Lake Whatcom
Homeowner Incentive Program

DESIGN MANUAL

Program Details and Best Management Practices (BMP) Design Guidelines

Lake Whatcom Cooperative Management Program

Version 3—July 2025

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Part I:

Overview

1 Introduction

Lake Whatcom, the drinking water source for more than 100,000 Whatcom County residents, has seen a marked decline in water quality over the past 50 years. Excess nutrients, particularly phosphorus, generated by residential properties and conveyed to the lake through public infrastructure, have caused a significant decrease in dissolved oxygen levels deep in the water column as well as seasonal algal blooms on the surface. In April, 2016, the Environmental Protection Agency finalized the Lake Whatcom Total Maximum Daily Load study, which has set in motion a 30- to 50-year cleanup effort focused on reducing phosphorus inputs to Lake Whatcom by nearly 87%, compared to current conditions. In order to address part of this water quality issue, the City of Bellingham and Whatcom County use public funds to manage runoff from some of the areas around the Lake. However, much of the developed land lies outside of the reach of infrastructure projects, especially along the lake shore and adjacent to the many tributaries.

The Homeowner Incentive Program (HIP) approaches the problem from a complimentary angle, by providing technical and financial assistance to property owners in the Lake Whatcom watershed, especially those owning properties that are difficult to address through infrastructure projects. Homeowners are encouraged to make changes on their private property to reduce phosphorus entering the public infrastructure or the lake.

This manual describes the process for developing HIP-eligible project designs that will qualify for streamlined permitting and program incentives. The manual is divided into sections that address individual components of the HIP but is not intended to represent the entirety of resources available to assist in the successful design and implementation of a HIP-eligible project. Designers should check the HIP website for more information and updates to accompany this guidance document.

The HIP has been developed based on guiding principles approved by City of Bellingham and Whatcom County Councils and vetted by the Lake Whatcom Policy Group and representatives of the Lake Whatcom Management Program.

- **HIP projects must provide a public benefit to qualify for use of public funds**
- **HIP projects must comply with all applicable current regulations**
- **HIP BMPs must be designed according to Washington State Department of Ecology approved methodology**

HIP rules and BMP design standards were developed to abide by these principles. Conformance with the standards described in this manual equates to conformance with regulations and pre-approved programmatic permits and ensures public benefits are achieved.

Questions in regard to the content of this manual should be directed to HIP Staff. Contact information for relevant and current staff can be found under the "Contact Us" tab on the HIP website.

2 Homeowner Incentive Program Overview

HIP Process Overview

Homeowners who live in the area draining to Lake Whatcom within the City of Bellingham (see map below) are eligible to participate in the HIP. These property owners voluntarily complete projects that improve the quality or reduce the amount of runoff generated by surfaces on their private property. In return, HIP provides streamlined permitting, technical assistance, and financial reimbursement to encourage and facilitate these projects.

Property owners interested in HIP first receive a site visit that provides them with a baseline of understanding about how the program works, its conditions, and the types of projects available for them to complete. Working with HIP staff and private professionals, the homeowners then evaluate strategies for improving their property based on their budget, aesthetics, and the unique characteristics of their lot.

Once the homeowner has narrowed down their preferred options and signed an acknowledgement form, they are directed to engage a designer of their choice to complete a design and the application submittal packet necessary to permit and build the project and ensure reimbursement for project expenses. HIP staff are available, as needed, to support the homeowner and designer as they navigate the permitting process. The City issues a permit to the homeowner and the permitted plans are used to solicit bids from construction contractors, landscape installers, or other professionals qualified to construct the project as designed.

The HIP promotes and encourages best management practices (BMPs) that most effectively reduce phosphorus runoff to protect Lake Whatcom, are cost-effective for residential-scale installations, and result in property improvements that appeal to homeowners. The BMPs included in this manual have been reviewed and approved by the Washington State Department of Ecology. They include native landscaping, infiltration trenches, media filter drains, dispersion systems, Lake Whatcom rain gardens, and the Phosphorus Optimized Stormwater Treatment (POST) system. Within each of these BMPs are aesthetic design options that can be adapted to homeowner preferences. In addition to these primary BMPs, some homeowners are able to include accessory features, such as permeable pavement and rainwater cisterns that improve the overall benefit of the project.

At the completion of construction, with the assistance of HIP staff, reimbursement is provided toward applicable project expenses including design fees, contractor invoices, material receipts, and other necessary expenditures made on behalf of the project. The amount of reimbursement eligible for each project is wholly based on the property area that has been improved at $2.00 per square foot. In order to receive reimbursement homeowners sign a maintenance agreement that requires periodic inspection and minor maintenance actions. Resources are available from the City of Bellingham to provide technical support to homeowners to help them complete maintenance actions.

Program staff will be working with homeowners, designers, contractors, and community partners to periodically update the HIP with new features, tools, and revised criteria for participation as the program evolves over time.

HIP Process—10 Steps

Step 1: Contact

- Homeowner hears about the program and either visits www.lakewhatcomHIP.org and schedules site visit or contacts the HIP Coordinator at the Whatcom Conservation District (WCD) directly

The players and their roles:

- **City** - maintains website
- **HIP Coordinator** - responds to inquiries and schedules site visits
- **Homeowner** - inquires and schedules site visit

Step 2: Site Visits/Pre-Design

- HIP Coordinator visits site, explains program, provides options for projects, and identifies red flags
- Acknowledgement forms are signed
- HIP Coordinator develops feasibility report with information on site-specific design considerations/constraints and critical areas, as applicable
- City of Bellingham provides utility maps and 8-1-1 is contacted for utility locates

The players and their roles:

- **City** – Assists with utility locates and utility conflict information
- **HIP Coordinator** - conducts site visit and provides point of contact for ongoing communications, coordinates critical area mapping, if applicable, develops pre-design & provides to homeowner
- **Homeowner** - attends site visit and asks questions; signs acknowledgement form

Step 3: Designer Interviews

- Homeowner expresses interest in moving forward
- HIP Coordinator provides list of certified professional designers and offers to attend meeting with designers
- Homeowner meets with designers and makes selection
- If non-pre-approved professional is selected, HIP Coordinator confirms eligibility for reimbursement

The players and their roles:

- **Homeowner** - confirms interest in moving forward, contacts and interviews designers
- **HIP Coordinator** - provides list of pre-approved designers, attends meetings (if invited), confirms business eligibility of non-listed designers, communicates important details to both designer and homeowner
- **Designer** - attends meeting, reviews pre-design report, provides feedback on project ideas

Step 4: Project Design

- Designer completes design/permitting paperwork and plans and submits to HIP Coordinator for initial review
- HIP Coordinator provides reimbursement estimate and signs off on plans

- Homeowner or HIP Coordinator submits to City for permitting and follows through as necessary

The players and their roles:

- **Homeowner** – participates in design scoping and provides input to designer
- **Designer** - completes site-specific design work, including plans and narrative portions of HIP submittal requirements. Submits completed project design for review and permitting
- **HIP Coordinator** - ensures design is complete and meets minimum requirements for reimbursement through HIP, provides reimbursement budget estimate, signs off on completed design

Step 5: Review and Approval

- City staff reviews plans and provides comments to homeowner or designated agent/contact if additional information is needed
- Jurisdiction issues project permit to homeowner

The players and their roles:

- **City Staff** - reviews plans, provides comments, requests amendments, and issues permits to homeowner
- **Homeowner** – responds to comments asking for assistance from the designer and HIP Coordinator as needed
- **Designer** - responds to comments as needed, provides revised plans and submittal forms if needed
- **HIP Coordinator** - reviews approved permit and plans, preps homeowner for hiring a contractor if needed, takes "before" photos if agreed to by homeowner

Step 6: Contractor Interviews

- HIP Coordinator provides list of pre-approved contractors to homeowner and offers to attend meetings with homeowners and contractors

The players and their roles:

- **HIP Coordinator** - provides list of approved contractors, attends meetings (if invited), communicates important details to both contractor and homeowner
- **Homeowner** - contacts and interviews contractors
- **Contractor** - reviews homeowner's approved plans and permit, attends meeting, listens to homeowner's unique situation, and asks questions as needed to prepare bid

Step 7: Bids and Contracting

- Contractors bid project, homeowner makes selection, and enters into private contract with contractor
- If non-pre-approved contractor selected, HIP Coordinator confirms eligibility for reimbursement

The players and their roles:

- **Homeowner** - reviews bids, selects contractor, negotiates private contract

- **Contractor** - provides detailed bid, negotiates private contract for work, confirms ability to complete project per plan and with approved materials
- **HIP Coordinator** - confirms business eligibility of non-listed contractors, attends meetings with contractor and homeowner if invited

Step 8: Construction

- BMPs installed according to approved plan and permit conditions
- HIP Coordinator inspects and helps with plan amendments/changes as needed
- Homeowner makes payment to contractor and/or vendors

The players and their roles:

- **Homeowner** - manages project, directs contractor, contacts HIP Coordinator if issues arise, and makes payment for work completed and/or materials
- **Contractor** - builds the project per plans and specifications, arranges inspections, contacts HIP Coordinator if issues with design or construction arise, and adaptively manages project to maintain compliance with rules, regulations, guidelines, and limitations
- **HIP Coordinator** - inspects project regularly, takes construction photos if agreed to by homeowner

Step 9: Reimbursement

- HIP Coordinator inspects completed project and issues final inspection form
- Homeowner signs Maintenance Agreement and submits this agreement with their reimbursement paperwork to HIP Coordinator and then to the City.

The players and their roles:

- **Homeowner** - allows final inspection, signs the Maintenance agreement, completes and submits reimbursement request to HIP Coordinator and then County
- **HIP Coordinator** - confers with jurisdiction regarding project specifics, inspects and signs off on completed project, takes "After" photos if agreed to by homeowner, assures proper completion of Maintenance Agreement, and approves invoices and receipts for reimbursement payment
- **City** – Receives completed reimbursement request with original signed Maintenance agreement , invoices, and final inspection form; processes reimbursement to homeowner

Step 10: Close Out

- HIP Coordinator follows up to close out project and get feedback from property owner, contractor, and designer; issues post-project survey.

The players and their roles:

- **Homeowner** - provides feedback on process and experience
- **Contractor** - provides feedback on process and experience
- **Designer** - provides feedback on process and experience
- **HIP Coordinator** - issues surveys, collects feedback, closes out project, and records data and outcomes in format necessary to report progress and project impacts

3 HIP Design Steps - Specific Guidance

Five of the ten steps outlined in the previous section are directly relevant to project design and the role of the designer in the HIP process. This section of the manual describes those steps in detail and provides additional information applicable to each step.

HIP Step 2 — Site Visits/Pre-Design Report

As a HIP designer, you are not required to initiate contact with potential participants. However, you may have a client (or a potential client) who lives in the program area that might be a good fit for the HIP. Ideally, interested homeowners will be directed to the HIP website, www.lakewhatcomHIP.org, as a first step to determine if they qualify to participate and what types of projects they qualify for. Entering the property's address on the website will allow the homeowner to review BMPs that are HIP-eligible for their property based on characteristics such as location, lot size, and proximity to critical areas. Note that the feasibility of some BMPs listed on the website are dependent on soil investigations and infiltration rates. Site visits from the HIP Coordinator can be scheduled through the website.

It's important to note that the HIP Coordinator is the only official entity that can specifically determine program eligibility, BMP applicability, and reimbursement budget for an individual property owner. However, as a designer, you can certainly help your potential clients understand the concepts that guide these determinations.

Site visits are initiated by request of the homeowner and are open to anyone else they choose to invite including designers, contractors, neighbors, and friends. The purposes of these visits include:

- Introduce the homeowner to HIP and describe how it may apply to projects they may already have in mind or may be interested in pursuing in the next few years.
- Explain the purpose behind HIP and how it works to help keep Lake Whatcom clean and meet regulatory requirements.
- Describe how (and which) HIP-eligible BMPs could be installed or implemented at this specific site and estimate the water quality benefits of various BMP configurations or combinations.
- Answer common homeowner questions about these BMPs, including specifics about their design and construction and generalities about time investments, ease of construction, and overall cost.
- Leave the homeowner with detailed information about all BMPs discussed at the visit to help the homeowner decide on a project to pursue.
- Conduct a rudimentary site evaluation to identify potential conflicts or challenges related to slopes, critical areas, utilities, right-of-way issues, noxious or invasive weeds, or existing conditions that are otherwise incompatible with recommended BMPs.

At the completion of the site visit, the HIP Coordinator will follow-up with the homeowner summarizing the site visit outcomes and outlining next steps. When the homeowner has confirmed a desire to move forward and signed the acknowledgement form, the HIP Coordinator will develop a feasibility report.

Items commonly identified in feasibility report include (may vary):

- Critical areas identification
  - Shoreline / ordinary high water mark (OHWM)
  - Creeks / streams and their buffers
  - Wetlands and their buffers
  - Steep slopes and geo-hazard areas
- Utilities preliminary identification (from City maps or marked by calling 8-1-1 prior to visit)
  - Water / sewer / storm public utilities in rights-of-way
  - Potential location of private utilities (owner responsible to locate and mark)
  - Septic systems and septic drain fields (if any)
- Rights-of-Way or property line estimates (not an official survey)
- Noxious weeds or invasive species that could affect BMP installation
- Existing easements (from City records)
- Specific limitations to particular BMPs of interest
- Preliminary soil information needed for particular BMPs (may be conducted at a follow up site visit if not applicable during preliminary project evaluations)

HIP Step 3 ——— Designer Interview

When ready to choose a designer, or evaluate their project further, the homeowner will be given a list of designers that have been vetted by HIP staff to confirm they are eligible for reimbursement. The homeowner will be encouraged to arrange interviews with one or more designers from the list and make a choice on whom to hire based on their own criteria. The homeowner may choose from the HIP-approved list or hire any designer they choose, as long as that professional holds a business license within the State of Washington. To collect fees for professional services within Bellingham City Limits, professionals must also be registered with the City's Finance Office**. It is important to note that if a homeowner chooses to hire a designer or contractor that has not been HIP-approved , they must ask the HIP Coordinator to confirm eligibility for reimbursement to ensure those costs are HIP-eligible.**

The homeowner will schedule interviews with designers of their choice. The homeowner may invite the HIP Coordinator to attend the meeting, but it is not a requirement. The agreement

between the homeowner and the designer remains a private contract to be negotiated only between the two parties. The HIP Coordinator will not provide recommendations on hiring or comments about fees, beyond simply confirming that expenses paid to that designer would be reimbursable. The HIP Coordinator will respond to questions from both designers and homeowners and will provide technical support addressing design or permitting questions to the homeowner throughout the interview and selection process as needed.

At the interview, designers should expect to see a draft feasibility report. The homeowner may ask questions about your experience, cost, material availability, similar projects you've completed, and a multitude of other questions on a variety of topics. Designers are encouraged to reach out to the HIP Coordinator or consult the program website to answer any questions that aren't associated with their specific services.

Be prepared to discuss some common topics including:

- Examples of similar projects successfully completed by you or your firm
- The types of people who would be on the project team, and how they work together to serve the client
- Level of design detail a homeowner can expect
- Potential for completing projects that are not HIP-eligible, either in concert with or subsequent to HIP participation (note, this design work is **not** eligible for reimbursement)
- Plant selection preferences and overall aesthetics of the completed project
- Relationships with material suppliers and ability to easily procure the project materials
- Examples of projects that have had design challenges and a description of how you overcame those challenges
- Relationships with HIP-certified or preferred contractors and/or the ability to complete the project under an integrated design/build contract
- Total fee for services, including contingency for changes, amendments, or project management work
- Procedure for billing / invoicing and payment arrangement options

HIP Step 4 — Project Design

The HIP is meant to function in a way that empowers designers to apply pre-approved design details to unique lot layouts. The result is a standard submittal packet that can be modified to fit any number of site-specific considerations and an overall project plan that is personalized to fit the homeowner's aesthetic preferences. The amount of site-specific design necessary to meet HIP permitting requirements varies depending on the complexity of the site and the scope and scale of proposed work. The level of design detail you provide as a professional can also vary depending on your focus and the desires of the homeowner. In the end, all HIP-eligible projects can be designed using the BMP guidelines and resources found in this manual and on the website.

As a HIP designer, you will work directly with the homeowner to complete a project design consisting of HIP-approved BMPs that are feasible for the site. In most cases, you will also need to conduct on-site investigation work prior to, and during, the design of the BMP.

The basic steps to complete a design and HIP project application include:

- Review the feasibility report provided by the HIP Coordinator noting information on soil data, critical areas, utilities, and required setbacks. Ask the HIP Coordinator questions about the information provided in the report as needed.
- Using the information provided in the feasibility report and the design standards and permitting requirements for each BMP provided in Part II of this manual, work with the homeowner and conduct additional onsite investigation to finalize BMP selection and maximize the area treated.
- Use the BMP design tools provided in this manual and the website including: sizing calculators, soil investigation instructions, standard details, and material specifications.
- Complete a HIP submittal packet (project application) using the forms provided in this binder and on the website (you can download blank forms from the website).
- Review the completed submittal packet with the homeowner and work with the HIP Coordinator to answer questions as needed before submitting the final packet.

HIP Step 5 — Review & Approval

Once complete, submit the final HIP project design and application packet to the HIP Coordinator who will review the application to ensure that the design meets HIP requirements and the packet is complete. Once this review is complete and the HIP Coordinator has signed off on the packet, the homeowner or their designated agent/contact submits the application packet to the City for permitting. City permitting staff will confirm that the project complies with HIP streamlined permitting requirements and does not contain work that would require additional permits before issuing a permit. Designers may not have any additional work to do in this step but should be prepared to respond to comments and submit revised plans if needed for permitting. The HIP

Coordinator can assist in this process, primarily by serving as a liaison between the permitting agency, the designer, and the homeowner.

HIP Step 8 ——— Construction

If the homeowner hires a contractor that isn't associated with your business and does not retain you as a project manager, your work does not need to extend into the construction phase. However, businesses that are capable of completing design/build projects for their clients are encouraged to do so. In the same way, we encourage the concept of "integrated design" wherein contractors are included in the design from the first step. However, these are options available to the homeowner and not requirements. The primary role for the designer during construction is in addressing unexpected challenges or facilitating changes in design requested by either the homeowner or the contractor. Plan amendment documents and procedures are outlined Part III of this manual.

Part II:

HIP

Best Management Practices

4 Primary Best Management Practices

Native Landscaping

Infiltration Trench

Media Filter Drain (MFD)

- MFD Sheet Flow Configuration
- MFD End-of-Pipe Configuration
- MFD Clean Beach (shoreline only)

Dispersion

Lake Whatcom Rain Garden

POST Filter System

BMP Introduction

This section of the manual details approved best management practices (BMPs) supported by HIP designed specifically for maximizing phosphorus reduction on residential sites in the Lake Whatcom watershed These BMPs were vetted by a team of professional experts, including engineers, landscape designers/architects, and construction contractors. **If proposed HIP projects follow these prescriptive instructions and guidelines without variation, no additional paperwork, justification, or analysis will be necessary.**

Designers are strongly encouraged to develop HIP projects following the design standards, construction methods, material specifications, and example plans for HIP BMPs provided in this manual. Following the prescriptive instructions and guidelines provided without variation ensures compliance with program reimbursement requirements and pre-approved permits obtained for HIP projects by the City of Bellingham.

Technical Background

Native Landscaping BMP
The HIP-specific Native Landscaping BMP was developed using the best available guidance for watershed-friendly landscaping from Washington State University (WSU). Methodology for landscape design and installation was based on guidance from WSU Whatcom County Extension as well as King County's Native Plant Guide, and modified to minimize phosphorus inputs as required in the Lake Whatcom watershed. Additional input on best practices was provided by the International Society of Arboriculture (ISA) -certified arborists and other landscape professionals convened during the creation of the City of Bellingham's Lake Whatcom development regulations.

The HIP Native Landscaping BMP represents a reduction in requirements compared to non-voluntary conservation planting projects. Allowances for native planting activities outside of the regulated Lake Whatcom watershed work window were developed using erosion control principles found in the Washington State Department of Ecology's (Ecology) Stormwater Management Manual for Western Washington (2019) supplemented with other specific strategies that reduce the risk of phosphorus migration off site.

Infiltration, Treatment & Dispersion BMPs
The Infiltration Trench, Lake Whatcom Rain Garden, Media Filter Drain (MFD), and Dispersion BMPs were developed based on design guidelines and requirements from the Ecology's Stormwater Management Manual for Western Washington (2019), modified slightly for constructability in residential retrofit applications and maximization of phosphorus reduction.

Variations on the MFD BMP were based on the Washington State Department of Transportation's Highway Runoff Manual (2014) and information found in the MFD approval published by Ecology through the Technology Assessment Protocol - Ecology (TAPE) process. The POST filter BMP was modified from the original design guidelines developed by the City of Bellingham and Herrera Environmental Consultants and approved through TAPE in 2022.

Further guidelines on soil testing and rain garden design were derived from the Rain Garden Handbook for Western Washington (2013, updated in 2024) published by Ecology and WSU. Standard details, material specifications, and modifications for constructability and phosphorus reduction were made by a private civil engineering firm retained by the Lake Whatcom Management Program.

BMPs and specifications were reviewed and further refined with input from a private sector technical stakeholders group assembled specifically for HIP in December 2016 and refined additionally as suggested by HIP stakeholders in 2019, 2022, and 2025.

Modifications

Minor modifications to HIP BMP standards that don't result in a change in BMP size, location, or ability to use standard cross sections provided may be submitted for review and approval on a case-by-case basis. Alternative materials or design modifications must be clearly described in the application materials. **These project components are subject to additional conditions and permit review with no guarantee of approval.** Longer review time will be required for projects not conforming to the standards as described in this manual.

Designers with suggestions for new HIP BMPs or significant design modifications to the current primary BMPs are encouraged to share their suggestions with the HIP Coordinator. Any HIP BMP not part of this manual must be vetted internally by staff before HIP funding may be used toward design or construction of that BMP. All new BMPs accepted must meet minimum requirements for phosphorus reduction, cost effectiveness, and maintenance procedures. Demonstrating compliance with these minimum requirements is the responsibility of the professional making the proposal.

Design Standards and Permitting Requirements

Native Landscaping

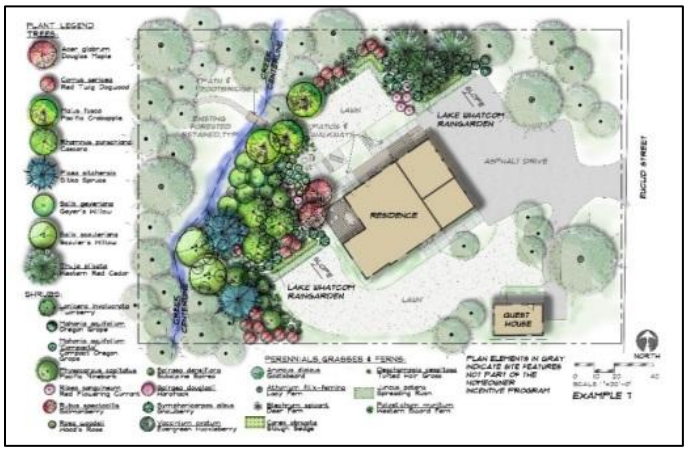
DESCRIPTION

Vegetated areas consisting of a thick mulch layer and a minimum density of plants common to forests of the Pacific Northwest. Native plants are generally defined as those found west of the Cascade Range prior to the arrival of European settlers, along with cultivars of those species and a few regionally-common species that are adapted to our climate.

Above: HIP Native Landscape Installed in 2016

METHOD OF PHOSPHORUS REDUCTION

Native landscaping re-creates the natural soil chemistry and biology found in forested areas. Plants and mulch in the vegetated area capture, neutralize, and recycle phosphorus, turning extra nutrients into healthy plants and soil. Up to 40% of rainfall is captured by plants prior to reaching the ground, resulting in less runoff.



Example of computer-generated native landscaping design

ADDITIONAL DESIGN FEATURES

Enhance your native landscape with one or more of the following site-specific options:

"Wet Garden" where moisture-loving native plants are installed in wet areas and thrive where other plants may struggle.

"Vegetated Berm" where strategically-placed soil piles are used to create visual complexity in the design.

"Riparian Buffer" a native plant garden that separates outdoor living spaces from streams, creeks, or shorelines.

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All Native Landscaping projects must meet these minimum requirements in order to be approved for construction under these HIP Standards:

DESIGN

- At least 4" of low-P mulch throughout
- Minimum density of plants (use plant density calculator) divided between at least two layers (trees, shrubs, and groundcover)
- At least 90% of plants must be native to the Pacific Northwest, based on USDA PLANTS Database or equivalent*

LOCATION

- No trees or shrubs within 5' of a known utility on private property or within 10' of a known utility in the public rights-of-way.
- No trees on or adjacent to septic tanks, drainfields, and reserve areas
- Planting area is not on or next to a slope >35%

CONSTRUCTION METHOD/ CRITICAL PATH

1. Define planting area. If desired, install edging material or a hand-dug trench around the perimeter to keep new mulch in place. Digging trenches is limited to summer months only.
2. Recommended: Place a single layer of cardboard over all flat, lawn-covered areas, leaving existing lawn in place. Cardboard is not recommended on slopes or landscaped areas without an existing lawn.
3. Install mulch to a depth of 4" on flat areas or 6" on sloped areas
4. Prepare hole for planting. Push mulch away. Cut an "X" in the cardboard (if any) and fold it back, exposing the ground below. Dig a hole as deep as the root mass and twice as wide.
5. Install plants. Remove potting media from the roots. Spread roots out and backfill gently with native soil.
6. Replace mulch to within 6" of plant stems.
7. Optional: Install irrigation system and rain barrels.
8. Water plants well.
9. Optional: Install temporary deer fencing.
10. Sweep any impervious surfaces that may have been dirtied by mulch or soil

NOTES ON SEQUENCING

- Construction step order may be adjusted to meet individual project needs.
- To phase the work, mulch first in the spring or summer then plant during the fall.
- If planting and mulching at the same time, during the summer months, plant first then immediately mulch. In winter, mulch must be spread first before planting is allowed.

NATIVE LANDSCAPING ON THE SHORELINE

Installing native landscaping along the Lake Whatcom shoreline is an effective way to reduce direct phosphorus runoff into the lake and provides an opportunity to create pleasing landscapes combined with other HIP BMPs and existing landscape features. When working on a native landscaping project next to the shoreline, make sure to:

- Assess soil conditions prior to plant selection and select appropriate native plants for the conditions. Many shoreline areas are affected by a high water table.
- Identify the high water mark and install a barrier like a straw wattle above it prior to starting work.
- Take extra care to keep exposed soil and sediment from coming into contact with water.

Design Submittal

Native Landscaping

Section I: System and Sizing Summary

☐	I have defined the area that will be converted into native landscaping and have provided a site map showing the planting area.
	Native landscaping will replace _____ ft² of lawn/existing landscape and/or _____ ft² of impervious surface
☐	If any of my planting is in the public right-of-way, I have received written approval from the jurisdiction that manages the public area (City or County).
	The size of the area of the Right-of-Way I plan to landscape is _____ft²
☐	I have selected a vegetation layer combination for each unique planting area (e.g., right-of-way area, front yard, back yard, etc...) and used the HIP plant density calculator to calculate the number of plants and yards of mulch required for each planting area.
	The total combined quantities for <u>all</u> of my planting areas are: _____ cubic yards of approved mulch, _____ trees, _____ shrubs, and _____ groundcovers.

Section II: Site-Specific Planning

☐	I have determined that I will not be planting trees or shrubs within 5' of a known utility, including septic systems (on private property) or 10' from a utility (in public ROW).
☐	I have determined that I will not need additional approvals for planting trees in the public right-of-way (if proposed, tree planting in ROW is not required).
☐	I have determined that the planting area is not on or next to a slope steeper than 35%.
☐	I have developed a plan to prevent erosion or runoff during my planting activities, including work during the wet season that complies with winter work provisions.

Plant Density Calculator

Native Landscaping

Instructions: Select one of the options listed below for each unique planting area and calculate the minimum required planting density and mulch. Note that existing plants may be counted to meet required plant density numbers.

Option	Vegetation Layer Combination	Plant Layer	Project area (sq ft)	Density Divider	Number of Plants
A	Tree, Shrub, and Groundcover	Trees	÷	225 (15' o.c.*)	=
		Shrubs	÷	64 (8' o.c.)	=
		Groundcovers	÷	25 (5' o.c.)	=
B	Tree and Shrub Only (No Groundcovers)	Trees	÷	144 (12' o.c.)	=
		Shrubs	÷	36 (6' o.c.)	=
C	Tree and Groundcover Only (No Shrub)	Trees	÷	144 (12' o.c.)	=
		Groundcovers	÷	16 (4' o.c.)	=
D	Shrub and Groundcover Only (No Tree)	Shrubs	÷	49 (7' o.c.)	=
		Groundcovers	÷	25 (5' o.c.)	=
Cubic Yards of Mulch			÷	80	=

*The abbreviation "o.c." stands for "on center", a convention used to describe the average distance between plants. For example, a tree that is planted 15' o.c. would be, on average, 15' from its nearest neighbor.

Plant List

Instructions: submit a list of native plants proposed for the project categorized by tree, shrub, and groundcover. List plant name (scientific preferred) and quantity. Include number of existing plants used to meet plant density requirements. Identify non-natives and cultivars and limit to no more than 10% of total plants.

Design Standards and Permitting Requirements

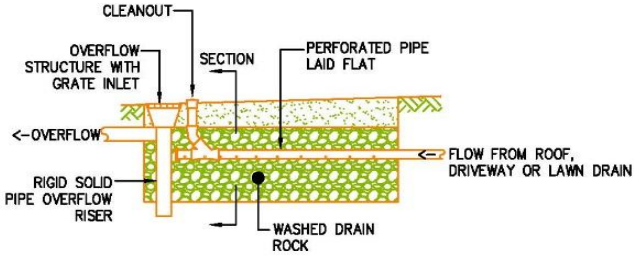
Infiltration Trench

DESCRIPTION

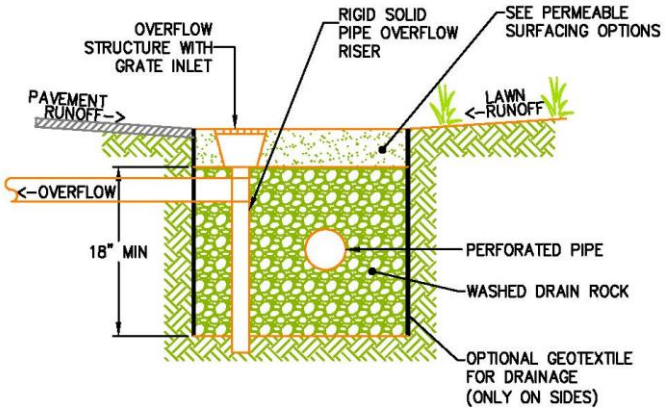
An underground drainage facility, consisting of washed rock and constructed with a flat bottom, intended to capture and infiltrate runoff from impervious and pervious surfaces. This facility does not have an underdrain or bypass structure, so it requires a dedicated and protected overflow structure.

METHOD OF PHOSPHORUS REDUCTION

Treatment via infiltration through native soils. Runoff entering the infiltration trench is detained and allowed to slowly pass through subsoils, where phosphorus is bound by, captured within, and recycled into the soil matrix.



PROFILE VIEW



SECTION VIEW

Above: HIP infiltration trench installed in 2016

ADDITIONAL DESIGN FEATURES

Enhance your infiltration trench with one or more of the following site-specific options:

"Dry Creek Bed" where river rock creates the look of a stream channel in the landscape.

"Patio Drywell" where spaced pavers* with gaps create a useable outdoor living space.

"Walkway Trench" where pea gravel or spaced pavers* create durable pathways.

"Garden Path" where low-P mulch provides a way to access and enjoy the landscape (only allowed through landscaped areas).

* See Design Standards for HIP Permeable Pavement Surfacing. Restrictions and limitations apply to certain properties.

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All infiltration trench projects must meet these minimum requirements in order to be approved for construction under these HIP Standards:

DESIGN

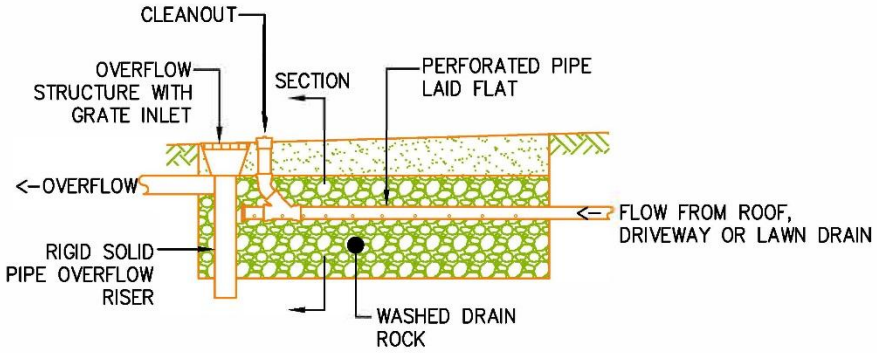
- At least 18" wide in all locations
- At least 18" deep, on average
- Total slope of trench less than 2%
- Bottom of trench more than 1' from groundwater or bedrock
- Only clean rock (no fines) is allowed in any layer

LOCATION

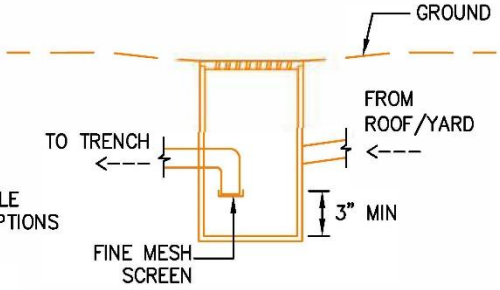
- **Critical Areas:** setback requirements near critical areas (wetlands, shorelines, or creeks) and their buffers will vary depending on site specifics. Consult with the HIP Coordinator for requirements pertaining to each unique site.
- **Slopes:** unless approved by a licensed geotechnical engineer, trenches cannot be placed on slopes >10% and must be at least 10' upgradient from slopes >15% and 50' upgradient from slopes steeper than 35%.
- **Separation:** at a minimum, all infiltration facilities must be at least: 25' from shorelines or creeks, 5' from known public and private utilities, 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space. Septic tanks must be protected by placing the trench at least 5' from tanks, and 10' upgradient and 30' downgradient from drain fields and drain field reserve areas.
- **Property Lines:** trenches cannot be located in public rights-of-way and should be placed at least 10' from neighboring property lines except in some specific cases. Consult with the HIP Coordinator to determine site-specific setback requirements.

CONSTRUCTION METHOD/ CRITICAL PATH

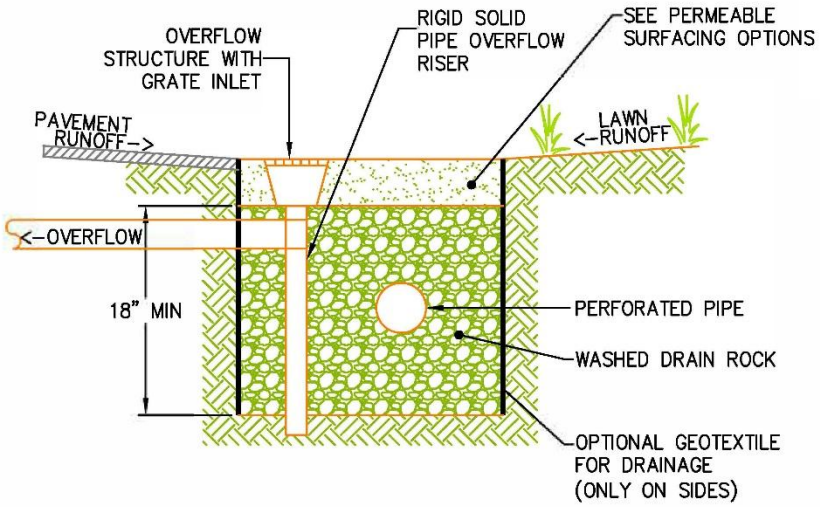
1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Gently scarify subgrade
4. Install 75% base rock in first lift
5. Install elevated distribution pipe
6. Install overflow riser and pipe
7. Connect overflow pipe to downstream drainage system
8. Install drains and conveyance into trench from site surfaces
9. Connect conveyance to distribution pipe
10. Install second lift of rock (25%) to reach final grade
11. Install surfacing (optional)
12. Stabilize disturbed soils
13. Remove erosion controls



PROFILE VIEW



JUNCTION BOX



SECTION VIEW

ROCK-FILLED INFILTRATION TRENCH

HIP BMP "B" TYPICAL NTS

Construction Criteria for Infiltration Facilities

Initial basin excavation should be conducted to within 1-foot of the final elevation of the basin floor. Excavate infiltration trenches and basins to final grade only after all disturbed areas in the upgradient project drainage area have been permanently stabilized. The final phase of excavation should remove all accumulation of silt in the infiltration facility before putting it in service. After construction is completed, prevent sediment from entering the infiltration facility by first conveying the runoff water through an appropriate pretreatment system such as a pre-settling basin, wet pond, or sand filter.

Infiltration facilities should generally not be used as temporary sediment traps during construction. If an infiltration facility is to be used as a sediment trap, it must not be excavated to final grade until after the upgradient drainage area has been stabilized. Any accumulation of silt in the basin must be removed before putting it in service.

Traffic Control Relatively light-tracked equipment is recommended for this operation to avoid compaction of the basin floor. The use of draglines and trackhoes should be considered for constructing infiltration basins. The infiltration area should be flagged or marked to keep heavy equipment away.

Design Submittal
Infiltration Trench

Section I: System and Sizing Summary

☐	I have defined the area that will drain into the infiltration trench, by piping or sheet flow and have provided a site plan and facility cross-section.
	The drainage area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have sized the trench using approved methodology (HIP Sizing Calculator or stormwater hydrological modeling software) and attached that data.
	The trench will be at least _____ft² in size and at least 1.5' (18 inches) deep.
☐	I have calculated the amount of rock needed to fill the trench (cubic feet of trench volume ÷ 27).
	I will need to install at least _____ yd³ of drain rock.

Section II: Site-Specific Planning

☐	I have determined that the trench is at least 5' from known public and private utilities.
☐	I have determined that the trench is at least 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space.
☐	If any portion of my trench is within 10' of a neighboring property, I have received written approval to proceed from that neighboring property owner.
☐	I have determined that the trench is not on a slope steeper than 10% and not within 10' upgradient of a slope steeper than 15% and not within 50' upgradient of a slope steeper than 35%.
☐	I have developed an erosion control plan for the excavation of the trench and completed a site-specific SWPPP that is included with this application.

Soil Characterization Sheet

Step 1. Review available soil data and recommend on-site soil testing

To be completed by HIP Coordinator

Off-site test pit data. Review map provided by HIP. If one test pit is within 100' of any property line, list only that data. Otherwise, please list three representative test pits, preferably within ¼ mile of the site.

Test Pit Number	Soil Type/ Infiltration Rate	Depth to Groundwater	Depth to Bedrock

Based on this information, the recommended soil investigation procedure to follow in Step 2 is (determined by HIP Coordinator):

Step 2. On-site testing procedure to determine soil type

To be completed by HIP Coordinator or the project designer

Follow the soil testing methods and instructions for infiltration BMPs, found in the HIP Design Manual (Infiltration Trench and Lake Whatcom Rain Garden).

Note: If designing for infiltration facilities in multiple locations, it is suggested that each location be checked for factors that might affect design considerations. Consult with the HIP Coordinator to determine the number of additional investigations recommended for each unique site.

I completed an on-site soil investigation using (check boxes of all completed tests):

☐ Soil Drainage Test

I used the Rain Garden Manual

After one wet season (or three dry season) tests I have determined that my soil drainage rate is _____in/hr.

I've characterized my soil as:

- ☐ Good
- ☐ Moderate
- ☐ Marginal
- ☐ Poor

☐ Simple Investigation

I dug to a depth of 3' below ground surface and found:

- ☐ Groundwater
- ☐ Bedrock
- ☐ Other: _____
  _____
  _____
- ☐ None of the above

☐ Soil Texture Test

I used this test method to determine soil type (circle one):

Clay	Clayey Silt
Silt/Loam	Sandy Loam/Sand

I've characterized my soil as:

- ☐ Good
- ☐ Moderate
- ☐ Marginal
- ☐ Poor

"SOIL DRAINAGE TEST" INSTRUCTIONS

Modified for HIP from procedures found in the Rain Garden Handbook for Western Washington Homeowners

After identifying the location of a potential infiltration system (HIP Infiltration Trench BMP or HIP Lake Whatcom Rain Garden BMP), the next step is to test the soil in that location. You will be evaluating the "infiltration rate", defined as the amount of time it takes water to soak into the ground. Determining an infiltration rate will allow you to use the HIP Standard Calculator to size the system for maximum water quality benefit and free permits through HIP.

1 LOCATE UTILITIES

Call 8-1-1 and mark with white paint the location of your proposed test hole or other potential underground features. The Call-Before-You-Dig professionals will arrive, from the various utilities, over the next week or so to mark the location of public utilities on your property.

Make sure you identify any potential private utilities (such as septic system drain fields and/or private electrical conduit) that would not be part of the public utility marking. You may need to do shallow, careful, excavations (pot-holing) to confirm some utilities.

2 DIG TEST HOLE

Dig a small hole at least 2 feet deep and at least 18 inches in diameter.

3 DETERMINE DRAINAGE RATE

Fill the hole with 12 inches of water. Secure a yard stick or a self-made gauge in the hole for measuring the drainage rate. The self-made gauge can be a board or pipe with markings every half inch from the bottom.

Time how long it takes for the water to drain out completely. By the way, this can take a while, so start in the morning and check back regularly throughout the day. If there is still water in the hole after 12 hours, record how many inches have gone down since you started the test. Divide total inches by total hours to calculate the soil drainage rate.

4 REPEAT IN DRY SEASON

If it's the wet season (December through April), do this soil drainage test once. If you must test during the dry season, do the test three times (with each test performed immediately after completion of the last). Use the third test as your drainage rate (measured in inches per hour). Testing three times during the dry season provides a better estimate of wetter conditions present in the winter when the system is doing the most work.

5 CHARACTERIZE YOUR SOIL

- If your calculated drainage rate is greater than two inches per hour (2"/hr), **use the "good" designation** on the soil characterization sheet in the design packet. This soil is likely sand.
- If your calculated drainage rate is between a half-inch per hour (1/2"/hr) and two inches per hour (2"/hr), **use the "moderate" designation** on the soil characterization sheet in the design packet. This soil is likely silty sand.
- If your calculated drainage rate is between an eighth-inch per hour (1/8"/hr) and a half-inch per hour (1/2"/hr), **use the "marginal" designation** on the soil characterization sheet in the design packet. This soil is likely a silt or loamy material.
- If your calculated drainage rate is less than an eighth-inch per hour (1/8"/hr), **use the "poor" designation** on the soil characterization sheet in the design packet. This soil is likely clay.

"SIMPLE INVESTIGATION TEST" INSTRUCTIONS

Modified for HIP from procedures found in the Rain Garden Handbook for Western Washington Homeowners

Avoid locating your infiltration system in an area with high groundwater or shallow bedrock by performing a simple investigation test. It's best to figure out the groundwater level during the rainy winter months, December through April, and you can search for bedrock at the same time.

1 LOCATE UTILITIES

Call 8-1-1 and mark with white paint the location of your proposed test hole or other potential underground features. The Call-Before-You-Dig professionals will arrive, from the various utilities, over the next week or so to mark the location of public utilities on your property.

Make sure you identify any potential private utilities (such as septic system drain fields and/or private electrical conduit) that would not be part of the public utility marking. You may need to do shallow, careful, excavations (pot-holing) to confirm some utilities.

2 DIG INVESTIGATION HOLE

Dig down 36 inches below the ground surface, if possible. You can use a post-hole digger or hand operated auger to reach the desired depth.

If you are digging in groundwater (i.e. the hole is filling with water faster than you can remove it) or hitting rock that prohibits any additional digging, you can stop the test as this location is not conducive to infiltration.

3 LOOK INTO THE HOLE

If you see water seeping in from the bottom or sides, or hit an impenetrable layer of rock or clay, find another location for your infiltration facility or choose a treatment BMP (such as the HIP Media Filter Drain or Dispersion BMPs).

"SOIL TEXTURE TEST" INSTRUCTIONS

Modified for HIP from procedures found in the Rain Garden Handbook for Western Washington Homeowners

Avoid locating your infiltration system in an area with high groundwater or shallow bedrock by performing a simple investigation test. It's best to figure out the groundwater level during the rainy winter months, December through April, and you can search for bedrock at the same time.

1 LOCATE UTILITIES

Call 8-1-1 and mark with white paint the location of your proposed test hole or other potential underground features. The Call-Before-You-Dig professionals will arrive, from the various utilities, over the next week or so to mark the location of public utilities on your property.

Make sure you identify any potential private utilities (such as septic system drain fields and/or private electrical conduit) that would not be part of the public utility marking. You may need to do shallow, careful, excavations (pot-holing) to confirm some utilities.

2 DIG TEST HOLE

Dig a small hole at least 18 inches deep and at least 6 inches in diameter. A post-hole digger or small hand auger is the perfect tool for this job.

3 EVALUATE SOIL TEXTURE

When you reach a depth of at least 18", take a scoop of soil from the bottom of the hole and use the procedure below to characterize its soil type.

Prepare the soil: put some soil in the palm of your hand and try to squeeze it into a ball. If the soil is dry, add water a few drops at a time, break down the chunks to work the water into the soil, and then perform the soil texture test.

Characterize the soil texture:

- If the soil is light in color, feels gritty, and will not stick together at all when wet **use the "good" designation** on the soil characterization sheet in the design packet. This soil is likely sand.
- If the soil is dark in color, feels gritty, and falls apart easily when worked, **use the "moderate" designation** on the soil characterization sheet in the design packet. This soil is likely silty sand.
- If the soil feels smooth, and breaks apart into chunks when worked but stays together in a ball when held, **use the "marginal" designation** on the soil characterization sheet in the design packet. This soil is likely a silt or loamy material.

- If the soil is very sticky and forms a dense ball that can't be easily broken apart, **use the "poor" designation** on the soil characterization sheet in the design packet. This soil is likely clay.

Sizing Calculator
Infiltration Trench

Sizing Calculator: input soil characterization data into the table below to calculate the size of the facility.

Instructions: using the soil type identified on the Soil Characterization Sheet measure the amount of hard surface (roof, pavement, gravel) in square feet and amount of lawn and/or landscape area in square feet and insert values into table below. Use multipliers below to calculate required trench area.

Soil Type	Hard Surface (square feet)	Hard Surface Multiplier	Lawn/Landscape (square feet)	Lawn/LS Multiplier	Trench Minimum (square feet)
Good	[	0.06]	[	0.02]	
Moderate	[	0.09]	[	0.04]	
Marginal	[	0.12]	[	0.06]	
Poor	Infiltration Not Recommended. Use Media Filter Drain or Dispersion BMPs.				

Design Standards and Permitting Requirements

Media Filter Drain (MFD)

DESCRIPTION

An underground drainage facility, consisting of specially-mixed media (MFD mix), intended to treat runoff from hard surfaces and lawn and landscaped areas. Configurations are slightly different depending on how runoff enters the facility (via pipe or sheet flow). This facility does have an underdrain and requires either a controlled bypass structure or an overflow to function properly.

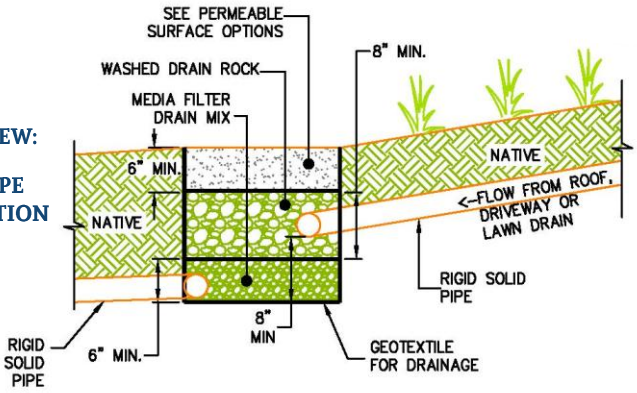
METHOD OF PHOSPHORUS REDUCTION

Treatment via media (MFD mix). Runoff entering the facility passes through the media, where perlite, dolomite, and gypsum provide physical, chemical, and biological treatment for total and dissolved phosphorus.

Above: useful yard space on top of a MFD

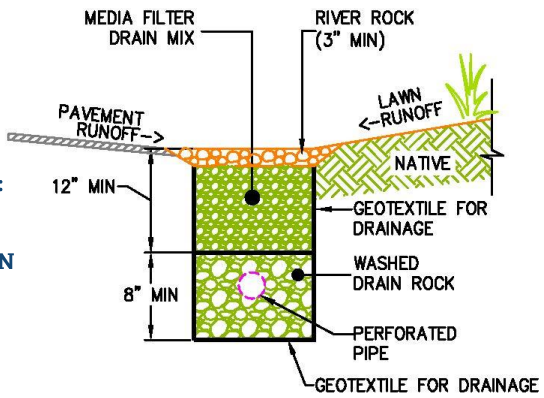
SECTION VIEW:

END-OF-PIPE CONFIGURATION



SECTION VIEW:

SHEET FLOW CONFIGURATION



ADDITIONAL DESIGN FEATURES

Enhance the look of your MFD with one or more of the following site-specific options:

"Patio MFD" where spaced pavers* with gaps create a useable outdoor living space.

"Sidewalk MFD" where pea gravel or spaced pavers* create durable pathways.

* See Design Standards for HIP Permeable Pavement Surfacing. Restrictions and limitations apply to certain properties

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All Media Filter Drain projects must meet these minimum requirements in order to be approved for construction under these HIP Standards:

DESIGN

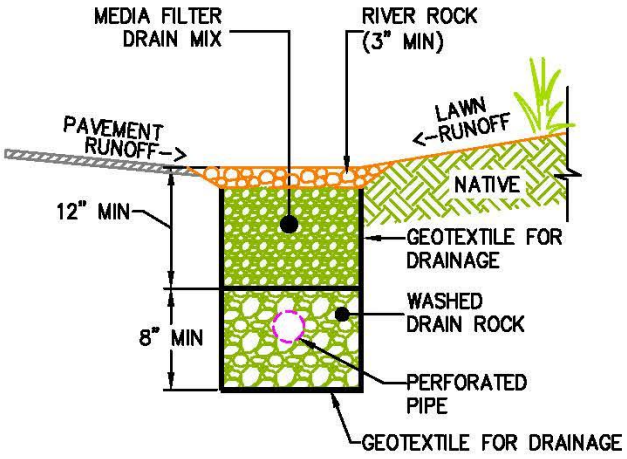
- For MFD trenches accepting sheet flow, trench must be at least 24" wide in all locations
- MFD mix at least 12" deep throughout (sheet flow design)
- For MFD trenches accepting piped flow, the trench must be at least 36" wide in all locations
- MFD mix at least 6" deep throughout (end-of-pipe design)
- Total slope of trench less than 2%
- No single trench longer than 50', use multiple trenches
- Bottom of MFD mix cannot contact groundwater

LOCATION

- **Critical Areas:** setback requirements near critical areas (wetlands, shorelines, or creeks) and their buffers will vary depending on site specifics. Consult with the HIP Coordinator for requirements pertaining to each unique site.
- **Slopes:** unless approved by a licensed geotechnical engineer, MFDs cannot be placed on slopes >10% and must be at least 10' upgradient from slopes >15% and 50' upgradient from slopes steeper than 35%
- **Separation:** at a minimum, all MFDs must be at least: 25' from shorelines or creeks (distance may be reduced if soil investigation demonstrates feasibility; check with HIP Coordinator), 5' from known public and private utilities, 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space. Septic tanks must be protected by placing the trench at least 5' from tanks and 10' upgradient and 30' downgradient from drain fields and drain field reserve areas
- **Property Lines:** MFDs cannot be located in public rights-of-way and should be placed at least 10' from neighboring property lines except in some specific cases. Consult with the HIP Coordinator to determine site-specific setback requirements.

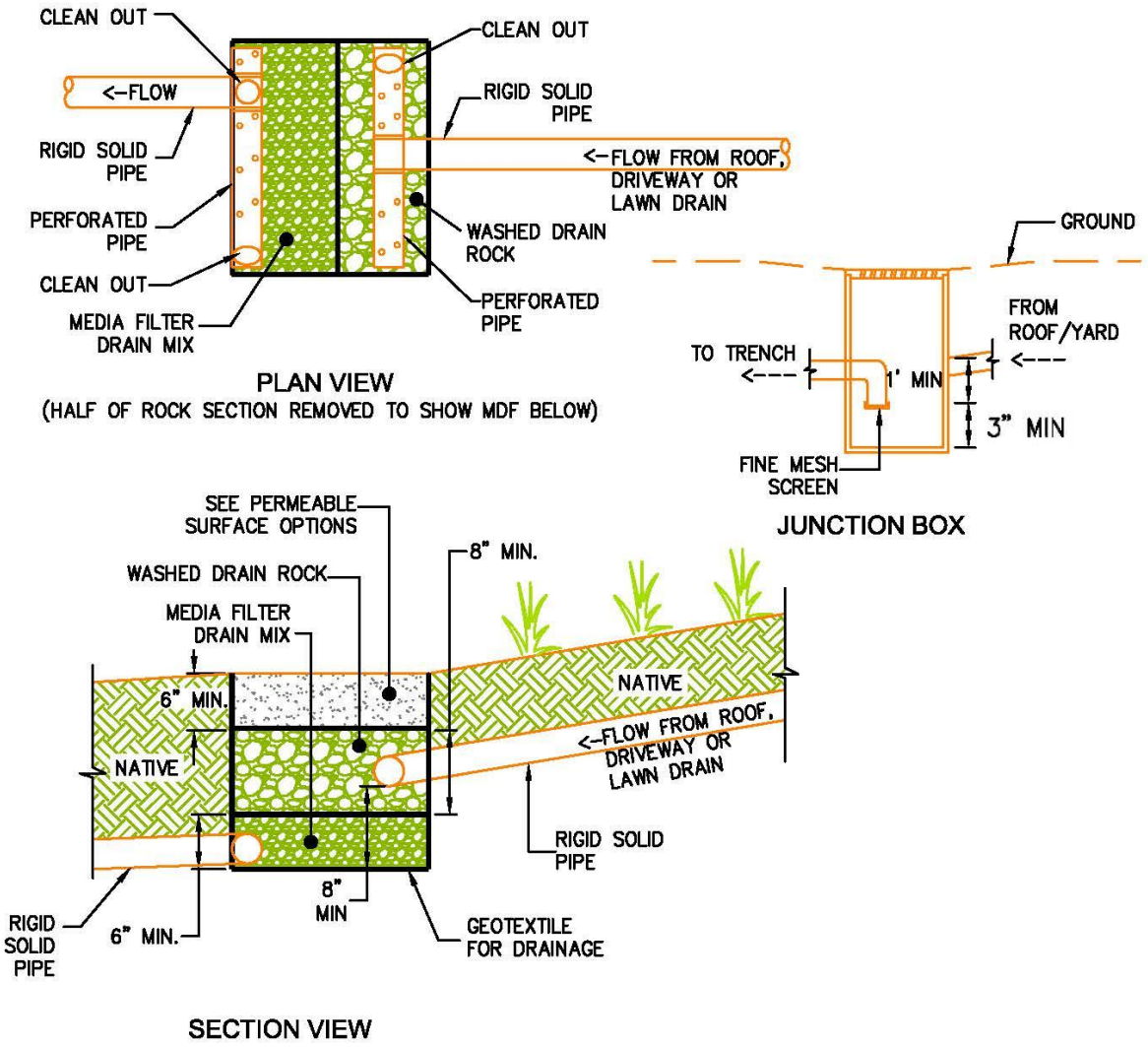
CONSTRUCTION METHOD/ CRITICAL PATH

1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Lay fabric in trench and pin to edge
4. Install bottom layer* of material to bed underdrain pipe
5. Install underdrain pipe and stub out
6. Fold fabric over bottom layer
7. Place fabric over remaining trench
8. Install second layer* of material in 6" lifts over fabric
9. Install dispersion inlet (runnel with grade board or perforated pipe)
10. Fold fabric over second layer, cut to fit.
11. Connect underdrain pipe to downstream drainage system
12. Install conveyance to dispersion inlet
13. Connect roof/driveway/yard drains to conveyance
14. Install surfacing (optional)
15. Stabilize disturbed soils
16. Remove erosion controls



SECTION VIEW

MEDIA FILTER DRAIN ; SHEET FLOW CONFIGURATION
HIP BMP "C.1", TYPICAL NTS



MEDIA FILTER DRAIN END-OF-PIPE CONFIGURATION
HIP BMP "C.2", TYPICAL NTS

Design Standards and Permitting Requirements

Media Filter Drain (MFD) - Clean Beach

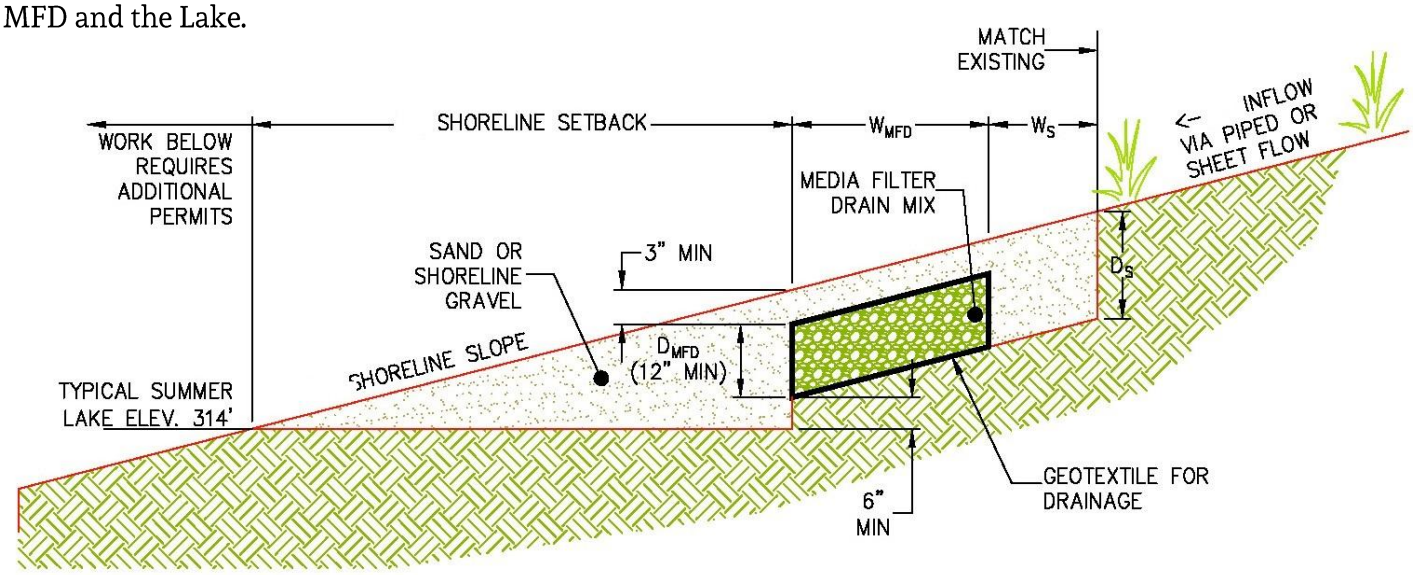
DESCRIPTION

An underground drainage facility, consisting of specially-mixed media (MFD mix), intended to treat runoff from hard surfaces and lawn and landscaped areas. Along the shoreline, MFDs can be coupled with a beach made of treatment sand and native landscaping to enhance the performance of the system. This facility does not require an underdrain or structural overflow because excess water will flow into the sand filter beach. Runoff enters the facility via pipe or sheet flow per to "HIP BMP C.1 and C.2". Projects within Whatcom County must be designed per 30% Clean Beach requirements (see below). Projects within the City of Bellingham can utilize up to 100% clean beach along the shoreline.

Above: Bloedel Donovan Beach MFD

METHOD OF PHOSPHORUS REDUCTION

Treatment via media (MFD mix). Runoff entering the facility passes through the media and sand layers, where perlite, dolomite, and gypsum provide physical, chemical, and biological treatment for total and dissolved phosphorus. Excess runoff is treated by sand between the MFD and the Lake.



Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All Clean Beach projects must meet the following minimum requirements in order to be approved for construction under these HIP Standards:

DESIGN

- For MFD trenches accepting sheet flow, the trench must be at least 24" wide in all locations
- For MFD trenches accepting piped flow, the trench must be at least 36" wide in all locations
- MFD mix at least 12" deep throughout
- Total slope of trench less than 2%
- No single trench longer than 50', use multiple trenches
- Bottom of MFD mix cannot contact groundwater
- Any non-lawn vegetation along the shoreline must be retained or replaced 3:1 elsewhere on site (see additional requirements if designing a 30% clean beach)
- Permeable surfacing is not permittable in a clean beach design

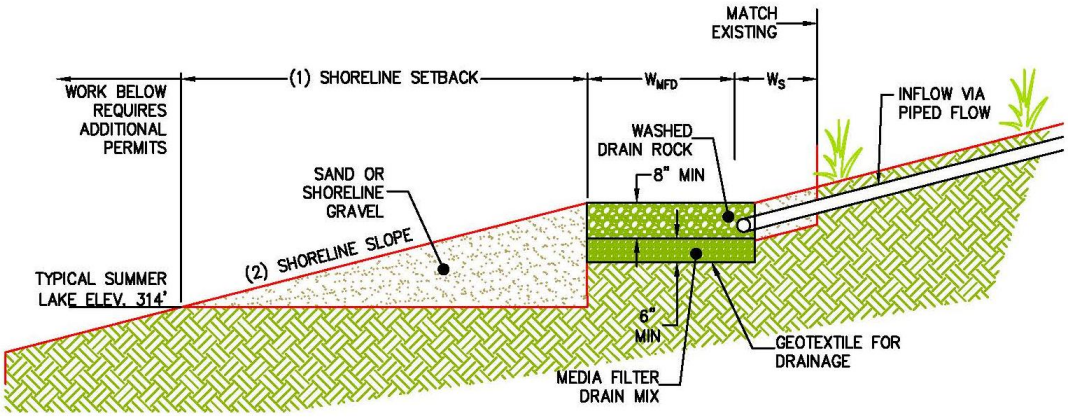
LOCATION

Conformance with MFD Standards: Clean beach MFD trenches must adhere to the minimum requirements for Critical Areas, Slopes, Separation, and Property Lines described in the HIP Standards for Media Filter Drains. Unless recommended by the HIP Coordinator, Clean Beach MFD trenches must be located at least 25' from the Lake Whatcom ordinary high water mark (OHWM). Placing MFD trenches closer to the shoreline (15' minimum setback) may be possible on some sites if soil investigations demonstrate feasibility.

CONSTRUCTION METHOD/ CRITICAL PATH

1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Place non-woven geotextile (for drainage) onto subgrade
4. Install MFD mix in 6" lifts
5. Pull geotextile edges up and around MFD material, creating a MFD "burrito"
6. Backfill clean sand around and over MFD burrito and match to grade
7. Place drain rock layer and distribution piping*
8. Install conveyance to dispersion inlet*
9. Connect roof/driveway/yard drains to conveyance*
10. Stabilize disturbed soils
11. Remove erosion controls

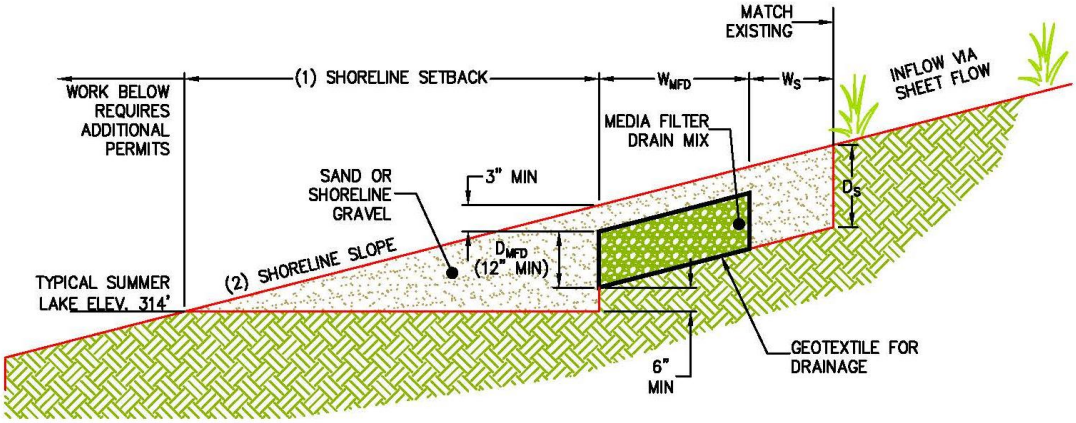
*Additional steps for end-of-pipe configuration



MEDIA FILTER DRAIN - CLEAN BEACH CONFIGURATION — SECTION VIEW
HIP BMP "C.3" TYPICAL END OF PIPE — NTS

(1) 25' RECOMMENDED SHORELINE SETBACK. MAYBE REDUCED TO 15' IF SOIL INVESTIGATION DEMONSTRATES BOTTOM OF MFD IS ABOVE HIGH GROUNDWATER ELEVATION.

(2) MATCH EXISTING SLOPE TO GREATEST EXTENT FEASIBLE RECOMMENDED MAXIMUM SLOPE IS 7:1 (4:1 SLOPE MAY BE STABLE ON CERTAIN SITES).



MEDIA FILTER DRAIN - CLEAN BEACH CONFIGURATION — SECTION VIEW
HIP BMP "C.3" TYPICAL — NTS

(1) 25' RECOMMENDED SHORELINE SETBACK. MAYBE REDUCED TO 15' IF SOIL INVESTIGATION DEMONSTRATES BOTTOM OF MFD IS ABOVE HIGH GROUNDWATER ELEVATION

(2) MATCH EXISTING SLOPE TO GREATEST EXTENT FEASIBLE. RECOMMENDED MAXIMUM SLOPE IS 7:1. 4:1 SLOPE MAYBE BE STABLE ON CERTAIN SITES

Design Submittal
Media Filter Drain System

Section I: System and Sizing Summary

☐	I have provided a site plan and facility cross-section.
☐	I have defined the area that will drain into the MFD by piping.
	That area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have defined the area that will drain into the MFD by sheet flow.
	That area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have sized the MFD using approved methodology (HIP Sizing Calculator or stormwater hydrological modeling software) and attached that data.
	My trench will need to be at least _____ feet wide and_____ ft² in filter area

Section II: Site-Specific Planning

☐	I have determined that the MFD is at least 5' from known public and private utilities.
☐	I have determined that the MFD is at least 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space.
☐	I have determined that the MFD is not on or next to a slope steeper than 15% and not within 50' upgradient of a slope steeper than 35%.
☐	I have developed an erosion control plan for the excavation of the trench and completed a site-specific SWPPP that is included with this application.

Sizing Calculator

Media Filter Drain System

Instructions: Measure hard surface area and lawn/landscaping surface area draining to trench. Characterize flow as sheet flow or piped flow. Insert values in the table below and use the following formula to calculate the size of MFD trench that is needed to adequately manage the runoff directed to the system. Sheet flow trenches must be at least 2' wide while piped flow trenches must be at least 3' wide in order for this calculation to be applicable. Runoff from a pipe that crosses at least 25' of lawn or landscape before reaching the trench can be considered sheet flow.

Drainage Type	Hard Surface (square feet)	Hard Surface Multiplier		Lawn/Landscape (square feet)	Lawn/LS Multiplier		Minimum Trench Area (square feet)
Sheet Flow	[	0.03]	+	[	0.01]	=	
Piped Flow	[	0.04]	+	[	0.01]	=	
Total area of trench needed (add trench areas above):							

Design Standards and Permitting Requirements

Dispersion

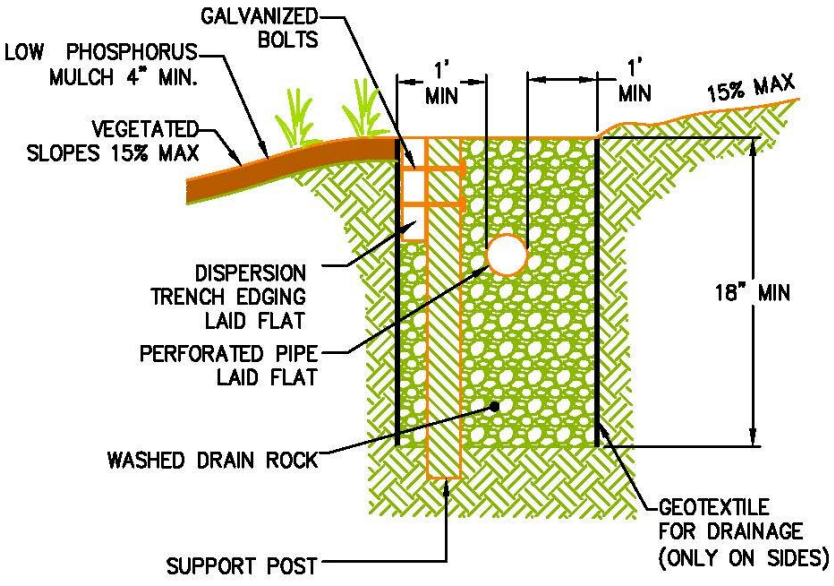
DESCRIPTION

A surface drainage facility, consisting of washed rock and constructed with a flat bottom, intended to convert concentrated flows into sheet flows for dispersion into existing or newly established vegetated areas. This facility does not have underdrain, bypass, or overflow structures.

Above: Dispersion system uses nearby forested area

METHOD OF PHOSPHORUS REDUCTION

Treatment via dispersion into native forested areas. Runoff entering the rock trench is spread evenly throughout the trench and then overflows evenly into the vegetated area. Plants and mulch in the vegetated area capture, neutralize, and recycle phosphorus into healthy plants and soil.



SECTION VIEW

ADDITIONAL DESIGN FEATURES

Enhance your dispersion system with one or more of the following site-specific options:

"Dry Creek Bed" where river rock creates the look of a stream channel in the landscape.

"Dispersion Walkway" where pea gravel creates durable pathways.

"Garden Path" where low-P mulch provides a way to access and enjoy the landscape (only allowed through landscaped areas).

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All dispersion projects must meet these minimum requirements in order to be approved for construction under these HIP Standards:

DESIGN

- At least 24" wide in all locations
- Rock at least 18" deep
- Total slope of trench less than 2%
- Bottom of trench cannot contact groundwater
- No single trench longer than 50', use multiple trenches.
- Vegetated flow path is long enough to absorb all dispersed runoff[1]
- Plant density in flow path meets minimum requirements[2]

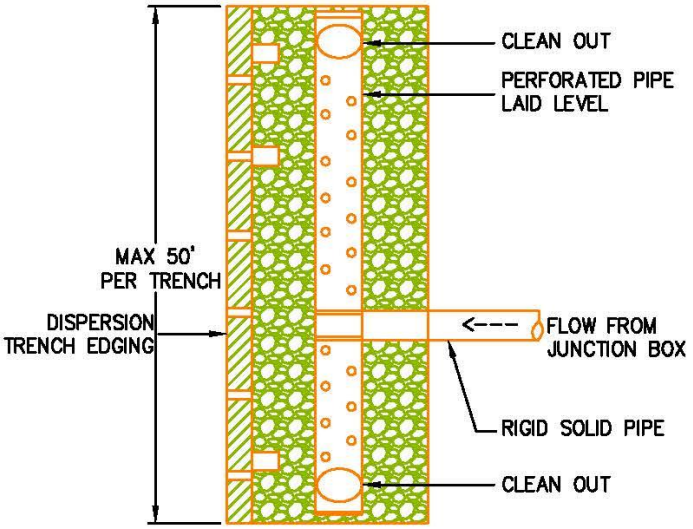
[1] use Dispersion Calculator to determine required flow path
[2] use the Native Landscaping BMP to create a new vegetated flow path

LOCATION

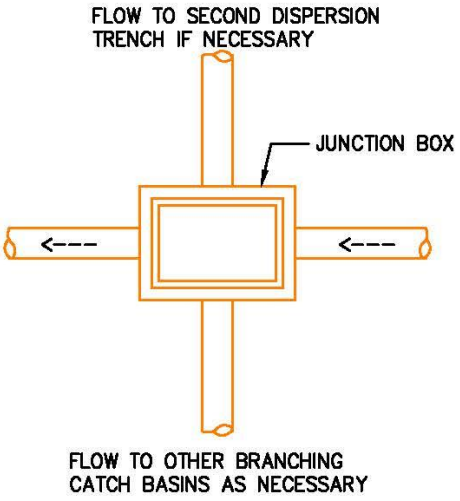
- **Critical Areas:** setback requirements near critical areas (wetlands, shorelines, or creeks) and their buffers will vary depending on site specifics. Consult with the HIP Coordinator for requirements pertaining to each unique site.
- **Slopes:** unless approved by a licensed geotechnical engineer, trenches cannot be placed on slopes >15% and must be at least 50' upgradient from slopes steeper than 35%
- **Separation:** at a minimum, all dispersion facilities must be at least: 25' from shorelines or creeks (distance is greater when critical areas are present), 5' from known public and private utilities, 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space. Septic tanks must be protected by placing the trench at least 5' from tanks, and 10' upgradient and 30' downgradient from drain fields and drain field reserve areas
- **Property Lines:** trenches cannot be located in public rights-of-way and dispersed water should not cross property lines. Consult with the HIP Coordinator to determine site-specific setback requirements.

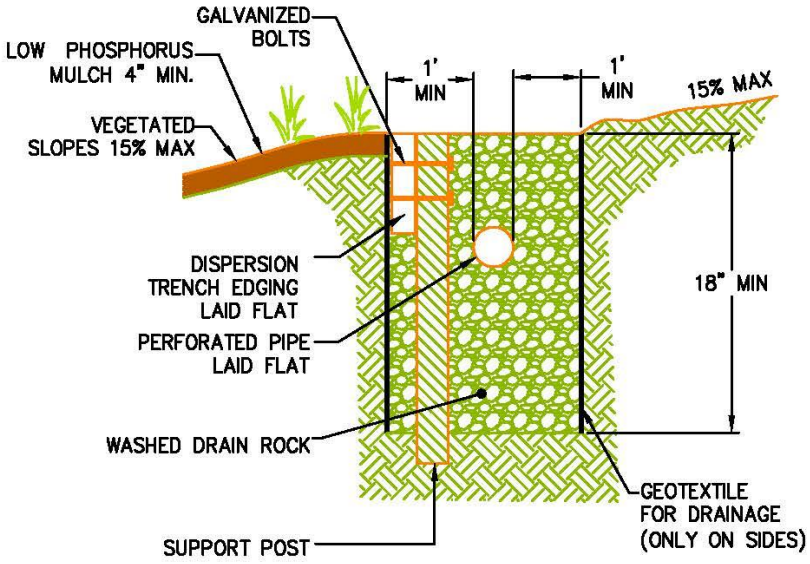
CONSTRUCTION METHOD/ CRITICAL PATH

1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Gently scarify subgrade
4. Install 75% base rock in first lift
5. Install elevated distribution pipe
6. Install drains and conveyance into trench from site surfaces
7. Connect conveyance to distribution pipe
8. Install second lift of rock (25%) to reach final grade
9. Install surfacing (optional)
10. Stabilize disturbed soils
11. Remove erosion controls

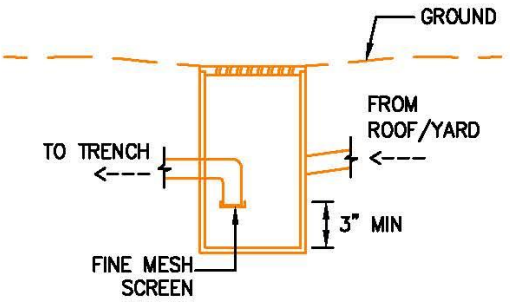


PLAN VIEW

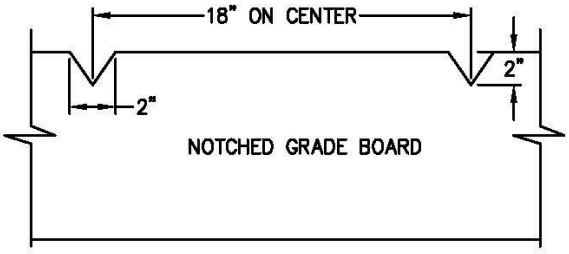




SECTION VIEW



JUNCTION BOX



DISPERSION TRENCH EDGING

DISPERSION TRENCH
HIP BMP "D" TYPICAL

NTS

Design Submittal
Dispersion

Section I: System and Sizing Summary

☐	I have provided a site plan and facility cross-section.
☐	I have defined the area that will drain into the trench by piping.
	The drainage area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have defined the area that will drain into the trench by sheet flow
	That area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have sized the trench using approved methodology (HIP Sizing Calculator or stormwater hydrological modeling software) and attached that data.
	The trench will be at least _____feet long and the downstream vegetated flow path must be at least _____feet in length.

Section II: Site-Specific Planning

☐	I have determined that the trench is at least 5' from known private or public utilities.
☐	I have determined that the trench is at least 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space.
☐	I have determined that the trench is not on or next to a slope steeper than 15% and not within 50' upgradient of a slope steeper than 35%.
☐	I have developed an erosion control plan for the excavation of the trench and completed a site-specific SWPPP that is included with this application.

Sizing Calculator
Dispersion

Step 1: Determine Trench Length. Measure the hard surface area draining to the trench. Measure the lawn/landscaping surface area draining to the trench. Use the following formula to calculate the length of dispersion trench that is needed to adequately mange the runoff directed to the system. All dispersion trenches are 2' wide at minimum. Runoff from a pipe that crosses at least 25' of lawn or landscape before reaching the trench can be considered sheet flow.

Drainage Type	Impervious Surface (square feet)		Hard Surface Multiplier		Lawn/Landscape (square feet)		Lawn/LS Multiplier		Minimum Trench Length (linear feet)
Sheet Flow	[	×	0.009]	+	[	×	0.005]	=	
Piped Flow	[	×	0.014]	+	[	×	0.005]	=	
Total length of trench needed (add trench lengths above):									

Step 2: Determine Vegetated Flow Path Length. Use the following formula to calculate how far the dispersed water must travel, through vegetation, before it leaves your property or enters a water body. Runoff from a pipe that crosses at least 25' of lawn or landscape before reaching the trench can be considered sheet flow.

Drainage Type	Hard Surface (square feet) "A"	Lawn/Landscape (square feet) "B"	Lawn Length "C"	Formula	Minimum Flow Path Length* (linear feet)
Sheet Flow	Not part of formula	Not part of formula		((C-25)/3)+25	
Piped Flow			Not part of formula	((A/(B+1))*100)+25	
Total length of vegetated flow path needed* (add flow path lengths above):					

* Note that the total vegetated flow path length will never be less than 25' or more than 100'. If your calculation comes out below or above those numbers, adjust up to 25 or down to 100.

Step 3: If there is no existing established vegetated flow path on-site to disperse to and a vegetated flow path needs to be created, please use the Native Landscaping BMP and accompanying calculator and submittal page in addition to this Dispersion BMP.

Design Guidance and Permitting Requirements

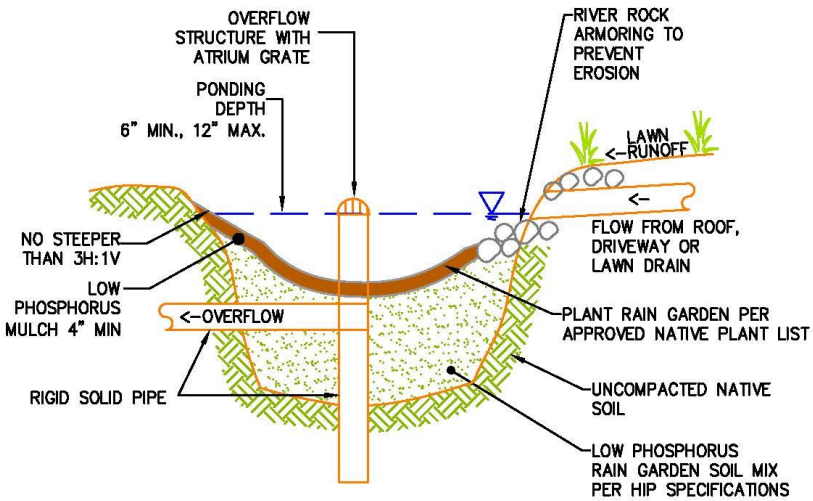
Lake Whatcom Rain Garden

DESCRIPTION

A hybrid underground/surface drainage facility, consisting of special soil mixes and vegetation and constructed with a flat bottom, intended to capture and infiltrate runoff from impervious and pervious surfaces.

METHOD OF PHOSPHORUS REDUCTION

Treatment via infiltration through native soils. Runoff entering the rain garden is detained and allowed to slowly pass through imported and native soil mixes, where phosphorus is bound by, captured within, and recycled into the soil matrix. Plants in the facility attenuate flows through evapotranspiration and reduce nutrient loading by uptake and binding in the vegetative biomass.



SECTION VIEW

Photo source: Stewardship Partners

Photo source: Stewardship Partners

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All rain gardens must meet these minimum requirements in order to be approved for construction under these Design Standards:

DESIGN

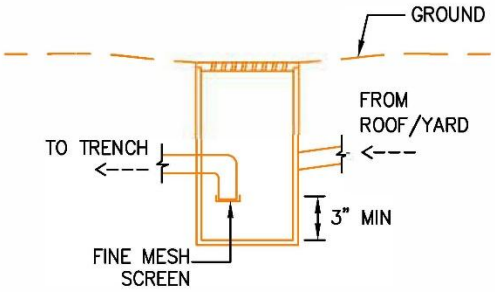
- At least 18" of rain garden soil throughout ponding area
- Total slope of bottom surface less than 2%
- Side slopes 3:1 Horizontal to Vertical or flatter, measured from top of soil mix
- Bottom of soil mix (media) must be more than 1' from groundwater or bedrock
- Low-P mulches from approved list cover all soils with at least 4" deep
- Includes a mix of approved rain garden plants at a minimum density
- Ponding depth cannot exceed 12" or occupy more than half of the side slope area

LOCATION

- **Critical Areas:** Setback requirements near critical areas (wetlands, shorelines, or creeks) and their buffers will vary depending on site specifics. Consult with the HIP Coordinator for requirements pertaining to each unique site.
- **Slopes:** unless approved by a licensed geotechnical engineer, rain gardens cannot be placed on slopes >10% and must be at least 10' upgradient from slopes >15% and 50' upgradient from slopes steeper than 35%
- **Separation:** at a minimum, all wetted areas must be at least: 25' from shorelines or creeks 5' from known public and private utilities, 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space. Septic tanks must be protected by placing the rain garden at least 5' from tanks, and 10' upgradient and 30' downgradient from drain fields and drain field reserve areas
- **Property Lines:** rain gardens cannot be located in public rights-of-way and placed at least 10' from neighboring property lines except in some specific cases. Consult with the HIP Coordinator to determine site-specific setback requirements.

CONSTRUCTION METHOD/ CRITICAL PATH

1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Gently scarify subgrade
4. Install overflow riser and pipe
5. Install 75% of rain garden mix on first lift
6. Connect overflow pipe to downstream drainage system
7. Install drains and conveyance into rain garden from site surfaces
8. Install river rock for energy dissipation at inlet
9. Install second lift of rain garden mix (25%) to final surface grade
10. Place 75% of mulch over all soil surfaces
11. Install plants
12. Place remaining 25% of mulch
13. Stabilize disturbed soils
14. Remove erosion controls



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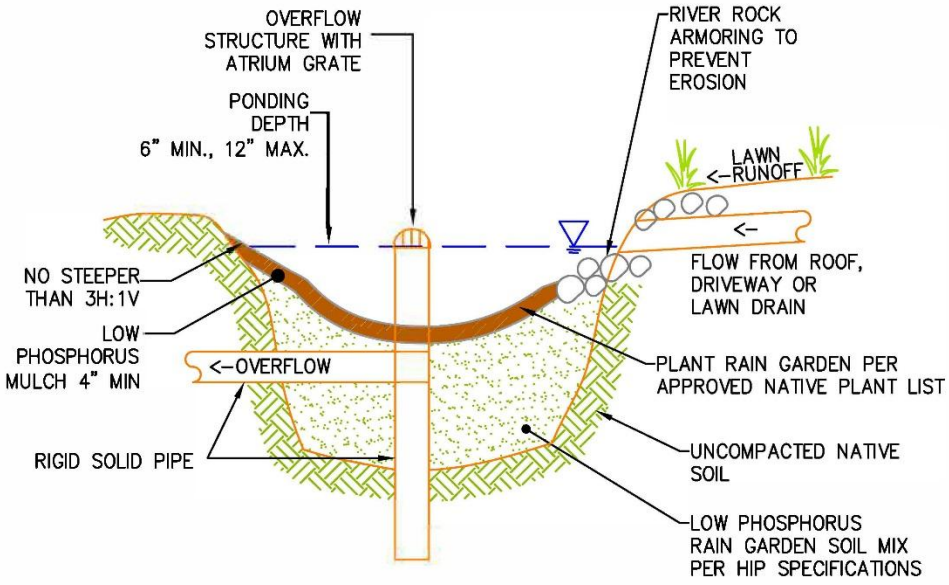


SECTION VIEW

LAKE WHATCOM RAIN GARDEN
HIP BMP "E" TYPICAL NTS

Construction Criteria for Infiltration Facilities

Initial basin excavation should be conducted to within 1-foot of the final elevation of the basin floor. Excavate infiltration trenches and basins to final grade only after all disturbed areas in the upgradient project drainage area have been permanently stabilized. The final phase of excavation should remove all accumulation of silt in the infiltration facility before putting it in service. After construction is completed, prevent sediment from entering the infiltration facility by first conveying the runoff water through an appropriate pretreatment system such as a pre-settling basin, wet pond, or sand filter.

Infiltration facilities should generally not be used as temporary sediment traps during construction. If an infiltration facility is to be used as a sediment trap, it must not be excavated to final grade until after the upgradient drainage area has been stabilized. Any accumulation of silt in the basin must be removed before putting it in service.

Traffic Control Relatively light-tracked equipment is recommended for this operation to avoid compaction of the basin floor. The use of draglines and trackhoes should be considered for constructing infiltration basins. The infiltration area should be flagged or marked to keep heavy equipment away.

Design Submittal

Lake Whatcom Rain Garden

Section I: System and Sizing Summary

☐	I have provided a site plan and facility cross-section. I have defined the area that will drain into the rain garden, by piping or sheet flow.
	The drainage area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have sized the system using approved methodology (HIP Sizing Calculator or stormwater hydrological modeling software) and attached that data.
	The ponding area of the rain garden will be at least _____ft² in size.
☐	I have calculated the number of plants needed for the total rain garden area (square feet of ponding area divided by 16) and completed a plant list.
	I will need to install at least _____ native plants in my rain garden.
☐	I have calculated the amount of lake-friendly mulch (area divided by 80) I will need. I have chosen mulch from the HIP-approved mulch list.
	My rain garden plan requires _____ cubic yards of approved mulch.

Section II: Site-Specific Planning

☐	I have determined that the ponding area is at least 5' from known utilities.
☐	I have determined that the ponding area is at least 10' from structures or property lines.
☐	I have determined that the rain garden is not on a slope >10% or within 10' upgradient of a slope >15% or within 50' upgradient of a slope >35%.
☐	I have developed an erosion control plan for the excavation of the rain garden and completed a site-specific SWPP that is included with this application.

Soil Characterization Sheet

Step 1. Review available soil data and recommend on-site soil testing

To be completed by HIP Coordinator

Off-site test pit data. Review map provided by HIP. If one test pit is within 100' of any property line, list only that data. Otherwise, please list three representative test pits, preferably within ¼ mile of the site.

Test Pit Number	Soil Type/ Infiltration Rate	Depth to Groundwater	Depth to Bedrock

Based on this information, the recommended soil investigation procedure to follow in Step 2 is (determined by HIP Coordinator):

_____

Step 2. On-site testing procedure to determine soil type

To be completed by HIP Coordinator or the project designer

Follow the soil testing methods and instructions for infiltration BMPs, found in the HIP Design Manual (Infiltration Trench and Lake Whatcom Rain Garden).

Note: If designing for infiltration facilities in multiple locations, it is suggested that each location be checked for factors that might affect design considerations. Consult with the HIP Coordinator to determine the number of additional investigations recommended for each unique site.

I completed an on-site soil investigation using (check boxes of all completed tests):

☐ Soil Drainage Test

I used the Rain Garden Manual

After one wet season (or three dry season) tests I have determined that my soil drainage rate is _____in/hr.

I've characterized my soil as:

- ☐ Good
- ☐ Moderate
- ☐ Marginal
- ☐ Poor

☐ Simple Investigation

I dug to a depth of 3' below ground surface and found:

- ☐ Groundwater
- ☐ Bedrock
- ☐ Other: _____
  _____
  _____
- ☐ None of the above

☐ Soil Texture Test

I used this test method to determine soil type (circle one):

Clay	Clayey Silt
Silt/Loam	Sandy Loam/Sand

I've characterized my soil as:

- ☐ Good
- ☐ Moderate
- ☐ Marginal
- ☐ Poor

"SOIL DRAINAGE TEST" INSTRUCTIONS

Modified for HIP from procedures found in the Rain Garden Handbook for Western Washington Homeowners

After identifying the location of a potential infiltration system (HIP Infiltration Trench BMP or HIP Lake Whatcom Rain Garden BMP), the next step is to test the soil in that location. You will be evaluating the "infiltration rate", defined as the amount of time it takes water to soak into the ground. Determining an infiltration rate will allow you to use the HIP Standard Calculator to size the system for maximum water quality benefit and free permits through HIP.

1 LOCATE UTILITIES

Call 8-1-1 and mark with white paint the location of your proposed test hole or other potential underground features. The Call-Before-You-Dig professionals will arrive, from the various utilities, over the next week or so to mark the location of public utilities on your property.

Make sure you identify any potential private utilities (such as septic system drain fields and/or private electrical conduit) that would not be part of the public utility marking. You may need to do shallow, careful, excavations (pot-holing) to confirm some utilities.

2 DIG TEST HOLE

Dig a small hole at least 2 feet deep and at least 18 inches in diameter.

3 DETERMINE DRAINAGE RATE

Fill the hole with 12 inches of water. Secure a yard stick or a self-made gauge in the hole for measuring the drainage rate. The self-made gauge can be a board or pipe with markings every half inch from the bottom.

Time how long it takes for the water to drain out completely. By the way, this can take a while, so start in the morning and check back regularly throughout the day. If there is still water in the hole after 12 hours, record how many inches have gone down since you started the test. Divide total inches by total hours to calculate the soil drainage rate.

4 REPEAT IN DRY SEASON

If it's the wet season (December through April), do this soil drainage test once. If you must test during the dry season, do the test three times (with each test performed immediately after completion of the last). Use the third test as your drainage rate (measured in inches per hour). Testing three times during the dry season provides a better estimate of wetter conditions present in the winter when the system is doing the most work.

5 CHARACTERIZE YOUR SOIL

- If your calculated drainage rate is greater than two inches per hour (2"/hr), **use the "good" designation** on the soil characterization sheet in the design packet. This soil is likely sand.
- If your calculated drainage rate is between a half-inch per hour (1/2"/hr) and two inches per hour (2"/hr), **use the "moderate" designation** on the soil characterization sheet in the design packet. This soil is likely silty sand.
- If your calculated drainage rate is between an eighth-inch per hour (1/8"/hr) and a half-inch per hour (1/2"/hr), **use the "marginal" designation** on the soil characterization sheet in the design packet. This soil is likely a silt or loamy material.
- If your calculated drainage rate is less than an eighth-inch per hour (1/8"/hr), **use the "poor" designation** on the soil characterization sheet in the design packet. This soil is likely clay.

"SIMPLE INVESTIGATION TEST" INSTRUCTIONS

Modified for HIP from procedures found in the Rain Garden Handbook for Western Washington Homeowners

Avoid locating your infiltration system in an area with high groundwater or shallow bedrock by performing a simple investigation test. It's best to figure out the groundwater level during the rainy winter months, December through April, and you can search for bedrock at the same time.

1 LOCATE UTILITIES

Call 8-1-1 and mark with white paint the location of your proposed test hole or other potential underground features. The Call-Before-You-Dig professionals will arrive, from the various utilities, over the next week or so to mark the location of public utilities on your property.

Make sure you identify any potential private utilities (such as septic system drain fields and/or private electrical conduit) that would not be part of the public utility marking. You may need to do shallow, careful, excavations (pot-holing) to confirm some utilities.

2 DIG INVESTIGATION HOLE

Dig down 36 inches below the ground surface, if possible. You can use a post-hole digger or hand operated auger to reach the desired depth.

If you are digging in groundwater (i.e. the hole is filling with water faster than you can remove it) or hitting rock that prohibits any additional digging, you can stop the test as this location is not conducive to infiltration.

3 LOOK INTO THE HOLE

If you see water seeping in from the bottom or sides, or hit an impenetrable layer of rock or clay, find another location for your infiltration facility or choose a treatment BMP (such as the HIP Media Filter Drain or Dispersion BMPs).

"SOIL TEXTURE TEST" INSTRUCTIONS

Modified for HIP from procedures found in the Rain Garden Handbook for Western Washington Homeowners

Avoid locating your infiltration system in an area with high groundwater or shallow bedrock by performing a simple investigation test. It's best to figure out the groundwater level during the rainy winter months, December through April, and you can search for bedrock at the same time.

1 LOCATE UTILITIES

Call 8-1-1 and mark with white paint the location of your proposed test hole or other potential underground features. The Call-Before-You-Dig professionals will arrive, from the various utilities, over the next week or so to mark the location of public utilities on your property.

Make sure you identify any potential private utilities (such as septic system drain fields and/or private electrical conduit) that would not be part of the public utility marking. You may need to do shallow, careful, excavations (pot-holing) to confirm some utilities.

2 DIG TEST HOLE

Dig a small hole at least 18 inches deep and at least 6 inches in diameter. A post-hole digger or small hand auger is the perfect tool for this job.

3 EVALUATE SOIL TEXTURE

When you reach a depth of at least 18", take a scoop of soil from the bottom of the hole and use the procedure below to characterize its soil type.

Prepare the soil: put some soil in the palm of your hand and try to squeeze it into a ball. If the soil is dry, add water a few drops at a time, break down the chunks to work the water into the soil, and then perform the soil texture test.

Characterize the soil texture:

- If the soil is light in color, feels gritty, and will not stick together at all when wet **use the "good" designation** on the soil characterization sheet in the design packet. This soil is likely sand.
- If the soil is dark in color, feels gritty, and falls apart easily when worked, **use the "moderate" designation** on the soil characterization sheet in the design packet. This soil is likely silty sand.
- If the soil feels smooth, and breaks apart into chunks when worked but stays together in a ball when held, **use the "marginal" designation** on the soil characterization sheet in the design packet. This soil is likely a silt or loamy material.

- If the soil is very sticky and forms a dense ball that can't be easily broken apart, **use the "poor" designation** on the soil characterization sheet in the design packet. This soil is likely clay.

Sizing Calculator

Lake Whatcom Rain Garden

How to Use Sizing Calculator:
Input project-specific data into the table below to calculate the size of the ponding area of the rain garden facility. Choose soil type based on test results in Step 1. Insert amount of hard surface (roof, pavement, gravel) in square feet and amount of lawn and/or landscape area in square feet. Determine multipliers by using the table below and calculate required ponding area.

Soil Type	Impervious Surface (square feet)		Hard Surface Multiplier (Varies)*		Lawn/Landscape (square feet)		Lawn/LS Multiplier (Varies)*		Ponding Area Minimum (square feet)**
Good	[	×	]	+	[	×	]	=	
Moderate	[	×	]	+	[	×	]	=	
Marginal	[	×	]	+	[	×	]	=	
Poor	Infiltration Not Recommended. Use Treatment, Dispersion, or Native Landscaping BMPs								

*Use multiplier reference table below.

** The ponding area is defined as the area that will be flooded before the system overflows. All rain gardens will have side slopes extending at least 18" from the top of this ponding area in all directions. See Design Guidance for more details and examples.

MULTIPLIER REFERENCE TABLE
RAIN GARDEN SIZING

	Multiplier by Soil Type		
	Good	Moderate	Marginal
Hard Surface Area			
Less than 5,000 sf	0.09	0.12	0.15
More than 5,000 sf	0.07	0.09	0.12
Lawn/Landscape Area			
Less than 2,000 sf	0.05	0.07	0.10
Between 2,000-10,000 sf	0.04	0.06	0.08
Between 10,000 - 40,000 sf	0.03	0.05	0.07
More than 40,000 sf	0.02	0.04	0.06

Design Guidance and Permitting Requirements Phosphorus Optimized Stormwater Treatment (POST)

DESCRIPTION

An underground drainage facility, consisting of specially-mixed media (POST mix), intended to treat runoff from hard surfaces and lawn and landscaped areas. Configurations are slightly different depending on how space is available (side-by-side or stacked). This facility does have an underdrain and requires either a controlled bypass structure or a robust overflow to function properly.

METHOD OF PHOSPHORUS REDUCTION

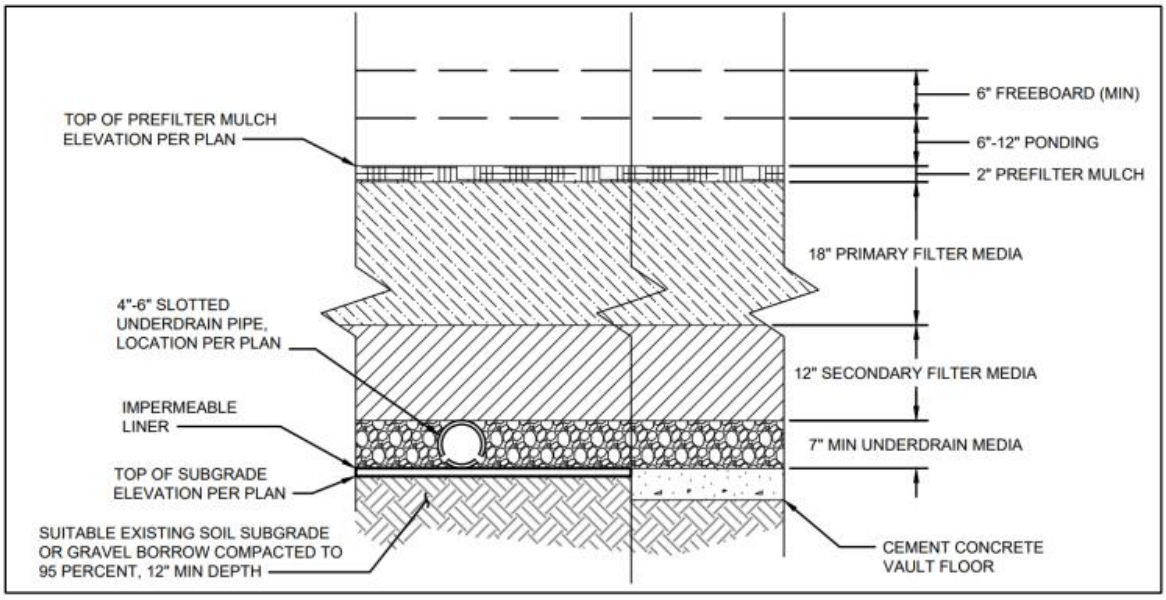
Treatment via media (POST mix). Runoff entering the facility passes through the media, where activated alumina, iron aggregate, coconut coir, and biochar provide physical, chemical, and biological treatment for total and dissolved phosphorus.

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

APPROVED HIP VARIATIONS

"Patio POST" topped with pea gravel or spaced pavers with gaps (see HIP Standard Detail for Permeable Surfacing). NOT ALLOWED ALONG SHORELINES.

"Planted POST" with native groundcovers and small shrubs (not edible plants) to create an interesting feature in your landscape.



SECTION VIEW: STACKED CONFIGURATION

MINIMUM REQUIREMENTS AND DESIGN LIMITATIONS

All POST projects must meet these minimum requirements in order to be approved for phosphorus reduction:

DESIGN

- Side-by-Side Configuration:
  Minimum 16 square feet of filter surface area.
- Stacked Configuration:
  Minimum 8 square feet of filter area
- Primary Media layer at least 18" in deep.
- Secondary Media layer at least 12" deep.
- Bedding layer to cover underdrain pipe

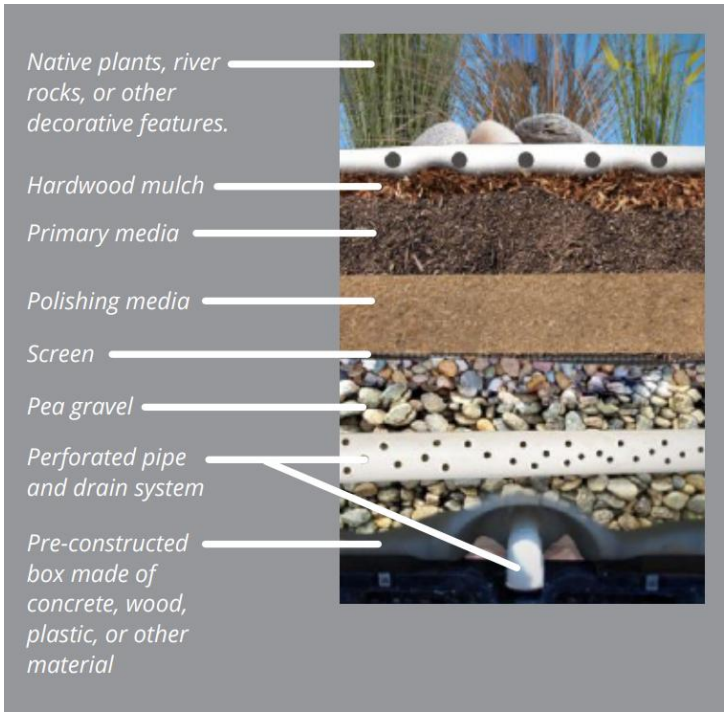
LOCATION

- Not on or adjacent to slopes >35%
- At least 25' upgradient from shorelines or creeks
- At least 5' from known public and private utilities
- At least 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space, unless using waterproofing (see HIP spec for waterproof liner)
- Outside of rights-of-way
- Additional site-specific location requirements may apply if wetlands or other critical areas are identified

CONSTRUCTION METHOD/ CRITICAL PATH

1. Install erosion controls
2. Excavate soil and reuse on site or dispose
3. Install waterproof box or liner
4. Install bottom layer of material to bed underdrain pipe
5. Install underdrain pipe and stub out
6. Install secondary media
7. Install primary media
8. Connect underdrain outlet pipe to downstream drainage system
9. Install conveyance to inlet
10. Connect roof/driveway/yard drains to conveyance
11. Install surfacing (optional)
12. Stabilize disturbed soils
13. Remove erosion controls

SECTION OF "PLANTED POST", ABOVE-GROUND INSTALLATION



Are you a designer, an engineer, or a contractor who would like to become a HIP professional? We'd love to help your business serve HIP participants. Please contact HIP staff at (360) 778-7742 to learn more about the HIP Professional program or visit lakewhatcomHIP.org

Design Submittal
POST Media Filter System

Section I: System and Sizing Summary

☐	I have provided a site plan and facility cross-section.
☐	I have defined the area that will drain into the POST filter by piping.
	That area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have defined the area that will drain into the POST filter by sheet flow.
	That area is_____ft² of impervious surface and/or _____ft² of lawn/landscape
☐	I have sized the POST using approved methodology (HIP Sizing Calculator or stormwater hydrological modeling software) and attached that data.
	My POST filter needs to be at least _____ft² in filter surface area (Minimum: 8ft² stacked configuration, 16 ft² side-by-side configuration)

Section II: Site-Specific Planning

☐	I have determined that the MFD is at least 5' from known public and private utilities.
☐	I have determined that the MFD is at least 5' from structures with slab-on-grade foundations and 10' from structures with a basement or crawl space.
☐	I have determined that the MFD is not on or next to a slope steeper than 15% and not within 50' upgradient of a slope steeper than 35%.
☐	I have developed an erosion control plan for the excavation of the trench and completed a site-specific SWPPP that is included with this application.

Sizing Calculator
POST Media Filter System

Instructions: Measure hard surface area and lawn/landscaping surface area draining to POST. Characterize flow as sheet flow or piped flow. Insert values in the table below and use the following formula to calculate the size of POST Filter that is needed to adequately manage the runoff directed to the system. The minimum width of the POST filter is 2 feet. Runoff from a pipe that crosses at least 25' of lawn or landscape before reaching the trench can be considered sheet flow.

Stacked Configuration (Minimum 8ft^2)

Drainage Type	Hard Surface (square feet)		Hard Surface Multiplier		Lawn/Landscape (square feet)		Lawn/LS Multiplier		Minimum POST Area (square feet)
Sheet Flow		×	0.0010	+		×	0.0005	=	
Piped Flow		×	0.0015	+		×	0.0005	=	
Total area of POST Surface needed (add areas above):									

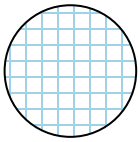
Side-by-Side Configuration (Minimum 16ft^2)

Drainage Type	Hard Surface (square feet)		Hard Surface Multiplier		Lawn/Landscape (square feet)		Lawn/LS Multiplier		Minimum POST Area (square feet)
Sheet Flow		×	0.002	+		×	0.001	=	
Piped Flow		×	0.003	+		×	0.001	=	
Total area of POST Surface needed (add areas above):									

5 Supplemental & Secondary Best Management Practices

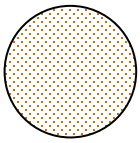
Supplemental Best Management Practices

Supplemental Best Management Practices (BMPs) support the functioning of many primary BMP projects. The need for Supplemental BMPs is based on site-specific requirements.



Conveyance

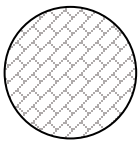
- Downspout inlet
- Junction box
- French drain
- Pipe connections to existing infrastructure



Erosion and Sediment Control

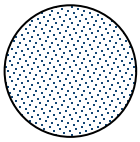
Secondary Best Management Practices

Secondary Best Management Practices (BMPs) may be permitted only in conjunction with one or more HIP-permitted primary BMP projects.



Permeable Pavement Surfacing

Note: This BMP is only eligible for HIP projects as a surface over a proposed infiltration or treatment BMP. Stand-alone permeable pavement projects, or those that propose an expansion of paver area beyond the necessary footprint, may not be permitted under HIP's free permit process.

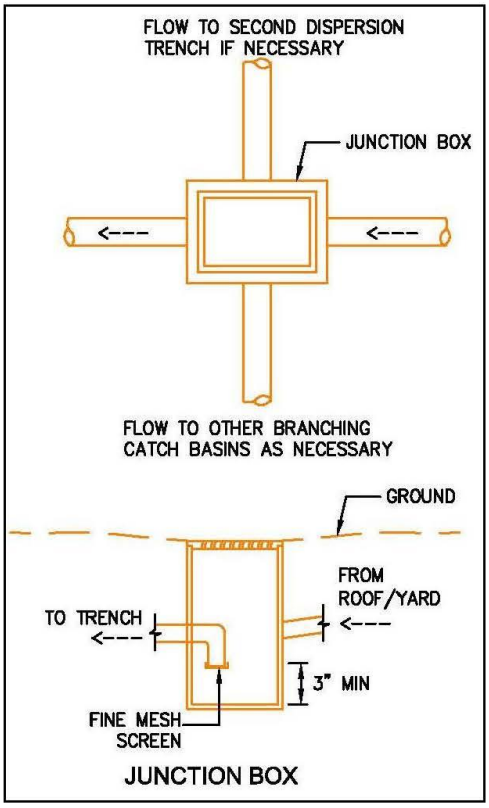


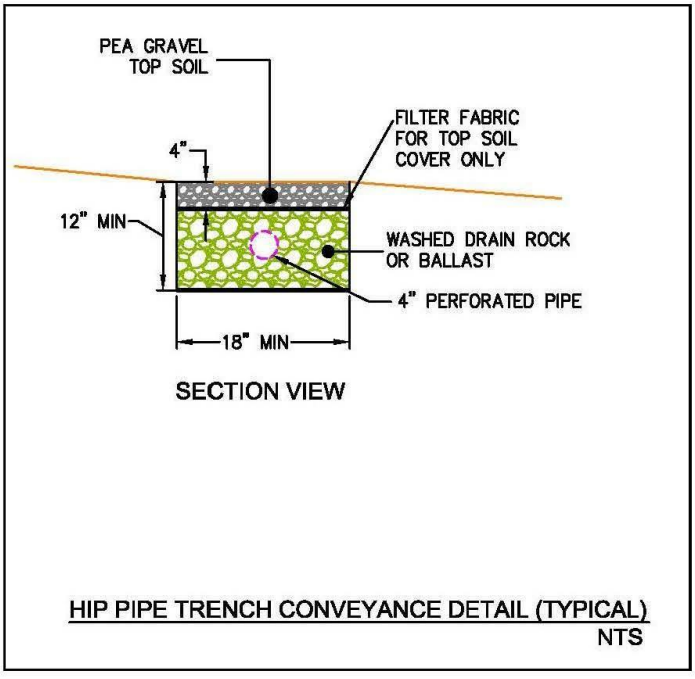
Rainwater Harvesting

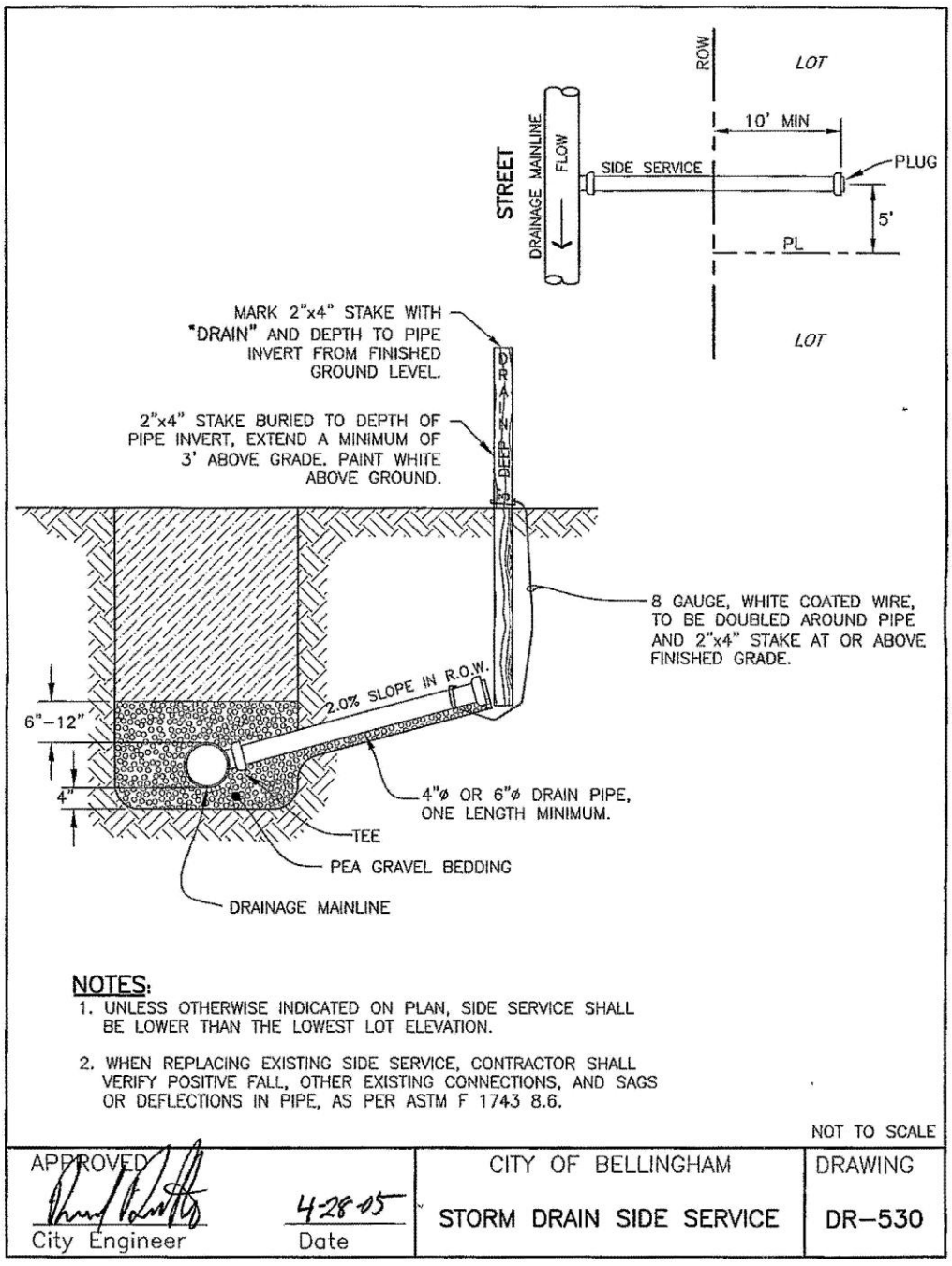
Note: This BMP is only eligible for HIP projects as a means to provide irrigation water to new native landscaping, rain garden plantings, or dispersion area vegetation. Stand-alone rainwater harvesting projects, or those that propose utilizing the water for other needs such as lawn or vegetable garden watering, may not be permitted under HIP's free permit process.

Design Guidance

Conveyance







NOTES:

1. UNLESS OTHERWISE INDICATED ON PLAN, SIDE SERVICE SHALL BE LOWER THAN THE LOWEST LOT ELEVATION.
2. WHEN REPLACING EXISTING SIDE SERVICE, CONTRACTOR SHALL VERIFY POSITIVE FALL, OTHER EXISTING CONNECTIONS, AND SAGS OR DEFLECTIONS IN PIPE, AS PER ASTM F 1743 8.6.

NOT TO SCALE

APPROVED		CITY OF BELLINGHAM	DRAWING
City Engineer	4-28-05 Date	STORM DRAIN SIDE SERVICE	DR–530

Design Guidance

Erosion and Sediment Control

GENERAL CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

PURPOSE

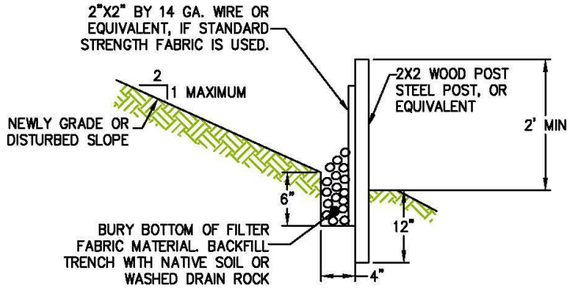
TO PREVENT THE DISCHARGE OF SEDIMENT AND OTHER POLLUTANTS TO THE MAXIMUM EXTENT PRACTICABLE FROM SMALL CONSTRUCTION PROJECTS.

DESIGN AND INSTALLATION

PLAN AND IMPLEMENT PROPER CLEARING AND GRADING OF THE SITE. IT IS MOST IMPORTANT ONLY TO CLEAR THE AREAS NEEDED KEEPING EXPOSED AREAS TO A MINIMUM. PHASE CLEARING SO THAT ONLY THOSE AREAS THAT ARE ACTIVELY BEING WORKED ARE UNCOVERED.

NOTE: CLEARING LIMITS SHALL BE FLAGGED ON THE LOT OR PROJECT AREA PRIOR TO INITIATING CLEARING.

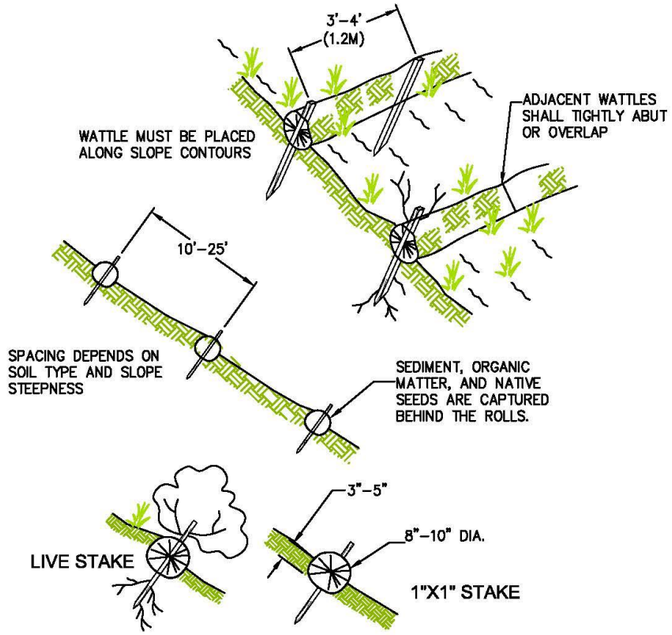
- FROM OCTOBER 1 THROUGH APRIL 30, NO SOILS SHALL REMAIN EXPOSED AND UNWORKED FOR MORE THAN TWO DAYS FROM MAY 1 TO SEPTEMBER 30, NO SOILS SHALL REMAIN EXPOSED AND UNWORKED FOR MORE THAN SEVEN DAYS.
- SOIL SHALL BE MANAGED IN A MANNER THAT DOES NOT PERMANENTLY COMPACT OR DETERIORATE THE FINAL SOIL AND LANDSCAPE SYSTEM. IF DISTURBANCE AND/OR COMPACTION OCCUR THE IMPACT MUST BE CORRECTED AT THE END OF THE CONSTRUCTION ACTIVITY. THIS SHALL INCLUDE RESTORATION OF SOIL DEPTH, SOIL QUALITY, PERMEABILITY, AND PERCENT ORGANIC MATTER. CONSTRUCTION PRACTICES MUST NOT CAUSE DAMAGE TO OR COMPROMISE THE DEPTH OF PERMANENT LANDSCAPE OR INFILTRATION AREAS.
- LOCATE ANY SOIL PILES AWAY FROM DRAINAGE SYSTEMS. SOIL PILES SHOULD BE TARPED OR MULCHED UNTIL THE SOIL IS EITHER USED OR REMOVED. PILES SHOULD BE SITUATED SO THAT RUNOFF DOES NOT RUN INTO THE STREET OR ADJOINING YARDS.
- BACKFILL WALLS AS SOON AS POSSIBLE AFTER BACKFILLING. THIS WILL ELIMINATE ANY SEDIMENT LOSS FROM SURPLUS FILL.
- THE CONSTRUCTION ENTRANCE SHALL BE STABILIZED WHERE TRAFFIC WILL BE LEAVING THE CONSTRUCTION SITE AND TRAVELING ON PAVED ROADS OR OTHER PAVED SURFACES.
- PROVIDE FOR PERIODIC STREET CLEANING TO REMOVE ANY SEDIMENT THAT MAY HAVE BEEN TRACKED OUT. SEDIMENT SHOULD BE REMOVED BY SHOVELING OR SWEEPING AND CAREFULLY REMOVED TO A SUITABLE DISPOSAL AREA WHERE IT WILL NOT BE RE-ERODED, STREET WASHING IS PROHIBITED.



TYPICAL CROSS SECTION

SILT FENCE SEDIMENT BARRIER

NTS

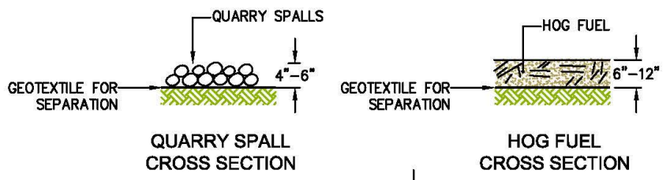


NOTE:

1. WATTLE INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE WATTLE IN A TRENCH, 3"-5" DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND WATTLE

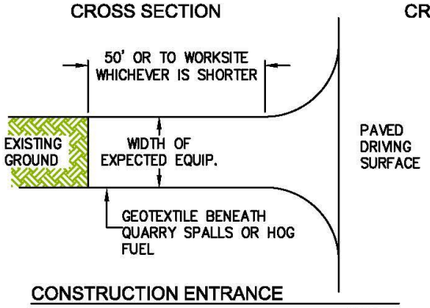
WATTLES (SEDIMENT BARRIER)

NTS



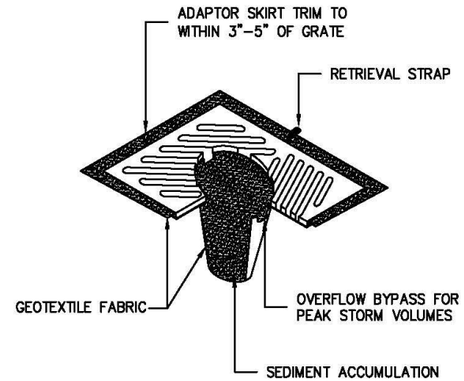
QUARRY SPALL CROSS SECTION

HOG FUEL CROSS SECTION



CONSTRUCTION ENTRANCE

NTS



NOTES:

1. INSERT SHALL BE INSTALLED PRIOR TO CLEARING AND GRADING ACTIVITY, OR UPON PLACEMENT OF A NEW CATCH BASIN.
2. SEDIMENT SHALL BE REMOVED FROM THE UNIT WHEN IT BECOMES HALF FULL.
3. SEDIMENT REMOVAL SHALL BE ACCOMPLISHED BY REMOVING THE INSERT, EMPTYING, AND RE-INSERTING IT INTO THE CATCH BASIN.

CATCH BASIN INSERT (INLET PROTECTION) DETAIL

NTS

Design Guidance and Permitting Requirements

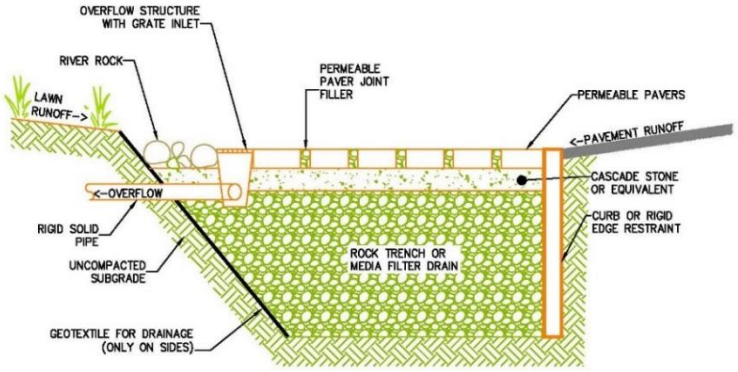
Permeable Pavement

DESCRIPTION

Permeable pavement provides surface stabilization and protection for infiltration trenches and drywells. In some cases, under the right conditions, this component may also be installed above Media Filter Drain (MFD) trenches.

METHOD OF PHOSPHORUS REDUCTION

Permeable pavement does not directly reduce the amount of phosphorus in runoff. This component protects the phosphorus-reducing capacity of the underlying infiltration or treatment facility.



SECTION VIEW

MATERIAL REQUIREMENTS

- All proprietary pavements must be installed and maintained per manufacturer's recommendations based on anticipated use.
- All non-propriety individual pavers must be less than 2 square feet with greater than ½ inch gaps between pavers.
- Special considerations apply near creeks or the Lake Whatcom shoreline. Consult with HIP Coordinator prior to selecting materials

CONSTRUCTION METHOD/ CRITICAL PATH

1. Install primary BMP
2. Install edge restraints (optional)
3. Place #2 stone over BMP surface
4. Place #8 stone ("Cascade Stone") to final depth
5. Install spaced pavers or proprietary permeable pavement material
6. Install clean pea gravel or manufacturer's recommended product in paver gaps. **DO NOT USE SAND.**

MATERIAL EXAMPLES

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

Design Guidance
Rainwater Harvesting

DESCRIPTION

Rainwater harvesting is the process of collecting water from an impervious surface, such as a roof, and routing it to a location where it is beneficially used.

METHOD OF PHOSPHORUS REDUCTION

Rainwater harvesting does not directly reduce the amount of phosphorus in runoff. However, because rainwater is captured in barrels or cisterns, the amount of runoff that carries phosphorus to the Lake during precipitation events is decreased. In addition, harvested rainwater can be connected to other HIP projects, such as native landscaping, rain gardens, and underground pollution filters, where the water is slowed and cleaned prior to reaching Lake Whatcom.

CONSTRUCTION METHOD/ CRITICAL PATH

1. Install primary BMP
2. Choose a location for cistern
3. Choose a material that is compatible with water use
4. Design connectivity to other HIP water quality projects

DESIGN REQUIREMENTS

- All individual tanks hold less than 320 gallons
- Total system storage is less than 5,000 gallons when all tanks are full
- Height to width ratio of tanks are 2:1 or less
- Water from tanks are not used for indoor purposes such as drinking and cooking
- Tanks not meeting these requirements may be permitted through alternative pathways outside of the HIP permitting process
- Overflow/outflow water must be directed to a HIP BMP for tanks to be reimbursable under HIP

Note: This design methodology is applicable for HIP projects only. These methods may not be suitable for, and have not been evaluated for, compliance with regulations which require professional engineering.

For more guidance on rainwater harvesting for residential beneficial uses visit cob.org/rainwater.

Part III:

HIP Submittal Packet Requirements and Support

6 HIP Submittal Packet

HIP Submittal Packet Development

As a HIP project designer, you are responsible for completing the HIP submittal packet. Use the Submittal Requirements Checklist to determine which forms and supporting materials are required for each HIP project. You can download blank forms and copies of BMP-specific design submittals, sizing calculators, and standard details from the "Resources For Professionals" tab on the HIP website. Refer to the examples provided in the sample HIP submittal packet and ask for assistance from the HIP Coordinator as needed.

Timelines

HIP BMPs that require ground disturbance (infiltration trench, media filter drain, dispersion, Lake Whatcom rain garden, and POST Filter) may **only** be installed during the Lake Whatcom watershed work window between June 1 and September 30. Native Landscaping may be installed anytime of the year; however, planting during the fall rainy season (October – November) is recommended to allow plants time to establish before the next summer. For projects including ground disturbing BMPs, the **recommended** application submittal time is winter/spring to allow adequate time for project approval, contractor selection, and advanced scheduling to complete the work during the summer watershed work window. Once an application packet is submitted to the City for permitting, it takes approximately two weeks for permit approval. See Part I for additional details on the submittal and approval process.

The application deadline for projects that include ground disturbing BMPs is September 1st to the HIP Coordinator. Applications received after September 1st that include infiltration trenches, media filter drains, dispersion trenches, Lake Whatcom rain gardens, or any other ground disturbing activities (e.g., grading or creating a berm) will be accepted and reviewed for construction the following year.

HIP Submittal Packet Core Elements

The core elements of the HIP Submittal Packet include the following:

- Submittal Requirements Checklist
- City Specific Forms & Information
- Project Summary
- Project Narrative
- BMP Specific Forms
- Material Specifications
- Existing Conditions Sheet
- Proposed Improvements Sheet
- Stormwater Pollution Prevention Plan (SWPPP)
    - SWPPP Narrative
    - Erosion & Sediment Control Plan Sheet
    - Erosion & Sediment Control Standard Details

Please note that there may be additional paperwork needed based on project specifics. The HIP Coordinator will provide direction in these cases.

City-specific Submittal Forms & Information

In the City of Bellingham, HIP projects are eligible for free permits and expedited reviews and are exempt from certain regulations. The following forms and informational sheets need to be included in the HIP submittal packet in order to qualify for the streamlined HIP permitting process. These forms and informational sheets titled "City Submittal Forms & Information Packet" can be found on the HIP website under the "For Professionals" tab. A hard copy is also provided in the example HIP submittal packet.

- **Stormwater Permit Application**
  This is the permit application form to use for all City of Bellingham HIP projects. Download a fillable copy from the City Submittal Forms & Information Packet on the HIP website.

- **Copy of the Lake Whatcom Stormwater Considerations**
  This document ensures that HIP projects are in compliance with local regulations. Please read carefully. This sheet does not need to be filled out. Simply include a copy with your submittal packet.

- **Copy of City of Bellingham Code 16.80.120 – Seasonal Restrictions for Earthwork**
  This document ensures that HIP projects stay in compliance with local regulations. Please read carefully. This sheet does not need to be filled out. Simply include a copy with your submittal packet.

In order to protect Lake Whatcom from accidental impacts from erosion, work that disturbs soil is restricted by law to the period between June 1st and September 30th (the "watershed work window"). Special exemptions are in place to allow HIP projects to spread mulch and install plants throughout wet season.

The following documents are **required if doing any planting outside of the work window:**

- **Copy of Erosion and Sediment Control Native Landscaping Projects Only (Oct-May)**
  This document ensures that HIP projects stay in compliance with local regulations. Please read carefully. This sheet does not need to be filled out. Simply include a copy with your submittal packet.

- **Copy of City of Bellingham Director's Exemption (dated 10/14/10), pre-approved**
  This document exempts HIP native planting projects from seasonal restrictions on work. Please read carefully. This sheet does not need to be filled out. Simply include a copy with your submittal packet.

7 HIP Project Site Plans and Stormwater Pollution Prevention Plans

Overview

In order for HIP projects to be reviewed, approved, and permitted consistently, designers will need to submit - at minimum - three project site plan sheets with a Stormwater Pollution Prevention Plan (SWPPP). These sheets will be used to document and build the project and guide sediment control measures during construction.

- The "Existing Conditions" sheet describes the state of the property before the project is constructed.
- The "Proposed Improvements" sheet shows the location of the proposed HIP BMPs and any piping or drains installed as part of the project.
- The Stormwater Pollution Prevention Plan (SWPPP), which includes the "Erosion and Sediment Control Plan" sheet and the Erosion and Sediment Control standard details, outlines the proposed methods for protecting water quality if a rainstorm occurs during construction.

Each sheet should use the same base map, which may be created by hand-drawing site maps or simply by printing out aerial photos. The HIP Coordinator can also provide base maps if needed. Directions on how to use City IQ to make base maps with current aerial photography follows. Once the base map has been developed, designers are tasked with adding legible and accurate details to reflect the scope and scale of the project. The following guidance describes an approach toward creating simple, but approvable, HIP project site plans.

As a designer reviewing these descriptions and instructions, keep in mind that your goals are two-fold. While it is important to provide HIP staff with enough information to approve the project, it is equally important to provide professional customer service to your HIP-participating client. They may need much more visual detail to satisfy their aesthetic interests, allay concerns about function, and/or make the project easier to build. Your final design work may look significantly different from these examples, and that's perfectly fine and completely within the guidelines of the Homeowner Incentive Program. The program supports and encourages any design strategy that both meets program requirements and makes the client happy.

Creating a Base Map Using City IQ

HIP-eligible properties, both in the City of Bellingham and Whatcom County areas, can be viewed and analyzed using a free online mapping service called City IQ. Before we jump into City IQ feet first, please take note that property lines, and some utilities, found on City IQ maps are only applicable for properties within Bellingham City Limits.

Those discrepancies aside, the ability to view, analyze, and measure properties throughout the HIP area remains a primary tool in your design toolbox. You may also use other viewers, such as Google Maps®, to view the property and surrounding areas, but using City IQ provides more detailed information.

1 FIND CITY IQ

To get started with City IQ, visit the City of Bellingham's web portal here:

http://www.cob.org/cityiq

On your first visit, you may consider clicking on one of the options under "Getting Started" to learn more about how to use the website. Or, you can skip this step and simply start the process by clicking on "Launch CityIQ Online Map Viewer."

2 FIND PROPERTY

Once you have launched the online map viewer, you will see a broad map of the City of Bellingham. Now enter the address you're mapping in the "Search..." box in the upper right-hand corner.

The search results will bring up clickable address points within the table along the left edge of the page, or could automatically change your view to focus on that address, depending on your browser's settings.

At first, you'll be looking at a street-map type of image, along with some basic information such as street names, building addresses, and property lines.

Note: the property line locations on CityIQ are estimated and may differ by several feet from their actual location.

3 CREATE BASE MAP

To create your HIP basemap, you'll want to bring up the most recent aerial photo by clicking on the icon titled "Layers" in the lower left-hand corner of the map, selecting the "Basemaps" icon, and then selecting the most recent image (2016 Pictometry, as of this writing).

Use the "+" and "-" icons in the upper left to zoom in and out until the entire site is visible. Click and hold to drag the map around until it's centered on the property.

Now it is time to add any known utilities to the map, along with the additional details needed for project design approval.

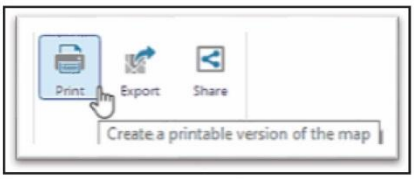
This can be accomplished by checking a series of appropriate boxes in the "Layers" table along the left edge of the map. You may turn layers on and off by clicking the check-box and toggle detailed information by using the plus and minus signs.

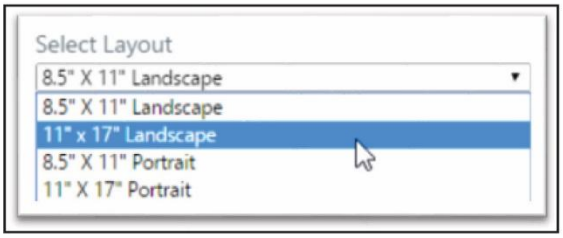
Your table should match the image to the left as closely as possible (layers accurate as of 1/31/17).

4 PRINT MAP

You're now ready to print out a base map to utilize for your project design. Click the tool bar (wrench and screwdriver icon) in the upper right-hand corner of the map to open up the drop down menu.

Click on the print icon and choose "11" x 17"" Landscape or Portrait layout from the "Select Layout" dropdown menu. Print base map.

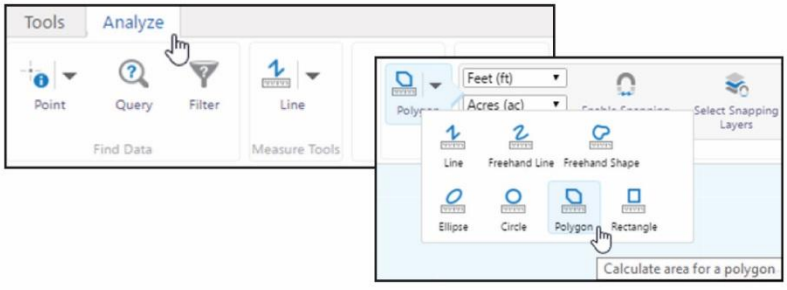




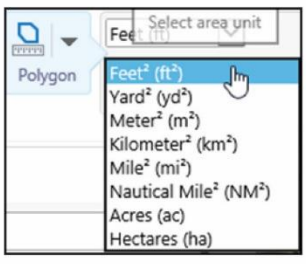
5 ANALYZE MAP

Once you have printed out your project site basemap, the next step is to measure site areas for the "existing conditions" and "proposed improvements" sheets.

To measure the area of parts of your site, go to the toolbar in the upper right corner of the screen (wrench and screwdriver) near the search box and select the icon. At the top of the page, select the "Analyze" tab, followed by the "measure polygon" tool below it.



Make sure you convert the default "acres" units to square feet before measuring, for best results.



5 ANALYZE MAP
CONTINUED

Once you've selected the measure tool, all you need to do is click on the map to start measuring areas of roof, lawn, pavement, or other surfaces on the property.

To get this measurement, click on the corners of the area you want to measure, and double click when the area perimeter is complete. A screen will appear giving you the measurement. Jot down the results, because the measurement screen may disappear from time to time, depending on your browser settings.

The "measure line" tool, from the same drop down menu, will allow you to get the lengths of property boundaries, roof lines, and other linear dimensions you might need to define for the project.

Click to start a line, click once to add nodes or bends to your line, and double-click when you've reached the end to display the distance.

Write in your measurements onto the basemap, either by hand or using annotation software, as shown in the general examples on the following pages.

Make sure you reference the design guidelines for each Best Management Practice to make sure you include the proper information in each sheet.

The more accurate you are in submitting the paperwork, the easier and quicker your project can be approved and move toward the construction phase.

Developing the "Existing Conditions" Sheet

Once you've completed your base map, and are either proficient at measuring surfaces using City IQ or have been provided measurements by the HIP Coordinator, you're ready to complete the first of three necessary site plan sheets for a HIP project design. Remember, the homeowner you are working with may ask you to complete a more detailed drawing. Or, you may have skills in computer-aided design that allow you to create more realistic-looking plan sheets. These differences are expected and completely allowable under HIP.

Include the following items in the “Existing Conditions” sheet:

- Parcel boundary (corner markers are adequate; include adjacent rights-of-way)
- Label existing surfaces with their area (square feet)
- Utilities
- Scale
- Slope or contour lines
- Waterways (ditches, streams, shoreline, wetlands)
- Any other critical areas or important features included in the Feasibility Report

For examples of Existing Conditions sheets, refer to the example submittal packets provided for City of Bellingham properties. These examples represent **the bare minimum** that is necessary to allow the project to be permitted. Your design work may look different, but that will be acceptable as long as the same information is provided.

Developing the "Proposed Improvements" Sheet

Using a clean copy of the base map with critical areas, buildings, and utilities from the ‘Existing Conditions” sheet, your goal is now to show what is changing as a result of the proposed HIP-improvements.

Include the following in the “Proposed Improvements” sheet:

- The location and dimensions of proposed HIP BMPs.
- The tributary area draining into infiltration trench, media filter drain, dispersion, and Lake Whatcom rain garden BMPs (label area in square feet)
- All piping or drains installed as part of the project.

For examples of ”Proposed Improvements” sheets, refer to the example submittal packets provided for City of Bellingham properties. When possible, include all proposed BMPs on a single map. Note that the labels and dimensions shown in the examples **are all considered necessary for permitting**, so no matter the way you do your design, you'll need to make sure all of this information is included on the "Proposed Improvements" sheet.

Developing the Stormwater Pollution Prevention Plan (SWPPP) & "Erosion and Sediment Control Plan" Sheet

A Stormwater Pollution Prevention Plan (SWPPP) is a set of best management practices that you will use at the project location to ensure that the stormwater discharged off site does not harm downstream water quality. A SWPPP is required for all HIP projects that create ground disturbance. **The only HIP BMP that is considered non-ground disturbing and therefore exempt from the SWPPP requirement is Native Landscaping using the sheet mulching method.** All other project proposals require a SWPPP and must be constructed during the watershed work window. The SWPPP has three parts:

- SWPPP Narrative—A SWPPP template was created for HIP projects that includes the standard protocol for elements that are not expected to vary from site to site. You will be required to fill in elements of the SWPPP that are specific to your project and not provided in the template (the SWPPP template is available for download from the Resources For Professionals tab on the HIP website).
- "Erosion and Sediment Control Plan" sheet—This sheet shows the placement of SWPPP elements and erosion and sediment control BMPs on the site plan.
- Erosion and Sediment Control standard details—The suggested erosion and sediment control details are from the Department of Ecology's stormwater manual and are the most applicable erosion control BMPs for HIP projects. If soil is disturbed, many (or all) of these BMPs may be necessary. Any BMP shown on the plan sheet must have an accompanying detail. If a strategy that is not shown on any of the details is proposed, sketch it in the empty space in the lower right corner, or add a separate page describing this strategy. Remember that all erosion control plans and details must address construction equipment access, soil coverage, and sediment barriers.

  The SWPPP is paramount to protecting Lake Whatcom from dirty, phosphorus-laden runoff. The improvements installed through HIP are only effective if they are built in a way that protects existing soil, plants, and slopes, while also making sure no muddy water leaves the property. For projects near critical areas, including the shoreline, extra measures may be necessary to protect water quality.

If the only BMP proposed is Native Landscaping using the sheet mulching method described in the HIP Standards, you do not need to include a SWPPP as part of the application submittal packet. Submit a copy of the Erosion and Sediment Control Native Landscaping Projects Only (Oct-May) informational sheet as described in the City-specific forms and information section.

For all other BMPs, you will need to fill out the SWPPP as a written description of the erosion control measures shown on your "Erosion and Sediment Control Plan" sheet. Address the following questions in the "Erosion and Sediment Control Plan" sheet, some of which will apply to multiple elements in the SWPPP:

- **Construction Access**: How will equipment, including trucks, enter and exit the site without dirtying hard surfaces or creating a muddy mess?
- **Soil Coverage**: If it rains during construction, how do you propose to cover all of your exposed soil to prevent any erosion?
- **Sediment Barriers**: If those soil coverage methods do not work perfectly, how will you prevent muddy water from entering drains, ditches, or neighboring properties?

Depending on the specifics of your project, and the unique layout of the property, you may need more or fewer erosion controls. However, you must still consider and address all components of the SWPPP if you are planning to disturb soil or have exposed soil piles on your project site. If a component does not apply, write "not applicable" in the SWPPP template. For examples of SWPPPs and “Erosion and Sediment Control Plan” sheets, refer to the example HIP submittal packets provided for City of Bellingham properties. You may find it helpful to adapt the elements shown in the example plans to your project, but you may not need all of the items shown.

8 Special Considerations

Critical Areas and Their Buffers

Critical areas are environmentally sensitive areas designated for protection and special management. The Washington State Growth Management Act requires local jurisdictions to designate critical areas and regulate activities within them to protect ecological functions and public health, safety, and welfare. Critical areas include shorelines, streams/creeks, wetlands, fish and wildlife habitat, steep or unstable slopes, frequently flooded areas, and aquifer recharge areas. Critical areas typically have a buffer, determined by local code, where special regulations also apply.

The HIP Coordinator will work with other Conservation District, city, or county staff as needed to identify and locate critical areas and buffers as part of the Feasibility Report. If applicable, the HIP Coordinator will also provide site-specific information on required setbacks from critical areas in the Feasibility Report and be available to work with designers to troubleshoot BMP placement in critical area buffers.

Possible critical areas on HIP properties include:

- Shorelines—the area adjacent to Lake Whatcom
- Streams/Creeks—natural stream channels or modified waterways (may include ditches)
- Wetlands—areas with unique soils affected by saturated conditions and plants adapted to grow in wet soils; may be found along the lake shoreline or in upland locations
- Steep Slopes (Geohazards)—generally considered to be slopes >35%

Check the Feasibility Report and work with the HIP Coordinator to answer specific questions about BMP location requirements for a given parcel. The HIP Coordinator and city staff are available to answer questions and provide clarification for a specific site.

Noxious Weeds

Noxious Weeds are non-native plants that have been introduced to our native ecosystem from other parts of the world that have the potential to be highly destructive and difficult to control. The Washington State Noxious Weed Control Board determines which plants are placed on the official Washington State Noxious Weed List. Whatcom County Public Works Natural Resources manages a Noxious Weed Program designed to ensure noxious weeds are properly controlled.

Noxious weeds play a role in HIP projects when they are found growing in the project area because they have the potential to damage HIP BMPs, reduce their effectiveness, and increase maintenance costs (think blackberries taking over a new native planting area or covering an infiltration trench). The HIP Coordinator will look for noxious weeds during site visits and document their presence in the Feasibility Report. Proper removal and disposal of noxious weeds will be required during BMP installation. Noxious weeds cannot simply be cut off and dumped in a pile somewhere else on the property to compost because they will continue to spread and grow from where they are dumped. The HIP Coordinator can provide guidance on proper weed removal and disposal techniques or refer the homeowner or contractor to the Whatcom County Weed Control Coordinator as needed.

For more information on noxious weeds and the latest weed list visit www.whatcomcounty.us/914/Weeds

Rights-of-Way, Disputed Property Lines, and Conservation Easements

Before beginning design, review the Pre-Design Report and talk to the homeowner and HIP Coordinator to confirm known rights-of-way, property lines, and easements.

- Rights-of-Way—For HIP projects, an estimate of road or alley right-of-way location is adequate. A property boundary survey is not required. Within the City of Bellingham, City IQ provides an adequate estimate of road right-of-way location. Check with the HIP Coordinator with any questions about rights-of-way. Additional help is available from county staff to verify right-of-way information. Be aware that lots may be adjacent to vacant rights-of-way that are not clearly marked and that homeowners may not be aware of.
- Disputed Property Lines—In most cases, HIP projects will be installed according to the current established property boundary (e.g., fence location). If a property boundary is disputed between neighbors, the homeowner is responsible for resolving the dispute and obtaining a legal property boundary survey as part of the design process.
- Easements—In the event that a parcel has an existing conservation, utility, or other easement, HIP BMPs must be placed outside of the easement area unless formal written permission is obtained. Easements will be identified in the Feasibility Report.

Utility Conflicts

The Feasibility Report will contain preliminary information on utility location. It is the designer's and homeowner's responsibility to confirm the location of all utilities in areas where BMPs will be located as part of the design process. Call 811 to request a free utility locate and work with the homeowner to identify the location of septic systems and utility routes to

outbuildings. Contact the HIP Coordinator for assistance. Refer to the utility set-back requirements in the Design Guidance and Permitting Requirements for each BMP.

Plan Amendment Process

Sometimes HIP project designs need to change due to unforeseen circumstances. Depending on your role as Designer in the construction of a HIP project, you may or may not be directly involved in on-the-ground changes to the project. The magnitude of the changes will determine the process for making those changes. **In all cases, the HIP Coordinator should be notified prior to making any adjustments to approved, permitted HIP project plans.**

Simple material substitutions that do not affect the design or area treated are allowable. Examples of minor site plan changes that do not require additional paperwork include:

- Substituting one approved low-P mulch for another.
- Substituting a native plant for another within the same plant category (tree, shrub, groundcover).

Larger scale changes may require an official plan amendment form be completed and submitted for approval by the HIP Coordinator and the City. Large-scale changes could affect permit rules and conditions, the HIP reimbursement budget, and HIP eligibility. Examples of site plan changes that require the submittal of a plan amendment form include:

- Reducing the number of plants in a planting plan.
- Removing a BMP from the plan.
- Adding a BMP to the plan.
- Changing the size, configuration, or location of a BMP.

The Plan Amendment Form can be downloaded from the HIP website under the “For Professionals” tab.