIA) equation shall be used with the following intensities.

Table 4.2: Water Quality Design Storm for Flow Rate-Based Facilities[2]

Site Time of Concentration (Minutes)	Rainfall Intensity (inches per hour)
5	0.19
10	0.16
25	0.13

4.6 Groundwater

High groundwater levels are pervasive throughout the City and must be addressed in every stormwater submittal to the city. Many areas throughout the city have shallow or perched groundwater that requires special consideration. The following soil types are especially prone to shallow groundwater:

1. **53 – Heceta Fine Sand**
2. **140 – Yaquina loamy fine sand**
3. **141 Yaquina urban Land complex**

In high groundwater areas, groundwater shall be addressed in one of the following ways:

[1] The terms "Flow Control" and "Flood Control", as used in this Manual, are interchangeable.

[2] Note: Table 4.2 supersedes and replaces Table 2.5 in the Stormwater Management Plan.

1. Install an under drain system, or other approved mitigation measure, in each vegetated infiltration facility connected to an approved conveyance facility (not a drywell or soakage Trench).
2. Provide a **Depth to Groundwater Investigation** (see Appendix D) demonstrating that the bottom of the infiltration facility is sufficiently above the high groundwater table.
3. Provide detention facilities sized assuming zero infiltration with connection to an approved conveyance system.
4. If flow control is not required, provide overflow to approved conveyance facility

5. STORMWATER FACILITY DESIGN

5.1 Choosing a Facility

Table 5.1 Stormwater Facilities: Impervious Area Reduction Techniques

Technique	Simplified	Presumptive For Private	Presumptive for Streets	Performance
Pervious Pavement	X	X		X

Table 5.2 Stormwater Facilities: Vegetated Facilities

Technique	Simplified	Presumptive For Private	Presumptive for Streets	Performance
Swale	X	X	X	X
Planter	X	X	X	X
Rain Garden	X	X	X	X
Filter Strip	X			X

Table 5.3 Stormwater Facilities: Structural Facilities

Technique	Simplified	Presumptive For Private	Presumptive for Streets	Performance
Soakage Trench	X			
Drywell	X	X		
Manufactured Treatment Technology		X	X	
Structural detention				X
Pond				X

Each stormwater facility has additional applicability criteria related to slopes, soils, setbacks, and geometry included in following design sections.

5.2 Pervious Pavements

See **Appendix I.1 SW-110** for typical details.

Description: Pervious pavements allow rainwater to pass directly through the paving surface into gravel layers below, where it infiltrates into the native soils. There are many types of porous pavements available on the market today, including but not limited to porous asphalt mixes, porous concrete mixes, and concrete paver systems designed with gaps or holes to allow water to pass through. The following list includes the types of paving systems that are considered by the City to be pervious and acceptable. Other paving systems may be reviewed on a case-by-case basis for porous designation, and must show the ability to pass water quickly through the pavement layer:

- Porous concrete mix, open-graded mix placed over an open-graded base rock layer
- Uni Eco-Stone® pavers placed over an open-graded base rock layer
- Uni Ecoloc® pavers placed over an open-graded base rock layer
- SF RIMA™ pavers placed over an open-graded base rock layer
- TurfStone paver system, planted with grass or filled with clean gravel

The long-term effectiveness of a pervious pavement system to retain and/or infiltrate water depends on the ability and practice of keeping its surface and pavement layer clear of debris and sediment that can cause clogging.

Applicability: See **Appendix I** for detail drawings. Pervious pavements that meet all applicable State and City building codes may be used on private property to receive stormwater management credit. Pervious pavement areas do not need to be entered into Form SIM for further management. Pervious pavement surfaces must be designed and stamped by a registered professional engineer in the State of Oregon. Proprietary pervious pavement systems must be installed per manufacturer specifications. Porous pavement proposals in the public right-of-way must be pre-approved by the City of Florence. Porous pavements shall not be used in areas covered by the 100-year floodplain, or at slopes that exceed 3%.

Groundwater: In high groundwater areas, groundwater must be addressed per Section 4.6. An underdrain may be necessary to maintain permeability of the pavement.

Safety Overflow: Pervious pavement systems shall be designed with a safety overflow mechanism to prevent ponding in the event that the surface is clogged with sediment or debris. The overflow mechanism may consist of an inlet drain, catch basin, curb opening, or other method.

Submittal Requirements
Depending on the scope and scale of the proposed project, the following design approaches apply to pervious pavement:

• Simplified Approach for pedestrian walkways and residential driveways.

• Presumptive Approach for parking lots, shared courts, and fire lanes.
• When considering permeable pavement for the public right-of-way, the applicant must submit the project under the Performance Approach. Permeable pavement in the public right-of-way is approved on a case-by-case basis at the discretion of the City of Florence Public Works Director.

• When considering pervious pavement for private streets the street section must be designed by a registered professional engineer. A site development permit is required for private street construction.

Operations and Maintenance requirements: See **Chapter 6**.

5.3 Vegetated Swales

See **Appendix I SW-120** for typical private property swale detail and **Appendix I SW-300-302** for typical Green Street swale details.

Description: Swales are long and narrow landscaped depressions used to collect and convey stormwater runoff, allowing pollutants to settle and filter out as the water flows from one bay to the next through the facility. Swales should be integrated into the overall site design and can be used to help fulfill a site's required landscaping area requirement.

Design Considerations: When designing swales, slopes and depth should be kept as mild as possible to avoid safety risks, improve aesthetics, and prevent erosion within the facility. For street swales in the public right-of-way all applicable City requirements for other street elements (curbs, sidewalks, trees, etc.) must be met. Swales located next to public sidewalks shall have a minimum 12"-wide flat area between the swale and the sidewalk.

Construction Considerations: Swale areas should be clearly marked before site work begins to avoid soil disturbance and compaction during construction.

Design Requirements:

Groundwater In high groundwater areas, groundwater must be addressed per **Section 4.6**.

Growing Medium: Topsoil shall be used within the top 18 inches of the facility per **Appendix B** to support plant growth. Maximum design infiltration rate of the facility is controlled by the infiltration rate of the growing medium and shall not be greater than 4 in/hr. With a demonstrated hardship, higher design infiltration rates may be used with the infiltration blend soil (see **Appendix B)** if stormwater from vehicular surfaces is pretreated. Design infiltration rate shall be demonstrated with testing certified by a professional Engineer or Geologist and shall not exceed 10 inches per hour. Areas subject to inundation shall be covered in non-floatable mulch or washed pea gravel. Side slopes shall be covered with suitable mulch such as fine or medium hemlock bark mulch.

Dimensions and Slopes: See **Appendix I** for detail drawings. The minimum swale width is 5 feet on private property and 8 feet on streets. A 2-foot-wide flat bottom width is required where feasible. Swales designed with the Simplified Approach are 9 inches deep measured from the top

of the growing medium to the overflow inlet elevation. Swales designed with the Presumptive Approach vary in depth from 6 to 12 inches. In all cases, maximum side slopes are 3 horizontal to 1 vertical and 4 horizontal to 1 vertical is required immediately adjacent to pedestrian areas. Maximum longitudinal slope is 6 percent. Freeboard for swales must be noted on the plans. Freeboard can be defined as the vertical distance between the design water surface elevation and overtopping elevation or the vertical distance between the top of the check dam and the outside berm or curb elevation (whichever is lower).

Flow spreader: The swale shall incorporate a flow-spreading device at the inlet to the swale. The flow spreader shall provide a uniform flow distribution across the swale bottom. Private swales may use riprap to disperse the flow from the inlet pipe. In swales with a bottom width greater than 6 feet, a flow spreader shall be installed at least every 50 feet.

Check dams: Check dams are required in swales to allow water to pool and infiltrate into the ground. They shall be constructed of durable, non-toxic materials such as rock, brick, concrete, or soil by integrating these materials into the grading of the swale. Check dams are as long as the width of the swale, perpendicular to flow line. They generally form a 12 inch wide bench on top and measure 4 to 10 inches high, depending on the depth of the facility. See **Appendix I.3 SW-340** for typical check dam details.

Access routes: Access routes to the swale for maintenance purposes must be shown on the plans. Public swales require a minimum 10-foot wide access route for maintenance, not to exceed 10 percent in slope.

Setbacks: Required setback from building foundations is 10 feet unless lined with impermeable fabric. Easements for non-buildable areas on adjacent properties may be required if facilities are located next to property lines.

Simplified Approach Sizing: Swales sized with the Simplified Approach shall be designed to receive less than 0.5 acre of impervious area runoff. For these projects, a Simplified Approach sizing factor of 0.09 for vegetated swales may be used to receive credit for pollution reduction. Swales with greater than 0.5 acre of impervious area to manage must use the Presumptive Approach to size the swale.

Presumptive Approach Sizing Criteria:

1) Pollution Reduction Criteria (no flow control): The swale width and profile shall be designed to convey runoff from the Water Quality Design Storm (See Table 4.2) and shall meet the following criteria:

- Maximum flow depth during the Water Quality Design Storm is 4 inches.
- Maximum water velocity during the Water Quality Design Storm is 0.9 feet per second.
- Minimum hydraulic residence time (time for design flow rate to pass through the swale) of 9 minutes. (if infiltration not possible)
- Minimum longitudinal slope of 0.5 percent, maximum slope of 6 percent. For slopes greater than 2 percent, check dams shall be used (one dam every 12 feet).
- Designed using a Manning "n" value of 0.35 for vegetated swales.

2) Flow Control Criteria: In order for swale facilities to meet flow control requirements under the presumptive approach the swale shall be designed to store and infiltrate the entire 25 yr Design Storm. The areas behind each check dam shall be modeled as individual infiltration basins varying in depth from the height of the check dam to zero. The length of the pool is dependent on the height of the check dam and the slope of the swale.

3) Vegetation shall be established as soon as possible after the swale is completed, and before water is allowed to enter the facility.

4) Unless vegetation is established, biodegradable erosion control matting appropriate for low-velocity flows (approximately 1 foot per second) shall be installed in the flow area of the swale before allowing water to flow through the swale.

Landscaping:

Vegetated Swales

Vegetation provides filtration and root uptake functions, protects from rain and wind erosion, and enhances aesthetic conditions. The "facility area" is equivalent to the area of the swale, including bottom and side slopes. The minimum plant material quantities per **100** square feet of facility area shall be as follows:

Private Swales:

Zone A (wet): 115 herbaceous plants or 100 herbaceous plants and 4 small shrubs
Zone B (moderate to dry): 1 tree, 3 large shrubs/small trees, 4 small shrubs, and 140 groundcover plants

Public Swales:

Zone A (wet): 115 herbaceous plants or 100 herbaceous plants and 4 small shrubs
Zone B (moderate to dry): 12 small shrubs, and 70 groundcover plants

The delineation between Zone A and Zone B shall be either the height of the check dam or the overflow outlet elevation which ever is lower.

Trees: For private swales, the following evergreen or deciduous trees shall be retained or planted within or adjacent to the swale and continuing approximately 30 feet on center the length of the swale:

Evergreen trees: Minimum height: 6 feet
Deciduous trees: Minimum caliper: 1 ½ inches at 6 inches above base.

Stormwater Report Requirements For Presumptive Approach:
Checklist of minimal information to be shown on the permit drawings:

1) Facility dimensions and setbacks from property lines and structures

2) Profile view of facility, including typical cross-sections with dimensions
3) Growing medium specification
4) Filter fabric specification (if applicable)
5) All curb cut details and stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection
6) Landscaping plan

Inspection requirements and schedule: The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be requested:

Facility Component Inspection Requirement

Swale grading	
Curbs / curb cuts	Call for Inspection
Piping (if applicable)	Call for Inspection
Filter fabric (if applicable)	
Growing medium	Call for Inspection
Plantings/seeding/sod	Call for Inspection

Operations and Maintenance requirements: See **Chapter 6**.

Stormwater Planters

See **Appendix I.1 SW-130** for typical private property planter detail and
Appendix I.3 SW-310 through **SW-313** for typical Green Street planter details.

Description: Stormwater planters are structural landscaped reservoirs used to collect, filter, and/or infiltrate stormwater runoff, allowing pollutants to settle and filter out as the water percolates through the planter soil before infiltrating into the ground below or piped to its downstream destination. In addition to providing pollution reduction, flow rates and volumes can also be managed with stormwater planters. Stormwater planters can be used to help fulfill a site's required landscaping area requirement and should be integrated into the overall site design. Numerous design variations of shape, wall treatment, and planting scheme can be used to fit the character of a site. Stormwater planters may provide either "infiltration treatment" or "filtration treatment".

5.4.1 Infiltration Stormwater Planters:

Groundwater In high groundwater areas, groundwater must be addressed per Section 4.6.

Construction Considerations: Location of *Infiltration Stormwater Planters* should be clearly marked before site work begins to avoid soil disturbance during construction. No vehicular traffic, except that specifically used to construct the facility, should be allowed within 10 feet facility areas.

Soil: Topsoil shall be used within the top 18 inches of the facility per **Appendix B** to support plant growth. Maximum design infiltration rate of the facility is controlled by the infiltration rate of the growing medium and shall not be greater than 4 in/hr. With a demonstrated hardship, higher design infiltration rates may be used with the infiltration blend soil (see **Appendix B)** if stormwater from vehicular surfaces is pretreated. Design infiltration rate shall be demonstrated with testing certified by a professional Engineer or Geologist and shall not exceed 10 inches per hour. The bottom shall be covered in non-floatable mulch or washed pea gravel.

Dimensions and Slopes: See **Appendix I** for detail drawings. Facility storage depth must be at least 9 inches, unless a larger than- required planter square-footage is used. Minimum *Infiltration Stormwater Planter* width is 30 inches. Planters shall be constructed without slope.

Setbacks: Required setback for *Infiltration Stormwater Planters* is 5 feet from property lines and 10 feet from structures. Easements for non-buildable areas on adjacent properties may be required if facilities are located next to property lines.

5.4.2 Filtration Stormwater Planters:

Design Considerations: These facilities are appropriate for facilities located within 10-feet of building foundations or in high groundwater areas with an approved impermeable membrane. Filtration Planters shall only be used where infiltration planters are not feasible.

Construction Considerations:
Special attention needs to be paid to the planter waterproofing if constructed adjacent to building structures. The walls of a *Filtration Stormwater Planter* can often times be incorporated with the building foundation plans. The bottom of *Filtration Stormwater Planters* must be lined with an impermeable membrane of 60 mil plastic film.

Soil: Topsoil shall be used within the top 18 inches of the facility per **Appendix B** to support plant growth. Maximum design infiltration rate of the facility is controlled by the infiltration rate of the growing medium and shall not be greater than 4 in/hr. With a demonstrated hardship, higher design infiltration rates may be used with the infiltration blend soil (see **Appendix B)** if stormwater from vehicular surfaces is pretreated. Design infiltration rate shall be demonstrated with testing certified by a professional Engineer or Geologist and shall not exceed 10 inches per hour. The bottom shall be covered in non-floatable mulch or washed pea gravel.

Dimensions and Slopes: Facility storage depth must be at least 9 inches, unless a larger than-required planter square-footage is used. Minimum *Filtration Stormwater Planter* width is 18 inches. Planters shall be constructed without slope.

Setbacks: A setback for *Filtration Stormwater Planters* is not required.

5.4.3 General Requirements

Planter Walls: Planter walls shall be made of stone, concrete, brick, wood, or other durable material. Chemically treated wood that can leach out toxic chemicals and contaminate stormwater shall not be used.

Simplified Sizing: Individual Stormwater Planters sized with the Simplified Approach shall be designed to receive less than 0.5 acre of impervious area runoff. For stormwater planters a Simplified Approach sizing factor of 0.06 may be used to receive credit.

Presumptive Method Sizing: The Presumptive Approach may be used to downsize the Simplified Approach sizing factor. The applicant shall size stormwater planter to have sufficient storage

volume for the entire 25 year storm. Planters shall be designed to pond water for less than 18 hours after each storm event.

Landscaping: Plantings shall be designed at the following quantities per **100** square feet of facility area. Facility area is equivalent to the area of the planter.

Zone A (wet): 115 herbaceous plants or 100 herbaceous plants and 4 small shrubs

Note: Tree planting is not required in planters, but tree planting is encouraged near planters.

Checklist of minimal information to be shown on the permit drawings:

1) Facility dimensions and setbacks from property lines and structures
2) Profile view of facility, including typical cross-sections with dimensions
3) Planter wall material and waterproofing membrane specification
4) Growing medium specification
5) Drain rock specification (if applicable)
6) Filter fabric specification (if applicable)
7) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection (if applicable)
8) Stormwater destination
9) Landscaping plan

Inspection requirements and schedule: The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be requested. Please note that, while not all facility components may require an inspection call, inspectors will inspect for all required components in the field.

Facility Component Inspection Requirement

Planter grading/ excavation	
Structural components/ liner	Call for Inspection
Piping (if applicable)	Call for Inspection
Filter fabric (if applicable)	
Growing medium	Call for Inspection
Plantings	Call for Inspection

Operations and Maintenance requirements: See **Chapter 6**

5.5 Rain Gardens

See **Appendix I.1 SW-140** for typical rain garden details.

Description: Rain gardens are landscaped reservoirs used to collect, filter, and/or infiltrate stormwater runoff, allowing pollutants to settle and filter out as the water percolates through the planter soil before infiltrating into the ground below or being piped to its downstream destination. In addition to providing pollution reduction, flow rates and volumes can also be managed with rain gardens. Rain gardens can be used to help fulfill a site's required landscaping area requirement and should be integrated into the overall site design. Numerous design variations of shape, and planting scheme can be used to fit the character of a site. Rain gardens may provide either "infiltration treatment" or "filtration treatment".

Simplified Method Sizing: A Simplified Approach sizing factor of 0.06 may be used to receive credit for pollution reduction and flow control. The square-footage is determined at the peak water surface prior to overflow.

Presumptive Method Sizing: The Presumptive Approach may be used to downsize the Simplified Approach sizing factor. The applicant shall size stormwater planter to have sufficient storage volume for the entire 25 year storm. Planters shall be designed to pond water for less than 18 hours after each storm event.

Soil: Topsoil shall be used within the top 18 inches of the facility per **Appendix B** to support plant growth. Maximum design infiltration rate of the facility is controlled by the infiltration rate of the growing medium and shall not be greater than 4 in/hr. With a demonstrated hardship, higher design infiltration rates may be used with the infiltration blend soil (see **Appendix B)** if stormwater from vehicular surfaces is pretreated. Design infiltration rate shall be demonstrated with testing certified by a professional Engineer or Geologist and shall not exceed 10 inches per hour. The bottom shall be covered in non-flotable mulch or washed pea gravel.

Geometry/Slopes: See **Appendix I** for detail drawings.

• There is no shape requirement for rain gardens. They can be designed as square, rectangular, circular, oblong, or irregular.
• The minimum width for any rain garden shall be 5 feet.
• The maximum side slopes within rain gardens shall be 3 horizontal to 1 vertical.
• The minimum ponding depth shall be 6 inches. Maximum ponding depth shall be 12 inches during water quality storm.
• The minimum depth of soil amendment for rain gardens shall be 18 inches. See Appendix B for the required soil amendment specifications to be included with the permit plans.

5.5.1 Infiltration Rain Gardens:

Infiltration Rain Gardens- Applicability: Infiltration rain gardens are used to manage stormwater flowing from all types of impervious surfaces on private property and from the public right-of-way. If located within 10 feet from building foundations or upslope of building structures, a filtration rain garden must be used instead with an impermeable liner.

Groundwater In high groundwater areas, groundwater must be addressed per Section 4.6.

Piping for Infiltration Rain Gardens: Piping per Plumbing Code requirements shall be used to direct stormwater from impervious if used within the public street right-of-way or within or surfaces to infiltration rain gardens, or adjacent to parking lot areas, stormwater may flow directly into them via curb openings. An overflow drain, when required, shall be constructed to allow at least 6 inches but not more than 12 inches of water to pond in the rain garden prior to overflow. On private property, this overflow drain and piping must meet Plumbing Code requirements and shall direct excess stormwater to an approved disposal point as identified on the Public Works Permit drawings.

Within the public street right-of-way, this overflow drain and piping must meet City of Florence Public Works Standards and shall direct excess stormwater to an approved disposal point.

5.5.2 Filtration Rain Gardens:

Filtration Rain Gardens- Applicability: Filtration rain gardens are used to manage stormwater flowing from all types of impervious surfaces on private property, when rain garden must be located within 10 feet of building foundations, immediately upslope of building structures.

Piping for Filtration Rain Gardens: Piping per Plumbing Code requirements shall be used to direct stormwater from impervious surfaces to filtration rain gardens, or if used within or adjacent to parking lot areas, stormwater may flow directly into them via curb openings. An overflow drain shall be constructed to allow at least 6 inches but not more than 12 inches of water to pond in the rain garden prior to overflow. A perforated system of pipes shall be constructed 18” under the filtration rain to drain water that has filtered through the topsoil and prevent long-term ponding. On private property, this overflow drain and piping must meet Plumbing Code requirements and shall dire excess and filtered stormwater to an approved disposal point as identified on the subdivision’s Public Works Permit drawings.

5.5.3 General Requirements

Setbacks

For infiltration rain gardens and filtration rain gardens without an impermeable liner:

- Minimum setback from building structures shall be 10 feet.
- Infiltration rain gardens or filtration rain gardens without a liner may not be located immediately upslope of building structures.
- There is not a required setback for filtration rain garden as long as an impermeable 60 mils a PVC liner is used.
- Infiltration rain gardens shall be set back a minimum of 5 feet from property lines.

Landscaping: Vegetation provides filtration and root uptake functions, protects from rain and wind erosion, and enhances aesthetic conditions. Plantings shall be designed at the following quantities per **100** square feet of facility area. Facility area is equivalent to the area of the rain garden calculated from Form SIM.

Zone A (wet): 115 herbaceous plants or 100 herbaceous plants and 4 small shrubs
Zone B (moderate to dry): 1 tree, 3 large shrubs/small trees, and 4 small shrubs.

Facility Component Inspection Requirement

Rain Garden grading/ excavation	
Structural components/ liner	Call for Inspection
Piping (if applicable)	Call for Inspection
Filter fabric (if applicable)	
Growing medium	Call for Inspection
Plantings	Call for Inspection

Operations and Maintenance requirements: See **Chapter 6**

5.6 Vegetated Filter Strips

See **Appendix I SW-160** for typical filter strip details.

Description: Vegetated filter strips, or vegetated filters, are gently sloping areas used to filter, slow, and infiltrate sheet flow runoff. Stormwater enters the filter as sheet flow from an impervious surface or is converted to sheet flow using a flow spreader. Flow control is achieved using the relatively large surface area, and for slopes greater than 5%, a generous proportion of check dams or terraces. Pollutants are removed through filtration and sedimentation. Filters can be planted with a variety of trees, shrubs, and ground covers, including grasses. Sod may be used for single-family residential sites and for filter strips along sidewalks. There are an infinite number of ways to fit this concept into site designs and designers are encouraged to use the site landscape areas for this purpose. An approved conveyance/destination method may be required at the end of the filter.

Design Considerations: When designing vegetated filters, slopes should be kept as flat as possible to prevent erosion. Spreading the flow evenly across the filter is also important in ensuring that the facility functions correctly and avoids flow channeling.

Construction Considerations: Vegetated filter areas should be clearly marked before site work begins to avoid soil disturbance during construction. No vehicular traffic, except that specifically used to construct the facility, should be allowed within 10 feet of filter areas. Flow spreaders must be constructed perfectly level to distribute flows evenly across the filter, and for public facilities must be surveyed after construction.

Design Requirements: See **Appendix I** for detail drawings.

Groundwater In high groundwater areas, groundwater must be addressed per Section 4.6.

Soil Topsoil shall be used within the top 18 inches of the facility per **Appendix B** to support plant growth. Maximum design infiltration rate of the facility is controlled by the infiltration rate of the growing medium and shall not be greater than 4 in/hr. **Soil:** Topsoil shall be used within the top 18 inches of the facility per **Appendix B** to support plant growth. Maximum design infiltration rate of the facility is controlled by the infiltration rate of the growing medium and shall not be greater than 4 in/hr. With a demonstrated hardship, higher design infiltration rates may be used with the infiltration blend soil (see **Appendix B)** if stormwater from vehicular surfaces is pretreated. Design infiltration rate shall be demonstrated with testing certified by a professional Engineer or Geologist and shall not exceed 10 inches per hour.

Dimensions and Slopes: The maximum slope allowable for fully planted vegetated filter strips is 10%. The maximum slope allowable for vegetated filter strips which are planted with sod only is 5%. Terraces may be used to decrease ground slopes. Minimum slopes are 0.5%.

Setbacks: Required setback is 10 feet from structures unless lined with impermeable fabric. Easements for non-buildable areas may be required if facilities are located near property lines.

Sizing: Unless used for very long, narrow projects such as pathways and trails, vegetated filters cannot be used to manage flow from more than 0.5 acre of impervious area. Filters shall be a minimum of 10 feet wide x 10 feet long. A Simplified Approach sizing factor of 0.2 may be used to receive credit for pollution reduction and flow control.

Destination Use: Vegetated filter strips which are designed per the Simplified Approach may be used to meet stormwater destination requirements for up to 0.5 acre of impervious surfaces. Minimum filter strip width may be reduced to 5 feet for narrow, linear impervious surfaces, such as pedestrian and bicycle paths.

Check Dams: When necessary, check dams allow water to pool and infiltrate into the ground and also reduce erosion as well as promote infiltration on steeper slopes. They shall be constructed of durable, non-toxic materials such as rock, brick, concrete, or soil by integrating these materials into the grading of the swale. Check dams are as long as the width of the swale, perpendicular to flow line. They generally form a 12 inch wide bench on top and measure 3 to 5 inches high, depending on the depth of the facility. See **Appendix I.3 SW-340** for typical check dam details.

Landscaping: The entire filter strip must have 100 percent coverage by native grasses, native wildflower blends, native ground covers, or any combination thereof.

Checklist of minimal information to be shown on the permit drawings:

1) Facility dimensions and setbacks from property lines and structures
2) Profile view of facility, including typical cross-sections with dimensions
3) Growing medium specification (if applicable)
4) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection
5) Landscaping plan
6) Flow spreader details and specifications
7) Check dam or terrace details and specifications

Inspection requirements and schedule: The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be requested. Please note that, while not all facility components may require an inspection call, inspectors will inspect for all required components in the field.

Facility Component Inspection Requirement

Filter grading if applicable	
Terraces (if applicable	
Piping and flow spreader (if applicable)	Call for Inspection
Growing medium (if applicable)	Call for Inspection
Plantings	Call for Inspection

Operations and Maintenance requirements: See **Chapter 3.0**.

5.7 Soakage Trench

See **Appendix I SW-180 and SW-181** for typical soakage trench details.

A soakage or "infiltration" trench is a shallow trench in permeable soil that is backfilled with sand and coarse stone and lined with filter fabric. The trench surface may be covered with grating, stone, sand, or a grassed cover with a surface inlet. Soakage trenches are recognized as a stormwater destination and are not intended to be used to meet pollution reduction requirements. **Unless the Soakage Trench is used exclusively for residential roof runoff, pollution reduction facilities must be used to receive runoff before it enters the drywell.**

> ***Note:*** *DEQ has identified soakage trenches as "Class V Injection Wells" under the federal Underground Injection Control (UIC) Program. These facilities must be classified as exempt, authorized by rule, or authorized by permit by DEQ. Since the UIC Program states that these types of wells can have a direct impact on groundwater, pollution reduction is required before disposing stormwater into them. All soakage trenches must be registered with DEQ. Designers shall design all underground injection systems to qualify for DEQ Rule Authorization. More information about the UIC Program can be found at DEQ's website at:* ***Http://www.deq.state.or.us/wq/groundwa/uichome.htm*** *For technical questions call DEQ- UIC Program at 503-229-5945.*

1) **Pre-treatment requirements**:
   a) **Residential roof area (only) runoff** does not require pretreatment.
   b) **Residential runoff from pavements** requires pre-treatment.
   c) **Commercial roof area (only) runoff** requires pre-treatment
   d) **Commercial runoff from pavements** requires pre-treatment.

5.7.1 Soakage Trench Design and Sizing Method

Non- residential use of soakage trenches must be pre-approved by the City. Supporting geotechnical evidence and a Depth to Groundwater Investigation **(Appendix D)** may be required. Soakage trenches shall be sized in accordance with **the Presumptive Approach**, once City approval has been given.

Note: *Designers should refer to OAR 340, Division 44, "Construction and Use of Waste Disposal Wells or Other Underground Injection Activities" for additional design and regulatory requirements.*

General Requirements:
Maximum area to be served:
15,000 square-feet per trench

(1) If designed as the only stormwater destination, the soakage trench shall infiltrate the entire flood control design storm (i.e., 25-year storm) without overflow.

(2) DEQ requires that soakage trenches receiving residential roof runoff have a minimum of 5-feet of separation from the bottom of the proposed soakage trench to the top of the high groundwater level. All other uses must have 10-feet of separation to the high groundwater level.

Public Facilities: See **Appendix I** for detail drawings.
(3) Public underground injection systems are approved as a temporary solution to stormwater management in areas having no piped system available within 500 feet. The designer shall prepare a long range stormwater management plan and construct the necessary facilities for future connections.
(4) Public facilities require utility concurrences prior to final plan approval.
(5) Clear notes and/or graphics shall be provided in the construction plans stating the dimensions and locations for each facility.
(6) Public facilities within rights of way shall be constructed a minimum of 36 inches below the ground surface.
(7) Stormwater shall be directed through an approved source control and pre-treatment device before entering the injection facility.
(8) A standard cleanout or manhole is required at the end of each run of an injection facility.
(9) Public utility easements adjacent to public facilities in rights of way shall be increased to 9 feet instead of the standard 7 feet.

Location:
(10) All trenches shall be constructed on native soil and shall not be subject to vehicular traffic and construction activities that will compact the soil, thus reducing permeability, prior to constructing the facility.
(11) There shall be no less than 5 feet of depth of filtration medium and/or undisturbed soil between the bottom of the facility's drain rock layer and any impervious layer (hardpan, solid rock, etc.) or seasonal high groundwater level.
(12) Soakage trenches shall not be located near slopes of 20% or greater without geotechnical evidence the facility will not cause slope failures.
(13) Soakage trench areas shall be clearly marked before site work begins to avoid soil disturbance during construction.
(14) Soakage trenches should be located down slope of structures, and are required to be setback at least 10 feet from structures and 5 feet from property lines and/or public utility lines.
(15) Soakage trenches shall be located a minimum of 500 feet away from any domestic drinking water wells, and a minimum of 500 feet or the distance of a 2- year travel time, whichever is smaller, away from public drinking water supply wells.

Soakage Trench Sizing: See **Appendix I** for detail drawings.
(16) Hydraulic calculations shall be performed using either the Rational Method or a hydrograph-based method such as the Santa Barbara Urban Hydrograph (SBUH).

a) When using the Rational Method, the required storage capacity of the facility shall be determined by subtracting the volume of water that can exfiltrate out of the facility within the required drawdown period from the volume runoff from the contributing basin for each facility design.

b) When using SBUH, the 25 year, 24-hour storm with NRCS type 1A rainfall distribution shall be used. The design professional may also use the NRCS TR-55, HEC-1, or SWMM.

c) Regardless of methodology used, the measured infiltration rate shall be the lesser of 6 inches per hour or the measured infiltration rate divided by 2.

(17) Drawdown time when full shall not exceed 10 hours.

Trench:

(19) The bottom of the drain rock portion of the soakage trench shall be no less than 5 feet above the seasonal high groundwater elevation.

(20) The bottom of the soakage trench shall be flat, or clay check-dams may be used to prevent water from collecting near the downstream end.

(21) Special design considerations shall be given at property corners (or where utilities must make property connections). A gap in the trench design or utility sleeves going through the soakage trench shall be included in the design as needed for utility crossings.

(22) Drain rock shall have filter fabric between the medium and native soils or backfill.

(23) At least 12" minimum of backfill shall be placed over the trench.

Drainage Rock:

(25) Drainage rock shall be a minimum of 12" of 2 ½ inch to ¾ inch coarse aggregate.

Pipe:

(27) The number and distribution of the holes in the dispersion pipe shall adequately allow the stormwater runoff to exit the pipe while maintaining a maximum hydraulic head elevation 6 inches below the gutter elevation. Designers using pre-fabricated perforated pipe shall follow the manufacturer's recommendations and provide a sufficient length of pipe to adequately disperse the water. All design calculations and/or manufacturer's recommendations shall be submitted with the design application.

(28) The pipe covered with filter fabric shall be laid flat on top of the sand and parallel with the contour of the finished surface grade.

(29) The solid pipe from the downspout or pretreatment facility to connection with perforated pipe must be installed at a minimum 0.002 foot per foot slope.

(30) Pipe must have a minimum cover of 12" measured from top of pipe to finished grade.

Filter Fabric:

(31) Approved drainage fabric shall be placed on the sides and top of the drainage rock.

(32) Filter Fabric must be one of the following types/brands: LINQ 125EX; LINQ TYPAR3201; TNS E040; TNS R035; TNS R040; TNS R042; AMOCO 4535; Marafi 140NL.

Checklist of minimal information to be shown on the permit drawings:

1) Facility dimensions and setbacks from property lines and structures
2) Profile view of facility, including typical cross-sections with dimensions
3) Drain rock specification
4) Sand specification
5) Filter fabric specification

6) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection.
7) Groundwater and bedrock elevations.
8) Soil units encountered.
9) The longitude and latitude for each facility.
10) The total impervious surface drained for each facility.

Inspection Requirements and Schedule:
The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be requested:

Facility Component Inspection Requirement

Trench grading	
Piping	Call for Inspection
Filter Fabric	
Drain Rock	Call for Inspection

5.8 Drywell

See **Appendix I SW-170** for typical drywell details.

Description: Drywells can be used as a stormwater destination by collecting and recharging stormwater runoff into the ground..

> ***Note:*** *DEQ has identified Drywells as "Class V Injection Wells" under the federal Underground Injection Control (UIC) Program. These facilities must be classified as exempt, authorized by rule, or authorized by permit by DEQ. Since the UIC Program states that these types of wells can have a direct impact on groundwater, pollution reduction is required before disposing stormwater into them. All soakage trenches must be registered with DEQ. Designers shall design all underground injection systems to qualify for DEQ Rule Authorization. More information about the UIC Program can be found at DEQ's website at:* ***Http://www.deq.state.or.us/wq/groundwa/uichome.htm*** *For technical questions call DEQ- UIC Program at 503-229-5945.*

5.8.1 Drywell Design and Sizing Method

Non-residential drywells must be pre-approved by the City. Supporting geotechnical evidence and a Depth to Groundwater Investigation **(Appendix D)** may be required. Soakage trenches shall be sized in accordance with **the Presumptive Approach**, once City approval has been given.

Note: *Designers should refer to OAR 340, Division 44, "Construction and Use of Waste Disposal Wells or Other Underground Injection Activities" for additional design and regulatory requirements.*

Drywell Sizing: See **Appendix I** for detail drawings.

• Hydraulic calculations shall be performed using the Rational Method. The required storage capacity of the facility shall be determined by subtracting the volume of water that can exfiltrate out of the facility with the required drawdown period from the volume runoff from the contributing basin for each facility design.

• Drywells shall be designed for the Flood Control Design Storm, with a safety factor of 2.

• The drawdown time for drywell design when full shall not exceed 12 hours.

• The time of concentration for a Drywell design shall be 5 minutes.

General Requirements:

1) Maximum ground slopes-20 percent

2) There shall be no less than 5 feet of undisturbed depth of infiltration medium between the bottom of the facility and any impervious layer (hardpan, solid rock, etc.) or seasonal high groundwater levels.
3) Drawdown time when full shall not exceed 10 hours.
4) Drywells shall meet the following setback requirements for downstream slopes: minimum of 100 feet from slopes of 20%; add 5 feet of setback for each additional percent of slope up to 30%; drywells shall not be used within 200 feet of where slopes exceed 30%.
5) Drywells should be located down slope of structures, and are required to be setback at least 10 feet from structures, 5 feet from property lines, and 5 feet from public utility lines.

Checklist of minimal information to be shown on the permit drawings:

1) Facility location with setbacks from property lines and structures.
2) Depth and diameter of drywell.
3) Drain rock specification
4) Sand specification
5) Filter fabric specification
6) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection.
7) Groundwater and bedrock elevations.
8) Soil units encountered.
9) The longitude and latitude for each facility.
10) The total impervious surface drained for each facility.

Inspection requirements and schedule: The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be requested. Please note that, while not all facility components may require an inspection call, inspectors will inspect for all required components in the field.

Facility Component Inspection Requirement

Drywell Excavation	
Piping	Call for Inspection
Drywell installation and backfill	Call for Inspection

Operations and Maintenance requirements: See **Chapter 6**.

5.9 Manufactured Treatment Technology

The City of Florence currently has two levels of approval for pollution reducing proprietary stormwater treatment devices: Stand-Alone (Basic Treatment), and Pretreatment. Devices approved for **Stand-Alone Use** may be used to satisfy the pollution reduction requirements of the Stormwater Management Manual when sized per this document. Devices approved for **Pre-treatment Use** may be used to satisfy the pollution reduction requirements of the Stormwater Management Manual when used in conjunction with low-profile elbows (catch basin traps) in all system inputs (catchbasins, curb inlets, etc.) and sized per this document. For the list of approved devices see **http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html**.

Manufacturers wishing to submit technologies for approval shall submit those technologies to the Washington Department of Ecology (WashDOE). The City of Florence does not test pollution reduction treatment technologies. Proprietary manufactured stormwater treatment devices are approved for use within the City of Florence based on WashDOE use level designations. In addition, to be approved for use as a publicly owned or city-maintained facility, the manufacturer must also submit detailed information about the facility's design criteria, construction techniques, operation and maintenance procedures, reliability, and cost to City of Florence Public Works. This information will be reviewed by Public Works, which will decide whether or not the facility can be used for public projects. Please note that use of filter technologies is conditionally approved within the public right-of-way and must receive specific City approval for each proposed location.

Manufactured stormwater treatment technologies on the city's approved list must be designed and constructed in accordance with the manufacturer's recommendations. Florence may also place special design conditions on the acceptance of the technology, such as sizing requirements that go beyond the manufacturer's recommendations, which must also be followed to obtain plan approval.

In addition to design calculations shown in the Stormwater Management Report requirements (Appendix A.3), the following must be submitted with each manufactured stormwater treatment technology project:

1) Pollution reduction capacity of the facility
2) Flow-through conveyance capacity (i.e., how much flow can be passed through the facility without stirring up and releasing trapped pollutants)

Checklist of minimal information to be shown on the permit drawings:
1) Facility dimensions and setbacks from property lines and structures
2) Profile view of facility, including typical cross-sections with dimensions
3) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection

Inspection requirements and schedule: The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be

requested. Please note that, while not all facility components may require an inspection call, inspectors will inspect for all required components in the field.

Facility Component Inspection Requirement

Vault Excavation	
Piping	Call for Inspection
Vault installation and backfill	Call for Inspection

Operations and Maintenance requirements: An operations and maintenance packet will be required, including information from the manufacturer, as per **Chapter 6**

5.10 Structural Detention Facilities

See **Appendix I** **SW-260** through **SW- 265** for typical structural detention facility details.

Description: Structural detention facilities such as tanks, vaults, and oversized pipes provide underground storage of stormwater as part of a runoff flow control system. As with any underground structure, they must be designed not only for their function as runoff flow control facilities, but also to withstand an environment of periodic inundation, potentially corrosive chemical or electrochemical soil conditions, and heavy ground and surface loadings. They must also be accessible for maintenance.

Facilities in this section must be designed using acceptable hydrologic modeling techniques to meet applicable flow control requirements. Additional facilities will be required to meet applicable pollution reduction requirements. Tanks and vaults typically do not have a built-in design feature for containing sediment, as do multi-cell detention ponds. When tanks or vaults are used for detention storage, therefore, either a surface sediment containment pond shall be placed upstream of the tank or vault, or the tank/vault shall be oversized to allow for the temporary accumulation of sediment.

Where the tank or vault is designed to provide sediment containment, a minimum of ½ foot of dead storage shall be provided, and the tank or vault shall be designed and constructed with 0% (flat) bottom slope. Tanks and vaults can be used in conjunction with other detention storage facilities, such as ponds or parking lot ponds, to provide initial or supplemental storage. Because of minimum orifice size specifications, structural flow control facilities (such as detention tanks, vaults, and oversized pipes) for projects with less than 0.5 acre of impervious surface are not effective and will not be permitted. Projects with less than 0.5 acre of impervious surface are required to use surface retention facilities to control flows.

Design Requirements: See **Appendix I** for detail drawings. The following criteria apply to detention tank, vault, and oversized pipe design.

- All areas of a tank or vault shall be within 50 feet of a minimum 36-inch diameter access entry cover. All access openings shall have round, solid locking lids.
- Publicly owned detention tanks, vaults, and pipes are permitted within public rights-of-way. City-maintained tanks and vaults that are not located within the right-of-way shall be located in separate open space tracts with public sewer easements that are dedicated to the City of Florence. All privately owned and maintained facilities shall be located to allow easy maintenance and access. (**Chapter 6.0**: Operation and Maintenance)
- All tanks and vaults shall be designed as flow-through systems, unless separate sediment containment is provided.
- Minimum size for a public detention pipe shall be 36 inches. If the collection system piping is designed also to provide storage, the resulting maximum water surface elevation shall maintain a minimum 1-foot of freeboard in any catch basin below the catch basin grate. Pipe capacity shall be verified using an accepted methodology. The minimum

internal height of a vault or tank shall be 3 feet, and the minimum width shall be 3 feet. The maximum depth of the vault or tank invert shall be 20 feet. Pipe material and surface treatment shall conform to the standards for detention tanks and vaults

• Detention tanks and vaults shall have a minimum of ½ foot of dead storage, unless upstream sedimentation is provided

Flow Control:

• To restrict flow rates exiting the facility to those required by **Chapter 3**, a control structure per **Appendix I** must be used.

Materials and Structural Stability:

• For city-maintained facilities, pipe materials and joints shall conform to the City of Portland's *Sewer and Drainage Design Manual*. For privately owned and maintained facilities, the pipe material shall conform to the Unified Plumbing Code.

• All tanks, vaults, and pipes shall meet structural requirements for overburden support and traffic loadings, if appropriate. H-20 live loads shall be accommodated for tanks and vaults under roadways and parking areas. End caps shall be designed for structural stability at maximum hydrostatic loading conditions.

• Detention vaults shall be constructed of structural reinforced concrete (3000 psi, ASTM 405). All construction joints shall be provided with water stops.

• In soils where groundwater may induce flotation and buoyancy, measures shall be taken to counteract these forces. Ballasting with concrete or earth backfill, providing concrete anchors or other counteractive measures shall be required. Calculations shall be required to demonstrate stability.

• Tanks and vaults shall be placed on stable, consolidated native soil with suitable bedding. Tanks and vaults shall not be allowed in fill slopes, unless a geotechnical analysis is performed for stability and construction practices.

Stormwater Report Requirements For Presumptive Approach: See **Exhibit 2-2**.

Checklist of minimal information to be shown on the permit drawings:

1) Facility dimensions and setbacks from property lines and structures
2) Profile view of facility, including typical cross-sections with dimensions
3) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection

Operations and Maintenance requirements: See **Chapter 6.0**.

5.11 Ponds

See **Appendix I SW-230** through **SW- 234** for typical pond details.

Facility Description

Three types of ponds are described in this section: wet ponds, extended wet ponds, and dry ponds, all of which must be designed and submitted under the Performance Approach. (See **Appendix A.2** for submittal requirements.) The facility must be able to provide 70 percent total suspended solids removal from 90 percent of the average annual runoff (as described in **Section 3.4**) and provide detention of the postdevelopment peak runoff rates to less than pre-development peak runoff rates (as described **Section 3.3)**.

The City encourages applicants to design ponds to function as multipurpose facilities (e.g., parks, open space, or recreation facilities), provided that any alternative uses are compatible with the primary stormwater functions and maintenance standards.

Wet ponds are constructed with a permanent pool of water (commonly referred to as pool storage or dead storage). Stormwater enters the pond at one end and displaces water from the permanent pool. Pollutants are removed from stormwater through gravitational settling and biological processes. When the sizing criteria presented in this section are used, pollution reduction requirements are presumed to be met. Additional facilities may be required in order to meet flow control requirements, as applicable. An overflow mechanism to an approved discharge point is required.

Extended wet ponds are also constructed with a permanent pool of water, but have additional storage above that fills during storm events and releases water slowly over a number of hours. The permanent pool is sized to provide pollution reduction, and the additional storage above (extended detention area) is sized to meet flow control requirements. Pollutants are removed from stormwater through gravitational settling and biological processes. When the sizing criteria presented in this section are used, pollution reduction requirements are presumed to be met. The extended detention must be designed using acceptable hydrologic modeling techniques (see **Section 4.4**) to meet applicable flow control requirements. An overflow mechanism to an approved discharge point) is required.

Dry detention ponds are designed to fill during storm events and slowly release the water over a number of hours. Dry detention ponds must be designed using acceptable hydrologic modeling techniques to meet applicable flow control requirements. Additional facilities are required in order to meet

Design Requirements

Location and Ownership:

- All open ponds to be maintained by the City of Florence shall be located in a separate open space tract with public utility easements dedicated to the City.

- Open ponds serving more than one tax lot or designed to function as multiuse/recreational facilities shall be located in a separate tract (e.g., Tract A), defined easement, or designated open space.

- Instream ponds are not allowed.

Soil Suitability: Wet, extended wet, and dry detention ponds are applicable to high groundwater areas where infiltration disposal is not reliable year round.

Setbacks: Ponds shall be constructed to maintain the following setback distances from structures and other facilities. (All distances are measured from the edge of the maximum water surface elevation.

- Minimum distance from the edge of the pond water surface to property lines and structures: 20 feet, unless an easement with adjacent property owner is provided.

- Distance from the toe of the pond berm embankment to the nearest property line: one-half of the berm height (minimum distance of 5 feet).

- Minimum distance from the edge of the pond water surface to septic tank, distribution box, or septic tank drain field: 100 feet.

- Surrounding slopes shall not exceed 10 percent. Minimum distance from the edge of the pond water surface to the top of a slope greater than 15 percent: 200 feet, unless a geotechnical report is submitted and approved by the City (see **Appendix I.2 SW-230**).

- Minimum distance from the edge of the pond water surface to a well: 100 feet (see **Appendix I.2 SW-230**).

Dimensions and slopes:

- Slopes and depth should be kept as mild as possible to avoid safety risks. Slopes within the pond shall not exceed 3 horizontal to 1 vertical.

- The maximum depth of the pond shall not exceed 4 feet. The 0- to 2-foot depth shall be distributed evenly around the perimeter of the pond.

- The distance between all inlets and the outlet shall be maximized to facilitate sedimentation. The minimum length-to-width ratio is 3:1, at the maximum water surface elevation. This ratio is

critical to prevent “short-circuiting,” where water passes directly through the facility without being detained for any length of time. If area constraints make this ratio unworkable, baffles, islands, or peninsulas may be installed, with City approval, to increase the flow path and prevent short-circuiting.

- Minimum freeboard shall be 1 foot above the highest potential water surface elevation (1 foot above the emergency overflow structure or spillway elevation).

- Dry detention ponds shall be divided into a minimum of two cells. The first cell (forebay) shall contain approximately 10 percent of the design surface area and shall provide at least 0.5 foot of dead storage for sediment accumulation.

- Wet and extended wet detention ponds shall be divided into a minimum of two cells. The first cell (forebay) shall contain approximately 10 percent of the design surface area.

Reference Design Requirements

For detailed design requirements including design methods of orifice and weir controls refer to section **2.3.3** of the Portland Stormwater Management Manual.

6. OPERATION AND MAINTENANCE

The O&M requirements for the city of Florence are the same as City of Portland as described in Chapter 3 of the Portland Stormwater Management Manual and apply to all stormwater management facilities and related facility components of this *Stormwater Design Manual,* except that the determination of public versus private stormwater facilities shall be made consistent with Florence City Code Title 9 Chapter 5.

- When the **Simplified Approach** is used for design, the O&M Specifications provided in Appendix H is sufficient.
- When the **Presumptive Approach** or **Performance Approach** is used, a site specific O&M Plan must be developed.
- If a stormwater facility that is not included in this manual is used (such as a manufactured stormwater treatment technology), the applicant must still prepare and submit an O&M Plan that includes facility-specific O&M activities in compliance with this chapter and with manufacturer requirements.

It is essential to maintain facilities so they function as intended and limit offsite environmental impacts. Owners are required to check their facilities regularly to determine maintenance needs. Routine inspection and maintenance can help keep overall maintenance costs low by detecting problems early and avoiding large repair or replacement costs.

The key goals of any O&M plans and specifications are to:

• Relay information between the designer/engineer and those actually providing the maintenance.

• Identify all facilities, runoff sources, and discharge points that require maintenance. Show the integration of site stormwater design and related regular operations.

• Provide long-term guidance on items to address in order to prevent system deterioration and failure.

• Provide a schedule for maintenance and regular operation.

• Designate and clarify responsibilities.

• Establish fiscal responsibility.

• Provide logs to be filled out by maintenance personnel.

Refer to Chapter 3 of the Portland Stormwater Management Manual for detailed instructions on preparing O&M manuals.

Form O&M: Operations & Maintenance Agreement contained in **Appendix A**: must be completed, notarized, recorded, and submitted to the City for all Stormwater Management Facilities prior to building permit issuance:

In order to function for their intended purpose over the long term, Stormwater Management Facilities must be periodically maintained. Privately owned facilities such as rain gardens, stormwater planters, and porous pavements on private property are the sole responsibility of the

property owner to maintain. The owner must sign an O&M agreement with the City, committing the owner and future owners to certain operation and maintenance activities.

This agreement must be recorded with Lane County prior to building permit issuance. Maintenance responsibility of Stormwater Management Facilities will be set out in the Operations and Maintenance Agreement (see Appendix for a sample agreement). For example, facilities located within public street right-of ways or easements dedicated to the City may be shared between the City and adjacent private property owner. The City's maintenance responsibility may include periodic removal of accumulated trash, debris, and sediment, and repair or replacement of curbing, inlet drains, or rock check-dams. Weeding and trimming or replacement of shrubs, grasses, or other plantings may be the responsibility of the adjacent private property owner. In order to comply with adjacent private property owners' aesthetic values, adjacent private property owners may perform trash and sediment removal on a more frequent basis than the City is capable of achieving. Under no circumstance shall a private property owner place fill, trash, lawn trimmings, or leaves into public or private stormwater facilities.

Submit the completed Form O&M with the building permit application for review by the City of Florence. The form will need to be recorded with Lane County and proof submitted to the City of Florence prior to building permit issuance.

County Clerks's Office Contact Information:
Lane County Deeds and Records
125 E 8th Ave
Eugene OR 97401
541-682-3654

7. SOURCE CONTROLS

7.1 Site Uses and Characteristics That Trigger Source Controls

Source controls are additional requirements for high risk sites or activities. Projects with the following site uses and characteristics are subject to the requirements of Chapter 4 of the Portland Stormwater Management Manual:

- Fuel Dispensing Facilities and Surrounding Traffic Areas
- Above-Ground Storage of Liquid Materials
- Solid Waste Storage Areas, Containers, and Trash Compactors
- Outdoor Storage of Bulk Materials
- Material Transfer Areas/Loading Docks
- Equipment and/or Vehicle Washing Facilities
- Stormwater and Groundwater Management for Development on Land With Suspected or Known Contamination
- Covered Vehicle Parking Areas

Detailed descriptions of these site uses and characteristics can be found in the city of Portland Stormwater Management Manual. Refer to the Portland Stormwater Management Chapter 4 for detailed source control Requirements applicable within the city of Florence

8. REFERENCES AND RESOURCES

1. City of Florence Stormwater Code, Title 9 Chapter 5
2. City of Florence Development Code, Title 10
3. City of Portland Stormwater Management Manual, Revision 4, August 4, 2008
4. City of Portland Sustainable Stormwater Management, http://www.portlandonline.com/bes/index.cfm?c=34598
5. City of Eugene Stormwater Management Manual, April 2008
6. Low Impact Development, Technical Guidance Manual for Puget Sound, Puget Sound Action Team & Washington State University Pierce County Extension, January 2005
7. Oregon Standard Specifications for Construction, 2008, Oregon Department of Transportation,
8. Rain Garden Informational Web Sites
    a. www.raingardennetwork.com/
    b. www.appliedeco.com/Projects/Rain%20Garden.pdf
    c. www.uri.edu/ce/healthylandscapes/raingarden.htm
    d. http://www.lowimpactdevelopment.org/raingarden_design/whatisaraingarden.htm
9. National Resources Conservation Service Web Soil Survey, http://websoilsurvey.nrcs.usda.gov
10. EPA Stormwater program, http://cfpub.epa.gov/npdes/home.cfm?program_id=6
11. City of Gresham, Green Development Practices for Stormwater Management, July 2007

APPENDIX A

Forms And Checklists

APPENDIX A.1 SIMPLIFIED APPROACH SUBMITTAL GUIDE

When the Simplified Approach is used to design stormwater facilities (see **Section 4.2.1)**, the minimum submittal requirements are as follows.

1. **Scaled Site Plans** must include the following information (at a minimum):
   - Minimum scale of 1 inch to 10 feet
   - North arrow
   - Elevations and topography
   - Property lines
   - Lot area and setbacks
   - Footprints of structures
   - Easements and driveways
   - Wells and septic systems
   - Utility lines
   - Width of right-of-way and curb height
   - Impervious areas
   - Type, location and size of stormwater facility
   - Existing and proposed surface drainage
   - Proposed discharge point

2. **Cross Section and Details** of the proposed facility must be included with the plan set. Where sites are topographically varied, it may be imperative to show elevations of inlets, outlets, and discharge points on the cross-section to show how gravity drainage will be met.

3. The **Simplified Approach Form** (see next page) must be completely filled out. The form provides the simplified sizing for the facilities.

4. The **O&M Form** (see **Appendix A.4**) must be recorded with Lane County and submitted to Community Development Department at 250 Highway 101. Florence, OR 97439.

5. The **O&M Specification** (see **Appendix H**) must be recorded with the O&M Form and submitted to Community Development Department.

6. **Landscape plans** are required (see **Section 2.3.2 and Appendix D.1)**

CITY OF FLORENCE: SIMPLIFIED APPROACH FORM

Date:_____

Permit Number: _____

If total impervious area for submitted development proposal is less than 0.5 acre, the Simplified Approach form may be used for sizing stormwater facilities. If total impervious area for submitted development proposal is equal to or greater than 0.5 acre or includes public or private street improvements, the Presumptive or Performance Approach must be used and a Stormwater Management Report will be required. For more information, refer to the 2010 City of Florence Stormwater Design Manual Chapter 4.

Site Information

1. Site Address:
2. State Property ID (R number):
3. Brief Description of Proposed Development:

4. Total Amount of Impervious Area (New and/or Redeveloped):

Site Evaluation

Please refer to Stormwater Design Manual (SWMM) References and Resources section for site evaluation maps (including soil Types and groundwater).

S1. NRCS Soil Types: _____(http://websoilsurvey.nrcs.usda.gov)

S2. Is there a known or suspected high groundwater table in the project area? ___yes ___no

If a site contains seasonal ponding or contains shallow groundwater soil types (53 – Heceta Fine Sand, 140 – Yaquina loamy fine sand, 141 Yaquina urban Land complex), a Partial Infiltration Facility with underdrains should be installed if feasible) ad an overflow provide to an approved disposal point.

Please Note: Each individual tax lot is required to manage the stormwater it generates on the same lot to the maximum extent feasible. If the proposal is unable to meet this requirement, the applicant must submit a special circumstance request.

Applicants must provide surface infiltration facility with overflow to an approved discharge point. Drywells may be used for overflow in areas with a minimum of 10' depth to groundwater but must be registered with DEQ as Underground Injection Control UIC (for more information refer to DEQ) Projects that infiltrate roof runoff with private soakage trenches or drywells are not required to provide pollution reduction prior to infiltration. This exemption does not apply to projects that discharge stormwater offsite. Single-family residential (up to three units) roofs and footing drains are excluded from UIC registration.

Facility Sizing Worksheet Instructions

All facilities sized with this form are presumed to comply with the City's pollution and flow control requirements. Infiltration and discharge requirements are site specific and approved with the use of this form.

1. Enter square footage (sf) of total impervious area being developed on Line 1.
2. Enter square footage (sf) for impervious area reduction (pervious pavement).
3. Enter sum of the impervious area reduction techniques on Line 2.
4. Subtract Line 1 from Line 2 to find Line 3, the amount of impervious area that requires stormwater management.
5. Select appropriate stormwater management facility.

6. Enter the square footage of impervious area managed that will flow into each facility type.
7. Check whether the planter, swale, basins, and filter strips are flow-through facilities.
8. Multiply each impervious area managed by the corresponding sizing factor. Enter this area as the facility surface area, which is the required size to manage the runoff.
9. Where selecting facilities that will overflow, select the final discharge location.
10. Enter the sum of the total of all the impervious area managed on Line 4. The value in Line 4 must be greater than or equal to Line 3.

Facility Sizing Worksheet

Line 1

Total impervious area being developed or redeveloped: _____ SF

Impervious Area Reduction:
Pervious Concrete_____ Sf
Permeable Pavers _____ Sf

Line 2 Total Impervious Area Reduction: _____

Line 3 Total impervious area requiring stormwater management: (Line 1 – Line 2)

Surface Facilities

Subsurface Facilities	*Impervious Area Managed*		*Sizing Factor*		*Facility Surface Area*
Rain Garden	_____sf	x	0.06	=	_____ sf
Planter	_____sf	x	0.06	=	_____ sf
Swale	_____sf	x	0.09	=	_____ sf
Vegetated Filter Strip	_____sf	x	0.20	=	_____ sf

* Overflow will be directed to (check all that apply)

Subsurface facility ____ Surface Water____ Storm Sewer ____

Subsurface Facilities

The following subsurface facilities can receive overflow from the facilities listed above or can be used independently to manage stormwater from residential roofs. If stormwater is generated from anything other than residential roofs, the facilities must have pretreatment. All subsurface facilities are subject to the UIC (Underground Injection Control) requirements.

Drywell	_____ sf	_____ Diameter	_____ Depth
Soakage Trench	_____ sf	_____ Length	_____ Width

Line 4 **Sum of Total Impervious Area Managed: _____**

Note: In the event the stormwater facility temporarily fails or rainfall exceeds the facility design capacity, describe where flows will drain to in order to maintain public safety and avoid property damage. Depending on site conditions, this may include storage in an overflow structure, parking lot, street, or landscaped area.

APPENDIX A.2 PRESUMPTIVE APPROACH SUBMITTAL GUIDE

When the Presumptive Approach (See section 4.2.3) is used to design stormwater facilities, the minimum submittal requirements are as follows.

1. **Scaled Site Plans** including (at a minimum):
   - Minimum scale of 1 inch to 10 feet
   - North arrow
   - Elevations and topography
   - Property lines
   - Lot area and setbacks
   - Footprints of structures
   - Easements and driveways
   - Wells and septic systems
   - Utility lines
   - Width of right-of-way and curb height
   - Impervious areas
   - Type, location and size of stormwater facility
   - Existing and proposed surface drainage
   - Proposed discharge point

2. **Cross Section and Details** of the proposed facility must be included with the plan set. Where sites are topographically varied, it may be imperative to show elevations of inlets, outlets, and discharge points on the cross-section to show how gravity drainage will be met.

3. A **Stormwater Management Report** must be submitted. An outline is provided on the next page to identify report requirements.

4. The **O&M Form** (see **Appendix A.4**) must be recorded with Lane County and submitted to the Community Development Department at 250 HWY 101. Florence, OR 97439.

5. An **O&M Plan** (see **Section 6**) must be developed, recorded with the O&M Form, and submitted to the Community Development Department at 250 HWY 101. Florence, OR 97439.

6. **Landscaping plans** are required (see **Section 2.3.2 and Appendix D.1**).

APPENDIX A.3 Stormwater Management Report Checklist

The Stormwater Management Report is required for every site improvement where the Presumptive or Performance Approach is used and the minimum submittal requirements are as follows. All reports shall be paginated and securely fastened (including maps and exhibits).

- Engineers scale: Maximum 1"=10' Minimum 1"=50'
- All site topography with existing and proposed contours and spot elevations as necessary
- If there are streets, provide the names
- If curbs and no section view, show the curb height
- Utility structures, underground and overhead lines
- Sidewalks
- Surface materials
- Dimensions

1) Cover Sheet
- Project name and owner
- Site address
- Associated permit numbers
- Submittal date
- Engineer
- Firm
- Address
- Contact information

2) Designer's Certification and Statement
"I hereby certify that this Stormwater Management Report for _____ (name of project) has been prepared by me or under my supervision and meets minimum standards of the City of Florence and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me."
Requires Design Professional's Oregon registration stamp

3) Table of Contents

4) Project Overview and Description
- Size and location of project site (vicinity map)
- Property zoning
- Type of development/proposed improvements
- Watershed description
- Permits required (local, state, federal)
- Existing vs. post-construction conditions

5) Methodology

- Drainage at existing site
    - Potential impacts on the proposed site from existing conditions
    - Potential impacts from the proposed site on existing drainage
    - Techniques for mitigating potential conflicts or problems
- Depth to Groundwater Testing results (as applicable)
- Narrative that defines the proposed stormwater management techniques, including discharge point(s) for runoff from private and public impervious areas
- Demonstration of maximized infiltration and vegetative treatment

6) Analysis

- Design Assumptions
    - Design storms used
    - Computation methods
    - Software used
    - Safety factors, curve numbers, and design coefficients
    - Clarify variations from the norm
- Presumptive approach requirements and analysis
- Conveyance requirements and design
- Table of impervious area treated (differentiates public vs. private and roof vs. pavement).
- See example Table 1 below ("Catchment and Facility Table").
- Comparison table of the flow rates for pre and post construction. Table must show that the project meets the flow control requirements set forth in **Section 4.4**. See example Table 2 below ("Pre vs. Post Construction Flow Rates").
- Determination of the escape route or inundation level for the 24-hour 100-year event

Example Table 1

Catchment and Facility Table *(shows each catchment on proposed site as well as proposed facility)*

Catchment/ Facility ID	Source (roof/road/other)	Impervious Area (sf/ac)	Ownership (private/public)	Facility Type	Facility Size (sf/ac)	Curve #
AA						
BB						

Example Table 2

Pre vs. Post Construction Flow Rates

Facility ID	Peak Flow Rate (cfs)								ToC (min)	
	2 yr		5 yr		10 yr		25 yr			
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Project Site										
AA										
BB										

7) Engineering Conclusions
- Based on compliance with Stormwater Design Manual
- How water quality, flow control, and discharge requirements are satisfied
- Post-construction peak flow=pre-development peak flow (2-yr 24-hr events)

8) Stormwater Facility Details/Exhibits
- Contour maps of pre and post development
- Impervious area identification
- Watershed delineation
- Existing and new drainageways
- Point(s) of discharge
- Delineation of each catchment (area treated by one facility)
- Landscape plans (see Appendix D.1)

9) Operations and Maintenance Plan and O&M Form (See Appendix A.4)
- Must include entity responsible for long-term fiscal responsibilities of O&M

10) Additional Forms
- Source Control Special Circumstances Installations (if applicable)
- Special Circumstances (if applicable)

11) Associated Reports Submitted

After Recording Return to:
Name:
Address:

Place Recording Label Here

APPENDIX A.4

Form O&M: Operations and Maintenance Plan

Permit Application No ._____

Owner Name: _____

Phone: (*area code required)* _____

Mailing Address: *(return address for records)* _____

City/State/Zip:_____

Site Address: _____

City/State/Zip:_____

Site Legal Description:

_____

_____

_____

1 Responsible Party for Maintenance (*check one)*

_ Homeowner association _ Property Owner _ Other *(describe)*

_____

2 Contact Information for Responsible Party(ies) if Other than Owner

Daytime Phone: (*area code required)* _____- _____-_____
Emergency/After Hours Phone: _____- _____-_____
Contact Name and Address:

_____

_

Instructions

Simplified Sizing Approach: *Attach O&M Specifications from the Florence Stormwater Design Manual Appendix H.*

Presumptive and Performance Sizing Approach: *Attach the site-specific O&M Plan (See Stormwater Design Manual Section 6).*

3 Site Plan
Show all facility locations in relation to labeled streets, buildings, or other permanent features on the site. Also show the sources of runoff entering the facility, and the final onsite/offsite discharge point.
Please complete the table below

Maintaining the stormwater management facility on this site plan is a required condition of building permit approval for the identified property. The property owner is required to operate and maintain this facility in accordance with the O&M specifications or plan on file with the City of Florence. That requirement is binding on all current and future

owners of the property. Failure to comply with the O&M specifications or plan may result in enforcement action, including penalties. The O&M specifications or plan may be modified by written consent of new owners and written approval by re-filing with the Community Development Department.

Complete and recorded O&M Forms shall be submitted to:
Community Development Department, 250 Highway 101, Florence, OR, 97439
Office hours are 8 - 5, Monday through Friday. Call 541-997-3436 for assistance.

Required Site Plan (insert here or attach separate sheet)

☐ I Have Attached a Site Plan

Please complete this table

Facility Type	Size (sf)	Drainage is from:	Impervious Area Treated (sf)	Discharge Point	

BY SIGNING BELOW *filer accepts and agrees to the terms and conditions contained in this O&M Form and in any document executed by filer and recorded with it. To be signed in the presence of a notary.*

_____
Filer signature

INDIVIDUAL Acknowledgement
STATE of OREGON county of:

This instrument was acknowledged before me on:

By:

Notary Signature:

My Commission Expires: _____ *for notary seal*

CORPORATE Acknowledgement
STATE of OREGON county of:

_____

This instrument was acknowledged before me on:

_____

By:

_____

As (title):

_____

Of (corporation):

_____

Notary Signature:

_____

My Commission Expires: _____

(SAMPLE)
STORMWATER MANAGEMENT FACILITY
CITY OF FLORENCE, OREGON
OPERATION & MAINTENANCE AGREEMENT

Sediment and other pollutants that degrade water quality will accumulate in urban stormwater facilities. The operation and maintenance of stormwater management facilities including the implementation of pollution reduction facilities is essential to the protection of the city's water quality. Removal of accumulated pollutants and sediment is important for proper operation. All property owners are expected to conduct business in a manner that promotes resource protection. This agreement contains specific provisions with respect to city maintenance of private stormwater management facilities and use of pollution reduction facilities.

Property Address:

Legal description:

Whereas, _____, herein referred to as Owner, has constructed improvements, including but not limited to buildings, pavement, and stormwater management facilities on the property described above. In order to further the goals of the City of Florence to ensure the protection and enhancement of water quality, the City of Florence and Owner hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

Recitals

1. Owner owns the above described property within the City of Florence, Lane County, Oregon.
2. Owner owns and operates stormwater management facilities approved and permitted as required by land use permit _____.
3. Owner has requested the city to provide the functional maintenance of the facility.
4. City approved construction plans dedicating the drainage system conveying the runoff from the residential properties to the stormwater facility as a public drainage system are on file.
5. Access routes for maintenance have been located within a dedicated public easement on private or commonly held property, within the public right-of-way or on city owned property.
6. Sufficient easement area, right-of-way width or property have been provided to accommodate the construction and maintenance of all existing and proposed utilities and public infrastructure.

Owner shall:

1. Implement the stormwater management plan included herein as Attachment "A". (Stormwater disposal and pollution reduction construction details, and source control protection, etc.)
2. Implement the stormwater maintenance plan included herein as Attachment "B". (Owner responsibilities such as vegetation control, debris pickup, etc.)
3. Inspect the facilities monthly and after significant storm events to determine if maintenance activity is warranted.
4. Maintain maintenance and inspection records (in the form of a log book) of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by appointment at _____. The log book shall catalog any action taken, who took the action, when it was taken, how it was done, and any problems encountered or follow-on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more often if necessary. The Owner and Users are encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its inspections. These completed checklists would then, in combination, comprise the logbook.
5. Submit an annual report to the City of Florence regarding implementation programs referenced in (1) and (2) above. The report must be submitted on or before June 30 of each calendar year after execution of this agreement. At a minimum, the following items shall be included in the report:
    a. Name, address, and telephone number of the businesses, persons, or firms responsible for maintenance plan implementation, and the persons completing the report.

   b. Time period covered by the report.
   c. A chronological summary of activities conducted to implement the program and plan referenced in (1) and (2) above. A photocopy of the applicable sections of the logbook with any additional explanations needed shall suffice. For any activities conducted by paid parties, include a copy of the invoice for services.
   d. Any outline planned activities for the upcoming year.
6. Allow the City of Florence staff to inspect stormwater management facilities at the above referenced site.

City of Florence shall:

1. Execute the following periodic major maintenance on the subdivision's pollution reduction facilities: sediment removal from facilities, resetting orifice sizes and elevations, and adding baffles.
2. Maintain all stormwater management facility elements within the public rights of way and dedicated easements, such as catch basins, weirs, oil-water separators, and pipes.
3. Provide technical assistance to the Owner in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request and as the City of Florence's time and resources permit.
4. Review the annual report and conduct a minimum of one (1) site visit per year to discuss performance and problems with the stormwater management facilities.
5. Review the agreement with the Owner and modify it as necessary at least once every three (3) years.

Remedies:

1. If the City of Florence determines that maintenance that maintenance or repair work is required to be done to the stormwater management facilities located in the subdivision, the City of Florence shall give the Owner notice of the specific maintenance and/or repair required. The City of Florence shall set a reasonable time in which such work is to be completed the persons who were given notice. If the above required maintenance and/or repair is not completed within the time set by the City of Florence, written notice will be sent to the Owner stating the City of Florence's intention to perform such maintenance and bill the Owner for all incurred expenses.
2. If, at any time, the City of Florence determines that the existing facility creates any imminent threat to public health, safety, or welfare, the City of Florence may take immediate measures to remedy said threat. No notice to the persons listed in Remedies (1), above shall be required under such circumstances. All other

Owner responsibilities shall remain in effect.

1. The Owner shall grant unrestricted authority to the City of Florence for access to any and all stormwater management facilities for the purpose of performing maintenance or repair as may become necessary under Remedies (1) and/or (2).
2. The Owner shall assume responsibility for the cost of maintenance and repairs to the stormwater management facilities, except for those maintenance actions explicitly assumed by the City of Florence in the preceding section. Such responsibility shall include reimbursement to the City of Florence within 90 days of the receipt of the invoice for any such work performed. Overdue payments will require payment of interest at the current legal rate for liquidated judgments. If legal action ensues, any costs or fees incurred by the City of Florence will be borne by the parties responsible for said reimbursements. This Agreement is intended to protect the value and desirability of the real property described above and to benefit all the citizens of the City of Florence. It shall run with the land and be binding on all parties having or acquiring any right, title, or interest or any part thereof, of real property in the subdivision. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof or interest therein, and to the benefit of all citizens of the City of Florence.

This instrument is intended to be binding upon the parties hereto, their heirs, successors and assignees.

In Witness whereof, the undersigned has executed this instrument on this _____ day of _____,20____.

OWNER(s):

Signature _____

_____
(print name)

STATE OF OREGON,
County of Lane, ss:
This instrument was acknowledged before me this _____ day of _____,
20__,by _____, owner(s) of the above described premises.

_____
Notary Public for Oregon

_____
My commission expires

MANAGER, CITY OF FLORENCE
In Witness whereof, the undersigned agent of the City of Florence has executed this instrument and acknowledged
the said instrument to be free and voluntary act and deed on this _____ day of _____,
20____ for the purposes herein mentioned and on oath states he is authorized to execute said instrument.

_____
City Manager

STATE OF OREGON,
County of Lane, ss:
This instrument was acknowledged before me this _____ day of _____,
20__, by _____, owner(s) of the above described premises.

_____
Notary Public for Oregon

_____
My commission expires

APPENDIX B

Growing Medium Specification

City of Florence Growing Medium Specification

The specified soil described in the following is required for all public facilities and private facilities. Testing and submittals are not required for private facilities unless they are requested by the Public Works Department. The two allowable soils are as follows:

1. Standard Stormwater Facility Topsoil:
    a. In-situ or commercially blended mixture of 1 part Sand, 1 part Loam, and 1 part Compost.
    b. Stormwater Facilities requiring infiltration rates in excess of 4 inches per hour are only allowed by exception. Applicant must demonstrate site constraints or hardship requiring exception. Applicant must Submit in-situ testing results sealed by a registered professional engineer or geologist after facility is constructed showing adequate infiltration capacity.

2. Infiltration Blend Stormwater Facility Topsoil:
    a. A uniform mixture of 60% native sand, 40% compost.
    b. Requires approval
    c. May only be used where site restraints require the use of a high infiltration rate facility.
    d. In-situ infiltration testing and soil analysis required sealed by a registered professional engineer or geologist.

Standard Stormwater Facility Topsoil Specification

B.1. Standard Stormwater Facility Topsoil - Furnish topsoil for vegetated stormwater facilities conforming to the following:

1.1 Standard Blend for Public and Private Facilities - Use this blend for all vegetated stormwater management facilities, except those in the right-of-way where compaction from foot traffic is a concern or where site constraints necessitate a high infiltration rate soil, in which case the "infiltration blend soil" may be allowed.

a. General Composition - The medium shall be any blend of approximately 1 part loamy soil, 1 part native sand, and 1 part compost (by volume) and meets the other criteria in this specification.

b. Analysis Requirements for the Blended Material:

1. Testing Requirements- All public facilities, and private facilities utilizing the presumptive or performance design method with more than 6 inches per hour design infiltration rate, shall provide infiltration and soil analysis

2. Particle Gradation - A particle gradation analysis of the blended material, including compost, shall be conducted in conformance with ASTM C117/C136 (AASHTO T11/T27). The analysis shall include the following sieve sizes: 1 inch, 3/8 inch, #4, #10, #20, #40, #60, #100, #200. The gradation of the blend shall meet the following gradation criteria.

Sieve Size	Percent Passing
1 inch	100
# 4	75 -100
# 10	40-100
# 40	15-50
# 100	5-25
# 200	5-15

The blend shall have a Coefficient of Uniformity (D60/D10) equal to or greater than 6 to ensure that it is well graded (has a broad range of particle sizes). The coefficient is the ratio of two particle diameters on a grain-size distribution curve; it is the particle diameter at 60 percent passing divided by the particle diameter at 10 percent passing.

3. Organic Matter Content - An analysis of soil organic matter content shall be conducted in conformance with ASTM D2974 (loss on ignition test). The soil organic matter content shall be a minimum of 10 percent, as reported by that test.

4. Power of Hydrogen (pH) - The pH of the blended material shall be tested and have a pH of 5 to 8**.**

c. General Requirements for the Blended Material:

1. The material shall be loose and friable.
2. It shall be well mixed and homogenous.
3. It shall be free of wood pieces, plastic, and other foreign matter.
4. It shall have no visible free water.
5. It shall infiltrate a minimum of 4 in/hr

d. Compost - The compost shall be derived from plant material and provided by a member of the US Composting Council Seal of Testing Assurance (STA) program. See www.compostingcouncil.org for a list of providers in Oregon. The compost shall be the result of the biological degradation and transformation of plant-derived materials under conditions designed to promote aerobic decomposition. Compost feedstock may include, but is not limited to: agricultural, food or industrial residuals; class A biosolids as defined in the EPA CFR Title 40, Part 503; yard trimmings, or source-separated municipal solid waste. The material shall be well composted, free of viable weed seeds, and stable with regard to

oxygen consumption and carbon dioxide generation. The compost shall have no visible free water and produce no dust when handled. It shall meet the following criteria, as reported by the US Composting Council STA Compost Technical Data Sheet provided by the vendor.

- 100 percent of the material must pass through a ½-inch screen.
- The pH of the material shall be between 6 and 8.
- Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight.
- The organic matter content shall be between 35 and 65 percent.
- Soluble salt content shall be less than 6.0 mmhos/cm.
- Germination (an indicator of maturity) shall be greater than 80%.
- Stability shall be between classes 5-7.
- Carbon/nitrogen ratio shall be less than 25:1.
- Trace metals test result = "pass."

e. Mycorrhizal Fungi:

1. Mycorrhizal Fungi shall be incorporated into planting mix at rates recommended by manufacturer.

f. Submittals –10 working days prior to placing the growing medium, A sample mixture shall be made, and the following submitted:

1. Documentation for the three analyses (particle gradation with calculated coefficient of uniformity; organic matter content; pH). The analyses shall be performed by an accredited laboratory with certification maintained current. The date of the analyses shall be no more than 90 calendar days prior to the date of the submittal. The report shall include the following information:

- Name and address of the laboratory.
- Phone contact and e-mail address for the laboratory.
- Test data, including the date and name of the test procedure.

2. A compost technical data sheet from the vendor of the compost. The analysis and report must be consistent with the sampling and reporting requirements of the US Composting Council Seal of Testing Assurance (STA) program. The analysis shall be performed and reported by an approved independent STA program laboratory.

The date of the analysis shall be no more than 90 calendar days prior to the date of the submittal.

3. If soil is mixed in situ, then within five (5) working days receipts shall be furnished to City demonstrating soil was mixed in same proportions as approved sample batch.

f. Stormwater Facility Topsoil Installation - See 01040.43(c).

(1) Protection of the Growing Medium - The growing medium shall be protected from all sources of contamination, including weed seeds, while at the supplier, in conveyance, and at the project site**.**
(2) Placement of the Growing Medium - The medium shall be placed in loose lifts, not to exceed 8 inches each and each lift shall be compacted with a water-filled landscape roller. The material shall not otherwise be mechanically compacted**.**
(3) Timing of Plant Installation - Weather permitting, plants shall be installed as soon as possible after placing and grading the growing medium in order to minimize erosion and further compaction.
(4) Erosion Control - Temporary erosion control measures are required until permanent stabilization measures are functional, including protection of overflow structures.
(5) Protection of the Facility - In all cases, the facility must be protected from foot or equipment traffic that is unrelated to the construction of the facility. Temporary fencing or walkways should be installed as needed to keep workers, pedestrians, and equipment out of the facility. Under no circumstances should materials and equipment be stored in the facility.
Stormwater facilities shall be kept clean and shall not be used as erosion and sediment control structures during construction.
(6) Wet and Winter Conditions - Placement of the growing medium will not be allowed when the ground is frozen or saturated or when the weather is determined to be too wet.

B.2. Stormwater Infiltration Facility Topsoil - Furnish topsoil for vegetated infiltration stormwater facilities conforming to the following:

2.1 Standard Blend for Public and Private Facilities - Use this blend for all vegetated stormwater facilities where Higher Design infiltration rates are required. This mix shall not be used in identified Drinking Water Protection Areas (See Appendix C)

a. General Composition - The medium shall be a blend of 60% Native sand and 40% compost, that meets the other criteria in this specification.
c. General Requirements for the Blended Material - See 01040.14(d)(1)c.
d. Compost - See 01040.14(d)(1)d.
e. Submittals - See 01040.14(d)(1)e.
f. Stormwater Facility Topsoil Installation - See 01040.43(e).

B.3. Stormwater Facility Topsoil Installation

(1) Protection of the Growing Medium - The growing medium shall be protected from all sources of contamination, including weed seeds, while at the supplier, in conveyance, and at the project site**.**

(2) Placement of the Growing Medium - The medium shall be placed in loose lifts, not to exceed 8 inches each and each lift shall be compacted with a water-filled landscape roller. The material shall not otherwise be mechanically compacted**.**

(3) Timing of Plant Installation - Weather permitting, plants shall be installed as soon as possible after placing and grading the growing medium in order to minimize erosion and further compaction.

(4) Erosion Control - Temporary erosion control measures are required until permanent stabilization measures are functional, including protection of overflow structures.

(5) Protection of the Facility - In all cases, the facility must be protected from foot or equipment traffic that is unrelated to the construction of the facility. Temporary fencing or walkways should be installed as needed to keep workers, pedestrians, and equipment out of the facility. Under no circumstances should materials and equipment be stored in the facility. Stormwater facilities shall be kept clean and shall not be used as erosion and sediment control structures during construction.

(6) Wet and Winter Conditions - Placement of the growing medium will not be allowed when the ground is frozen or saturated or when the weather is determined to be too wet.

B.4 Water - Use the following watering tables (when Applicable):

Water deciduous trees 1-1/2 inches or larger and conifer trees over 4 feet in height as follows:

Time	Frequency	Gallons/Tree (Minimum)
May - June	weekly	15
July - August	weekly	20
September - October	weekly	15

Water shrubs as follows:

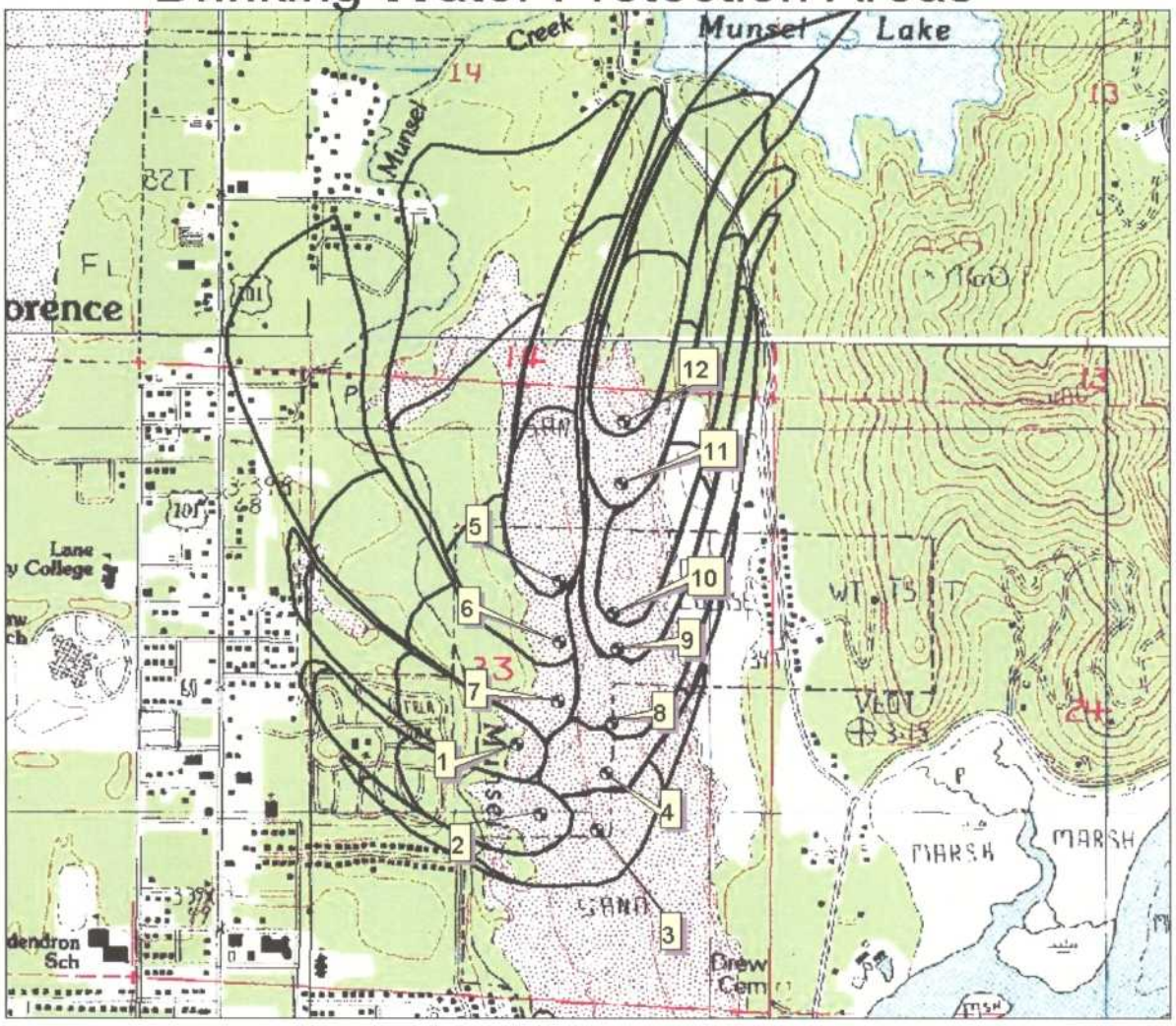
Time	Frequency	Gallons/Shrub
May - June	weekly	5 - 10
July - August	weekly	15 - 20
September - October	weekly	10 - 15

APPENDIX C

Drinking Water Protection Area Map

City of Florence
Drinking Water Protection Areas

Figure 1b



Drinking Water Protection Areas
1-, 2-, 5- and 10 year Groundwater
time-of-travel within the aquifer to the wells shown.
Total area of delineation: 1.03 mi2 (660 acres)
Model Used: MODFLOW numerical
Florence Dunal Aquifer: Unconfined sand
Permeability: 20 - 40 feet/day
Thickness: ~65 feet
Model Pump rates: 125 gpm for each well

Prepared by: Dennis Nelson RG1224
Drinking Water Program
Department of Human Services
10/15/02
PWS# 4100299

Well Locations:

T18S R12W Sec 14 and 23
Florence and Mercer Lake USGS 7.5 minute
topographic quadrangles

Lane County

Figure 1b: City of Florence Drinking Water Protection Areas

APPENDIX
D

Depth to Groundwater Investigation

APPENDIX D DEPTH TO GROUNDWATER INVESTIGATION

Several areas within the City of Florence have known shallow groundwater. Within areas of known or suspected shallow groundwater, additional information about the depth to groundwater (DTW) must be collected to ensure that the proposed underground injection control will be effective and sufficient separation between drywell and groundwater exists. A DTW is optional for surface infiltration facilities but a demonstrated separation to the groundwater can eliminate the need for overflows/underdrains that would be required otherwise.

Depth to Groundwater Investigation Requirements

The DTW investigation requires sufficient time to plan for and perform the necessary steps to collect a reliable measurement, including obtaining permits, performing utility locates, borings, piezometer/well installation, collection of water level measurements, and decommissioning of the monitoring well. The DTW investigation, including design, installation oversight, water measurements, and decommissioning, must be performed by an Oregon licensed registered geologist (RG), certified engineering geologist (CEG), or professional engineer (PE) with experience in hydrogeologic investigations and well design and installation; the investigation may include either the installation of a temporary piezometer(s) or groundwater monitoring well(s).

The qualified professional is responsible for developing an appropriate scope of work to document the DTW, including:

- Determining the number and location(s) of the DTW measurements needed to address project objectives. (It is recommended, but not required, to have each piezometer or well location surveyed to a datum.)
- Determining the appropriate method for obtaining DTW measurements (e.g., piezometer or monitoring well).
- Determining the appropriate depth of the boring(s). (Boring depth must be a minimum of 20 feet deeper than the proposed UIC depth.)
- Observing and describing soils encountered during drilling.
- Developing an appropriate well or piezometer design.
- Ensuring that construction and abandonment of piezometer or monitoring well complies with Oregon Administration Rules 690-240.
- Obtaining depth to groundwater measurements.
- Estimating the measured DTW to be representative of the “groundwater seasonal high,” based on available data and best professional judgment.
- Documenting the procedures used and the results of the DTW investigation.
- Submitting a signed and stamped DTW investigation report.

To the extent practicable, DTW measurements should be obtained in the immediate vicinity (less than or equal to 75 feet) of the proposed facility. If high-quality shallow groundwater level data is available (e.g., piezometer, monitoring well, drinking water well, irrigation well) within 200 feet of the proposed UIC location, this data may be considered in lieu of site-specific data.

Requirements and Guidelines for Obtaining DTW Measurements

Using the following guidelines to collect and evaluate site-specific groundwater information will ensure that new facilities will meet the vertical separation requirement.

Permitting

Piezometers, monitoring wells, temporary wells, geotechnical holes, and other holes must by drilled, installed, and abandoned in accordance with Oregon Administrative Rules (OAR) 690-240 *Construction, Maintenance, Alteration, Conversion and Abandonment of Monitoring Wells, Geotechnical Holes and Other Holes in Oregon*. These rules require the licensed well constructor to provide notice and pay the associated fee(s) to the Oregon Water Resources Department (OWRD) prior to drilling or abandoning any new monitoring well, piezometer, or geotechnical hole. Additional information is available on OWRD's website: www.wrd.state.or.us.

Utility Clearance

Boring locations must be checked for underground utilities prior to any drilling activity. The Oregon Utility Notification Center's (OUNC) one-call number provides a free service to home owners, contractors, and other excavators, informing them of any buried facilities in the area where they are planning to dig. The OUNC must be called two business days prior to digging. To request locates for proposed excavation, call the One-Call Center at 1-800-332-2344.

Piezometer/Well Design

The piezometer or well design should include the following, where necessary:

- Total boring depth.
- Appropriate well screen interval.
- Piezometer or well materials (e.g., well screen, filter pack, casing). Factory-fabricated prepacked wells screens may be used. New or reused equipment must be thoroughly decontaminated by steam cleaning or high-pressure hot water washing unless delivered in packaging with documentation of proper decontamination.
- Appropriate annular seal.
- Appropriate surface seal and security casing.

Piezometer/Well Borehole Drilling and Installation

Continuous soil sampling is recommended to allow detailed characterization of subsurface soil and identification of groundwater depth. The RG, CEG, or PE must prepare and submit a detailed boring log of subsurface conditions. Soil boring logs should be in accordance with the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* (ASTM D2488-00). Borings must be advanced to the groundwater level, or to a minimum of 20 feet below the proposed total depth of the UIC or 10 feet below a proposed UIC of 5 feet or less. If water is encountered in the boring, it must be noted on the drilling log. The appropriate drilling method should be selected by the RG, CEG, or PE in conjunction with the driller, based on anticipated site-specific geologic and hydrogeologic conditions, anticipated boring depth, site

accessibility, availability of equipment, and piezometer/well design. All equipment placed into the boreholes must be properly decontaminated prior to use.

Any investigation-derived material (e.g., soil cutting, water, personal protective gear) generated during drilling activities must be properly contained, characterized, and disposed in accordance with applicable state and federal regulations. Soil and water disposal must be documented.

Depth to Water Measurements

Following piezometer/well installation, water levels must be allowed to equilibrate for a minimum of 24 hours in fine-grained soils. After the water level has stabilized, an electronic water level indicator or a weighed tape should be used to measure the depth to water. Measurements should be made relative to ground surface and to the nearest 1/8 inch (~0.01 feet). The observer must make at a minimum two measurements over a period of about 15 minutes to show the results are static.

If water is not encountered in the soil boring, advanced 20 feet below the proposed UIC completion depth, it must be documented on the boring log and in the investigation report. In this case, the depth to water is assumed to be outside the range of seasonal fluctuation; the minimum required separation distance for the proposed bottom of the UIC to seasonal high groundwater is therefore met by default. The borehole may be decommissioned immediately, in accordance with OAR 690-240.

APPENDIX

E

City of Florence Stormwater Code

TITLE 9
CHAPTER 5

STORMWATER MANAGEMENT UTILITY, USER FEE SYSTEM AND STORMWATER MANAGEMENT REQUIREMENTS

SECTION:

9-5-1: GENERAL PROVISIONS

9-5-1-1: PURPOSE

The purpose of this Code is to protect, maintain, and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse effects of stormwater runoff associated with existing and future land development within the City. Proper management of stormwater runoff will minimize damage to public and private property, ensure a functional drainage system, reduce the negative effects of development on the existing stream channels, assist in the attainment of water quality standards, help protect the quantity and quality of the water in the aquifer, enhance and protect the natural environment associated with the drainage system, and facilitate orderly development while mitigating the associated impacts of development.

Further, the purpose is to establish a Stormwater Utility with a user fee system to fund stormwater management activities and facilities within the City.

This Code defines the minimum requirements for stormwater management facilities. Additional requirements may be required by the City if the minimum requirements will not satisfy the overall purpose of this Code.

9-5-1-2: DEFINITIONS:

For the purposes of this Chapter, the following words and phrases shall have the meanings indicated:

BACKWATER	Areas of water where the water surface elevation is raised as a result of down gradient activities or constrictions.
BASE RATE	Means the Stormwater Management Fee charges on a base unit. The annual (fiscal year) Stormwater Management Fee for a single family residential property in the City equals the base rate.
BASE UNIT	Means the median net surface area associated with a single-family residential property in the City.
BEST MANAGEMENT PRACTICES (BMPs)	BMPs to be used in Florence are described in the Stormwater Manual.
BUFFER ZONE	A physical setback from a sensitive area used to protect the water quality, the aquatic and riparian wildlife communities, and the habitat value within the sensitive area. The start of the buffer starts at the edge of the defined channel (bank full stage) for streams/rivers, delineated wetland boundary, delineated spring boundary, or average high water for lakes.
DETENTION FACILITY	A permanent stormwater management structure that temporarily stores runoff by controlling the release rate from the facility to prevent down gradient flooding and high velocities.
DEVELOPED PROPERTY	Real property which has been altered from its natural state. This includes but is not limited to the addition of any improvements such as buildings, structures, or other impervious area and for which the intended use relies upon the ability to access the property and/or to protect the property from surface flooding, and erosion, or to prevent the degradation of water quality.
DEVELOPMENT	The clearing, grubbing, stripping, grading, excavating, and filling of land, the construction of structures, facilities, utilities or other improvements, or the creation or improvement of an access to a public street.
DIVISION OF LAND	The creation of lots or parcels.
DRAINAGE FACILITY	Any of a number of types of stormwater conveyance detention, retention or other related facilities, including: pipes, culverts, ditches, natural drainageways, streams, catch basins, inlets, trash racks, and other types of open-channel systems.
DRAINAGE PLAN	The submittal requirement for all projects except those specifically exempt from the submittal process or subject to the modified requirements. The plan helps to identity the major impact of the proposed development on the quality and quantity of stormwater and the proposed activities to limit and address negative impacts. The submittal requirements for the Drainage Plan are specified in the Stormwater Manual.
EASEMENT	A grant or interest in land owned by another that entitles its holder a specific limited use.

EQUIVALENT SERVICE UNIT	The average net area of single family residential properties within the city, and is utilized to establish the user charge rate for the non-single family residential properties.
FEE OR STORMWATER MANAGEMENT FEE	The charge established under this Chapter and levied on owners of parcels or pieces of real property to fund the costs of stormwater management and of operating, maintaining, and improving the stormwater system in the City.
FLOW CONTROL	The practice of limiting the release of peak flow rates and volumes from a site. Flow control is intended to protect downstream properties, infrastructure, and natural resources from the increased stormwater runoff peak flow rates and volumes resulting from development. The terms “flow control” and “flood control” are used interchangeably.
FLOW CONTROL FACILITY	Any structure or drainage device that is designed, constructed, and maintained to collect, retain, infiltrate, or detain surface water runoff during and after a storm event for the purpose of controlling post-development quantity leaving the site.
HEC-1	The first in a series of models developed by the Hydrologic Engineering Center, which is a division of the U.S. Army Corps of Engineers. HEC-1 is a hydrologic model. It is available at: http://www.wrc-hec.usace.army.mil
HECRAS	Another model developed by the Hydrolic Engineering Center. RAS stands for River Analysis System. This is a hydraulic model and is an update to the older HEC-2 model. It is also available at: http://www.wrc-hec.usace.army.mil
HSPF	A Hydrological Simulation Program translated into Fortran. It is a hydrologic model. It is an EPA/USGS program and can be found at: http://water.usgs.gov/software/hspf.html
HYDRA	A commercial program from Pizer which is both hydrologic and hydraulic. More information can be found at: http://www.pizer.com/hydra.htrn.
IMPERVIOUS SURFACES	Buildings, roofs, sidewalks, streets, paved parking areas, gravel streets and parking areas, and other types of paved or hard surfaces that severely limit the infiltration of stormwater into the underlying soil. Surfaces with a Rational Method runoff coefficient of 0.8 or higher shall be considered impervious.
IMPROVED PROPERTY	Property which has been modified from its natural state for a human purpose.
LAND DISTURBING ACTIVITIES	Any use of the land by any person that results in a change in the natural cover or topography.
LOT	A unit of land that is created by a subdivision of land.
MAJOR PARTITION	A partition which includes the creation of a road or street and which does not result in the creation of more than two (2) or three (3) lots within a calendar year.
MINOR PARTITION	A partition which does not include the creation of a road or street, and which does not result in the creation of more than two (2) or three (3) lots within a calendar year.
MULTI-FAMILY DWELLING	A building with more than two dwelling units.

NET SURFACE AREA	The total area of a lot or parcel of land less the area of adjacent public rights-of-way.
OTHER DEVELOPED PROPERTY	Developed property other than single-family residential property. Such property shall include, but not be limited to, multi-family dwellings, commercial properties, industrial properties, parking lots, hospitals, schools, recreational and cultural facilities, hotels, offices, and churches.
OWNER	An individual, association, partnership or corporation having legal or equitable title to land sought to be divided, other than legal title held for purposes of security only.
PARTITION LAND	Division of an area or tract of land in two (2) or three (3) parcels within a calendar year when such area or tract of land exists as a unit or contiguous units of land under a single ownership at the beginning of such year.
POLLUTION GENERATING IMPERVIOUS SURFACE	Impervious surfaces that generate pollution, including but not limited to: impervious surfaces subject to regular vehicular use, such as roads, un-vegetated road shoulders, driveways, parking lots, diesel equipment storage yards, and airport runways; storage areas of erodible or leachable materials, wastes, or chemicals; and metal roofs that are not treated to prevent leaching.
POLLUTION GENERATING PERVIOUS SURFACE	Any non-impervious surface with vegetative ground cover subject to the use of pesticides and fertilizers, including: lawns and landscaping of commercial sites, golf courses, parks and sports fields.
PORTLAND EROSION AND SEDIMENT CONTROL MANUAL	The technical document that provides guidance for temporary and permanent erosion prevention, sediment control, and control of other development activities that can cause pollution during the construction process (before, during, and after clearing, grubbing, grading, and excavation).
POST-DEVELOPED CONDITIONS	The conditions that exist following the completion of the land disturbing activity in terms of topography, vegetation, land use and rate, volume or direction of stormwater runoff.
PRE-DEVELOPED CONDITIONS	The conditions of the land prior to the initiation of the land disturbing activity in terms of topography, vegetation, land use and rate, volume or direction of stormwater runoff.
PUBLIC STORMWATER FACILITY	Drainage and stormwater management facilities located within the public right-of-way or easements dedicated to the City and that are owned and maintained by the City.
RETENTION FACILITY	Similar to a detention facility, except the retention facility is designed with a permanent pool of water that may have a detention storage volume above the permanent pool. Many of these facilities use infiltration and evaporation to discharge the retained volume of water.
RIGHT-OF-WAY	The area between boundary lines of a street or other easement, whether improved or unimproved.

SENSITIVE AREAS	Natural streams (perennial or intermittent), rivers, lakes, or wetlands hydraulically connected by surface water to streams, rivers, or lakes and areas defined by the City of Florence's Local Wetlands and Riparian Inventory. Also, includes all areas that are protected for species as per areas designated by Oregon Department of Fish and Wildlife, Oregon Division of State Lands, National Marine Fisheries Service, United States Fish and Wildlife Service, and Oregon Department of Transportation.
SINGLE FAMILY RESIDENTIAL PROPERTY	Means a developed property which serves the primary purpose of providing a permanent dwelling unit and which is classified as residential in the State assessment rolls. A single family detached dwelling or a townhouse containing an accessory apartment or second dwelling unit is included in this definition.
STORMWATER DESIGN MANUAL (CITY OF FLORENCE STORMWATER DESIGN MANUAL)	The City-recognized guide to designing and installing Best Management Practices (BMPs) in order to meet the requirements for stormwater facilities in this Title. The Stormwater Design Manual supersedes the 2008 Portland Stormwater Management Manual.
STORMWATER MANAGEMENT	The planning, design, construction, regulation, improvement, repair, maintenance, and operation of facilities and programs relating to flood control, erosion prevention, conservation, and water quality utilizing the construction of facilities or structures to control the quantity and quality of stormwater.
STORMWATER MANAGEMENT FACILITIES	Facilities or structures that control the quality or quantity of stormwater, including: detention ponds, water quality ponds, vegetated swales, water quality manholes, treatment wetlands, infiltration systems, etc.
STORMWATER MANAGEMENT FUND OR FUND	The Fund created by this Chapter to operate, maintain, and improve the City's stormwater system.
STORMWATER MANAGEMENT PLAN OR SWMP	The City-recognized plan that was prepared with the input of a Stakeholder Advisory Committee that makes recommendations for addressing flooding problems, improving water quality, and protecting the quantity and quality of the aquifer and valuable natural resources (e.g. wildlife habitat). It is intended to guide upgrades and expansion of the public stormwater conveyance system and related public facilities to meet the area's needs over a 20 year period.
STORMWATER MANUAL	The term "Stormwater Manual" means the 2008 *City of Portland Stormwater Management Manual*, as superseded by the *City of Florence Stormwater Design Manual*, December 2010, and the 2008 *City of Portland Erosion and Sediment Control Manual*. The 2008 *City of Portland Stormwater Management Manual* is the technical document that outlines the City of Florence stormwater management requirements. The requirements defined in the manual apply to all development and redevelopment projects within the City of Florence on both private and public property, except as superseded by the *Florence Stormwater Design Manual,* as amended by the City of Florence.
STORMWATER SYSTEM	All of the structures and facilities that are designed for the collection, conveyance, storage, treatment, and disposal of stormwater runoff and surface water, including both man made and natural drainage systems.
SUBDIVIDE LAND	The division of an area or tract of land into four (4) or more lots within a calendar year when such area or tract of land exists as a unit or continuous units of land under single ownership at the beginning of such year.

SUBDIVISION	Either an act of subdividing land, or an area or tract of land subdivided as defined in Title 11 Chapter 1 of the City Code.
SWMM	This is a hydrologic and hydraulic stormwater management model and it is an official EPA model. It was originally developed and maintained by Wayne Huber of Oregon State University. It is available at: http://www.ccee.orst.edu/swmm.
ZONE OF CONTRIBUTION	The up-gradient boundary of a wellhead protection area as defined by the 10-year time of travel.

9-5-1-3: FINDINGS:

A. The City maintains a system of storm and surface water management facilities including, but not limited to, inlets, conduits, manholes, channels, ditches, drainage easements, retention and detention basins, infiltration facilities, and other components as well as natural waterways.

B. The stormwater system in the City needs regular maintenance and improvements.

C. Water quality is degraded due to erosion and the discharge of nutrients, metals, oil, grease, toxic materials, and other substances into and through the stormwater system.

D. The public health, safety, and welfare is adversely affected by poor ambient water quality and flooding that results from inadequate management of both the quality and quantity of stormwater.

E. All real property in the City either uses or benefits from the improvement and maintenance of the stormwater system.

F. The extent of use of the stormwater system by each property is dependant on factors that influence runoff, and is proportional to the total net area of the property.

G. The costs of improving, maintaining, operating, and monitoring the stormwater system should be allocated, to the extent practicable, to all property owners based on the impact of runoff from the net areas of their property on the stormwater management system.

H. Management of the stormwater system to protect the public health, safety, and welfare requires adequate revenues and it is in the interest of the public to finance stormwater management adequately with a user charge system that is reasonable and equitable so that each user of the system pays to the extent to which he contributes to the need for it.

9-5-1-4: ESTABLISHMENT OF STORMWATER UTILITY:

A. A Surface Water Management Utility is hereby created.

B. Powers and Duties.

1. The Surface Water Management Utility shall plan, design, construct, maintain, administer and operate all City surface water conveyances and facilities, and the regulations for its control, as well as establish standards for design and construction.

2. The City Manager or his/her designee shall be the administrator of the Program.

3. Ownership of City Surface Water Facilities and Assets. The following assets are hereby vested in the Surface Water Management Utility: All properties, interests, and physical or intangible rights owned or held by the City insofar as they concern surface water or surface water management. These rights include all properties or interests in property acquired by

adverse possession or prescription, directly or through another, in the drainage or storage of surface waters via lands, watercourses, sloughs, streams, wetlands, ponds and lakes, all beginning at a point where surface waters first enter the system of the City and ending in each instance at a point where the surface waters exit from the system of the City, and in width to the full extent of inundation caused by storm or flood conditions.

9-5-1-5: STORMWATER MANAGEMENT CHARGE:

A. Except as otherwise provided by this Chapter, a stormwater utility user charge shall be applied to all persons who use developed property, as defined in 9-5-1-2 "Developed Property." Collection of said charge shall be through City water or sewer utility services or other mechanism adopted by the City Council.

B. The stormwater utility user charge shall be established by resolution of the City Council in an amount reasonable and necessary to fund the administration, planning, design, construction, water quality programming, operation, maintenance and repair of the City's utility systems.

C. The surface water management utility user charge shall be based upon the amount of net surface area used by a customer. The Methodology shall recognize the unique nature of stormwater runoff within the city of Florence due to the soil and groundwater characteristics.

D. Owners or occupants of undeveloped property shall not be charged. Each customer using a location for single family residential shall be charged a uniform rate based upon containing one equivalent service unit (ESU). The charge for all other parcels shall be proportional to the ESU charge, based upon the total amount of net surface area of the property divided by the area of one ESU.

E. The City utility user charge may be reviewed by the City Council periodically. The City Council may set the stormwater utility charge by resolution.

F. Stormwater utility users may appeal the calculation of impervious surface area used to calculate the Stormwater utility user charge. The City may use any method deemed necessary to measure the impervious surface area. If impervious surface area is reduced by the appeal, refunding of overcharges will be limited to one year prior to the date of the approval of the appeal.

9-5-1-6: PUBLIC STORMWATER SYSTEM:

A. Storm drainage and management facilities may or may not be publicly owned and maintained.

B. The City Manager or his/her designee may require that a stormwater facility that serves more than one property be a public facility provided the easement and maintenance requirements of this Code are satisfied.

C. Storm drainage and management facilities within a Planned Unit Development (PUD) may or may not have a publicly owned and maintained system. Generally, if the City owns and maintains the roads and there is free ingress and egress from the community (not gated), then the City may own and maintain the stormwater system provided the easement and maintenance requirements of this Code are satisfied. Ownership of the PUD stormwater system shall be established prior to the issuance of construction permits.

D. Natural streams and drainage ways may or may not be publicly owned and maintained.

E. The stormwater management facilities identified in the City of Florence Stormwater Management Plan shall be publicly owned.

F. The City may accept ownership of the major components of the existing stormwater system located outside of the current City boundary after the area is annexed into the City. In general, the stormwater system owned and maintained by Lane County (prior to annexation) will be accepted by the City. The City Manager or his/her designee shall consider the following factors prior to acceptance of any facilities into the public drainage system:

1. standards used in the design,

2. the location of the system relative to the public right-of-way,

3. functionality of the system,

4. associated flooding problems,

5. maintenance requirements,

6. ability to access facilities, and

7. any other factors pertinent to the decision.

9-5-1-7: EXTENSION OF PUBLIC STORMWATER SYSTEM:

A. If necessary or required, the public stormwater system shall be extended up to and through to the most distant up gradient and down gradient parcel boundary(ies) to accommodate current and future flows entering or exiting the property. Consideration and accommodation shall be made for all existing drainage routes. Except as otherwise provided, the extension of the public stormwater system to serve any parcel or tract of land shall be done by and at the expense of the property owner(s) or applicant. The City may require that a stormwater system that serves more than one property be a public system.

9-5-1-8: STORMWATER MANUAL, ADOPTION BY REFERENCE:

Except as noted below in Sections 9-5-1-8 A and B, the standards and requirements contained in the 2008 *City of Portland Stormwater Management Manual*, the 2008 *City of Portland Erosion and Sediment Control Manual*, and the *City of Florence Stormwater Design Manual*, December 2010, are adopted by reference into this Code.

A. The following Sections of the 2008 *City of Portland Stormwater Management Manual* are not adopted by the City of Florence:
- Appendix A: (City of Portland Code and Policy)
- Appendix B: (Vendor Submission)
- Appendix D: (Submittal Guides)
- Appendix E: (Storm Development Methodology)
- Other Sections that the Florence Public Works Director finds are not directly applicable to Florence or are partially applicable because they have been modified by the *Florence Stormwater Design Manual*, December 2010.

B. The *City of Florence Stormwater Design Manual,* December 2010, shall supersede the 2008 *City of Portland Stormwater Management Manual.*

9-5-2: DRAINAGE PLAN SUBMITTAL REQUIREMENTS:

9-5-2-1: GENERAL:

A. A Drainage Plan is required for all development, except as provided in FCC 9-5-2-4. Submittal requirements are tailored to the size and impacts of the development. The submittal requirements are specified in the Stormwater Manual.

B. A registered Professional Engineer licensed by the State of Oregon shall prepare, certify, and seal the Drainage Plan whenever a Professional Engineer is required in the Stormwater Manual or state law. Furthermore, prior to land disturbing activity, the developer for the land disturbing activity shall certify that the proposed activities will be accomplished pursuant to the approved plan.

C. If a land use approval is required, the Drainage Plan shall be submitted and approved as part of the land use approval process. If no land use approval is required, the Drainage Plan shall be submitted as part of the application for a construction or facility permit.

9-5-2-4: EXEMPTION AND MODIFIED REQUIREMENTS:

A. **Exemptions:** Projects exempt from the requirements of this Code include:

1. Projects with site development applications submitted for City review and approval prior to the effective date of this Code.

2. Emergency projects which if not performed immediately would substantially endanger life or property.

3. Public works and private utility projects completely within easements adjacent to the public right-of-way which do not add impervious surface (not to include trenching activities) or impact water quality, wetlands, streams, open space buffers, park and recreation lands, or natural resource lands.

4. Grading and working of land for agricultural purposes, provided the activity does not affect water quality, wetlands, streams, open space buffers, park and recreation lands, or natural resource lands.

5. Maintenance of public roads or utilities when performed by a public agency and the project has been reviewed and approved for compliance with applicable State, Federal and City regulations, and the work is in an existing right-of-way or easement dedicated to or on property owned by the City.

6. Public Works maintenance activities for routine repetitive activities, provided that erosion and sediment control measures are implemented as required.

7. All utility trenching and installation where said utility has filed a plan with the City that addresses sediment and erosion control methods to be implemented as part of the work.

B. **Modified Requirements:** Projects described below shall follow the requirements contained in the "Erosion Prevention and Sediment Control Practices for Single Family Residences and Small Projects" brochure available from the City:

1. Single family residential construction projects that are separate from the development (partitioning or subdividing) of the land.

2. Non-residential construction projects adding less than 500 square feet of impervious surface to the area.

3. Land clearing and grading activities disturbing less than 10,000 square feet of land and involving less than 50 cubic yards of excavated or fill material.

C. In accordance with Section 9-5-2-1 the City Manager or his/her designee will determine if a proposed project meets the criteria defined by Section 9-5-2-4 The City reserves the right to require additional protection measures if a project is deemed to present a risk to the community.

9-5-3: STORMWATER DESIGN CRITERIA:

9-5-3-1: GENERAL:

A. The criteria in Section 9-5-3 shall be used in the design of public and private stormwater drainage and management systems. Stormwater management facilities shall be constructed in accordance with the Stormwater Manual: the 2008 *Portland Stormwater Management Manual*, as superseded by the December 2010 *City of Florence Stormwater Design Manual;* and the 2008 *City of Portland Erosion and Sediment Control Manual.*

9-5-3-2: STORMWATER QUANTITY (FLOW CONTROL):

A. A 25-year, return period storm shall be used for the design of all private and public stormwater drainage systems.

B. Onsite stormwater management facilities shall be required to prevent the post-development runoff rates from a project site from exceeding the pre-development runoff rates from the site, based on a 2 through 25-year storm. Exemptions to this requirement may be approved by the City Manager or his/her designee if it is determined that a more effective solution is available and that downstream capacity will accommodate the increase in flow.

C. Each new development project is responsible for mitigating its impacts on the stormwater system. This mitigation requirement can be satisfied through the use of any of the following techniques, subject to the other limitations identified by this Code:

1. Construction of onsite facilities to limit the flow rate of stormwater runoff leaving the development site, in accordance with the Stormwater Manual.

2. Enlargement or improvement of the down gradient conveyance system in accordance with the requirements of this Code and the City of Florence Stormwater Management Plan.

D. The development of any land requiring a Drainage Plan shall address onsite and off-site drainage concerns, both up gradient and down gradient (a minimum of 1/4-mile) of the project, including:

1. Modifications to the existing onsite stormwater drainage and management facilities and drainage patterns shall not restrict or redirect flows creating backwater or direct discharge onto off-site property to levels greater than the existing condition unless approved by the affected off-site property owners and the City. Proof of off-site property owners approval shall be provided by having the affected property owner(s) sign an easement identifying the location of the backwater storage or impoundment area. This area shall be clearly shown on the submitted Drainage Plan site sheet(s). The easement shall be in a form approved by the City and recorded with the Lane County Deeds and Records Office.

2. Stormwater facilities shall be designed and constructed to accommodate all flows generated from the project property in accordance with the land use zoning as shown in the most recent approved City Code.

3. Capacity of the downstream drainage system to determine if increases in peak flow rates resulting from the proposed development can be accommodated.

E. The types of stormwater management controls presented in the Stormwater Manual are available for owners and developers to use in satisfying the pre-developed and post-development runoff requirement. More than one of these types of controls may be needed to satisfy the runoff requirement. In areas where the runoff requirement in Section 9-5-3-2-F are exempt or partially exempt, the City may require improvements to the down gradient conveyance system.

9-5-3-3: STORMWATER QUALITY:

A. Stormwater management facilities to treat stormwater are required for certain types of projects. These water quality facilities shall be designed and constructed for all projects requiring a Drainage Plan and for other projects as required by this section. Stormwater management facilities required for development shall be designed, installed and maintained in accordance with the Stormwater Manual, which is based on achieving at least 70% removal of the Total Suspended Solids (TSS) from the flow entering the facility for the design storm specified in the Stormwater Manual.

B. Water quality facilities shall be designed and constructed for all projects requiring a Drainage Plan.

C. Projects located in the Zones of Contribution must have pre-treatment facilities prior to infiltration facilities as prescribed in the Stormwater Manual. When a wellhead protection plan is developed and adopted by the City, this specific requirement may be rescinded or modified by the City.

D. The water quality design storm shall be based on an intensity of 0.25 inches per hour, or 0.83 inches for a 24-hour SCS Type 1A rainfall return event.

E. Water quality facilities must be designed to prevent damage to the facility for flows exceeding the water quality design storm and to ensure no re-suspension of pollutants, consistent with the Stormwater Manual.

F. Sensitive areas shall be protected by a buffer zone of native, undisturbed vegetation. The outer boundary of the buffer shall be determined by a minimum 50-feet setback from the edge of the sensitive area, or wider if required by other City requirements (See Florence City Code Title 10, Chapter 7.) The width and nature of protection required within the buffer may change as the Endangered Species Act and other state and federal regulations are promulgated. The City requires that the buffer width meet all state and federal requirements. No land disturbing activities, structures, development and construction activities, gardens, lawns, application of chemicals, pet wastes, dumping of any kind of materials shall be permitted within the buffer zone, except as noted below:

1. Roads, pedestrian, or bike paths crossing the buffer from one side to the other in order to provide access to or across the sensitive area.

2. A pedestrian or bike path constructed within a buffer and parallel to a sensitive area shall have the buffer widened by the width of the path if the path is constructed of impervious material.

3. Pedestrian or bike paths shall not exceed 10-feet in width.

4. Utility/service infrastructure construction (i.e., storm, sanitary sewer, water, phone, gas, cable, etc.) If approved by the City Manager or his/her designee.

5. Measures to remove or abate hazards, nuisance, or fire and life safety violations as approved by the City.

6. Enhancement of the riparian corridor for water quality or quantity benefits, fish, or wildlife habitat as approved by the City and other appropriate regulatory authorities.

7. Water quality facilities planted with appropriate native vegetation may encroach into the buffer area as approved by the City and other appropriate authorities.

G. The types of stormwater management facilities presented in the Stormwater Manual are available for owners and developers to use in satisfying the stormwater quality requirement. More than one of these types of facilities may be required to satisfy this requirement.

9-5-4: MAINTENANCE RESPONSIBILITY:

9-5-4-1: PUBLIC FACILITIES:

A. The City will maintain and operate Public Stormwater Facilities as set out in FCC 9-5-1-2 and FCC 9-5-1-6.

9-5-4-2: PRIVATE FACILITIES:

A. Private stormwater facilities must be maintained in accordance with the Operations and Maintenance Plan approved as part of the Drainage Plan. The Operations and Maintenance Agreement will be recorded with the Lane County Deeds and Records Office. The Stormwater Manual contains the Operations and Maintenance Agreement Form to be used. A log of all maintenance activity shall be kept by the owner and made available to the City upon request. The City may, at its option, inspect the facilities for compliance with the requirements. If a property owner fails to maintain their facilities, the City may issue a written notice specifying the required actions. If corrective actions are not completed in a timely manner, the City may pursue legal remedies to enforce the provisions of the Operations and Maintenance Plan. The City will only enter the property to perform the required corrections if the public's health and public property are in imminent danger. In this situation,

reasonable attempts will be made to contact the property owner(s), but a written notice may not be required. The property owner(s) will be billed for City incurred expense.

B. The Maintenance Agreement shall provide that upon notification by the City of any violation, deficiency or failure to comply with the agreement or this Code, corrections shall be completed within ten (10) days after notice thereof. Thereafter the City may pursue legal action to enforce the provisions of the agreement. In an emergency situation, the City may provide for all necessary work to place the facility in proper working conditions. The persons specified as responsible for maintenance in the Maintenance Agreement shall be charged the costs of the work performed by the City or its agents.

9-5-4-3: CITY ACCEPTANCE OF NEW STORMWATER FACILITIES:

A. The City may accept for maintenance new residential stormwater facilities constructed under approved permits when the following conditions are met:

1. Improvements in the residential subdivisions or Planned Unit Developments have been completed to the satisfaction of the city,

2. All drainage and stormwater management facilities have been inspected and have been in satisfactory operation for at least one (1) year, and

3. Any stormwater system improvements made during the one-year maintenance period have been inspected and approved by the City.

9-5-5: EASEMENTS:

9-5-5-1: PUBLIC FACILITIES:

A. Public facilities must have an easement, tract, or right-of-way granted to the City to provide for the inspection and maintenance of the drainage system and stormwater management facilities. A minimum of 7-1 /2 feet is required along each side of the centerline of stormwater pipes and culverts. A fifteen-(15) foot wide access is required around the perimeter of stormwater management facilities (ponds, wetlands, infiltration facilities, etc). A fifteen-(15) foot wide easement with a minimum 10’ wide access road located within the easement shall be provided when the public facility does not front a public road. Increased easements/improvements may be required on a case-by-case basis depending upon the unique drainage situation or facility maintenance requirements.

9-5-5-2: PRIVATE FACILITIES:

A. Private facilities must be placed in an easement, tract, or right-of-way that allows for the maintenance of these facilities in accordance with the Operations and Maintenance Agreement.

B. The City may determine that certain privately owned facilities are critical components of the overall stormwater system. In these situations, the City shall be granted perpetual, non-exclusive access that allows for public inspection. The access shall be defined in accordance with the requirements for a public easement, tract, or right-of-way.

9-5-6: CONSTRUCTION AND INSPECTION:

9-5-6-1: CONSTRUCTION:

A. Prior to the construction of, or modification to any public stormwater facility, a letter of commitment along with a performance bond or cash deposit in form and substance satisfactory to the City shall be submitted by the owner or his agent as a performance assurance for such work. The amount of the performance assurance shall be the sum necessary to construct the public stormwater facility improvements. The performance assurance shall remain in effect until released by the City. A final inspection shall be conducted by the City upon completion of the work included in the approved Site Stormwater Management Plan or Drainage Plan to determine if the completed work is constructed

in accordance with the plan(s). At a minimum, all of the following must be complete prior to release of the performance assurance:

1. Construction is completed on all public improvements required for the stormwater drainage and management system to operate. Each component of the stormwater system must have been inspected and accepted by the City, including all compaction, pipeline video inspections, and plastic pipe deflection testing.

2. The City has inspected and accepted the public improvements and the owner has submitted a maintenance assurance (letter of commitment, maintenance bond, or cash deposit, as approved by the City Manager or his/her designee). The amount of the maintenance assurance shall be for ten (10) percent of the cost of construction of the public improvements, excluding the cost of landscaping. The assurance shall be for a period of not less than one year from the date of completion of construction.

3. For projects with landscaping, the landscaping has been installed and accepted by the City. A two-year landscaping maintenance assurance has been submitted and accepted by the City. The amount of the assurance shall be fifty (50) percent of the cost of construction of the landscaping features.

4. All onsite and off-site easements as required by the City are granted to the City and recorded with the Lane County Deeds and Records Office.

5. The post construction erosion control is completed.

6. All required record drawings are submitted.

9-5-6-2: INSPECTION:

A. A City representative shall inspect the stormwater project as necessary and shall check materials, equipment, and the construction of the project to determine whether the work is proceeding in accordance with the approved plans and the requirements of this Code. The purpose of these inspections is to monitor compliance with City construction standards and the inspections are for the benefit of the City. The City does not provide the primary inspection for the project, and only provides a level of inspection necessary to monitor the quality of work being performed by others. The City's role in making inspections is not supervisory and the City has no responsibility, by virtue of such inspections, for any construction means or methods or compliance with safety requirements that remain the responsibility of the Contractor.

9-5-7: MISCELLANEOUS PROVISIONS:

9-5-7-1: TECHNICAL EQUIVALENCY:

A. The City may grant a technical deviation from the requirements of this Code if there are exceptional circumstances applicable to the project such that the provisions of the Code will result in unnecessary hardship and not fulfill the intent and objectives of the Code. The costs to comply with the requirements of this Code shall not be considered as justification for a technical equivalency.

B. To be approved, the proposed technical equivalency shall meet the following conditions:

1. The technical equivalency complies with the development conditions imposed on the project.

2. The granting of a technical equivalency will produce compensating or comparable results that are in the public interest.

3. The granting of a technical equivalency will meet the objectives of safety, function, appearance, environmental protection, and maintainability based on sound engineering judgment.

4. The City shall make written findings supporting the determination of technical equivalency.

C. A written request for a technical equivalency shall be required and shall state the specific equivalency sought and the reasons, with supporting data, for their granting. The request shall include descriptions, drawings, calculations and any other information that is necessary to evaluate the proposed equivalency. A technical equivalency shall only be granted when the applicant can show that an unnecessary hardship exists that is unique to the project or the property.

D. The City may have the technical equivalency proposal reviewed by an engineer licensed by the State of Oregon. The City reserves the right to select the engineer to perform the evaluation. The City will take the recommendation of the engineer under consideration as part of the technical equivalency review process. The applicant shall pay for the cost of the engineering review.

9-5-7-2: PENALTIES:

A. Upon determination that a violation of this Code has occurred the owner shall be given a written notice of the violations and the time in which to correct the deficiencies.

B. If construction violations of the approved plan are occurring, an immediate stop work order may be issued by the City. If the City issues a stop work order, the City must show cause within forty-eight (48) hours.

C. Any person violating this Code or any part thereof, including failing to stop work upon order, shall upon conviction thereof, be fined not more than one thousand dollars or imprisoned not more than thirty (30) days for each offense. Each separate interval of 24 hours, or every day, such violations shall be continued, committed or existing, shall constitute a new and separate offense and be punished for each separate period of violation.

D. The City Attorney shall institute appropriate actions or proceedings at law or equity for the enforcement of this Code or to correct violations of this Code.

9-5-7-3: CONFLICT WITH OTHER LAWS:

A. Whenever the provisions of this Code potentially conflict with any other Code, the requirements of the more restrictive Code shall prevail.

9-5-7-4: SEVERABILITY:

A. If any term, requirement or provision of this Code or the application of this Code to any person or circumstance shall, to any extent, be invalid or unenforceable, the reminder of this Code shall be valid and be enforced to the fullest extent permitted by law.

9-5-7-5: LIABILITY:

A. Neither the approval of a plan under the provisions of this Code nor the compliance with the provisions of this Code shall relieve any person from the responsibility for damage to any person or property otherwise imposed by law nor shall it impose any liability upon the City for damage to any person or property.

Adopted by Ord. No. 10, Series 2005
Corrections made 1/7/2008 to Code
Sections 9-5-2-2-B & C and 9-5-2-3-B-10 amended by Ordinance 9, 2009 (11-2-09)
Ord. No. 3, Series 2010 amended Section 9-5-1-5
Sections 9-5-1-2, 9-5-1-6, 9-5-1-7, 9-5-2, 9-5-2-4, 9-5-3-1, 9-5-3-2, 9-5-3-3, 9-5-4-1, 9-5-4-2, 9-5-5-1 and 9-5-5-2 amended, and Section 9-5-1-8 added, and Section 9-5-2-1, 9-5-2-3 deleted and Sections 9-5-2-2-B & 9-5-2-2-C moved to Section 9-5-2-1 by Ord. No. 18, Series 2011 effective September 19, 2011

APPENDIX

F

Erosion Control Pamplet

Why do we need to provide Erosion and Sediment Control on Small Construction Sites?

•Keeping sediment out of Siuslaw River and Munsel Creek helps reduce flooding, keeps water clean for swimming, boating and helps to protect fish.

•Just a little bit of sand from all construction activities in Florence adds up to a big problem for the City's stormwater system, Munsel Creek and Siuslaw River.

•It is less expensive for you than cleaning sand from streets and storm drainage systems. It's simply cheaper to prevent erosion and sediment deposition than having to clean up after the fact.

•It also helps you to avoid costly delays from stop work orders and fines.

Don't forget to submit a Sand Management Plan

Sand Management Plan is required with each building permit per FCC 4-1-15-3-B:

It shall set out the means by which the applicant will ensure that its actions will not result in the off-site movement or displacement of loose, open or raw sand onto any public way, or public or private property by action of wind or water erosion. The Community Development Department reviews the Sand Management Plan by reviewing the measures to reasonably ensure that the proposal will not have movement or displacement of sand.

Best Practices for Sand

Native Vegetation:
Minimize the clearing of Native Vegetation as much as possible.

Ground Cover:
Placing rock at the entrance of the site keeps the construction equipment from tracking sand off site.

Gravel:
The best cover for sand is gravel (midsize crushed). Gravel will not prevent the sand from being used as fill. Geotextile fabric may be placed under the gravel for quicker cleanup. Sand gravel mix is not desirable for plantings.

Bark:
Bark and organic cover mix over sand also works well, but the sand will not be able to be used for structural fill.

Water:
Gently wetting sand on level surfaces with irrigation sprinklers will help compact the sand and prevent wind erosion, however, should not be used on slopes or piles of sand.

Around the Perimeter:
Hay bales, sand or silt fences work well to keep the sand on your property. Don't forget to keep the fences maintained!

Storm Drainage:
Protect the storm drains with biobags which will keep the sand out of the storm drains.

Vegetated Swales:
Keep the stormwater from getting out into the storm drains, by providing a swale. The swale pools the water which gives it time to slowly be released in the ground. Below is an example of a vegetated swale for Dutch Brothers.

Photo: Frank Dietz, 2007

GOAL: TO HAVE NO SEDIMENT LEAVE YOUR SITE

Violations

Florence City Code (FCC) Title 4, Chapter 1, Section 15-3, requires securing loose, open or raw sand for excavation; removal of any natural or planted ground cover, trees, shrubs, and grass; and alteration or removal of any existing building or structure.

Taking any actions without a City-approved Sand Management Plan or violating a provision of an approved Sand Management Plan constitutes a violation of the FCC. If the violation is not taken care of within 30 days after notice, the City has the authority to clean up the sand and bill the violator the cost plus a 10% administrative fee.

The guidelines within this brochure need to be followed for:

- A single family residence;
- A non-residential construction that is adding less than 500 square feet of impervious surface to the area; or
- A land clearing and grading activity disturbing less than 10,000 square feet of land and involving less than 50 cubic yards of excavated or fill material

If your project is larger than what is listed here, please refer to FCC 9-5-2-2 and/or 9-5-2-3.

Photo: Frank Dietz, 2007

Erosion Prevention and Sediment Control Practices for Single Family Residences and Small Projects

City of Florence
Community Development
250 Highway 101
Florence, Oregon 97439
(541) 997-2141

Created on July 1, 2008

APPENDIX
G

Approved Tree and Plant List

Pond Plant List							
Plant Name	Planting Zone			Characteristics			
Botanic name, Common Name	Wet to Saturated	Moist to Dry	Dry/Upland	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Vaccinium ovatum, California Huckleberry		X	X			8'	4'
Vaccinium parvifolium, Red Huckleberry		X	X			8'	4'
Trees							
Abies grandis, Grand Fir		X		Y	Y	150'	
Acer macrophyllum, Big Leaf Maple		X		Y	Y	60'	
Alnus rubra, Red Alder	X	X		Y	N	80'	
Alnus rhombifolia, White Alder	X	X		Y	N	80'	
Arbutus menziesii, Madrone			X	Y	N	35'	
Cornus nuttalii, Western Flowering Dogwood		X	X	Y	N	20'	
Crataegus douglasii, Black Hawthorn	X			Y	N	40'	
Frangula purshiana, Cascara Buckthorn	X			Y	N	30'	
Malus fusca, Oregon Crab Apple	X	X		Y	N	30'	
Picea sitchensis, Sitka Spruce	X	X	X	Y	Y	200’	
Pinus contorta var. contorta, Beach Pine		X	X	Y	Y	40’	
Prunus emarginata var. mollis, Bitter Cherry	X	X		Y	N	50'	
Pseudotsuga menziesii, Douglas Fir		X	X	Y	Y	200'	
Salix hookeriana, Dune Willow	X	X		Y	N	15'	
Salix scouleriana, Scouler's Willow	X	X		Y	N	15'	
Sequoia sempervirens, Coast Redwood		X	X	Y	Y	250’	
Taxus brevifolia, Pacific Yew		X	X	Y	Y	25’	
Thuja plicata, Western Red Cedar	X	X	X	Y	Y	150'	

Pond Plant List							
Plant Name	Planting Zone			Characteristics			
Botanic name, Common Name	Wet to Saturated	Moist to Dry	Dry/Upland	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Sagittaria latifolia, Wapato	X			Y	N	24"	12"
Potamogeton natans, Floating-leafed Pondweed	X			Y	Y	18"	12"
Schoenoplectus (Scirpus) acutus var. acutus, Hardstem Bulrush	X			Y	N	10"	12"
Schoenoplectus (Scirpus) americanus, American Bulrush	X			Y	Y	30"	12"
Schoenoplectus tabernaemontani, Softstem Bulrush	X			Y	N	5'	12"
Scirpus microcarpus, Small Fruited Bulrush	X	X		Y	Y	24"	12"
Sparganium emersum, Narrowleaf Bur-reed	X			Y	N	24"	12"
Veronica americana, American Brooklime	X			Y	N	12"	12"
Veronica scutellata, Marsh Speedwell	X			Y	N	12"	12"
Viola palustris, Marsh Violet	X	X		Y	N	6"	6"
Large Shrubs and Small Trees							
Acer circinatum, Vine Maple			X	Y	N	15'	10'
Amelanchier alnifolia, Saskatoon Serviceberry			X	Y	N	20'	10'
Holodiscus discolor, Oceanspray			X	Y	N	6'	4'
Lonicera involucrata, Black Twinberry		X	X	Y	N	5'	4'
Morella californica, California Wax Myrtle	X	X		Y	Y	20'	4'
Oemleria cerasiformis, Indian Plum		X	X	Y	N	6'	4'
Philadelphu lewisii, Wild Mock Orange			X	Y	N	6'	4'
Rhododendron macrophyllum, Pacific Rhododendron			X	Y	Y	20'	10'
Rhododendron occidentale, Western Azalea			X	Y	N	10'	4'
Ribes sanguineum, Red-Flowering Current		X	X	Y	N	8'	4'
Rubus parviflorus, Thimbleberry		X		Y	N	8'	4'
Rubus spectabilis, Salmonberry	X	X		Y	N	10'	4'
Salix geyeriana , Geyer's Willow		X		Y	N	15'	6'
Salix lucida var. 'Lasiandra', Pacific Willow	X	X		Y	N	15''	6'
Salix stichensis, Sitka Willow	X	X		Y	N	20'	6'
Sambucus racemosa, Red Elderberry		X		Y	N	10'	10'
Spriaea douglasii, Douglas Spiraea		X		Y	N	7'	4'
Viburnum edule, Squashberry		X		Y	N	6'	4'
Shrubs							
Arctostaphylos columbiana, Hairy Manzanita		X	X	Y	Y	10'	4'
Cornus sericea, Red-twig Dogwood	X	X		Y	N	6'	4'
Gaultheria shallon, Salal			X	Y	Y	24"	24"
Ledum glandulosum, Western Labrador Tea	X	X		Y	Y	3'	3'
Mahonia aquifolium, Oregon Grape		X	X	Y	Y	5'	3'
Mahonia nervosa, Dull Oregon Grape		X		Y	Y	24"	24"
Physocarpus capitatus, Pacific Ninebark	X			Y	N	6'	3'
Rosa gymnocarpa, Baldhip Rose	X			Y	N	3'	3'
Rosa nutkana, Nootka Rose		X		Y	N	8'	3'
Rosa pisocarpa, Swamp Rose	X			Y	N	8'	3'

Pond Plant List							
Plant Name	Planting Zone			Characteristics			
Botanic name, Common Name	Wet to Saturated	Moist to Dry	Dry/Upland	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Herbaceous Plants							
Achillea millefolium, Common Yarrow			X	Y	N	24"	12"
Agrostis exarata, Spike Bentgrass		X		Y	N	4'	12"
Alisma triviale, Water Plantain	X			Y	N	24"	12"
Athyrium felix-femina, Lady Fern	X			Y		36"	24"
Beckmannia syzigachne, American Slough Grass	X					3'	12"
Bidens cernua, Nodding Beggerticks		X		Y	N	24"	12"
Blechnum spicant, Deer Fern	X	X		Y	N	24"	24"
Bromus sitchensis, Alaska Brome		X	X	Y	Y	18"	12"
Calamagrostis nutkaensis, Pacific Reed Grass	X			Y	Y	4'	12"
Camassia leichtlinii, Camas Lily		X		Y	N	24"	12"
Camassia quamash, Common Camas		X		Y	N	24"	12"
Carex densa, Dense Sedge	X	X		Y	N	24"	12"
Carex lenticularis, Lakeshore Sedge	X			Y	N	24"	12"
Carex leptopoda, Taperfruit Shortscale Sedge	X	X		Y	Y	36"	12"
Carex obnupta, Slough Sedge	X	X		Y	Y	4'	12"
Carex stipata, Sawbeak Sedge	X	X		Y	N	20"	12"
Carex unilateralis, One-sided Sedge	X			Y	Y	3'	12"
Carex utriculata, Large-headed Sedge	X			Y	Y	4'	12"
Comarum palustre (Potentilla palustris), Purple Marshlocks	X			Y	N	12"	6"
Danthonia californica, California Oatgrass		X		Y	N	24"	6"
Deschampsia cespitosa, Tufted Hair Grass		X		Y	N	36"	12"
Eleocharis obtusa, Ovate Spike Rush	X			Y	Y	8"	12"
Eleocharis palustris, Creeping Spike Rush	X			Y	Y	18"	12"
Elymus glaucus, Blue Wild Rye		X		Y	Y	24"	12"
Fragaria chiloensis, Coastal Strawberry		X	X	Y	Y	6"	12"
Glyceria elata, Tall Managrass	X	X		Y	Y	30"	12"
Glyceria occidentalis, Western Manna Grass	X	X		Y	Y	18"	12"
Juncus balticus, Baltic Rush	X	X		Y	Y	3'	12"
Juncus bolanderi, Bolander's Rush	X	X		Y	Y	20"	12"
Juncus effusus var. pacificus, Soft rush	X	X		Y	Y	36"	12"
Juncus ensifolius, Dagger-leaf Rush	X	X		Y	Y	24"	12"
Juncus falcatus, Sickle-leafed Rush	X	X		Y	Y	12"	12"
Juncus lesueurii, Salt Rush	X	X		Y	Y	4'	12"
Juncus nevadensis, Sierra Rush	X	X		Y	Y	24"	12"
Juncus oxymeris, Pointed Rush	X	X		Y	Y	24"	12"
Juncus patens, Spreading Rush	X	X		N	Y	36"	12"
Juncus tenuis, Slender Rush	X	X		Y	Y	36"	12"
Lotus formosissimus, Seaside Bird's-foot Trefoil		X		Y	N	12"	12"
Lysichiton americanus, Western Skunkcabbage	X			Y	N	3'	24"
Myosotis laxa, Small-flowered Forget-Me-Not	X			Y	N	18"	12"
Polystichum munitum, Sword Fern	X	X		Y	Y	24"	24"
Potentilla anserina, Pacific Silverweed		X		Y	N	12"	6"

Green Street Plant List									
Plant Name		Facility Type			Characteristics				
Botanical name, Common Name	Zone	Public Swale	Curb Extension	Planter	NW Native	Evergreen	Potential Hgt.	O.C. Spacing	Under Powerlines
Street Trees									
Arbutus unedo, Strawberry Tree	B		X	X	N	Y	20’	10’	Y
Acer campestre 'Evelyn', Queen Elizabeth Hedge Maple	A/B	X	X	X	N	N	30”	10’	N
Acer rubrum, ‘Red Sunset’ Maple	B	X	X	X	N	N	60’	20’	N
Betula jacquemontii, Jacquemontii Birch	A/B	X	X	X	N	N	60'	20’	N
Betula papyrifera, Paper Birch		X	X	X	Y	N	60’	20’	N
Carpinus caroliniana, American Hornbeam	A/B	X	X	X	N	N	30'	10’	Y
Cedrus deodara, Deodara Cypress	B	X	X	X	N	Y	50’	20’	N
Celtis occidentalis, Hackberry	A/B	X	X	X	N	N	50'	20’	N
x Cupressocyparis leylandii, Leyland Cypress	B				N	Y	50’	20’	N
Frangula purshiana, Cascara Buckthorn	A/B	X	X	X	Y	N	30'	10’	Y
Gleditsia triacanthos 'Impcole', Imperial Honeylocust	A/B	X	X	X	N	N	30'	10’	Y
Gleditsia triacanthos 'Skycole', Skyline Honeylocust	A/B	X	X	X	N	N	70'	20’	N
Juglans ailantifolia, Heartnut	B	X	X	X	N	N	60’	20’	N
Koelreuteria paniculata, Goldenrain Tree	A/B	X	X	X	N	N	30'	10’	Y
Lavatera arborea, Tree Mallow	B	X	X	X	N	N	8’	4’	Y
Magnolia stellata, Star Magnolia	B		X	X	N	Y	20’	10’	Y
Nyssa sylvatica, Black Tupelo	A	X	X	X	N	N	50'	20’	N
Prunus serrulata ‘Amanogawa’, Amanogawa Japanese Flowering Cherry	B	X	X	X	N	N	30’	10’	Y
Prunus Serrulata ‘Kwanzan’, Kwanzan Flowering Cherry	B	X	X	X	N	N	30’	10’	Y
Prunus serrulata 'Shogetsu', Shogetsu Flowering Cherry	B	X	X	X	N	N	30’	10’	Y
Prunus serrulata, Japanese Flowering Cherry	B	X	X	X	N	N	30’	10’	Y
Prunus virginiana 'Canada Red', Canada Red Chokecherry	A/B	X	X	X	N	N	25'	10’	Y
Styrax japonicus, Japanese Snowbell	B		X	X	N	N	30’	10’	Y

Green Street Plant List									
Plant Name		Facility Type			Characteristics				
Botanical name, Common Name	Zone	Public Swale	Curb Extension	Planter	NW Native	Evergreen	Potential Hgt.	O.C. Spacing	Under Powerlines
Herbaceous Plants									
Camassia leichtlini, Great Camas	A/B	X	X	X	Y	N	24"	12"	
Camassia quamash, Common Camas	A/B	X	X	X	Y	N	24"	12"	
Carex densa, Dense Sedge	A	X	X	X	Y	Y	24"	12"	
Carex obnupta, Slough Sedge	A	X	X	X	Y	Y	4'	12"	
Carex stipata, Sawbeak Sedge	A	X	X	X	N	N	20"	12"	
Festuca glauca, Blue Fescue Grass									
Hebe 'Autumn Glory', Hebe	B	X		X	N	Y	14"	12"	
Deschampsia cespitosa, Tufted Hair Grass	A/B	X	X	X	Y	N	36"	12"	
Iris douglasiana, Douglas Iris	B	X	X		Y	N	18"	12"	
Iris tenax, Oregon Iris	B	X	X		Y	N	18"	12"	
Juncus patens, Spreading Rush	A	X	X	X	N	Y	36"	12"	
Polystichum munitum, Sword Fern	A/B	X	X		Y	Y	24"	24"	
Shrubs									
Chamaecyparis obtusa, False Cypress	A/B	X	X	X	N	N	24"	24"	
Cornus mas, Cornelian Cherry	B	X	X	X	N	N	8'	4'	
Cornus sanguinea 'Midwinter Fire'	A/B	X	X	X	N	N	5'	24"	
Cornus sericea 'Flaviramea', Yellow Twig Dogwood	A/B	X	X	X	N	N	5'	24"	
Cornus sericea 'Kelseyii', Kelsey Dogwood	A/B	X	X	X	N	N	24"	24"	
Euonymus occidentalis, Western Burning Bush									
Euonymous japonicus 'Microphyllus', Boxleaf Evergreen Euonymus	B	X	X		N	Y	24"	24"	
Gaultheria shallon, Salal	B	X	X		Y	Y	24"	24"	
Lavandula angustifolia Lavander	B	X	X	X	N	N	24"	24"	
Lonicera nitida (Box Honeysuckle)	B	X	X	X	N	Y	5'	24"	
Mahonia nervosa, Dull Oregon Grape	B	X	X		Y	Y	24"	24"	
Spirarea betulifolia, Birchleaf Spiraea	A/B	X	X	X	Y	N	24"	24"	
Rhododendron occidentale, Western Azalea	B	X	X	X	Y	N	20'	10'	
Rhododendron macrophyllum, Pacific Rhododendron	B	X	X	X	Y	Y	10	4'	
Rhododendron sp., Dwarf & Hybrid Rhododendron Varieties	B	X	X	X	N	Y	5'	5'	
Rosmarinus officinalis Rosemary	B	X	X		N	N	4'	24"	
Viburnum opulus 'Nanum', Dwarf European Cranberry	B	X	X		N	N	24"	24"	
Goundcovers									
Arctostapylos uva-ursi, Kinnickinnick	B	X	X		Y	Y	6"	12"	
Fragaria chiloensis, Coastal Strawberry	B	X	X	X	Y	Y	6"	12"	
Helictotrichon sempervirens, Blue Oat Grass	B	X	X	X	N	Y	24"	12"	
Lithodora diffusa, Lithodora	B	X	X	X	N	Y	6"	12"	
Mahonia repens, Creeping Oregon Grape	B	X	X		Y	Y	12"	12"	

Facility Plant List											
Plant Name		Proposed Facility Type						Characteristics			
Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Populus tremuloides, Quaking Aspen	A			X			X	Y	N	40'	10
Prunus emarginata var. mollis, Bitter Cherry	A/B	X	X	X			X	Y	N	50'	10
Pseudotsuga menziesii, Douglas Fir	B	X		X			X	Y	Y	200'	30'
Quercus agrifolia, Coast Live Oak	B	X		X			X	N	Y	60'	20'
Frangula purshiana, Cascara Buckthorn	A/B	X	X	X	X		X	Y	N	30'	20'
Salix hookeriana, Dune Willow	A/B	X	X	X		X	X	Y	N	15'	6'
Salix scouleriana, Scouler's Willow	A/B	X	X	X	X	X	X	Y	N	15'	6'
Sequoia sempervirens, Coast Redwood	B	X		X			X	Y	Y	250'	30'
Sequoiadendron giganteum, Giant Redwood	B			X			X	N	Y	250'	30'
Taxus brevifolia, Pacific Yew	B	X	X	X	X		X	Y	Y	25'	15'
Taxodium distichum, Bald Cypress	A/B	X		X			X	N	N	100'	30'
Thuja plicata, Western Red Cedar	A/B	X		X	X		X	Y	Y	150'	30'
Tsuga hetrophylla, Western Hemlock	B	X		X			X	Y	Y	125'	30'

Facility Plant List											
Plant Name		Proposed Facility Type						Characteristics			
Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Blueberry											
Empetrum nigrum, Black Crowberry	A/B	X	X	X	X	X	X	Y	Y	6”	12”
Eriogonum latifolium, Seaside Buckwheat	A/B	X	X	X			X	Y	N	24”	12”
Fragaria chiloensis, Coastal Strawberry	B	X	X	X	X		X	Y	Y	6"	12"
Helictotrichon sempervirens, Blue Oat Grass	B	X	X	X				N	Y	24"	12"
Lycopodium clavatum, Running Clubmoss	A/B		X	X				Y	Y	6”	12"
Satureja douglasii, Yerba Buena	B	X	X	X			X	Y	Y	6”	24"
Viola adunca, Hookedspur Violet	B	X	X	X				Y	N	6”	12"
Viola sempervirens, Evergreen Violet	B	X	X	X	X		X	Y	Y	12”	12"
Mahonia repens, Creeping Oregon Grape	B	X	X	X	X		X	Y	Y	12"	12"
Trees											
Abies grandis, Grand Fir	B	X		X			X	Y	Y	150'	20’
Acer griseum, Paperbark Maple	B	X	X	X				N	N	30'	10’
Acer macrophyllum, Big Leaf Maple	B	X		X			X	Y	Y	80’	20’
Alnus rhombifolia, White Alder	A/B	X		X	X	X	X	Y	N	80'	20’
Alnus rubra, Red Alder	A/B	X		X	X	X	X	Y	N	80'	20’
Arbutus menziesii, Madrone	B	X		X			X	Y	N	35'	20’
Cornus nuttalii, Western Flowering Dogwood	B	X		X	X		X	Y	N	60’	20
Chamaecyparis lawsoniana, Port Orford Cedar	B	X		X	X		X	Y	Y	200’	30’
Corylus cornuta var. californica, California Hazelnut	B	X	X	X	X		X	Y	N	15’	10’
Crataegus douglasii, Black Hawthorn	A/B	X		X	X	X	X	Y	N	40'	10'
Garrya elliptica, Wavyleaf Silktassel	B			X			X	Y	Y	15’	10’
Juglans hindsii, Northern California Black Walnut	B	X		X	X		X	N	N	60’	20’
Malus fusca, Oregon Crab Apple	A/B	X	X	X	X		X	Y	N	30'	10'
Metasequoia glyptostroboides, Dawn Redwood	B	X		X			X	N	N	80'	20’
Picea sitchensis, Sitka Spruce	B	X		X	X		X	Y	Y	200’	30’
Pinus contorta var. contorta, Beach Pine	B	X		X	X		X	Y	Y	40’	20’

Facility Plant List											
Plant Name		Proposed Facility Type						Characteristics			
Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Salix lucida var. *'Lasiandra'*, Pacific Willow	A/B	X	X	X	X	X	X	Y	N	15"	6'
Salix stichensis, Sitka Willow	A	X	X	X	X	X	X	Y	N	20'	6'
Sambucus racemosa, Red Elderberry	B	X	X	X	X		X	Y	N	10'	10'
Spriaea douglasii, Douglas Spiraea	A/B	X	X	X	X	X	X	Y	N	7'	4'
Viburnum edule, Squashberry	A/B	X	X	X	X		X	Y	N	8'	4'
Shrubs											
Arctostaphylos columbiana, Hairy Manzanita	B	X	X	X	X		X	Y	Y	10'	4'
Baccharis pilularis, Coyote Brush	B			X	X			Y	Y	8'	4'
Ceanothus velutinus, Snowbrush	B	X		X			X	Y	Y	4'	3'
Cornus sericea, Red-twig Dogwood	A	X	X	X	X	X	X	Y	N	6'	3'
Gaultheria shallon, Salal	B	X	X	X	X		X	Y	Y	24"	24"
Juniperus communis, Common Juniper	B	X		X	X			Y	Y	18"	24"
Ledum glandulosum, Western Labrador Tea	A/B	X	X	X	X	X	X	Y	Y	3'	3'
Mahonia aquifolium, Tall Oregon Grape	B	X		X			X	Y	Y	5'	3'
Mahonia nervosa, Dull Oregon Grape	B	X		X			X	Y	Y	24"	24"
Philadelphus lewisii, Mock Orange	B	X		X	X		X	Y	N	10'	24"
Physocarpus capitatus, Pacific Ninebark	A/B	X	X	X	X	X	X	Y	N	10'	3'
Rosa gymnocarpa, Baldhip Rose	B	X	X	X			X	Y	N	3'	3'
Rosa nutkana, Nootka Rose	B	X		X	X	X	X	Y	N	8'	3'
Rosa pisocarpa, Swamp Rose	A/B	X	X	X		X	X	Y	N	8'	3'
Vaccinium ovatum, California Huckleberry	B	X		X	X		X	Y	Y	8'	4'
Vaccinium parvifolium, Red Huckleberry	B	X		X	X		X	Y	N	8'	4'
Groundcovers											
Arctostaphylos uva-ursi, Kinnickinnick	B	X		X				Y	Y	6"	12"
Cornus canadensis, Bunchberry Dogwood	B	X	X	X	X		X	Y	Y	8"	12"
Vaccinium oxycoccos, Small Cranberry	A	X	X	X		X	X	Y	Y	12"	12"
Vaccinium uliginosum, Bog	A	X	X	X		X	X	Y	N	18"	12"

Facility Plant List											
Plant Name		Proposed Facility Type						Characteristics			
Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Golden Blue-eyed Grass											
Spiranthes romanzoffiana, Hooded Ladies' Tresses	A		X	X	X			Y	N	24"	12"
Sparganium emersum, Narrowleaf Bur-reed	A	X		X		X	X	Y	Y	6"	12"
Stachys cooleyae, Hedge Nettle	A	X	X	X	X		X	Y	N	4'	6"
Tellima grandiflora, Fringecup	B	X	X	X				Y	N	3"	12"
Thalictrum occidentale, Western Meadowrue	B	X	X	X				Y	N	24"	12"
Tolmiea menziesii, Piggyback Plant	B	X	X	X				Y	N	24"	12"
Veronica Americana, American Brooklime	A	X	X	X		X	X	Y	N	3'	12"
Veronica scutellata, Marsh Speedwell	A	X	X	X		X	X	Y	N	24"	12"
Large Shrubs and Small Trees											
Acer circinatum, Vine Maple	A/B	X	X	X			X	Y	N	15'	10'
Amelanchier alnifolia, Saskatoon Serviceberry	B	X		X	X		X	Y	N	12'	10'
Ceanothus gloriosus, Point Reyes Ceanothus	B	X	X	X			X	N	Y	6'	3'
Ceanothus sanguineus, Oregon Redstem Ceanothus	B	X		X			X	Y	Y	7'	4'
Holodiscus discolor, Oceanspray	B	X		X			X	Y	N	6'	4'
Lonicera hispidula, Pink Honeysuckle	B	X		X	X		X	Y	N	20'	6'
Lonicera involucrata, Twinberry Honeysuckle	B	X		X	X	X	X	Y	N	5'	4'
Morella californica, California Wax Myrtle	B	X	X	X	X	X	X	Y	Y	20'	10'
Oemleria cerasiformis, Indian Plum	B	X		X	X		X	Y	N	6'	4'
Rhododendron macrophyllum, Pacific Rhododendron	B	X	X	X			X	Y	Y	20'	10'
Rhododendron occidentale, Western Azalea	B	X	X	X			X	Y	N	10'	4'
Ribes bracteosum, Bog Currant	A/B	X		X	X		X	Y	N	8'	6'
Ribes divaricatum, Straggly Gooseberry	B	X	X	X			X	Y	N	10'	4'
Ribes sanguineum, Red-Flowering Currant	B	X	X	X	X		X	Y	N	8'	4'
Rubus parviflorus, Thimbleberry	B	X		X	X	X	X	Y	N	8'	4'
Rubus spectabilis, Salmonberry	A/B	X	X	X	X	X	X	Y	N	10'	4'
Salix geyeriana , Geyer's Willow	A	X		X	X	X	X	Y	N	15'	6'

Facility Plant List												
Plant Name		Proposed Facility Type						Characteristics				
Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing	
Monkey-flower												
Nuphar lutea, Yellow Pond-lily	A					X		Y	Y	6”	12”	
Oenanthe sarmentosa, Pacific Water Parsley	A	X		X		X	X	Y	N	3’	24”	
Polypodium glycyrrhiza, Licorice Fern	A	X	X	X				Y	Y	12"	12"	
Panicum acuminatum, Western Panic Grass	A	X		X	X		X	Y	N	24”	6”	
Polystichum munitum, Sword Fern	A/B	X		X	X		X	Y	Y	24"	24"	
Potentilla anserina, Pacific Silverweed	A	X		X	X	X	X	Y	N	12”	6”	
Plagiobothrys figuratus, Fragrant Popcorn Flower	A	X	X	X	X		X	Y	N	12”	6”	
Plectritis congesta, Rosy Plectritis	A	X		X	X		X	Y	N	12”	6”	
Prunella vulgaris var. *lanceolata,* Self-heal	B	X	X	X	X		X	Y	N	12”	6’	
Ranunculus occidentalis, Western Buttercup	A/B	X	X	X			X	Y	N	24”	12”	
Ranunculus orthorhyncus, Straightbeak Buttercup	A	X	X	X			X	Y	N	24”	12”	
Rumex salicifolius, Willow Dock	A	X		X	X		X	Y	N	3’	12”	
Sanguisorba officinalis, Great Burnet	A	X	X	X	X		X	Y	N	24”	12”	
Schoenoplectus (Scirpus) acutus var. *acutus*, Hardstem Bulrush	A	X	X	X		X		Y	N	5’	12"	
Schoenoplectus (Scirpus) americanus, American Bulrush	A	X	X	X		X	X	Y	N	3’	12"	
Schoenoplectus tabernaemontani, Softstem Bulrush	A	X	X	X		X		Y	N	5'	12"	
Scirpus microcarpus, Small Fruited Bulrush	A			X		X	X	Y	Y	24"	12"	
Scrophularia californica, California Figwort	A	X	X	X			X	Y	N	12”	6”	
Sedum oreganum, Oregon Stonecrop	B	X	X					Y	Y	4"	12"	
Sidalcea hendersonii, Henderson's Checkerbloom	B	X	X	X	X		X	Y	N	5’	12”	
Sidalcea malviflora, Dwarf Checkerbloom	B	X	X	X	X		X	Y	N	12”	6”	
Sisyrinchium californicum,	A/B	X	X	X	X			N	Y	6"	12"	

Facility Plant List											
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Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Gentiana sceptrum, King's Scepter Gentian	A	X	X	X		X	X	Y	N	24”	6”
Glycera elata, Tall Managrass	A			X		X	X	Y	Y	3’	12"
Glycera occidentalis, Western Manna Grass	A			X		X	X	Y	Y	18"	12"
Heuchera micrantha, Crevice Alumroot	B		X	X			X	Y	N	24”	6”
Iris douglasiana, Douglas Iris	B	X		X			X	Y	N	18"	12"
Iris sibirica, Siberian Iris	A	X	X	X				N	N	3’	12"
Iris tenax, Oregon Iris	B	X		X			X	Y	N	18"	12"
Juncus articulatus, Jointed Rush	A	X	X	X		X	X	Y	Y	3’	12”
Juncus balticus, Baltic Rush	A	X	X	X		X	X	Y	N	24"	12"
Juncus bolanderi, Bolander’s Rush	A	X	X	X		X	X	Y	Y	24”	12”
Juncus effusus var. *pacificus,* Soft Rush	A	X	X	X			X	Y	Y	3’	12"
Juncus ensifolius, Dagger-leaf Rush	A	X	X	X		X	X	Y	N	10"	12"
Juncus falcatus, Sickle-leafed Rush	A	X	X	X		X	X	Y	Y	12”	12”
Juncus lesueurii, Salt Rush	A	X	X	X		X	X	Y	Y	4’	12”
Juncus nevadensis, Sierra Rush	A	X	X	X		X	X	Y	Y	24”	12”
Juncus oxymeris, Pointed Rush	A	X	X	X		X	X	Y	Y	24”	12”
Juncus patens, Spreading Rush	A	X	X	X	X	X	X	Y	Y	3’	12"
Lasthenia californica, Perennial Goldfields	B	X	X	X			X	Y	N	12”	6”
Lilium columbianum, Columbia Lily	B	X	X	X			X	Y	N	3’	12”
Lotus formosissimus, Seaside Bird's-foot Trefoil	A	X	X	X	X		X	Y	N	12”	12”
Lotus purshianus, Spanish Clover	B	X	X	X	X		X	Y	N	12”	12”
Lotus pinnatus, Bog Trefoil	A	X	X	X	X		X	Y	N	12”	12”
Lupinus micranthus, Small Flowered Lupine	B	X		X			X	Y	N	18"	12"
Lupinus albicaulis, Sickle Keeled Lupine	A/B	X	X	X	X		X	Y	N	24”	12”
Lysichiton americanus, Western Skunkcabbage	A	X		X	X	X	X	Y	N	3’	24”
Lysimachia terrestris, Earth Loosestrife	A	X		X			X	Y	N	12”	12”
Maianthemum dilatatum, False Lily of the Valley	A	X	X	X			X	Y	Y	12”	6”
Mimulus guttatus, Yellow	A	X	X	X	X		X	Y	N	24”	12”

Facility Plant List											
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Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Carex lyngbyei, Lyngby's Sedge	A	X		X		X	X	Y	Y	24"	12"
Carex obnupta, Slough Sedge	A	X	X	X	X	X	X	Y	Y	4'	12"
Carex pansa, Sanddune Sedge	B	X		X	X		X	Y	Y	24"	12"
Carex stipata, Sawbeak Sedge	A	X	X	X				Y	N	24"	12"
Carex unilateralis, One-sided Sedge	A	X		X		X	X	Y	Y	3'	12"
Carex utriculata, Large-headed Sedge	A	X		X		X	X	Y	Y	4'	12"
Castilleja affinis ssp. litoralis, Coast Indian Paintbrush	B	X	X	X			X	Y	N	12"	6"
Clarkia amoena ssp. amoena, Farewell to Spring	B	X	X	X			X	Y	N	12"	6"
Comarum palustre (Potentilla palustris), Purple Marshlocks	A	X	X	X	X		X	Y	N	12"	6"
Danthonia californica, California Oatgrass	B	X		X			X	Y	N	24"	6"
Dicentra formosa, Bleeding Heart	B	X	X	X			X	Y	N	12"	6"
Deschampsia cespitosa, Tufted Hair Grass	A/B	X	X	X	X		X	Y	N	3'	12"
Drosera rotundifolia, Roundleaf Sundew	A	X	X	X		X		Y	Y	1"	1"
Eleocharis acicularis, Needle Spike Rush	A	X	X	X		X	X	Y	Y	4"	12"
Eleocharis obtusa, Ovate Spike Rush	A	X	X	X		X	X	Y	Y	8"	12"
Eleocharis palustris, Creeping Spike Rush	A			X		X	X	Y	Y	18"	12"
Elymus glaucus, Blue Wild Rye	B	X		X			X	Y	Y	24"	12"
Erigeron glaucus, Seaside Fleabane	B	X	X	X			X	Y	N	12"	6"
Eriophorum chamissonis, Chamisso's Cottongrass	A	X		X		X	X	Y	N	24"	6"
Eriophorum crinigerum, Fringed Cottongrass	A	X		X		X	X	Y	N	24"	6"
Erysimum capitatum, Sanddune Wallflower	B	X	X	X			X	Y	N	4'	12"
Festuca occidentalis, Western Fescue Grass	A	X		X			X	Y	N	24"	12"
Festuca roemeri, Roemer's Fescue	B	X		X			X	Y	N	12"	6"
Festuca rubra, Red Fescue	B	X		X			X	Y	Y	24"	12"
Geum macrophyllum, Large-leaved Avens	B	X	X	X			X	Y	N	3'	12"

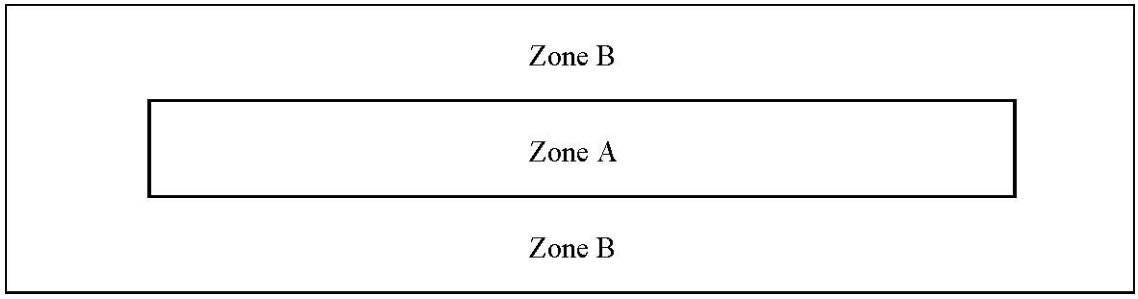
Facility Plant List											
Plant Name		Proposed Facility Type						Characteristics			
Botanical name, Common Name	Zone	Swale	Planter	Rain Garden (Private)	Dry Pond	Wet Pond	Public Rain Garden	NW Native	Evergreen	Potential Hgt.	O.C. Spacing
Herbaceous Plants											
Aster subspicatus, Douglas' Aster	B	X		X			X	Y	N	3'	12"
Actaea rubra, Wild Baneberry	B	X		X				Y	N	3'	12"
Achillea millefolium, Common Yarrow	B	X	X	X	X		X	Y	N	24"	12"
Agrostis exarata, Spike Bentgrass	A	X		X	X	X	X	Y	N	4'	12"
Angelica hendersonii, Henderson's Angelica	A/B	X	X	X				Y	N	3'	12"
Angelica lucida, Seacoast Angelica	A/B	X	X	X			X	Y	N	3'	12"
Alisma triviale, American Water Plantain	A	X		X		X	X	Y	N	3'	12"
Aquilegia formosa, Red Columbine	B	X	X	X			X	Y	N	24"	12"
Armeria maritima, Sea Thrift	B	X	X	X	X		X	Y	N	24"	6"
Asclepias speciosa, Showy Milkweed	B	X	X	X			X	Y	N	3'	12"
Athyrium felix-femina, Lady Fern	B	X		X			X	Y	N	3'	24"
Beckmannia syzigachne, American Slough Grass	A	X		X	X	X	X	Y	N	3'	6"
Brodiaea coronaria, Harvest Brodiaea	B	X	X	X			X	Y	N	10"	6"
Blechnum spicant, Deer Fern	B	X		X			X	Y	N	24"	24"
Bromus carinatus, Califonia Brome Grass	A	X		X	X		X	Y	Y	18"	12"
Bromus sitchensis, Alaska Brome	A	X		X	X		X	Y	Y	18"	12"
Bromus vulgaris, Columbia Brome	A	X		X			X	Y	Y	18"	12"
Calamagrostis nutkaensis, Pacific Reed Grass	A	X		X	X		X	Y	Y	4'	12"
Calamagrostis canadensis var. canadensis, Canada Bluejoint Reedgrass	A	X		X	X		X	Y	Y	24"	6"
Camassia leichtlinii, Camas Lily	A	X	X	X				Y	N	24"	12"
Camassia quamash, Common Camas	A/B	X	X	X			X	Y	N	24"	12"
Carex densa, Dense Sedge	A	X	X	X		X	X	Y	Y	24"	12"
Carex lenticularis, Lakeshore Sedge	A	X		X		X	X	Y	Y	3'	12"
Carex leptopoda, Taperfruit Shortscale Sedge	A	X		X		X	X	Y	Y	18"	12"

Grassy Swale Native Seed Mix	
Species	% by Weight
Hordeum brachyantherum Meadow Barley	= 25%
Danthonia californica California Oat-grass	= 15%
Elymus glaucus Blue Wild Rye	= 10%
Bromus carinatus California Brome	= 10%
Festuca romerii Roemer's fescue	= 10%
Deschampsia cespitosa Tufted hairgrass	= 10%
Agrostis exarata Spike bentgrass	= 10%
Poa secunda	= 5%
Prunella vulgaris var lanceolata, Self Heal	= 4%
Achillea millefolium, Common Yarrow	= 1%

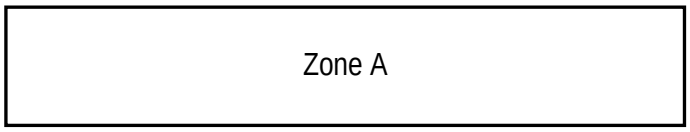
Zone A: Area of the facility defined as the bottom of the facility to the designed high water mark. This area has moist to wet soils and plants located here should be tolerant of mild inundation.

Zone B: Area of the facility defined as the side slopes from the designed high water line up to the edge of the facility. This area typically has dryer to moist soils, with the moist soils being located further down the side slopes. Plants here should be drought tolerant and help stabilize the slopes.

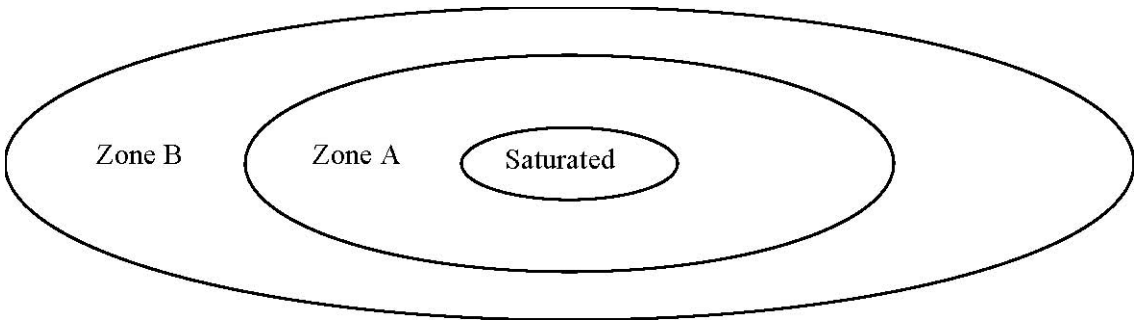
Swale Planting Zones



Planter Planting Zones



Rain Garden/Pond Planting Zones



APPENDIX

H

Portland Facility Specific O&M Plans

Insects & Rodents shall not be harbored in the spill control manhole. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  i) Installation of predacious bird or bat nesting boxes.
  ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
  iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
  iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the manhole shall be filled.

Signage may serve to educate people about the importance or function of the site's stormwater protection measures.

Signage (where applicable) shall be maintained and repaired as needed during or shortly after inspections.

Spill Control Manholes

Operations & Maintenance Plan

Spill Control Manholes operate using the principal that oil and water are immiscible (do not mix) and have different densities. Oil, being less dense than water, floats to the surface. The spill control manhole shall be inspected and cleaned quarterly. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

- **Stormwater Drain Inlet Pipe** shall be inspected for clogging or leaks where it enters the manhole during every inspection and cleanout. Debris/sediment that is found to clog the inlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.

Manhole Chamber shall be inspected for cracks or damage during each inspection.

- The manhole shall be cleaned out quarterly. Cleanout shall be done in a manner to minimize the amount of trapped oil entering the outlet pipe. If there is a valve on the outlet pipe it shall be closed otherwise the outlet will be plugged prior to cleanout.
- Water and oil shall be removed, tested, and disposed of in accordance with regulations. Grit and sediment that has settled to the bottom of the chamber shall be removed during each cleaning
- Cleaning shall be done without use of detergents or surfactants. A pressure washer may be used if necessary.

Absorbent Pillows and Pads (where applicable) absorb oil from the separation chamber.

- Replacement shall occur at least twice a year, in the spring and fall, or as necessary to retain oil-absorbing function.

Stormwater Drain Outlet Pipe shall be inspected for clogging or leaks where it exits the manhole. Particular attention shall be paid to ensure that the joint where the tee joins the outlet pipe is watertight.

- Debris/sediment that is found to clog the outlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.

Vegetation such as trees should not be located in or around the spill control manhole because roots can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging.

- Large shrubs or trees that are likely to interfere with manhole operation shall be identified at each inspection and removed.

Source Control measures typically include structural and non-structural controls. Non-structural controls can include street sweeping and other good house keeping practices.

- Source control measures shall be inspected and maintained.

Spill Prevention procedures require high-risk site users to reduce the risk of spills. However, virtually all sites, including residential and commercial, present dangers from spills. Homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, nail polish remover, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important to exercise caution when handling substances that can contaminate stormwater.

Spill prevention procedures shall be implemented in areas where there is likelihood of spills from hazardous materials.

Training and/or written guidance information for operating and maintaining spill control manholes shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the spill control manhole is required for efficient maintenance. Egress and ingress routes shall be open and maintained to design standards.

Insects & Rodents shall not be harbored in the drywell. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  i) Installation of predacious bird or bat nesting boxes.
  ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
  iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
  iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the drywell shall be filled.

Signage may serve to educate people about the importance or function of the site's stormwater protection measures. Signs may also discourage behavior that adversely impacts the stormwater protection measures and encourages behavior that enhances or preserves stormwater quality. If debris is a problem, a sign reminding people not to litter may partially solve the problem.
Signage (where applicable) shall be maintained and repaired as needed during or shortly after inspections.

Drywells

Operations & Maintenance Plan

Drywells are designed to infiltrate stormwater into the ground. Stormwater is piped to drywells from roof downspouts or pollution control facilities such as swales or planters. The pollution control facility is designed to settle out sediments and separate oils and greases from the water before releasing it through a pipe to the drywell. This prolongs the life of the drywell and helps to prevent the contamination of soils and groundwater. The drywell is a concrete or plastic manhole section with many small holes in the sides to allow stormwater to infiltrate into the surrounding soil. The drywell system shall be inspected and cleaned quarterly and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Stormwater Drain Pipe shall be inspected for clogging or leaks where it enters the drywell.

- Debris/sediment that is found to clog the pipe shall be removed and disposed of in accordance with applicable federal and state requirements.

Drywell shall be inspected during each cleanout. Ponding around the catch basins or sedimentation manhole or drywell lids may indicate that the drywell is failing due to siltation, or the clogging of the sediment pores surrounding the drywell.
Clogged drywells must be replaced.

Vegetation such as trees should not be located in or around the drywell because roots from trees can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging the intake pipe.

- Large shrubs or trees that are likely to interfere with operation will be identified at each inspection and removed.

Source Control measures typically include structural and non-structural controls. Non-structural controls can include parking lot or street sweeping and other good house keeping practices. It is often easier to prevent pollutants from entering stormwater than to remove them.

- Source control measures shall be inspected and maintained (where applicable).

Spill Prevention procedures require high-risk site users to reduce the risk of spills. However, virtually all sites, including residential and commercial, present dangers from spills. Homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, solvents, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important to exercise caution when handling substances that can contaminate stormwater.
Spill prevention procedures shall be implemented in areas where there is likelihood of spills from hazardous materials.

A **Shut-Off Valve or Flow-Blocking Mechanism** may have been required with the construction of the drywell to temporarily prevent stormwater from flowing into it, in the event of an accidental toxic material spill. This may also involve mats kept on-site that can be used to cover inlet drains in parking lots. The shut-off valve shall remain in good working order, or if mats or other flow-blocking mechanisms are used, they shall be kept in stock on-site.

Training and/or written guidance information for operating and maintaining drywell systems shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the drywell is required for efficient maintenance. Egress and ingress routes shall be open and maintained to design standards.

Signage may serve to educate people about the importance or function of the site's stormwater protection measures. Signs may also discourage behavior that adversely impacts the stormwater protection measures and encourages behavior that enhances or preserves stormwater quality. If debris is a problem, a sign reminding people not to litter may partially solve the problem.
Signage (where applicable) will be maintained and repaired as needed during or shortly after inspections.

Insects & Rodents shall not be harbored in the detention facility. Pest control measures shall be taken when insects/rodents are found to be present

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
    i) Installation of predacious bird or bat nesting boxes.
    ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
    iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
    iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the detention facility shall be filled.

Underground Detention Tanks, Vaults, and Pipes

Operations & Maintenance Plan

Underground detention tanks, vaults, and pipes are designed to fill with stormwater during large storm events, slowly releasing it over a number of hours. There are numerous components to each system. **Drain Inlet Pipes** convey stormwater into the detention facility. The **detention Chamber** is the structure in which stormwater accumulates during a storm event. **Orifice Structure/ Outlet Drain Pipe** restricts the flow out of the detention chamber, allowing it to fill up and slowly drain out. The orifice structure is located at the downstream end of the detention chamber. Underground facilities shall be inspected quarterly and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Drain Inlet Pipes shall be inspected for clogging or leaks where it enters the vault or basin during every inspection and cleanout.

- Debris/sediment that is found to clog the inlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.

Detention Chamber shall be inspected for cracks or damage during each inspection.

- The detention chamber shall be cleaned out yearly or after an inch of sediment has accumulated. If there is a valve on the outlet pipe it shall be closed otherwise the outlet shall be plugged prior to cleanout. Grit and sediment that has settled to the bottom of the chamber shall be removed during each cleaning.
- Water and sediment in the detention chamber shall be removed, tested, and disposed of in accordance with regulations.
- Cleaning shall be done without use of detergents or surfactants. A pressure washer may be used if necessary.

Orifice Structure/ Outlet Drain Pipe shall be inspected for clogging during unit inspections/cleanouts.

- Debris/sediment that is found to clog the inlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.

Vegetation such as trees should not be located in or around the detention facility because roots from trees can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging the intake pipe.

- Large shrubs or trees that are likely to interfere with detention facility operation shall be identified at each inspection then removed.

Source Control measures typically include structural and non-structural controls. Non-structural controls can include street sweeping and other good house keeping practices. It is often easier to prevent pollutants from entering stormwater than to remove them.

- Source control measures shall be inspected and maintained (where applicable).

Spill Prevention procedures require high-risk site users to reduce the risk of spills. However, virtually all sites, including residential and commercial, present dangers from spills. Homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, nail polish remover, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important for everyone to exercise caution when handling substances that can contaminate stormwater.
Spill prevention procedures shall be implemented in areas where there is likelihood of spills from hazardous materials.

Training and/or written guidance information for operating and maintaining detention facilities shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the detention facility is required for efficient maintenance.
Egress and ingress routes shall be open and maintained to design standards.

Insects & Rodents shall not be harbored in the soakage trench. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  i) Installation of predacious bird or bat nesting boxes.
  ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
  iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
  iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the soakage trench shall be filled.

Soakage Trenches

Operations & Maintenance Plan

Soakage Trenches consist of drain rock and sand, and receive stormwater from roof downspouts and/or area drains. There are various components within the system – piping, silt basin and the trench itself. The **Conveyance Piping** consists of an inlet pipe (downspout or area drain), an outlet pipe located between the silt basin and the soakage trench, and a perforated pipe, located on top of the aggregate bed of the soakage trench. The **Silt Basin** is a structure receiving runoff from an inlet pipe and conveying it to the soakage trench. The silt basin serves as the pre-treatment system for the soakage trench, removing sediments and other debris that can impact its proper functioning. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first two years from the date of installation, then two times per year afterwards, or within 48 hours after each major storm. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Soakage trench infiltration: If water is noticed on top of the trench within 48 hours of a major storm, the soakage trench may be clogged.

- Check for debris/sediment accumulation, rake and remove and evaluate upland causes (erosion, surface or roof debris, etc
- Assess the condition of the aggregate and the filter fabric in the trench. If there is sediment in the aggregate, excavate and replace.
- If there is a tear in the filter fabric, repair or replace.

Conveyance Piping: If water ponds over the trench for more than 48 hours after a major storm and no other cause if identified, it may be necessary to remove the filter fabric to determine if the perforated pipe is clogged with sediment or debris.

- Any debris or algae growth located on top of the soakage trench should be removed and disposed of properly.
- If the piping has settled more than 1-inch, add fill material. If there are cracks or releases, replace or repair the pipe. If there are signs of erosion around the pipe, this may be an indication of water seeping due to a crack or break.

Silt Basin: If water remains in the soakage trench for 36-48 hours after storm, check for sediment accumulation in the silt basin

- If less than 50% capacity remains in the basin or 6" of sediment has accumulated, remove and dispose the sediment.

Spill Prevention*:* Virtually all sites, including residential and commercial, present dangers from spills. All homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, nail polish remover, pesticides, and cleaning aids that can adversely affect groundwater if spilled. It is important to exercise caution when handling substances that can contaminate stormwater.

- Activities that pose the chance of hazardous material spills shall not take place near soakage trenches.

A **Shut-Off Valve or Flow-Blocking Mechanism** may have been required with the construction of the soakage trench to temporarily prevent stormwater from flowing into it, in the event of an accidental toxic material spill. This may also involve mats kept on-site that can be used to cover inlet drains in parking lots. The shut-off valve shall remain in good working order, or if mats or other flow-blocking mechanisms are used, they shall be kept in stock on-site.

Training and/or written guidance information for operating and maintaining soakage trenches shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the soakage trench is required for efficient maintenance. Egress and ingress routes will be maintained to design standards at inspections.

Rain Gardens

Operations & Maintenance Plan

Training and/or written guidance information for operating and maintaining vegetated infiltration basins shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the infiltration basin shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the infiltration basin shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects & Rodents shall not be harbored in the infiltration basin. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  i) Installation of predacious bird or bat nesting boxes.
  ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
  iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
  iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the infiltration basin shall be filled.

If used at this site, the following will be applicable:

Fences shall be maintained to preserve their functionality and appearance.

- Collapsed fences shall be restored to an upright position.
- Jagged edges and damaged fences shall be repaired or replaced.

Rain Gardens

Operations & Maintenance Plan

A **vegetated Infiltration Basin** is a vegetated depression created by excavation, berms, or small dams to provide for short-term ponding of surface water until it percolates into the soil. The basin shall infiltrate stormwater within 24 hours. All facility components and vegetation shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Basin Inlet shall assure unrestricted stormwater flow to the vegetated basin.

- Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present.
- Inlet shall be cleared when conveyance capacity is plugged.
- Rock splash pads shall be replenished to prevent erosion.

Embankment, Dikes, Berms & Side Slopes retain water in the infiltration basin.

- Structural deficiencies shall be corrected upon discovery:
- Slopes shall be stabilized using appropriate erosion control measures when soil is exposed/ flow channels are forming.
- Sources of erosion damage shall be identified and controlled.

Overflow or Emergency Spillway conveys flow exceeding reservoir capacity to an approved stormwater receiving system.

- Overflow shall be cleared when 25% of the conveyance capacity is plugged.
- Sources of erosion damage shall be identified and controlled when soil is exposed.
- Rocks or other armament shall be replaced when only one layer of rock exists.

Filter Media shall allow stormwater to percolate uniformly through the infiltration basin. If water remains 36-48 hours after storm, sources of possible clogging shall be identified and corrected.

- Basin shall be raked and, if necessary, soil shall be excavated, and cleaned or replaced.

Sediment/ Basin Debris Management shall prevent loss of infiltration basin volume caused by sedimentation. Gauges located at the opposite ends of the basin shall be maintained to monitor sedimentation.

- Sediment and debris exceeding 4" in depth shall be removed every 2-5 years or sooner if performance is affected.

Debris and Litter shall be removed to ensure stormwater infiltration and to prevent clogging of overflow drains and interference with plant growth.

- Restricted sources of sediment and debris, such as discarded lawn clippings, shall be identified and prevented.

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion.

- Mulch shall be replenished as needed to ensure healthy plant growth.
- Vegetation, large shrubs or trees that limit access or interfere with basin operation shall be pruned or removed.
- Grass shall be mowed to 4"-9" high and grass clippings shall be removed no less than 2 times per year.
- Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- Nuisance or prohibited vegetation from the Eugene Plant List (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when infiltration basin function is impaired. Vegetation shall be replaced within 3 months, or immediately if required to control erosion.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Stormwater Planters

Operations & Maintenance Plan

Training and/or written guidance information for operating and maintaining stormwater planters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the stormwater planter shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the stormwater planter shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects & Rodents shall not be harbored in the stormwater planter.
Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  i) Installation of predacious bird or bat nesting boxes.
  ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
  iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
  iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the stormwater planter shall be filled and compacted.

Stormwater Planters

Operations & Maintenance Plan

Planters are designed to allow runoff to filter through layers of topsoil (thus capturing pollutants) and then either infiltrate into the native soils (infiltration planter) or be collected in a pipe to be discharged off-site (flow-through planter). The planter is sized to accept runoff and temporarily store the water in a reservoir on top of the soil. The flow-through planter is designed with an impervious bottom or is placed on an impervious surface. Water should drain through the planter within 3-4 hours after a storm event. All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Downspout from rooftop or sheet flow from paving allows unimpeded stormwater flow to the planter.

- Debris shall be removed routinely (e.g., no less than every 6 months) and upon discovery.
- Damaged pipe shall be repaired upon discovery.

Splash Blocks prevent splashing against adjacent structures and convey water without disrupting media.

- Any deficiencies in structure such as cracking, rotting, and failure shall be repaired.

Planter Reservoir receives and detains storm water prior to infiltration. Water should drain from reservoir within 3-4 hours of storm event.

- Sources of clogging shall be identified and corrected.
- Topsoil may need to be amended with sand or replaced all together.

Filter Media consisting of sand, gravel, and topsoil shall allow stormwater to percolate uniformly through the planter.

The planter shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates.

- Holes that are not consistent with the design and allow water to flow directly through the planter to the ground shall be plugged.
- Sediment accumulation shall be hand removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- Litter and debris shall be removed routinely (e.g., no less than quarterly) and upon discovery.

Planter shall contain filter media and vegetation.

- Structural deficiencies in the planter including rot, cracks, and failure shall be repaired.

Overflow Pipe safely conveys flow exceeding reservoir capacity to an approved stormwater receiving system**.**

- Overflow pipe shall be cleared of sediment and debris when 50% of the conveyance capacity is plugged.
- Damaged pipe shall be repaired or replaced upon discovery.

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion.

- Mulch shall be replenished at least annually.
- Vegetation, large shrubs or trees that limit access or interfere with planter operation shall be pruned or removed.
- Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- Nuisance or prohibited vegetation from the Eugene Plant List shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when planter function is impaired. Vegetation shall be replaced within a specific timeframe, e.g., 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.

Debris and Litter shall be removed to ensure stormwater infiltration and to prevent clogging of overflow drains and interference with plant growth.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Vegetated Filter Strips

Operations & Maintenance Plan

Training and/or written guidance information for operating and maintaining vegetated filters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the vegetative filter shall be safe and efficient. Egress and ingress routes shall be maintained to design standards.
Obstacles preventing maintenance personnel and/or equipment access to the facility shall be removed.
Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects & Rodents shall not be harbored in the vegetated filter. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
    iii) Installation of predacious bird or bat nesting boxes.
    iv) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
    v) Stocking ponds and other permanent water facilities with fish or other predatory species.
    vi) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the vegetated filter shall be filled.

Vegetated Filter Strips

Operations & Maintenance Plan

Vegetated filter strips are gently sloped vegetated areas that stormwater runoff is directed to flow and filter through. Stormwater enters the filter as sheet flow from an impervious surface or is converted to sheet flow using a flow spreader. Flow control is achieved using the relatively large surface area and check dams. Pollutants are removed through infiltration and sedimentation. The vegetative filter should drain within 48 hours of storm event. All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Flow Spreader shall allow runoff to enter the vegetative filter as predominantly sheet flow.

- Source of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are forming.
- Sediment build-up near or exceeding 2" in depth shall be removed.

Filter Inlet shall assure unrestricted stormwater flow to the vegetative filter.

- Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present.
- Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- Inlet shall be cleared when conveyance capacity is plugged.
- Rock splash pads shall be replenished to prevent erosion.

Filter Media shall allow stormwater to percolate uniformly through the vegetative filter.

- If the vegetative filter does not drain within 48 hours, it shall be regraded and replanted according to design specifications. Established trees shall not be removed or harmed in this process.
- Debris in quantities more than 2" deep or sufficient to inhibit operation shall be removed routinely (e.g., no less than quarterly), or upon discovery.

Check Dams shall direct and control flow.

- Causes for altered water flow and channelization shall be identified, and obstructions cleared upon discovery.
- Cracks, rot, and structural damage shall be repaired.

Filter Outlet shall allow water to exit the vegetative filter as sheet flow, unless a collection drainpipe is used.

- Sources of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are deeper than 2 inches.
- Outlet shall be cleared when 50% of the conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected.

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion.

- Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- Nuisance and prohibited vegetation from the Eugene Plant List (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when vegetative filter function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.

Debris and Litter shall be removed to ensure stormwater conveyance and to prevent clogging of inlet drains and interference with plant growth.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

- If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the level spreader shall be filled.

Level Spreaders

Operations & Maintenance Plan

Level spreaders are used to spread and disperse a concentrated flow thinly over a vegetated or forested riparian buffer or filter strip. Stormwater enters the spreader as a concentrated flow and discharges as sheet flow across a buffer area. All facility components and the vegetated buffer shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Level Spreader shall allow runoff to enter the vegetative filter as predominantly sheet flow.

- Source of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are forming.
- Sediment build-up near or exceeding 2" in depth shall be removed.

Inlet shall assure unrestricted stormwater flow to the level spreader.

- Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present.
- Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- Inlet shall be cleared when conveyance capacity is plugged.
- Rock splash pads shall be replenished to prevent erosion.

Spreader lip shall allow water to exit the level spreader as sheet flow.

- Sources of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are deeper than 2 inches.
- Outlet shall be cleared when 50% of the conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected.

Vegetated buffer shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion.

- Nuisance and prohibited vegetation from the Eugene Plant List (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when vegetation function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater.
Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining level spreaders shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the level spreaders shall be safe and efficient. Egress and ingress routes shall be maintained to design standards.
Obstacles preventing maintenance personnel and/or equipment access to the facility shall be removed.

Insects & Rodents shall not be harbored in the level spreader. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  i) Installation of predacious bird or bat nesting boxes.
  ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.

- Obstacles preventing maintenance personnel and/or equipment access to the swale shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects & Rodents shall not be harbored in the swale. Pest control measures shall be taken when insects/rodents are found to be present.

- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  i) Installation of predacious bird or bat nesting boxes.
  ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
  iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
  iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the swale shall be filled.

If used at this site, the following will be applicable:

Check Dams shall control and distribute flow.

- Causes for altered water flow shall be identified, and obstructions cleared upon discovery.
- Causes for channelization shall be identified and repaired.

Swales (Vegetated, Grassy, and Street)
Operations & Maintenance Plan

Swales are planted or grassed open channels that trap pollutants by filtering and slowing flows, allowing particles to settle out. The swale should drain within 48 hours of a storm event. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Swale Inlet (such as curb cuts or pipes) shall maintain a calm flow of water entering the swale**.**

- Source of erosion shall be identified and controlled when native soil is exposed or erosion channels are forming.
- Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4" thick or so thick as to damage or kill vegetation.
- Inlet shall be cleared when conveyance capacity is plugged. Sources of sediment and debris shall be identified and corrected.
- Rock splash pads shall be replenished to prevent erosion.

Side Slopes shall be maintained to prevent erosion that introduces sediment into the swale.

- Slopes shall be stabilized and planted using appropriate erosion control measures when native soil is exposed or erosion channels are forming.

Swale Media shall allow stormwater to percolate uniformly through the landscape swale. If the swale does not drain within 48 hours, it shall be tilled and replanted according to design specifications.

- Annual or semi-annual tilling shall be implemented if compaction or clogging continues.
- Debris in quantities that inhibit operation shall be removed routinely (e.g., no less than quarterly), or upon discovery.

Swale Outlet shall maintain sheet flow of water exiting swale unless a collection drain is used. Source of erosion damage shall be identified and controlled when native soil is exposed or erosion channels are forming.

- Outlets such as drains and overland flow paths shall be cleared when 50% of the conveyance capacity is plugged.
- Sources of sediment and debris shall be identified and corrected.

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion.

Mulch shall be replenished as needed to ensure survival of vegetation.

- Vegetation, large shrubs or trees that interfere with landscape swale operation shall be pruned.
- Fallen leaves and debris from deciduous plant foliage shall be removed.
- Grassy swales shall be mowed to keep grass 4" to 9" in height. Clippings shall be removed to remove pollutants absorbed in grasses.
- Nuisance and prohibited vegetation from the Eugene Plant List (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- Dead vegetation and woody material shall be removed to maintain less than 10% of area coverage or when swale function is impaired. Vegetation shall be replaced within 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.

Debris and Litter shall be removed to ensure stormwater conveyance and to prevent clogging of inlet drains and interference with plant growth.

Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining swales shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the swale shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

Insects & Rodents shall not be harbored at the pervious pavement. Pest control measures shall be taken when insects/rodents are found to be present.

- Standing water creating an environment for development of insect larvae shall be eliminated.
- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
    i) Installation of predacious bird or bat nesting boxes.
    ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
    iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
    iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the pervious pavement shall be filled and compacted.

If used at this site, the following will be applicable:

Signage may serve to educate people about the importance or function of the site's stormwater protection measures. It may also discourage behaviors that adversely affect stormwater protection measures. For example, if debris is a problem, a sign reminding people not to litter may partially solve the problem. Broken or defaced signs shall be replaced/repaired.

Pervious Pavement
Operations & Maintenance Plan

Pervious pavement is a permeable pavement surface with an underlying stone reservoir that temporarily stores surface runoff before infiltrating into the subsoil or being collected in underlying drain pipes and being discharged off-site. There are many types of pervious pavement including plastic rings planted with grass, stone or concrete blocks with pore spaces backfilled with gravel or sand, porous asphalt, and porous concrete. Pervious pavement accepts only precipitation, not stormwater runoff. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Surface: In most pervious pavement design, the pavement itself acts as pretreatment to the stone reservoir below. The surface shall be kept clean and free of leaves, debris, and sediment. The surface shall not be overlaid with an impermeable paving surface

- Regular sweeping shall be implemented for porous asphalt or concrete systems.

Overflows or Emergency Spillways are used in the event that the facility's infiltration capacity is exceeded. Overflow devices shall be inspected for obstructions or debris, which shall be removed upon discovery Overflow or emergency spillways shall be capable of transporting high flows of stormwater to an approved stormwater receiving system.

- Sources of erosion damage shall be identified and controlled when native soil is exposed near the overflow structure.

Vegetation (where applicable) shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Vegetation, such as trees and shrubs, should not be located in or around the pervious pavement because roots from trees can penetrate the pavement, and leaves from deciduous trees and shrubs can increase the risk of clogging the surface.

- Vegetation and large shrubs/trees that limit access or interfere with porous pavement operation shall be pruned.
- Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- Poisonous, nuisance, dead or odor producing vegetation shall be removed immediately.
- Grass shall be mowed to less than four inches and grass clippings shall be bagged and removed.
- Irrigation shall be provided as needed.

Source Control measures prevent pollutants from mixing with stormwater. Typical non-structural control measures include raking and removing leaves, street sweeping, vacuum sweeping, limited and controlled application of pesticides and fertilizers, and other good house keeping practices.

Spill Prevention measures shall be exercised when handling substances that can contaminate stormwater. A spill prevention plan shall be implemented at all non-residential sites and in areas where there is likelihood of spills from hazardous materials. However, virtually all sites, including residential and commercial, present potential danger from spills. All homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, solvents, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important to exercise caution when handling substances that can contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Training and/or written guidance information for operating and maintaining pervious pavement shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the pervious pavement shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

Obstacles preventing maintenance personnel and/or equipment access to the porous pavement shall be removed.

Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Debris and Litter shall be removed to prevent clogging.

Contained Planters

Operations & Maintenance Plan

Contained planters are designed to intercept rainfall that would normally fall on impervious surfaces. In this respect contained planters convert impervious surfaces to pervious ones, decreasing the amount of stormwater runoff from a site. Water should drain through the planter within 3-4 hours after a storm event. All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation and 2 times per year thereafter. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Filter Media consisting of sand or topsoil shall allow stormwater to percolate uniformly through the planter.

- The planter shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates.
- Holes that are not consistent with the design and allow water to flow directly through the planter to the ground shall be plugged.
- Litter and debris shall be removed routinely (e.g., no less than quarterly) and upon discovery.

Planter shall contain filter media and vegetation.

- Structural deficiencies in the planter including rot, cracks, and failure shall be repaired.

Planter Reservoir receives and detains storm water prior to infiltration. If water does not drain from reservoir within 3-4 hours of storm event, sources of clogging shall be identified and corrected. Topsoil may need to be amended with sand or replaced all together.

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion.

- Mulch shall be replenished at least annually.
- Planter vegetation shall be irrigated to ensure survival.
- Vegetation, large shrubs or trees that limit access or interfere with planter operation shall be pruned or removed.
- Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- Nuisance and prohibited vegetation from the Eugene Plant List shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species (measured in a 10 x 10 foot plot) shall be removed and replaced.
- Dead vegetation shall be removed to maintain less than 10% of area coverage or when planter function is impaired. Vegetation shall be replaced within a specific timeframe, e.g., 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.

Training and/or written guidance information for operating and maintaining planters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.

Access to the stormwater planter shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- Obstacles preventing maintenance personnel and/or equipment access to the stormwater planter shall be removed.
- Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

Insects & Rodents shall not be harbored at the stormwater planter. Pest control measures shall be taken when insects/rodents are found to be present.

- Standing water creating an environment for development of insect larvae shall be eliminated.
- If a complaint is received or an inspection reveals that a stormwater facility is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee may be required to eliminate the infestation at the City inspector's discretion. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City's inspector. Acceptable methods include but are not limited to the following:
  - i) Installation of predacious bird or bat nesting boxes.
  - ii) Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
  - iii) Stocking ponds and other permanent water facilities with fish or other predatory species.
  - iv) If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.
- Holes in the ground located in and around the stormwater planter shall be filled and compacted.

Debris and Litter shall be removed to maintain soil health and to prevent interference with plant growth.

STORMWATER MANAGEMENT FACILITY INSPECTION & MAINTENANCE LOG (SAMPLE)

Property Address:

Inspection Date:

Inspection Time:

Inspected By:

Approximate Date/Time of Last Rainfall:

Type of Stormwater Management Facility:

Location of Facility on Site (In relation to buildings or other permanent structures):

Water levels and observations (Oil sheen, smell, turbidity, etc.):

Sediment accumulation & record of sediment removal:

Condition of vegetation (Height, survival rates, invasive species present, etc.) & record of replacement and management (mowing, weeding, etc.):

Condition of physical properties such as inlets, outlets, piping, fences, irrigation facilities, and side slopes. Record damaged items and replacement activities:

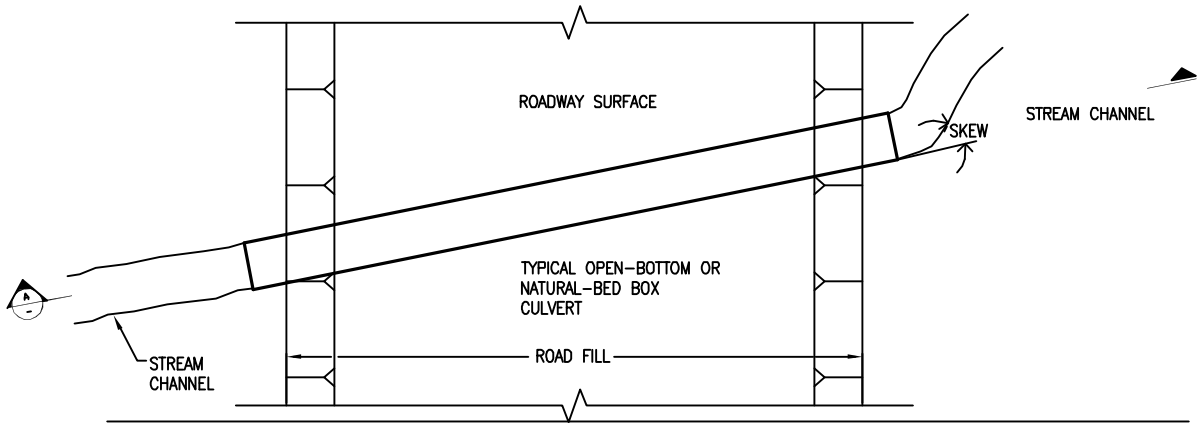
Presence of insects or vectors. Record control activities:

Identify safety hazards present. Record resolution activities:

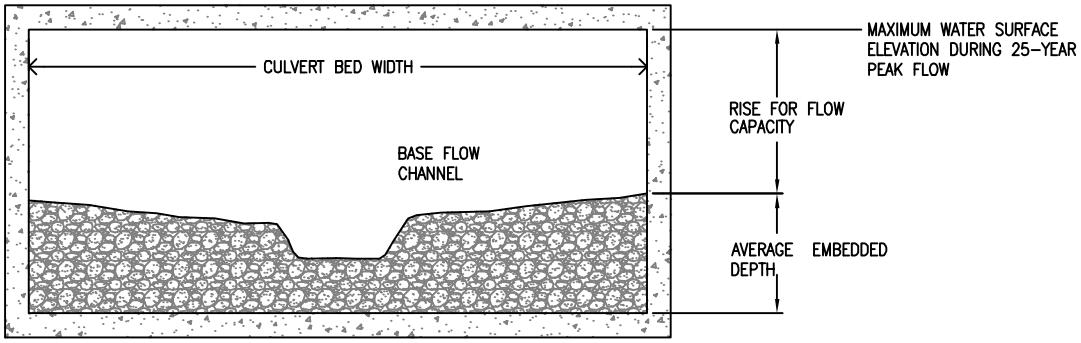
APPENDIX

I

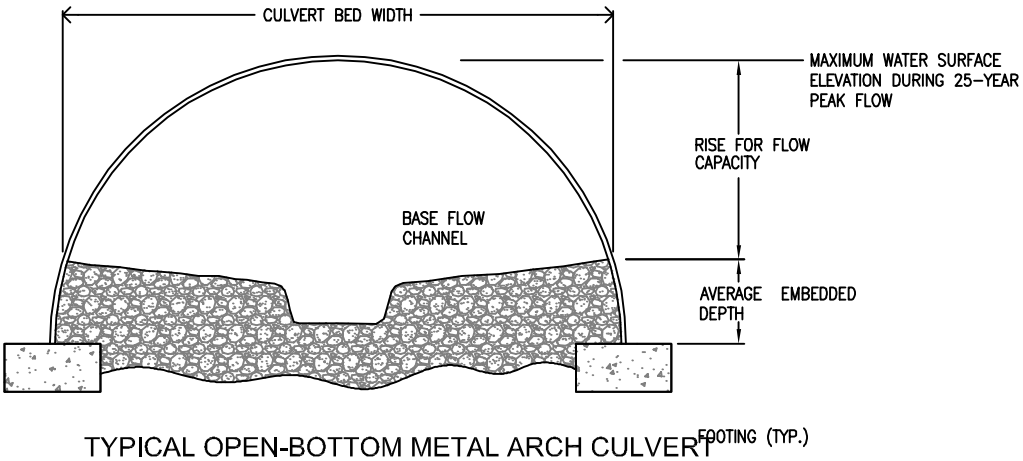
Stormwater BMP Detail Drawings



TYPICAL OPEN-BOTTOM OR NATURAL-BED BOX CULVERT



TYPICAL NATURAL-BED BOX CULVERT



TYPICAL OPEN-BOTTOM METAL ARCH CULVERT

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

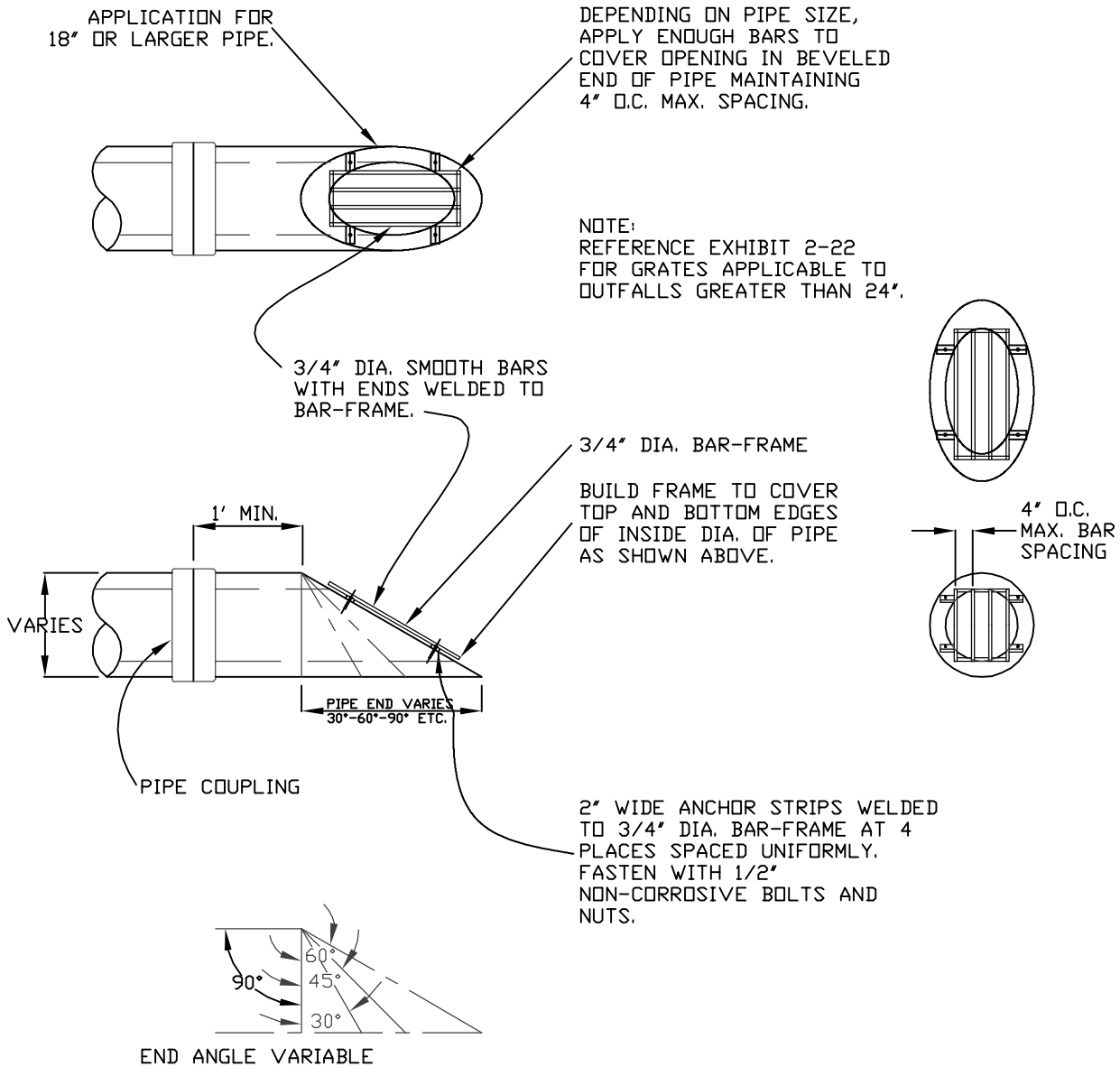
DATE: 11-30-10

- Supplemental Details -

Outfall
Alignment & Profile

NUMBER

SW-530



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

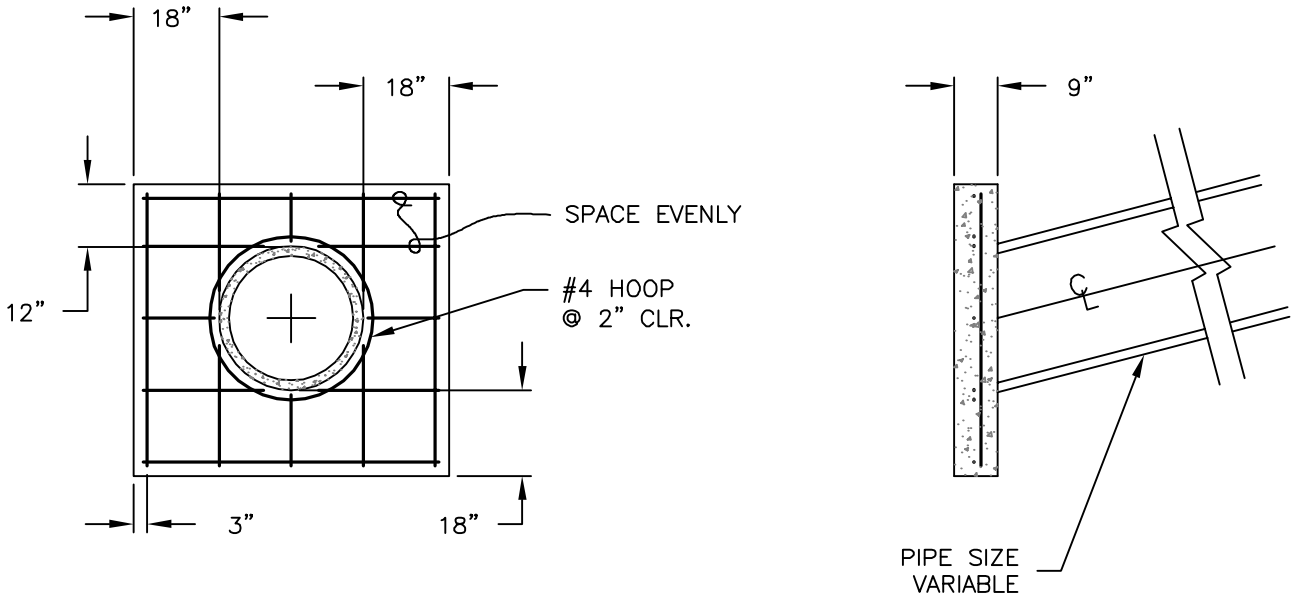
- Supplemental Details -

Outfall

Grated Protection

NUMBER

SW-526



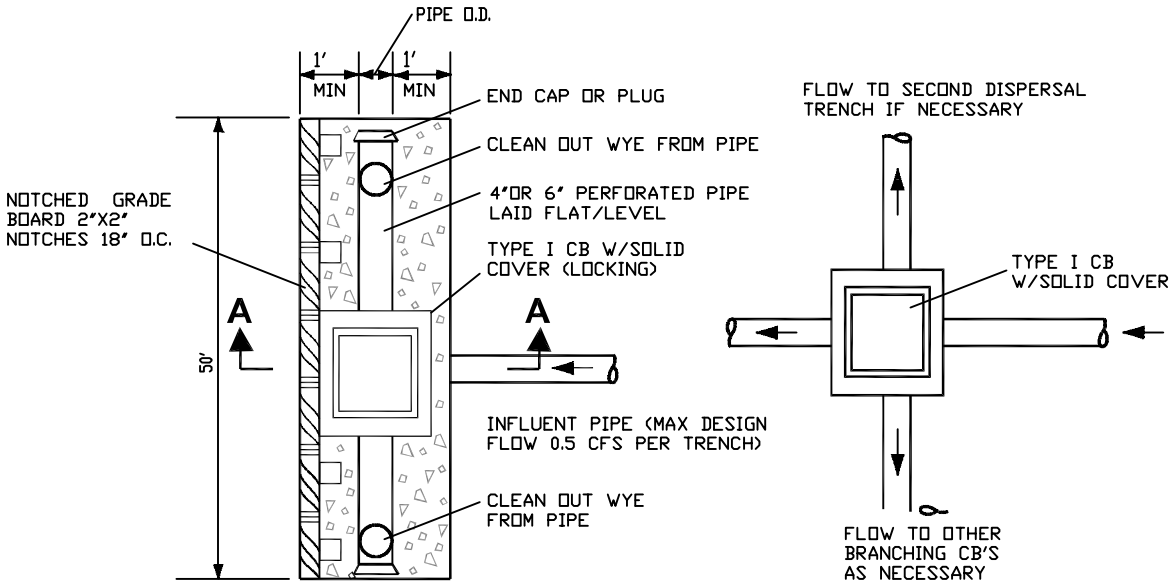
NOTES:

1. CONCRETE TO BE 3000psi (28 DAYS ULTIMATE STRENGTH, SLUMP OF 2" TO 5" AND 1 1/2" MINUS AGGREGATE).
2. ALL REINFORCING STEEL fy = 60,000psi.
3. FILL AROUND ENDWALLS TO 6" BELOW TOP OF WALL.
4. BASE OF OUTFALL SHALL BE POURED AGAINST UNDISTURBED SOIL.

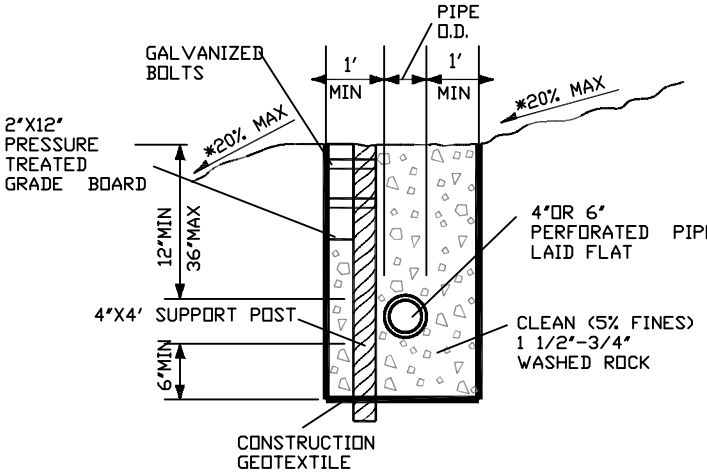
- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

	CITY OF FLORENCE PUBLIC WORKS DEPARTMENT 989 Spruce Street Florence, OR 97439 Phone: 541-997-4106 DATE: 11-30-10	- Supplemental Details - Outfall End Wall	NUMBER SW-525

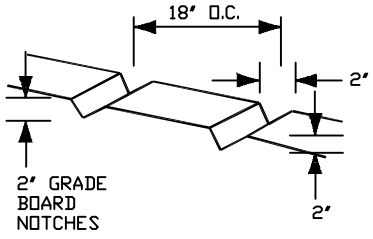


PLAN
NTS



SECTION A-A
NTS

*15% MAX FOR FLOW CONTROL/WATER QUALITY TREATMENT IN RURAL AREAS.



NOTES:

1. THIS TRENCH SHALL BE CONSTRUCTED SO AS TO PREVENT POINT DISCHARGE AND/OR EROSION.
2. TRENCHES MAY BE PLACED NO CLOSER THAN 50 FEET TO ONE ANOTHER. (100 FEET ALONG FLOWLINE)
3. TRENCH AND GRADE BOARD MUST BE LEVEL. ALIGN TO FOLLOW CONTOURS OF SITE.
4. SUPPORT POST SPACING AS REQUIRED BY SOIL CONDITIONS TO ENSURE GRADE BOARD REMAINS LEVEL.

FLOW DISPERSAL TRENCH

THIS DRAWING IS ONLY A TEMPLATE THAT NEEDS TO BE ADJUSTED AND REVISED FOR EACH PROJECT

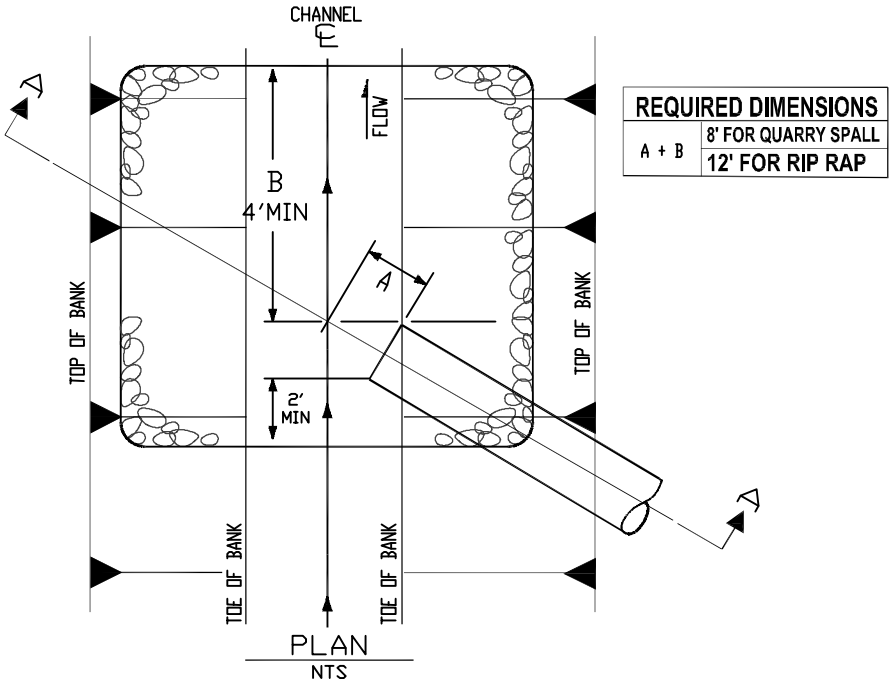
NOTES

1. SOURCE: WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) HIGHWAY RUNOFF MANUAL, FIGURE 5.4.3.9.
2. FOR MORE INFORMATION AND DETAILS SEE *CONCEPT DESIGNS AND TECHNICAL GUIDANCE: STORMWATER OUTFALLS* (HERRERA 2007).

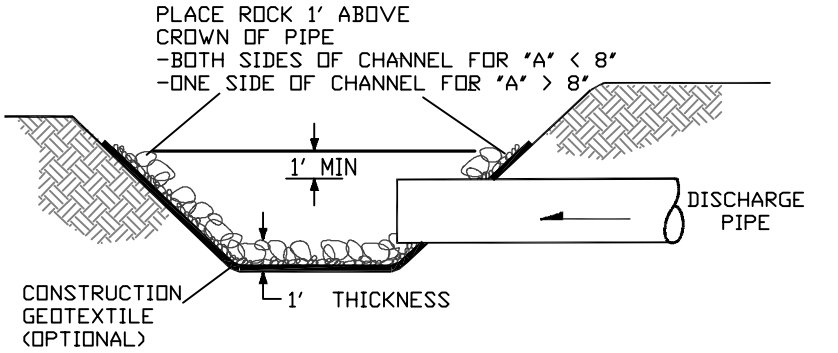
- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

	CITY OF FLORENCE PUBLIC WORKS DEPARTMENT 989 Spruce Street Florence, OR 97439 Phone: 541-997-4106 DATE: 11-30-10	- Supplemental Details - Outfall Upland Dispersion	NUMBER SW-524



REQUIRED DIMENSIONS	
A + B	8' FOR QUARRY SPALL
	12' FOR RIP RAP



SECTION A-A
NTS

THIS DRAWING IS ONLY A TEMPLATE THAT NEEDS TO BE ADJUSTED AND REVISED FOR EACH PROJECT

PIPE/CULVERT OUTFALL DISCHARGE PROTECTION

NOTES

1. SOURCE: WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) HIGHWAY RUNOFF MANUAL, FIGURE 5.4.3.8.

2. FOR MORE INFORMATION AND DETAILS SEE *CONCEPT DESIGNS AND TECHNICAL GUIDANCE: STORMWATER OUTFALLS* (HERRERA 2007).

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

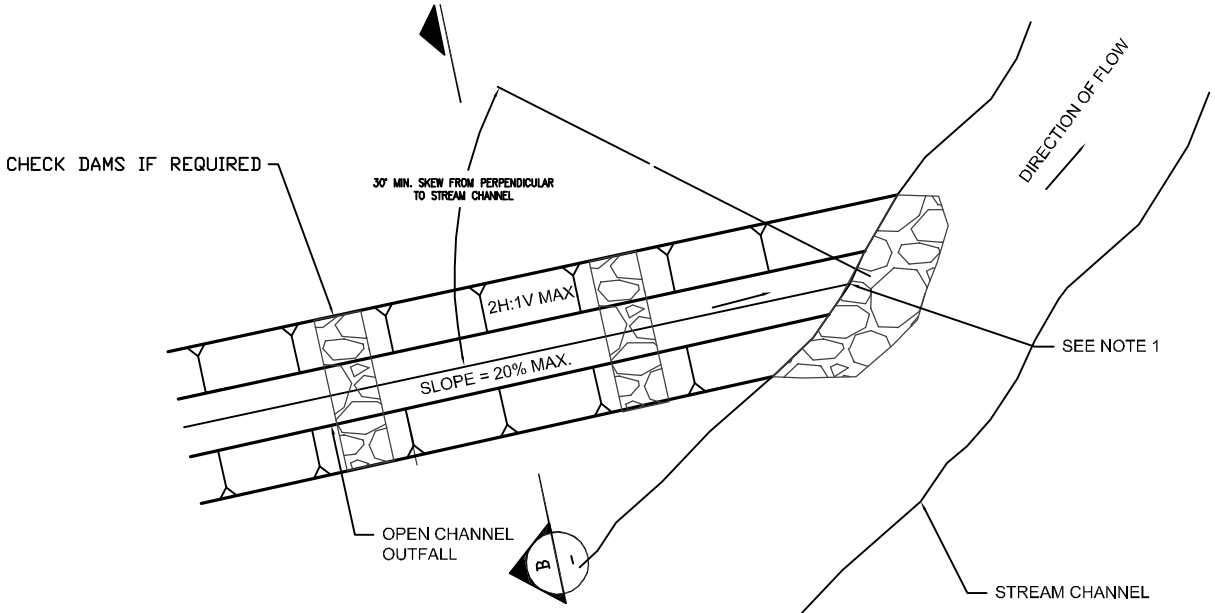
- Supplemental Details -

Outfall

Rock Energy Dissipator

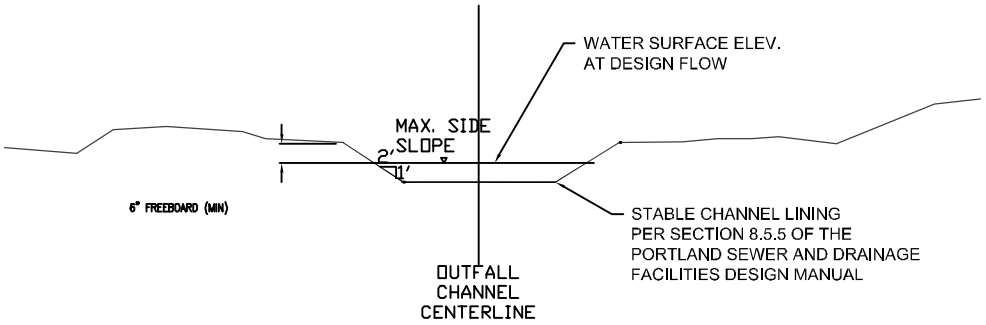
NUMBER

SW-523



TYPICAL OPEN CHANNEL OUTFALL 2/–

NTS



SECTION B/–

NTS

NOTES

1. INVERT ELEVATION OF OPEN CHANNEL OUTFALL AT CONFLUENCE WITH STREAM CHANNEL SHALL BE AT OR NEAR INVERT OF MAIN CHANNEL.
2. OPEN CHANNEL OUTFALLS SHOULD NOT BE CONSTRUCTED IN AREAS WTIH UNSTABLE SOILS.
3. MAXIMUM LONGITUDINAL SLOPE FOR OPEN CHANNEL OUTFALL = 20 PERCENT.
4. FOR LINING REQUIREMENTS, SEE SECTION 8.5.1 OF THE PORTLAND SEWER AND DRAINAGE FACILITIES DESIGN MANUAL 2006. FLEXIBLE LININGS RECOMMENDED FOR CHANNEL SLOPES > 2 PERCENT.
5. MAXIMUM SIDE SLOPES 2 H: 1 V. SHALLOWER SIDE SLOPES MAY BE REQUIRED DEPENDING ON THE CHANNEL MATERIAL.
6. ALL DISTURBED AREAS TO BE REPLANTED WITH NATIVE VEGETATION.
7. CHECK DAMS MAY BE PROVIDED AS AN ALTERNATIVE TO LININGS TO MEET VELOCITY RESTRICTIONS.
8. 6 TO 12 INCHES OF FREEBOARD ABOVE THE 25-YEAR DESIGN STORM SURFACE WATER ELEVATION REQUIRED.
9. FOR MORE INFORMATION AND DETAILS SEE *CONCEPT DESIGNS AND TECHNICAL GUIDANCE: STORMWATER OUTFALLS* (HERRERA 2007).

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

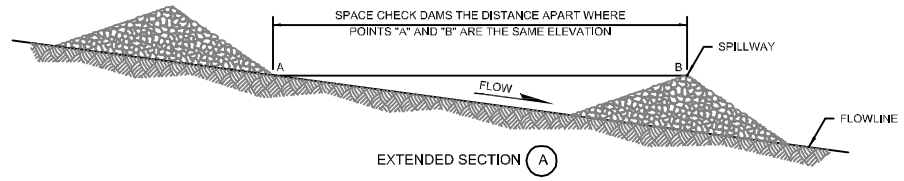
- Supplemental Details -

Outfall

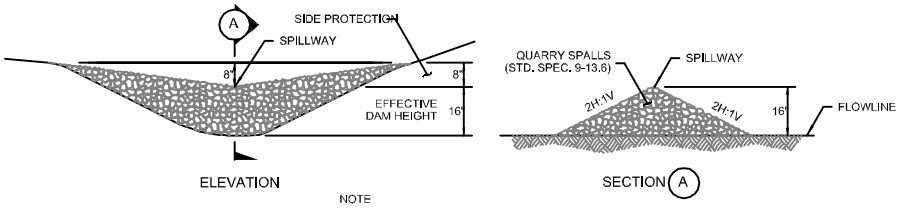
Open Channel Outfall

NUMBER

SW-521



EXTENDED SECTION (A)

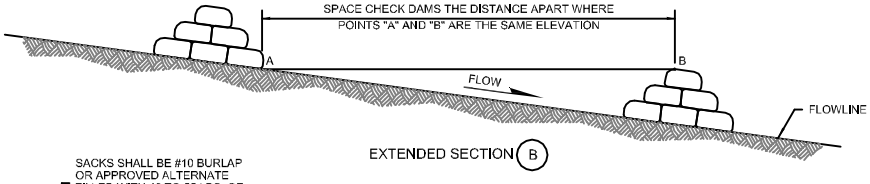


ELEVATION

SECTION (A)

NOTE
ROCK CHECK DAMS SHALL BE PLACED OUTSIDE OF THE CLEAR ZONE, OR BEHIND TRAFFIC BARRIER.

ROCK CHECK DAM



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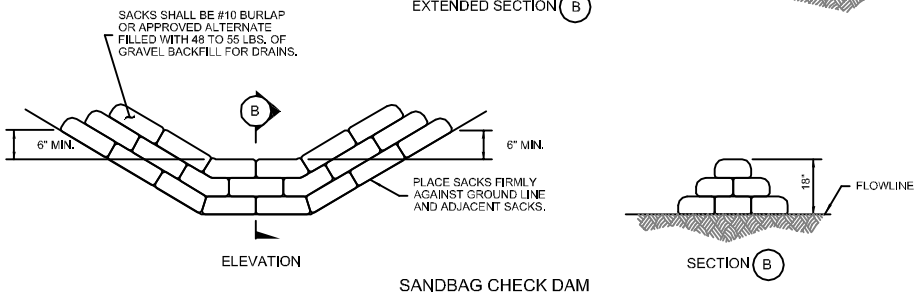
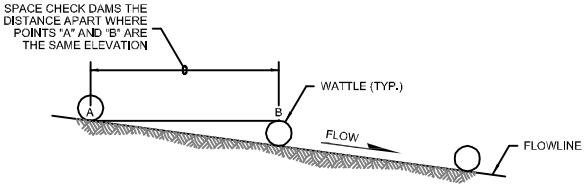


ELEVATION

SECTION (B)

SANDBAG CHECK DAM



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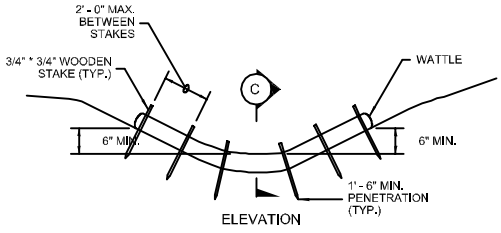


ELEVATION

WATTLE CHECK DAM

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Supplemental Details -

Outfall
Check Dams

NUMBER

SW-520

Pollution Control

IN THE EVENT OF A SPILL

USE Safety Precautions

- Wear protective gear
- Keep vehicles and people out of spill
- Contain materials with the spill kit
  1) Seal off drains
  2) Berm to contain the spill
  3) Clean up with absorbent materials

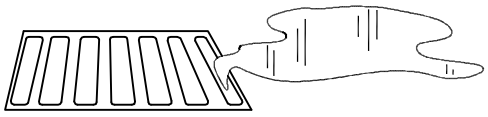
① Turn off valve located at

_____

(your location, ie: NE corner of parking lot)

② CALL: Supervisor @ 503 XXX-XXXX and Environmental Services Emergency Spill Response @ 503 823-7180

SAMPLE



Pollution Control

IN THE EVENT OF A SPILL

① Turn off valve located at

_____

(your location, ie: NE corner of parking lot)

② CALL: Supervisor @ 503 XXX-XXXX and Environmental Services Emergency Spill Response @ 503 823-7180

SAMPLE

USE Safety Precautions

- Wear protective gear
- Keep vehicles and people out of spill
- Contain materials with the spill kit
  1) Seal off drains
  2) Berm to contain the spill
  3) Clean up with absorbent materials

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

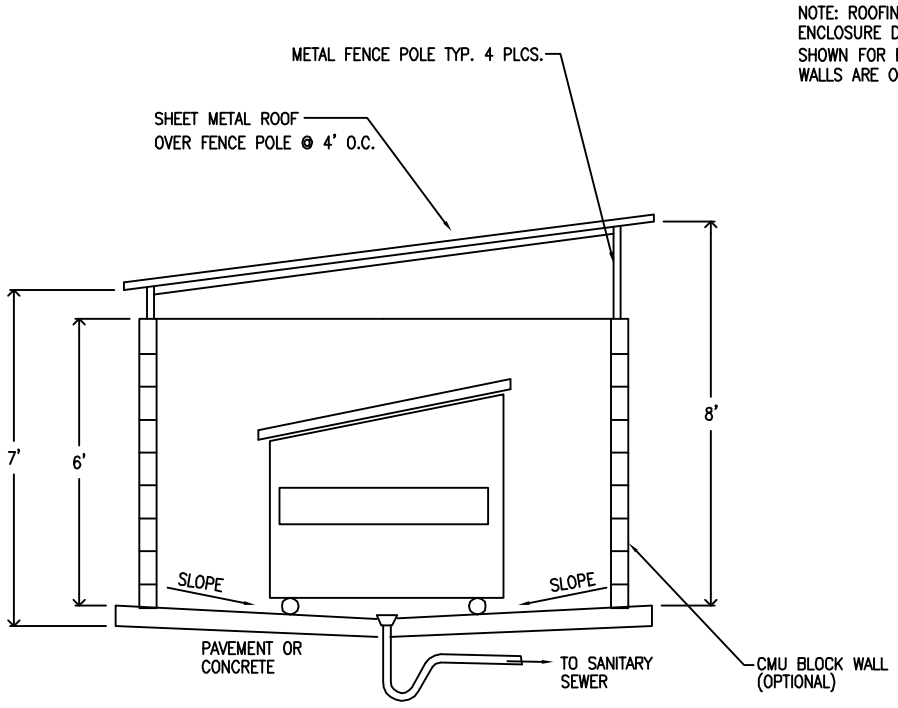
- Supplemental Details -

Spill Control Sign Examples

Source Control

NUMBER

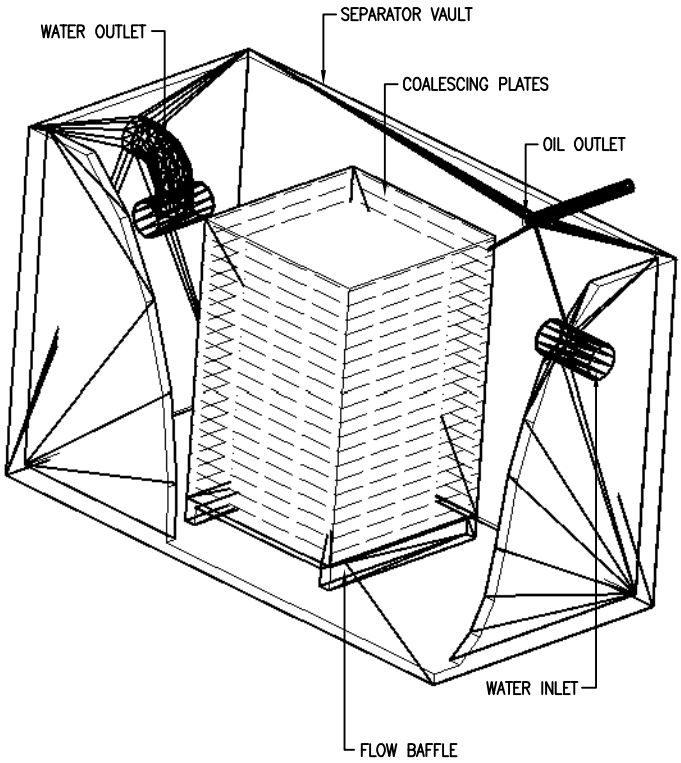
SW-511



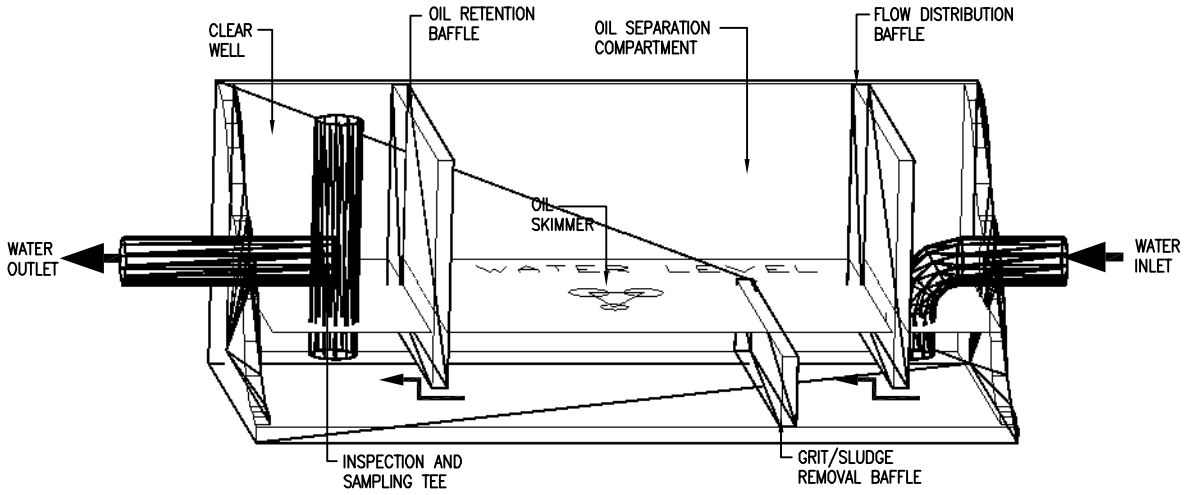
- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

	CITY OF FLORENCE PUBLIC WORKS DEPARTMENT 989 Spruce Street Florence, OR 97439 Phone: 541-997-4106 DATE: 11-30-10	- Supplemental Details - Trash Enclosure Source Control	NUMBER SW-510



COALESCING PLATE (CP) SEPARATOR



AMERICAN PETROLEUM TYPE (API) SEPARATOR

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

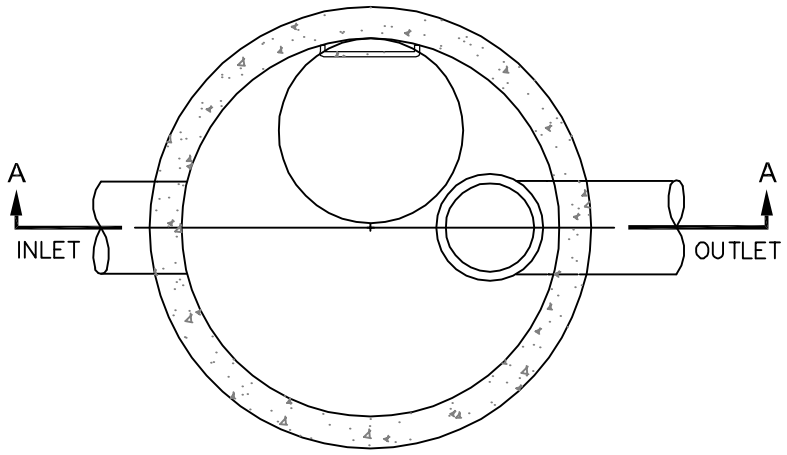
- Supplemental Details -

Oil-Water Separators

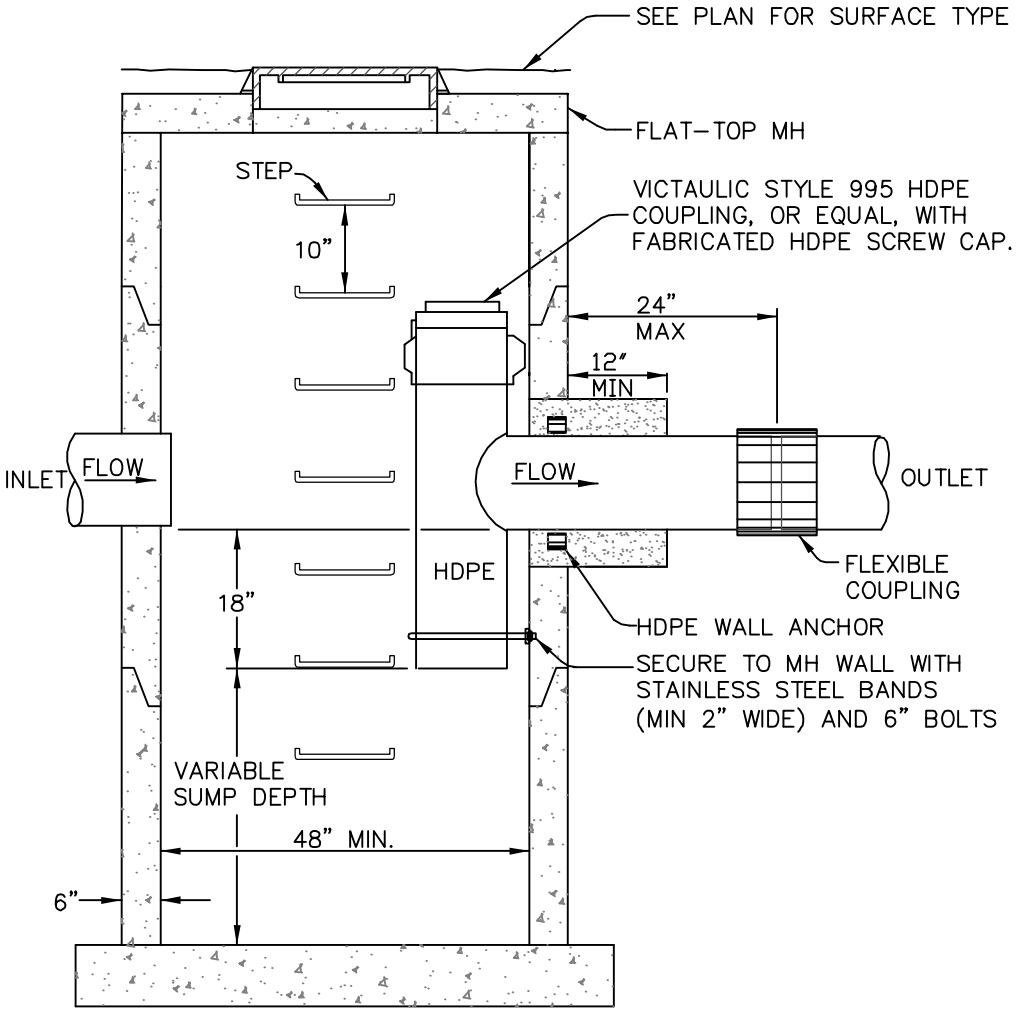
Source Control

NUMBER

SW-501



PLAN



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Supplemental Details -

Spill Control Manhole

Source Control

NUMBER

SW-500

Appendix I.5 Table of Contents

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Supplemental Details -

Table of Contents

NUMBER

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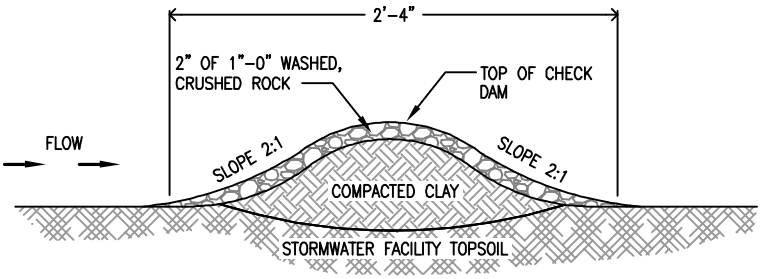


CHECK DAM

CHECK DAM NOTES:

1. Check Dams to be evenly spaced between inlet and outlet. Additional requirements maybe necessary on steep slopes.
2. Additional inlets to be placed directly downstream of check dams.
3. Top of Check Dam to be 1" below gutter elevation at inlet (at curb line) but not greater than 2" below top of curb.

CHECK DAM SPACING

Facility Length	Longitudinal Street Slope	# of Check Dams *	Additional Inlets **
30	<=1%	0	None
	>1%	1	None
31 - 50	<=1%	1	None
	>1%	2	1
51 - 70	<=1%	2	1
	>1%	3	2
71-90	<=1%	3	2
	>1%	4	3
91 +	<=1%	4	3
	>1%	5	4

TABLE 1

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

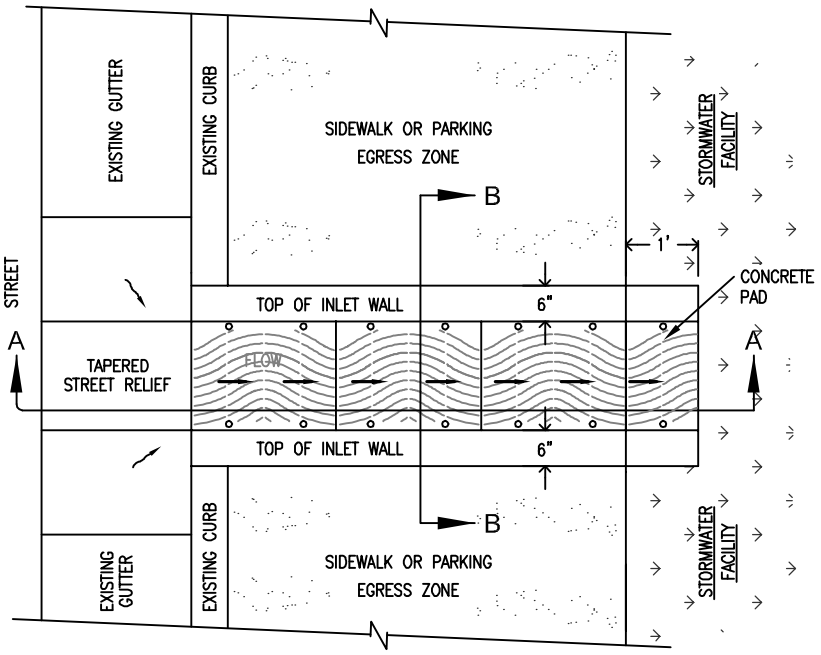
DATE: 11-30-10

- Green Streets -

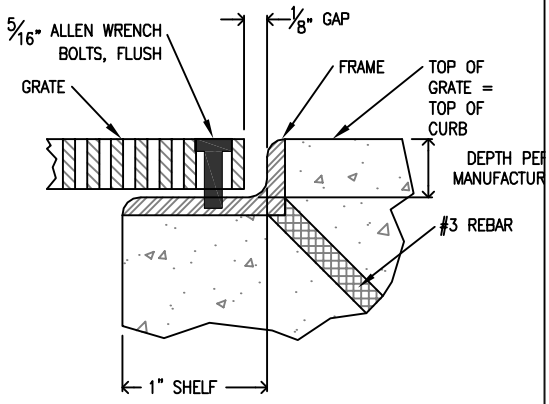
Growing Medium Profile and Check Dam

NUMBER

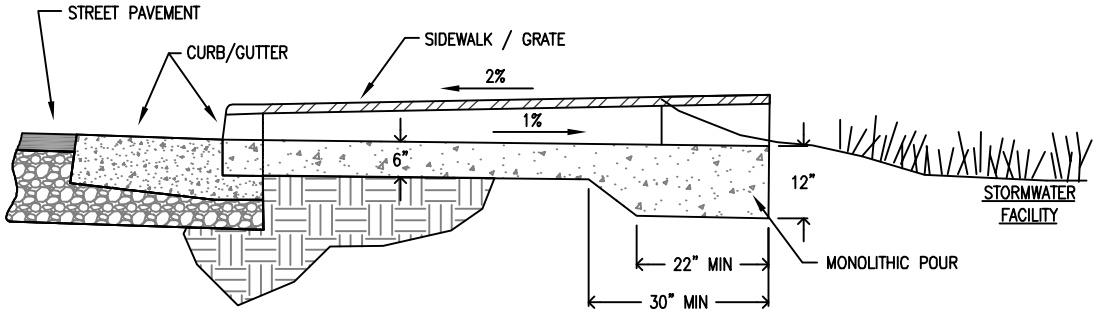
SW-340



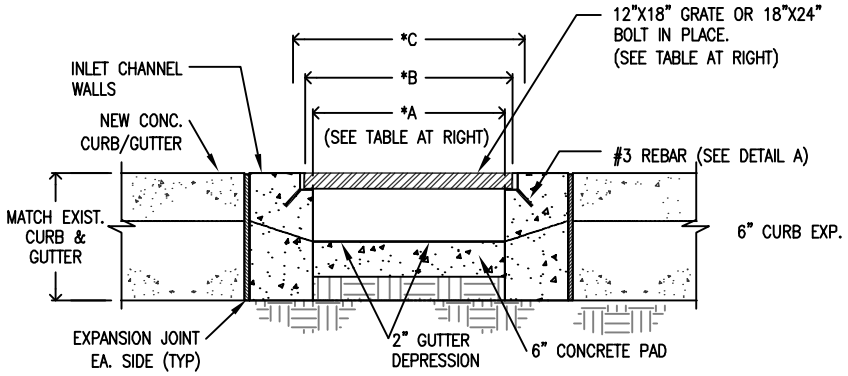
PLAN VIEW



DETAIL A



SECTION A-A



SECTION B-B

*TRENCH GRATING

A TRENCH WIDTH	B GRATE WIDTH	C FRAME WIDTH
10"	11 7/8"	12 1/8"
16"	17 7/8"	18 1/8"

NOTE: MAXIMUM GRATE HOLE WIDTH (OPEN) 1/4 INCH. GRATE SIZE 12"X18" OR 18"X24". CAST IRON URBAN ACCESSORIES TRENCH GRATE AND FRAME. TITLE WAVE MODEL OR EQUAL.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

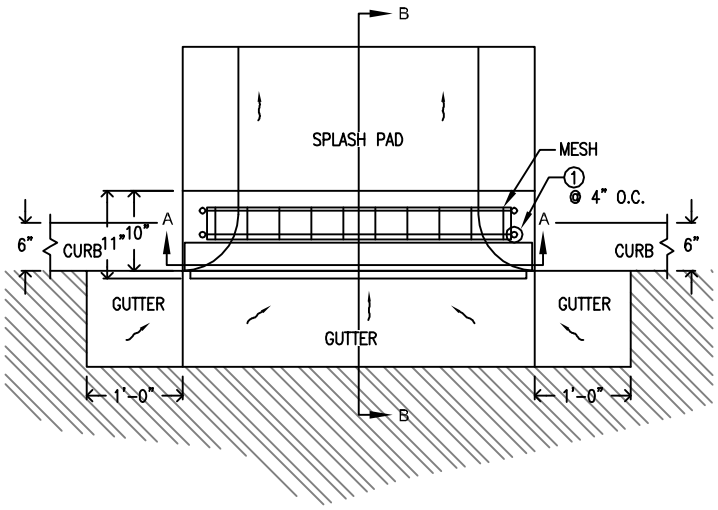
- Green Streets -

Concrete Inlet

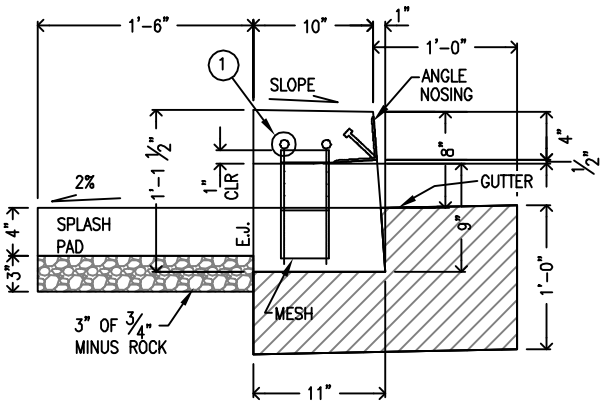
Type Channel & Grate

NUMBER

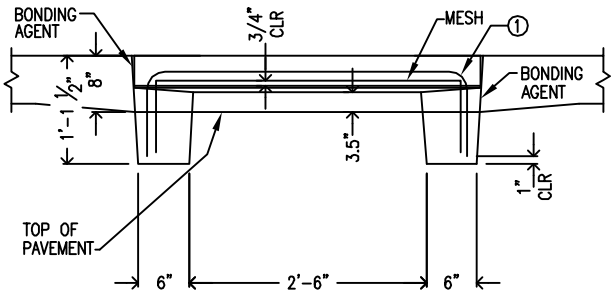
SW-333



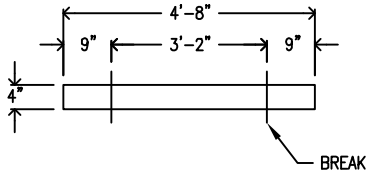
PLAN



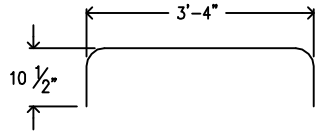
SECTION B-B



SECTION A-A



DETAIL MESH



DETAIL 1

E.J. = EXPANSION JOINT
CLR. = CLEAR
O.C. = ON CENTER

STRUCTURAL NOTES:

1. Concrete: 28 Day Strength f'c = 5,500 PSI.
2. Rebar: ASTM A-615 Grade 60.
3. Mesh: ASTM A-185 Grade 65.
4. Design: ACI-318 Building Code, ASTM C-857 "Min structural design loading for underground precast concrete utility structures".
5. Loads: H-20 truck wheel w/ 30% impact.

BILL OF MATERIAL

PART	DESCRIPTION	QTY.	SIZE	TOTAL WT. LBS.
	ANGLE NOSING	1	3.5"x3.5"x3'-7" GALV.	
MESH	W2.9/W2.9 4x4	1	SEE DETAIL MESH	2 SF
1	#6 GR 60	2	SEE DETAIL 1	15

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

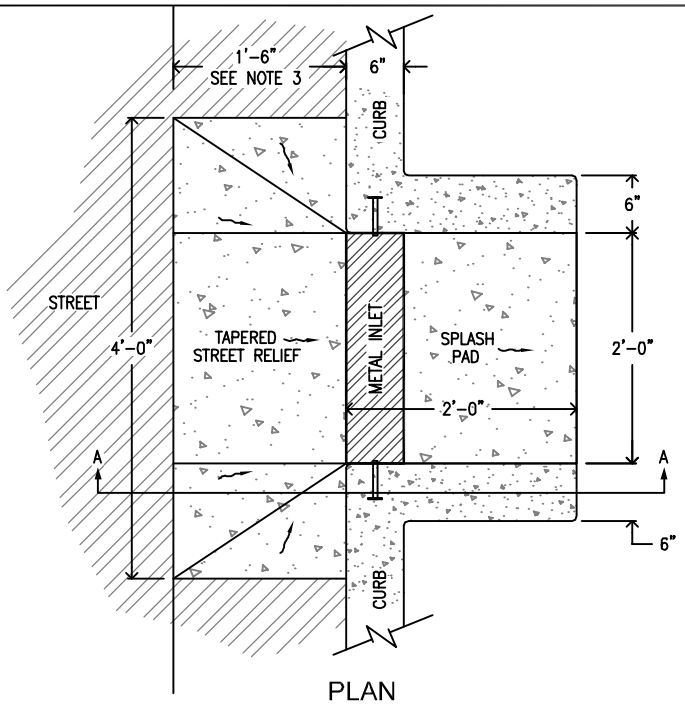
- Green Streets -

Concrete Inlet, Type PB

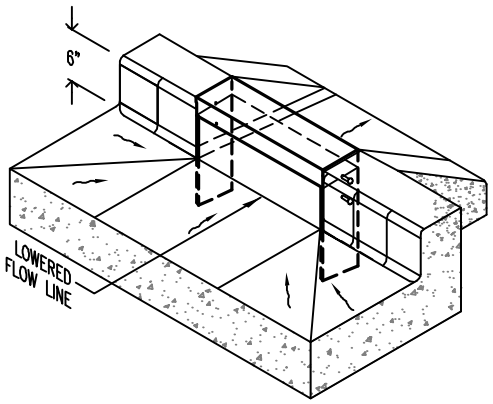
For Neighborhood Collectors and Above

NUMBER

SW-332



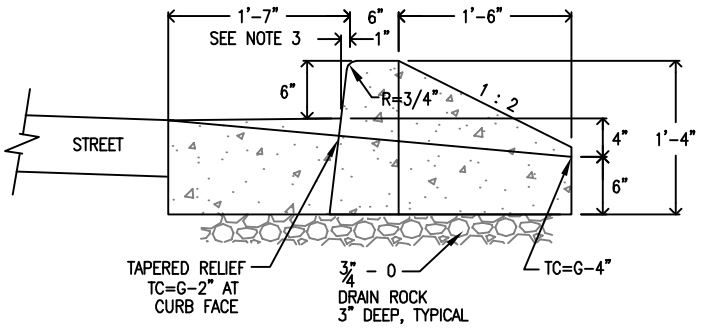
PLAN



ISOMETRIC

NOTES:

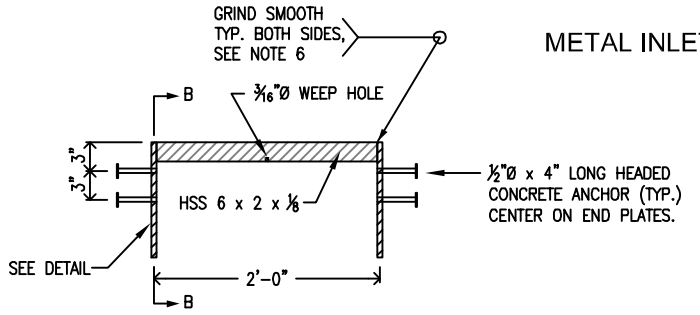
1. Headed concrete anchors shall meet the requirements of ASTM A-108.
2. HSS 6 x 2 x 1/8 shall meet the requirements of ASTM A-500 Grade B.
3. End Plates shall meet the requirements of ASTM A-36.
4. Entire assembly shall be Hot-Dip Galvanized in accordance with ASTM A-123.
5. Design vertical wheel load is 8.5kips (1/2 of tandem axle weight specified in FHWA-HOP-06-105).
6. Single Bevel Groove Weld.



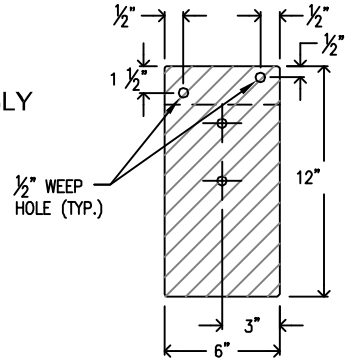
TC = TOP OF CONCRETE
G = GUTTER

SECTION A-A

METAL INLET ASSEMBLY



ELEVATION



SECTION B-B
END PLATE DETAIL

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

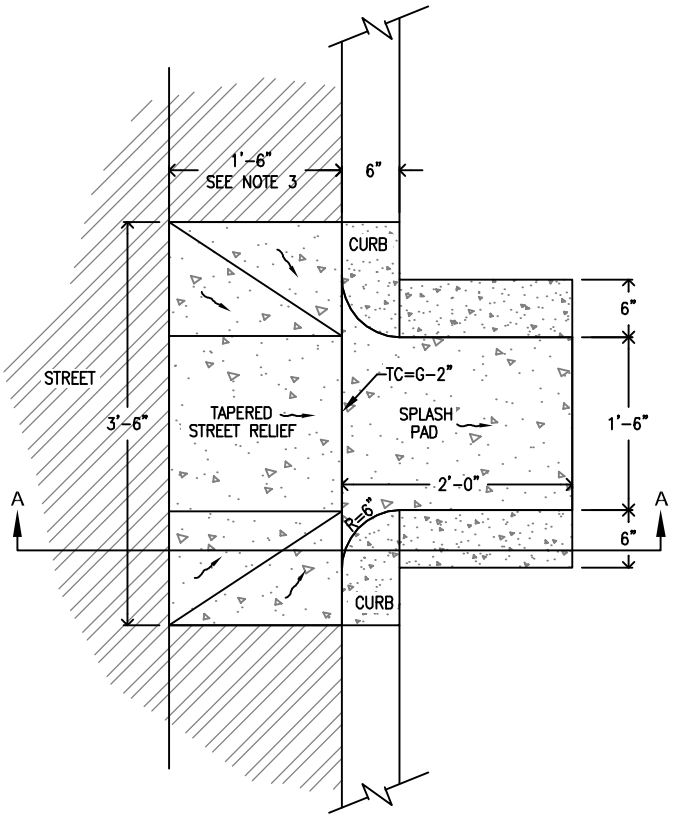
- Green Streets -

Concrete Inlet, Type PB (Metal)

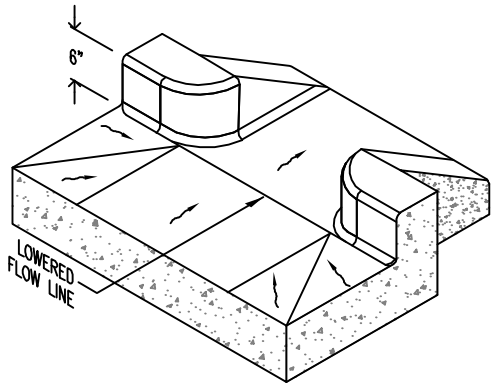
For Neighborhood Collectors and Above

NUMBER

SW-331



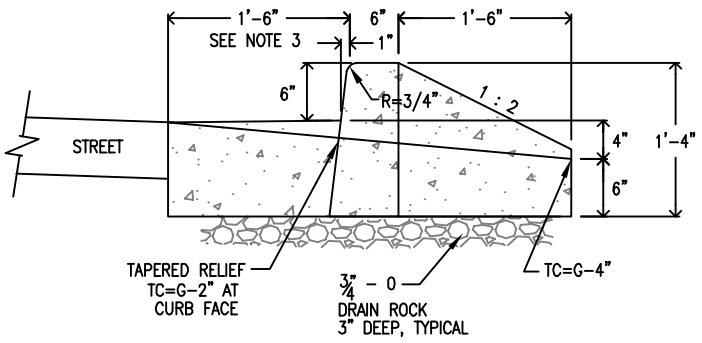
PLAN



ISOMETRIC

NOTES:

1. Concrete splash pad necessary where water enters and/or exits facility.
2. For stormwater facilities, install washed pea gravel or river rock to transition from splash pad to topsoil.
3. Reference ODOT Standard Drawing RD 700 . Use 1'-6" wide gutter, typical.



TC = TOP OF CONCRETE
G = GUTTER

SECTION A-A

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

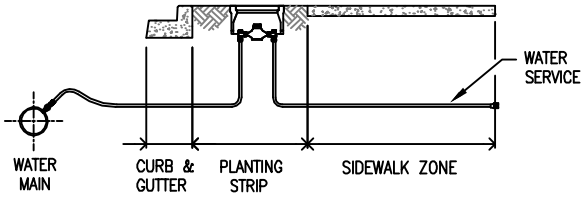
- Green Streets -

Concrete Inlet, Type SW

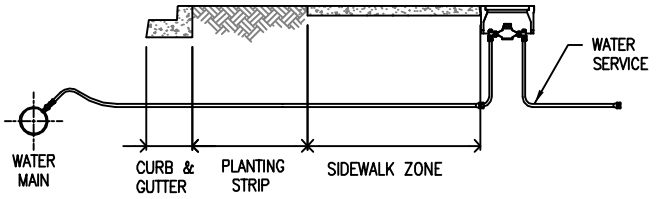
For Local Service Streets

NUMBER

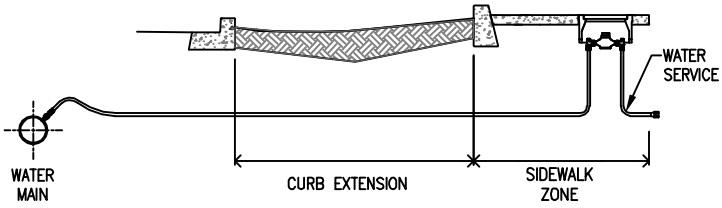
SW-330



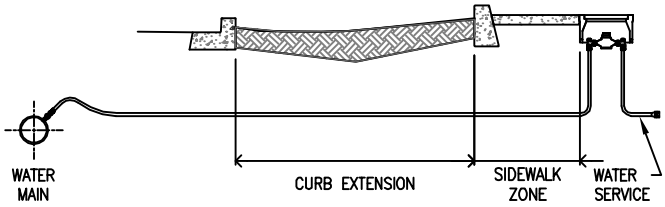
SECTION A-A



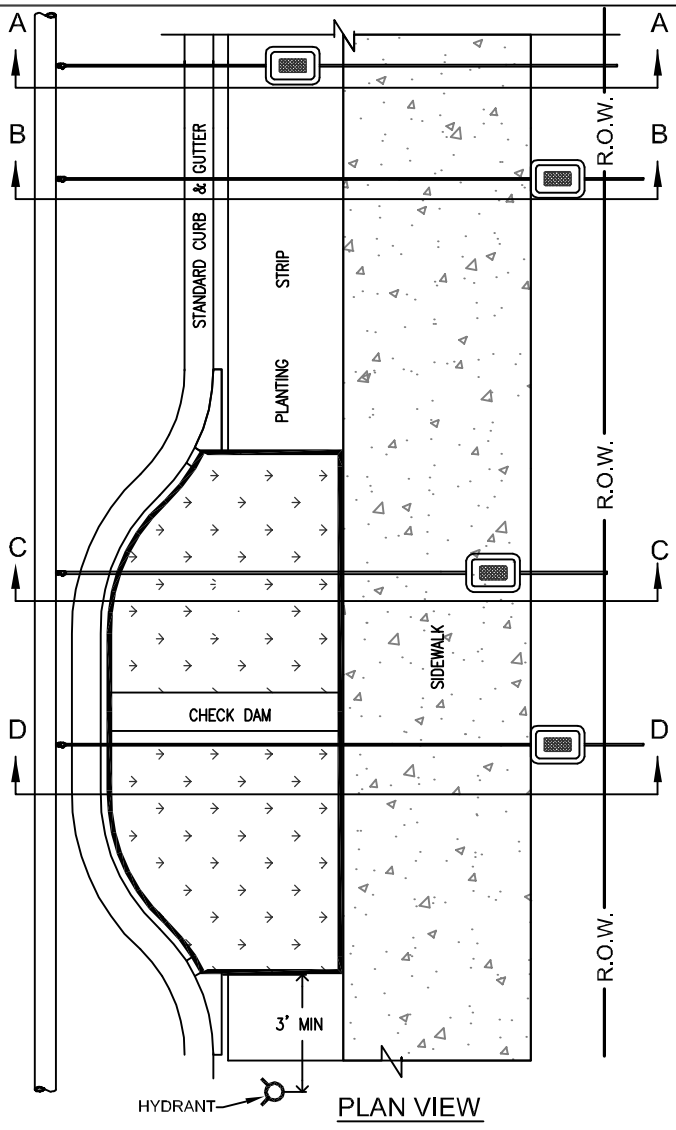
SECTION B-B



SECTION C-C



SECTION D-D



PLAN VIEW

NOTES:

1. Refer to fire hydrant installation plan. Fire hydrants must have min 3' clearance from the edge of a stormwater facility.

2. Standard meter location is A or D. Option B or D can be used only if the meter box is fully within the Right-of-Way. Option C can only be used where the meter box cannot be placed behind the sidewalk within the Right-of-Way.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

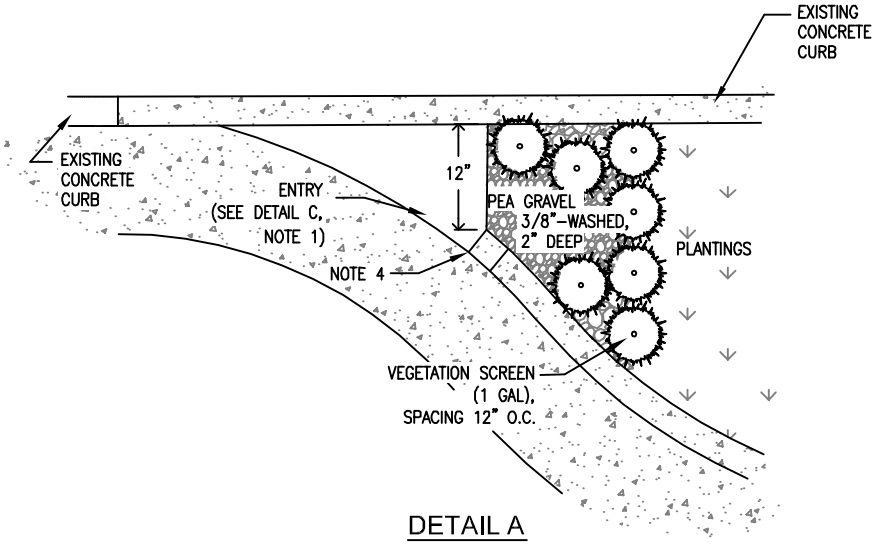
DATE: 11-30-10

- Green Streets -

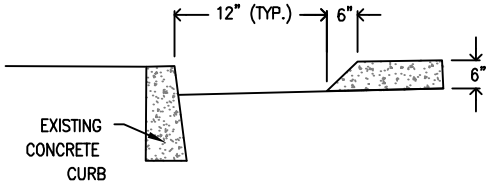
Curb Extension
Meter & Hydrant Locations

NUMBER

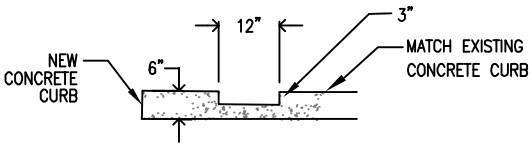
SW-324



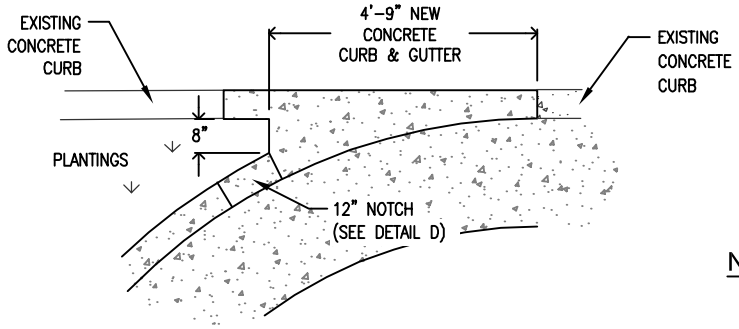
DETAIL A
FOREBAY



DETAIL C
MODIFIED INLET



DETAIL D
MODIFIED OUTLET



DETAIL B
OUTLET CURB PLAN

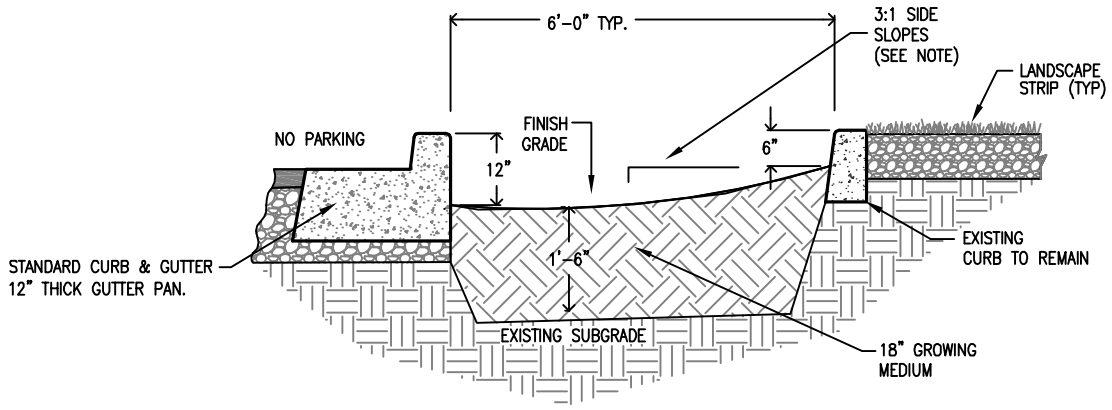
NOTES:

1. Detail A: Pea gravel forebay for use with stormwater curb extensions only. Pea gravel forebay replaces standard concrete splash pad.
2. Detail C: To prevent ponding, position inlet closer to existing curb if the street cross-slope is >2%. Additional inlets can be added if necessary (preferably immediately downstream of each check dam to minimize potential backflow). Additional inlets are not recommended for streets sloped <1%.
3. Details B, C & D: For use on local service streets only.
4. Inlet may be modified to maximize flow entry to stormwater facility.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

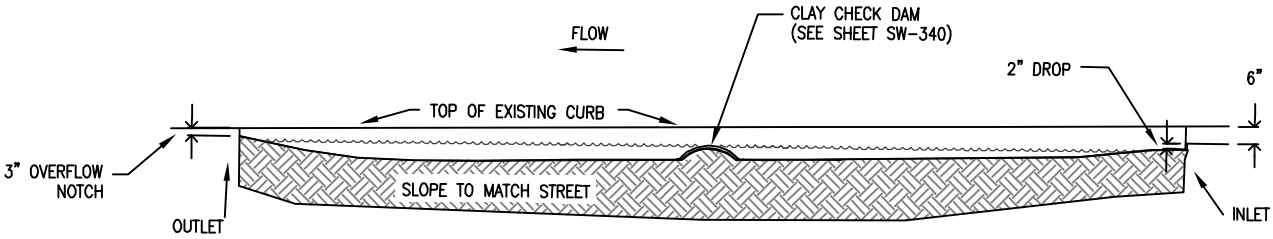
	CITY OF FLORENCE PUBLIC WORKS DEPARTMENT 989 Spruce Street Florence, OR 97439 Phone: 541-997-4106 DATE: 11-30-10	- Green Streets - Curb Extension Inlet / Outlet Details	NUMBER SW-323



SECTION A-A
CURB EXTENSION SECTION

NOTE:

1. If stormwater curb extension is constructed next to an existing sidewalk, soil elevation must be brought to top of curb and slope away from curb at a 4:1 slope.



SECTION B-B
CURB EXTENSION PROFILE

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

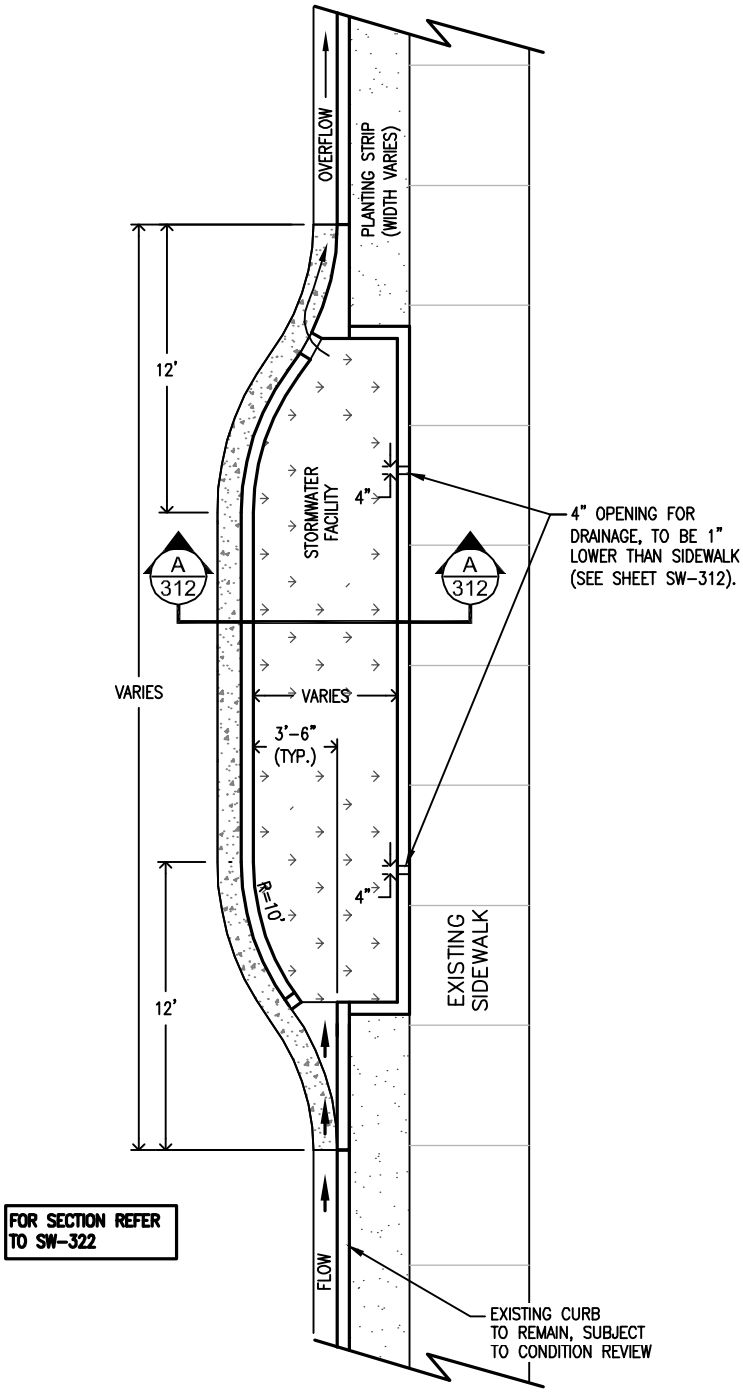
DATE: 11-30-10

- Green Streets -

Curb Extension Sections

NUMBER

SW-322



CURB EXTENSION PLAN

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

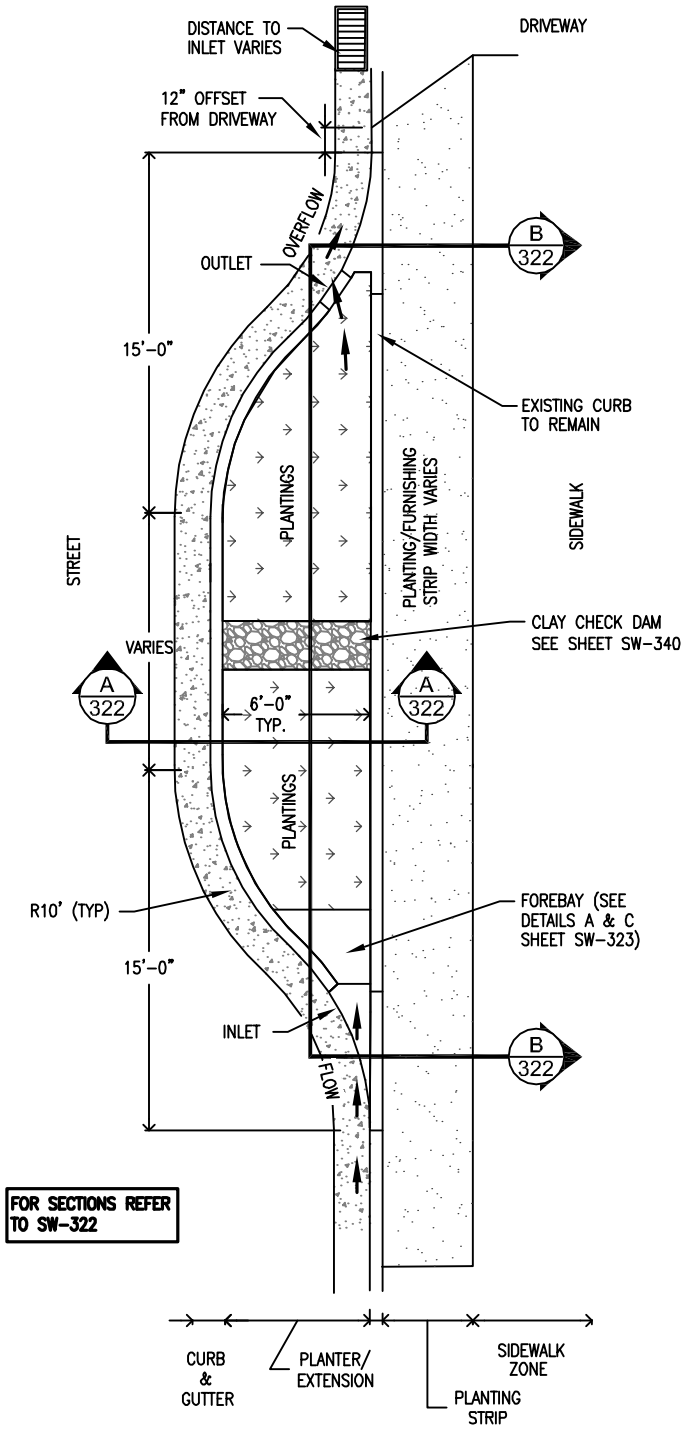
DATE: 11-30-10

- Green Streets -

Curb Extension
In-Planter Plan

NUMBER

SW-321



CURB EXTENSION PLAN

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

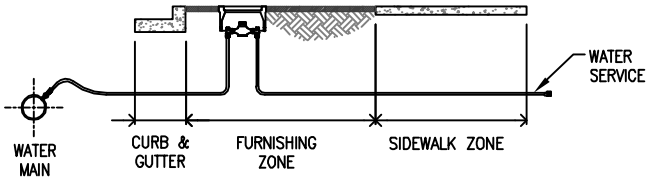
- Green Streets -

Curb Extension

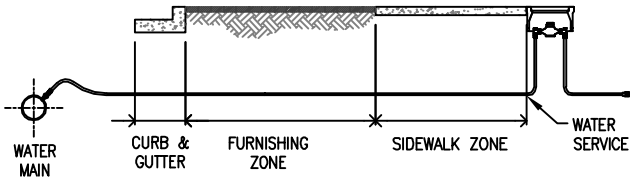
In-Street Plan

NUMBER

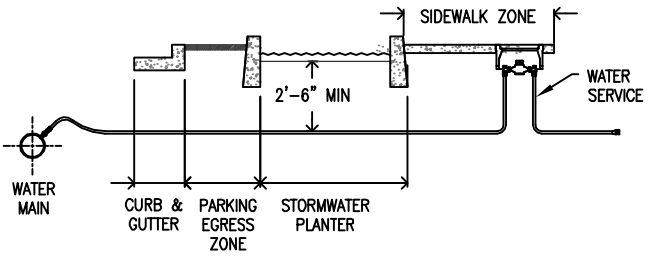
SW-320



SECTION A-A



SECTION B-B



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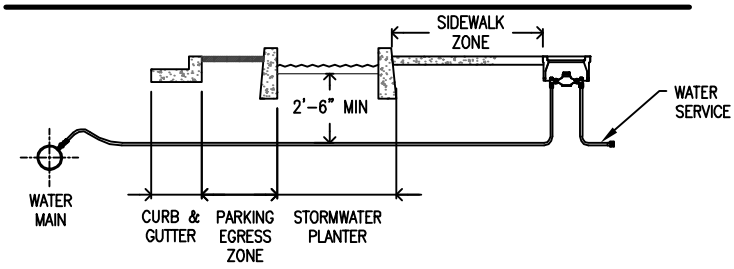

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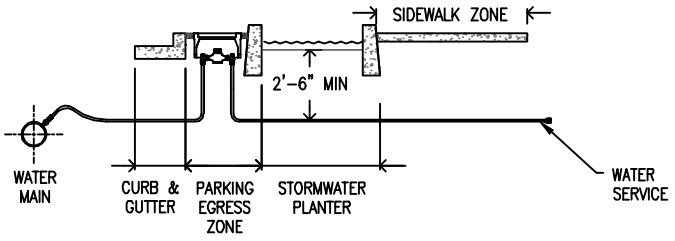
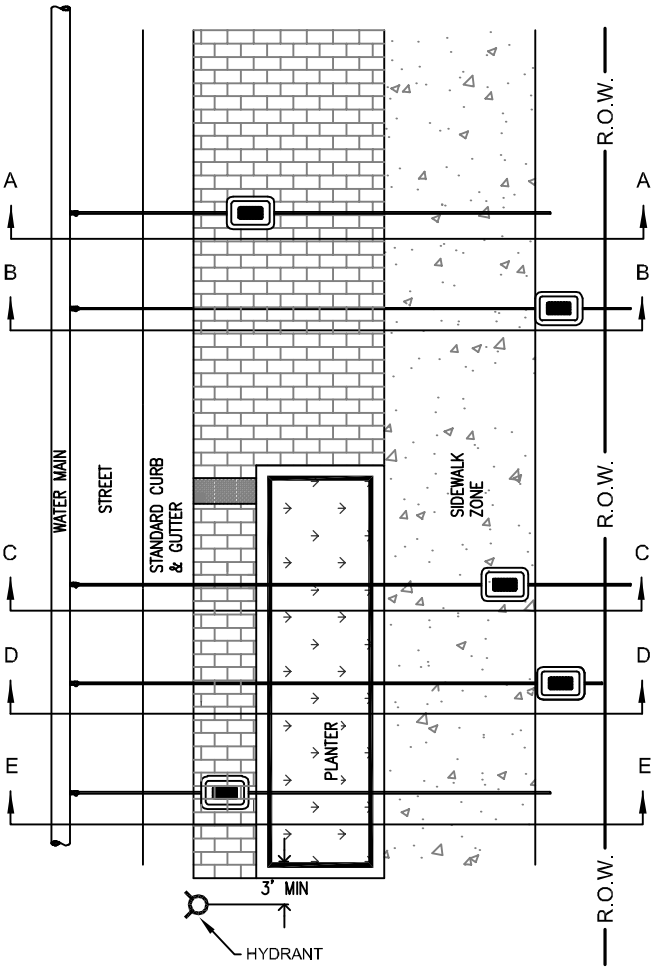


SECTION E-E



NOTES:

1. Refer to fire hydrant installation plan. Hydrants must have min 3' clearance from the edge of a stormwater facility.

2. Standard meter location is A or D. Option B or D can be used only if the meter box is fully within the Right-of-Way. Option C can only be used if furnishing zone is available and the meter box cannot be placed behind the sidewalk within the Right-of-Way.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

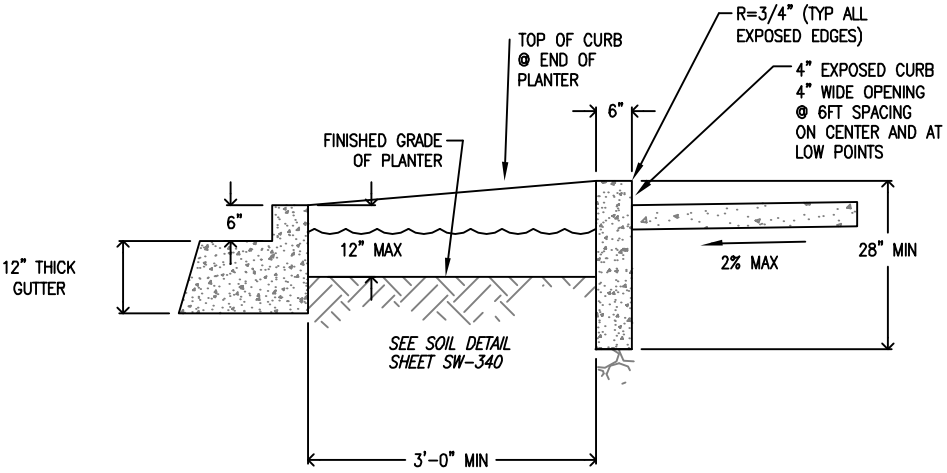
DATE: 11-30-10

- Green Streets -

Planter
Meter & Hydrant Locations

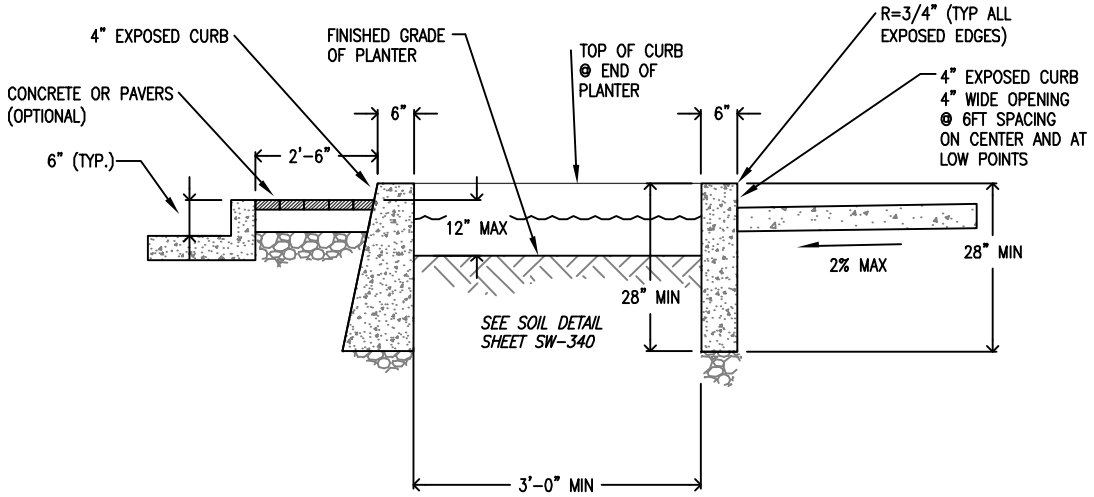
NUMBER

SW-313



SECTION A-A
PLANTER WITHOUT PARKING

FOR PLAN REFER TO SW-310 AND SW-321.



SECTION B-B
PLANTER WITH PARKING

FOR PLAN REFER TO SW-311

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

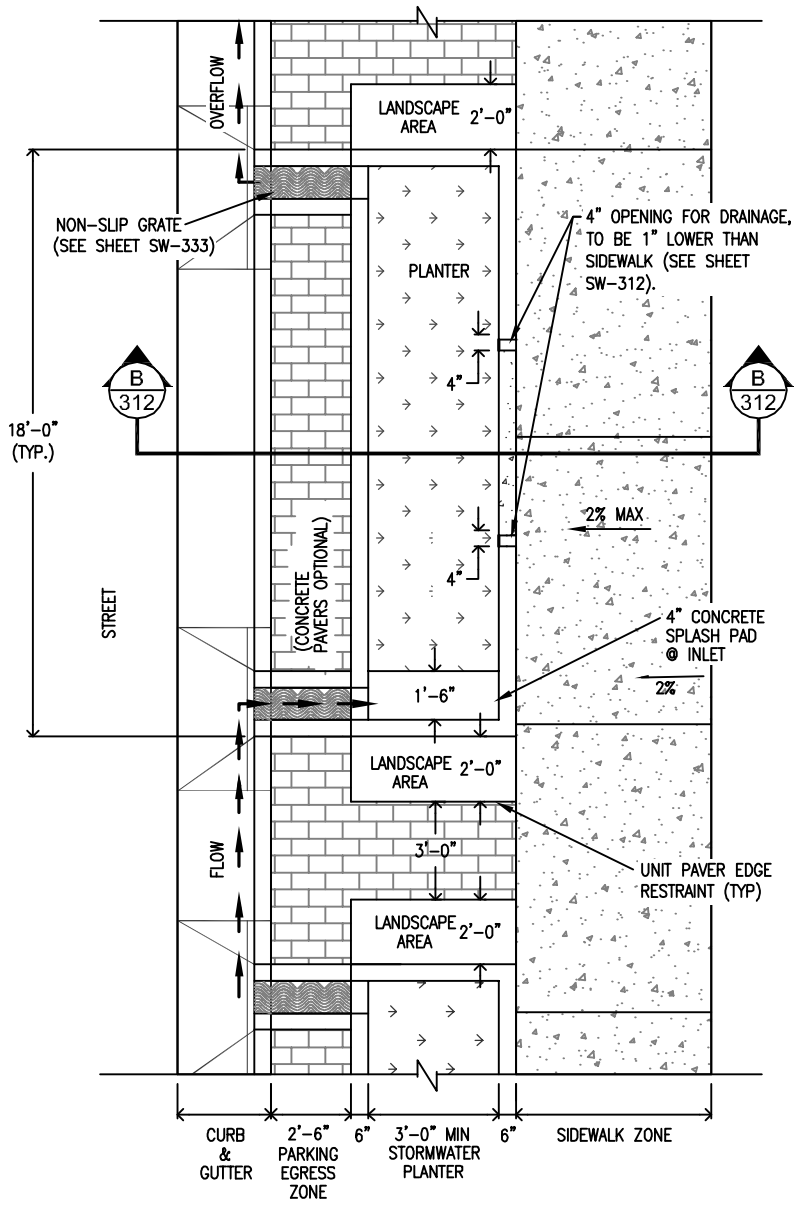
DATE: 11-30-10

- Green Streets -

Planter Sections

NUMBER

SW-312



FOR SECTIONS REFER TO SW-312

PLANTER PLAN

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

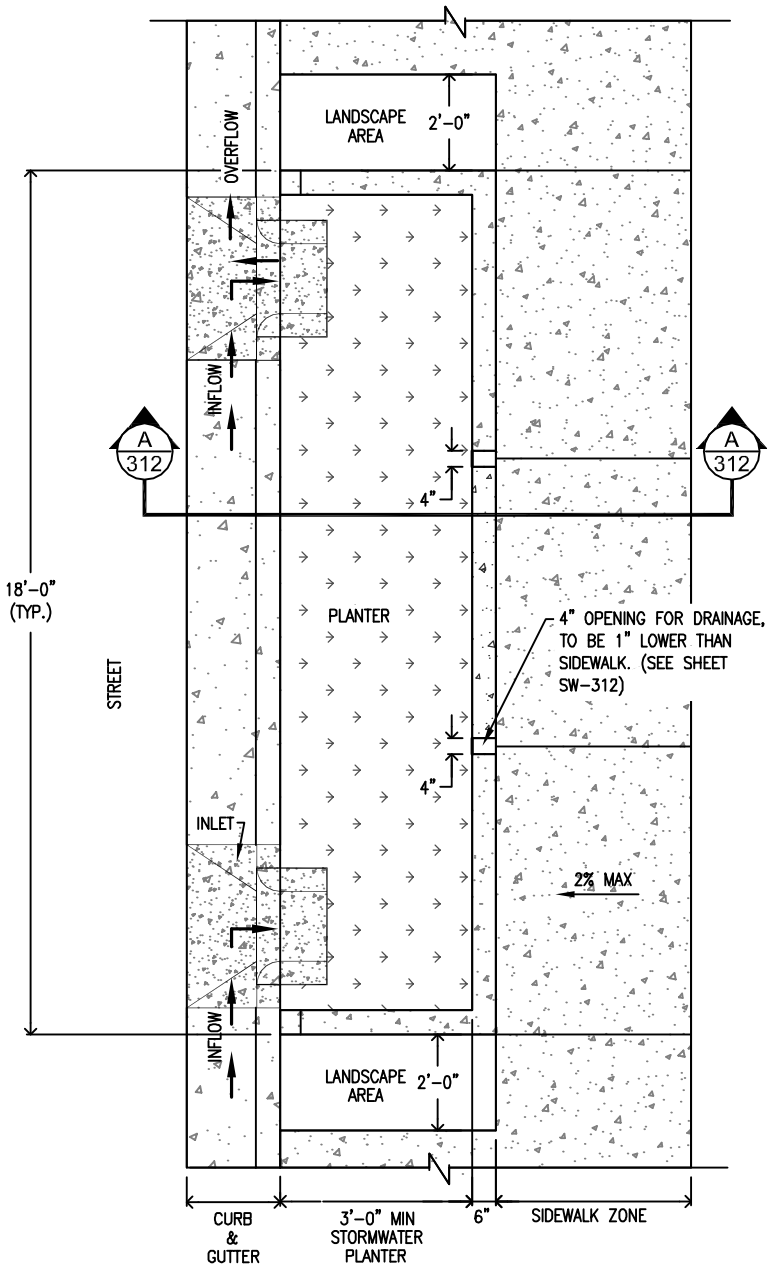
DATE: 11-30-10

- Green Streets -

Planter Plan
With Parking

NUMBER

SW-311



FOR SECTIONS REFER TO SW-312

PLANTER PLAN

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

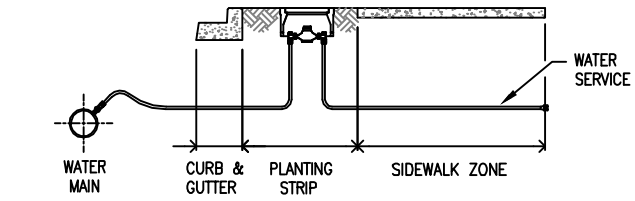
DATE: 11-30-10

- Green Streets -

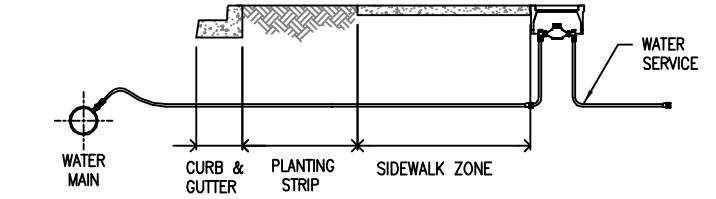
Planter Plan
Without Parking

NUMBER

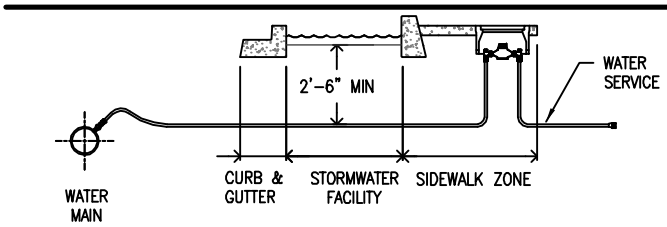
SW-310



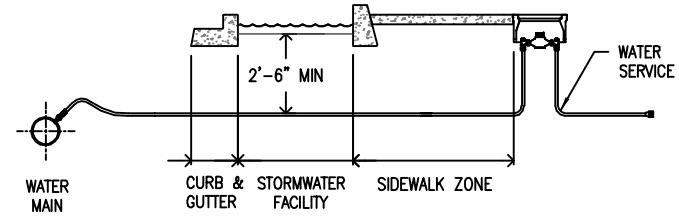
SECTION A-A



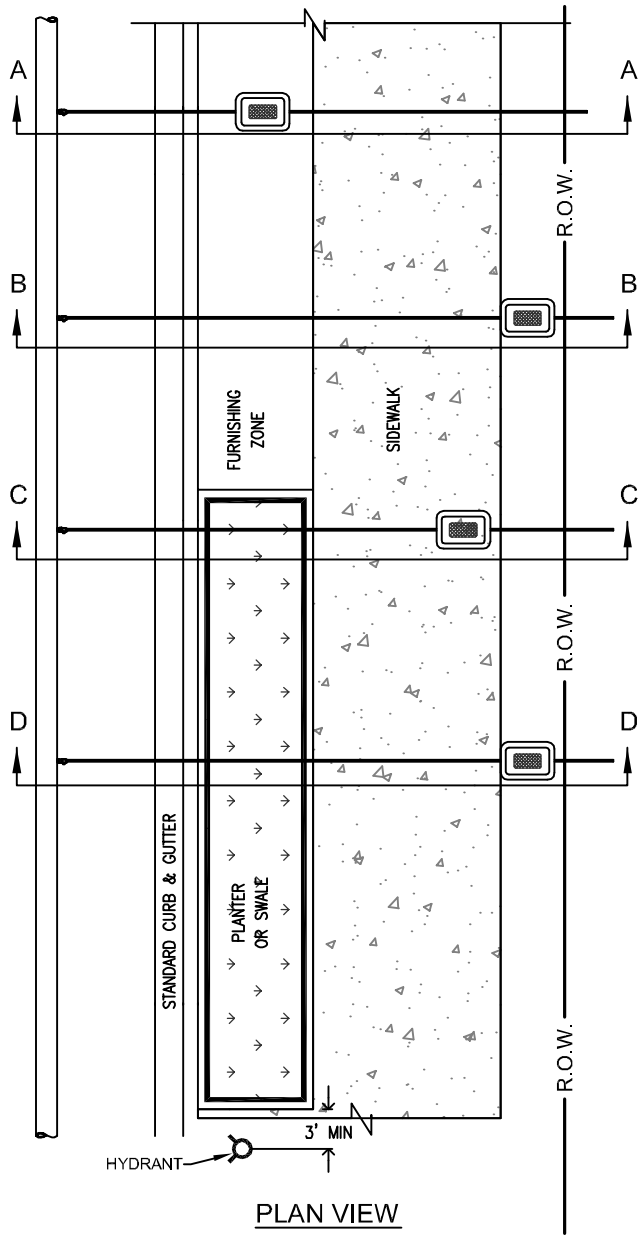
SECTION B-B



SECTION C-C



SECTION D-D



PLAN VIEW

NOTES:

1. Refer to fire hydrant installation plan. Hydrants must have min 3' clearance from the edge of stormwater facility.

2. Standard meter location is A or D. Option B or D can be used only if the meter box is fully within the Right-of-Way. Option C can only be used where the meter box cannot be placed behind the sidewalk, within the Right-of-Way.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

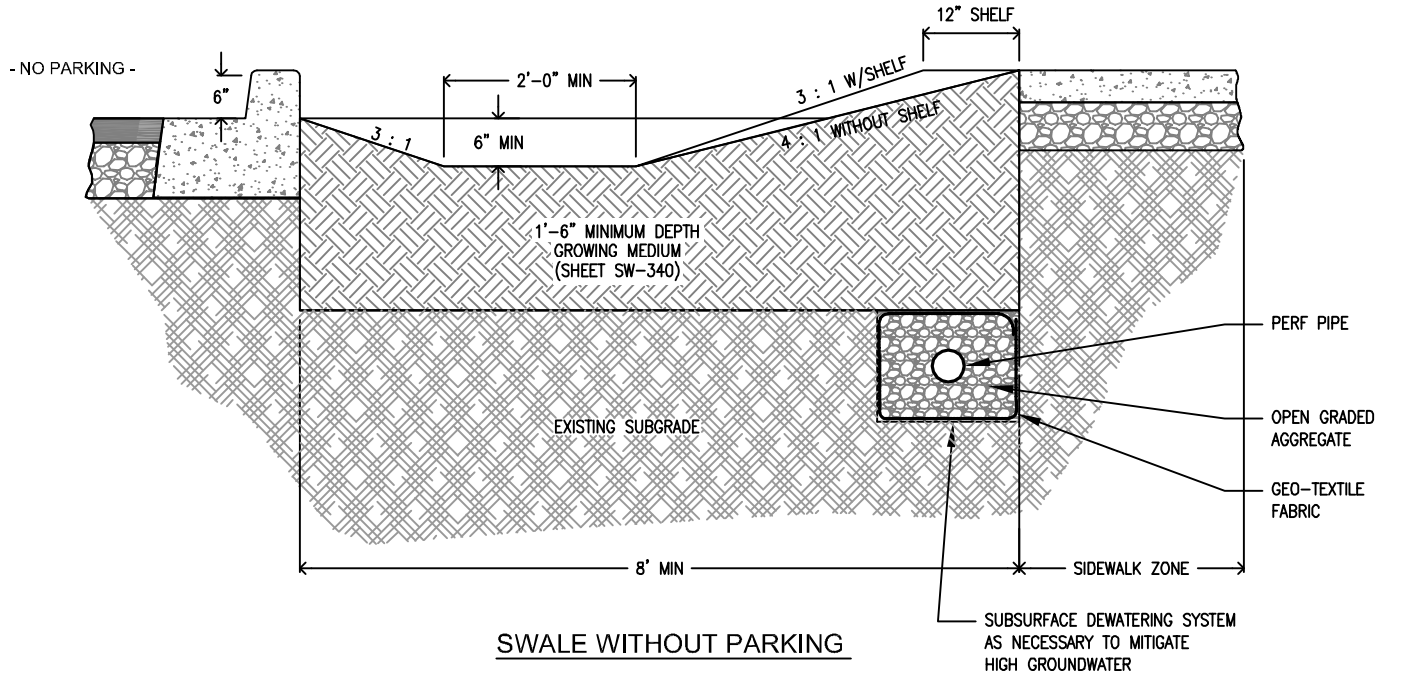
- Green Streets -

Swale

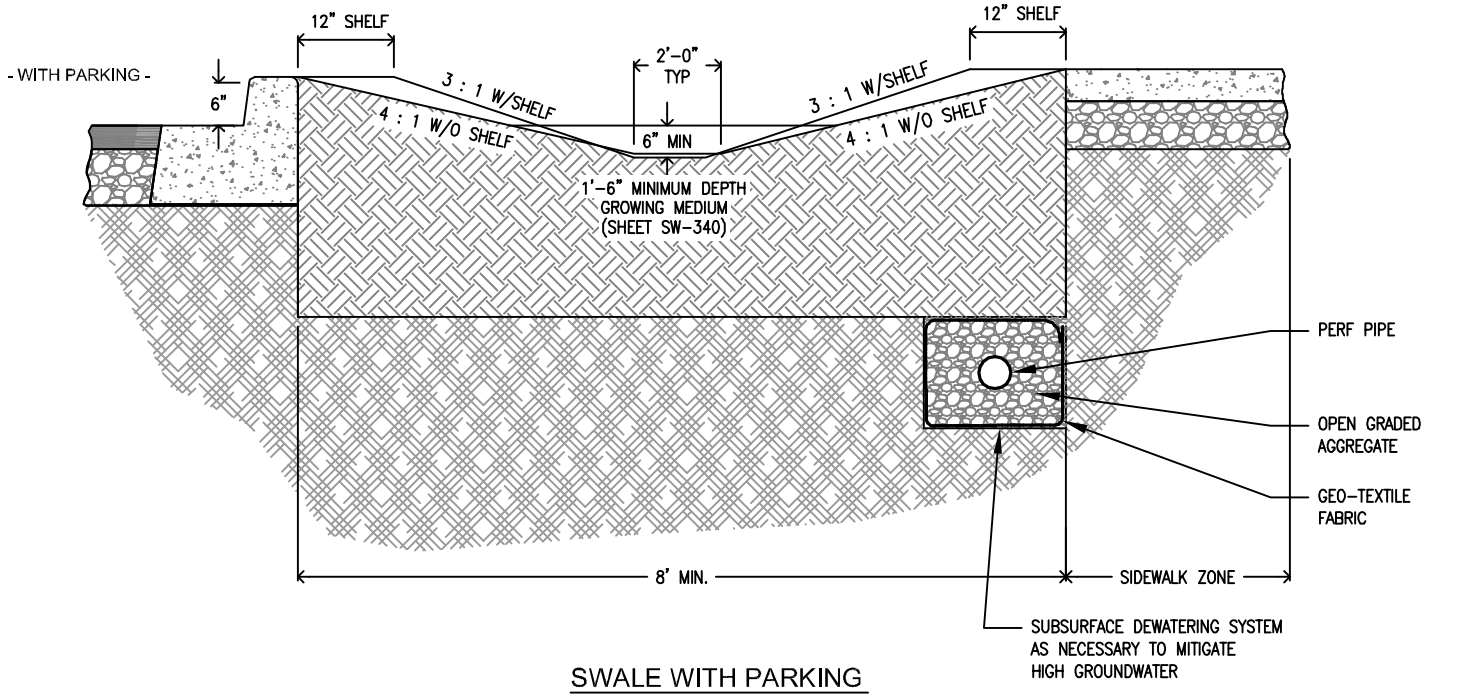
Meter & Hydrant Locations

NUMBER

SW-302



SWALE WITHOUT PARKING



SWALE WITH PARKING

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Green Streets -

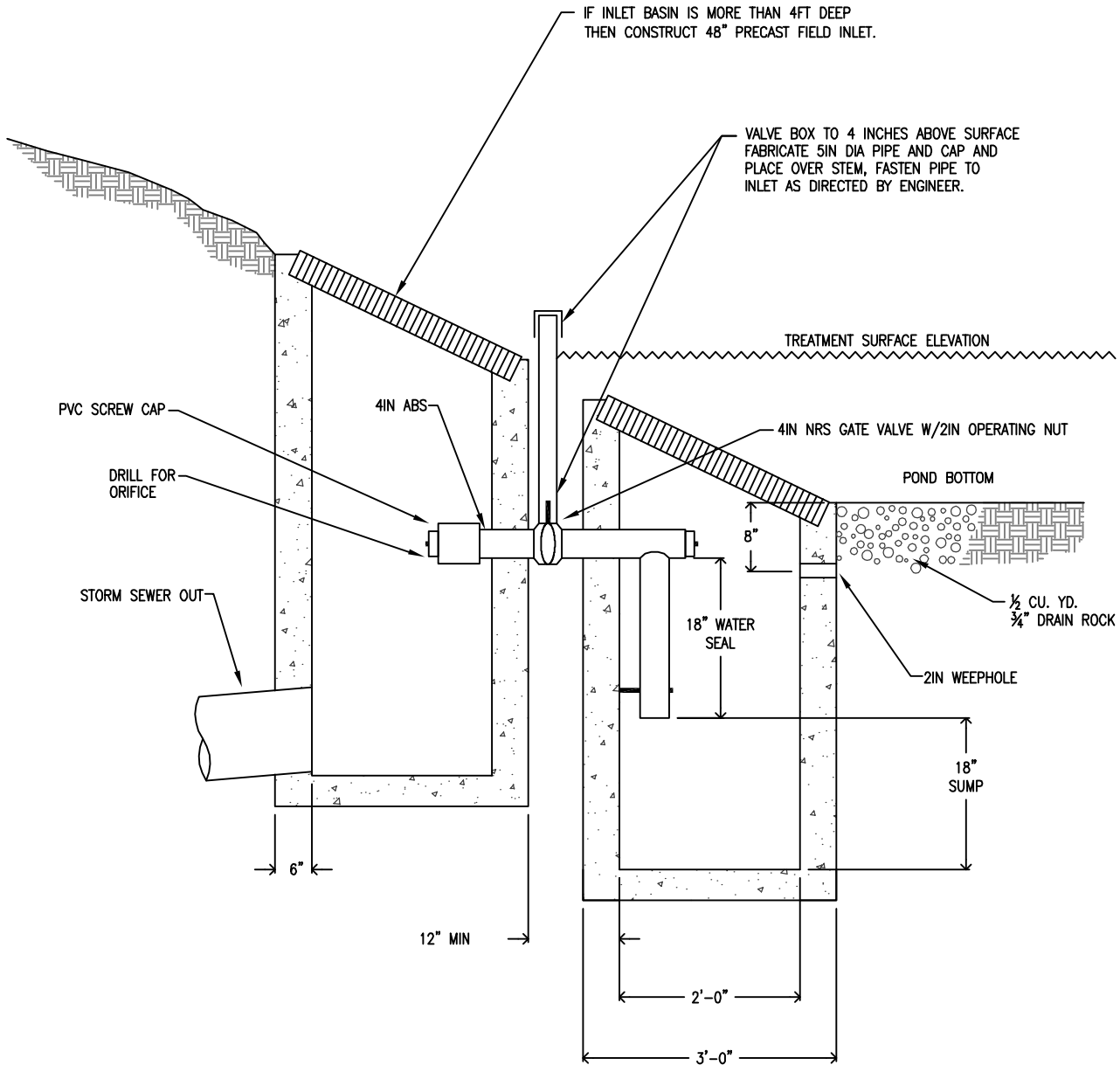
Swale Sections
With and without Parking

NUMBER

SW-301

Appendix I.3 Table of Contents

- DRAWING NOT TO SCALE -



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Performance Approach -

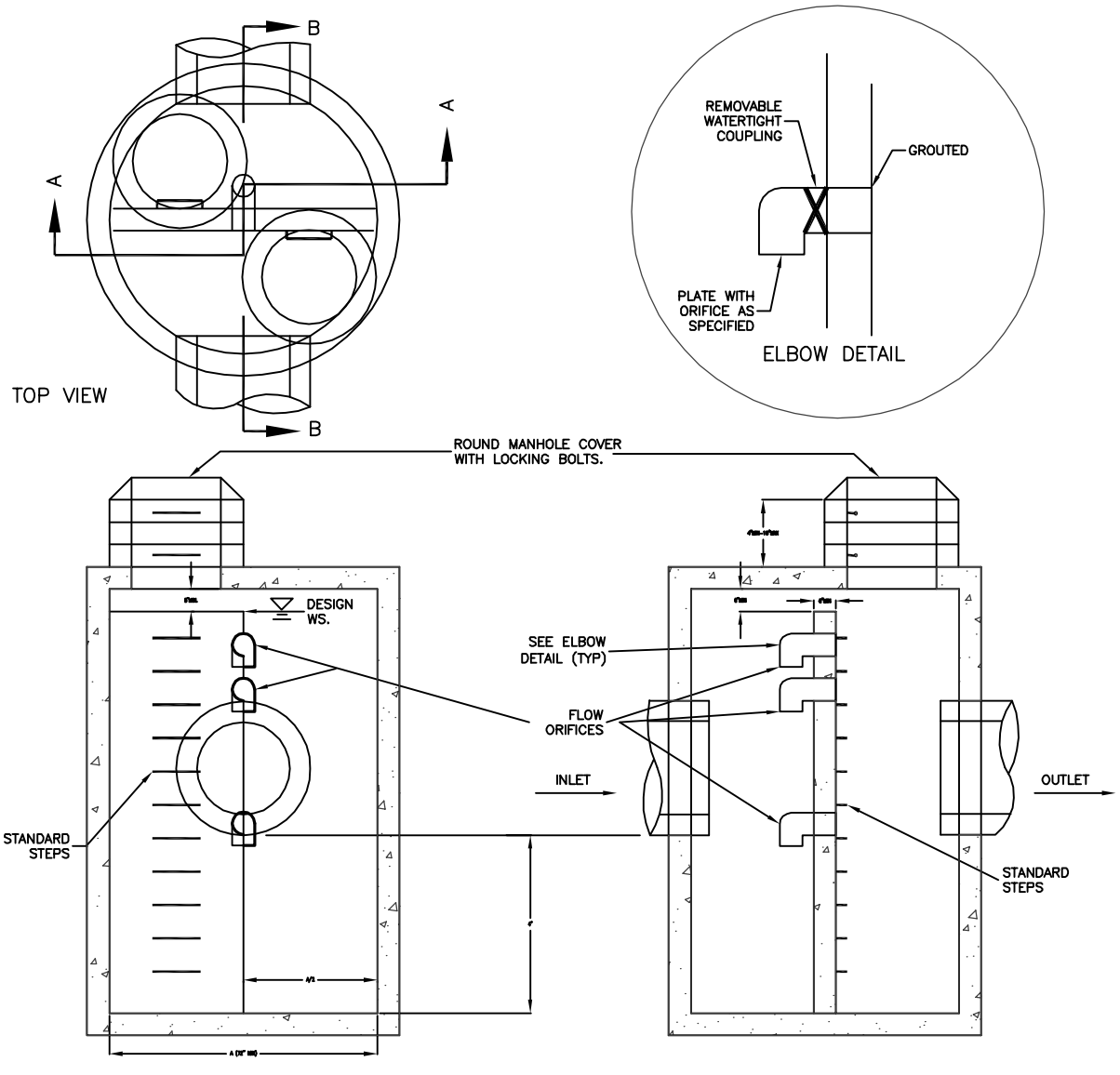
Orifice Structure

NUMBER

SW-265

NOTES

1. EXCEPT AS SHOWN OR NOTED, UNIT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS FOR LARGE PRE CAST CONCRETE MANHOLES.
2. SEE PROJECT PLANS FOR SIZE AND LOCATION OF ORIFICES.
3. PIPE SIZES, SLOPES AND ALL ELEVATIONS AS SHOWN IN THE PLANS.
4. BAFFLE WALL SHALL HAVE #4 BAR AT 12" SPACING EACH WAY.
5. PRE CAST BAFFLE WALL SHALL BE KEYED AND GROUTED IN PLACE.
6. ORIFICE PLATES TO BE 1/4" THICK MIN. HDPE OR APPROVED EQUAL AND ATTACHED WITH 1/2" STAINLESS STEEL BOLTS.



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

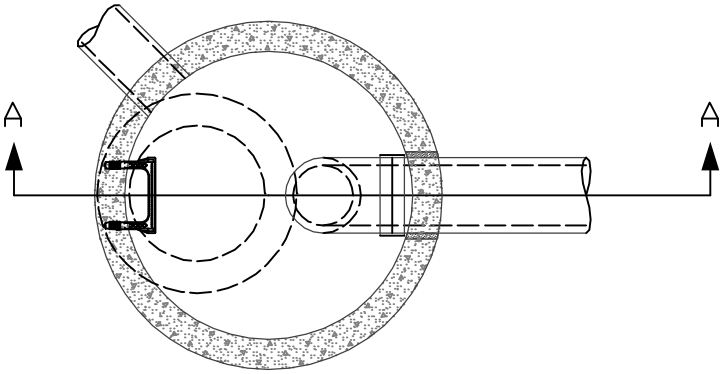
DATE: 11-30-10

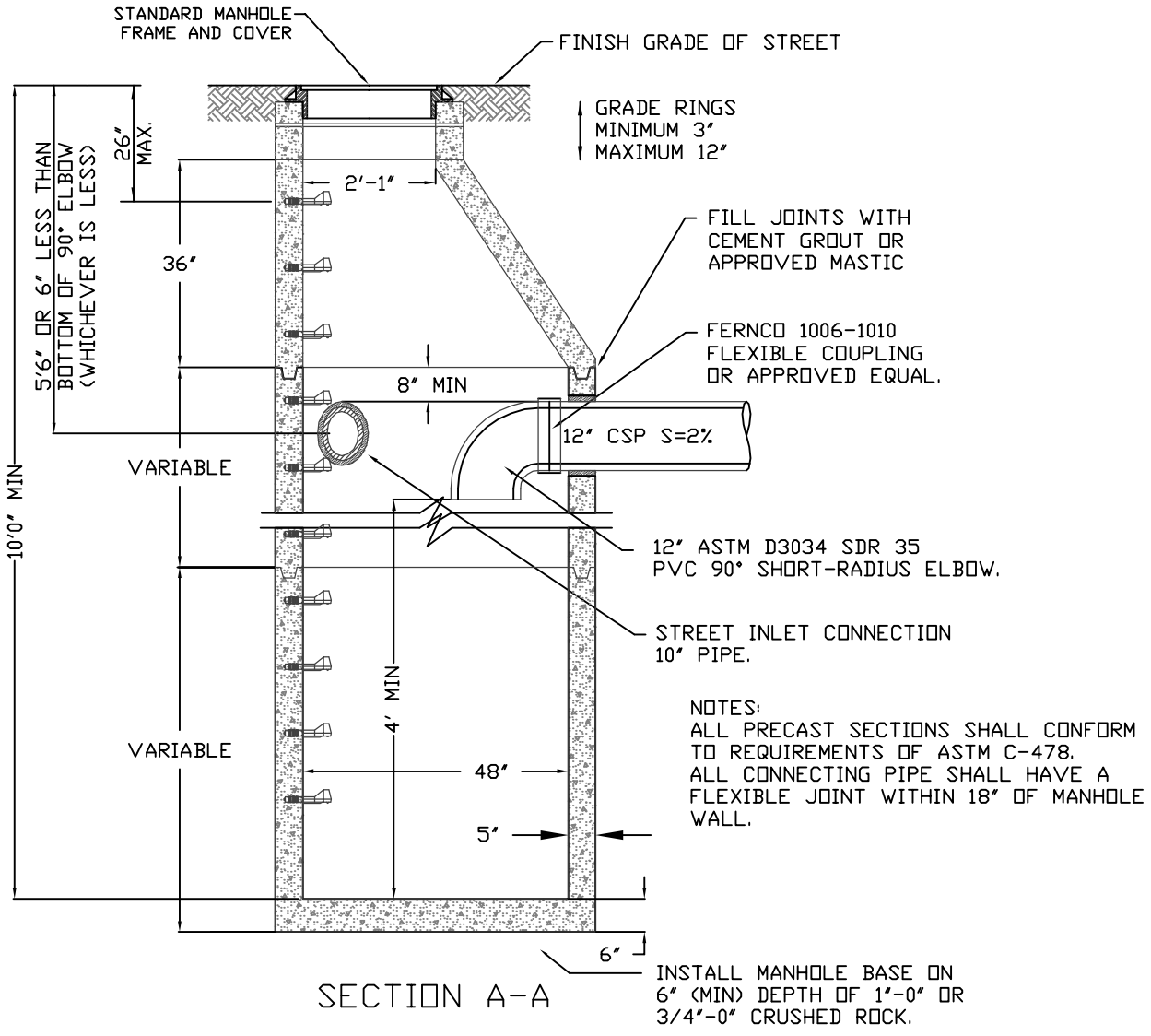
- Performance Approach -

Orifice Location Baffle Riser

NUMBER

SW-264





NOTES:
ALL PRECAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF ASTM C-478.
ALL CONNECTING PIPE SHALL HAVE A FLEXIBLE JOINT WITHIN 18" OF MANHOLE WALL.

SECTION A-A

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

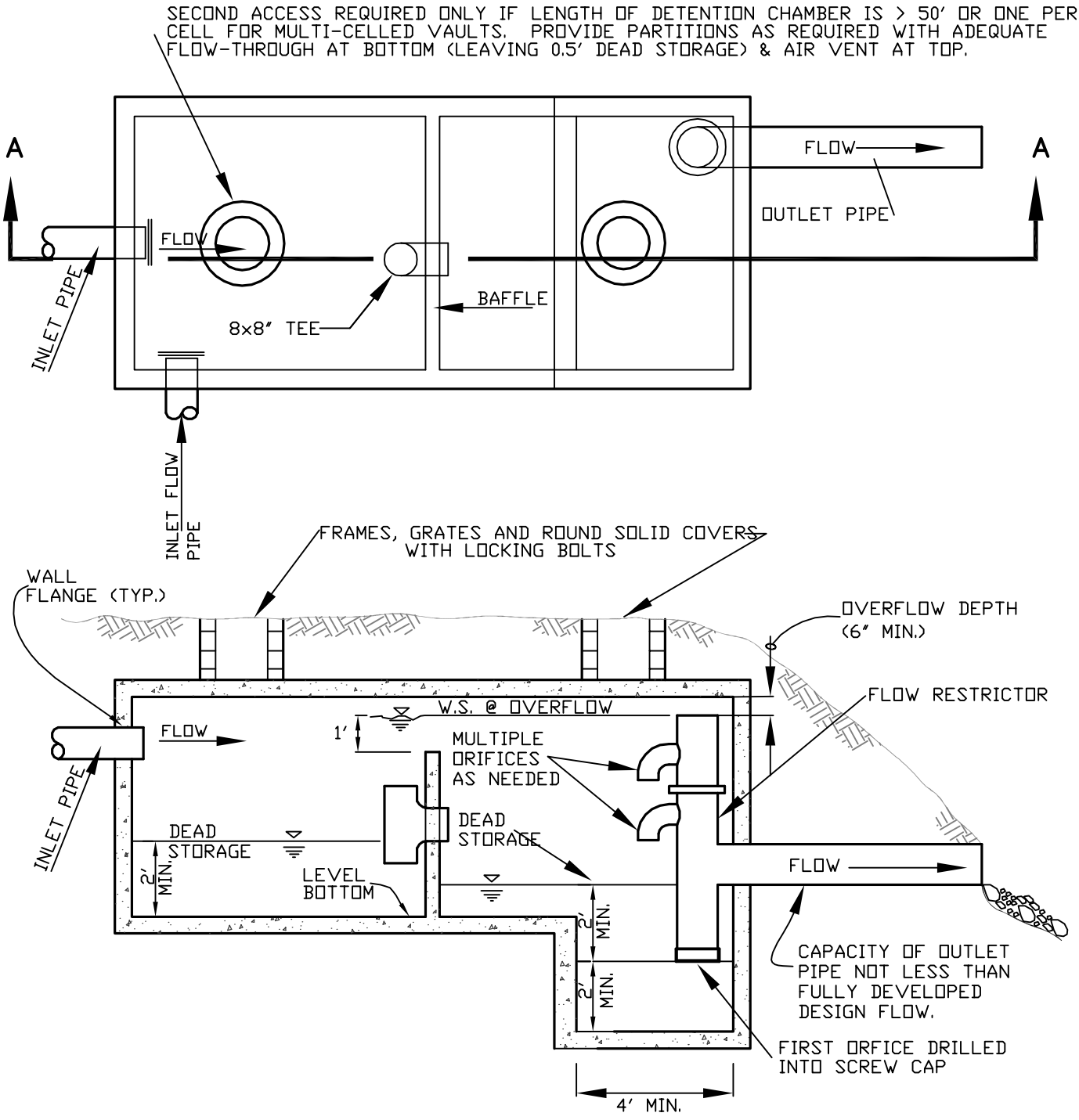
DATE: 11-30-10

- Performance Approach -

Orifice Location Tee Riser

NUMBER

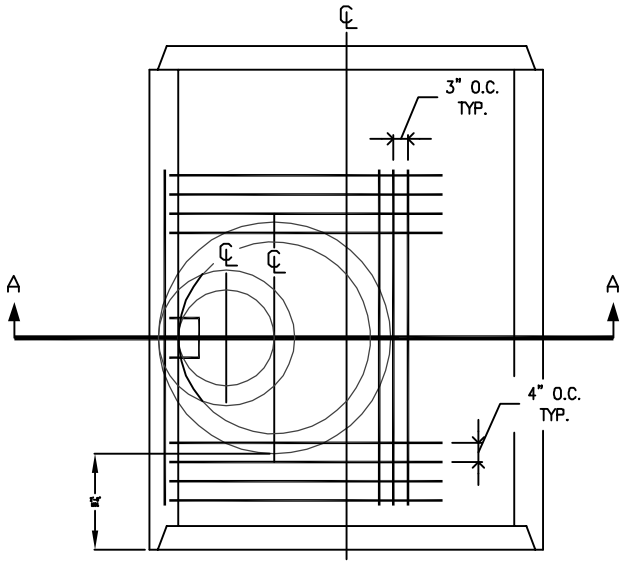
SW-263

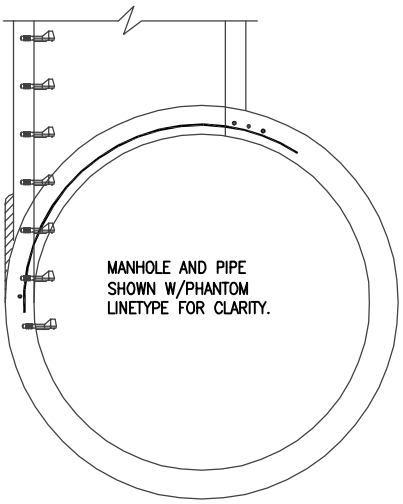


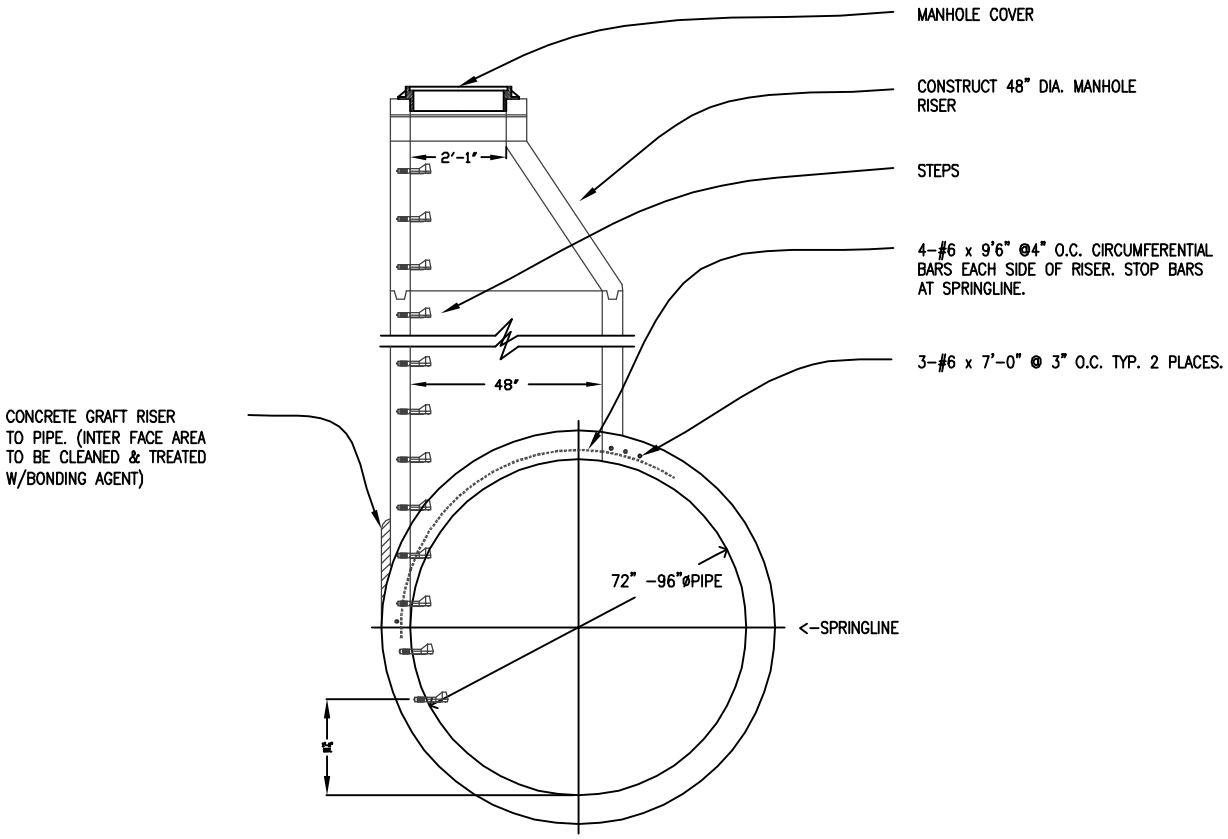
- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

	CITY OF FLORENCE PUBLIC WORKS DEPARTMENT 989 Spruce Street Florence, OR 97439 Phone: 541-997-4106 DATE: 11-30-10	- Performance Approach - Detention Vault	NUMBER SW-262







- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

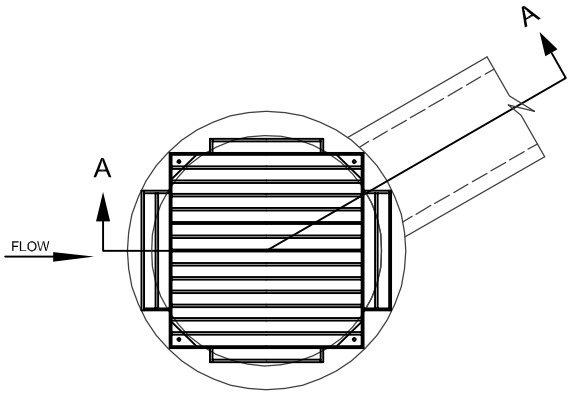
DATE: 11-30-10

- Performance Approach -

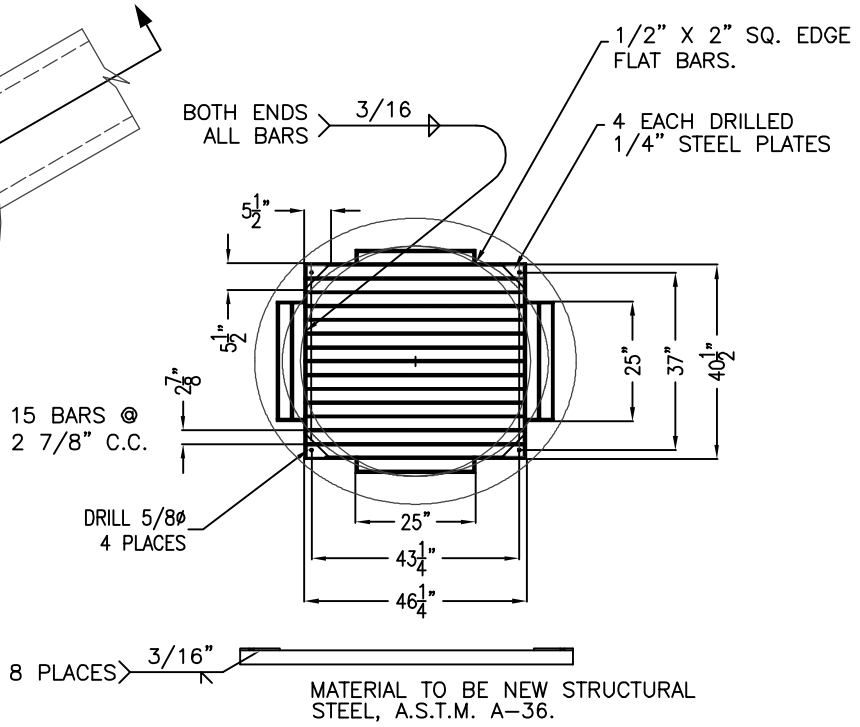
Access Riser

NUMBER

SW-261

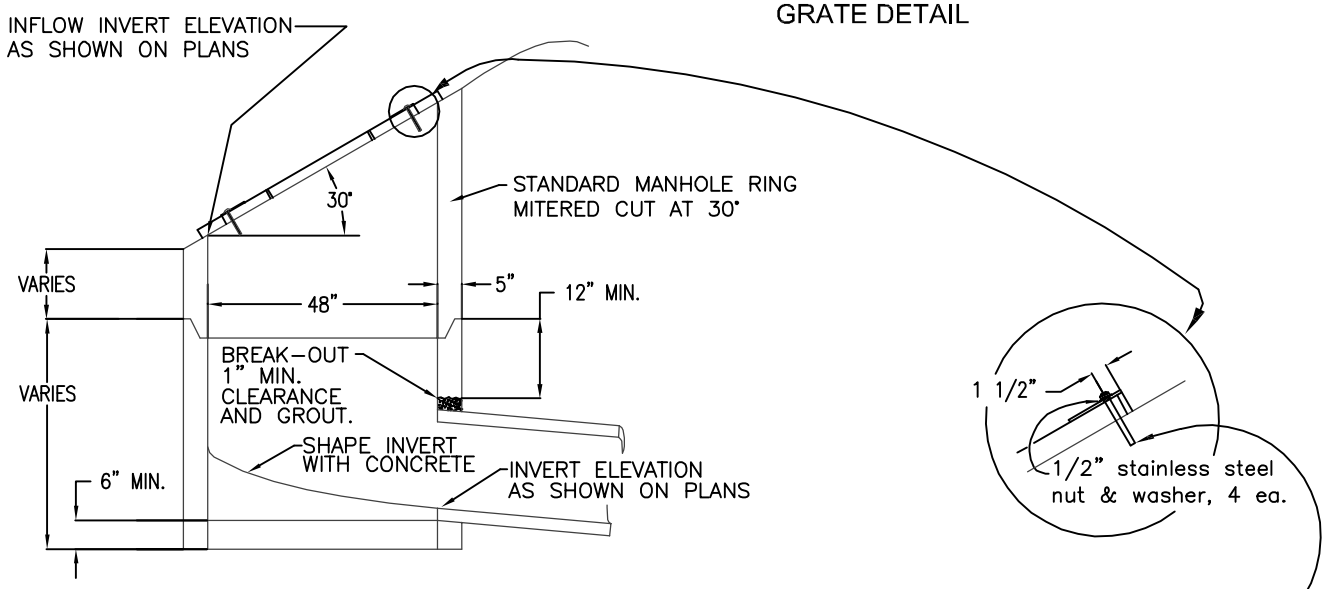


PLAN VIEW



MATERIAL TO BE NEW STRUCTURAL STEEL, A.S.T.M. A–36.

GRATE DETAIL



SECTION A-A

1/2" x 5 1/2" Phillips Redhead stainless steel wedge anchors, 4 ea. (catalog no. W.W.1254 or equal)

NOTES:
ALL PRECAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF A.S.T.M. C–478.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

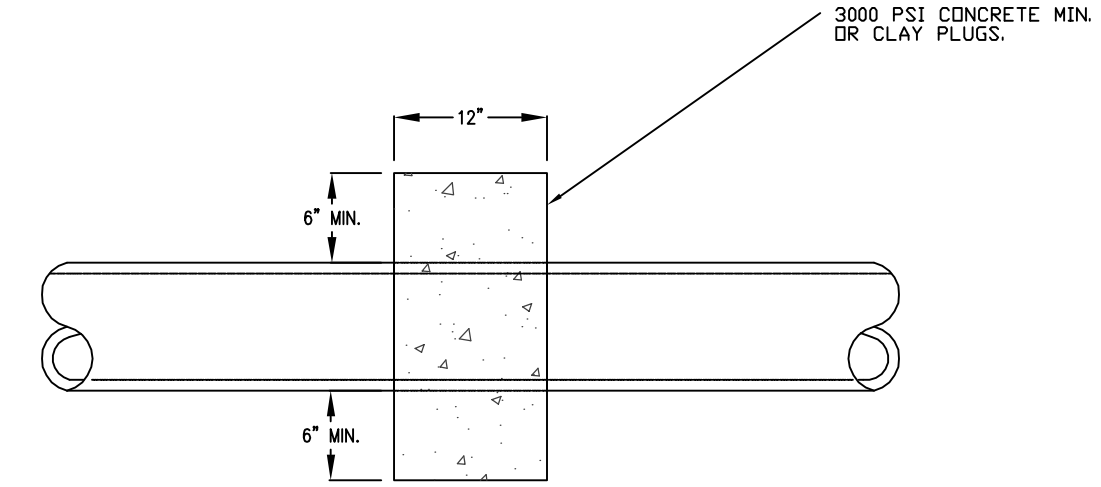
- Performance Approach -

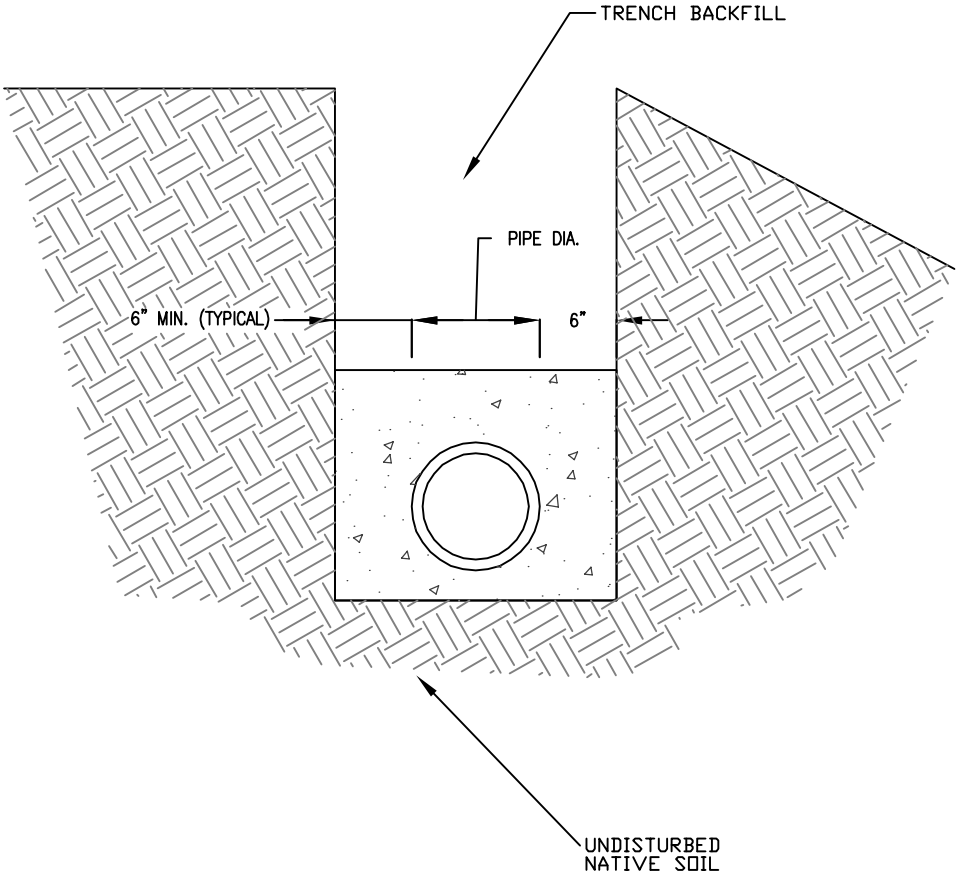
Pond

Inflow Riser Manhole w/ Grate Cover

NUMBER

SW-234





- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

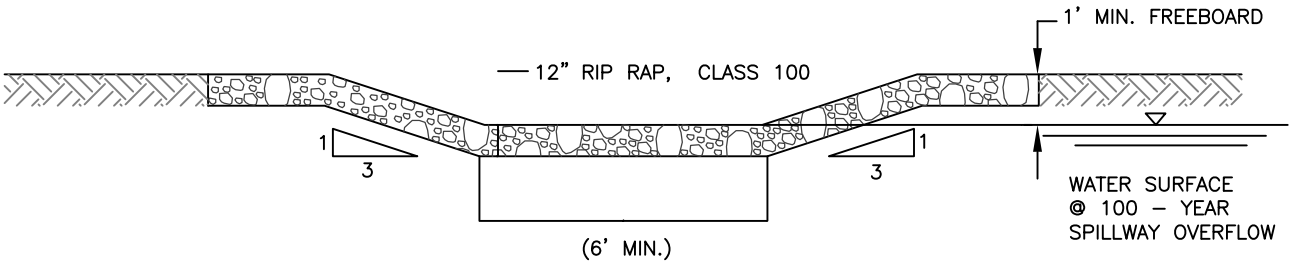
- Performance Approach -

Pond

Inlet/Outlet Anti-Seepage Collar

NUMBER

SW-233



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

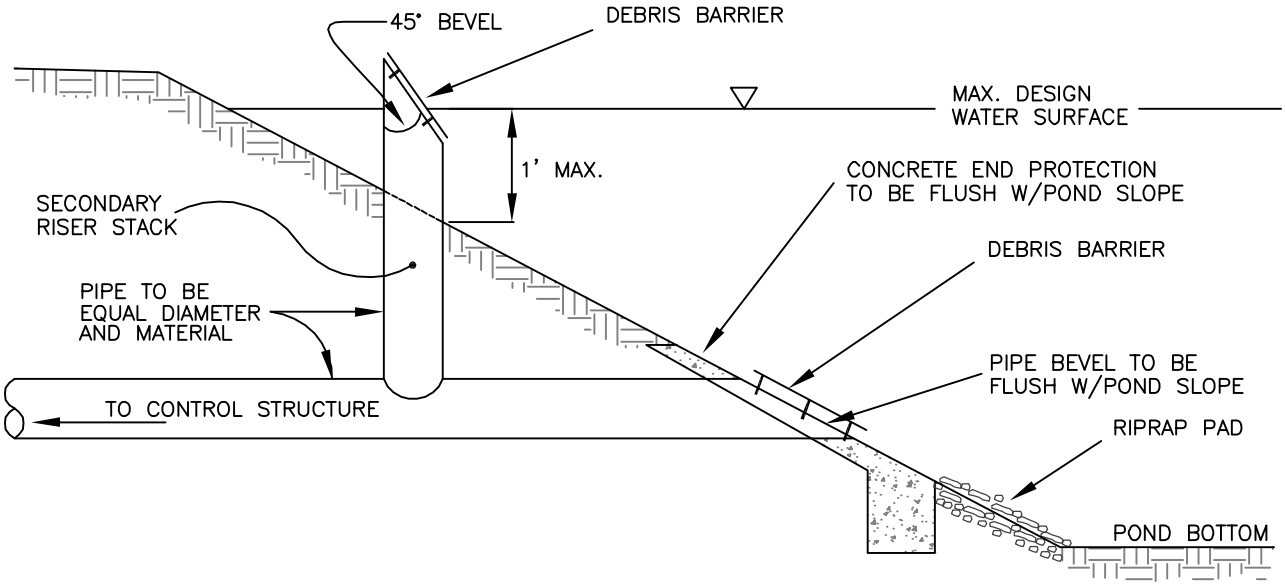
- Performance Approach -

Pond

Emergency Overflow Spillway Weir

NUMBER

SW-232



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

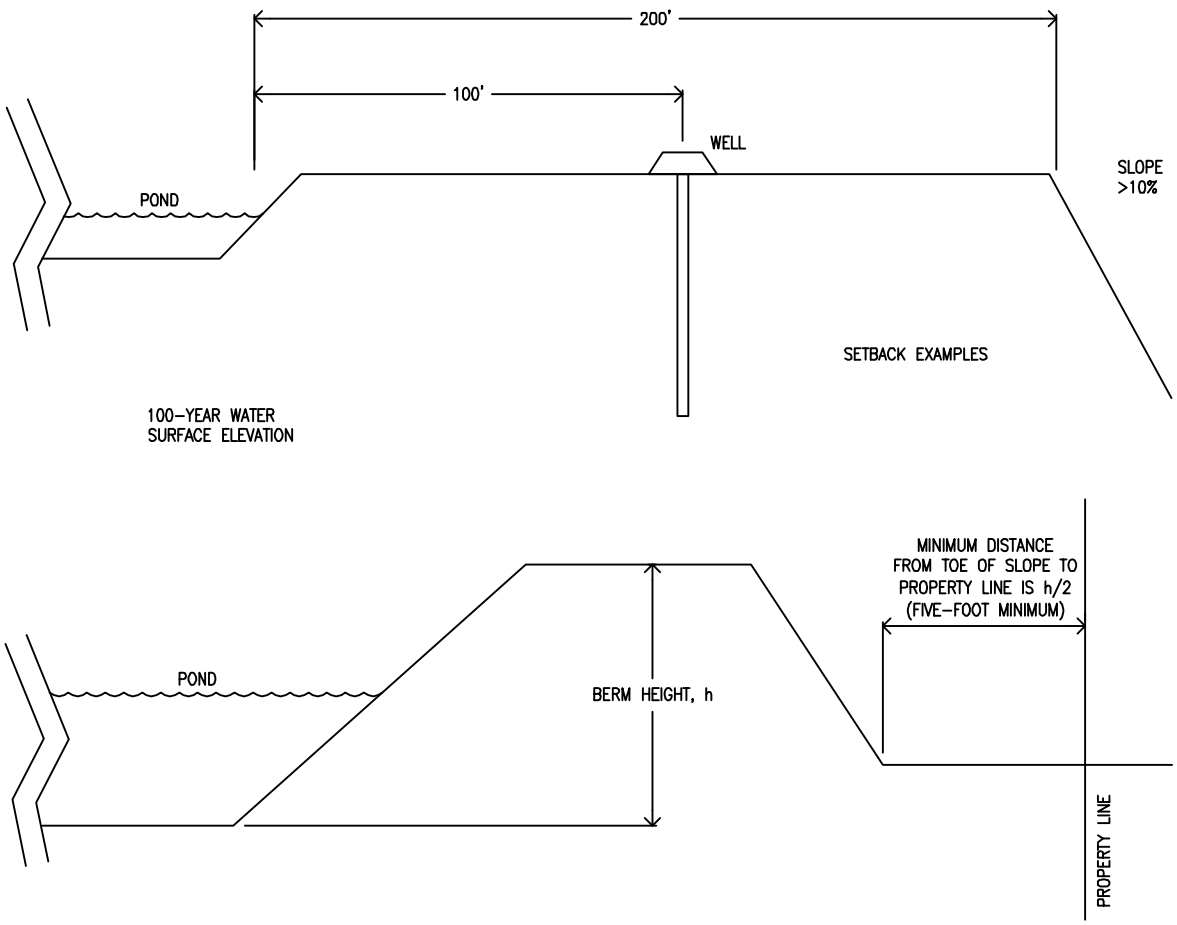
- Performance Approach -

Pond

Secondary Riser Stack

NUMBER

SW-231



- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Performance Approach -

Pond

Setback Details

NUMBER

SW-230

Appendix I.2 Table of Contents

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Performance Facilities -

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NUMBER

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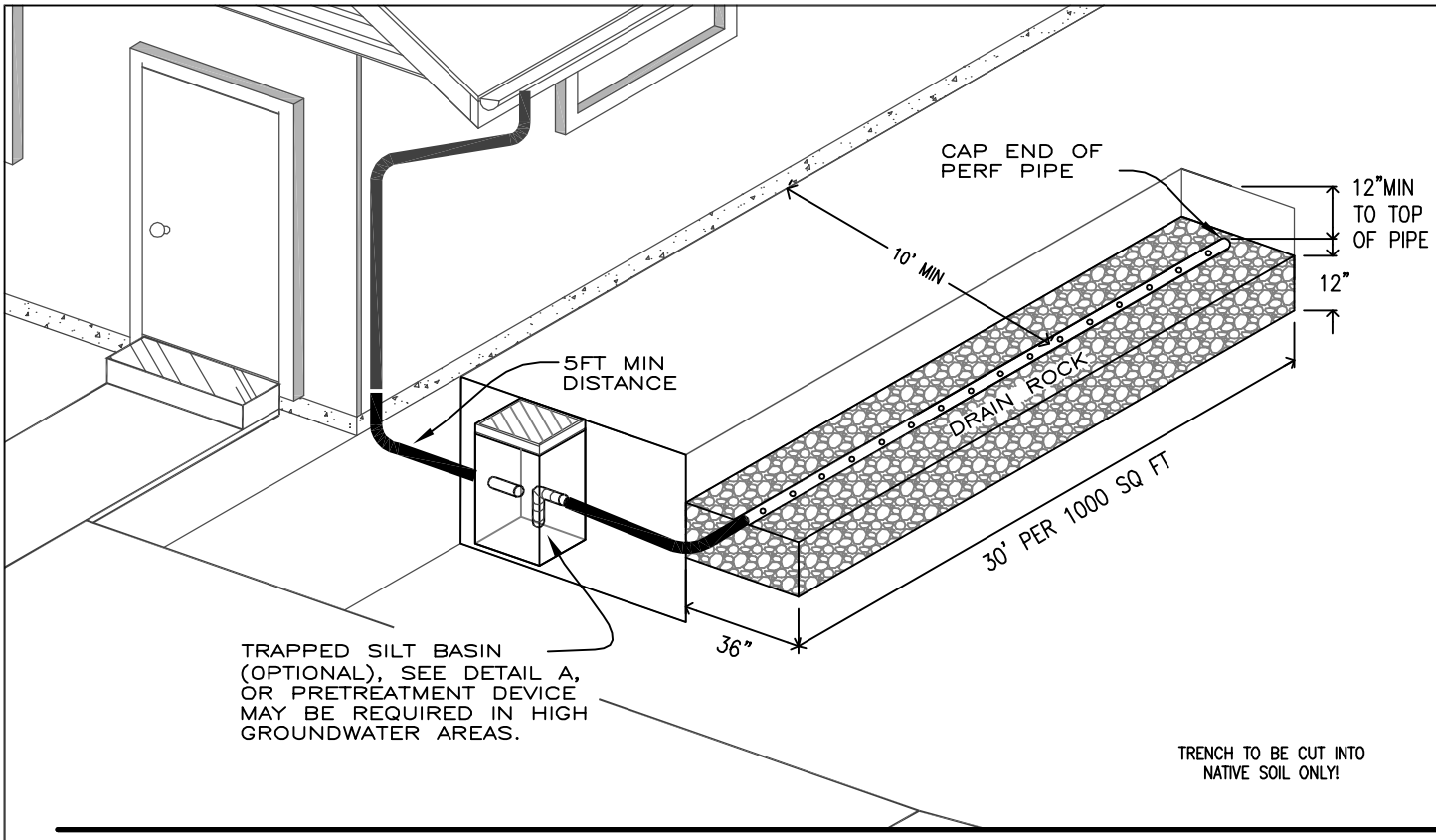
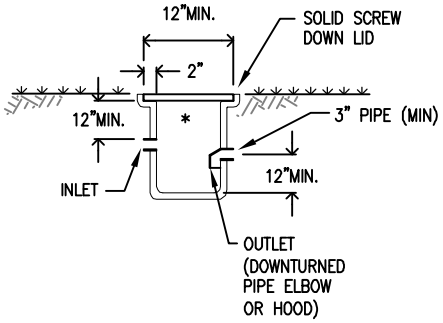
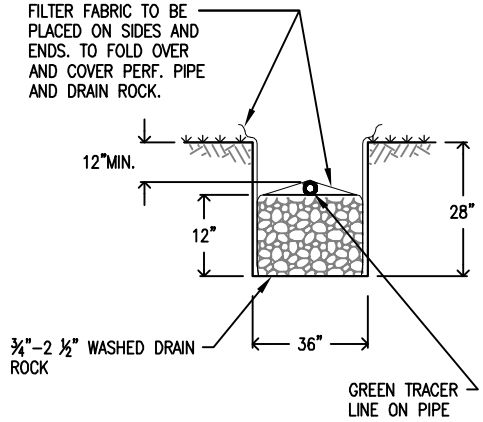


DETAIL A: OPTIONAL TRAPPED SILT BASIN DETAIL



* THE BOTTOM OF THE INLET PIPE MUST NOT BE LOWER THAN THE TOP OF THE OUTLET PIPE.

DETAIL B: SOAKAGE TRENCH CONSTRUCTION



LINE TRENCH SIDES WITH FILTER FABRIC AS SHOWN, ADD 18" OF DRAIN ROCK. PLACE PERF. PIPE AND COVER ALL.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

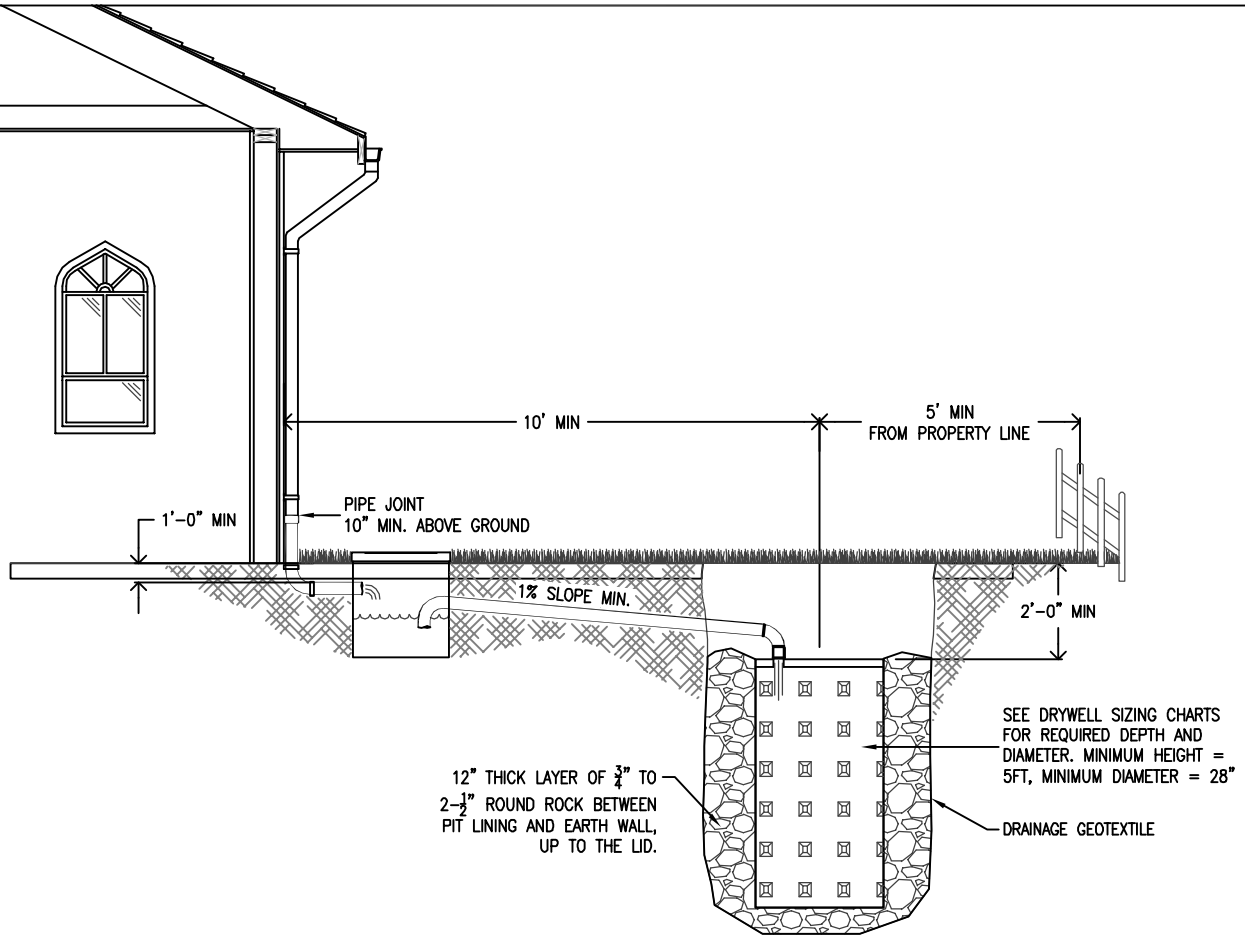
DATE: 11-30-10

- Simplified / Presumptive Design Approach -

Soakage Trench

NUMBER

SW-180



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Sizing: **Exhibit 2-36** is used to appropriately size the drywell(s) based on the amount of impervious area that each drywell is designed to manage. This chart shall be used as guidance, is based on field experience, and should be used as minimums only.

3. DEQ requires 5' of separation from bottom of drywell to high ground water table for roof runoff from single family homes, and 10' of separation for all other uses.

4. Top of drywell must be below lowest finished floor.

5. Setbacks (from center of facility):
   a. 10' from foundations
   b. 5' from property lines
   c. 20' from cesspools.

7. Piping shall be ABS SCH40, cast iron, or PVC SCH40. 3" pipe must be used for up to 1500sf of impervious area, otherwise 4" minimum. Piping must have 1% grade and must follow current Uniform Plumbing Code.

Exhibit 2-36: Drywell Sizing Table

Once approval has been given by City for onsite infiltration of stormwater, the following chart shall be used to select the number and size of drywells. Gray boxes are acceptable.

IMPERVIOUS Area (sq-ft)	28" Diameter Drywell Depth	48" Diameter Drywell Depth
	5'	5'
1000		
2000		
3000		

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

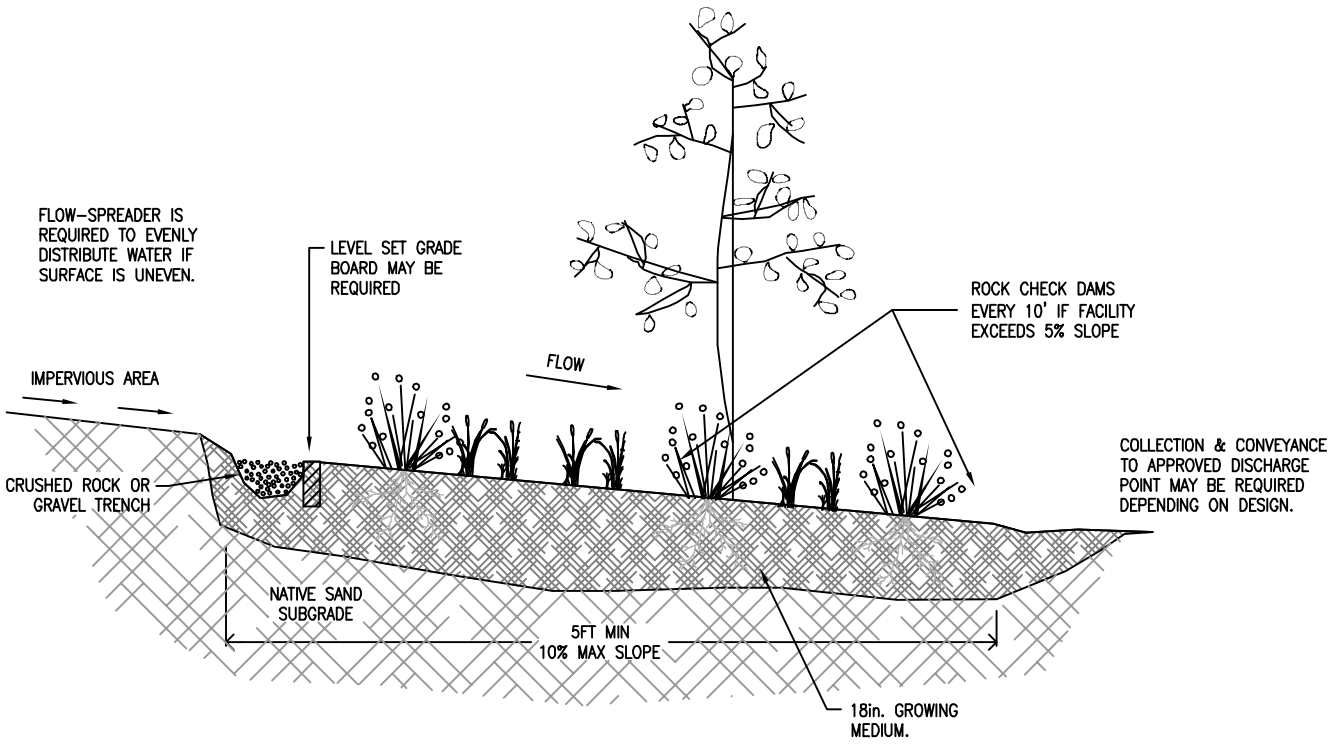
DATE: 11-30-10

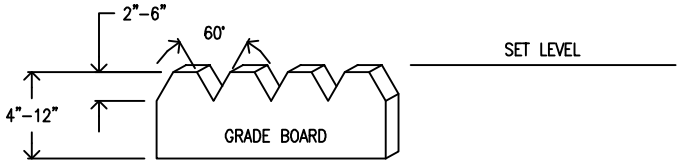
- Simplified / Presumptive Design Approach -

Drywell

NUMBER

SW-170





1. Provide protection from all vehicle traffic, equipment staging, as well as foot traffic for proposed infiltration areas prior to and during construction.

2. Dimensions:
   a. Flow line length: 5' minimum.
   b. Slopes: 0.5 - 10%

3. Setbacks (from beginning of facility):
   a. 5' from property line
   b. 10ft from buildings
   c. 50ft from wetlands, rivers, streams, and creeks where required.

4. Overflow: Collection from filter strip shall be specified on plans to approved discharge point according to Stormwater Design Manual.

5. Growing medium: Growing medium shall be used within the top 18" (See Appendix B for specifications).

6. Vegetation: The entire filter strip must have 100% coverage by grasses, shrubs and trees. Irrigation may be required. See Appendix G of the SWDM for approved plants.

7. Level Spreaders: A grade board or sand/gravel trench may be required to disperse the runoff evenly across the filter strip to prevent a point of discharge. The top of the level spreader must be horizontal and at an appropriate height to provide sheetflow directly to the soil without scour. Level spreaders shall not hold a permanent volume of runoff. Grade boards can be made of any material that will withstand weather and solar degradation. Trenches used as level spreaders can be filled with washed crushed rock or pea gravel.

8. Check dams: shall be placed according to facility design otherwise:
   a. 12" in length
   b. Equal to the width of the filter
   c. 3 to 5" in height
   d. Every 10' where slope exceeds 5%.

9. Inspections: Call City of Florence Public Works (541) 997-4106 to schedule appropriate inspections.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

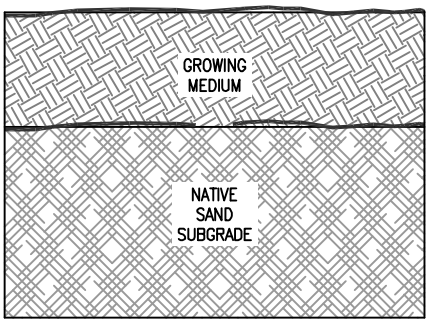
DATE: 11-30-10

- Simplified / Presumptive / Performance Design Approach -

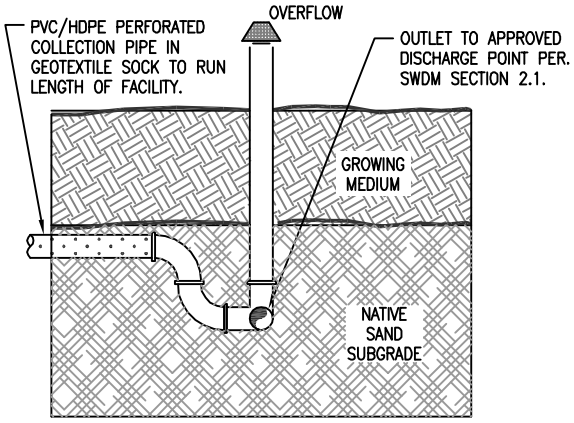
Filter Strip

NUMBER

SW-160

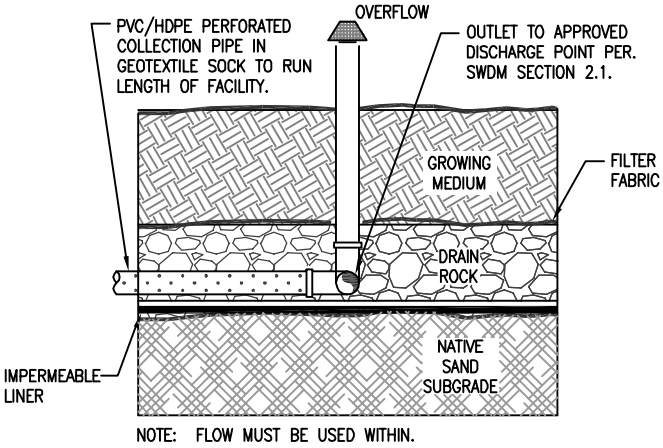


INFILTRATION



PARTIAL INFILTRATION

OVERFLOW AND UNDERDRAIN REQUIRED.
SET UNDERDRAIN WITHIN DRAIN ROCK

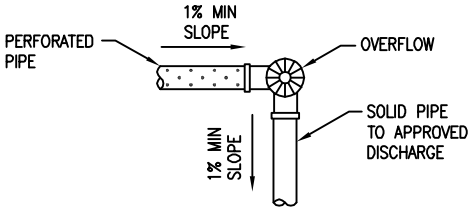


NOTE: FLOW MUST BE USED WITHIN.

FLOW-THROUGH

STORMWATER HIERARCHY CATEGORY 3 or 4

OVERFLOW AND UNDERDRAIN REQUIRED.
SET UNDERDRAIN AT BASE OF DRAIN ROCK LINER.



PLAN VIEW

PIPE W/ UNDERDRAIN & DISCHARGE POINT

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

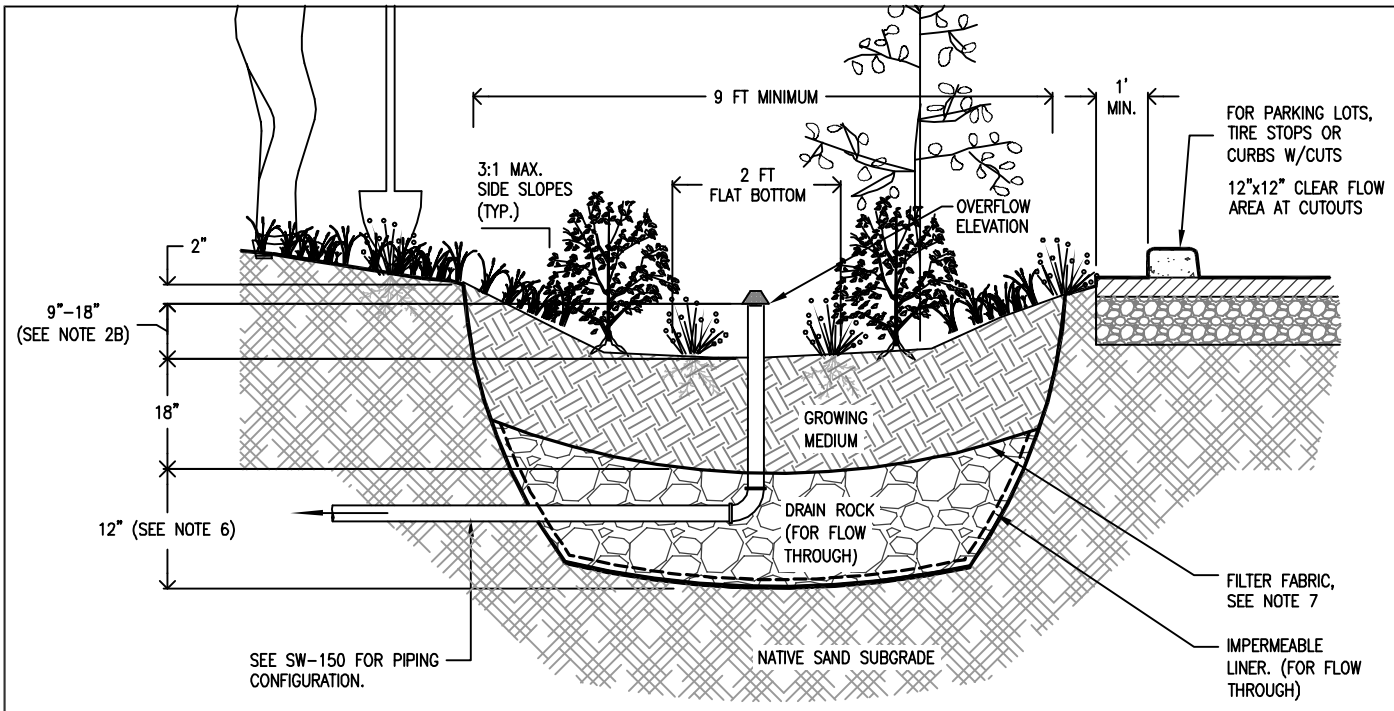
DATE: 11-30-10

- Simplified / Presumptive Design Approach -

Facility Overflow Configurations

NUMBER

SW-150



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Dimensions:
   a. Width of basin: 9' minimum.
   b. Depth of basin (from top of growing medium to overflow elevation); Simplified: 12", Presumptive: 9"-18".
   c. Flat bottom width: 2' min.
   d. Side slopes of basin: 3:1 maximum.

3. Setbacks (from midpoint of facility):
   a. Infiltration basins must be 10' from foundations and 5' from property lines.
   b. Flow-through swales must be lined with connection to approved discharge point according to SWDM Section 2.1.

4. Overflow:
   a. Overflow required for Simplified Approach.
   b. Inlet elevation must allow for 2" of freeboard, minimum.
   c. Protect from debris and sediment with strainer or grate.

5. Piping: shall be ABS Sch.40, cast iron, or PVC Sch.40. 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping must have 1% grade and follow the Uniform Plumbing Code.

6. Drain rock:
   a. None required for infiltration basin
   b. Size for flow-through basin: ¾" washed

7. Separation between drain rock and growing medium: Use filter fabric (see SWDM Exhibit 2-5).

8. Growing medium:
   a. 18" minimum
   b. See Appendix B for specification.

9. Vegetation: Follow landscape plans otherwise refer to plant list in SWDM Appendix G. Minimum container size is 1 gallon. # of plantings per 100sf of facility area):
   a. Zone A (wet): 115 herbaceous plants OR 100 herbaceous plants and 4 shrubs
   b. Zone B (moderate to dry): 1 tree AND 3 large shrubs AND 4 medium to small shrubs.

   The delineation between Zone A and B shall be either at the outlet elevation or the check dam elevation, whichever is lowest.

10. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.

11. Inspections: Call City of Florence Public Works (541) 997-4106 to schedule appropriate inspections.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

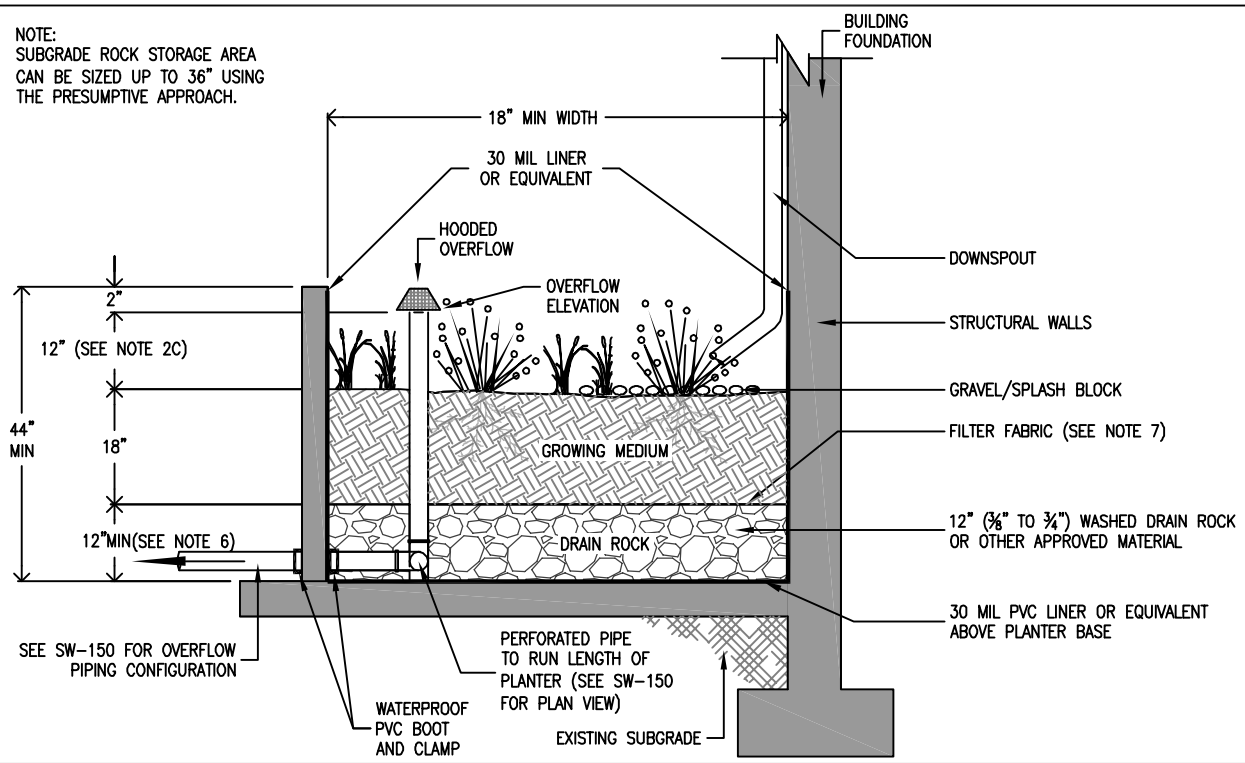
DATE: 11-30-10

- Simplified / Presumptive Design Approach -

Rain Garden

NUMBER

SW-140



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Dimensions:
   a. Width of flow-through planter: 18" minimum.
   b. Width of infiltration planter: 30" minimum.
   c. Depth of planter (from top of growing medium to overflow elevation). Simplified: 12"; Presumptive: 6"- 18".
   d. Slope of planter: 0.5% or less.

3. Setbacks (from centerline of facility):
   a. Infiltration planters must be 10' from foundations and 5' from property lines.
   b. Flow-through planters must be less than 30" in height above surrounding area if within 5 feet of property line.

4. Overflow:
   a. Overflow required for Simplified Approach.
   b. Inlet elevation must allow for 2" of freeboard, minimum.
   c. Protect from debris and sediment with strainer or grate.

5. Piping: shall be ABS Sch.40, cast iron, or PVS Sch.40. 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping must have 1% grade and follow the Uniform Plumbing Code.

6. Drain rock:
   a. Size for infiltration planter: None required
   b. Size for flow-through planter: ¾" washed
   c. Depth for Simplified: 12"
   d. Depth for Presumptive: 0-48", see calcs.

7. Separation between drain rock and growing medium: Use filter fabric.

8. Growing medium:
   a. 18" minimum
   See Appendix B for specification.

9. Vegetation: Follow landscape plans otherwise refer to plant list in SWDM Appendix G. Minimum container size is 1 gallon. # of plantings per 100sf of facility area:
   a. Zone A (wet) 115 herbaceous plants, OR
   b. Zone A (wet) 100 herbaceous plants and 4 small shrubs.

10. Planter walls:
   a. Material shall be stone, brick, concrete, wood, or other durable material (no chemically treated wood).
   b. Concrete, brick, or stone walls shall be included on foundation plans.

11. Waterproof liner: Shall be 30 mil PVC or equivalent, for flow-through facilities.

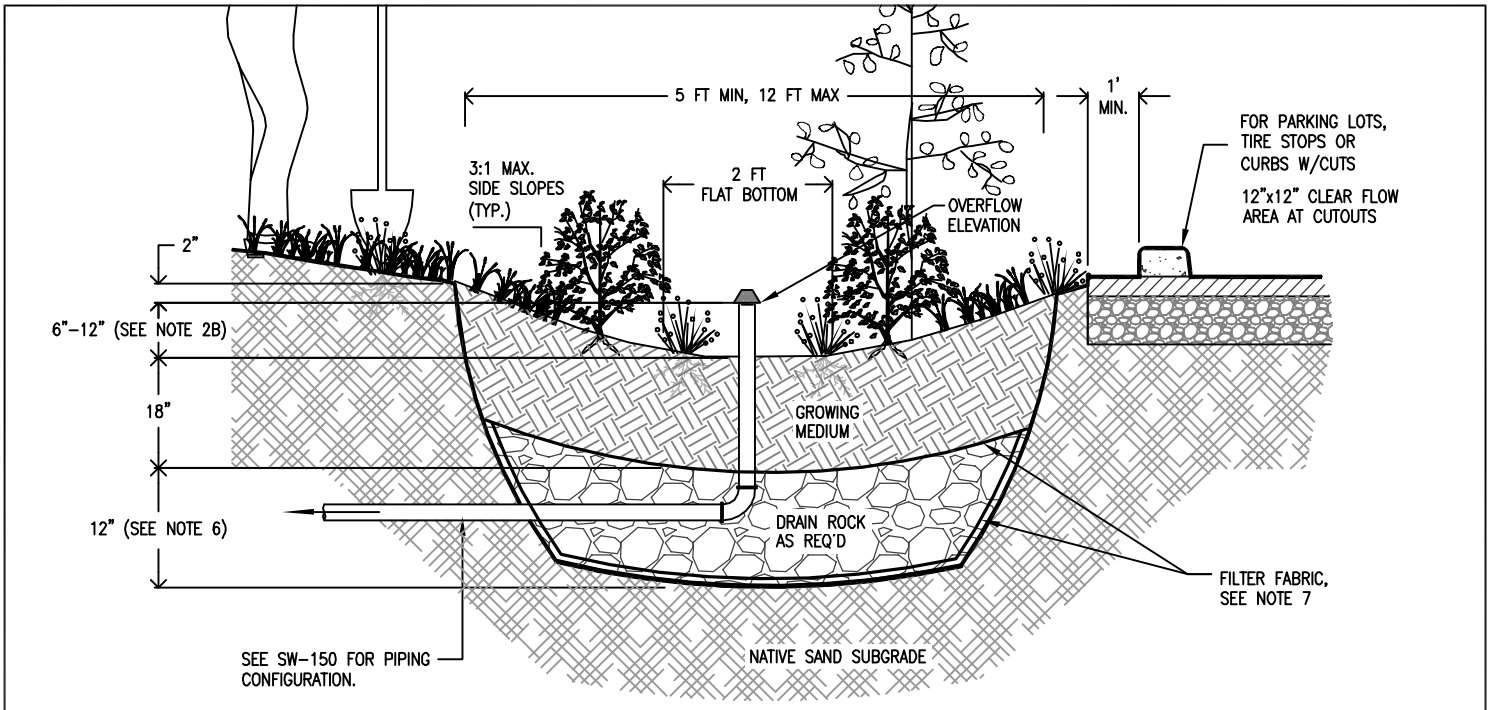
12. Install washed pea gravel or river rock to transition from inlet or splash pad to growing medium.

13. Inspections: Call City of Florence Public Works (541) 997-4106 to schedule appropriate inspections.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

	CITY OF FLORENCE PUBLIC WORKS DEPARTMENT 989 Spruce Street Florence, OR 97439 Phone: 541-997-4106	- Simplified / Presumptive Design Approach -	NUMBER
	DATE: 11-30-10	Stormwater Planter	SW-130



1. Provide protection from all vehicle traffic, equipment staging, and foot traffic in proposed infiltration areas prior to, during, and after construction.

2. Dimensions:
   a. Width of swale: 5' - 12'.
   b. Depth of swale (from top of growing medium to overflow elevation); Simplified: 9", Presumptive: 6"-12".
   c. Longitudinal slope of swale: 6.0% or less.
   d. Flat bottom width: 2'.
   e. Side slopes of swale: 3:1 maximum.

3. Setbacks (from centerline of facility):
   a. Infiltration swales must be 10' from foundations and 5' from property lines.
   b. Flow-through swales must be lined with connection to approved discharge point according to SWDM Section 2.1.

4. Overflow:
   a. Overflow required for Simplified Approach
   b. Inlet elevation must allow for 2" of freeboard, minimum.
   c. Protect from debris and sediment with strainer or grate.

5. Piping: shall be ABS Sch.40, cast iron, or PVS Sch.40. 3" pipe required for up to 1,500 sq ft of impervious area, otherwise 4" min. Piping must have 1% grade and follow the Uniform Plumbing Code.

6. Drain rock:
   a. Infiltration swale: None required
   b. Size for flow-through swale: ¾" washed
   c. Depth for Simplified and Presumptive: 12"

7. Separation between drain rock and growing medium: Use filter fabric.

8. Growing medium:
   a. 18" minimum
   b. See Appendix B for specification.

9. Vegetation: Follow landscape plans otherwise refer to plant list in SWDM Appendix G. Minimum container size is 1 gallon. # of plantings per 100sf of facility area:
   a. Zone A (wet): 115 herbaceous plants OR 100 herbaceous plants and 4 small shrubs.
   b. Zone B (moderate to dry): 1 tree AND 3 large shrubs / small trees AND 4 small shrubs AND 140 groundcover plants.

   The delineation between Zone A and B shall be either at the outlet elevation or the check dam elevation, whichever is lowest.

10. Waterproof liner: Shall be 30 mil PVC or equivalent for flow-through facilities.

11. Install washed pea gravel or river rock to transition from inlets and splash pad to growing medium.

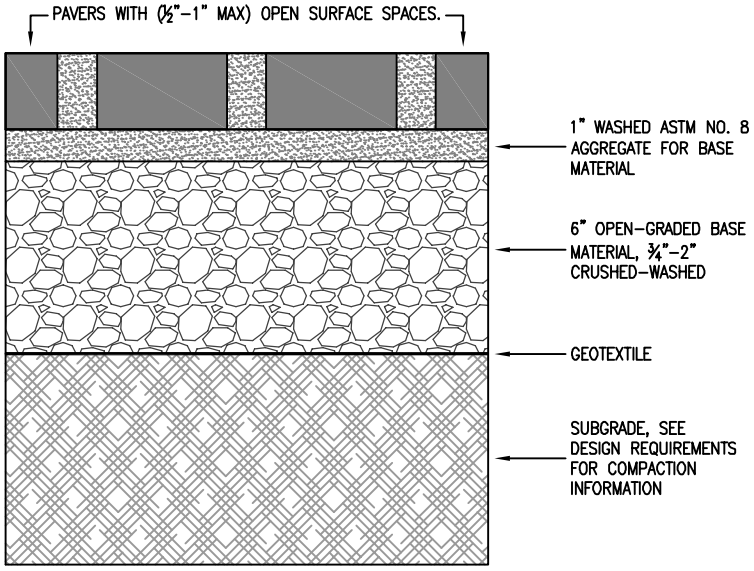
12. Check dams: Shall be placed according to facility design. Refer to SW-340 for profile and spacing.

13. Inspections: Call City of Florence Public Works (541) 997-4106 to schedule appropriate inspections.

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

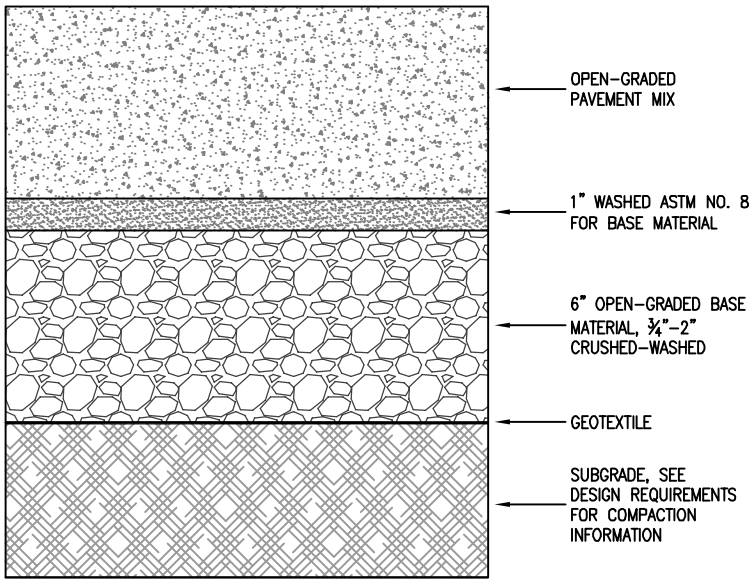
	CITY OF FLORENCE PUBLIC WORKS DEPARTMENT 989 Spruce Street Florence, OR 97439 Phone: 541-997-4106 DATE: 11-30-10	- Simplified / Presumptive Design Approach - Swale	NUMBER SW-120



PERMEABLE CONCRETE BLOCK OR "PAVER" SYSTEMS

	RESIDENTIAL DRIVEWAY OR PEDESTRIAN ONLY	PRIVATE STREET, PARKING LOT, OR FIRE LANE
MINIMUM PERVIOUS CONCRETE	4"	6"
PAVERS	2 ⅜"	3 ⅛"
ENGINEERING REQ'D	NO	YES
COMPACTION REQ'D	NO	YES

EXHIBIT 2-8
PERVIOUS PAVEMENT REQUIREMENTS FOR TOP LIFT DEPTH, ENGINEERING, AND COMPACTION.



PERVIOUS (OPEN GRADED) CONCRETE SYSTEMS

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

CITY OF FLORENCE
PUBLIC WORKS DEPARTMENT
989 Spruce Street
Florence, OR 97439
Phone: 541-997-4106

DATE: 11-30-10

- Simplified / Presumptive / Performance Design Approach -
Pervious Pavement

NUMBER
SW-110

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