CITY OF GIG HARBOR

Stormwater Management and Site Development Manual

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GIG HARBOR®
"THE MARITIME CITY"

City of Gig Harbor
Stormwater Management and Site Development Manual

Volume I
Minimum Technical Requirements and Site Planning

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Additional Sources
Washington Department of Ecology Stormwater Management Manual for Western Washington, 2005
King County Surface Water Design Manual, 2005
Seattle Public Utilities-Low Impact Development Guidelines

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Chapter 1 - Introduction

1.1 Objective

The objective of this manual is to provide guidance and requirements related to the measures necessary to control the quantity and quality of stormwater produced by new development and redevelopment such that they comply with water quality standards and contribute to the protection of beneficial uses of the receiving waters. The water quality standards include: Chapter 173-200 WAC, Water Quality Standards for Ground Waters of the State of Washington; Chapter 173-201A, Water Quality Standards for Surface Waters of the State of Washington; and Chapter 173-204, Sediment Management Standards.

This volume establishes the minimum requirements for stormwater control and site development requirements for all new development and redevelopment in the city and applies to all sites as detailed in Chapter 2 – Minimum Requirements for New Development and Redevelopment and Chapter 3 – Stormwater Submittal Requirements. These requirements are, in turn, satisfied by the application of best management practices (BMPs) from Volumes II through VI. The Director shall have the authority to increase requirements to protect the health, safety, and welfare of the public on the basis of information regarding threatened water quality, erosion problems, habitat destruction, historic flooding, protection of uninterruptible services, endangerment to property, or increases in requirements imposed by state or federal agencies or other pertinent factors.

Water quantity design criteria, water quality controls, erosion and sediment control (ESC) practices, and site development are outlined in this manual and apply throughout the city, and within the jurisdictional boundaries of any governmental entity which adopts this manual. This manual is applicable to all types of land development – including residential, commercial, industrial, and roads.

The intent and purpose of this manual is to:

- Establish criteria for review and analysis of all development
- Manage stormwater to minimize contact with contaminants
- Mitigate the impacts of increased runoff due to urbanization
- Manage runoff from developed property and that being developed
- Protect the health, safety, and welfare of the public.

It is not the intent of this manual to preclude alternative engineering solutions to design situations. It is expected that the professional engineer

will bring to each project the best of his/her skills and abilities to see that the project is thoroughly analyzed and designed correctly, accurately, and in compliance with generally accepted engineering practices. Alternatives to standard plans, specifications, and design details found in this manual will be accepted if they meet or exceed the performance of these standards as determined by the city. Engineers are encouraged to be innovative. The burden of proof, however, is on the engineer to document that his/her innovations meet or exceed the performance of the standards.

This manual is based on the premise that development and redevelopment shall not negatively impact adjacent and/or downstream property owners nor degrade groundwater or the natural drainage system, including but not limited to streams, ravines, wetlands, potholes, and rivers. Further, development activities should not impact adjacent and/or downstream property owners in a detrimental manner compared to the predeveloped condition.

It is not the intent of this manual to make Gig Harbor a guarantor or protector of public or private property with regards to land development activities.

Through this manual, Gig Harbor is complying with the Clean Water Act, the Puget Sound Water Quality Management Plan and the National Pollutant Discharge Elimination System (NPDES) Stormwater Permit. Where requirements in this document are also covered in any other law, ordinance, resolution, rule or regulation of any kind the more restrictive law shall govern.

1.2 Organization of this Manual

1.2.1 Overview of Manual Content

To accomplish the objective described in Section 1.1, the manual includes the following:

- *Minimum requirements* that cover a range of issues, such as submittal requirements, pollution prevention during the construction phase of a project, control of potential pollutant sources, treatment of runoff, control of stormwater flow volumes, protection of wetlands, and long-term operation and maintenance (O&M). The minimum requirements applicable to a project vary depending on the type and size of the proposed project.

- *Best management practices (BMPs)* that can be used to meet the minimum requirements. BMPs are defined as schedules of activities, prohibitions of practices, maintenance procedures, managerial practices, or structural features that prevent or reduce adverse impacts to waters of Washington. BMPs are divided into

those for short-term control of stormwater from construction sites, and those addressing long-term management of stormwater at developed sites. Long-term BMPs are further subdivided into those covering management of the volume and timing of stormwater flows (Volume III), prevention of pollution from potential sources (Volume IV), treatment of runoff to remove sediment and other pollutants (Volume V), and BMPs using low impact development (LID) techniques (Volume VI).

- *Guidance on how to prepare and implement stormwater submittals.* Chapter 3 of this volume covers Gig Harbor submittals required depending on the nature of the project or site characteristics.

1.2.2 Organization of this Manual

Volume I of this manual serves as an introduction, summarizes minimum requirements, and describes submittal requirements. The remaining volumes of this manual cover BMPs for specific aspects of stormwater management. Volumes II through VI are organized as follows:

- Volume II covers BMPs for short-term stormwater management at construction sites
- Volume III covers hydrologic analysis and BMPs to control flow volumes from developed sites
- Volume IV addresses BMPs to minimize pollution generated by potential pollution sources at developed sites
- Volume V presents BMPs to treat runoff that contains sediment or other pollutants from developed sites
- Volume VI presents LID strategies, BMPs, and related guidelines and requirements.

1.2.3 Organization of Volume I

Following this introduction, Volume I contains three additional chapters.

- *Chapter 2 – Minimum Requirements for New Development and Redevelopment* identifies the minimum requirements for stormwater management at all new development and redevelopment projects.
- *Chapter 3 – Stormwater Submittal Requirements* describes submittal requirements. One or more of the following submittals will be required depending on the nature of the project: Drainage

Control Plan, Erosion and Sediment Control Plan, Engineered Abbreviated Plan, Abbreviated Plan, and stormwater maintenance plan. Chapter 3 describes each of these submittals and provides step-by-step guidance on how to develop these plans.

- *Chapter 4 –BMP and Facility Selection Process for Permanent Stormwater Control Plans* describes the process for selecting BMPs for long-term management of stormwater flows and quality.

- *Appendix I-A – Requirements for Drainage and Erosion and Sediment Control for Construction of Single Family and Duplex Residences and Other Small Projects* provides a summary of submittal requirements as well as design guidelines for roof runoff controls and erosion/sediment control practices that are applicable to small projects.

- *Appendix I-B – Maintenance Including Example Maintenance Schedules* provides information on drainage facility O&M requirements.

- *Appendix I-C – Wetlands and Stormwater Management Guidelines* provides information on stormwater management impacts and mitigation related to wetlands.

- *Appendix I-D – Guidance for Altering the Minimum Requirements Through Basin Planning* provides information on basin planning as a tool for setting alternative stormwater management requirements.

This volume concludes with a glossary of terms.

1.3 How to Use this Volume

To ensure that projects are in compliance with state, federal, and local regulations pertaining to stormwater, it is recommended that at a minimum, project applicants refer to the following manual sections:

1. Determine what minimum requirements apply (see Chapter 2).

2. Refer to Chapter 3, Section 1.7 for general information on additional permits, regulations, and requirements that may apply to a project depending on its location and specific concerns of receiving waters.

3. Determine what submittal requirements apply (see Chapter 3).

4. Select appropriate BMPs (see Chapter 4).

These manual sections will direct the user to other relevant sections of the manual for specific BMP design guidance (Volumes III through VI) and construction practices (Volume II).

Developers of single family residences or small commercial developments will want to refer to Appendix I-A, which provides applicable requirements.

For site design measures that can be implemented to minimize the size and cost of flow control and water quality treatment BMPs, refer to the LID guidance in Volume VI.

1.4 Site Design Techniques and Requirements

The design professional is strongly encouraged to address the issue of stormwater management, both quantity and quality, in the early phases of the site planning process. Through careful consideration of site planning, effective impervious areas (EIAs) can be reduced thereby reducing the size and costs for facilities; efficient stormwater facilities can be integrated into the specific site parameters such as topography, soils, etc.; and source control measures can be utilized to prevent problems both during and post construction.

1.4.1 Site Planning and Layout

Some of the things that should be considered during site planning and layout include: minimizing creating impervious surfaces; clustering buildings and preserving larger areas of open space; minimizing directly connected impervious areas (try to separate impervious surfaces with areas of turf, other vegetation, or gravel); incorporation of low maintenance landscaping that doesn't need frequent applications of fertilizers, herbicides, and pesticides; and minimizing the impact area and soil compaction during construction.

The approach to considering and minimizing stormwater impacts at the site layout stage is commonly referred to as low impact development (LID). LID is a land use development strategy that emphasizes protection and use of onsite natural features integrated with engineered, small-scale hydrologic controls at the parcel and subdivision scale to manage stormwater and more closely mimic predevelopment watershed hydrologic functions. This is achieved by recognizing and focusing on the relationship among the overland and subsurface flow, infiltration, storage, and evapotranspiration characteristics of the site. LID strategies focus on evaporating, transpiring, and infiltrating stormwater onsite through native or amended soils, vegetation, and bioengineering applications to reduce and treat overland flow. Additional details on LID approaches and requirements in Gig Harbor are outlined in Volume VI.

1.4.2 Protection and Establishment of Natural Buffer Areas

Natural buffer areas may be required to protect drainage courses from erosion and pollutants. Natural buffer areas will be required adjacent to all wetlands, per the city's requirements, as documented in the , Chapter 18.08 Critical Areas GHMC. Where development is proposed near buffer zones that have been established by the city near an environmentally sensitive area, obtain the city's regulations regarding buffer zones.

Natural buffer areas are not to be confused with vegetated filter strips. Specifically, untreated sediment laden waters will not be allowed to discharge directly to a natural buffer area for treatment. Further, concentrated flows that could cause erosive damages will not be allowed.

1.5 Maintenance of Stormwater Best Management Practices

The importance of maintenance for the proper functioning of stormwater control facilities cannot be over-emphasized. Maintenance is crucial to performance of runoff treatment and flow control BMPs with a substantial portion of failures (clogging of filters, resuspension of sediments, loss of storage capacity, etc.) of such facilities resulting from inadequate maintenance. In addition, maintenance must be a basic consideration in design and in determination of cost. Therefore, provisions to facilitate maintenance operations must be built into the project when the BMP is installed.

Likewise, for both private and public facilities, it is important to include maintenance personnel early and throughout the design process. During discussions with maintenance personnel, describe the maintenance procedures that will need to be performed on the BMP. This will help ensure that future maintenance work and potential access needs are clearly understood.

The description of each BMP in subsequent volumes includes a brief section on facility maintenance. Appendix I-B includes a detailed schedule of maintenance standards for all drainage facilities. In addition, Section 3.3.4 outlines the specific requirements related to the maintenance plan submittal.

1.6 Development of BMPs for Stormwater Management

1.6.1 Best Management Practices

BMPs are activities, restrictions, or constructed stormwater facilities, that when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington. The types of BMPs are source control, treatment, flow control, and LID. BMPs that

involve construction of engineered structures are often referred to as facilities in this manual. For instance, the BMPs referenced in the menus in Volume V, Chapter 3 are called treatment facilities.

The primary purpose of using BMPs is to protect beneficial uses of water resources through the reduction of pollutant loads and concentrations, and through reduction of discharges (volumetric flow rates) causing stream channel erosion. If it is found that, after the implementation of BMPs advocated in this manual, beneficial uses are still threatened or impaired, additional controls may be required.

1.6.2 Source Control BMPs (Volume IV)

Source control BMPs **prevent** pollution, or other adverse effects of stormwater, from occurring. Source control BMPs are classified as operational or structural. Examples of source control BMPs include methods as various as using mulches and covers on disturbed soil, putting roofs over outside storage areas, and berming areas to prevent stormwater runon and pollutant runoff.

It is generally more cost effective to use source controls to prevent pollutants from entering runoff, than to treat runoff to remove pollutants. However, since source controls cannot prevent all impacts, some combination of measures will always be needed.

1.6.3 Treatment BMPs (Volume V)

Treatment BMPs include facilities that remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, and soil adsorption. Treatment BMPs can accomplish significant levels of pollutant load reductions if properly designed and maintained.

1.6.4 Flow Control BMPs (Volume III)

Flow control BMPs typically control the rate, frequency, and flow duration of stormwater surface runoff. The need to provide flow control BMPs depends on where the development site runoff is discharged to, e.g., to a stream system, wetland, or closed depression – either directly or indirectly.

Construction of a detention pond is probably the most common means of meeting flow control requirements. Construction of an infiltration facility is the preferred option but is feasible only where more porous soils are available.

The previous City of Gig Harbor Stormwater Design Manual Revised July 2006 focused primarily on controlling the peak flow release rates for recurrence intervals of concern – the 2-, 10-, and 100-year rates. This level of control did not adequately address the increased duration at which those high flows occur because of the increased volume of water from the

developed condition as compared to the predeveloped conditions. To protect stream channels from increased erosion, it is necessary to control the durations over which a stream channel experiences geomorphically significant flows such that the energy imparted to the stream channel does not increase significantly. Geomorphically significant flows are those that are capable of moving sediments. This target will translate into lower release rates and significantly larger detention ponds than the previous city standard. The size of such a facility can be reduced by changing the extent to which a site is disturbed. In addition, projects are encouraged to also look for means to improve or restore natural conditions to compliment, or in lieu of, traditional flow control measures. The LID techniques outlined in Volume VI are one means to accomplish this. See also Section 1.6.5 below.

1.6.5 Low Impact Development BMPs (Volume VI)

LID is a land use development strategy that emphasizes protection and use of onsite natural features integrated with engineered, small-scale hydrologic controls at the parcel and subdivision scale to manage stormwater and more closely mimic predevelopment watershed hydrologic functions. LID techniques may be considered an alternative to traditional, structural stormwater management solutions, or may supplement sites also using traditional stormwater approaches. Volume VI outlines both the performance goals and objectives for using LID methods as an effective stormwater management tool, both from an overall site design perspective, as well as for individual LID BMPs.

1.7 Relationship of this Manual to Federal, State, and Local Regulatory Requirements

This section describes some of the local, state, and federal regulations and permits that may apply to your project depending on the nature of the project and site characteristics. Gig Harbor staff is available to help in determining which permits apply and helping project applicants through the permitting process.

The Gig Harbor website has information on the city's permitting process, including online permit information: http://www.cityofgigharbor.net/page.php?id=38.

Permit information can also be obtained by calling the general information line at (253) 851-6170, or visiting the Public Works Department at 3510 Grandview Street in Gig Harbor.

The Joint Aquatic Resources Permit Application (JARPA) is another resource that can help to streamline the environmental permitting process. As noted in the following sections, several of the permits described in this

section are included in the JARPA, so they can be covered under a single permit application. Refer to the Access Washington, one-stop e-permitting website for more information: <http://epermitting.org/site/alias__resourcecenter/jarpa_introduction/10042/introduction.aspx>.

1.7.1 The Manual's Role as Technical Guidance and Requirements

The Gig Harbor Stormwater Management and Site Development Manual is to be used for identifying, selecting, and designing BMPs and completing submittal requirements to comply with city permits.

The requirements of this manual apply to all incorporated areas of Gig Harbor. These requirements also apply to cross-jurisdictional projects (e.g., utility, port, irrigation, drainage or flood control district, city, town, county, or other local, state, or federal government entity) located totally, or in part of, the city unless one of the following applies:

- Activity is exempted from submittal requirements (see Section 2.2)
- Development/redevelopment and stormwater activities are conducted in accordance with an approved stormwater management manual consistent with the Washington Department of Ecology's Stormwater Management Manual for Western Washington.

The manual provides technical guidance on measures to control the quantity and quality of stormwater runoff from new development and redevelopment projects. These measures are considered to be necessary to achieve compliance with state water quality standards and to contribute to the protection of the beneficial uses of the receiving waters (both surface and groundwaters). Stormwater management techniques applied in accordance with this manual are presumed to meet the technology-based treatment requirement of state law to provide all known available and reasonable methods of treatment, prevention and control (AKART; Revised Code of Washington [RCW] 90.52.040 and RCW 90.48.010).

This technology-based treatment requirement does not excuse any discharge from the obligation to apply additional stormwater management practices as necessary to comply with state water quality standards. The state water quality standards include: Chapter 173-200 WAC, Water Quality Standards for Ground Waters of the State of Washington; Chapter 173-201A, Water Quality Standards for Surface Waters of the State of Washington; and Chapter 173-204, Sediment Management Standards.

Severability

If any provisions of the manual or their application to any person or property are amended or held to be invalid, the remainder of the provisions in this manual in their application to other persons or circumstances shall not be affected.

Penalties and Enforcement

Penalties and enforcement shall be in accordance with Chapter 12.17 (GHMC).

Appeals

Appeals shall be handled in accordance with the Building Code Advisory Board (Chapter 15.02 GHMC).

1.7.2 More Stringent Measures and Retrofitting

Total maximum daily loads (TMDL) – which are also known as water cleanup plans – may identify more stringent measures needed to restore water quality in an impaired water body. For more information, refer to the Washington State Department of Ecology (Department of Ecology) website: <http://www.ecy.wa.gov/PROGRAMS/WQ/tmdl/index.html>.

1.7.3 Presumptive Versus Demonstrative Approaches to Protecting Water Quality

Wherever a discharge permit or other water-quality-based project approval is required, project applicants may be required to document the technical basis for the design criteria used to design their stormwater management BMPs. This includes: how stormwater BMPs were selected; the pollutant removal performance expected from the selected BMPs; the scientific basis, technical studies, and/or modeling which supports the performance claims for the selected BMPs; and an assessment of how the selected BMP will comply with Federal technology-based treatment requirements, state water quality standards, and satisfy "all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the State of Washington." This statutory requirement is generally known by the acronym AKART.

The BMPs presented in this manual are approved by Gig Harbor, Pierce County and the Department of Ecology and are *presumed* to protect water quality and instream habitat – and meet the stated environmental objectives of the regulations described in this chapter. Project applicants always have the option of not following the stormwater management practices in this manual. However, if a project applicant chooses not to

follow the practices in the manual then the project applicant will be required to individually *demonstrate* that the project will not adversely impact water quality by collecting and providing appropriate supporting data to show that the alternative approach is protective of water quality and satisfies state and federal water quality laws. Project interested in pursuing the demonstrative approach should contact Gig Harbor Public Works Department early in the process.

If a project applicant wants to follow the demonstrative approach for a water quality treatment BMP, the Ecology manual and website have more information on setting up an approved water quality monitoring plan to demonstrate that a project will protect water quality and satisfy state and federal laws. Additional Gig Harbor requirements will also apply. Contact City of Gig Harbor Public Works Department for additional information (253) 851-6170.

1.7.4 The Puget Sound Water Quality Management Plan

The Puget Sound Water Quality Management Plan directs every city and county in the Puget Sound Basin to develop and implement a comprehensive stormwater management program. Publication of this manual partially fulfills Gig Harbor's responsibilities under the Puget Sound Water Quality Management Plan. For more information, see the Puget Sound Partnership web page at: <http://www.psp.wa.gov/>.

1.7.5 Phase II – NPDES Stormwater Permits for Municipalities

The United States Environmental Protection Agency (EPA) NPDES Phase II Regulations went into effect. The EPA delegated Ecology authority to issue and administer the NDPES Phase II Municipal Stormwater Permits for municipalities. The City submitted the Notice of Intent application to Ecology as required.

The NDPES Phase II Municipal Stormwater Permit was issued on January 17, 2007 to the City of Gig Harbor and is available on the City website:
<http://www.ecy.wa.gov/programs/wq/stormwater/municipal/phase_I_permit/phase_i_wwa-0107/ph_i_permit-final.pdf>.

1.7.6 Reserved.

1.7.7 Construction Stormwater General Permit.

Construction sites that will disturb 1 acre or more and will have a discharge of stormwater from the project site to surface water must apply for Ecology's construction stormwater general permit. The permit requires application of stabilization and structural practices to reduce the potential

for erosion and the discharge of sediments from the site. The stabilization and structural practices cited in the permit are similar to the minimum requirements for sedimentation and erosion control in Chapter 2 of this volume. Developers must file a Notice of Intent with Ecology and develop a SWPPP prior to beginning construction. It is the responsibility of the project applicant to contact Ecology to determine if these or other requirements apply to their project. However, to minimize review time and effort by both the project applicant and the city, the Erosion and Sediment Control Plan required by the city has been structured to be consistent with Ecology's SWPPP requirements.

1.7.8 Endangered Species Act

With the listing of multiple species of salmon as threatened or endangered across much of Washington, and the probability of more listings in the future, implementation of the requirements of the Endangered Species Act will have a dramatic effect on urban stormwater management. The manner in which that will occur is still evolving. Provisions of the Endangered Species Act that may apply directly to stormwater management include the Section 4(d) rules, Section 7 consultations, and Section 10 Habitat Conservation Plans (HCP).

The Ecology manual has more information on stormwater-related concerns associated with the Endangered Species Act.

1.7.9 Section 401 Water Quality Certifications (included in JARPA)

For projects that require a fill or dredge permit under Section 404 of the Clean Water Act, Ecology must certify to the permitting agency, the U.S. Army Corps of Engineers (USACE), that the proposed project will not violate water quality standards. In order to make such a determination, Ecology may do a more specific review of the potential impacts of a stormwater discharge from the construction phase of the project and from the completed project. As a result of that review, Ecology may condition its certification to require application of the minimum requirements in this volume, or more stringent requirements.

1.7.10 Hydraulic Project Approvals (included in JARPA)

Under Chapter 77.55 RCW, the Hydraulics Act, the Washington State Department of Fish and Wildlife (WDFW) has the authority to require actions when stormwater discharges related to a project would change the natural flow or bed of state waters. The implementing mechanism is the issuance of a Hydraulics Project Approval (HPA) permit. In exercising this authority, WDFW may require application of the minimum requirements in this volume, or more stringent requirements.

1.7.11 Aquatic Lands Use Authorizations (included in JARPA)

The Washington State Department of Natural Resources (WDNR), as the steward of public aquatic lands, may require a stormwater outfall to have a valid use authorization, and to avoid or mitigate resource impacts. Through its use authorizations, which are issued under authority of Chapter 79.90 through 96, and in accordance with Chapter 332-30 WAC, DNR may require application of the minimum requirements in this volume, or more stringent requirements.

1.7.12 Requirements Identified through Watershed/Basin Planning or Total Maximum Daily Loads

A number of the requirements of this manual can be superseded by the adoption of ordinances and rules to implement the recommendations of watershed plans or basin plans. In accordance with the Watershed Management Act (Chapter 90.82 RCW) or the basin planning option in accordance with Chapter 400-12 WAC, the state allows Gig Harbor to initiate their own watershed or basin planning processes to identify more stringent or alternative requirements. As long as the actions or requirements identified in those plans and implemented through local or state ordinances or rules comply with applicable state and federal statutes, they can supersede the requirements in this manual. The decisions concerning whether such locally derived requirements comply with federal and state statutes rest with the regulatory agencies responsible for implementing those statutes.

A requirement of this manual can also be superseded or added to through the adoption of actions and requirements identified in a TMDL that is approved by the U.S. EPA. However, it is likely that at least some TMDLs will require use of the BMPs in this manual.

1.7.13 Underground Injection Control Authorizations

To implement provisions of the Safe Drinking Water Act, Ecology has adopted rules (Chapter 173-218 WAC) for an underground injection control program. Depending upon the manner in which it is accomplished, the discharge of stormwater into the ground can be classified as an underground injection control system. Additional information on underground injection control and how it applies to infiltration and stormwater management is included in Volume III, Section 3.4.

Chapter 2 - Minimum Requirements for New Development and Redevelopment

2.1 Overview

This chapter identifies the 11 minimum requirements for stormwater management applicable to new development and redevelopment sites. The minimum requirements are:

1. Preparation of stormwater site plans
2. Construction stormwater pollution prevention
3. Source control of pollution
4. Preservation of natural drainage systems and outfalls
5. Onsite stormwater management
6. Runoff treatment
7. Flow control
8. Wetlands protection
9. Basin/watershed planning
10. Operation and maintenance
11. Financial liability.

Depending on the type and size of the proposed project, different combinations of these minimum requirements apply. In general, small sites are required to control erosion and sedimentation from construction activities and to apply simpler approaches for treatment and flow control of stormwater runoff from the developed site. Controlling flows from small sites is important because the cumulative effect of uncontrolled flows from many small sites can be as damaging as those from a single large site. For small sites, including single family and small commercial developments, Appendix I-A provides separate applicable submittal, design, and stormwater management requirements.

Large sites must provide erosion and sedimentation control during construction, permanent control of stormwater runoff from the developed site through selection of appropriate BMPs and facilities, and other measures to reduce and control the onsite and offsite impacts of the project. Sites being redeveloped must generally meet the same minimum requirements as new development for the new impervious surfaces and pervious surfaces converted from natural vegetation to lawn or landscaped areas. Redevelopment sites must also provide erosion control, source control, and onsite stormwater management for the portion of the site being redeveloped. In addition, if the redevelopment meets certain cost or space (as applied to roads) thresholds, updated stormwater management for the redeveloped pervious and impervious surfaces must be provided. There may also be situations in which additional controls are required for sites, regardless of type or size, as a result of basin plans or special water quality concerns.

Development sites are to demonstrate compliance with these requirements through the preparation of stormwater site plans. The plans are described in detail in Chapter 3. Two major components of these plans are the Erosion and Sediment Control Plan (which includes a Construction SWPPP) and the Drainage Control Plan. The Erosion and Sediment Control Plan and SWPPP shall identify how the project intends to control pollution generated during the construction phase only, primarily erosion and sediment. The Drainage Control Plan shall identify how the project intends to provide permanent BMPs for the control of pollution from stormwater runoff after construction has been completed. Sites must submit these plans for review by the local government if they add or replace 2,000 square feet or more of impervious surface, or disturb 7,000 square feet or more of land.

Section 2.3 and 2.4 provide additional information on applicability of the minimum requirements to different types of sites, and Chapter 3 provides details on required stormwater submittals.

2.2 Exemptions

See exemptions listed in Section 14.20.070 Exemptions (GHMC). All other projects are subject to one or more of the minimum requirements (see Section 2.4).

2.2.1 Public Drainage Facilities

Drainage facilities conceived, designed, or constructed by or through an agent of the city shall be exempted from the submittal and permitting requirements of this manual. The city shall meet the intent and specific requirements of this manual on all projects relative to drainage or incorporating drainage components and shall maintain records adequate to reflect such compliance. These records shall be available upon request per the State Public Disclosure of Information Act, RCW 42.17.

The city shall incorporate the provisions of this manual into the design calculations, drawings, and specifications of all projects released for public bid. These provisions shall also apply to projects constructed by city staff.

This exclusion from submittal and permitting requirements only applies to this manual and does not relax any requirements of other applicable ordinances, regulations, or legislation except that superseded by this manual.

2.3 Applicability of the Minimum Requirements

Not all of the minimum requirements apply to every development or redevelopment project. The applicability varies depending on the type and

size of the project. This section identifies thresholds that determine the applicability of the minimum requirements to different projects. The flow charts in Figures 2.1 and 2.2 can be used to determine which requirements apply. The minimum requirements themselves are presented in Section 2.4.

Note: For definitions related to the minimum requirements (redevelopment, converted pervious surface, pollutant generating surface etc.) refer to the glossary in Volume I.

2.3.1 New Development

All new development shall be required to comply with Minimum Requirement #2.

The following new development shall comply with Minimum Requirements #1 through #5 for the new and replaced impervious surfaces and the land disturbed:

- Creates or adds 2,000 square feet, or greater, of new, replaced, or new plus replaced impervious surface area, or
- Has land-disturbing activity of 7,000 square feet or greater,
- The following new development shall comply with Minimum Requirements #1 through #11 for the new impervious surfaces and the converted pervious surfaces:
    - Creates or adds 5,000 square feet, or more, of new impervious surface area
    - Converts three-fourths acres, or more, of native vegetation to lawn or landscaped areas
    - Converts 2.5 acres, or more, of native vegetation to pasture.

Supplemental Guidelines

Basin planning is encouraged and may be used to tailor certain of the minimum requirements to a specific basin (Minimum Requirement #9).

Treatment and flow control requirements also may be achieved through construction of regional facilities, or discharge to city approved regional facilities. Such facilities must be operational prior to development, and must have the capacity and capability to meet the performance criteria applicable to the new development.

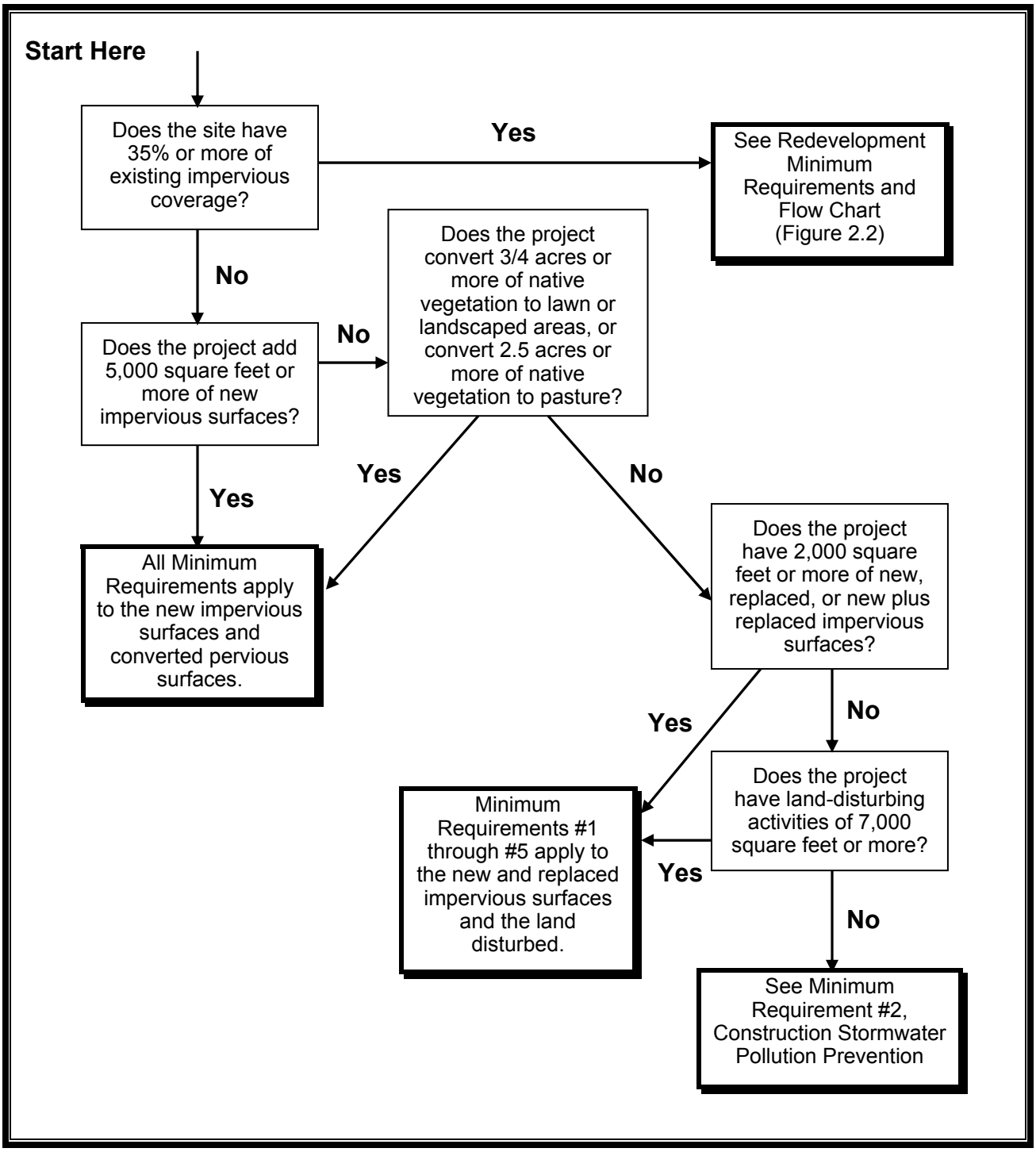

Figure 2.1. Flow Chart for Determining Requirements for New Development.

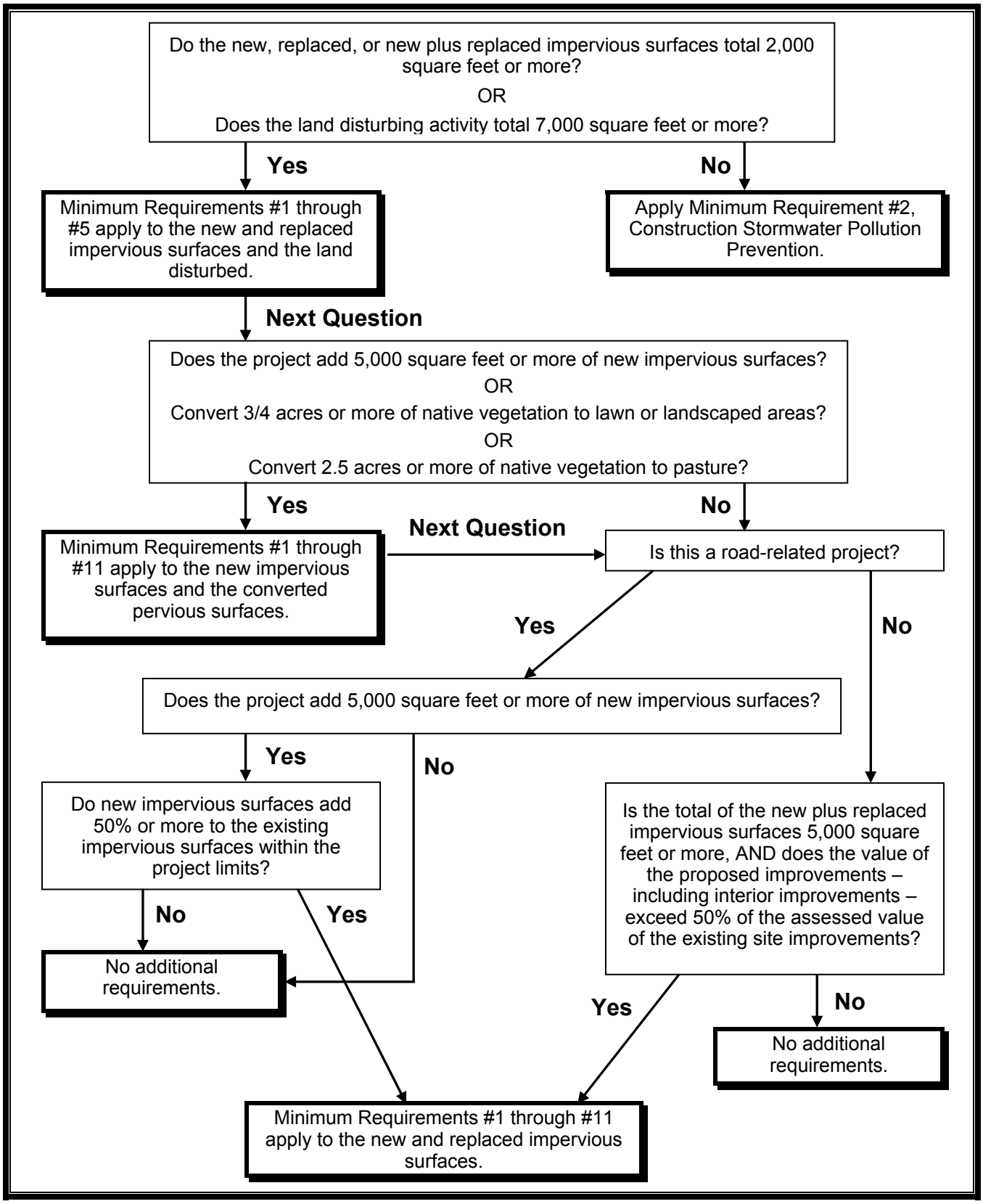

Figure 2.2. Flow Chart for Determining Requirements for Redevelopment.

Low Impact Development

The size and cost of stormwater management (treatment and flow control) facilities often can be reduced through effective implementation of LID techniques, which are described in Volume VI. Project applicants are encouraged to consider these site techniques at the earliest stages of project design, and through Minimum Requirement #5 must be maximizing the use of onsite stormwater management practices. Contact the Gig Harbor Public Works Department for assistance or more information.

Subdivisions

For the purposes of applying the thresholds in Chapter 3, Table 3.1 to a proposed subdivision (i.e., a plat or short plat project), the impervious surface coverage must be specified for each lot. The impervious coverage shall be assumed to be 4,000 square feet, the size of the lot, or the maximum allowed by GHMC, whichever is less. **Note: the impervious areas assumed for the lots must be set as the maximum allowable impervious area through a declaration of covenant recorded for the lot.** Therefore, it is extremely important to make an accurate estimate of the expected impervious coverage. In addition, the converted pervious surface on each created lot shall be the entire lot area minus the assumed impervious surface area and any area in which native conditions are preserved by a required clearing limit, a covenant or easement recorded for the lot, or a tract dedicated by the proposed subdivision.

Compensatory Flow Control or Treatment

Where new development projects require improvements (e.g., frontage improvements) that are not within the same threshold discharge area, Gig Harbor may allow the minimum requirements to be met for an equivalent (flow and pollution characteristics) area that drains to the same receiving water.

2.3.2 Redevelopment

All redevelopment shall be required to comply with Minimum Requirement #2. In addition, all redevelopment that exceeds certain thresholds shall be required to comply with additional minimum requirements as follows.

The following redevelopment shall comply with Minimum Requirements #1 through #5 for the new and replaced impervious surfaces and the land disturbed:

- The new, replaced, or total of *new plus replaced* impervious surfaces is 2,000 square feet or more, or

- 7,000 square feet or more of land disturbing activities.
- The following redevelopment shall comply with Minimum Requirements #1 through #11 for the new impervious surfaces and converted pervious areas:
    - Adds 5,000 square feet or more of new impervious surfaces
    - Converts three-fourths acres, or more, of native vegetation to lawn or landscaped areas
    - Converts 2.5 acres, or more, of native vegetation to pasture.

If the runoff from the new impervious surfaces and converted pervious surfaces is not separated from runoff from other surfaces on the project site, the stormwater treatment facilities must be sized for the entire flow that is directed to them. Alternatively, Gig Harbor may allow the minimum requirements to be met for an equivalent (flow and pollution characteristics) area within the same site. For roadway projects, the equivalent area does not have to be within the project limits, but must drain to the same receiving water.

Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics should not be subject to redevelopment requirements except construction site erosion control.

Additional Requirements for the Project Site

For road-related projects, runoff from the replaced and new impervious surfaces (including pavement, shoulders, curbs, and sidewalks) shall meet all the minimum requirements if the new impervious surfaces total 5,000 square feet or more and total 50 percent or more of the existing impervious surfaces within the project limits. The project limits shall be defined by the length of the project and the width of the right–of-way.

Other types of redevelopment projects shall comply with all the minimum requirements for the new and replaced impervious surfaces if the total of new plus replaced impervious surfaces is 5,000 square feet or more, and the valuation of proposed improvements – including interior improvements – exceeds 50 percent of the assessed value of the existing site improvements as determined by the city Building Official.

Finally, if the city determines that the project site contributes to an existing water quality, flooding, or erosion problem, the city may require that the project site comply with additional stormwater management requirements. The city shall base the determination on the results of basin planning for the basin in which the project is located; historic water

quality data; or historic information on flooding, erosion, or habitat degradation in receiving waters.

Objective

Redevelopment projects have the same requirements as new development projects in order to minimize the impacts from new surfaces. To not discourage redevelopment projects, replaced surfaces are not required to be brought up to new stormwater standards unless the noted cost or space thresholds are exceeded. As long as the replaced surfaces have similar pollution-generating potential, the amount of pollutants discharged shouldn't be significantly different. However, if the redevelopment project scope is sufficiently large that the cost or space criteria noted above are exceeded, it is reasonable to require the replaced surfaces to be brought up to current stormwater standards. This is consistent with other utility standards.

Supplemental Guidelines

If runoff from new impervious surfaces, converted pervious surfaces, and replaced impervious surfaces (if the applicable cost or space threshold has been exceeded) is not separated from runoff from other existing surfaces within the project site or the site, the guidance in Volume III for offsite inflow shall be used to size the detention facilities.

2.4 Minimum Requirements

This section describes the minimum requirements for stormwater management at development and redevelopment sites. Section 2.3 should be consulted to determine which requirements apply to any given project. Volumes II through VI of this manual present BMPs for use in meeting the minimum requirements.

2.4.1 Minimum Requirement #1: Preparation of Stormwater Site Plans

All projects meeting the thresholds in Section 2.3 are required to prepare one or more stormwater site planning documents for city review. **In addition, Gig Harbor requires Abbreviated Plan submittals for some projects that fall below the Minimum Requirement #1 threshold identified in Section 2.3.** The information required in the various stormwater site plans varies depending on the nature of the project and its location. Some projects will be required to prepare more than one type of plan depending on the project characteristics. Each of the four plan submittals listed below are described in detail in Chapter 3. See Chapter 3 and Table 3.1 for the specific information on required plans and plan content.

- Drainage Control Plan
- Erosion and Sediment Control Plan
- Engineered Abbreviated Plan
- Abbreviated Plan.

Completing the applicable plan in accordance with the requirements in Chapter 3 will meet Minimum Requirement #1.

Objective

The 2,000 square feet threshold for impervious surfaces and 7,000 square foot threshold for land disturbance are specified by Ecology to capture most single family home construction and their equivalent. The city-specific thresholds identified in Chapter 3, Table 3.1 were developed to meet more specific Gig Harbor needs and interests, without negating Ecology's requirements.

2.4.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention

All new development and redevelopment shall comply with Construction SWPPP Elements #1 through #12 as detailed in Volume II, Section 2.2.3. The twelve elements are summarized below, but project applicants must refer to Volume II, Section 2.2.3 for the full list of applicable requirements.

Projects in which the new, replaced, or new plus replaced impervious surfaces total 2,000 square feet or more, or disturb 7,000 square feet or more of land must prepare a Construction SWPPP as part of the Stormwater Site Plan (see 2.4.1). Each of the 12 elements must be considered and included in the Construction SWPPP unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the SWPPP.

Projects that add or replace less than 2,000 square feet of impervious surface or disturb less than 7,000 square feet of land are not required to prepare a Construction SWPPP, but must consider all of the 12 Elements of Construction Stormwater Pollution Prevention and develop controls for all elements that pertain to the project site.

These elements cover the general water quality protection strategies of limiting site impacts, preventing erosion and sedimentation, and managing activities and sources to during the construction phase of a project.

The 12 elements are:

1. Mark clearing limits
2. Establish construction access
3. Control flow rates
4. Install sediment controls
5. Stabilize soils
6. Protect slopes
7. Protect drain inlets
8. Stabilize channels and outlets
9. Control pollutants
10. Control dewatering
11. Maintain BMPs
12. Manage the project.

If a Construction SWPPP is found to be inadequate (with respect to ESC requirements), Gig Harbor may require that other BMPs be implemented as needed.

A complete description of each element and the associated BMPs are given in Volume II, Chapter 2.

2.4.3 Minimum Requirement #3: Source Control of Pollution

All known, available and reasonable source control BMPs shall be applied to all projects. Source control BMPs shall be selected, designed, and maintained according to this manual.

Objective

The intention of source control BMPs is to prevent stormwater from coming in contact with pollutants. They are a cost-effective means of reducing pollutants in stormwater, and, therefore, should be a first consideration in all projects.

Supplemental Guidelines

An adopted and implemented basin plan (Minimum Requirement #9) or a TMDL (also known as a Water Cleanup Plan) may be used to develop more stringent source control requirements that are tailored to a specific basin.

Source control BMPs include operational BMPs and structural source control BMPs. See Volume IV for design details of these BMPs. For construction sites, see Volume II.

Structural source control BMPs should be identified in the stormwater site plan and should be shown on site plans submitted for local government review.

2.4.4 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties. When downstream drainage courses are inadequate or systems are undersized, or when in the opinion of the city, property or properties may be adversely affected by the existing and/or proposed stormwater release rates, additional stormwater flow control measures may be required. Such determination by the city may be based upon existing information indicating problem areas or based upon current or past litigation over drainage problems within the vicinity of the project. If additional stormwater flow control measures are required by the city, the applicant may have the option to correct and/or improve downstream drainage conditions so that the proposed stormwater release rate does not have to be further restricted. Any offsite improvements will require the obtaining by the applicant to obtain easements from the owners of any property where work is to take place.

All outfalls require energy dissipation.

Objective

To preserve and utilize natural drainage systems to the fullest extent because of the multiple stormwater benefits these systems provide; and to prevent erosion at and downstream of the discharge location.

Supplemental Guidelines

Creating new drainage patterns results in more site disturbance and more potential for erosion and sedimentation during and after construction. Creating new discharge points can create significant stream channel erosion problems as the receiving water body typically must adjust to the new flows. Diversions can cause greater impacts than would otherwise occur by discharging runoff at the natural location.

Where no conveyance system exists at the adjacent downgradient property line and the discharge was previously unconcentrated flow or significantly lower concentrated flow, then measures must be taken to prevent downgradient impacts. Drainage easements from downstream property owners may be needed and should be obtained prior to approval of engineering plans.

The following discharge requirement applies:

Where no conveyance system exists at the abutting downstream property line and the natural (existing) discharge is unconcentrated, any runoff concentrated by the proposed project must be discharged as follows:

- If the 100-year recurrence interval peak discharge is less than or equal to 0.2 cubic feet per second under existing conditions and will remain less than or equal to 0.2 cubic feet per second under developed conditions, then the concentrated runoff may be discharged onto a rock pad or to any other system that serves to disperse flows.

- If the 100-year recurrence interval peak discharge is less than or equal to 0.5 cubic feet per second under existing conditions and will remain less than or equal to 0.5 cubic feet per second under developed conditions, then the concentrated runoff may be discharged through a dispersal trench or other dispersal system, provided the applicant can demonstrate that there will be no significant adverse impact to downhill properties or drainage systems.

- If the 100-year recurrence interval peak discharge is greater than 0.5 cubic feet per second for either existing or developed conditions, or if a significant adverse impact to downgradient properties or drainage systems is likely, then a conveyance system must be provided to convey the concentrated runoff across the downstream properties to an acceptable discharge point (i.e., an enclosed drainage system or open drainage feature where concentrated runoff can be discharged without significant adverse impact).

Stormwater control or treatment structures should not be located within the expected 25-year water level elevations for salmonid-bearing waters. Such areas may provide off-channel habitat for juvenile salmonids and salmonid fry. Designs for outfall systems to protect against adverse impacts from concentrated runoff are included in Volume III, Section 4.8.

2.4.5 Minimum Requirement #5: Onsite Stormwater Management

Projects shall employ onsite stormwater management BMPs to infiltrate, disperse, and retain stormwater runoff onsite to the maximum extent feasible without causing flooding or erosion impacts. Roof downspout control BMPs, functionally equivalent to those described in Volume VI, Section 3.9 through 3.11, and dispersion and soil quality BMPs, functionally equivalent to those in Volume VI, Sections 3.12 through 3.14, shall be required to reduce the hydrologic disruption of developed sites.

Objective

To use inexpensive practices on individual properties to reduce the amount of disruption of the natural hydrologic characteristics of the site.

Supplemental Guidelines

"Flooding and erosion impacts" include impacts such as flooding of septic systems, crawl spaces, living areas, outbuildings, etc.; increased ice or algal growth on sidewalks/roadways; earth movement/settlement, increased landslide potential; erosion and other potential damage.

2.4.6 Minimum Requirement #6: Runoff Treatment

Applicability

Projects must provide runoff treatment to reduce the water quality impacts of stormwater runoff from pollution generating surfaces.

Enhanced treatment is required for the following project sites that discharge to fish-bearing streams, lakes, or to waters or conveyance systems tributary to fish-bearing streams or lakes:

- Industrial project sites
- Commercial project sites
- Multifamily project sites with 200 units or greater
- High design year average daily traffic roads as follows:
    - Within urban growth management areas:
        - Fully controlled and partially controlled limited access highways with design year average daily traffic (counts of 15,000 or more)
        - All other roads with a design year average daily traffic of 7,500 or greater
    - Outside of Urban Growth Management Areas:
        - Roads with an design year average daily traffic of 15,000 or greater unless discharging to a fourth Strahler Stream Order stream or larger;
        - Roads with a design year average daily traffic of 30,000 or greater if discharging to a fourth Strahler Stream Order stream or larger (as determined using 1:24,000 scale maps to delineate stream order).

- The design year average daily traffic is defined as the planned traffic 5 years after the road is scheduled to be built.

However, such sites listed above that discharge directly (or, indirectly through a municipal storm sewer system) to basic treatment receiving waters (see below) are not subject to enhanced treatment requirements. For developments with a mix of land use types, the enhanced treatment requirement shall apply when the runoff from the areas subject to the Enhanced treatment requirement comprises 50 percent or more of the total runoff within a threshold discharge area.

Basic treatment receiving waters currently include all salt waters.

Thresholds

The following require construction of stormwater treatment facilities (see Table 2.1):

- Projects in which the total of effective, pollution-generating impervious surface (PGIS) is 5,000 square feet or more in a threshold discharge area of the project, or

- Projects in which the total of pollution-generating pervious surfaces (PGPS) is three-fourths of an acre or more in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site.

Table 2.1. Treatment Requirements by Threshold Discharge Area

	<¾ Acres of PGPS	≥¾ Acres PGPS	<5,000 sf PGIS	≥5,000 sf PGIS
Treatment Facilities		✔		✔
Onsite Stormwater BMPs	✔	✔	✔	✔

PGPS = pollution-generating pervious surfaces
PGIS = pollution-generating impervious surfaces
sf = square feet

Treatment Facility Sizing

Water Quality Design Storm Volume: The volume of runoff predicted from 91st percentile, 24-hour runoff volume indicated by an approved continuous simulation runoff model must be used to size treatment facilities (e.g., the Western Washington Hydrology Model [WWHM], MGSFlood, or Hydrological Simulation Program–Fortran [HSPF]).

Water Quality Design Flow Rate:

- *Preceding Detention Facilities or when Detention Facilities are not required*: The flow rate at or below which 91 percent of the runoff volume, as estimated by an approved continuous runoff model, will be treated.

- *Downstream of Detention Facilities*: The full 2-year recurrence interval release rate from the detention facility.

Alternative methods can be used if they identify volumes and flow rates that are at least equivalent.

That portion of any development project in which the above PGIS or PGPS thresholds are not exceeded in a threshold discharge area shall apply onsite stormwater management BMPs in accordance with Minimum Requirement #5.

Treatment Facility Selection, Design, and Maintenance

Stormwater treatment facilities shall be:

- Selected in accordance with the process identified in Chapter 4

- Designed in accordance with the design criteria in Volume V

- Maintained in accordance with the maintenance schedule in Appendix I-B.

Additional Requirements

Direct discharge of untreated stormwater from pollution-generating impervious surfaces to groundwater is prohibited. Volume V, Section 6.4 details the soil requirements to achieve water quality treatment through infiltration.

Objective

The purpose of runoff treatment is to reduce pollutant loads and concentrations in stormwater runoff using physical, biological, and chemical removal mechanisms so that beneficial uses of receiving waters are maintained and, where applicable, restored. When site conditions are appropriate, infiltration can potentially be the most effective BMP for runoff treatment.

Supplemental Guidelines

See Volume V for more detailed guidance on selection, design, and maintenance of treatment facilities. Volume V includes performance goals for basic, enhanced, phosphorus, and oil control treatment, and a menu of facility options for each treatment type. Treatment facilities that

are selected from the appropriate menu and designed in accordance with their design criteria are presumed to meet the applicable performance goals.

An adopted and implemented basin plan (Minimum Requirement #9), or a TMDL may be used to develop runoff treatment requirements that are tailored to a specific basin. However, treatment requirements shall not be less than that achieved by facilities in the basic treatment menu (see Volume V, Section 3.5).

Treatment facilities applied consistent with this manual are presumed to meet the requirement of state law to provide all known available and reasonable methods of treatment (RCW 90.52.040, RCW 90.48.010). This technology-based treatment requirement does not excuse any discharge from the obligation to apply whatever technology is necessary to comply with state water quality standards, Chapter 173-201A WAC; state groundwater quality standards, Chapter 173-200 WAC; state sediment management standards, Chapter 173-204 WAC; and the underground injection control program, Chapter 173-218 WAC. Additional treatment to meet those standards may be required by federal, state, or local governments.

Infiltration through use of onsite stormwater management BMPs can provide both treatment of stormwater, through the ability of certain soils to remove pollutants, and volume control of stormwater, by decreasing the amount of water that runs off to surface water. Infiltration through engineered treatment facilities that utilize the natural soil profile can also be very effective at treating stormwater runoff, but pretreatment must be applied and soil conditions must be appropriate to achieve effective treatment while not impacting groundwater resources. See Volume V, Chapter 6 for design details.

PGIS surfaces that are dispersed in accordance with the dispersion BMPs in Volume VI, Chapter 3 are not considered effective pollution generating impervious surfaces. Impervious surfaces on residential development sites are considered ineffective if the runoff is dispersed through at least 100 feet of native vegetation in accordance with the full dispersion BMP requirements outlined in Volume VI, Chapter 3. See also Appendix I-A for requirements and BMPs applicable to single family and other small projects.

2.4.7 Minimum Requirement #7: Flow Control

Applicability

Projects must provide flow control to reduce the impacts of stormwater runoff from impervious surfaces and land cover conversions. The requirements below applies to projects that discharge stormwater directly,

or indirectly through a conveyance system, into a fresh water – except for projects that discharge to any saltwater body.

Discharges to flow control-exempt receiving waters are only allowed in accordance with the following restrictions:

- Direct discharge to the exempt receiving water does not result in the diversion of drainage from any perennial stream classified as Types 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Types "S", "F", or "Np" in the Permanent Water Typing System, or from any Category I, II, or III wetland

- Flow splitting devices or drainage BMPs are applied to route natural runoff volumes from the project site to any downstream Type 5 stream or Category IV wetland:

    - Design of flow splitting devices or drainage BMPs will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50 percent of the 2-year to the 50-year recurrence interval peak flow.

    - Flow splitting devices or drainage BMPs that deliver flow to Category IV wetlands will also be designed using continuous hydrologic modeling to preserve preproject wetland hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction

- The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection, etc.) and extends to the ordinary high water line of the exempt receiving water

- The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected

- Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.

If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both this requirement and Minimum Requirement #8 apply.

Thresholds

The following require construction of flow control facilities and/or land use management BMPs that will achieve the standard requirement for western Washington (see Table 2.2):

- Projects in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area
- Projects that convert three-fourths of an acre or more of native vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site
- Projects that through a combination of effective impervious surfaces and converted pervious surfaces cause a 0.1 cubic feet per second increase in the 100-year recurrence interval flow frequency from a threshold discharge area as estimated using the WWHM, MGSFlood, or other approved model. See the supplemental guidelines below for example scenarios that could trigger this requirement.

That portion of any development project in which the above thresholds are not exceeded in a threshold discharge area shall apply onsite stormwater management BMPs in accordance with Minimum Requirement #5.

Table 2.2. Flow Control Requirements by Threshold Discharge Area

	Flow Control Facilities	Onsite Stormwater Management BMPs
<¾ acres conversion to lawn/landscape, or <2.5 acres to pasture		✔
≥¾ acres conversion to lawn/landscape, or ≥2.5 acres to pasture	✔	✔
<10,000 square feet of effective impervious area		✔
≥10,000 square feet of effective impervious area	✔	✔
≥0.1 cubic feet per second increase in the 100-year flood frequency	✔	✔

Discharge Requirements

The allowable release rates from a project are dependent upon the ultimate destination for the stormwater. All projects not directly attributable to one of the four categories defined below, and not exempted per the flow-control exempt receiving waters outlined above, shall use Category A for determining the allowable discharge rates. The requirements for each category are also outlined in Volume III, Section 3.1.

Category A: Discharge to a minor water body as defined below:

Any water body not defined as a flow control-exempt receiving waters (presented above), closed depression, a publicly owned regional retention and/or detention facility, or privately constructed regional detention and/or retention facilities.

In regard to implementation of the revised flow control requirement for highly urbanized basins, the Department of Ecology has published initial maps listing total impervious area for basins in western Washington. At the time this manual was published, no basins in Gig Harbor meet the 40 percent of the total impervious area/20-year criterion.

Requirements:

Stormwater discharges shall match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50 percent of the 2-year recurrence interval peak flow up to the full 50-year peak flow. The predeveloped condition to be matched shall be a forested land cover unless:

- Reasonable, historic information is provided that indicates the site was prairie prior to settlement (modeled as "pasture" in the WWHM)

- The drainage area of the immediate stream and all subsequent downstream basins have had at least 40 percent total impervious area since 1985. In this case, the predeveloped condition to be matched shall be the existing land cover condition. Where basin-specific studies determine a stream channel to be unstable, even though the above criterion is met, the predeveloped condition assumption shall be the "historic" land cover condition, or a land cover condition commensurate with achieving a target flow regime identified by an Ecology and Pierce County approved basin study.

This standard requirement is waived for sites that will reliably infiltrate all the runoff from impervious surfaces and converted pervious surfaces.

Alternative Requirement

An alternative requirement may be established through application of watershed-scale hydrological modeling and supporting field observations. Possible reasons for an alternative flow control requirement include:

- Establishment of a stream-specific threshold of significant bedload movement other than the assumed 50 percent of the 2-year recurrence interval peak flow

- Zoning and Land Clearing Ordinance restrictions that, in combination with an alternative flow control standard, maintain or reduce the naturally occurring erosive forces on the stream channel

- A duration control standard is not necessary for protection, maintenance, or restoration of designated beneficial uses or Clean Water Act compliance.

Category A: Objective

To prevent increases in the stream channel erosion rates that are characteristic of natural conditions (i.e., prior to disturbance by European settlement). The standard intends to maintain the total amount of time that a receiving stream exceeds an erosion-causing threshold based upon historic rainfall and natural land cover conditions. That threshold is assumed to be 50 percent of the 2-year recurrence interval peak flow. Maintaining the naturally occurring erosion rates within streams is vital, though by itself insufficient, to protect fish habitat and production.

Category B: Discharge to a Closed Depression

Applies to discharges to any low-lying area(s) which has / have no outlet, or such a limited surface outlet that in most storm events the area acts as a retention basin holding water for infiltration or evaporation shall be considered a pothole area. Appropriate water quality treatment BMPs will be applied to all discharges.

Requirements:

- Due to the significant adverse impacts which can result from increasing the rate, volume, and duration of stormwater runoff to closed depressions, the contributing area to each depression must be analyzed using a continuous runoff model for the 100-year recurrence interval developed runoff condition. When a proposed development is contributory to a pothole area, discharge to the pothole may be allowed when the discharge matches durations to predeveloped (existing) durations for the range of discharges from 50 percent of the 2-year recurrence interval flow up to the full 50-year flow. In addition, discharge rates must match the predeveloped (existing) rates for the 2-, 10-, and 100-year recurrence interval flows. In addition, a mandatory additional 20 percent safety factor must also be added to the final design storage volume. Appropriate water quality treatment BMPs must also be applied to all discharges. When selecting appropriate treatment BMPs, the engineer shall assume the soil is fully saturated all year within the closed depression unless the engineer provides supporting documentation for an alternative condition.

- Potential overflow routes from the closed depression shall be analyzed, using a fully developed contributing basin, and the engineer will identify and address potential adverse impacts per the minimum requirements outlined in this chapter. The closed depression will be analyzed, at a minimum, for uncontrolled discharge from the site to the pothole.

- If the project site discharges excess volumes to a privately owned closed depression, the applicant must obtain written permission/easements from the owner(s) of record for drainage course to the closed depression, the closed depression, and potential overflow. The applicant shall record the information with the Pierce County Auditor. This information shall be recorded with all affected property titles including those for the depression, overflow route, and the applicant's property. If easements cannot be obtained, discharge to the pothole may be allowed on a case by case basis in accordance with the first bullet of this requirement.

Category C: Discharge to a publicly owned regional retention facility. Applies to discharges to existing and any future publicly owned regional retention facilities.

Requirements:

- If the public retention facility is determined by the city to have capacity the developer shall have the option of paying the city a one-time buy in fee, as determined by the city, for the right to discharge excess stormwater flow, rates and volumes from the developed site. On a case by case basis the city may determine that it is reasonable and feasible for the developer to infiltrate the excess volumes on site, and thereby reject the request to discharge to the public facility.

- The project site must be located within the existing natural drainage basin tributary to the publicly owned regional retention facility.

- Water quality treatment is always required prior to discharge from the project site. Discharge to regional retention facilities that also provide water quality treatment will not be justification to remove this requirement.

- The allowable discharge rates from the project site shall be limited as follows based on the type of conveyance system from the project site to the regional retention facility:

- Direct discharge (after water quality treatment) may be allowed when the conveyance system to the retention facility is public and has capacity to convey stormwater runoff from its entire contributing basin in a fully developed condition. The retention facility must be designed or retrofitted to accept the increased flows without sustaining any damage. The city may limit the number of connection points into the retention facility to facilitate maintenance.

- Discharges (after water quality treatment) to existing public conveyance systems that are undersized or have unresolved capacity issues may be required to apply runoff duration and/or peak flow controls on site or install a new conveyance system with increased capacity.

- Discharge to or through a natural drainage system may be required to have flow controls that protect the channel and maintain flow capacity.

- The publicly owned regional retention facility must be available by the time of the construction of the new development or redevelopment with adequate capacity as determined by the city.

Category D: Privately constructed regional detention and/or retention facilities.

Requirements:

- In lieu of individual systems, applicants can design and build regional facilities in accordance with the design requirements of Category A or B, as applicable and with excess capacity which, when completed, may be dedicated to the city. Such a facility can be onsite or offsite. Upon city approval of the facility, the city may:

  - Accept the dedicated facility; and

  - If funds are available as determined by the Gig Harbor Public Works Director *and* the facility is constructed in a location within a basin studied by the Gig Harbor Public Works Department *and* is currently budgeted for in the approved 6-year capital facilities plan, reimburse the developer for the excess capacity provided by the facility at a rate mutually agreed upon, or

  - Enter into a latecomer's agreement with the developer for reimbursement as other properties are developed which opt to discharge to the regional facility.

Additional Requirements

Under any of the above categories, when downstream drainage courses are inadequate or systems are undersized, or when in the opinion of the city, property or properties may be adversely affected by the existing and/or proposed stormwater release rate, a restricted release rate may be required. Such determination by the city may be based upon existing information indicating problem areas or based upon current or past litigation over drainage problems within the vicinity of the project.

The release rate will be approved by the city and must be compatible with downstream drainage conditions. If a restricted release rate is required, the applicant may correct and/or improve downstream drainage conditions so that the proposed release rate does not have to be further restricted. When a restricted release rate is used, a corresponding increase in storage must be provided.

In addition, flow control BMPs shall be selected, designed, and maintained according to this manual.

Supplemental Guidelines

Calculations to determine whether a project exceeds the 0.1 cubic feet per second increase in the 100-year recurrence interval flow must be done individually for each project. The unique site, soil, precipitation, and other project-specific factors will ultimately determine whether this threshold is exceeded. Nonetheless, the following general guidelines (based on hypothetical site designs) may be used to help identify the likelihood of this threshold being exceeded. The following land uses changes are likely to exceed this threshold under certain conditions:

- Converting approximately 5,000 square feet of forest to impervious surface
- Converting approximately 5,000 square feet of pasture to impervious surface
- Converting approximately 0.25 acres of forest to landscape surface
- Converting approximately 1.25 acres of forest to pasture surfaces (in till soil conditions).

Reduction of flows through infiltration decreases surface water runoff and helps to maintain base flow throughout the summer months. However, infiltration should only be used where groundwater quality is not threatened by such discharges.

Volume III includes a description of the WWHM and other approved continuous simulation runoff models. Some of these models provide tools and/or credits for use of certain LID techniques described in Volume VI. Using those BMPs and LID techniques reduces the size of the required flow control facilities.

Application of sufficient types of LID and onsite stormwater management BMPs can result in reducing the effective impervious area and the converted pervious areas, thereby reducing or eliminating the need for a flow control facility. Impervious surfaces that are fully dispersed in accordance with Volume VI, Chapter 3 are not considered effective impervious surfaces. Porous pavers and modular grid pavements are assigned lower surface runoff calibrations and may also reduce stormwater flow control facility sizes. See Volume III, and Volume VI, Chapter 3, for more complete descriptions of hydrologic credits for onsite and LID stormwater management BMPs.

Diversions of flow from perennial streams and from wetlands can be considered if significant existing (i.e., preproject) flooding, stream stability, water quality, or aquatic habitat problems would be solved or significantly mitigated by bypassing stormwater runoff rather than providing stormwater detention and discharge to natural drainage features. Bypassing should not be considered as an alternative to applicable flow control or treatment if the flooding, stream stability, water quality or habitat problem to be solved would be caused by the project.

2.4.8 Minimum Requirement #8: Wetlands Protection

Applicability

The requirements below apply only to projects whose stormwater discharges into a wetland, either directly or indirectly through a conveyance system. These requirements must be met in addition to meeting Minimum Requirement #6: Runoff Treatment.

Thresholds

The thresholds identified in Minimum Requirement #6: Runoff Treatment, and Minimum Requirement #7: Flow Control shall also be applied for discharges to wetlands.

Standard Requirement

Discharges to wetlands shall maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses. The hydrologic analysis shall use the existing land cover condition to determine the existing hydrologic conditions unless directed otherwise by a regulatory agency with

jurisdiction. A wetland can be considered for hydrologic modification and/or stormwater treatment in accordance with Gig Harbor Critical Areas Ordinance, Chapter 18.08 GHMC and Guide Sheet 1B in Appendix I-C of this volume.

Additional Requirements

The standard requirement does not excuse any discharge from the obligation to apply whatever technology is necessary to comply with state water quality standards, Chapter 173-201A WAC, or state groundwater standards, Chapter 173-200 WAC. Additional treatment requirements to meet those standards may be required by federal, state, or local governments.

Stormwater treatment and flow control facilities shall not be built within a natural vegetated buffer, except for:

- Necessary conveyance systems as approved by Gig Harbor
- As allowed in wetlands approved for hydrologic modification and/or treatment as approved by Gig Harbor and any additional regulatory agency with jurisdiction.

An adopted and implemented basin plan (Minimum Requirement #9), or a TMDL may be used to develop requirements for wetlands that are tailored to a specific basin.

Objective

To ensure that wetlands receive the same level of protection as any other waters of the state. Wetlands are extremely important natural resources which provide multiple stormwater benefits, including groundwater recharge, flood control, and stream channel erosion protection. They are easily impacted by development unless careful planning and management are conducted. Wetlands can be severely degraded by stormwater discharges from urban development due to pollutants in the runoff and also due to disruption of natural hydrologic functioning of the wetland system. Changes in water levels and the frequency and duration of inundations are of particular concern.

Supplemental Guidelines

Appendix I-C, “Wetlands and Stormwater Management Guidelines” also includes Guide Sheet 2B from the publication “Wetlands and Urbanization, Implications for the Future,” the final report of the Puget Sound Wetland and Stormwater Management Research Program in 1997. It should be consulted when discharging to natural wetlands and wetlands constructed as mitigation.

Note that if selective runoff bypass is an alternative being considered to maintain the hydroperiod, the hydrologic analysis must consider the impacts of the bypassed flow. For instance, if the bypassed flow is eventually directed to a stream, the flow duration standard, Minimum Requirement #7, applies to the bypass.

2.4.9 Minimum Requirement #9: Basin/Watershed Planning

Projects may be subject to equivalent or more stringent minimum requirements for erosion control, source control, treatment, and O&M, and alternative requirements for flow control and wetlands hydrologic control as identified in basin/watershed plans. Basin/watershed plans shall evaluate and include, as necessary, retrofitting urban stormwater BMPs into existing development and/or redevelopment in order to achieve watershed-wide pollutant reduction and flow control goals that are consistent with requirements of the Clean Water Act. Standards developed from basin plans shall not modify any of the above minimum requirements until the basin plan is formally adopted and implemented by the local governments within the basin, and approved or concurred with by Ecology.

At the time this manual was published, there are no city and Ecology approved basin plans that establish new or alternative stormwater management requirements relative to this manual.

Objective

To promote watershed-based planning as a means to develop and implement comprehensive, water quality protection measures. Primary objectives of basin planning are to reduce pollutant loads and hydrologic impacts to surface and groundwaters in order to protect beneficial uses.

Supplemental Guidelines

In order for a basin plan to serve as a means of modifying the minimum requirements the following conditions must be met:

- The plan must be formally adopted by all jurisdictions with responsibilities under the plan
- All ordinances or regulations called for by the plan must be in effect.

Basin planning provides a mechanism by which the minimum requirements and implementing BMPs can be evaluated and refined based on an analysis of an entire watershed. Basin plans are especially well suited to develop control strategies to address impacts from future development and to correct specific problems whose sources are known or

suspected. Basin plans can be effective at addressing both long-term cumulative impacts of pollutant loads and short-term acute impacts of pollutant concentrations, as well as hydrologic impacts to streams, wetlands, and groundwater resources. Examples of how basin planning can alter the minimum requirements of this volume are given in Appendix I-D.

2.4.10 Minimum Requirement #10: Operation and Maintenance

A maintenance plan that is consistent with the provisions in this manual shall be provided for all proposed stormwater facilities and BMPs, and the party (or parties) responsible for maintenance and operation shall be identified. At private facilities, a copy of the plan shall be retained onsite or within reasonable access to the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the plan shall be retained in the appropriate department. A log of maintenance activity that indicates what actions were taken shall be kept and be available for inspection by the city. Section 3.3.4 outlines additional details applicable to the maintenance plan submittal, which is included as part of the Drainage Control Plan.

Objective

To ensure that stormwater control facilities are adequately maintained and operated properly.

Supplemental Guidelines

Inadequate maintenance is a common cause of failure for stormwater control facilities. Appendix I-B provides detailed maintenance O&M requirements for each BMP presented in this plan.

2.4.11 Minimum Requirement #11: Financial Liability

Performance bonding or other appropriate financial instruments shall be required for all projects to ensure compliance with these standards.

2.5 Additional Guidance

2.5.1 Financial Guarantees

Financial guarantees shall be either by bond or assignment of funds (see Attachments Section I). Financial guarantees shall be on the most recent version of the applicable city form.

Financial guarantees under $5,000.00 must be by an assignment of funds. Financial guarantees greater than or equal to $5,000.00 can be by assignment of funds or bonds.

All financial guarantees shall run continuously until released by Gig Harbor and shall not be subject to expirations or cancellations.

In the event that a property is sold, the applicant is responsible for transferring their financial guarantee liability by having the new owner(s) replace any existing financial guarantees that the city is holding.

A right of entry form (see Attachments Section I) shall be signed by the property owner for use in the event that the city must enter onto the property to complete the necessary improvements. The right of entry shall run with the land. A completed right of entry form is required prior to acceptance of any financial guarantee covering improvements on private property.

Reclamation Guarantee

The purpose of this guarantee is to ensure that adequate erosion control measures are employed during the course of construction and that permanent stabilization is achieved at the conclusion of significant activity. The guarantee may be utilized to reduce drainage impacts and permanently stabilize the site in the event that the city determines a site has been abandoned after construction begins. The city will consider a site to be abandoned based on a lack of response by the applicant to correct noted deficiencies or non-completion of improvements prior to permit expiration. Permanent stabilization includes reclamation of the site if a project is abandoned after construction begins.

The guarantee shall be for $1,500.00 per acre to be disturbed, $1,500.00 minimum.

The reclamation guarantee must be accepted by Gig Harbor prior to approval of a site development permit and will be released after the conclusion of significant activity on the project site and upon the recommendation of the city inspector. The city inspector will recommend release of the reclamation guarantee when he/she determines that little potential for erosion, sedimentation, or stormwater impacts remains.

Upon identification by the city of deficiencies relating to erosion control, site stabilization, or project abandonment, the city will provide written notification to the applicant identifying the deficiencies. The applicant will have 10 calendar days to respond. The city will begin collection proceedings after the 10 calendar day period if the deficiencies are not satisfactorily addressed or satisfactory response detailing how the deficiencies will be addressed in a timely fashion has not been received.

Construction Guarantee

The purpose of this guarantee is to ensure the completion of proposed improvements as required by this manual, other ordinances, Hearing Examiner conditions, SEPA mitigation, etc. The construction guarantee will also ensure completion of an improvement in city right-of-way or on city property in the event that a project is abandoned after construction has begun.

The construction guarantee amount can be determined by submitting a scope of work to be accomplished and an engineer's estimate for the cost thereof. The estimate shall be based on current construction cost data. The city will review the estimate and, if acceptable, establish the financial guarantee at 300 percent of the estimate for short plats and 125 percent of the estimate for formal plats and commercial activities to allow for inflation and administrative expenses should the city have to complete the work. Alternatively, the amount can be determined by using the same percentage of an executed construction contract for all of the work to be guaranteed.

When work is proposed in the city right-of-way, a construction guarantee must be accepted by Gig Harbor prior to approval of the site development and right-of-way permits for the project. The financial guarantee may be in-lieu of construction of required improvements within public rights-of-way except in situations where the work involves a safety or public welfare issue. A construction guarantee for work on private property is required when the project applicant desires to obtain final approval of the development project (final plat, short plat, , etc.) prior to construction of some or all of the necessary improvements.

The following conditions must be met prior to release of the construction guarantee:

- Completion of the necessary improvements
- Submittal to and acceptance by the city of the Engineer's Inspection Report Form
- Acceptance by the city of the completed construction
- Submittal to and acceptance by the city of the 18-month guarantee.

All improvements financially guaranteed must be completed within 3 years of the date of issuance of the site development permit or right-of-way permits. The city will begin collection proceedings after the 3-year time limit has expired. The applicant will remain financially responsible for any and all costs exceeding the amount of the original guarantee.

Defect and Maintenance Guarantee

The purpose of this guarantee is to ensure that the applicant will correct any defect or subsequent problem and conduct all maintenance and inspections as shown in the approved O&M manual. The intent is to protect the taxpayers and/or affected private property owners from the undue financial burden of having to correct problems caused by improper design, faulty construction, or other project-related reasons determined by the city. The defect and maintenance guarantee will also ensure the facility is fully functional and meets manual requirements when turned over to the homeowners' association or future owner, or is accepted by the city. The defect and maintenance guarantee performance period will be 42 months (3.5 years) unless modified by the city. During the defect and maintenance guarantee performance period facilities are to demonstrate they function as designed in a final built-out condition of the project.

The guarantee shall be for 15 percent of the engineer's estimate (or alternatively 15 percent of an executed construction contract for all of the work to be guaranteed) but not less than $5,000.

The defect and maintenance guarantee must be submitted to and accepted by the city prior to final project approval or prior to release of the construction guarantee when applicable.

The city will start the performance period on the defect and maintenance guarantee and administer it as follows:

- The defect and maintenance guarantee period will begin when road and storm drainage construction is complete and the guarantee has been submitted. Road and storm construction is considered to be complete when the final inspection has been completed, the as-built drawings have been approved, the engineer's inspection report form has been approved, and the O&M manual/maintenance schedule has been accepted.

- Inspection of the site will occur annually during the 42-month period. At the time of the second annual and subsequent inspections, the city may extend the 42-month period in the event that substantial portions (homes/buildings) of the project have yet to be constructed, or failures in design, performance or maintenance are evident.

- At the end of the defect and maintenance guarantee period it is the applicant's responsibility to request a final inspection by the city. This request shall be submitted to the city in writing. In the written request the applicant will include copies of all maintenance logs that comply with the approved O&M manual. Failures to submit

maintenance logs, complete required maintenance or observed design deficiencies are grounds for the city to extend the 42-month period for a time period determined by the city.

- Projects will be inspected on a first-come, first-serve basis. If no deficiencies are noted, the city will recommend release of the financial guarantee. If deficiencies are noted, the applicant will be notified of the specific deficiencies to be corrected. The applicant will have 30 days to respond. The city will begin collection proceedings after the 30-day period if the deficiencies are not satisfactorily addressed. The guarantee will not be released until the work is found to be acceptable.

The applicant may request in writing a reduced timeframe for the performance period for projects that have met all the criteria listed below. The intent is to give the applicant a method to reduce the standard 42-month performance period on projects that can be built and stabilized quickly. This option does not change the terms for releasing the financial guarantee. In no event shall the performance period be less than 18 months.

- Site is completely built out per approved plans (phased projects do not qualify). The city must accept that permanent erosion control measures have been fully established prior to the beginning of the wet season.

- All storm drainage facilities must have gone through one full wet season, October 1 to April 30, after permanent erosion control establishment has been accepted.

Temporary Driveway Approach Guarantee

The purpose is to ensure the removal of the temporary driveway approach and restoration of the city right-of-way. Removal of the temporary driveway approach means to permanently close the approach by blocking, berming, fencing, or other method suitable to the city. Restoration of the city right-of-way means to restore the city road, shoulder, and storm drainage system to the condition they were in prior to construction of the temporary driveway approach.

The amount shall be $2,000 for each temporary driveway approach to a paved city road, or $1,500 for each temporary driveway approach to a gravel city road. The temporary driveway approach guarantee must be accepted by Gig Harbor prior to approval of the site development permit for the temporary driveway approach.

Upon removal of the temporary driveway approach and restoration of the city right-of-way, the applicant will contact the city Inspector and request

inspection. The inspection will be completed on a first-come, first-serve basis. If the removal and restoration work is found to be acceptable, the financial guarantee will be released. If the work is not found to be acceptable, the applicant will be notified of the deficiencies to be corrected, the guarantee will not be released until the work is found to be acceptable.

The city will provide written notice to the applicant of deficiencies in the removed or constructed temporary driveway approach or the need to remove the temporary driveway approach. The applicant will have 30 days to respond. The city will begin collection proceedings after the 30-day period if the deficiencies are not satisfactorily addressed and/or the temporary driveway approach is not properly removed.

2.5.2 Deeds and Easements

The following deeds and easements should be used to convey property or rights to Gig Harbor:

- Statutory warranty deed (individual, partnership, or corporate) – used to convey real property to Gig Harbor
- Storm sewer easement – this document conveys to Gig Harbor the right to have and maintain a storm sewer system across a specific parcel of property
- Slope and utility easement – this document conveys the right to have fill material or a cut slope and utilities on private property
- Quitclaim deed – used to convey maintained but undocumented right-of-way to Gig Harbor.

2.5.3 Acceptance of New Stormwater Facilities

The developer of a stormwater facility is responsible for construction and maintenance of the facility which must be in compliance with this manual.

Public Ownership

The city may accept for maintenance those new stormwater facilities constructed under an issued site development permit that have met the permit requirements and the requirements for release of the Defect and Maintenance Guarantee.

Private Ownership – Subdivisions Projects

If a project's drainage facilities are not dedicated to and accepted by the city, and if the project is a subdivision or short subdivision, the applicant shall form a property owners' association. The document creating the

property owners' association shall at a minimum make provision for the following:

- Members of the property owners' association shall be responsible for maintenance of storm drainage facilities
- Inclusion by reference of the operation and maintenance manual prepared by the project engineer in accordance with the manual
- Power to assess fees to maintain storm drainage facilities
- Responsibility for payment of financial sanctions/repayments should the city have to conduct repairs/activities due to hazardous conditions.

A maintenance covenant will be recorded with the Pierce County Auditor for the plat and recorded against each lot within the subdivision or short division. See Appendix I-B and Attachments Section I.

Private Ownership – Other Projects

If the project is other than a subdivision, short subdivision, or the applicant will describe the organization or persons that will own and maintain the facility and provide evidence the maintenance activities will be performed and are adequately financed.

2.5.4 Construction Materials

All materials used in construction of private and city drainage facilities shall meet the current Washington State Department of Transportation standard specifications, American Association of State Highway and Transportation Officials (AASHTO), and American Society for Testing and Materials (ASTM) standards as amended or supplemented by the state or city. The applicant is responsible for contacting the city to obtain any modifications or supplements.

2.5.5 Variances

Exceptions to the minimum requirements may be granted through the variance process described in Section 14.20.080 Variances (GHMC).

Chapter 3 - Stormwater Submittal Requirements

This chapter defines the various requirements for submittal of plans, reports, and other documents for review by Gig Harbor. All projects and associated plans are subject to the minimum requirements outlined in Chapter 2. The plans described in this chapter meet the requirements of the stormwater site plan required by Minimum Requirement #1. Submittal requirements for single family residential lots are specifically addressed in Appendix I-A. This chapter is divided into 8 major sections:

- Section 3.1 describes the project completion criteria and the city's approval process
- Section 3.2 describes which submittals are required, depending on project thresholds. General submittal requirements are also discussed
- Section 3.3 describes Drainage Control Plans
- Section 3.4 describes Erosion and Sediment Control Plans
- Section 3.5 describes construction design drawing requirements
- Section 3.6 describes Engineered Abbreviated Plans
- Section 3.7 describes Abbreviated Plans
- Section 3.8 describes submittal requirements for construction drawings and specifications.

3.1 Project Completion Criteria and Approval Process

3.1.1 Preliminary Approval

Applicable submittals (Drainage Control Plans, Erosion and Sediment Control Plans, Abbreviated Plans, or Engineered Abbreviated Plans) must be approved by the city, and ESC measures must be in place as per the approved plan before the city will do the following:

- Grant any commercial or single family building, or other related structure permit
- Allow project clearing, earthwork, demolition, site work, logging activities, any preconstruction activity or construction activity except as needed to install ESC facilities to begin.

A preconstruction meeting with city staff may be required to discuss sequencing of construction or erosion control and infiltration facilities, inspection, and other matters.

3.1.2 Final Project Approval

The city will not approve developments, perform final building inspections, release financial guarantees related to drainage and erosion control, or accept final construction until the following have been completed:

- Construction inspection report(s) and as-built drawings of related drainage improvements, road, shared access or alleyway improvements and erosion control measures have been prepared by the project engineer and been accepted by the city.
- Special requirements on the cover sheet of a plat and a general easement for protection and maintenance have been completed or executed.
- Filing with the Pierce County Auditor of covenants on lots, property owners' association articles, maintenance easements, agreements with adjacent property owners, and similar documents as required in the Drainage Control Plan and Erosion and Sediment Control Plan.
- Conditions of approval fulfilled.
- Site stabilized and restored, and temporary erosion control measures are removed as required by the city as detailed in Volume II.
- Completion of city inspections.

The city will not issue single-family building permits in subdivisions, including short subdivisions until all necessary drainage improvements, roads, shared accesses or alleyways are completed, with the exception that minor items that may be damaged during homebuilding (such as sidewalks, bioswale linings, or shoulder leveling course) may be financially guaranteed.

3.1.3 Review and Acceptance Does Not Confer Responsibility

The city will review all submittals for general compliance with this manual. An acceptance of a submittal by the city does not relieve the applicant or project engineer from responsibility for ensuring that all facilities are completed in accordance with the calculations, plans, change orders and specifications, and that all of the preceding, and as-built (record) drawings comply with current engineering standards, this manual, and applicable federal, state, and local laws and codes.

3.1.4 Time Limitations of Approval for Plans

A site development permit shall be valid for 3 years from the date of approval or final plat approval whichever comes last. A site development permit may be extended once for 1 year if deemed appropriate by the city. At the end of all extensions or permit expirations, the project is subject to the requirements and standards adopted at that time. Any project not substantially completed or implemented within the applicable time period shall be resubmitted to the city for review and any revisions or modifications necessary to meet the current standards shall be made before the plans are approved by the city.

3.2 Projects and Activities Requiring Plan Submittal

Project thresholds are summarized in Table 3.1 based on the proposed project and site conditions. Project applicants should identify their type of project in the Table 3.1 rows, and then identify the applicable submittal requirements by each column, as well as any applicable table notes. Stormwater submittals will consist of one or more of the four plans described in Sections 3.3 to 3.7.

Unless otherwise exempted in Section 2.2, projects that are not required to submit a Drainage Control Plan shall submit an Abbreviated Plan as described in Section 3.7. An Engineered Abbreviated Plan shall be submitted in lieu of an Abbreviated Plan if the project is in or near areas described in Section 3.6 and Table 3.1.

The city may require the applicant to participate in a meeting early in the project to outline the conceptual approach for stormwater management on the project site.

3.2.1 Drainage Control Plans

Applicants of projects that meet the thresholds shown in Table 3.1 must submit a Drainage Control Plan as specified in Section 3.3. All such plans shall be developed by a professional engineer licensed to practice in the State of Washington (hereinafter referred to as the project engineer). Projects not meeting the thresholds shown in Table 3.1 for a Drainage Control Plan will be required to submit an Engineered Abbreviated Plan or an Abbreviated Plan per Section 14.20.020 GHMC and Section 14.20.050 GHMC. Note that Erosion and Sediment Control Plans may also be required.

Table 3.1. Thresholds for Abbreviated Plans, Engineered Abbreviated Plans, Erosion and Sediment Control Plans, and Drainage Control Plans

	Category	Critical Areas [1]		≥2,000 sf New or Replaced Impervious Surface or ≥7,000 sf Land Disturbed	≥5,000 sf New or Replaced Impervious Surface, or ≥0.75 ac of Native Vegetation Converted to Lawn, or ≥2.5 ac Native Vegetation Converted to Pasture	≥250 cy Materials Moved	Maintenance Includes Modification of the Original Design
		Yes	No				
1	Subdivisions, Short Plats,	EAP	AP	AP/EAP, ESCP	ESCP, DCP	ESCP, DCP	
2	Creation of New Impervious Surface	EAP	AP	AP/EAP, ESCP	ESCP, DCP [2]	ESCP, DCP	
3	Construction of Public and Private Roads, Shared Accesses, and Alleyways	ESCP, DCP [2]					
4	Maintenance and Repair of Private Roads, Shared Accesses, and Alleyways	EAP		EAP(if critical areas), ESCP	ESCP, DCP	ESCP, DCP	DCP
5	Maintenance and Repair of Private Stormwater drainage systems	EAP	AP			ESCP, DCP	DCP
6	Utility Line Work (construction or maintenance – inside R/W) [3]			ESCP	ESCP, DCP	ESCP, DCP	
7	Utility Line Work (construction or maintenance – outside R/W) [4, 5]	EAP		EAP(if critical areas), ESCP	ESCP, DCP	ESCP, DCP	
8	Non-residential Building Permit [6]	EAP	AP	AP/EAP, ESCP	ESCP, DCP [2]	ESCP, DCP	
9	Non-residential Building Permit for Structures in Plats (if the jurisdiction has already approved a DCP for the plat) [6]	EAP	AP	AP/EAP, ESCP	ESCP, DCP	ESCP, DCP	
10	Residential Building Permit [6]	EAP	AP	AP/EAP, ESCP	ESCP, DCP	ESCP, DCP	
11	Clearing	EAP	AP	AP/EAP, ESCP	ESCP, DCP		
12	Grading	EAP	AP	AP/EAP, ESCP		ESCP, DCP	
13	Driveway culvert installation in Roadside Swales/Ditches [6]						

AP = Abbreviated Plan
DCP = Drainage Control Plan
EAP = Engineered Abbreviated Plan
ESCP = Erosion and Sediment Control Plan

Table 3.1 notes:

1. An Abbreviated Plan or Engineered Abbreviated Plan is required unless the thresholds for a Drainage Control Plan are met. An Erosion and Sediment Control Plan may be required in addition to the Abbreviated Plan or Engineered Abbreviated Plan. Projects that involve the following activities or the following site conditions are in critical areas and require an Engineered Abbreviated Plan:

   - Critical fish and wildlife habitat areas
   - Wetlands and their associated buffers in accordance with Chapter 18.08 Critical Areas GHMC.
   - Flood hazard area as per Chapter Title 18.08 Critical Areas GHMC.
   - Active landslide hazard area, or landslide hazard management area or associated buffers in accordance with Chapter 18.08 Critical Areas GHMC.
   - Stable area in accordance with Chapter 18.08 Critical Areas GHMC.
   - Active Shoreline Erosion Hazard Area, or Shoreline Erosion Hazard Management Area or associated buffer in accordance with Chapter 18.08 Critical Areas GHMC.
   - Removal, deposit or displacement of material within 25 feet of a drainage course or drainage channel.

2. If the proposed project will result in the addition of new impervious surface amounting to 25 percent or more of existing impervious surface, providing that the site is greater than 1 acre in size with 50 percent or more impervious surface, or the city determines developed site contributes to existing water quality, flooding, or erosion problem, the entire site must be brought up to current stormwater standards.

3. All work shall be performed in accordance with the Public Works Standards in Gig Harbor Right-of-Way, shall include the implementation of the applicable Abbreviated Plan measures, and shall be in compliance with Chapter 14.30 Illicit Discharge Detection and Elimination GHMC for the life of the installation.

4. An individual site development permit is not required if utility line improvements are performed within a larger project (i.e., subdivision construction) that has a site development permit and the utility line improvements are performed within a larger project (i.e., subdivision

construction) that has a site development permit and the utility line improvements have been addressed under the larger project's site development permit.

5. Routine, repetitive maintenance or repair activities that do not meet the threshold for an Engineered Abbreviated Plan, Drainage Control Plan, or Erosion and Sediment Control Plan shall be performed in accordance with standard BMPs as published by the city.

6. Driveway culvert size and location to be per city inspector's direction. The city may require that the applicant retain an engineer to size and design the culvert in situations where a larger than standard diameter appears necessary.

Note: For the purposes of applying the thresholds in Chapter 3, Table 3.1 to a proposed subdivision (i.e., a plat or short plat project), the impervious surface coverage must be specified for each lot. The impervious coverage shall be assumed to be 4,000 square feet, the size of the lot, or the maximum allowed by GHMC, whichever is less. ***Note: the impervious areas assumed for the lots must be set as the maximum allowable impervious area through a declaration of covenant recorded for the lot.*** *Therefore, it is extremely important to make an accurate estimate of the expected impervious coverage. In addition, the converted pervious surface on each created lot shall be the entire lot area minus the assumed impervious surface area and any area in which native conditions are preserved by a required clearing limit, a covenant or easement recorded for the lot, or a tract dedicated by the proposed subdivision.*

3.2.2 Erosion and Sediment Control Plans

Applicants of projects that meet the thresholds shown in Table 3.1 must submit an Erosion and Sediment Control Plan as specified in Section 3.4. Erosion and Sediment Control Plans may be required in addition to an Abbreviated Plan, Engineered Abbreviated Plan, or Drainage Control Plan. For smaller projects, the ESCP need not be developed by a professional engineer. However, for more complex projects where a Drainage Control Plan is also required or where the ESCP involves engineering calculations, the ESCP must be developed by a professional engineer licensed to practice in the State of Washington.

3.2.3 Engineered Abbreviated Plans

Unless exempted from all submittal requirements per Section 14.20.020 GHMC and Section 14.20.050 GHMC, projects which do not meet the thresholds for a Drainage Control Plan but do include development in or near certain critical areas and their buffers, certain critical area management areas, an area that has erosion potential, a drainage course or drainage channel, or area that requires special grading controls must submit an Engineered Abbreviated Plan and reports. Engineered Abbreviated Plans must be as specified in Section 3.6. Engineered Abbreviated Plans must be prepared by a licensed professional engineer.

If new, replaced, or new plus replaced impervious surfaces are greater than or equal to 2,000 square feet or land-disturbing activity is greater than or equal to 7,000 square feet, the Engineered Abbreviated Plan must demonstrate that Minimum Requirements #1 through #5 are being met. The ESC requirements associated with Minimum Requirement #2 shall be addressed via the required Erosion and Sediment Control Plan, in addition to the Engineered Abbreviated Plan submittal.

3.2.4 Abbreviated Plans

Some projects which do not meet the thresholds for a Drainage Control Plan or Engineered Abbreviated Plan must submit to the city for approval an Abbreviated Plan as specified in Section 3.7. Project applicants must review the thresholds listed in Table 3.1, as well as the exemptions listed in Section 14.20.060 GHMC, to determine whether an Abbreviated Plan is required.

If new, replaced, or new plus replaced impervious surfaces are greater than or equal to 2,000 square feet or land-disturbing activity is greater than or equal to 7,000 square feet, the Abbreviated Plan must demonstrate that Minimum Requirements #1 through #5 are being met. The ESC requirements associated with Minimum Requirement #2 shall be addressed via the required Erosion and Sediment Control Plan, in addition to the Abbreviated Plan submittal.

Abbreviated Plans need not be prepared by and stamped with the seal of a licensed professional engineer, but are to be signed and dated by the applicant and/or the person preparing the Abbreviated Plan.

3.2.5 Minimum Requirements

In some cases, none of the submittals described above are required. Projects that do not have formal submittal requirements still must be performed in accordance with the minimum requirements and the BMPs outlined in this manual.

3.3 Drainage Control Plan

3.3.1 Drainage Control Plan Components

Drainage Control Plans shall contain the following components, which are described in this section:

- Cover sheet
- Project engineer's certification
- Table of contents
- Drainage report – this is the major component of the Drainage Control Plan. See Section 3.3.2 for details on content requirements.
- Drainage Control Plan drawings (Section 3.3.3)
- Maintenance plan (consisting of an operations and maintenance plan and a vegetation management plan – Section 3.3.4)
- Facility summary form (Attachments Section H).

Three copies of the plan shall be submitted, bound, and 8.5 x 11 inches in size, with the exception of required engineered drawing sheets which shall meet the criteria established within this general Section 3.3.1. Where possible, sheets shall be folded or rolled as small as possible, but not smaller than 8.5 x 11 inches.

Specific components are described in more detail below.

Cover Sheet: A Drainage Control Plan will have a cover sheet with the project name, applicant's name, address, and telephone number, project engineer's name, address and phone number, date of submittal, contact's name, address, and telephone number, and the name, address and phone number of the contractor, if known.

Project Engineer's Certification: The project engineer responsible for completion of a Drainage Control Plan as described herein shall be a professional engineer with a current State of Washington license. All plans and specifications, calculations, certifications, as-built drawings, and all other submittals which will become part of the permanent record of the Project must be dated and bear the project engineer's official seal and signature.

The Drainage Control Plan shall contain a page with the project engineer's seal with the following statement:

> "I hereby state that this Drainage Control Plan for _____ (name of project) has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that Gig Harbor does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

Table of Contents: Show the page number for each section of the report. Show page numbers of appendices.

Number all pages

Facility Summary Form (see Attachments Section H)

Phased Project Submittals

A plan showing the overall project, clearly delineating phase boundaries, and estimating dates of construction (if known), shall be part of any initial submittal. Phased projects shall be completed in accordance with approved plans and in accordance with phased development requirements placed upon the development by the city. Phasing of projects shall not result in a reduction of drainage control requirements.

3.3.2 Drainage Report Contents

All drainage reports shall have each of the following section titles (if sections do not apply, list and mark NA):

Drainage Report Section 1 - Proposed Project Description

Describe type of permit for which the applicant is applying, address and legal description of property, parcel number, property zoning, etc. Describe other permits required (e.g., hydraulic permits, USACE Section 404 Permit, wetlands, etc.) and present status.

Provide a brief description of the development project (type, size, location, and for additions/remodels only, current assessed value and cost of improvements excluding land value) and the stormwater features to be installed for storage, treatment, conveyance, and disposal/discharge (types, sizes, and locations). Identify which of the Minimum Requirements apply to the project, and how they are being addressed. Also include justification for those Minimum Requirements that do not apply. Summarize calculations for all facilities. Include a tabulation of the current and proposed impervious, pollution generating pervious and impervious, disturbed pervious (such as landscaped areas), and undisturbed areas. In this table, indicate any additions of impervious surface, and the value of any additions or remodels completed, during the last 5 years. Complete engineering calculations, including hydrologic modeling analyses and documentation, must be included with the report. It is recommended that these be placed in appendices and be referenced where appropriate.

Use the same nomenclature for facilities in the report as in the Facility Summary Form (see Attachments Section H).

Describe the stormwater BMPs and conveyance systems incorporated into the design. Describe the detention system, outlet works, and spillways. Discuss vegetation establishment and management plan for conveyance and detention systems.

Drainage Report Section 2 – Existing Conditions

Describe existing conditions including relevant hydrologic conditions including, but not limited to, the following:

- Existing ground cover, including pervious, impervious, and pollution generating areas.
- Offsite drainage to the property.
- Creeks, lakes, ponds, wetlands, ravines, gullies, steep slopes, springs, and other environmentally sensitive areas on or down gradient of the property.
- Is the project located in an aquifer recharge area or wellhead protection area as defined by the Tacoma-Pierce County Health Department, the EPA, county, or by the city? Cite reports.
- Any specific requirements included in a basin plan for the area.
- Drains, channels, and swales, within the project site and immediately adjacent.

- Points of exit for existing drainage from the property.
- Any known historical drainage problems such as flooding, erosion, etc.
- Include references to relevant reports such as basin plans, flood studies, groundwater studies, wetland designations, sensitive area designations, environmental impact statements, environmental checklists, lake restoration plans, water quality reports, etc. Where such reports impose additional conditions on the applicant, state these conditions and describe any proposed mitigation measures.

Drainage Report Section 3 – Infiltration Rates/Soils Reports

Specific infiltration testing and documentation requirements are outlined in Volume III, Section 3.3, and Appendix III-A. For all sites utilizing infiltration for stormwater management, a report must be prepared that is stamped by a professional engineer with geotechnical expertise, a licensed geologist, an engineering geologist, or a hydrogeologist that summarizes site characteristics and demonstrates that sufficient permeable soil for infiltration exists at the proposed facility location. The reporting requirements depend on the type of facility and analysis being performed. See Volume III, Section 3.3 and Appendix III-A for the detailed requirements.

If a retention and/or detention facility is near the top of a slope that is regulated through local ordinance, then a geotechnical report addressing effects of seepage and the potential for slope failure during any precipitation event through the design event is required as part of this section of the drainage report.

Drainage Report Section 4 – Wells and Septic Systems

The project engineer shall report the existence of wells and septic systems both of record and others on the site and on adjacent property within the setback distance for stormwater retention/detention facilities identified in Volume III. The project engineer shall inquire with the Tacoma-Pierce County Health Department and neighboring property owners as necessary to obtain location of wells and septic systems that are not of record. Wells and septic systems thus found, both active and abandoned, shall also be shown on the plans or as-builts (if found during construction).

The proper abandonment of wells is a matter regulated by state law (WAC 173-160). The Tacoma-Pierce County Health Department regulates drinking water and irrigation wells while the State Department of Ecology regulates resource protection wells. The respective phone numbers are (206) 591-6470 and (360) 407-6602. If a well on the site has not been properly sealed, the applicant shall be responsible for contacting the

Tacoma-Pierce County Health Department. The appropriate procedure shall be followed for sealing any well. Proof of proper abandonment (e.g., copies of the well log and invoice from a firm qualified to perform such work) shall be supplied to the Tacoma-Pierce County Health Department or Ecology per its requirements. If no wells or septic systems were found, indicate so.

Drainage Report Section 5 – Fuel Tanks

The project engineer shall report, the existence of fuel tanks, in-use or abandoned. Fuel tanks shall be shown on the plans or as-builts (if found during construction). If fuel tanks will be abandoned, contact the Tacoma-Pierce County Health Department for specific instructions. If no fuel tanks are found, indicate so.

Drainage Report Section 6 – Subbasin Description

Describe offsite drainage tributary to the Project. Describe any bypass drainage from the project which will not be controlled.

Describe the drainage system between the site and the receiving surface waters (or pothole, regional detention facility, etc.). Describe emergency services located along the flow path (e.g., fire/police stations, hospitals). Describe environmentally sensitive areas, such as wetlands, etc.

Drainage Report Section 7 – Flood Plain Analysis

If the project is within the potential flood hazard area as defined in Section 18.08.196 GHMC, show the 100-year flood hazard area on the plans. If the flood hazard area has not been established (or the city determines that it is in error), the city may require per Chapter 18.08 GHMC the applicant to establish the 100-year flood hazard area for the proposed project to be submitted with the Drainage Control Plan. Analysis will be for the 100-year flood for build out at maximum density allowed by zoning. The project engineer shall contact the city regarding the appropriate computer program(s) for backwater analysis.

Drainage Report Section 8 – Aesthetic Considerations for Facilities

Describe the effort made to make the facilities aesthetically pleasing, how facilities will provide useable open space, and how the facilities will fit into the landscaping plan for the property and be in keeping with any approved community plan. Drainage facilities should be made attractive features of the urban environment. To this end, engineers are encouraged to be creative in shaping and landscaping facilities.

Drainage Report Section 9 – Facility Sizing and Downstream Analysis

The project engineer shall provide calculations for the project's stormwater storage, treatment, and conveyance system components. All relevant work/calculations shall be submitted for city review. Documentation outlining whether and how each of the Minimum Requirements have been addressed in the drainage report also shall be submitted for city review. All calculations shall be keyed to features shown on the work map as described in Section 3.3.3. Note also that, per Volume III, all detention and infiltration facilities (including detention vaults) are required to include a crest gauge that will record maximum pond water surface elevation after a storm event. In addition, project submittals **must** include a table that identifies the design facility stage expected for the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence interval flows.

A downstream analysis of the project for a minimum of one-fourth of a mile is required. The engineer must field inspect all existing stormwater drainage systems downstream from the project and determine that the capacity of the drainage system(s) is adequate to handle the existing flows, flows generated by the proposed project, and any overflow. Adequacy will be evaluated based on conveyance capacity, flooding problems, erosion damage or potential, amount of freeboard in channel and pipes, and storage potential within the system.

If a capacity problem or stream bank erosion problem is encountered, the release rate from the project will be restricted accordingly or the applicant may correct the problem. Gig Harbor comprehensive storm drainage maps may be used as the basis for determining the capacity of existing systems. For naturally occurring drainage systems, drainage ditches, or undeveloped drainage courses, the engineer must take into account the hydraulic capacity of the existing drainage course and environmental considerations such as erosion, siltation, and increased water velocities or water depths.

A copy of the city comprehensive storm drainage map showing the flow route of the onsite water for the minimum of one-fourth of a mile downstream distance must be included in the storm drainage calculations. USGS maps may be utilized when city maps are not available.

If hydrologic modeling (see Chapter 2, and Volumes III and V) is required, the project engineer shall use an approved continuous simulation runoff model and document modeling methods, assumptions, parameters, data sources, and all other relevant information to the analysis. If model parameters are used that are outside the standards of practice, or if parameters are different than those standards, justify the parameters. The

applicant must also include digital copies of the model input parameters, as well as model output files, to the city.

Include copies of all calculations for capacity of channels, culverts, drains, gutters, etc. If used, include nomographs and tables indicating how they were used. Show headwater and tailwater analysis for culverts when necessary. Provide details on references and sources of information used.

Describe capacities, design flows, and velocities in each reach. Describe required materials or specifications for the design (e.g., rock lining for channels when velocity is exceeded; high density polyethylene pipe needed for steep slope).

Drainage Report Section 10 – Utilities

Describe how utilities will be installed to ensure no conflicts with proposed stormwater quantity and quality control measures.

Drainage Report Section 11 – Covenants, Dedications, Easements

Describe legal instruments needed to guarantee preservation of drainage systems and access for maintenance purposes (attach copies). Describe the organization or person which will be responsible for O&M of storm drainage facilities.

Drainage Report Section 12 – Property Owners' Association Articles of Incorporation

Attach a copy of the Articles of Incorporation, if applicable and available.

Drainage Report Section 13 – Other Permits or Conditions Placed on the Project

Construction of road and drainage facilities may require additional permits from other agencies for some projects. These additional permits may contain more restrictive drainage plan requirements.

This section should provide the title of any other necessary permits, the agencies requiring the other permits, and identify the permit requirements that affect the drainage plan.

Other agencies including, but not limited to, those listed may require drainage review for a proposed project's impact on surface and stormwater and conveyance systems. The applicant should take care to note that these other agency drainage requirements are separate from, and in addition to, Pierce County and Gig Harbor's drainage requirements. The applicant will be responsible to coordinate joint agency drainage review, including resolution of any conflicting requirements between agencies.

The additional agencies that may require permits for some projects are listed in Table 3.2. However, it is not a complete list of permits that may be required.

Table 3.2. Other Potential Permits.

Agency	Permit/Approval
Tacoma-Pierce County Health Department	Onsite Sewage Disposal and Well Permits
Washington State Department of Transportation (WSDOT)	Developer/Local Agency Agreement
Ecology	Short Term Water Quality Modification Approval
Washington State Department of Fish and Wildlife	Hydraulic Project Approval
Washington State Department of Ecology	Dam Safety Permit
United States Army Corps of Engineers	Section 10 Permit
United States Army Corps of Engineers	Section 401 Certification
United States Army Corps of Engineers	Section 404 Permit
Gig Harbor	Shoreline Permit
Gig Harbor	Site Development Permit
Gig Harbor	Wetlands Permit

* This is not a complete list of possible permits that may be required.

3.3.3 Drainage Control Plan Drawings

It is the responsibility of the project engineer to ensure that engineering plans supporting the Drainage Control Plan are sufficiently clear to construct the project in proper sequence, using specified methods and materials, with sufficient dimensions to fulfill the intent of drainage laws and ordinances and these design guidelines.

Number of Sheets – Content

The Drainage Control Plan will include sheets adequate to clearly display the following:

- **Vicinity Map**. Show the site location relative to other geographic features such as major roads, freeways, lakes, etc. Provide adequate details to show how to get to the project site. Use a minimum scale of 4 inches = 1 mile.

- **Basin Map**. Show project boundaries, subbasin boundaries, and offsite area tributary to the project. Show major drainage features (such as channels and detention facilities and floodways), and flow path to receiving waters. Use a scale of 1 inch = 200 feet.

- **Site Map**. Use a scale of 1 inch = 100 feet. On a topographic map, show existing conditions and the proposed project including (as applicable) but not limited to:
  - Project limits.
  - Existing topography for the site.
  - Finished grades.
  - Existing structures within 100 feet of project boundaries.
  - Utilities.
  - Existing paved surfaces, including roads.
  - Easements, both existing and proposed.
  - Areas of possible significant environmental concern (e.g., gullies, ravines, swales, wetlands, steep slopes, estuaries, springs, creeks, lakes, etc.). For natural drainage features show direction of flow.
  - 100-year flood plain boundary (if applicable).
  - Existing and proposed wells onsite and on adjacent properties (both of record and not of record) within specified setbacks.
  - Proposed structures including roads and parking surfaces.
  - Lot dimensions and areas.
  - Proposed drainage facilities.
  - Limits of clearing and grading.
  - Required natural buffer areas.
  - Contour intervals on the site plan shall be at a minimum as follows:

Slope (%)	Contour Interval (feet)
0 – 15	2
16 – 40	5
> 40	10

Topography must be field verified for drainage easements and conveyance systems. Contours shall extend a minimum of 25 feet beyond property lines and shall extend sufficiently to depict existing conditions. If survey

is restricted to the project site due to lack of legal access, contours shall be provided by other means; i.e., comprehensive drainage maps, etc.

- **Work Map (or maps).** On a topographic map at the same scale as site map show:
    - Unit areas greater than 1 acre as contributing to a reach of swale or to a catch basin including offsite area. Identify areas contributing to retention/detention facilities. Identify threshold discharge areas (TDAs) where applicable. Show the following on the work map (or on a schedule) for unit areas: total project area; total impervious, pollution generating impervious, pollution generating pervious, and total disturbed area; average slope; and estimated ultimate infiltration rate and Soil Conservation Service (SCS) Soil Group.
    - Conveyance data, identifier (for reference to model output), length, slope, inverts up and down.
    - Overland flow paths and distances.
    - Soil types.
    - Locations of soil pits and infiltration tests.
    - Spot water surface elevations, discharges and velocities for the design event.
- **Schedule of Structures.** Show the following information**:**
    - Catch basin/manhole
    - Street name
    - Cross-street (nearest)
    - Stationing
    - Washington State Plane Coordinate System (i.e., Northings and Eastings) if used
    - Street side
    - Catch basin/manhole diameter or size
    - Invert in/out
    - Pipe diameter in/out
    - Type of each structure and pipe, i.e., Type II, concrete.

Plans or worksheets of open channel systems shall show water surface elevation for the design storm, invert elevations at breaks in grade, design discharge, design velocity, and such other data which facilitates plan review.

3.3.4 Maintenance Plan

The importance of maintenance for the proper functioning of stormwater control facilities cannot be over-emphasized. A substantial portion of failures (clogging of filters, resuspension of sediments, loss of storage capacity, etc.) of such facilities is due to inadequate maintenance. In accordance with Minimum Requirement #10 and Table 3.1, a maintenance plan must be developed for projects that require a Drainage Control Plan. At private facilities, a copy of the plan shall be retained onsite or within reasonable access to the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the plan shall be retained in the appropriate department.

Note that, per Volume III, all detention and infiltration facilities (including detention vaults) are required to include a crest gauge that will record maximum pond water surface elevation after a storm event. In addition, project submittals **must** include a table that identifies the design facility stage expected for the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence interval flows.

Contents of Plan

The project engineer will prepare a maintenance plan describing required type and frequency of long-term maintenance of drainage facilities and identification of the party (or parties) responsible for maintenance and operation. Where it is the property owner(s) responsibility to maintain storm drainage facilities, the maintenance plan shall be prepared to the city's specifications and included by reference in the articles of the home or property owners' association.

A log of maintenance activity that indicates what actions were taken shall be kept and be available for inspection by the city. Frequency of sediment removal, cleaning of catch basins, monitoring, vegetation control, etc., shall be as per Appendix I-B and shall be described and recorded in the log. The maintenance plan shall also include maintenance for erosion and sedimentation controls. An estimate of the average annual cost of maintenance shall be included. See Appendix I-B for guidance.

Vegetation Management Plan

The effectiveness of many stormwater facilities will depend on the species planted in them and their proper maintenance. The project engineer shall prepare a listing of the proposed native species for the design conditions

and their requirements for maintenance for submittal to the city. Specifications and requirements shall be incorporated into the maintenance plan. Recommended wetland plants for stormwater facilities are included in Volume V and Volume III.

Pollution Source Control

Pollution source control is the application of pollution prevention practices on a developed site to reduce contamination of stormwater runoff at its source. BMPs and resource management systems are designed to reduce the amount of contaminants used and potentially discharged to the environment.

All maintenance plans shall contain language regarding pollution source control that is specifically developed for the type of site covered by the plan. The pollution source control section of the plan shall incorporate the relevant information found in Volume IV of this manual.

Surface Mines

The maintenance plan for a surface mine shall identify the measures (temporary swales, temporary berms, etc.) that will be implemented over the life of the mining activity to control stormwater runoff in accordance with the requirements of the manual.

3.4 Erosion and Sediment Control Plan

3.4.1 Erosion and Sediment Control Plan Components

Erosion and Sediment Control Plans shall contain the following components, which are described in this section. Some of these items may also be derived from the Drainage Control Plan, Engineered Abbreviated Plan, or Abbreviated Plan:

- Cover sheet
- Project engineer's certification (where required, see Section 3.2.2 and below)
- Table of contents
- ESC report – this is the major component of the Erosion and Sediment Control Plan. See Section 3.4.2 for details on content requirements
- Erosion and Sediment Control Plan drawings (Section 3.4.3)

- Maintenance plan (consisting of an operations and maintenance plan and a vegetation management plan – Section 3.3.4).

Three copies of the plan shall be submitted, bound, and 8.5 x 11 inches in size, with the exception of required engineered drawing sheets which shall meet the criteria established within this general Section 3.4.1. Where possible, sheets shall be folded or rolled as small as possible, but not smaller than 8.5 x 11 inches.

Specific components are described in more detail below.

Cover Sheet: An Erosion and Sediment Control Plan will have a cover sheet with the project name, applicant's name, address, and telephone number, project engineer's name, address and phone number, date of submittal, contact's name, address, and telephone number, and the name, address and phone number of the contractor, if known.

Project Engineer's Certification: For smaller projects, the ESCP need not be developed by a professional engineer. However, for more complex projects where a Drainage Control Plan is also required or where the ESCP involves engineering calculations, the ESCP must be developed by a professional engineer licensed to practice in the State of Washington. For projects where a PE is required, all plans and specifications, calculations, certifications, “as-built” drawings, and all other submittals which will become part of the permanent record of the project must be dated and bear the project engineer's official seal and signature.

The Erosion and Sediment Control Plan shall contain a page with the project engineer's seal with the following statement:

> "I hereby state that this Erosion and Sediment Control Plan for _____ (name of project) has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that Gig Harbor does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me."

Table of Contents: Show the page number for each section of the report. Show page numbers of appendices.

Number all pages

Phased Project Submittals

A plan showing the overall project, clearly delineating phase boundaries, and estimating dates of construction, shall be part of any initial submittal. Phased projects shall be completed in accordance with approved plans and

in accordance with phased development requirements placed upon the development by the city. Phasing of projects shall not result in a reduction of drainage and erosion control requirements.

Inspection Report

All projects subject to Minimum Requirement 2 (Section 2.4.2) must conform to the inspection guidelines stated in Element 12: Manage Project. See Volume II for full details, but in summary, site inspections shall be conducted by a person who is knowledgeable in the principles and practices of ESC. For construction sites that will disturb 1 acre or more and that discharge stormwater to surface waters of the state, a Certified Erosion and Sediment Control Lead (CESCL) shall be identified in the Erosion and Sediment Control Plan and Construction SWPPP and shall be onsite or on-call at all times.

In addition, for complex projects where a Drainage Control Plan is required or where the ESCP involves engineering calculations, the applicant shall have a professional engineer file with the city an Engineer's Inspection Report Form as shown in Attachments Section G before the project is accepted by the city as being completed. The report will consist of a completed form and sufficient additional text to describe all factors relating to the construction and operation of the system to meet treatment, erosion control, detention/retention, flow control, and conveyance requirements.

3.4.2 Erosion and Sediment Control Report Contents

The erosion and sediment control report includes all elements of a Construction SWPPP outlined in Volume II. An adequate erosion and sediment control report must include both a narrative and drawings. The narrative is a written statement to explain and justify the pollution prevention decisions made for a particular project. The narrative contains concise information concerning existing site conditions, construction schedules, and other pertinent items that are not contained on the drawings. The drawings and notes describe where and when the various BMPs should be installed, the performance the BMPs are expected to achieve, and actions to be taken if the performance goals are not achieved.

The 12 elements listed below must be discussed in the erosion and sediment control report unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the erosion/sediment control report. These elements are described in detail in Volume II, Section 2.2.3. They cover the general water quality protection strategies of limiting site impacts, preventing erosion and sedimentation, and managing activities and sources.

The 12 elements are:

1. Mark clearing limits
2. Establish construction access
3. Control flow rates
4. Install sediment controls
5. Stabilize soils
6. Protect slopes
7. Protect drain inlets
8. Stabilize channels and outlets
9. Control pollutants
10. Control dewatering
11. Maintain BMPs
12. Manage the project.

A complete description of the 12 elements and associated BMPs applicable to each element is provided in Volume II.

3.4.3 Erosion and Sediment Control Plan Drawings

It is the responsibility of the project engineer to ensure that engineering drawings supporting the Erosion and Sediment Control Plan shall be sufficiently clear to construct the project in proper sequence, using specified methods and materials, with sufficient dimensions to fulfill the intent of drainage laws and ordinances and these design guidelines.

Drawing requirements for the Erosion and Sediment Control Plan are described in Volume II, Section 2.3.2.

3.5 Construction Design Drawings

Engineered design drawings for construction purposes submitted to the city shall conform to the following protocols.

3.5.1 Required Drawing Protocol

- All sheets will have a north arrow, scale, a benchmark reference, the section, township, and range. Each set of drawings shall have a legend to define map symbols.

- All lettering shall be one-tenth of an inch or greater. Existing spot elevations will be no smaller than one-twentieth of an inch or greater than one-tenth of an inch.

- All submittals shall be stamped, signed, and dated by a licensed professional engineer prior to review by the city.

3.5.2 General Drawing Requirements

- Road alignments with 100-foot stationing, preferably increasing to the north or east and reading from left to right, and stationing at points of curve, tangent, and intersection, with ties to section or quarter corners or other established and monumented survey control points to include at the intersection of any proposed road or roads and the existing city road or state highway as applicable. All lettering shall be right reading.

- Bearing on all centerlines.

- Curve data including radius, delta, and arc length on all horizontal lines.

- Right-of-way, easement, and tract lines and dimensions for all existing and proposed facilities including proposed roads and intersecting roads. The plans shall show properly dimensioned lot lines, lot numbers and locate and dimension all tract and easement areas.

- All topographic features within project limits and sufficient area beyond to resolve questions of setback, slope, drainage, access onto abutting property, and road continuations.

- All ditch flow lines, all drainage structures with invert elevations, utility locations, fences, structures, existing curbing and approaches, pertinent trees and shrubbery, and other appurtenances which would affect the construction of the project.

- Identification of all existing public roads and adjoining subdivisions when it is pertinent to the scope of the project.

- Scale: 1 inch = 20 feet or 1 inch = 50 feet (1 inch = 100 feet may be used with prior city approval) for public facilities and roads to be dedicated to the city.

- Scale: 1 inch = 50 feet for plats, 1 inch = 20 feet, 30 feet, or 40 feet for all others.

- North arrow shall point to the top or to the left of the sheet.

- Existing features will be ghosted or shaded.

- A legend.

3.5.3 Cover Sheet

- Any drawing sets submitted for review and approval containing three or more sheets shall have a cover sheet.

- The cover sheet shall be sheet one of the drawing set and contain the following information:

    - A simple vicinity map, with north arrow oriented to the top of the sheet, showing project site, existing public road system and any other pertinent information. Minimum scale shall be 4 inches = 1 mile.

    - An overall site plan or location map showing the project site(s). Road and stormwater drainage system network including its connection to an existing public road or state highway. This does not have to be to scale.

    - The applicant's and project engineering's firm's names, address, and telephone numbers, current owner, and parcel numbers.

    - An index table of drawings.

    - Title block descriptive of project.

3.5.4 General Drawing Site and/or Grading Plan Sheets

- In addition to the general drawing requirements the site and/or grading plan sheets shall show the following:

    - The project's proposed storm drainage along with easements, tracts, drainage facilities, all buffer and screening areas, offsite and onsite existing drainage courses, delineated wetlands, and associated buffers.

    - Soil logs and soil log locations.

    - Wells – existing and proposed.

    - Topographic information including contour lines of the property in its existing condition. City or U.S. Geological Survey (USGS) topographic mapping must be field verified and supplemented with additional field topographic information when necessary to provide an accurate depiction of the property.

    - Proposed grades.

    - Property lines, parcel numbers and ownership.

- Contour intervals shall be as follows:

  - 0 percent < 15 percent 2-foot contour interval
  - 15 percent - 40 percent slope 5-foot contour interval
  - 40 percent + slope 10-foot contour interval.

3.5.5 Plan and Profile Sheet

Show the following:

- Original ground line at 100-foot stations and at significant ground breaks and topographic features, with accuracy to within 0.1 feet on unpaved surface and 0.01 feet on paved surfaces.

- Typical roadway/storm drainage cross-sections when applicable.

- Existing and proposed drainage features, indicating direction of flow, size, and kind of each drainage channel, pipe and structure. The status of existing drainage structures must be clarified as either, “existing-abandon" or “existing-remove.”

- Final surface and storm drain profile with stationing the same as the site/grading plan sheets. Preferably reading from left to right, to show stationing of points of curve, tangent, and intersection of vertical curves, with elevations to 0.01 feet.

- Surface grade and vertical curve data; roads to be measured at centerline.

- Datum and all bench mark information shall use established U.S.C. and G.S. control or county bench marks when there is an existing bench mark within one-half mile of the project.

- Vertical scale 1 inch = 5 feet. Clarifying details may be drawn to a convenient scale. Use 1 inch = 10 feet for vertical scale when horizontal scale is at 1 inch = 100 feet.

- When roads end at a property line, the existing ground profile shall be continued a minimum of 200 feet to show the proposed vertical alignment is reasonable.

- When intersecting road profile grades have a difference of 1 percent or less, a vertical curve is not required. All other vertical grade intersections will require a minimum 50-foot vertical curve.

- Storm drainage text to be shown in profile only to avoid duplication of text. Number of structure will be shown in the plan

and profile views. The following information shall be shown in the profile view:

- Type of structure
- Structure number
- Stationing/offsets (coordinates to be shown in the plan view)
- Rim elevation
- Invert elevations (in)
- Invert elevations (out)
- Pipe length, pipe size, material and slope (percent).

3.5.6 Detail Sheets

- All applicable standard notes.
- A minimum of two cross-sections of each retention/detention pond showing original property lines, slope catch points, and all other pertinent information to adequately construct the pond.
- Standard open conveyance system cross-sections if applicable.
- Right-of-way cross-sections as required by the city.
- Construction recommendations from a soils report if applicable.

3.5.7 Required Drawing Size

Required sheet size is 22 x 34 inches. Sheet size of 24 x 36 inches will continue to be accepted until January 1, 1999. Original sheets shall be Mylar or photo Mylar.

3.5.8 Plans and Specifications

The most recently adopted editions of standard specifications and standard plans (see Glossary) shall be the standards for all design and construction of drainage facilities not explicitly described herein. In the event of a conflict between the standard specifications, standard plans, and the manual, this manual shall prevail. When required by the city, standard specifications and general provisions for construction must be submitted with any road construction plans.

3.6 Engineered Abbreviated Plan and Report Format and Content

The intent of Engineered Abbreviated Plans and reports is to involve an experienced professional engineer in the design of developments in or near a critical area, a critical area buffer, a critical area management area, an area that has erosion potential, a drainage course or drainage channel, or an area that requires special grading controls.

In addition to the critical area specifics outlined below, an Engineered Abbreviated Plan shall contain all of the requirements of Section 3.7 Abbreviated Plans (see also Appendix I-A).

See Appendix I-A for full requirements, but in general the Engineered Abbreviated Plan shall provide necessary controls for drainage and ESC which shall include but not be limited to:

- An evaluation of the need for onsite facilities for disposal of runoff from roofs and other impervious surfaces. The size of facilities shall be determined through application of requirements specified in Appendix I-A.
- Routing for storm drainage as necessary and appropriate for the size of project.
- Erosion/sediment control devices as appropriate to meet the intent of the manual. See Volume II and Appendix I-A. Note that an Erosion and Sediment Control Plan may be required in addition to the Engineered Abbreviated Plan.

If new, replaced, or new plus replaced impervious surfaces are greater than or equal to 2,000 square feet or land-disturbing activity is greater than or equal to 7,000 square feet, the Abbreviated Plan must demonstrate that Minimum Requirements #1 through #5 are being met. The ESC requirements associated with Minimum Requirement #2 shall be addressed via the required Erosion and Sediment Control Plan, in addition to the Abbreviated Plan submittal. The city may impose additional ESC measures in its review and approval of the Abbreviated Plan.

For those utility projects exempted from a Drainage Control Plan and Erosion and Sediment Control Plan in accordance with Section 2.2, the following requirements of the Erosion and Sediment Control Plan shall also be met and addressed in the Engineered Abbreviated Plan:

- 8.10.1 Protecting Storm Line Inlets
- 8.10.2 Dust Control
- 8.10.3 Stockpile Management
- 8.10.4 Restrictions on Open Trenching
- 8.10.5 Exposed Slopes.

In addition, the Engineered Abbreviated Plan shall address and/or document the following:

- **Critical areas:** Confirm that the project is consistent with any applicable provisions in Chapter 18.08 Critical Areas GHMC. Describe specific site design and construction requirements that implement the applicable critical area standards.

- **Wetland hydrology:** If applicable, provide calculations and continuous modeling results demonstrating that wetland hydrology and hydroperiod are maintained in comparison to the predevelopment condition and the wetland is protected from water quality impacts and construction intrusions.

- **Hydrology and water quality:** Provide calculations documenting that hydrology and water quality impacts to Fish and Wildlife habitat areas are minimized, the project has meet applicable flow control and water quality standards, and protections are provided from construction intrusions.

- **Flood hazard areas:** Provide calculations demonstrating that predeveloped flood capacity is not diminished and proposed developments are protected from flood damage. Refer to Section 18.08.196 GHMC for applicable requirements.

- **Landslide hazard areas:** If there are any landslide hazard areas on the site, evaluate whether the proposed development is protected from impacts from an active landslide hazard area and document what measures have been implemented into the site design to ensure that impacts to the active landslide hazard area and associated buffer are prevented.

- **Steep slopes:** Discuss appropriate construction methods that will be utilized when creating or constructing on steep slopes as defined in Section 18.08.192 GHMC.

- **Geotechnical and shoreline requirements:** Document that the recommendations made in the geotechnical reports required in Chapter 18.08 GHMC have been approved by the city. Describe specific site design and construction measures that will be implemented to meet the applicable geotechnical recommendations and mitigations.

- **Downstream analysis:** Provide calculations demonstrating that the downstream capacity of drainage courses and drainage channels is sufficient for the proposed project improvements.

- **Neighboring properties:** Document that the design has been evaluated to confirm that neighboring properties are protected from drainage, grading and erosion impacts caused by development.

Engineered Abbreviated Plans consist of a plan sheet (or sheets) and written report. The plan sheet shall be 22 x 34 inches, at a scale of 1 inch = 20 feet, 1 inch = 30 feet, or 1 inch = 40 feet.

At a minimum, the plan sheets shall show the following:

- City approval block.
- Field surveyed property boundaries, dimensions, and boundaries of critical areas and associated buffers.
- Field topographic survey, 2-foot interval contour lines (specify datum used).
- Location of onsite sewage disposal systems and reserve areas.
- Existing and proposed easements.
- Established buffers, significant trees, natural vegetation easements and limits of 100-year floodplain.
- Field locate and show on the plans natural drainage channels, wetlands, canyons, gullies, water bodies, fish and wildlife habitat areas, etc.
- Location and elevations of all conveyance systems and appurtenances for runoff from structures and impervious surfaces.
- All necessary standard construction details and notes.
- Applicable standard driveway approach detail (driveway approaches shall be constructed or reconstructed to meet the requirements of the Public Works Standards).

Where it can be shown that the above plan and/or report items do not add value to or achieve the above-stated intents for a given project site, the city may waive a specific requirement at the city's discretion.

3.7 Abbreviated Plan Format and Content

An Abbreviated Plan is required for all projects subject to Gig Harbor permit requirements that do not meet the more stringent requirements of an Engineered Abbreviated Plan or a Drainage Control Plan. See the requirements outlined in Appendix I-A, Requirements for Drainage Control and ESC for Construction of Single Family and Duplex Residences and Other Small Projects for the specific submittal requirements for Abbreviated Plans. Note that an Erosion and Sediment

Control Plan may be required in addition to the Abbreviated Plan. See Table 3.1 for applicable submittals.

If new, replaced, or new plus replaced impervious surfaces are greater than or equal to 2,000 square feet or land-disturbing activity greater than or equal to 7,000 square feet, the Abbreviated Plan must demonstrate that Minimum Requirements #1 through #5 are being met. The ESC requirements associated with Minimum Requirement #2 shall be addressed via the required Erosion and Sediment Control Plan, in addition to the Abbreviated Plan submittal. The city may impose additional ESC measures in its review and approval of the Abbreviated Plan.

As outlined in Appendix I-A, the project shall provide necessary controls for drainage and ESC which shall include but not be limited to:

- An evaluation of the need for onsite facilities for disposal of runoff from roofs and other impervious surfaces. Size of facilities shall be determined through application of requirements specified in Appendix I-A.
- Routing for storm drainage as necessary and appropriate for the size of project.
- Erosion/sediment control devices as appropriate to meet the intent of the manual. See Volume II and Appendix I-A.

For those utility projects exempted from a Drainage Control Plan and Erosion and Sediment Control Plan in accordance with Section 2.2, the following requirements of the Erosion and Sediment Control Plan shall also be met and addressed in the Abbreviated Plan:

- Protecting storm line inlets
- Dust control
- Stockpile management
- Restrictions on open trenching
- Exposed slopes.

3.8 Submittal Standards

3.8.1 Submittal Procedures

Plans and reports as detailed in this manual for proposed developments, redevelopments, or land disturbing activities shall be submitted to the city with a transmittal letter. All submittals must comply with RCW 18.43.070 and (with the exception of Abbreviated Plans) must be stamped, signed, and dated by the engineer.

If the city begins its review and finds that the submittal is incomplete, it will be returned to the applicant unchecked and upon resubmittal it will be assigned a new review date. Reviewed plans will be returned directly to the applicant for corrections and/or revisions.

After initial review, all revised site development reports, plans, city mark-ups, financial guarantees, legal documents, easements, etc., as required by the city, must be resubmitted to the city with a completed "Revision/Correction Submittal Form" which has the plat name and/or City file number on it, i.e., Gig Harbor Public Works Department File No. xx.

The city reserves the right to review a site development plan or road plan and require a new permit when the resubmitted plans are found to have significant design and/or conceptual changes or changes in field conditions from the original submittal. Design errors which are undetected by the city do not relieve the engineer from ultimate responsibility. Where these errors are discovered, the plans are subject to revisions by the engineer and review and approval by the city.

Review fees, if applicable, shall be paid by the applicant at the time of submittal.

Submittals shall be reviewed by the city according to the date they were submitted. Previously reviewed or approved plans submitted with revisions shall be considered a new submittal. Approved plans under construction will be considered a resubmittal and will be reviewed prior to new submittals.

- First submittal: Three sets of prints of plans, profiles, and detail sheets, including three sets of the Drainage Control Plan, Erosion and Sediment Control Plan, Engineered Abbreviated Plan, or Abbreviated Plan.

- Final submittal: Original set of reproducible prints of corrected plans, profiles, and detail sheets; two sets of prints of corrected plans, profiles and detail sheets. One set of the Drainage Control Plan, Erosion and Sediment Control Plan, Engineered Abbreviated Plan, or Abbreviated Plan, and the quantity take-off and engineer's cost estimates of proposed construction when the project is to be bonded. The most recent set previously marked up by the city reviewers. Upon city approval of the final submittal, the city will make a reproducible set of the plan sheets and return the original reproducibles to the engineer. All other submittal items will be retained by the city. The city's reproducible set will be utilized for making copies for public inspection and distribution as required.

3.8.2 Other Submittals must be Concurrent with Drainage Control Plan and Erosion and Sediment Control Plan Submittals

Drainage Control Plans and Erosion and Sediment Control Plans must be submitted to the city concurrently with other plans for the project such as vegetation removal/clearing, final grading, landscaping, water and sewer, community onsite sanitary waste disposal systems, roads, utilities plans, and other relevant site work. Offsite roads and utility improvement plans do not have to be submitted with the Drainage Control Plans and Erosion and Sediment Control Plans if they do not impact the site, drainage or erosion potential.

3.8.3 Revisions to Approved Plans

The city may require that contractor or applicant initiated plan changes or field revisions to the approved construction plans be done using a change order form which is found in Attachments Section K or an approved equal. When the change form is required, the revisions procedure as outlined on the form must be followed or final approval of the project may be withheld by the city.

When the city has authorized revisions to the approved construction plans, the engineer shall submit as-built (record) construction plans, stamped and signed, reflecting the approved revisions once the construction is completed.

3.8.4 Survey Requirements

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. All as-built (record) drawings must be stamped and signed by a licensed engineer or surveyor.

3.8.5 Horizontal Control and Vertical Datum

For horizontal control within Gig Harbor, all drainage facilities shall be tied to a known quarter corner or section corner.

For vertical control within Gig Harbor, all drainage facilities shall be tied to a known National Geodetic Vertical Datum (NGVD) monument identified in the Pierce County elevation bench marks book when a bench is located within one-half mile (by straight line) of the proposed project. The Pierce County bench mark elevation, location, and designation must be shown on the plans. Elevation equations shall not be used. If a U.S. Coast and Geodetic Survey bench mark is not available, a temporary bench mark must be established on or adjacent to the project site and its assumed elevation shown on the drainage and/or site plan.

Horizontal control tied to a known quarter corner or section corner, and bench marks or use of vertical datum will not be required for drywell or infiltration systems serving individual residential structures.

Chapter 4 - BMP and Facility Selection Process for Permanent Stormwater Control Plans

4.1 Purpose

The purpose of this chapter is to provide guidance for selecting permanent BMPs and facilities for new development and redevelopment sites (including retrofitting of redevelopment sites). The task of selecting BMPs and facilities is necessary to develop a Stormwater Site Plan. The details for how to complete the other major component – a Construction Stormwater Pollution Prevention Plan (SWPPP) – are included in Volume II, Chapter 2.

Gig Harbor's pollution control strategy is to emphasize pollution prevention first, through the application of source control BMPs. Then the application of appropriate treatment and flow control facilities fulfills the statutory obligation to provide AKART, or "all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the State of Washington." (RCW 90.48.010)

The remainder of this chapter presents seven steps in selecting BMPs, treatment facilities, and flow control facilities.

4.2 BMP and Facility Selection Process

Step I: Determine and Read the Applicable Minimum Requirements

Section 2.4 establishes project size thresholds for the application of minimum requirements to new development and redevelopment projects. Figures 2.1 and 2.2 provide the same thresholds in a flow chart format.

Step II: Select Source Control BMPs

Note: If your project is a residential development, you may skip this step.

Refer to Volume IV. If the project involves construction of areas or facilities to conduct any of the activities described in Volume IV, Chapter 2, the "applicable" structural source control BMPs described in that section must be constructed as part of the project. In addition, if the specific business enterprise that will occupy the site is known, the "applicable" operational source control BMPs must also be described.

The project may have additional source control responsibilities as a result of area-specific pollution control plans (e.g., watershed or basin plans, water cleanup plans, groundwater management plans, lakes management plans), ordinances, and regulations.

Step III: Determine Threshold Discharge Areas and Applicable Requirements for Treatment, Flow Control, and Wetlands Protection

Minimum Requirement #6: Runoff Treatment and Minimum Requirement #7: Flow Control have size thresholds that determine their applicability (see Sections 2.4.6 and 2.4.7). Minimum Requirement #8: Wetlands Protection uses the same size thresholds as those used in #6 and #7. Those thresholds determine whether certain areas (called "threshold discharge areas") of a project must use treatment and flow control facilities, designed by a professional engineer, or whether Minimum Requirement #5: Onsite Stormwater Management BMPs can be applied instead (see Section 2.4.5).

Step 1: Review the definitions in the Glossary for the following terms: effective impervious surface, impervious surface, pollution-generating impervious surface (PGIS) and pollution-generating pervious surface (PGPS).

Step 2: ***Outline the threshold discharge areas*** for your project site.

Threshold Discharge Area - An onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath). The examples in Figure 4.1 below illustrate this definition. The purpose of this definition is to clarify how the thresholds of this manual are applied to project sites with multiple discharge points.

Step 3: Determine the amount of effective pollution-generating impervious surfaces and pollution –generating pervious surfaces in each threshold discharge area. Compare those totals to the categories in Section 2.4.6 (Table 2.1) to determine where treatment facilities are necessary. Note that onsite stormwater management BMPs are always applicable.

Step 4: ***Determine the amount of effective impervious surfaces and converted pervious surfaces*** in each threshold discharge area. Using an approved continuous simulation runoff model (e.g., WWHM or MGSFlood), also estimate the increase in the 100-year recurrence interval flow within each threshold discharge area.

Compare those totals to the categories in Section 2.4.7 (Table 2.2) to determine where flow control facilities are necessary. Note that onsite stormwater management BMPs are always applicable.

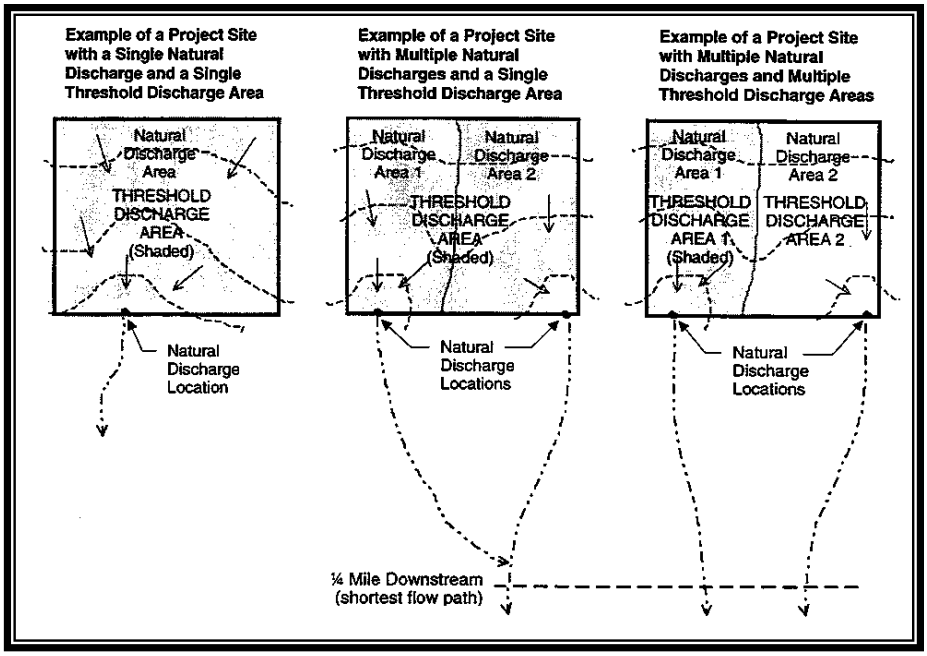

Figure 4.1. Threshold Discharge Areas

Step IV:Select Flow Control BMPs and Facilities

A determination should have already been made whether Minimum Requirement #7 or Minimum Requirement #8 applies to the project site. If one or both of them apply, LID BMPs from Volume VI, Chapter 3 must be applied in accordance with Minimum Requirement #5. In addition, flow control facilities must be provided for discharges from those threshold discharge areas that exceeded the thresholds outlined in Table 2.2. Use an approved continuous simulation runoff model (e.g., the WWHM, MGSFlood, or HSPF) and the details in Volume III, Chapter 3 to size and design the facilities.

The following describes a selection process for those facilities.

Step 1: Determine whether you can infiltrate.

There are two possible options for infiltration.

The first option is to infiltrate through rapidly draining soils that do not meet the site characterization and site suitability criteria for providing adequate treatment. See Volume III, Chapter 3 for design criteria for infiltration facilities intended to provide flow control without treatment. In this case, a treatment facility must be provided prior to discharge to the ground for infiltration. The treatment facility could be located off-line with a capacity to treat the water quality design flow rate or volume (see Volume V, Chapter 4) to the applicable performance goal (see Volume V, Chapter 3). Volumes or flow rates in excess of the design volume or flow

rate would bypass untreated into the infiltration basin. (Note that wet pool treatment facilities are always designed to be on-line.) The infiltration facility must provide adequate volume such that the flow duration standard of Minimum Requirement #7, or the water surface elevation requirements of Minimum Requirement #8, will be achieved.

The second option is to infiltrate through soils that meet the site characterization and site suitability criteria for treatment outlined in Volume V, Section 6.4. The facility would be designed to meet the requirements for treatment and flow control. However, since such a facility would have to be located on-line it would be quite large in order to achieve the flow duration standard of Minimum Requirement #7. Therefore this option will, in most cases, be cost and space prohibitive.

If infiltration facilities for flow control are planned, the flow control requirement has been met. Proceed to Step V. If infiltration facilities are not planned, proceed to Step 2.

Step 2: Use an approved continuous simulation runoff model to size a detention facility.

Refer to Volume III, Chapter 2 for an explanation of the use of the WWHM. Note that the more the site is left undisturbed, and the less impervious surfaces are created, the smaller the detention facility. Additional incentives are given within the model for reducing the disruption of the natural hydrology.

Step V: Select Treatment Facilities

Note: The details of this step-by-step process appear in Volume V, Chapter 2. The following headings summarize each key step.

- Step 1: Determine the receiving waters and pollutants of concern based on offsite analysis
- Step 2: Determine whether the facility will be city owned or privately owned
- Step 3: Determine if an oil control facility/device is required
- Step 4: Determine if infiltration for pollutant removal is practicable
- Step 5: Determine if control of phosphorous is required
- Step 6: Determine if enhanced treatment is required
- Step 7: Select a basic treatment facility.

Step VI: Review Selection of BMPs and Facilities

The list of treatment and flow control facilities and the list of source control BMPs should be reviewed. The site designer may want to re-evaluate site layout and design to reduce the need for stormwater facilities, or the size of the facilities by reducing the amount of impervious surfaces created and increasing the areas to be left undisturbed. This step presents another opportunity to maximize the use of onsite facilities and LID approaches to reduce stormwater facility needs.

Step VII: Complete Development of Permanent Stormwater Control Plans and Submittals

The design and location of the BMPs and facilities on the site must be determined using the detailed guidance in Volumes III through VI. Maintenance manuals for each treatment and flow control facility are also required. Please refer to Chapter 3 for guidance on the contents of required stormwater site plans and submittals, which may include: Drainage Control Plans, Erosion and Sediment Control Plans, Engineered Abbreviated Plans, or Abbreviated Plans.

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Appendix I-A – Requirements for Drainage Control and Erosion and Sediment Control for Construction of Single Family and Duplex Residences and Other Small Projects

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Appendix I-A – Requirements for Drainage Control and Erosion and Sediment Control for Construction of Single Family and Duplex Residences and Other Small Projects

A.1 Introduction

This appendix details the requirements for controlling surface water runoff quantity and quality for small projects. These guidelines apply to single family residences, duplexes located on existing single tax lots, and commercial buildings in plats with approved Drainage Control Plans and Erosion and Sediment Control Plans for the plat. **If new, replaced, or new plus replaced impervious surfaces are greater than or equal to 2,000 square feet or land-disturbing activity is greater than or equal to 7,000 square feet, applicants must demonstrate that Minimum Requirements #1 through #5 are being met.**

This appendix provides design guidance for residential and commercial projects for which only an Abbreviated Plan is required, and that do not meet the threshold for a Drainage Control Plan, an Erosion and Sediment Control Plan, or an Engineered Abbreviated Plan. Volume I, Chapter 3 provides a complete overview of submittals required as part of Gig Harbor's review and permitting process. Thresholds to assist in determining which submittals are required based on the nature of the proposed improvements and the existing site characteristics are described in detail in that chapter, and are summarized in Table 3.1 of that chapter. **Project applicants must review Volume I, Chapter 3 to ensure that no additional submittals are required before proceeding with the Abbreviated Plan guidelines in this appendix.**

In general, an Abbreviated Plan, prepared in accordance with the guidance in this appendix, is sufficient for small and/or residential projects that fall below the following criteria:

- Less than 2,000 square feet of new or replaced impervious surface
- Less than 250 cubic yards of materials moved
- Less than 7,000 square feet of land disturbed
- No critical areas issues.

Note that this is not a comprehensive list. See Section A.3 below, and Chapter 3, Table 3.1 for complete submittal details.

In addition, for the purposes of applying the thresholds in Chapter 3, Table 3.1 to a proposed subdivision (i.e., a plat or short plat project), the impervious surface coverage must be specified for each lot. The impervious coverage shall be assumed to be 4,000 square feet, the size of the lot, or the maximum allowed by GHMC, whichever is less. **Note: the impervious areas assumed for the lots must be set as the maximum allowable impervious area through a declaration of covenant recorded for the lot.** Therefore, it is extremely important to make an accurate estimate of the expected impervious coverage. In addition, the converted pervious surface on each created lot shall be the entire lot area minus the assumed impervious surface area and any area in which native conditions are preserved by a required clearing limit, a covenant or easement recorded for the lot, or a tract dedicated by the proposed subdivision. Refer to Volume I, Chapter 3 for further information.

This appendix is organized as follows:

- Section A.2 summarizes some of the reasons for requiring that single family residences meet the requirements of this appendix
- Section A.3 provides a brief overview of submittal requirements
- Section A.4 describes ESC practices
- Section A.5 provides design guidelines for stormwater flow control practices that are appropriate for single family and other small projects covered by this appendix.

A.2 Why Single Family Residences?

The Gig Harbor Stormwater Management and Site Development Manual has detailed guidance that is intended to apply to all types of development, from small residential to large industrial, under the city's jurisdiction. This appendix is provided to give owners and developers of smaller scale projects a quick overview of applicable requirements and direct them to applicable sections of the manual, without needing to review the manual in its entirety.

Although these projects are on a smaller scale than larger commercial, industrial, and multifamily developments, single family residential construction often has a negative effect on the environment. Traditional construction practice has consisted of stripping the building site of all vegetation, and in many cases, the topsoil. This leaves the site very susceptible to severe erosion from rainfall, winds, and offsite tracking of soil. Sediment from eroding soils clogs storm sewers and ditches, detention and infiltration systems and fills our bays, river channels,

streams, lakes and wetlands. Through the application of BMPs, sediment and runoff from construction sites can be controlled.

The construction of a single family residence reduces the amount of vegetation and topsoil on a site available to absorb rainfall. The construction project adds impervious surfaces, such as roofs and driveways, which prevents natural infiltration. It is necessary to control this extra runoff to prevent flooding, sediment transport and other problems. Various methods are used to control stormwater runoff from a site after a single family residence is constructed (postconstruction).

To learn more about design and construction methods that can minimize the environmental impact of residential or other development projects and reduce cost and space requirements of stormwater management facilities, by preserving vegetation, minimizing impervious surfaces, and treating and disposing of stormwater on the project site, refer to the LID guidelines in Volume VI.

A.3 Submittal Requirements

The applicant for a single family residence, duplex, or commercial building permit, which does not meet the threshold for a Drainage Control Plan, an Erosion and Sediment Control Plan, or an Engineered Abbreviated Plan (as determined by of Volume I, Chapter 3, Table 3.1, and in accordance with Section 14.20.020 GHMC and Section 14.20.050 GHMC) shall submit an Abbreviated Plan as outlined below. (Note: The information required by the "Single Family Submittal Checklist," available from the Gig Harbor Development Services, is being updated to reflect the information required in an Abbreviated Plan.)

A.3.1 Abbreviated Plan Contents

The Abbreviated Plan must contain the following:

- Plot plan, containing the elements and information described in Section A.3.2.
- Calculations and design information for onsite facilities for disposal of runoff from roofs and other impervious surfaces. Size of facilities shall be determined through application of requirements specified in Section A.5. If the project proposes to connect to the city drainage system, document why onsite runoff disposal is not feasible.
- Documentation outlining how the project complies with any applicable minimum requirements (see Volume I, Chapter 2).

- Details and documentation supporting the project storm drainage conveyance system design. Provide calculations demonstrating that it meets applicable city design standards (see Volume III, Chapter 4).

- Any additional description or information on erosion/sediment control devices to supplement the information on the plan sheets to indicate what measures will prevent sediment-laden water from leaving the site during construction.

- Note that if a project exceeds the thresholds for a Construction SWPPP in accordance with Minimum Requirement #2 and Table 3.1 (7,000 square feet or more land disturbance or new, replaced or new plus replaced impervious surfaces of greater than or equal to 2,000 square feet), an Erosion and Sediment Control Plan must be provided.

A.3.2 Abbreviated Plan – Information required on plan sheet

- Name, address, and telephone number of the applicant

- Name, address, and telephone number of the person preparing the plot plan

- Name, address, and telephone number of the contractor, if known

- Parcel number(s)

- Scale and north arrow

- Legend if symbols are used

- Vicinity map of sufficient clarity to locate the property and the receiving water body(ies)

- Property boundaries, dimensions and area

- Contour lines from the best available source (specify datum used)

- Adjoining street names

- Existing and proposed structures and other impervious surfaces such as driveways, patios, garages, barns, etc.

- Location of onsite sewage disposal systems

- Utility easements

- Established buffers, large (greater than 24 inches in diameter) trees and natural vegetation easements
- Natural drainage channels, wetlands, canyons, gullies, water bodies, etc.
- Clearing limits
- Areas to be graded, filled, excavated, or otherwise disturbed
- Location of known wells, and underground storage tanks
- The location and type of ESC measures
- Conveyance systems for runoff from structures
- Proposed location(s) determined for stockpiled materials, i.e., excavation wastes
- Location and details of construction entrance.

Lines shall be drawn with a straight edge with the exception of curved lines and features shall be to scale. Drawings shall be sufficiently clear to see footprints of structures and other features described above and shall be on 8.5 x 11-inch paper; 11 x 14-inch paper, or plan-size sheets per Volume I, Section 3.5.7, at the applicant's discretion. An example of a plan sheet for an Abbreviated Plan showing typical erosion and sediment control practices is provided in Attachments Section C, Detail 9.0.

A.4 Erosion and Sediment Control Practices

If new, replaced, or new plus replaced impervious surfaces are greater than or equal to 2,000 square feet or land-disturbing activity is greater than or equal to 7,000 square feet, the Abbreviated Plan must demonstrate that Minimum Requirements #1 through #5 are being met. To address the ESC requirements associated with Minimum Requirement #2, the applicant must prepare an Erosion and Sediment Control Plan per Volume I, Section 3.4, in addition to the Abbreviated Plan. The Abbreviated Plan does not need to outline the ESC measures outlined below if an Erosion and Sediment Control Plan is also required. However, the Abbreviated Plan must reference the Erosion and Sediment Control Plan.

Most projects that add or replace less than 2,000 square feet of impervious surface or disturb less than 7,000 square feet of land are not required to prepare an Erosion and Sediment Control Plan, but must still comply with Minimum Requirement #2, Construction Stormwater Pollution Prevention. Volume II, Chapter 2 provides detailed guidance on the 12 elements included in this minimum requirement. All projects must consider all of

the following 12 elements and develop controls for all elements that pertain to the project site:

1. Mark clearing limits
2. Establish construction access
3. Control flow rates
4. Install sediment controls
5. Stabilize soils
6. Protect slopes
7. Protect drain inlets
8. Stabilize channels and outlets
9. Control pollutants
10. Control dewatering
11. Maintain BMPs
12. Manage the project.

Erosion and sediment control practices are necessary both during and after construction. This section is separated into preconstruction/construction measures and postconstruction measures necessary to prevent the movement of soils offsite and to control the quantity of stormwater runoff to prevent degradation of or impacts to downstream properties. All erosion and sedimentation control measures shall be constructed prior to land disturbing activities.

A sample erosion control plan for a small site is shown in Attachments Section C, Detail 9.0.

A.4.1 Prior to Land Disturbing Activities

The plot plan submitted as part of the Abbreviated Plan shall show the proposed ESC measures as needed to address the 12 elements outlined previously. These measures shall be implemented/installed before any land disturbing activities occur. See Volume II for details and design requirements for individual BMPs.

At a minimum, these measures shall include but are not limited to:

- Filter fabric fence (see Attachments Section C, Detail 8.0) as needed to prevent migration of soils onto adjacent properties or into natural channels.

- Where existing pavement precludes installation of filter fabric fence (by preventing fence post installation), use gravel filter berm (see Attachments Section C, Detail 12.0) or brush barrier (see Attachments Section C, Detail 11.0) to prevent migration of soils onto adjacent properties or into natural channels.

- Construction of a construction entrance rock pad, see Attachments Section C, Detail 4.0.

- **Flagging of all wetland buffers or natural buffer areas, and marking of all vegetation areas to be preserved. Flagging shall be brightly colored and shall clearly identify areas to be preserved.**

- Soil stabilization measures such as covering exposed soil with black plastic, mulch, straw, etc., to prevent offsite migration of soil.

- Constructed channels (if necessary) to route offsite overland flows around the construction site.

- Measures to protect storm drain inlets from receiving sediment-laden stormwater runoff.

- The construction sequence requirements for single family residences are as follows:

    - Install construction entrance rock pad, filter fabric fence, and all other applicable ESC measures prior to land clearing.

    - During construction, the contractor shall continuously maintain the ESC measures to prevent offsite migration of soils. ESC measures shall be inspected and repaired (as needed) daily as part regular ongoing construction activities.

    - After construction, the site shall be temporarily stabilized using soil stabilization BMPs outlined in Volume II, Section 2.2.3 until permanent landscaping is established.

If the city determines, based on public health; safety and welfare concerns; or site specific characteristics, neighborhood concerns, etc.; that these measures are not adequate, additional measures may be required to meet the intent of this manual. Potential additional measures include, but are not limited to:

- Installation of gravel filter systems to clean runoff prior to discharge offsite

- Construction of a sediment pond (see Attachments Section C, Details 5.0 and 5.1) designed to remove total suspended solids from a 2-year recurrence interval runoff event

- Construction of a vegetated strip (see Volume II, BMP C234) for sediment removal

- Construction of a retention and/or detention pond meeting the criteria in Volume III

- Restricting vehicular access to portions of the site (show vehicular access locations on plans).

A.4.2 Exposed Aggregate Concrete

If an exposed aggregate driveway or walk is constructed, the washwater shall be directed to a separate, temporary, settling pond constructed for that purpose. Washwater shall not be allowed to runoff to the city system, private drainage system or the natural drainage system.

A.4.3 Postconstruction Activities/Practices

Until vegetation on exposed soils is established, the erosion and sedimentation control measures described in Section A.4.1 shall be continued. All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized. The applicant shall be responsible for removal of sediment which has been transported offsite. This may include, but not be limited to street sweeping, flushing storm drain lines, cleaning of catch basins, etc.

Postconstruction stormwater management for single family residences are handled through typical runoff controls such as connection to a city storm sewer system, infiltration of roof runoff either through infiltration trenches or drywells, or dispersion to vegetated areas. These permanent BMPs are described below.

A.5 Permanent Best Management Practices

The following BMPs are specifically recommended and allowed for single-family residential projects and other small projects. Some of the BMPs may also be required per the applicable minimum requirements (see also Section A.1). Additional information on other onsite stormwater management BMPs are provided in Volume VI, Low Impact Development.

A.5.1 Roof Runoff and Clean Impervious Surfaces

Runoff from non-metal roofs and clean impervious surfaces such as patios, sidewalks, and other such areas not intended for regular motor vehicle traffic must be infiltrated onsite where practicable. Depending upon site-specific factors, such as site availability, topography, and soils; runoff shall be conveyed to an infiltration trench or drywell, a dispersion system, an available and adequately sized offsite retention or detention

facility (such as for a subdivision), or an onsite facility. See also Volume VI, Chapter 3 for additional guidelines. This clean runoff does not require pretreatment prior to the storage/discharge facility provided that it is not mixed with other contaminated runoff. Care must be taken to ensure that storm runoff is not directed to onsite sewage disposal drainfield or drainfield reserve areas.

Preferred methods of stormwater disposal are shown in Table A.1. Runoff from roofs and other clean impervious surfaces shall be handled in such a fashion as to minimize any impacts to adjoining properties and to maintain the required separation from the septic drainfields (see Volume III and VI for requirements specific to each BMP). Direct connection to a city drainage system may be acceptable if onsite soils are not adequate for infiltration. Designs for infiltration trenches and retention ponds shall meet the criteria in Volume III, Section 3.3.6, for setback requirements as well as the applicable International Building Code (IBC) specifications.

Splash blocks may be used only where runoff can be directed away from the structure to a flat portion of the lot and where the lot size is such that runoff would be expected to be contained onsite (use 10,000 square feet as a guideline). Splash blocks are not suitable for small lots, steep slopes, or lots with poor soils and/or a high groundwater table.

A.5.2 Lot Stub-Outs

If drainage outlets (stub-outs) are to be provided for each individual lot, the stub-outs shall conform to the following:

- Each outlet shall be suitably located at the lowest elevation on the lot, so as to service all future roof downspouts and footing drains, driveways, yard drains, and any other surface or subsurface drains necessary to render the lots suitable for their intended use. Each outlet shall have free-flowing, positive drainage to an approved stormwater conveyance system or to an approved outfall location.

- Outlets on each lot shall be located with a 5-foot-high, 2-inch by 4-inch stake marked “storm” or “drain.” Stub-outs for discharge to a surface outfall location shall visibly extend above surface level and be secured to the stake.

- The developer and/or contractor shall be responsible for coordinating the locations of all stub-out conveyance lines with respect to the utilities (e.g., power, gas, telephone, television).

- All individual stub-outs shall be privately owned and maintained by the lot home owner.

A.5.3 Driveway Runoff

Runoff from driveways and other areas intended for regular motor vehicle traffic must be conveyed to an available and adequately designed offsite stormwater treatment and detention facility where practicable. This requirement can be met by conveying the runoff to the street, if the street runoff is collected by a city approved system.

If an offsite facility is not available, infiltration or dispersion may be used depending on site specific factors such as size, topography, and soils. Infiltration systems used for driveway runoff may consist of trenches designed for this purpose, or may allow for sheet runoff onto vegetated landscaping. The infiltration system shall be separate from roof runoff infiltration systems but may use the same Table A.2 for sizing of the infiltration facility. Gravel driveways using Table A.2 shall reduce the table values by 15 percent. Driveways exceeding the treatment thresholds identified in Volume I (5,000 square feet) are required to provide treatment per the requirements of Volume I and Volume V. Driveway dispersion systems must be designed in accordance with the requirements of Volume VI, Sections 3.12 and 3.13.

A.5.4 Infiltration and Dispersion Design – Single Family

No standardized design criteria will ever be able to account for all possible design situations. The homeowner will remain responsible for the ultimate satisfactory performance of any infiltration system used onsite. The following standardized design criteria are intended to guide the homeowner in providing an acceptable design for an individual downspout infiltration system.

For sites with proposed onsite sewage disposal systems, the soils professional designing that system can provide the onsite soils type(s) and design the infiltration system.

Downspout Infiltration System Design Criteria

Downspout infiltration systems are trench or drywell designs intended only for use in infiltrating runoff from roof downspout drains and clean impervious areas such as patios and sidewalks. They are not designed to directly infiltrate runoff from pollutant-generating impervious surfaces. See Volume V for infiltration treatment requirements. Also, a single individual downspout infiltration system can only serve a maximum of 5,000 square feet of roof area.

Any deviation, in design or construction, from the standardized design criteria detailed below will result in it being required that the individual downspout infiltration system be designed by a professional engineer registered in the State of Washington.

Flow Credit for Roof Downspout Infiltration

If roof runoff is infiltrated according to the requirements of this section, the roof area may be discounted from the project area used for sizing stormwater facilities. This is done by clicking on the "credit" button in WWHM and entering the percent of roof area that is being infiltrated.

Options for downspout infiltration systems include infiltration trenches and drywells. The city has developed standardized tables that can be used to facilitate sizing of infiltration trenches and drywells. Prior to selecting and designing an infiltration facility, the project must prepare a soils investigation and report, as discussed in the next section.

Procedure for Evaluating Soils Feasibility

- A soils report must be prepared by a professional soil scientist certified by the Soil Science Society of America (or an equivalent national program), a locally licensed onsite sewage designer, or by a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington to determine if soils suitable for infiltration are present on the site. The report must reference a sufficient number of soils logs to establish the type and limits of soils at the proposed trench locations. The report shall at a minimum identify the limits of any *outwash type soils* (i.e., those meeting USDA soil texture classes ranging from coarse sand and cobbles to medium sand) versus other soil types and include an inventory of topsoil depth

- For projects using the sizing tables presented in Table A.2, individual lot or site tests must consist of at least one soils log at the location of the infiltration system, a minimum of 4 feet in depth (from proposed grade), identifying the SCS series of the soil and the USDA textural class of the soil horizon through the depth of the log, and noting any evidence of high groundwater level, such as mottling. Soils in the location of the proposed infiltration system shall not be silty clay loam, clay loam, clay, or any other soil having a percolation rate slower than 1 inch per hour.

- Site-specific tests must indicate 18 inches or more of permeable soil from the proposed final grade to the seasonal high groundwater table.

- For sites that do not use the sizing tables presented in Table A.2, the site infiltration rates must be determined using the procedures outlined in Volume III, Appendix III-A.

Design Criteria for Infiltration Trenches

Attachments Section A, Detail 11.1 provides a typical downspout infiltration trench system. These systems are designed as specified below.

The following standardized design criteria are intended to guide the applicant in providing an acceptable design for an individual downspout infiltration system. A professional engineer will not be required to design an individual downspout infiltration system provided that: 1) the proposed site development does not result in a net increase in impervious surfaces of 5,000 square feet or more, 2) the project has prepared a soils report as outlined above, 3) the system is sized according to the sizing chart shown in Table A.2 and the general guidelines below, and 4) the system is to be constructed according to the standard design shown in Attachments Section A, Detail 11.1. Any deviation in design or construction from the items above or the standardized design criteria detailed below will result in it being required that the individual downspout infiltration be designed by a professional engineer in accordance with the guidelines presented in this volume as well as Volume III.

Table A.2 below outlines an approved prescriptive design for downspout infiltration trenches that meets Gig Harbor flow control requirements. The tables present trench footprint areas based on various depths, contributing areas, and infiltration rates. All trenches must be constructed according to the standard design shown in Attachments Section A, Detail 11.1. Note that for roof areas that fall between the areas represented by each column in the table, the required trench footprint area may be interpolated based on the information in the tables. However, for infiltration rates that fall between the rates represented in each table, the designer must use the more conservative (i.e., lower) infiltration rate in their design. All sites have the option to do their own engineered design for infiltration trenches in-lieu of using the tables below, subject to approval by the city. In addition to the sizing requirements outlined in the tables, the following design requirements apply:

- Maximum length of trench must not exceed 100 feet from the inlet sump.
- Minimum spacing between distribution pipe centerlines must be 6 feet.
- The aggregate material for the infiltration trench shall consist of 1.5- to three-fourth-inch washed round rock.
- Geotextile filter fabric shall be wrapped entirely around trench drain rock prior to backfilling EXCEPT that a 6-inch layer of sand below the trench bottom may be used in lieu of a filter fabric liner on the bottom.

- Infiltration trenches may be placed in fill material if the fill is placed and compacted under the direct supervision of a geotechnical engineer or professional civil engineer with geotechnical expertise, and if the measured infiltration rate is at least 8 inches per hour. Infiltration rates can be tested using the methods described in Volume III, Appendix III-A.
- Infiltration trenches shall be set back at least 50 feet from top of slopes steeper than 20 percent and greater than 10 feet high. A geotechnical analysis and report must be prepared addressing the potential impact of the facility on the slope. The geotechnical report may recommend a reduced setback, but in no case shall the setback be less than the vertical height of the slope.
- All trenches shall be a minimum of 10 feet away from any structure or property line.
- A structure with a sump (see Attachments Section A, Details 11.0 and 11.1) shall be located upstream of the trench, which provides a minimum of 12 inches of depth below the outlet riser. The outlet riser pipe bottom shall be designed so as to be submerged at all times, and a screening material shall be installed on the pipe outlet.
- Trenches may be located under pavement if designed by a professional engineer. Trenches must include an overflow at least 1 foot below the pavement, and in a location which can accommodate the overflow without creating a significant adverse impact to downhill properties or drainage systems. This is intended to prevent saturation of the pavement in the event of system failure. The trench depth must be measured from the overflow elevation, not the ground surface elevation.
- Prior to approval of an individual downspout infiltration system, a site plan must be submitted showing the location of the proposed infiltration system together with adjacent buildings, structures, wells, septic drainfields, and property lines. Prior to final approval of construction, an as-built (record) drawing must be submitted to the city that includes the site plan together with the actual constructed square footage of the infiltration system.
- See Volume III, Section 3.3.6, for additional required setbacks for infiltration facilities.

A sample design calculation is included at the end of this appendix.

Design Criteria for Infiltration Drywell Systems

Attachments Section A, Detail 14.0 shows a typical downspout infiltration drywell system. The drywell shall include a settling chamber (as shown in

Detail 14.0), or its equivalent for particulate removal. If non-roof runoff is also draining to the drywell system, the contributing flows must also pass through a catch basin structure with a sump (see examples in Attachments Section A, Details 11.1 and 11.0). Drywell systems are designed as specified below.

- Drywell bottoms must be a minimum of 1 foot above seasonal high groundwater level or impermeable soil layers.
- Soils in the proposed location shall not be silty clay loam, clay loam, clay, or any other soil having percolation rates slower than 1 in/hr.
- If using drywells, size the facilities according to the area and depth requirements outlined in Table A.2. For roof areas that fall between the areas represented by each column in the table, the required trench footprint area may be interpolated based on the information in the tables. For infiltration rates that fall between the rates represented in each table, the designer must use the more conservative (i.e., lower) infiltration rate in their design. All sites have the option to do their own engineered design for infiltration trenches in-lieu of using the tables below, subject to approval by the city.
- Typically drywells are 48 inches in diameter (minimum) and have a depth of 5 feet (4 feet of gravel and 1 foot of suitable cover material).
- Filter fabric (geotextile) must be placed on top of the drain rock and on trench or drywell sides prior to backfilling.
- Spacing between drywells must be a minimum of 4 feet.
- Downspout infiltration drywells must not be built on slopes greater than 25 percent (4:1). Drywells may not be placed on or above a landslide hazard area or slopes greater than 15 percent without evaluation by a professional engineer with geotechnical expertise or a licensed geologist, hydrogeologist, or engineering geologist, and with jurisdiction approval.
- See Volume III, Section 3.3.6, for additional required setbacks for infiltration facilities.

Downspout Dispersion Systems

Downspout dispersion systems are gravel-filled trenches or splash blocks, which serve to spread roof runoff over vegetated pervious areas.

Dispersion attenuates peak flows by slowing entry of the runoff into the conveyance system, allows for some infiltration, and provides some water quality benefits.

Flow Credit for Roof Downspout Dispersion

If roof runoff is dispersed according to the requirements of this section over a vegetative flow path that is 25 feet or larger (for trenches) or 50 feet or larger (for splashblocks) through undisturbed native landscape or an area that meets the soils criteria outlined in Volume VI, Section 3.14, the roof area may be modeled as grassed surface.

Design Criteria for Downspout Dispersion

This section provides design criteria for both dispersion trenches and splash blocks:

- Dispersion trenches shall be designed as shown in Figure A.1 and Attachments Section A, Detail 1.0.

- Splash blocks shall be designed as shown in Figure A.2.

- A vegetated flowpath of at least 25 feet in length must be maintained between the outlet of a trench and any property line; structure; critical area (i.e., stream, wetland), or impervious surface. Natural Resource Protection Areas and critical area buffers may count towards flowpath lengths. However, the area must be permanently protected from modification through a covenant or easement, or a tract dedicated by the proposed project. This **does not** include steep slopes. See steep slope setbacks are outlined below.

- Trenches serving up to 700 square feet of roof area may be simple 10-foot long by 2-foot wide gravel filled trenches as shown in Figure A.1. For roof areas larger than 700 square feet, a dispersion trench with notched grade board as shown in Attachments Section A, Detail 1.0 shall be used. The total length of this design must not exceed 50 feet and must provide at least 10 feet of trench per 700 square feet of roof area. In both systems it is important to include a cleanout structure prior to discharge into the dispersal area. Although the figures refer at times to a Type 1 catch basin being used, it is also acceptable to utilize an equivalent type structure which includes a lid, 1-foot minimum sump, and T-type outlet with screen as shown in Attachments Section A, Detail 11.1.

- Splash blocks shown in Figure A.2 may be used for downspouts discharging to a vegetated flow path at least 10 feet in width and 50 feet in length as measured from the downspout to the

downstream property line; structure; critical areas (i.e., stream, wetland), or other impervious surface. Natural resource protection areas and sensitive area buffers may count toward flowpath lengths. This **does not** include steep slopes. See steep slope setbacks below.

- A maximum of 700 square feet of roof area may drain to each splash block. When flow paths of multiple splash blocks are combined the vegetated flow path width shall increase by 50 percent with each additional splashblock.
- No erosion or flooding of downstream properties may result.
- For both trenches and splashblocks, the vegetated flowpath must be covered with well-established vegetation to prevent erosion and promote partial infiltration. Vegetated flowpaths shall consist of undisturbed native landscape area or an area that meets the requirements of Volume VI, Section 3.14.
- For sites with septic systems, the discharge point must be downslope of the primary and reserve drainfield areas. This requirement may be waived if site topography clearly prohibits flows from intersecting the drainfield.
- Dispersion systems shall be set back at least 50 feet from top of slopes steeper than 20 percent and greater than 10 feet high. A geotechnical analysis and report must be prepared addressing the potential impact of the facility on the slope. The geotechnical report may recommend a reduced setback, but in no case shall the setback be less than the vertical height of the slope.

Individual Infiltration Systems for Residential Subdivisions

Where the developer of a residential subdivision, short plat, or proposes to utilize individual infiltration systems for residential lots or for groups of lots with similar soils, the project engineer shall determine the required infiltration system sizing using the criteria in Volume III, Section 3.3. These sizes shall be recorded with the county on the face of the final plat Mylar or an alternative acceptable to the city to ensure they are used as restrictions for future building applications.

In addition, as noted at the beginning of this appendix, for the purposes of applying the thresholds in Chapter 3, Table 3.1 to a proposed subdivision (i.e., a plat or short plat project), the impervious surface coverage must be specified for each lot. The impervious coverage shall be assumed to be 4,000 square feet, the size of the lot, or the maximum allowed by GHMC, whichever is less. **Note: the impervious areas assumed for the lots must be set as the maximum allowable impervious area through a**

declaration of covenant recorded for the lot. Therefore, it is extremely important to make an accurate estimate of the expected impervious coverage. In addition, the converted pervious surface on each created lot shall be the entire lot area minus the assumed impervious surface area and any area in which native conditions are preserved by a required clearing limit, a covenant or easement recorded for the lot, or a tract dedicated by the proposed subdivision. Refer to Volume I, Chapter 3 for further information.

Soil Amendments

Volume VI, Section 3.14 provides design guidelines and requirements for amending site soils after construction. In general, amending soils is a method of regaining some of the absorption and infiltration capability of the soil, and increasing a site's ability to retain runoff and filter pollutants. Soil amendments are one of the tools that must be utilized where Minimum Requirement #5 applies.

A.5.5 Individual Onsite Retention/Detention Facilities (Ponds)

Where an onsite retention/detention facility is proposed or required due to site conditions, it shall be sized in accordance with the minimum requirements for storage for impervious areas tributary to a pond as outlined in Volume III. All sizing and design shall be prepared by a professional engineer. Roof runoff may be conveyed to the pond through either a constructed, defined, open channel, or by pipe. Driveway runoff shall be conveyed to the pond where feasible and preferably through a grass-lined channel or swale, designed according to the requirements in Volume V.

Onsite Pond Criteria

In order to facilitate pond maintenance and minimize impacts to the site and adjoining properties, the pond and the maintenance requirements shall be shown on building applications, and the pond design shall:

- Locate the pond adjacent to the right-of-way or in such a manner as to facilitate homeowner maintenance and avoid impacts to adjoining property.
- Integrate ponds into lawn areas with gentle side slopes, 4:1 or less preferred, shallow depths not to exceed 18 inches, and moisture tolerant grasses.
- Provide ponds with a flat bottom and with a depressed area on one side to allow overflow. Overflow cannot be directed across sidewalks.

Table A.1. Hierarchy of Approved Methods for "Clean"[a] Stormwater Disposal on Single Family and Small Commercial Lots.

• LID [b]
• Onsite infiltration
• LID facilities/BMPs [b]
• Splash Blocks
• Connection to an approved city system
• Connection to Maintained Drainage Ditches

NOTE: Requirements recorded on approved short plat subdivisions, or formal plat subdivisions and/or engineered plans approved by the city shall take precedence over this table.

[a] Non-metal roofs, patios, sidewalks, pathways and other areas not subject to vehicular use.

[b] Information on LID and LID BMPs is presented in Volume VI.

Table A.2. Sizing Table for Downspout Infiltration Trenches.

Square Feet of Trench Bottom for Gravel/Type A Soils (60 in/ hour)

Total Depth Below Ground Surface [a] (ft)	Roof Area (square feet)				
	500	1,000	2,000	3,000	4,000
2.5	12.0	24	48	72	96
3.0	10.8	21	43	65	86
3.5	9.5	19	38	57	76
4.0	9.0	18	36	54	72
4.5	8.5	17	34	51	68
5.0	7.9	16	32	47	63
5.5	7.5	15	30	45	60

Square Feet of Trench Bottom for Medium Sand/Type A Soils (12 in/hour)

Total Depth Below Ground Surface [a] (ft)	Roof Area (square feet)				
	500	1,000	2,000	3,000	4,000
2.5	29	58	116	173	231
3.0	26	52	104	155	207
3.5	23	46	92	137	183
4.0	22	43	86	129	171
4.5	20	41	82	123	164
5.0	19	38	76	113	151
5.5	18	36	72	108	144

Square Feet of Trench Bottom for Loamy Sand/Type A Soils (4 in/hour)

Total Depth Below Ground Surface [a] (ft)	Roof Area (square feet)				
	500	1,000	2,000	3,000	4,000
2.5	50	101	202	303	404
3.0	45	90	181	271	361
3.5	40	80	160	240	320
4.0	38	75	150	225	300
4.5	36	71	143	215	286
5.0	33	66	132	198	264
5.5	32	63	126	189	252

Table A.2 (continued). Sizing Table for Downspout Infiltration Trenches.

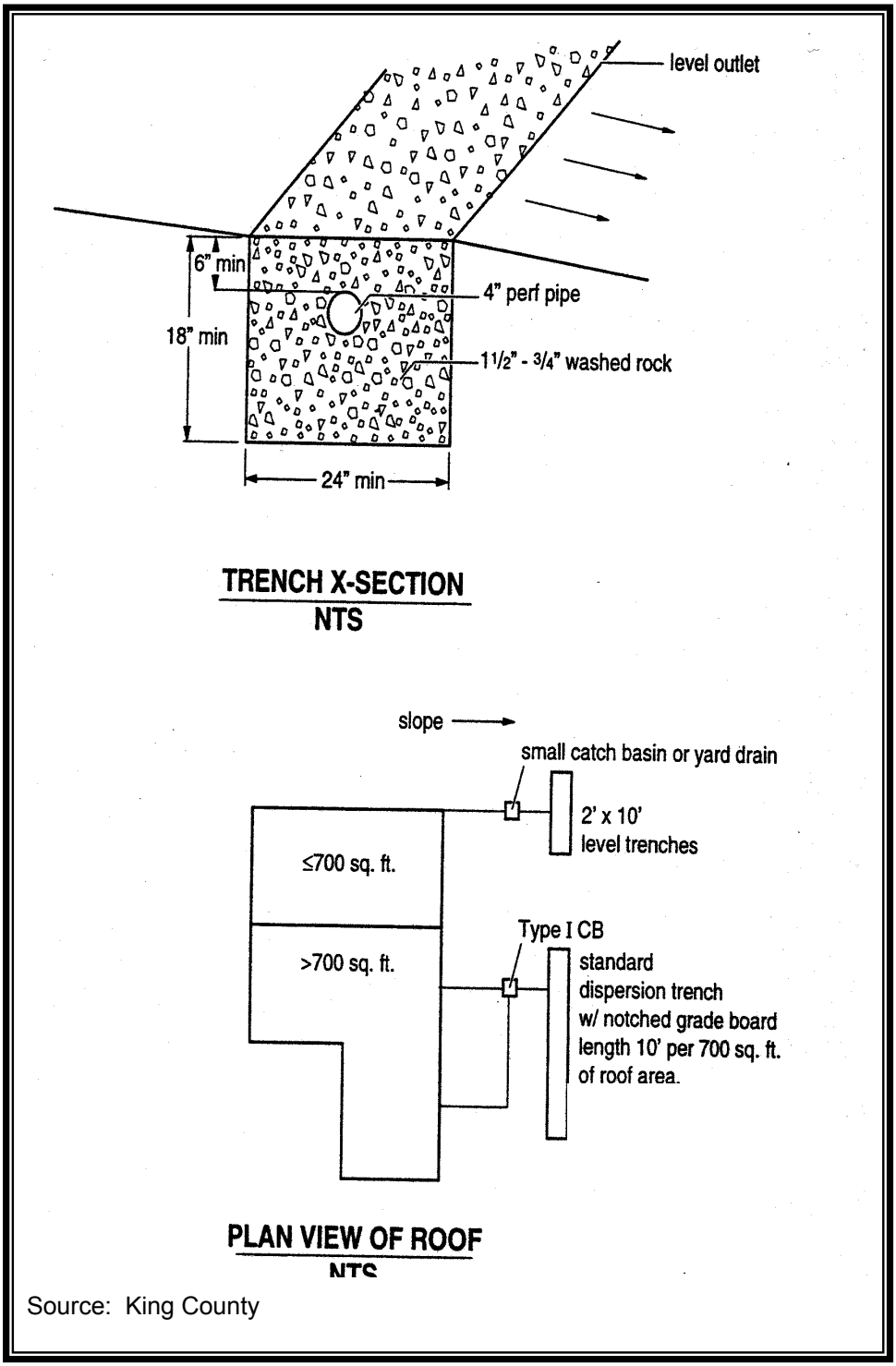
Square Feet of Trench Bottom for Loam/Type B Soils (2 in/hour)

Total Depth Below Ground Surface [a] (ft)	Roof Area (square feet)				
	500	1,000	2,000	3,000	4,000
2.5	72	144	288	432	576
3.0	65	129	258	387	516
3.5	57	114	228	342	456
4.0	54	107	214	321	428
4.5	51	102	204	306	408
5.0	47	94	188	282	376
5.5	45	90	180	270	360

Square Feet of Trench Bottom for Porous Silt Loam/Type C Soils (1 in/hour)

Total Depth Below Ground Surface [a] (ft)	Roof Area (square feet)				
	500	1,000	2,000	3,000	4,000
2.5	103	206	412	618	824
3.0	93	184	369	553	737
3.5	82	163	327	490	653
4.0	77	153	306	459	612
4.5	73	146	292	438	584
5.0	68	134	269	404	538
5.5	64	129	258	387	515

[a] The "total depth below ground surface" is the depth of the trench bottom. The trench consists of gravel covered by 6 inches of compacted backfill. Hence, the gravel thickness is 6 inches less than the depth listed.



Source: King County

Figure A.1. Typical Downspout Dispersion Trench.

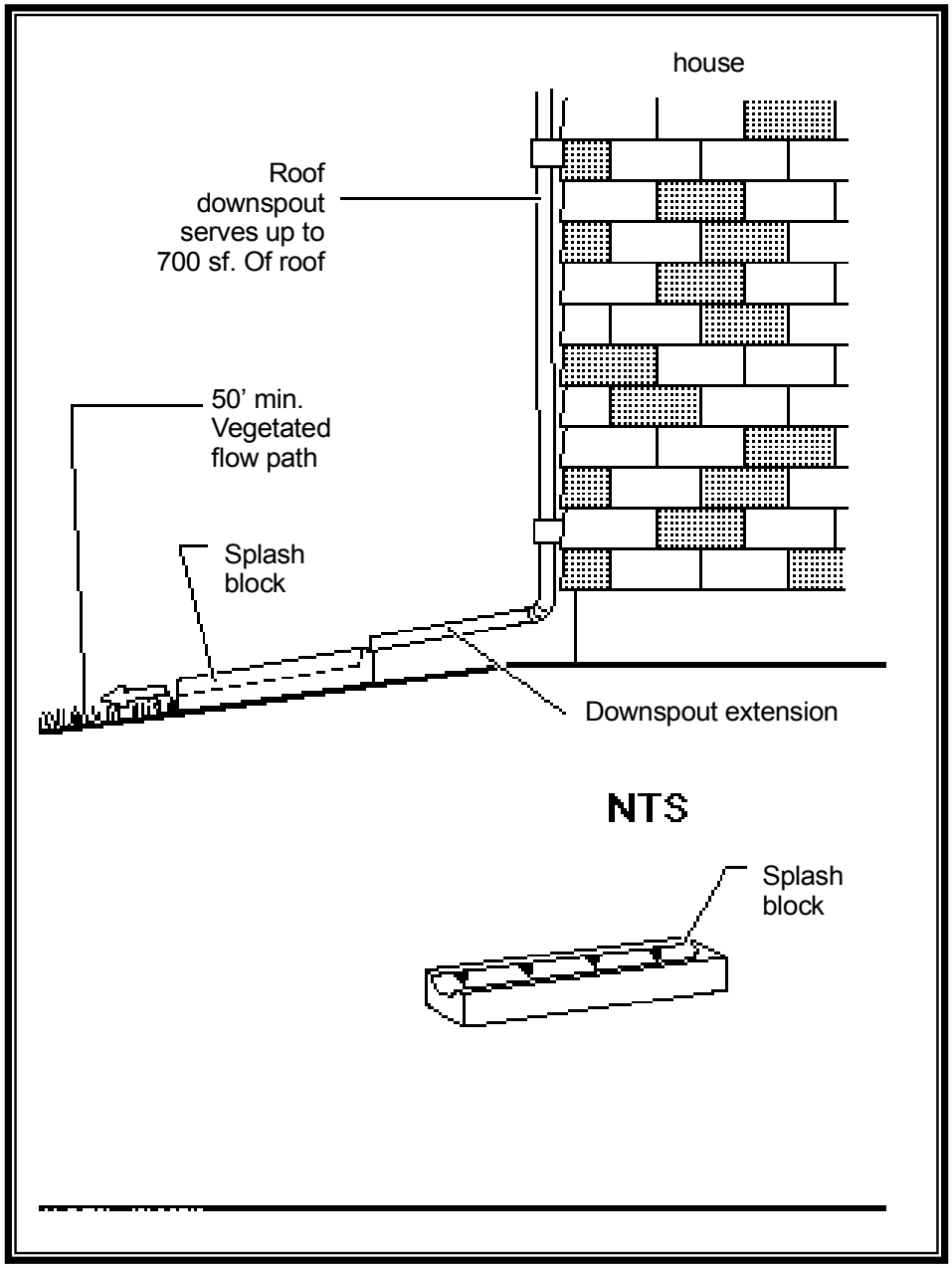


Figure A.2. Typical Downspout Splashblock Dispersion.

EXAMPLE

INFILTRATION TRENCH CALCULATION

Steps in Sizing Trenches

1. Determine the type of soil on your lot. A soils professional may be required.

2. Determine the size of roof area in square feet.

3. Select a trench depth based upon depth of soil, location of high groundwater table and other factors. Use the chart to determine the required square footage of trench bottom using the above information.

4. Select a trench width; the wider the trench (to a maximum of 4 inches), the shorter the length of the trench.

5. Calculate the trench length so that the width of the trench in feet, times the length of the trench in feet (which is the square footage of the trench bottom) matches the amount given on the chart for your roof area, type of soils and depth of trench.

Square footage of trench bottom (from chart) = width in feet x length in feet, **or**

Trench length = Square footage of trench bottom (from chart) / trench width

Example Trench Sizing

Given:

A property owner plans to build a house with 2,000 square feet of roof area. A soils professional has determined that the soils on the site are a loamy sand and have a seasonal high water table located 6 feet below the surface of the ground. The lot is flat.

Steps:

Step 1. Determine the type of soil on your lot.

As stated above, soils are loamy sand.

Step 2. Determine size of roof area in square feet.

As stated above, roof area is 2,000 square feet. *Note that this is less than 5,000 square feet, so an infiltration trench is appropriate.*

Step 3. Select trench depth that conforms to the requirements in Section A.5.4 and determine required square footage of trench bottom.

Depths of 1 to 4 feet are all appropriate for this site based on the criteria in Section A.5.4. *For this example, use a trench depth of 3.5 feet.* From Table A.2, the required trench area is 160 square feet.

Step 4. Select trench width.

For this example, use a trench width of 4 feet.

Step 5. Calculate the trench length.

(215 square feet)/(4 feet) = 53.75 feet (use 54 feet)

The infiltration trench for this example is 3.5 feet deep, 4 feet wide, and 54 feet long.

This may be broken into smaller trenches if all of the roof runoff is not directed to one trench.

Appendix I-B –
Maintenance Including Example Maintenance Schedules

Appendix I-B – Maintenance Including Example Maintenance Schedules

INSTRUCTIONS FOR PERSON ASSEMBLING MAINTENANCE INFORMATION

The following “Plat," "Commercial/Industrial," and Residential Agreements to Maintain Stormwater Facilities apply within Gig Harbor.

1. Select the correct type of maintenance agreement (plat, commercial or residential).

2. Include the “Instruction for Person Maintaining Stormwater System" sheet.

3. Include the Attachment A cover sheet.

4. See Volume I, Section 3.3.4 for additional requirements regarding Maintenance Plan content and preparation.

After recording return to:

Planning and Land Services
2401 South 35th Street
Tacoma, WA 98409-7487

P.C.D.E. File No. _____

"PLAT" AGREEMENT TO MAINTAIN STORMWATER FACILITIES AND TO IMPLEMENT A POLLUTION SOURCE CONTROL PLAN

THEIR HEIRS, SUCCESSORS, OR ASSIGNS (HEREINAFTER "_____")

For purposes of this agreement and for indexing by the Auditor as required by R.C.W. Ch. 65.04, the parties to this agreement are_____, **Grantor**, and Gig Harbor, **Grantee**.

LEGAL DESCRIPTION OF PROPERTY: (Abbreviated legal description if complete legal will not fit here and reference to where complete legal can be found.)

Assessor Parcel No.(s)

1.0 RECITALS

1.1 Grantor is the owner of certain real property in Gig Harbor, Washington, described as set forth in the legal description contained herein and referred to in this agreement as the ”property.”

1.2 In connection with the Grantor’s proposed development of the property, Gig Harbor has required and Grantor has agreed to construct stormwater facilities and to implement a pollution source control plan. The stormwater facilities and pollution source control plan were prepared by the engineering firm of _____ for the Grantor’s property and is on file with Gig Harbor.

1.3 The upkeep and maintenance of stormwater facilities and the implementation of pollution source control BMPs is essential to the protection of water resources. All property owners are expected to conduct business in a manner that promotes environmental protection. This Agreement contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

1.4 Whereas, _____ have (has) constructed improvements, including but not limited to, buildings, pavement, and stormwater facilities on the property described above, in order to further the goals of the city to ensure the protection and enhancement of water resources, the city and _____ hereby enter into this Agreement.

2.0 MAINTENANCE

The responsibilities of each party to this Agreement are identified below.

_____ SHALL:

(1) Implement the stormwater facility maintenance program included herein as Attachment “A."

(2) Implement the pollution source control program included herein as Attachment ”B."

(3) Execute the following periodic major maintenance on the subdivision's stormwater facilities: sediment removal from ponds, managing vegetation in wet ponds, resetting orifice sizes and elevations if damaged, and adding baffles unless said facilities have been dedicated to and accepted by the city.

(4) Maintain a record (in the form of a log book) of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by city staff at _____, during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-on actions recommended. Maintenance items ("problems") listed in Attachment A shall be inspected as specified in the attached instructions or more often if necessary. The _____ are encouraged to photocopy the individual checklists in Attachment A and use them to complete its inspections. These completed checklists would then, in combination, comprise the log book.

(5) Submit an annual report to the city regarding implementation of the programs referenced in (1) and (2) above. The report should be submitted to Gig Harbor Public Works Department, 3510 Grandview Street, Gig Harbor, WA 98335. The report must be submitted on or before May 15 of each calendar year and shall contain, at a minimum, the following:

(a) Name, address, and telephone number of the businesses, the persons, or the firms responsible for plan implementation, and the person completing the report.

(b) Time period covered by the report.

(c) A chronological summary of activities conducted to implement the programs referenced in (1) and (2) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties, include a copy of the invoice for services.

(d) An outline of planned activities for the next year.

(6) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under item 5 above and shall be approved of by the city. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by the city and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements, and application for a site development permit.

THE CITY SHALL:

(1) If the facility is dedicated to and accepted by the city; execute the following periodic major maintenance on the subdivision's stormwater facilities: sediment removal from ponds, managing vegetation in wet ponds, resetting orifice sizes and elevations, and adding baffles.

(2) Maintain all stormwater system elements in the public rights-of-way, such as catch basins, oil-water separators, and pipes.

(3) Provide technical assistance to _____ in support of its O&M activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request and as city time and resources permit.

(4) Review the annual report and conduct site visits as necessary to discuss performance and problems with _____.

(5) Review this agreement with _____ and modify it as necessary.

3.0 REMEDIES:

If the facility(ies) has(have) not been dedicated to and accepted by the city, then the city shall:

(1) If the city determines that maintenance, repair or retrofit work is required to be done to the stormwater facilities located in the subdivision, the city shall give

notice of the specific maintenance and/or repair required. The city shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance, repair and/or retrofit is not completed within the time set by the city, the city will assess financial sanctions (Chapter 12.17 Enforcement (GHMC)) and/or initiate enforcement proceedings.

(2) If at any time the city determines that the existing system creates any imminent threat to public health, welfare or water quality the city may take necessary measures to remedy said threat. No notice to the persons listed in Remedies (1), above, shall be required under such circumstances. All other _____ responsibilities shall remain in effect.

4.0 ACCESS and FAILURE to MAINTAIN

(1) The _____ grant unrestricted authority to the city for access to any and all stormwater system features for the purpose of routine inspections and/or performing maintenance, repair and/or retrofit as may become necessary under Remedy(2).

(2) The _____ shall assume responsibility for the cost of maintenance , repair, and /or retrofit to the stormwater facility, except for those maintenance actions explicitly assumed by the city in the preceding Section 2.0 and as necessary in 3.0 Remedies (2). Such responsibility shall include reimbursement to the city within 90 days of the receipt of the invoice for any such work performed as required by Section 3.0 (2). Overdue payments will require payment of interest at the current legal rate for liquidated judgments. If legal action ensues, any costs or fees incurred by the city will by borne by the parties responsible for said reimbursements.

5.0 SUCCESSORS and ASSIGNS

This Agreement is intended to protect the value and desirability of the real property described above and to benefit all the citizens of the city. It shall run with the land and be binding on all parties having or acquiring any right, title, or interest, or any part thereof, of real property in the subdivision including the applicant, heirs, successors and assigns. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the city.

This Agreement concerns that certain portion of real property described previously and is incorporated by reference herein.

Dated this _____ day of _____, 200__.

_____	_____	_____
Signature	Signature	Signature
_____	_____	_____
Address	Address	Address

City/State/Zip	City/State/Zip	City/State/Zip

STATE OF WASHINGTON)
) ss
COUNTY OF PIERCE)

I certify that I know or have satisfactory evidence that is/are the person(s) who appeared before me, and that said person(s) acknowledged that he/she/they signed this instrument and acknowledged it to be his/her/their free and voluntary act for the uses and purposes mentioned in the instrument.

DATED this _____ day of _____, 200__.

Signature:_____

Print Name:_____

Title:_____

My Appointment Expires:_____

STATE OF WASHINGTON)
) ss
COUNTY OF PIERCE)

I certify that I know or have satisfactory evidence that
is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument, on oath stated that (he/she) was authorized to execute the instrument and acknowledged it as the _____ of
to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED this _____ day of _____, 200 __.

Signature:_____

Print Name:_____

Title:_____

My Appointment Expires:_____

APPROVED as to form only:

_____
Gig Harbor City Attorney

_____
Date

ACCEPTED BY:

_____
Gig Harbor Executive

_____
Date

After recording return to:

Planning and Land Services
2401 South 35th Street
Tacoma, WA 98409-7487

P.C.D.E. File No. _____

"COMMERCIAL/INDUSTRIAL"
AGREEMENT TO MAINTAIN
STORMWATER FACILITIES AND TO IMPLEMENT A
POLLUTION SOURCE CONTROL PLAN

ITS HEIRS, SUCCESSORS, OR ASSIGNS
(HEREINAFTER "_____")

For purposes of this agreement and for indexing by the Auditor as required by R.C.W. Ch. 65.04, the parties to this agreement are
Grantor, and Gig Harbor, **Grantee**.

Grantee.

LEGAL DESCRIPTION OF PROPERTY: (Abbreviated legal description if complete legal will not fit here and reference to where complete legal can be found.)

Assessor Parcel No.(s)

1.0 RECITALS

1.1 Grantor is the owner of certain real property in Gig Harbor, Washington, described as set forth in the legal description contained herein and referred to in this agreement as the ”property.”

1.2 In connection with the Grantor’s proposed development of the property, Gig Harbor has required and Grantor has agreed to construct stormwater facilities and to implement a pollution source control plan. The stormwater facilities and pollution source control plan were prepared by the engineering firm of _____ for the Grantor’s property and is on file with Gig Harbor.

1.3 The upkeep and maintenance of stormwater facilities and the implementation of pollution source control BMPs is essential to the protection of water resources. All property owners are expected to conduct business in a manner that promotes environmental protection. This Agreement contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

1.4 Whereas, Business Name has constructed improvements, including but not limited to, buildings, pavement, and stormwater facilities on the property described above. In order to further the goals of the city to ensure the protection and enhancement of city's water resources, the city and Business Name hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

2.0 MAINTENANCE

BUSINESS NAME SHALL:

(1) Implement the stormwater facility maintenance program included herein as Attachment ”A."

(2) Implement the pollution source control program included herein as Attachment ”B."

(3) Execute the following periodic major maintenance on the stormwater facilities: sediment removal from ponds, managing vegetation in wet ponds, resetting orifice sizes and elevations if damaged, and adding baffles.

(4) Maintain a record (in the form of a log book) of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by city staff at _____ during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-on actions recommended. Maintenance items ("problems") listed in Attachment A shall be inspected on a monthly or more frequent basis as necessary. Business Name is encouraged to photocopy the individual checklists in Attachment A and use them to complete its monthly inspections. These completed checklists would then, in combination, comprise the monthly log book.

(5) Submit an annual report to the city regarding implementation of the programs referenced in (1) and (2) above. The report should be submitted to Gig Harbor Public Works

Department 3510 Grandview Street, Gig Harbor, WA 98335. The report must be submitted on or before May 15 of each calendar year and shall contain, at a minimum, the following:

(a) Name, address, and telephone number of the business, the person, or the firm responsible for plan implementation, and the person completing the report.

(b) Time period covered by the report.

(c) A chronological summary of activities conducted to implement the programs referenced in (1) and (2) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties not affiliated with Business Name, include a copy of the invoice for services.

(d) An outline of planned activities for the next year.

(6) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under item 5 above and shall be approved of by the city. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by the city and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements, and application for a site development permit.

THE CITY SHALL:

(1) Provide technical assistance to Business Name in support of its O&M activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request and as city time and resources permit, at no charge to Business Name.

(2) Review the annual report and conduct site visits as necessary to discuss performance and problems with Business Name.

(3) Review this agreement with Business Name and modify it as necessary.

3.0 REMEDIES

(1) If the city determines that maintenance, repair and /or retrofit work is required to be done to the stormwater facility existing on the Business Name property, the city shall give the owner of the property within which the drainage facility is located, and the person or agent in control of said property, notice of the specific maintenance, repair and/or retrofit required. The city shall set a reasonable time in which such work is to be completed by the persons who were given notice; such time shall not extend beyond 30 days. If the above required maintenance and/or repair is not completed within the time set by the city, written notice will be sent to the persons who were given notice stating the city's intention to assess financial sanctions Chapter 12.17 Enforcement (GHMC)) and /or initiate enforcement proceedings..

(2) If at any time the city determines that the existing system creates any imminent threat to public health, welfare or water quality the city may take necessary measures to remedy said threat. No notice to the persons listed in (1), above, shall be required under such circumstances.

4.0 ACCESS and FAILURE to MAINTAIN

(1) The owner grants unrestricted authority to the city for access to any and all stormwater system features for the purpose of performing inspection and maintenance, repair and/ or retrofit as may become necessary under Remedies (1) and/or (2).

(2) The persons listed in Remedies (1), above, shall assume all responsibility for the cost of any maintenance, repair and/or retrofit to the stormwater facility. Such responsibility shall include reimbursement to the city within 30 days of the receipt of the invoice for any such work performed. Overdue payments will require payment of interest at the current legal rate for liquidated judgments. If legal action ensues, any costs or fees incurred by the city will be borne by the parties responsible for said reimbursements.

5.0 SUCCESSORS and ASSIGNS

This Agreement is intended to protect the value and desirability of the real property described above and to benefit all the citizens of the city. It shall run with the land and be binding on all parties having or acquiring from Business Name or their successors any right, title, or interest in the property or any part thereof, as well as their title, or interest in the property or any part thereof, as well as their heirs, successors, and assigns. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the city.

This Agreement concerns that certain portion of real property described previously and is incorporated by reference herein.

Dated this _____ day of _____, 200 __.

Signature	Signature	Signature
Address	Address	Address
City/State/Zip	City/State/Zip	City/State/Zip

STATE OF WASHINGTON)
)ss
COUNTY OF PIERCE)

I certify that I know or have satisfactory evidence that
is/are the person(s) who appeared before me, and that said person(s) acknowledged that he/she/they signed this instrument and acknowledged it to be his/her/their free and voluntary act for the uses and purposes mentioned in the instrument.

DATED this _____ day of _____, 200 __.

Signature:_____

Print Name:_____

Title:_____

My Appointment Expires:_____

STATE OF WASHINGTON)
)ss
COUNTY OF PIERCE)

I certify that I know or have satisfactory evidence that
is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument, on oath stated that (he/she) was authorized to execute the instrument and acknowledged it as the _____ of
to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED this _____ day of _____, 200 __.

Signature:_____

Print Name:_____

Title:_____

My Appointment Expires:_____

APPROVED as to form only:

_____
Gig Harbor Prosecuting Attorney

_____
Date

ACCEPTED BY:

_____
Gig Harbor Executive

_____
Date

After recording return to:

Planning and Land Services
2401 South 35th Street
Tacoma, WA 98409-7487

P.C.D.E. File No. _____

"RESIDENTIAL" AGREEMENT TO MAINTAIN STORMWATER FACILITIES AND TO IMPLEMENT A POLLUTION SOURCE CONTROL PLAN

THEIR HEIRS, SUCCESSORS, OR ASSIGNS (HEREINAFTER "_____")

For purposes of this agreement and for indexing by the Auditor as required by R.C.W. Ch. 65.04, the parties to this agreement are
, **Grantor**, and Gig Harbor, **Grantee**.

LEGAL DESCRIPTION OF PROPERTY: (Abbreviated legal description if complete legal will not fit here and reference to where complete legal can be found.)

Assessor Parcel No.(s)

1.0 RECITALS

1.1 Grantor is the owner of certain real property in Gig Harbor, Washington, described as set forth in the legal description contained herein and referred to in this agreement as the ”property.”

1.2 In connection with the Grantor’s proposed development of the property, Gig Harbor has required and Grantor has agreed to construct stormwater facilities and to implement a pollution source control plan. The stormwater facilities and pollution source control plan were prepared by the engineering firm of _____ for the Grantor’s property and is on file with Gig Harbor.

1.3 The upkeep and maintenance of stormwater facilities and the implementation of pollution source control BMPs is essential to the protection of water resources. All property owners are expected to conduct business in a manner that promotes environmental protection. This Agreement contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

1.4 Whereas, _____ have (has) constructed improvements, including but not limited to, buildings, pavement, and stormwater facilities on the property described above, in order to further the goals of the city to ensure the protection and enhancement of water resources, the city and _____ hereby enter into this Agreement.

2.0 MAINTENANCE

The responsibilities of each party to this Agreement are identified below.

_____ SHALL:

(1) Implement the stormwater facility maintenance program included herein as Attachment “A."

(2) Implement the pollution source control program included herein as Attachment ”B."

(3) Execute the following periodic major maintenance on stormwater facilities: sediment removal from ponds, managing vegetation in wet ponds, resetting orifice sizes and elevations if damaged, and adding baffles unless said facilities have been dedicated to and accepted by the city.

(4) Maintain a record (in the form of a log book) of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by city staff at _____, during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-on actions recommended. Maintenance items ("problems") listed in Attachment A shall be inspected as specified in the attached instructions or more often if necessary. The _____ are encouraged to photocopy the individual checklists in Attachment A and use them to complete its inspections. These completed checklists would then, in combination, comprise the log book.

(5) Submit an annual report to the city regarding implementation of the programs referenced in (1) and (2) above. The report should be submitted to Gig Harbor Public Works Department 3510 Grandview Street, Gig Harbor, WA 98335. The report must be submitted on or before May 15 of each calendar year and shall contain, at a minimum, the following:

(a) Name, address, and telephone number of the businesses, the persons, or the firms responsible for plan implementation, and the person completing the report.

(b) Time period covered by the report.

(c) A chronological summary of activities conducted to implement the programs referenced in (1) and (2) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties, include a copy of the invoice for services.

(d) An outline of planned activities for the next year.

(6) Prevent any unauthorized modifications to the drainage system and prevent it from being dismantled, revised, altered or removed except as necessary for maintenance, repair or replacement. Any such actions will be covered under item 5 above and shall be approved of by the city. Modifications to the stormwater quantity control and stormwater quality system must be approved in advance by the city and may require the submittal of revised design drawings, supporting calculations, modifications to maintenance requirements, and application for a site development permit.

THE CITY SHALL:

(1) If the facility is dedicated to and accepted by the city; execute the following periodic major maintenance on the subdivision's stormwater facilities: sediment removal from ponds, managing vegetation in wet ponds, resetting orifice sizes and elevations, and adding baffles.

(2) Maintain all stormwater system elements in the public rights-of-way, such as catch basins, oil-water separators, and pipes.

(3) Provide technical assistance to _____ in support of its O&M activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request and as city time and resources permit.

(4) Review the annual report and conduct site visits as necessary to discuss performance and problems with _____.

(5) Review this agreement with _____ and modify it as necessary.

3.0 REMEDIES:

If the facility(ies) has(have) not been dedicated to and accepted by the city, then the city shall:

(1) If the city determines that maintenance, repair or retrofit work is required to be done to the stormwater facilities located in the subdivision, the city shall give notice of the specific maintenance and/or repair required. The city shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance, repair and/or retrofit is not completed within the time set by the city, the city will assess financial sanctions Chapter 12.17 Enforcement (GHMC) and/or initiate enforcement proceedings.

(2) If at any time the city determines that the existing system creates any imminent threat to public health, welfare or water quality the city may take necessary measures to remedy said threat. No notice to the persons listed in Remedies (1), above, shall be required under such circumstances. All other _____ responsibilities shall remain in effect.

4.0 ACCESS and FAILURE to MAINTAIN

(1) The _____ grant unrestricted authority to the city for access to any and all stormwater system features for the purpose of routine inspections and/or performing maintenance, repair and/or retrofit as may become necessary under Remedy(2).

(2) The _____ shall assume responsibility for the cost of maintenance , repair, and /or retrofit to the stormwater facility, except for those maintenance actions explicitly assumed by the city in the preceding Section 2.0 and as necessary in 3.0 Remedies (2). Such responsibility shall include reimbursement to the city within 90 days of the receipt of the invoice for any such work performed as required by Section 3.0 (2). Overdue payments will require payment of interest at the current legal rate for liquidated judgments. If legal action ensues, any costs or fees incurred by the city will by borne by the parties responsible for said reimbursements.

5.0 SUCCESSORS and ASSIGNS

This Agreement is intended to protect the value and desirability of the real property described above and to benefit all the citizens of the city. It shall run with the land and be binding on all parties having or acquiring any right, title, or interest, or any part thereof, of real property in the subdivision including the applicant, heirs, successors and assigns. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the city.

This Agreement concerns that certain portion of real property described previously and is incorporated by reference herein.

Dated this _____ day of _____, 200__.

_____	_____	_____
Signature	Signature	Signature
_____	_____	_____
Address	Address	Address
_____	_____	_____
City/State/Zip	City/State/Zip	City/State/Zip

STATE OF WASHINGTON)
) ss
COUNTY OF PIERCE)

I certify that I know or have satisfactory evidence that is/are the person(s) who appeared before me, and that said person(s) acknowledged that he/she/they signed this instrument and acknowledged it to be his/her/their free and voluntary act for the uses and purposes mentioned in the instrument.

DATED this _____ day of _____, 200 __.

Signature:_____

Print Name:_____

Title:_____

My Appointment Expires:_____

STATE OF WASHINGTON)
) ss
COUNTY OF PIERCE)

I certify that I know or have satisfactory evidence that_____ is the person who appeared before me, and said person acknowledged that (he/she) signed this instrument, on oath stated that (he/she) was authorized to execute the instrument and acknowledged it as the _____ of _____ to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED this _____ day of _____, 200 __.

Signature:_____

Print Name:_____

Title:_____

My Appointment Expires:_____

APPROVED as to form only: ACCEPTED BY:

_____ _____

Gig Harbor City Attorney Gig Harbor Executive

_____ _____

Date

ATTACHMENT A

MAINTENANCE PROGRAM
COVER SHEET FOR GIG HARBOR

Inspection Period:

Number of Sheets Attached:

Date Inspected:

Name of Inspector:

Inspector's Signature:

INSTRUCTIONS FOR USE OF MAINTENANCE CHECKLISTS

The following pages contain maintenance needs for most of the components that are part of your drainage system, as well as for some components that you may not have. Let the city know if there are any components that are missing from these pages. Ignore the requirements that do not apply to your system. You should plan to complete a checklist for all system components on the following schedule:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

Use photocopies of these pages and check off the problems you looked for each time you did an inspection. Add comments on problems found and actions taken. Keep these ”checked" sheets in your files, as they will be used to write your annual report (due in May, for Gig Harbor Only). Some items do not need to be looked at every time an inspection is done. Use the suggested frequency at the left of each item as a guideline for your inspection.

The facility-specific maintenance standards contained in this section are intended to be conditions for determining if maintenance actions are required as identified through inspection. They are not intended to be measures of the facility's required condition at all times between inspections. In other words, exceedance of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance schedules shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action.

ATTACHMENT A (CONTINUED)

#1 – Maintenance Checklist for Detention Ponds

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M,S	General					Trash and Debris	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one 32 gallon garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
A	General					Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined in the Pierce County Noxious Weeds List. (Apply requirements of adopted integrated pest management policies for the use of herbicides.)	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with Tacoma-Pierce County Health Department.) Complete eradication of noxious weeds may not be possible. Compliance with state or local eradication policies required
M,S	General					Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants	No contaminants or pollutants present. (Coordinate removal/cleanup with Gig Harbor Public Works Department 253-851-6170 and/or DOE Spill Response 800-424-8802.)
M	General					Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm.	Rodents removed and dam or berm repaired. (Coordinate with Tacoma-Pierce County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
M	General					Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.	Facility is returned to design function. (Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator)
A	General					Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted integrated pest management policies.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	General					Tree Growth and Dense Vegetation	Tree growth and dense vegetation which impedes inspection, maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements).	Trees and vegetation that does not hinder inspection or maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).
A	General					Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Remove hazard trees
S	General					Performance	Check crest gauge against design expectations (see maintenance plan)	Record reading. Notify city if not meeting design performance.
M, S	Crest Gage					Crest Gage Missing/Broken	Crest gage is not functioning properly, has been vandalized, or is missing.	Repair/replace
M	Side Slopes of Pond					Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.
M, S	Side Slopes of Pond					Erosion	Any erosion observed on a compacted berm embankment.	If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
M	Storage Area					Sediment	Accumulated sediment that exceeds 10 percent of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion. (If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)
M	Storage Area					Liner (If Applicable)	Liner is visible and has more than three one-fourth inch holes in it.	Liner repaired or replaced. Liner is fully covered.
A	Pond Berms (Dikes)					Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Pond Berms Over 4 ft in height (Dikes)					Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
A	Pond Berms (Dikes)					Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential eliminated.
A	Emergency Overflow/ Spillway					Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
A	Emergency Overflow/ Spillway					Rock Missing	Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Riprap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
A	Emergency Overflow/ Spillway					Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#2 – Maintenance Checklist for Infiltration Facilities

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M,S	General					Trash and Debris	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one 32 gallon garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
A	General					Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined in the Pierce County Noxious Weeds List. (Apply requirements of adopted integrated pest management policies for the use of herbicides.)	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with Tacoma-Pierce County Health Department) Complete eradication of noxious weeds may not be possible. Compliance with state or local eradication policies required
M,S	General					Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants	No contaminants or pollutants present. (Coordinate removal/cleanup with Gig Harbor Public Works Department 253-851-6170 and/or DOE Spill Response 800-424-8802.)
M	General					Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm.	Rodents removed and dam or berm repaired. (Coordinate with Tacoma-Pierce County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
M	General					Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.	Facility is returned to design function. (Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator)
A	General					Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted integrated pest management policies.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
S	General					Performance	Check crest gauge against design expectations (see maintenance plan)	Record reading. Notify city if not meeting design performance.
M, S	Crest Gage					Crest Gage Missing/Broken	Crest gage is not functioning properly, has been vandalized, or is missing.	Repair/replace
M	Storage Area					Water Not Infiltrating	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration (24 hours or design infiltration time). (A percolation test pit or test of facility indicates facility is only working at 90 percent of its designed capabilities. If 2 inches or more sediment is present, remove).	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.
M	Filter Bags (if applicable)					Filled with Sediment and Debris	Sediment and debris fill bag more than one-half full.	Filter bag is replaced or system is redesigned.
M,S	Rock Filters					Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
A,S	Trenches					Observation Well (Use surface of trench if well is not present)	Water ponds at surface during storm events. Less than 90 percent of design infiltration rate.	Remove and Replace/Clean rock and geomembrane.
M	Ponds					Vegetation	Exceeds 18 inches.	Mow
M	Ponds					Vegetation	Bare spots.	Revegetate and stabilize immediately.
M	Side Slopes of Pond					Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.
A	Pond Berms (Dikes)					Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Pond Berms (Dikes)					Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential eliminated.
A	General					Hazard Trees	If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Remove hazard trees
A	General					Tree Growth and Dense Vegetation	Tree growth and dense vegetation which impedes inspection, maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements).	Trees and vegetation that does not hinder inspection or maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).
A	Pond Berms (Dikes)					Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
A	Emergency Overflow/ Spillway					Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
A	Emergency Overflow/ Spillway					Rock Missing	Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Riprap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Emergency Overflow/ Spillway					Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
M	Presettling Ponds and Vaults					Facility or sump filled with Sediment and/or debris	6 inches or designed sediment trap depth of sediment.	Sediment is removed.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#3 – Maintenance Checklist for Closed Detention Systems (Tanks/Vaults)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Storage Area					Plugged Air Vents	One-half of the cross-section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
M	Storage Area					Debris and Sediment	Accumulated sediment depth exceeds 10 percent of the diameter of the storage area for one-half length of storage vault or any point depth exceeds 15 percent of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than one-half length of tank.)	All sediment and debris removed from storage area.
A	Storage Area					Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability.)	All joint between tank/pipe sections are sealed.
A	Storage Area					Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10 percent of its design shape. (Review required by engineer to determine structural stability.)	Tank/pipe repaired or replaced to design.
A	Storage Area					Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications and is structurally sound.
A	Storage Area					Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than one-fourth inch wide at the joint of the inlet/outlet pipe.
M, S	Crest Gage					Crest Gage Missing/Broken	Crest gage is not functioning properly, has been vandalized, or is missing.	Repair/replace
A	Manhole					Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Manhole					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than one-half inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
A	Manhole					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
A	Manhole					Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.

If you are unsure whether a problem exists, please contact a professional engineer.

Tanks and vaults are a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September).
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#4 – Maintenance Checklist for Control Structure/Flow Restrictor

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Trash and Debris (Includes Sediment)	Material exceeds 25 percent of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
A	General					Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
A	General					Structural Damage	Structure is not in upright position (allow up to 10 percent from plumb).	Structure in correct position.
A	General					Structural Damage	Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
A	General					Structural Damage	Any holes–other than designed holes–in the structure.	Structure has no holes other than designed holes.
A	Cleanout Gate					Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
A	Cleanout Gate					Damaged or Missing	Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
A	Cleanout Gate					Damaged or Missing	Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
A	Cleanout Gate					Damaged or Missing	Gate is rusted over 50 percent of its surface area.	Gate is repaired or replaced to meet design standards.
A	Orifice Plate					Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
M,S	Orifice Plate					Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
M,S	Overflow Pipe					Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
A	Manhole					Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Manhole					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than one-half inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
A	Manhole					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
A	Manhole					Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.

If you are unsure whether a problem exists, please contact a professional engineer.

Control structures are usually considered a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#5 – Maintenance Checklist for Catch Basins

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	General					"Dump no pollutants" Stencil or stamp not visible	Stencil or stamp should be visible and easily read	Warning signs (e.g., "Dump No Waste-Drains to Stream") shall be painted or embossed on or adjacent to all storm drain inlets.
M,S	General					Trash and Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10 percent.	No trash or debris located immediately in front of catch basin or on grate opening.
M	General					Trash and Debris	Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
M	General					Trash and Debris	Trash or debris in any inlet or outlet pipe blocking more than one-third of its height.	Inlet and outlet pipes free of trash or debris.
M	General					Trash and Debris	Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
M	General					Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
A	General					Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than one-fourth inch (intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
A	General					Structure Damage to Frame and/or Top Slab	Frame not sitting flush on top slab, i.e., separation of more than three-fourth inch of the frame from the top slab. Frame not securely attached.	Frame is sitting flush on the riser rings or top slab and firmly attached.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	General					Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
A	General					Fractures or Cracks in Basin Walls/ Bottom	Grout fillet has separated or cracked wider than one-half-inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
A	General					Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
M	General					Vegetation	Vegetation growing across and blocking more than 10 percent of the basin opening.	No vegetation blocking opening to basin.
M	General					Vegetation	Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.	No vegetation or root growth present.
M	General					Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No contaminants or pollutants present. (Coordinate removal/cleanup with Gig Harbor Public Works Department 253-851-6170 and/or DOE Spill Response 800-424-8802.)
A	Catch Basin Cover					Cover Not in Place	Cover is missing or only partially in place.	Any open catch basin requires maintenance. Catch basin cover is closed
A	Catch Basin Cover					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than one-half-inch of thread.	Mechanism opens with proper tools.
A	Catch Basin Cover					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
A	Ladder					Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
	Grates					Grate opening Unsafe	Grate with opening wider than seven-eighths of an inch.	Grate opening meets design standards.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M,S	Grates					Trash and Debris	Trash and debris that is blocking more than 20 percent of grate surface inletting capacity.	Grate free of trash and debris.
A	Grates					Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#6 – Maintenance Checklist for Debris Barriers (e.g., Trash Racks)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M, S	General					Trash and Debris	Trash or debris that is plugging more than 20 percent of the openings in the barrier.	Barrier cleared to design flow capacity.
A	General					Damaged/Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than three-fourth inch.
A	General					Damaged/Missing Bars.	Bars are missing or entire barrier missing.	Bars in place according to design.
A	General					Damaged/Missing Bars.	Bars are loose and rust is causing 50 percent deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
A	General					Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe.	Barrier firmly attached to pipe.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#7 – Maintenance Checklist for Energy Dissipaters

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
External:								
M	Rock Pad					Missing or Moved Rock	Only one layer of rock exists above native soil in area 5 square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
M	Rock Pad					Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
M	Dispersion Trench					Pipe Plugged with Sediment	Accumulated sediment that exceeds 20 percent of the design depth.	Pipe cleaned/flushed so that it matches design.
M	Dispersion Trench					Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a ”sheet flow” of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
M	Dispersion Trench					Perforations Plugged	Over one-half of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
M	Dispersion Trench					Water Flows Out Top of ”Distributor” Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
M	Dispersion Trench					Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:								
M	Manhole/ Chamber					Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to one-half of original size or any concentrated worn spot exceeding 1 square foot which would make structure unsound	Structure replaced to design standards.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Manhole/ Chamber					Trash and Debris	Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
M	Manhole/ Chamber					Trash and Debris	Trash or debris in any inlet or outlet pipe blocking more than one-third of its height.	Inlet and outlet pipes free of trash or debris.
M	Manhole/ Chamber					Trash and Debris	Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
M	Manhole/ Chamber					Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin.
A	Manhole/ Chamber					Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than one-fourth inch (intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
A	Manhole/ Chamber					Structure Damage to Frame and/or Top Slab	Frame not sitting flush on top slab, i.e., separation of more than three-fourth inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
A	Manhole/ Chamber					Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
A	Manhole/ Chamber					Fractures or Cracks in Basin Walls/ Bottom	Grout fillet has separated or cracked wider than one-half-inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
A	Manhole/ Chamber					Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Manhole/ Chamber					Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No contaminants or pollutants present. (Coordinate removal/cleanup with Gig Harbor Operations 253-851-6170 and/or DOE Spill Response 800-424-8802.)
A	Catch Basin Cover					Cover Not in Place	Cover is missing or only partially in place.	Any open catch basin requires maintenance. Catch basin cover is closed.
A	Catch Basin Cover					Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than one-half-inch of thread.	Mechanism opens with proper tools.
A	Catch Basin Cover					Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#8 – Maintenance Checklist for Typical Biofiltration Swale

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Sediment Accumulation on Grass	Sediment depth exceeds 2 Inches or inhibits vegetation growth in 10 percent or more of swale.	Remove sediment deposits on grass treatment area of the bioswale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
M	General					Standing Water	When water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.
M	General					Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.
M	General					Constant Baseflow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.
M	General					Poor Vegetation Coverage	When grass is sparse or bare or eroded patches occur in more than 10 percent of the swale bottom.	Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.
M	General					Vegetation	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
M	General					Excessive Shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.	Remove material so that there is no clogging or blockage in the inlet and outlet area.
M	General					Trash and Debris Accumulation	Trash and debris accumulated in the bioswale.	Remove leaves, litter, and oily materials, and re-seed or resod, and regrade, as needed. Clean curb cuts and level spreaders as needed.
M	General					Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#9 – Maintenance Checklist for Wet Biofiltration Swales

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Sediment Accumulation	Sediment depth exceeds 2 inches in 10 percent of the swale treatment area.	Remove sediment deposits in treatment area.
M	General					Water Depth	Water not retained to a depth of about 4 inches during the wet season.	Build up or repair outlet berm so that water is retained in the wet swale.
M	General					Wetland Vegetation	Vegetation becomes sparse and does not provide adequate filtration, OR vegetation is crowded out by very dense clumps of cattail, which do not allow water to flow through the clumps.	Determine cause of lack of vigor of vegetation and correct. Replant as needed. For excessive cattail growth, cut cattail shoots back and compost offsite. Note: normally wetland vegetation does not need to be harvested unless die-back is causing oxygen depletion in downstream waters.
M	General					Inlet/Outlet	Inlet/outlet area clogged with sediment and/or debris.	Remove clogging or blockage in the inlet and outlet areas.
M	General					Trash and Debris Accumulation	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one 32 gallon garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Remove trash and debris from wet swale.
M	General					Erosion/Scouring	Swale has eroded or scoured due to flow channelization, or higher flows.	Check design flows to assure swale is large enough to handle flows. By-pass excess flows or enlarge swale. Replant eroded areas with fibrous-rooted plants such as Juncus effusus (soft rush) in wet areas or snowberry (Symphoricarpos albus) in dryer areas.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#10 – Maintenance Checklist for Filter Strips

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.
M	General					Vegetation	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3-4 inches.
M	General					Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.	Remove trash and Debris from filter.
M	General					Erosion/Scouring	Eroded or scoured areas due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.
M	General					Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.	Level the spreader and clean so that flows are spread evenly over entire filter width

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#11 – Maintenance Checklist for Wet Ponds

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Water level	First cell is empty, doesn't hold water.	Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
M						Trash and Debris	Accumulation that exceeds 1 cubic foot per 1000 square feet of pond area.	Trash and debris removed from pond
M						Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material	No clogging or blockage in the inlet and outlet piping.
M						Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6 inches, usually in the first cell.	Sediment removed from pond bottom. (If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)
M						Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil- absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
A						Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom that exceeds 6 inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
A						Settlement of Pond Dike/Berm	Any part of these components that has settled 4 inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications
A						Internal Berm	Berm dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A						Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#11 – Maintenance Checklist for Treatment Wetlands

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	General					Trash and Debris	Any trash and debris accumulations which exceed 5 cubic feet per 1,000 square feet (this is a little more than the amount of trash it would take to fill up one standard 32 gallon garbage can). In general, there should be no visual evidence of dumping. If there is less than the threshold, remove all trash and debris as part of the next scheduled maintenance.	Trash and debris cleared from site.
B	General					Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined in the Pierce County Noxious Weeds List. (Apply requirements of adopted integrated vegetation management (IVM) policies for the use of herbicides.)	No danger of poisonous vegetation where maintenance personnel or the public might have contact. (Coordinate with Pierce County Noxious Weed Coordinator.) Complete eradication of noxious weeds may not be possible, however compliance with state or local eradication policies are required.
B	General					Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil- absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant emergent wetland plants such as Juncus effusus (soft rush) which can assist filtering small concentrations of oil.
B, S	General					Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material or damaged.	No clogging or blockage in the inlet and outlet piping.
B	General					Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm.	Rodents removed and dam or berm repaired. (Coordinate with Tacoma-Pierce County Health Department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	General					Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.	Facility is fully functioning. Evaluate using beaver deceiver and leveler devices. If beaver removal is necessary, contact WDFW Region 6 to coordinate with a Nuisance Wildlife Control Operator.
B	General					Tree Growth and Hazard Trees	Tree growth that impedes maintenance access.	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., firewood or construction).
B	General					Tree Growth and Hazard Trees	If dead, diseased, or dying trees are identified, use a certified Arborist to determine the health of tree and whether removal is required.	Remove hazard trees.
B	General					Liner	Liner is visible and has more than three one-fourth inch holes in it.	Liner is repaired or replaced. Liner is fully covered.
B	Forebay					Sediment Accumulation	Sediment accumulation in forebay exceeds the design depth of the sediment zone plus 6 inches.	Accumulated sediment is removed from forebay bottom to the design depth of the sediment zone.
B	Side Slopes of Wetland					Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized using appropriate erosion control measure(s) such as rock reinforcement, planting of grass, or additional compaction.
B, S	Side Slopes of Wetland					Erosion	Any erosion observed on a compacted berm embankment.	If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
B	Wetland Cell					Wetland Vegetation	20 percent or more of the constructed wetland area has dead or dying vegetation, as measured by stem counts relative to the design plant coverage.	Dead or dying vegetation is replaced by like species, unless recommended otherwise by the Wetlands Consultant and approved by the city. (Watering, physical support, mulching, and weed removal may be required on a regular basis especially during the first 3 years.)
B	Wetland Cell					Wetland Vegetation	Percent vegetated cover of constructed wetland bottom area, excluding exotic and invasive species, is less than 50 percent after 2 years.	Remove exotic/invasive species provide additional plantings may be required

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Wetland Cell					Wetland Vegetation	Decaying vegetation produces foul odors.	Decaying vegetation is removed, preferably in late summer.
C	Wetland Cell					Wetland Vegetation	Wetland vegetation is blocking flow paths causing flow back-up and flooding.	Areas of blocking vegetation are cut back sufficient to allow design flows and prevent flooding.
A	Wetland Cell					Wetland Vegetation	Water quality monitoring indicates that wetland vegetation is contributing phosphorus and metals to downstream waters rather than sequestering them.	To maximize removal of wetland pollutants, wetland vegetation must be periodically harvested, particularly with respect to phosphorus and metals removal. Harvesting should occur by mid-summer before plants begin to transfer phosphorus from the aboveground foliage to subsurface roots, or begin to lose metals that desorb during plant die off. Every 3 to 5 years the entire plant mass including roots should be harvested because the below ground biomass constitutes a significant reservoir (as much as half) of the nutrients and metals that are removed from stormwater by plants.
B	Wetland Cell					Sediment Accumulation	Sediment accumulation inhibits growth of wetland plants or reduces wetland volume (greater than 1 feet of sediment accumulation).	Dredge.
A	Wetland Berms (Dikes)					Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike restored to the design elevation.
A	Wetland Berms (Dikes)					Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repairs.	Piping eliminated. Erosion potential eliminated.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Wetland Berms Over 4 ft in height (Dikes)					Tree Growth	Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
A	Emergency Overflow/ Spillway					Obstruction	Tree growth or other blockage on emergency spillways may cause failure of the berm due to uncontrolled overtopping.	Obstruction should be removed. A licensed civil engineer should be consulted for proper berm/spillway restoration.
A	Emergency Overflow/ Spillway					Rock Missing	Only one layer of rock exists above native soil in an area 5 square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Riprap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
A	Emergency Overflow/ Spillway					Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(B) Biannually (once during growing season, once during non-growing season)
(C) Once in midsummer (late July or early August)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#12 – Maintenance Checklist for Wet Vaults

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Trash/Debris Accumulation	Trash and debris accumulated in vault, pipe or inlet/outlet (includes floatables and non-floatables).	Remove trash and debris from vault.
M	General					Sediment Accumulation in Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.	Remove sediment from vault. (If sediment contamination is a potential problem, sediment should be tested regularly to determine leaching potential prior to disposal.)
A	General					Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
A	General					Access Cover Damaged/Not Working	Cover cannot be opened or removed, especially by one person.	Pipe repaired or replaced to proper working specifications.
M	General					Ventilation	Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area. A specified percentage of the vault surface area must provide ventilation to the vault interior (see design specifications).
A	Vault Structure					Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Maintenance/inspection personnel determine that the vault is not structurally sound	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
A	Vault Structure					Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of the inlet/outlet pipe.
A	Vault Structure					Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection staff.	Baffles repaired or replaced to specifications.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Access Ladder					Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements.

If you are unsure whether a problem exists, please contact a professional engineer.

A vault is a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#13 – Maintenance Checklist for Sand Filters (aboveground/open)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Above ground (open sand filter)					Sediment Accumulation on top layer	Sediment depth exceeds one-half inch.	No sediment deposit on grass layer of sand filter that would impede permeability of the filter section.
M	Above ground (open sand filter)					Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.	Trash and debris removed from sand filter bed.
M	Above ground (open sand filter)					Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.	Sediment removed from clean-outs.
M	Above ground (open sand filter)					Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently.	Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material). Other options include removal of thatch, aerating the filter surface, tilling the filter surface, replacing the top 4 inches of filter media, and inspecting geotextiles for clogging.
M	Above ground (open sand filter)					Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities. (Consider 4-8 hour drawdown tests)	Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.
M	Above ground (open sand filter)					Short Circuiting	Drawdown greater than 12 inches per hour. When flows become concentrated over one section of the sand filter rather than dispersed. (Consider 4-8 hour drawdown tests)	Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Above ground (open sand filter)					Erosion Damage to Slopes	Erosion over 2 inches deep where cause of damage is prevalent or potential for continued erosion is evident.	Slopes stabilized using proper erosion control measures.
A	Above ground (open sand filter)					Rock Pad Missing or Out of Place	Soil beneath the rock is visible.	Rock pad replaced or rebuilt to design specifications.
M	Above ground (open sand filter)					Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter. Rills and gullies on the surface of the filter can indicate improper function of the inlet flow spreader.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
M	Above ground (open sand filter)					Damaged Pipes	Any part of the piping that is crushed or deformed more than 20 percent or any other failure to the piping.	Pipe repaired or replaced.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#14 – Maintenance Checklist for Sand Filters (below ground/enclosed)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Below Ground Vault					Sediment Accumulation on Sand Media Section	Sediment depth exceeds one-half inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
M	Below Ground Vault					Sediment Accumulation in Presettling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6 inches.	No sediment deposits in first chamber of vault.
M	Below Ground Vault					Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
M	Below Ground Vault					Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
M	Below Ground Vault					Clogged Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently. (Consider 4-8 hour drawdown tests.)	Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material). Other options include removal of thatch, aerating the filter surface, tilling the filter surface, and replacing the top 4 inches of filter media.
M	Below Ground Vault					Short Circuiting	Drawdown greater than 12 inches per hour. When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area. (Consider 4-8 hour drawdown tests.)	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
A	Below Ground Vault					Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
M	Below Ground Vault					Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Below Ground Vault					Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified percentage of the vault surface area must provide ventilation to the vault interior (see design specifications).
A	Below Ground Vault					Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
A	Below Ground Vault					Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
A	Below Ground Vault					Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of the inlet/outlet pipe.
A	Below Ground Vault					Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
A	Below Ground Vault					Access Ladder	Damaged Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

If you are unsure whether a problem exists, please contact a professional engineer.

A below ground enclosed sand filter is a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#15 – Maintenance Checklist for Stormfilter ™ Cast-In-Place, Precast, Linear Stormfilter Units and Catch Basin Units. Also check DOE website and manufacturer guidelines for updates to O&M requirements.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Media filter vault					Sediment accumulation on top of filter cartridges	Sediment accumulation exceeds 0.25 inches on top of cartridges.	No sediment deposits on top of cartridges. Sediment on cartridges likely indicates that cartridges are plugged and require maintenance.
M	Media filter vault					Sediment accumulation in vault	Sediment accumulation in vault exceeds 0.5 inches. Look for other indicators of clogged cartridges or overflow.	Sediment in vault should be removed. Cartridges should be checked and replaced or serviced as needed.
M	Media filter vault					Trash and floatable debris accumulation	Trash and floatable debris accumulation in vault	No trash or other floatable debris in filter vault.
S	Media filter vault					Filter cartridges submerged	Filter vault does not drain within 24 hours following storm. Look for evidence of submergence due to backwater or excessive hydrocarbon loading.	Filter media checked and replaced if needed. If cartridges are plugged with oil additional treatment or source control BMP may be needed.
M	Forebay					Sediment accumulation	Sediment accumulation exceeds 6 inches or one-third of the of available sump.	Sediment accumulation less than 6 inches.
M	Forebay					Trash and floatable debris accumulation	Trash and/or floatable debris accumulation.	Trash and/or floatable debris should be removed during monthly inspections. Significant oil accumulation may indicate the need for additional treatment or source control.
A	Drain Pipes/ Cleanouts					Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
A	Below ground vault					Access cover Damaged/ Not working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.	Cover repaired to proper working specifications or replaced.
A	Below ground vault					Damaged Pipes	Any part of the pipes are crushed or damaged due to corrosion and/or settlement.	Pipe repaired or replaced.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Below ground vault					Vault structure has cracks in wall, bottom, and damage to frame and/or top slab.	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault repaired or replaced so that vaults meets design specifications and is structurally sound.
A	Below ground vault					Vault structure has cracks in wall, bottom, and damage to frame and/or top slab.	Cracks wider than 0.5 inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks	Vault repaired so that no cracks exist wider than 0.25 inch at the joint of inlet/outlet pipe.
A	Below ground vault					Baffles	Baffles corroding, cracking , warping, and/or showing signs of failure as determined by maintenance/inspection person	Baffles repaired or replaced to design specifications.
A	Below ground vault					Ladder rungs unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.	Ladder meets design standards and allows maintenance persons safe access.
S	Below Ground Cartridge Type					Compost Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
S	Below Ground Cartridge Type					Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

If you are unsure whether a problem exists, please contact a professional engineer.

A vault is a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#16 – Maintenance Checklist for Baffle Oil/Water Separators (American Petroleum Institute [API] Type)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M,S	Monitoring					Inspection of discharge water for obvious signs of poor water quality.	Sheen, obvious oil present	Effluent discharge from vault should be clear without thick visible sheen.
M,S	Monitoring					Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth.	No sediment deposits on vault bottom that would impede flow through the vault and reduce separation efficiency.
M,S	Monitoring					Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
M,S	Monitoring					Oil Accumulation	Oil accumulations that exceed 1 inch, at the surface of the water or 6 inches of sludge in the sump.	Extract oil/sludge from vault by vactoring. Disposal in accordance with state and local rules and regulations.
A	Structure					Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired or replaced.
A	Structure					Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
A	Structure					Vault Structure Damage Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Maintenance person judges that structure is unsound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
A	Structure					Vault Structure Damage Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of the inlet/outlet pipe.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Structure					Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
A	Structure					Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

If you are unsure whether a problem exists, please contact a professional engineer.

An oil/water separator vault is a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#17 – Maintenance Checklist for Coalescing Plate Oil/Water Separators

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M,S	General					Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no thick visible sheen.
M,S	General					Sediment Accumulation	Sediment depth in bottom of vault exceeds 6 inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
M,S	General					Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
M,S	General					Oil Accumulation	Oil accumulation that exceeds 1 inch at the water surface.	Oil is extracted from vault using vactoring methods. Dispose of in accordance with state and local rules and regulations. Coalescing plates are cleaned by thoroughly rinsing and flushing. Direct wash-down effluent to the sanitary sewer system where permitted. Should be no visible oil depth on water.
A	Structure					Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
A	Structure					Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
A	Structure					Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
A	Structure					Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Structure					Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of the inlet/outlet pipe.
A	Structure					Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

If you are unsure whether a problem exists, please contact a professional engineer.

An oil/water separator vault is a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#19 – Maintenance Checklist for Fencing/Shrubbery Screen/Other Landscaping

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Missing or broken parts/dead shrubbery	Any defect in the fence or screen that permits easy entry to a facility.	Fence is mended or shrubs replaced to form a solid barrier to entry.
M,S	General					Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.	Replace soil under fence so that no opening exceeds 4 inches in height.
M	General					Unruly Vegetation	Shrubbery is growing out of control or is infested with weeds. See also Pierce County Noxious weeds list at: piercecountyweedboard.wsu.edu/weedlist.html	Shrubbery is trimmed and weeded to provide appealing aesthetics. Do not use chemicals to control weeds.
A	Fences					Damaged Parts	Posts out of plumb more than 6 inches.	Posts plumb to within 1.5 inches of plumb.
A	Fences					Damaged Parts	Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
A	Fences					Damaged Parts	Any part of fence (including posts, top rails, and fabric) more than 1 foot out of design alignment.	Fence is aligned and meets design standards.
A	Fences					Damaged Parts	Missing or loose tension wire.	Tension wire in place and holding fabric.
A	Fences					Damaged Parts	Missing or loose barbed wire that is sagging more than 2.5 inches between posts.	Barbed wire in place with less than three-fourth inch sag between posts.
A	Fences					Damaged Parts	Extension arm missing, broken, or bent out of shape more than 1.5 inches.	Extension arm in place with no bends larger than three-fourth inch.
A	Fences					Deteriorated Paint or Protective Coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
M	Fences					Openings in Fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	No openings in fabric.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#20 – Maintenance Checklist for Gates

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Damaged or Missing Components	Gate is broken, jammed, or missing.	Pond has a functioning gate to allow entry of people and maintenance equipment such as mowers and backhoe. If a lock is used, make sure the city field staff have a key.
M	General					Damaged or Missing Components	Broken or missing hinges such that gate cannot be easily opened and closed by one maintenance person.	Hinges intact and lubed. Gate is working freely.
A	General					Damaged or Missing Components	Gate is out of plumb more than 6 inches and more than 1 foot out of design alignment.	Gate is aligned and vertical.
A	General					Damaged or Missing Components	Missing stretcher bands, and ties.	Stretcher bar, bands, and ties in place.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#21 – Maintenance Checklist for Grounds (Landscaping)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	General					Weeds (nonpoisonous)	Weeds growing in more than 20 percent of the landscaped area (trees and shrubs only). See also Pierce County Noxious weeds list at: piercecountyweedboard.wsu.edu/weedlist.html	Weeds present in less than 5 percent of the landscaped area.
M	General					Insect Hazard	Any presence of poison ivy or other poisonous vegetation or insect nests.	No poisonous vegetation or insect nests present in landscaped area.
M,S	General					Trash or Litter	See Ponds Checklist.	See Ponds Checklist.
M,S	General					Erosion of Ground Surface	Noticeable rills are seen in landscaped areas.	Causes of erosion are identified and steps taken to slow down/spread out the water. Eroded areas are filled, contoured, and seeded.
A	Trees and shrubs					Damage	Limbs or parts of trees or shrubs that are split or broken which affect more than 25 percent of the total foliage of the tree or shrub.	Trim trees/shrubs to restore shape. Replace trees/shrubs with severe damage.
M	Trees and shrubs					Damage	Trees or shrubs that have been blown down or knocked over.	Replant tree, inspecting for injury to stem or roots. Replace if severely damaged.
A	Trees and shrubs					Damage	Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Place stakes and rubber-coated ties around young trees/shrubs for support.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#22 – Maintenance Checklist for Ecology Embankment

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	No Vegetation Zone adjacent to pavement					Erosion, Scour, or Vehicular Damage	No vegetation zone uneven or clogged so that flows are not uniformly distributed.	Level the area and clean so that flows are spread evenly.
M	No Vegetation Zone adjacent to pavement					Sediment Accumulation on Edge of Pavement	Flows no longer sheeting off of roadway. Sediment accumulation on pavement edge exceeds top of pavement elevation.	Remove sediment deposits such that flows can sheet off of roadway.
M	Vegetated Filter					Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even and flows pass evenly through Ecology Embankment.
M	Vegetated Filter					Excessive Vegetation or Undesirable Species	When the grass becomes excessively tall; when nuisance weeds and other vegetation starts to take over or shades out desirable vegetation growth characteristics. See also Pierce County Noxious weeds list at: piercecountyweedboard.wsu.edu/weedlist.html	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height that encourages dense even herbaceous growth.
M	Vegetated Filter					Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with suitable topsoil. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident.
M	Media Bed					Erosion, Scour, or Vehicular Damage	Eroded or scoured areas due to flow channelization, high flows or vehicular damage.	For ruts or areas less than 12 inches wide, repair the damaged area by filling with suitable media. If bare areas are large, generally greater than 12 inches wide, the media bed should be re-graded.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Media Bed					Sediment Accumulation on Media Bed	Sediment depth inhibits free infiltration of water.	Remove sediment deposits, re-level so slope is even and flows pass freely through Media Bed.
M	Underdrains					Sediment	Depth of sediment within perforated pipe exceeds one-half inch.	Flush underdrains through access ports and collect flushed sediment.
M	General					Trash and Debris Accumulation	Trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one 32 gallon garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Remove trash and debris.
M	General					Flows are Bypassing Ecology Embankment	Evidence of significant flows downslope (rills, sediment, vegetation damage, etc.) of Ecology Embankment.	Remove sediment deposits, re-level so slope is even and flows pass evenly through Ecology Embankment. If Ecology Embankment is completely clogged it may require a more extensive repair or replacement.

If you are unsure whether a problem exists, please contact a professional engineer.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September)
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#23 – Maintenance Checklist for Vortechs Stormwater Treatment System. Also check DOE website and manufacturer guidelines for updates to O&M requirements.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M,S	General					Sediment accumulation	Sediment depth is within 6 inches of dry weather water surface elevation.	Accumulated sediment should be removed.
M,S	General					Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
M,S	General					Oil Accumulation	Oil accumulation that exceeds 1 inch at the water surface.	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
A	Structure					Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
A	Structure					Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
A	Structure					Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
A	Structure					Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of the inlet/outlet pipe.

If you are unsure whether a problem exists, please contact a professional engineer.

A vault is a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Key:

A=Annual (March or April preferred)
M=Monthly (see schedule)
S=After major storms (use 1 inch in 24 hours as a guideline)

ATTACHMENT A (CONTINUED)

#24 – Maintenance Checklist for Stormceptor System. Also check DOE website and manufacturer guidelines for updates to O&M requirements.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Settling chamber					Excessive sediment Accumulation	Capacities vary depending on model number. See Table Below.	Sediments should be removed.
M	Settling chamber					Trash and Floatable Debris Accumulation	Excessive trash and floatable debris accumulation.	Minimal trash or other floatable debris.
M	Settling chamber					Excessive Oil Accumulation	Oil exceeds 6 inches in depth or evidence of a spill	Oil should be cleaned out.
M	Manhole Cover					Cover Damaged/ Not Working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.	Cover repaired to proper working specifications or replaced.
M	Disk Insert					Disk Insert Inlet/ Outlet Obstructed	Inlet or outlet piping obstructed	Disk insert inlet/outlet free from obstructions.
A	Structure					Structure has Cracks in wall, Bottom, and Damage to Frame and/or Top Slab.	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault repaired or replaced so that vaults meets design specifications and is structurally sound.
A	Structure					Structure has Cracks at the Joint of any Inlet/ Outlet Pipe.	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of inlet/outlet pipe.

If you are unsure whether a problem exists, please contact a professional engineer or the manufacturer's representative.

Comments:

Sediment Depths Indicating Required Servicing	
Model	Sediment Depth
STC 450i	8"
STC 900	8"
STC 1200	10"
STC 1800	15"
STC 2400	12"
STC 3600	17"
STC 4800	15"
STC 6000	18"
STC 7200	15"
STC 11000	15"
STC 13000	18"
STC 16000	15"

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September).
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#26 – Maintenance Checklist for Filterra. Also check DOE website and manufacturer guidelines for updates to O&M requirements.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Inlet					Excessive Sediment or Trash Accumulation	Accumulated sediments or trash impair free flow of water into Filterra	Inlet should be free of obstructions allowing free distributed flow of water into Filterra. Sediments and/or trash should be removed.
M	Mulch Cover					Trash and Floatable Debris Accumulation	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover. Trash and debris should be removed and mulch cover raked level.
M	Mulch Cover					Ponding of Water on Mulch Cover.	Ponding in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover. Recommend contact manufacturer and replace mulch or soil if necessary.
M	Vegetation					Plants not Growing or in Poor Condition.	Soil/ mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free. Contact manufacturer for advice.
M	Vegetation					Plant Growth Excessive	Plants should be appropriate to the species and location of Filterra.	Trim/prune plants in accordance with manufacturers recommendations.
A	Structure					Structure has Cracks in Wall, Bottom, and Damage to Frame and/or Top Slab.	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault repaired or replaced so that vaults meets design specifications and is structurally sound.
A	Structure					Structure has Cracks at the Joint of any Inlet/ Outlet Pipe.	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of inlet/outlet pipe.

If you are unsure whether a problem exists, please contact a professional engineer or the manufacturer's representative.

Comments:

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September).
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#27 – Maintenance Checklist for CDS Media Filtration System (MFS) ® Also check DOE website and manufacturer guidelines for updates to O&M requirements.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Media filter vault					Sediment Accumulation on Top of Filter Cartridges	Sediment accumulation exceeds one-half inch on top of cartridges.	Minimal sediment deposits on top of cartridges. Excess sediment on cartridges likely indicates that cartridges are plugged and require maintenance.
M	Media filter vault					Sediment Accumulation in Vault	Sediment accumulation in vault exceeds 6 inches.	Sediment in vault should be removed.
M	Media filter vault					Trash and Floatable Debris Accumulation	Excessive trash and floatable debris accumulation in vault.	Minimal trash or other floatable debris in filter vault.
M	Media filter cartridges					Filter Cartridges Full	Filter cartridge media appears dark. Check should be performed on a dry day. Requires entry to vault. See comments below.	Filter media checked and replaced if needed. If cartridges are plugged with oil additional treatment or source control BMP may be needed.
M	Media filter cartridges					Filter Cartridges Full	Area around cartridges has standing water and cartridges are submerged 24 hours after a storm.	Filter media checked and replaced if needed. If cartridges are plugged with oil additional treatment or source control BMP may be needed.
M	Media filter cartridges					Filter Cartridges Full	Water flowing over the head control box during light storm events and more than 1 inch of floatables has accumulated in the cartridge vent pipe.	Filter media checked and replaced if needed. If cartridges are plugged with oil additional treatment or source control BMP may be needed.
M	Access Cover					Access Cover Damaged/ Not Working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.	Cover repaired to proper working specifications or replaced.
A	Collector manifold					Damaged Piping	Any part of the pipes are crushed or damaged due to corrosion and/or settlement.	Pipe repaired or replaced.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Vault					Vault Structure has Cracks in Wall, Bottom, and Damage to Frame and/or Top Slab.	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault repaired or replaced so that vaults meets design specifications and is structurally sound.
A	Vault					Structure has Cracks at the Joint of any Inlet/ Outlet Pipe.	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks	Vault repaired so that no cracks exist at the joint of inlet/outlet pipe.
A	Baffles					Baffles	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to design specifications.
A	Access Ladder					Ladder Rungs Unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.	Ladder meets design standards and allows maintenance persons safe access.

If you are unsure whether a problem exists, please contact a professional engineer.

Comments:

CDS MFS system vault is a confined space. Visual inspections should be performed aboveground. If entry is required it should be performed by qualified personnel.

Default maintenance is annual.

Configuration options include precast or cast in place concrete vaults or precast manhole structures.

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September).
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#28 – Maintenance Checklist for Aqua Shield Aqua-Swirl. Also check DOE website and manufacturer guidelines for updates to O&M requirements.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
M	Sediment Storage area					Excessive Sediment Accumulation	Sediment accumulation within 36 inches of water surface	Sediments should be removed.
M	Aqua Swirl Chamber					Trash and Floatable Debris Accumulation	Excessive trash and floatable debris accumulation swirl chamber.	Minimal trash or other floatable debris.
M	Manhole Cover					Cover Damaged/ Not Working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.	Cover repaired to proper working specifications or replaced.
A	Structure					Vault Structure has Cracks in Wall, Bottom, and Damage to Frame and/or Top Slab.	Cracks wider than one-half inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault repaired or replaced so that vaults meets design specifications and is structurally sound.
A	Structure					Vault Structure has Cracks at the Joint of any Inlet/ Outlet Pipe.	Cracks wider than one-half inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks	Vault repaired so that no cracks exist wider than one-fourth inch at the joint of inlet/outlet pipe.
A	Baffles					Baffles	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to design specifications.

If you are unsure whether a problem exists, please contact a professional engineer or the manufacturer's representative.

Comments:

Key:

(M) Monthly from October through April.
(A) Once in late summer (preferably September).
(S) After any major storm (use 1 inch in 24 hours as a guideline).

ATTACHMENT A (CONTINUED)

#29 – Bioretention (Swales and Planters)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Ponding Area					Cracks or Failure in concrete planter reservoir	Cracks wider than ½ inch or maintenance/inspection personnel determine that the vault is not structurally sound	Vault repaired or replaced so that vaults meets design specifications and is structurally sound.
B	Ponding Area					Failure in earthen reservoir (embankments, dikes, berms, and side slopes)	Erosion (gullies/rills) greater than 2 inches around inlets, outlet, and along side slopes.	Eliminate source of erosion and stabilize damaged area (regrade, rock, vegetation, erosion control blanket)
B	Ponding Area					Failure in earthen reservoir embankments, dikes, berms, and side slopes)	Settlement greater than 4 inches (relative to undisturbed sections of berm)	Restore to design height
A	Ponding Area					Failure in earthen reservoir (embankments, dikes, berms, and side slopes)	Downstream face of berm or embankment wet, seeps or leaks evident	Plug holes. Contact geotechnical engineer ASAP.
A	Ponding Area					Failure in earthen reservoir (embankments, dikes, berms, and side slopes)	Any evidence of rodent holes or water piping around holes if facility acts as dam or berm	Eradicate rodents/repair holes (fill and compact)
Q	Ponding Area					Sediment or debris accumulation	Accumulation of sediment or debris	Remove excess sediment or debris. Identify and control the sediment source, if feasible. Facility should be free of material. May contain standing water.
A	Ponding Area					Rockery reservoir or walls	Rock walls are insecure.	Stabilize walls
B	Ponding Area					Basin inlet via surface flow	Soil is exposed or signs of erosion are visible.	Repair and control erosion sources

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Ponding Area					Basin inlet via concentrated flow (e.g., curb cuts)	Sediment, vegetation, or debris partially or fully blocking inlet structure.	Clear the blockage. Identify the source of the blockage and take actions to prevent future blockages.
B	Ponding Area					Basin inlet splash block failure	Water splashes adjacent buildings.	Reconfigure/repair blocks
B	Ponding Area					Basin inlet splash block failure	Water disrupts soil media.	Reconfigure/repair blocks
B	Ponding Area					Inlet/outlet pipe failure	Pipe is damaged.	Repair/replace
B	Ponding Area					Inlet/outlet pipe failure	Pipe is clogged.	Remove roots or debris
B	Ponding Area					Outlet pipe/structure failure	Sediment, vegetation, or debris partially or fully blocking inlet structure	Clear the blockage. Identify the source of the blockage and take actions to prevent future blockages.
B	Ponding Area					Trash rack failure	Trash or debris present on trash rack.	Clean and dispose trash
B	Ponding Area					Trash rack failure	Bar screen damaged or missing.	Replace
B	Ponding Area					Check dams and Weirs failures	Sediment, vegetation, or debris partially or fully blocking check dam or weir.	Clear the blockage. Identify the source of the blockage and take actions to prevent future blockages.
B	Ponding Area					Check dams and Weirs failures	Erosion and/or undercutting is present	Repair and take preventative measures to prevent future erosion and/or undercutting
B	Ponding Area					Flow Spreader problems	Sediment blocks 35% or more of ports/notches or, sediment fills 35% or more of sediment trap.	Remove and dispose
B	Ponding Area					Flow Spreader problems	Grade board/baffle damaged or not level.	Remove and reinstall to level position
B	Ponding Area					Overflow/ emergency spillway	Overflow spillway is partially or fully plugged with sediment or debris.	Remove/dispose
B	Ponding Area					Overflow/ emergency spillway	Native soil is exposed or other signs of erosion damage are present.	Repair erosion and stabilize surface of spillway

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Ponding Area					Overflow/emergency spillway	Spillway armament is missing.	Replace armament
B	Ponding Area					Bioretention soil	Water remains in the basin 48 hours or longer after the end of a storm.	Ensure that under drain (if present) is not clogged. If necessary, clear under drain. If this is not the problem, the bioretention soil is likely clogged. Remove upper 2 to 3 inches of soil and replace with imported bioretention soil. Identify sources of clogging and correct.
B	Vegetation					Bottom swale vegetation	Less than 80% of swale bottom is covered with healthy wetland vegetation.	Plant additional vegetation. Ideally, planting should be performed in the fall or winter.
B	Vegetation					Upland slope vegetation	Less than 70% of upland slopes are covered with healthy vegetation.	Plant additional vegetation. Ideally, planting should be performed in the fall or winter.
A	Vegetation					Trees and shrubs	Large trees and shrubs interfere with operation of the basin or access for maintenance.	Prune or remove large trees and shrubs
A	Vegetation					Trees and shrubs	Standing dead vegetation is present.	Remove standing dead vegetation when covering greater than 10% of basin area. Replace dead vegetation annually or immediately if necessary to control erosion (e.g., on a steep slope).
A	Vegetation					Mulch	Bare spots (without much cover) are present or mulch covers less than 3 inches deep for compost or 4 inches deep for course woody mulch.	Replenish mulch to cover bare spots and augment to minimum depth.
As needed	Vegetation					Clippings	Grass or other vegetation clippings accumulate to 2 inches or greater in depth.	Remove clippings
M	Vegetation					Noxious weeds	Listed noxious vegetation is present. See Pierce County noxious weed list.	By law, noxious weeds must be removed and disposed immediately. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.
Q	Vegetation					Weeds	Weeds are present (unless on edge and providing erosion control)	Remove and dispose of weed material. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
Based on manufacturer's instructions	Irrigation					Irrigation system (if any)	Irrigation system present.	Follow manufacturer's instructions for O&M
Weekly (May – September)	Irrigation					Plant watering	Plant establishment period (1-3 years).	Water weekly during periods of no rain to ensure plant establishment
As Needed	Irrigation					Plant watering	Longer term period (3+ years).	Water during drought conditions or more often if necessary to maintain plant cover
Ongoing	Spill Prevention and Response					Spill prevention	Storage or use of potential contaminants in the vicinity of facility.	Exercise spill prevention measures whenever handling or storing potential contaminants
As needed	Spill Prevention and Response					Spill response	Release of pollutants. Call to report any spill to the Washington Dept of Emergency Management 1-800-258-5990	Cleanup spills as soon as possible to prevent contamination of stormwater
At startup	Training and Documentation					Training / written guidance	Training / written guidance is required for proper O&M.	Provide property owners and tenants with proper training and a copy of the O&M manual and Landscape and Maintenance Manual.
A	Safety					Safety (slopes)	Erosion of sides causes slope to exceed 1:4 or otherwise becomes a hazard.	Take actions to eliminate the hazard
A	Safety					Safety (hydraulic structures)	Hydraulic structures (pipes, culverts, vaults, etc.) become a hazard to children playing in and around the facility.	Take actions to eliminate the hazard (such as covering and securing any openings)
A	Safety					Line of sight	Vegetation causes some visibility (line of sight) or driver safety issues.	Prune
A	Aesthetics					Aesthetics	Damage/vandalism/debris accumulation.	Restore facility to original aesthetic conditions
A	Aesthetics					Grass/vegetation	Less than 75% of planted vegetation is healthy with a generally good appearance.	Take appropriate maintenance actions. (e.g., remove/replace plants, amend soil, etc.)

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Aesthetics					Edging	Grass is starting to encroach on swale.	Repair edging
B	Pest Control					Mosquitoes	Standing water remains in the basin for more than three days following storms.	Identify the cause of the standing water and take appropriate actions to address the problem (see Bioretention Soil above)
A	Pest Control					Rodents	Rodent holes are present near the facility.	Fill and compact soil around the holes (refer to integrated pest management?)

If you are unsure whether a problem exists, please contact a professional engineer.

Comments:

Key:

(M) Monthly from November through April.
(A) Annually, once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).
(B) Biannually (spring and fall)
(Q) Quarterly

ATTACHMENT A (CONTINUED)

#30 – Cistern

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Collection Facilities					Roof	Debris has accumulated.	Remove debris
B	Collection Facilities					Gutter	Debris has accumulated.	Clean gutters (the most critical cleaning is in mid- to late-spring to flush the pollen deposits from surrounding trees)
A	Collection Facilities					Screens at the top of downspout and cistern inlet	Screen has deteriorated.	Replace
M	Collection Facilities					Screens at the top of downspout and cistern inlet	None. Preventative maintenance..	Clear screen of any accumulated debris
M	Collection Facilities					Low flow orifice	None. Preventative maintenance.	Clean low flow orifice
B	Collection Facilities					Overflow pipe	Pipe is damaged.	Repair/replace
B	Collection Facilities					Overflow pipe	Pipe is clogged.	Remove debris
A	Collection Facilities					Cistern	Debris has accumulated at bottom of tank	Remove debris
At startup	Training and Documentation					Training / written guidance	Training / written guidance is required for proper O&M.	Provide property owners and tenants with proper training and a copy of the O&M manual.
Ongoing	Safety					Access and Safety	Access to cistern required for maintenance or cleaning.	Any cistern detention systems opening that could allow the entry of people must be marked: “DANGER—CONFINED SPACE"

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Pest Control					Mosquitoes	Standing water remains for more than three days following storms.	Ensure cause of standing water is corrected. Also ensure all inlets, overflows, and other openings are protected with mosquito screens.

If you are unsure whether a problem exists, please contact a professional engineer.

Comments:

Key:

(M) Monthly from November through April.
(A) Annually, once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).
(B) Biannually (spring and fall)
(Q) Quarterly

ATTACHMENT A (CONTINUED)

#31 – Compost Amended Soil

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	General Facility Requirements					Soil media (maintain high organic soil content	Vegetation not fully covering ground surface.	Re-mulch landscape beds with 2-3 inches of mulch until the vegetation fully closes over the ground surface
Ongoing	General Facility Requirements					Soil media (maintain high organic soil content	None. Preventative maintenance	Return leaf fall and shredded woody materials from the landscape to the site as mulch.
Ongoing	General Facility Requirements					Soil media (maintain high organic soil content	None. Preventative maintenance	On turf areas, “grasscycle” (mulch-mow or leave the clippings) to build turf health
Ongoing	General Facility Requirements					Soil media (maintain high organic soil content	None. Preventative maintenance	Avoiding broadcast use of pesticides (bug and weed killers) like “weed & feed,” which damage the soil life.
A	General Facility Requirements					Soil media (maintain high organic soil content	None. Preventative maintenance	Where fertilization is needed (mainly turf and annual flower beds), a moderate fertilization program which relies on natural organic fertilizers (like compost) or slow release synthetic balanced fertilizers.
A	General Facility Requirements					Compaction	Soils become waterlogged, do not appear to be infiltrating.	To remediate, aerate soil, till or further amend soil. If drainage is still slow, consider investigating alternative causes (e.g., high wet-season groundwater levels, low permeability soils). Also consider land use and protection from compacting activities. If areas are turf, aerate compacted areas and top dress them with ¼-½ inch of compost to renovate them.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	General Facility Requirements					Erosion/scouring	Areas of potential erosion are visible.	Take steps to repair or prevent erosion. Identify and address the causes of erosion.
A	General Facility Requirements					Grass/vegetation	Less than 75% of planted vegetation is healthy with a generally good appearance.	Take appropriate maintenance actions (e.g., remove/replace plants)
M	General Facility Requirements					Noxious weeds	Listed noxious vegetation is present. See Pierce County noxious weed list.	By law, noxious weeds must be removed and disposed immediately. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.
Q	General Facility Requirements					Weeds	Weeds are present.	Remove and dispose of weed material. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.

If you are unsure whether a problem exists, please contact a professional engineer.

Comments:

Key:

(M) Monthly from November through April.
(A) Annually, once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).
(B) Biannually (spring and fall)
(Q) Quarterly

ATTACHMENT A (CONTINUED)

#32 – Vegetated Roof

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Soil / Growth Medium					Growth medium	Water does not permeate growth media (runs off soil surface).	Aerate or replace media
B	Soil / Growth Medium					Fallen leaves/debris	Fallen leaves or debris are present.	Remove/dispose
A	Soil / Growth Medium					Erosion/scouring	Areas of potential erosion are visible	Take steps to repair or prevent erosion. Stabilize with additional soil substrate/growth medium and additional plants.
A	System Structural Components					General	Structural components are present.	Inspect structural components for deterioration or failure. Repair/replace as necessary.
B	System Structural Components					Inlet pipe	Sediment, vegetation, or debris blocks 35% or more of inlet structure	Clear blockage. Identify and correct any problems that led to blockage.
A	System Structural Components					Inlet pipe	Inlet pipe is in poor conditions	Repair/replace
A	System Structural Components					Inlet pipe	Pipe is clogged.	Remove roots or debris.
B	Vegetation					Coverage	Vegetative coverage falls below 75% (unless design specifications stipulate less than 75% coverage).	Install more vegetation
M	Vegetation					Noxious weeds	Listed noxious vegetation is present. See Pierce County noxious weed list.	By law, noxious weeds must be removed and disposed immediately. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
Q	Vegetation					Weeds	Weeds are present	Remove and dispose of weed material. It is strongly encouraged that herbicides and pesticides not be used in order to protect water quality.
A	Vegetation					Plants	Dead vegetation is present.	Remove dead vegetation when covering greater than 10% of basin area. Replace dead vegetation annually or immediately if necessary to control erosion.
Based on manufacturers instructions	Irrigation					Irrigation system (if any)	Irrigation system present.	Follow manufacturer's instructions for O&M
Weekly (May – September)	Irrigation					Plant watering	Plant establishment period (1-3 years).	Water weekly during periods of no rain to ensure plant establishment
As Needed	Irrigation					Plant watering	Longer term period (3+ years).	Water during drought conditions or more often if necessary to maintain plant cover
Ongoing	Spill Prevention and Response					Spill prevention	Storage or use of potential contaminants in the vicinity of facility.	Exercise spill prevention measures whenever handling or storing potential contaminants
As needed	Spill Prevention and Response					Spill response	Release of pollutants. Call to report any spill to the Washington Dept of Emergency Management 1-800-258-5990	Cleanup spills as soon as possible to prevent contamination of stormwater
At startup	Training and Documentation					Training / written guidance	Training / written guidance is required for proper O&M.	Provide property owners and tenants with proper training and a copy of the O&M manual and Landscape and Maintenance Manual.
A	Safety					Access and Safety	Egress and Ingress routes	Maintain egress and ingress routes to design standards and fire codes
A	Aesthetics					Aesthetics	Damage/vandalism/debris accumulation.	Restore facility to original aesthetic conditions

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
A	Aesthetics					Grass/vegetation	Less than 75% of planted vegetation is healthy with a generally good appearance.	Take appropriate maintenance actions. (e.g., remove/replace plants, amend soil, etc.)
B	Pest Control					Mosquitoes	Standing water remains for more than three days following storms.	Remove standing water. Identify the cause of the standing water and take appropriate actions to address the problem (improve drainage).

If you are unsure whether a problem exists, please contact a professional engineer.

Comments:

Key:

(M) Monthly from November through April.
(A) Annually, once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).
(B) Biannually (spring and fall)
(Q) Quarterly

ATTACHMENT A (CONTINUED)

#33 – Pervious Pavement

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Surface					Pervious asphalt or cement concrete	None. Maintenance to prevent clogging with fine sediment.	Use conventional street sweepers equipped with vacuums, water, and brushes or pressure washer to restore permeability. Vacuum or pressure wash the pavement two to three times annually.
Ongoing	Surface					Pervious asphalt or cement concrete	None. Maintenance to prevent clogging with fine sediment.	Prohibit use of sand and sealant application and protect from construction runoff.
A	Surface					Pervious asphalt or cement concrete	Major cracks or trip hazards.	Fill with patching mixes. Large cracks and settlement may require cutting and replacing the pavement section.
As needed	Surface					Pervious asphalt or cement concrete	Utility cuts.	Any damage or change due to utility cuts must be replaced in kind.
B	Surface					Fallen leaves / debris	Fallen leaves or debris.	Remove/dispose.
B	Surface					Interlocking concrete paver blocks	Interlocking paving block missing or damaged.	Replace damaged paver block.
A	Surface					Interlocking concrete paver blocks	Settlement of surface.	May require resetting
B	Surface					Interlocking concrete paver blocks	Sediment or debris accumulation between paver blocks.	Remove/dispose
A	Surface					Interlocking concrete paver blocks	Loss of void material between paver blocks.	Refill per manufacturer's recommendations.
Varies	Surface					Interlocking concrete paver blocks	Varied conditions.	Perform O&M per manufacturer's recommendations.

		Date						
Frequency	**Drainage System Feature**	✓	✓	✓	✓	**Problem**	**Conditions to Check For**	**Maintenance Activities and Conditions That Should Exist**
B	Surface					Open-celled paving grid with gravel	Sediment or debris accumulation in grid voids.	Remove/dispose
A	Surface					Open-celled paving grid with gravel	Loss of soil and/or grass material in grid.	Refill and/or replant per manufacturer's recommendations.
Varies	Surface					Open-celled paving grid with gravel	Varied conditions.	Perform O&M per manufacturer's recommendations.
B	Surface					Open-celled paving grid with grass	Sediment or debris accumulation in grid voids.	Remove/dispose
A	Surface					Open-celled paving grid with grass	Loss of soil and/or grass material in grid.	Refill and/or replant per manufacturer's recommendations.
Varies	Surface					Open-celled paving grid with grass	Varied conditions.	Perform O&M per manufacturer's recommendations.
Ongoing	Spill Prevention and Response					Spill prevention	Storage or use of potential contaminants in the vicinity of facility.	Exercise spill prevention measures whenever handling or storing potential contaminants
As needed	Spill Prevention and Response					Spill response	Release of pollutants. Call to report any spill to the Washington Dept of Emergency Management 1-800-258-5990	Cleanup spills as soon as possible to prevent contamination of stormwater.

If you are unsure whether a problem exists, please contact a professional engineer.

Comments:

Key:

(M) Monthly from November through April.
(A) Annually, once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).
(B) Biannually (spring and fall)
(Q) Quarterly

Appendix I-C –
Wetlands and Stormwater Management Guidelines

Appendix I-C – Wetlands and Stormwater Management Guidelines

As Amended from Chapter 14 of "Wetlands and Urbanization, Implications for the Future," by Richard R. Horner, Amanda A. Azous, Klaus O. Richter, Sarah S. Cooke, Lorin E. Reinelt and Kern Ewing.

Guide Sheet 1B: Stormwater Wetland Assessment Criteria

This guide sheet gives criteria that disqualify a natural wetland from being structurally or hydrologically engineered for control of stormwater quantity, quality, or both. These criteria should be applied only after performing the alternatives analysis outlined in Guide Sheet 1A.

1. A wetland <u>should not</u> be structurally or hydrologically engineered for runoff quantity or quality control and should be given maximum protection from overall urban impacts (see Guide Sheet 2, Wetland Protection Guidelines) under any of the following circumstances:

    - In its present state it is primarily an **estuarine** or **forested wetland** or a **priority peat system**

    - It is a rare or irreplaceable wetland type, as identified by the Washington Natural Heritage Program, the Puget Sound Water Quality Preservation Program, or local government

    - It provides **rare, threatened, or endangered species** habitat that could be impaired by the proposed action. Determining whether or not the conserved species will be affected by the proposed project requires a careful analysis of its requirements in relation to the anticipated habitat changes.

    - It provides a high level of many functions.

2. 50 A wetland <u>can be considered</u> for structural or hydrological modification for runoff quantity or quality control if most of the following circumstances exist:

    - It is classified in Category IV in the "Washington State Wetland Rating System of Western Washington". In general, Category IV wetlands have monotypic vegetation of similar age and class, lack special habitat features, and are isolated from other aquatic systems. Any functions lost through hydrologic or structural modification in a Category IV wetland would have to be compensated/replaced.

- The wetland has been previously **disturbed** by human activity, as evidenced by agriculture, fill, ditching, and/or introduced or **invasive weedy plant species.**

- The wetland has been deprived of a significant amount of its water supply by draining or previous urbanization (e. g., by loss of groundwater supply), and stormwater runoff is sufficient to augment the water supply. A particular candidate is a wetland that has experienced an increased summer dry period, especially if the drought has been extended by more than two weeks.

- Construction for structural or hydrologic modification in order to provide runoff quantity or quality control will disturb relatively little of the wetland.

- The wetland can provide the required storage capacity for quantity or quality control through an outlet orifice modification to increase storage of water, rather than through raising the existing overflow. Orifice modification is likely to require less construction activity and consequent negative impacts.

- Under existing conditions the wetland's experiences a relatively high degree of water level fluctuation and a range of velocities (i.e., a wetland associated with substantially flowing water, rather than one in the headwaters or entirely isolated from flowing water).

- The wetland does not exhibit any of the following features:

    - Significant priority peat system or forested zones that will experience substantially altered hydroperiod as a result of the proposed action

    - Regionally **unusual biological community types**

    - Animal habitat features of relatively high value in the region (e. g., a protected, undisturbed area connected through undisturbed corridors to other valuable habitats, an important breeding site for protected species)

    - The presence of protected commercial or sport fish

    - Configuration and topography that will require significant modification that may threaten fish stranding

    - A relatively high degree of public interest as a result of, for example, offering valued local open space or educational,

scientific, or recreational opportunities, unless the proposed action would enhance these opportunities.

- The wetland is threatened by potential impacts exclusive of stormwater management, and could receive greater protection if acquired for a stormwater management project rather than left in existing ownership.

- There is good evidence that the wetland actually can be restored or enhanced to perform other functions in addition to runoff quantity or quality control.

- There is good evidence that the wetland lends itself to the effective application of the Wetland Protection Guidelines in Guide Sheet 2B.

- The wetland lies in the natural routing of the runoff. Local regulations often prohibit drainage diversion from one basin to another.

- The wetland allows runoff discharge at the natural location.

Guide Sheet 2B: Guidelines for Protection from Adverse Impacts of Modified Runoff Quantity Discharged to Wetlands

1. Protection of wetland plant and animal communities depends on controlling the wetland's **hydroperiod**, meaning the pattern of fluctuation of water depth and the frequency and duration of exceeding certain levels, including the length and onset of drying in the summer. A hydrologic assessment is useful to measure or estimate elements of the hydroperiod under existing **predevelopment** and anticipated **postdevelopment** conditions. This assessment should be performed with the aid of a qualified hydrologist. Postdevelopment estimates of watershed hydrology and wetland hydroperiod must include the cumulative effect of all anticipated watershed and wetland modifications. Provisions in these guidelines pertain to the full anticipated build-out of the wetland's watershed.

   This analysis hypothesizes a fluctuating water stage over time before development that could fluctuate more, both higher and lower after development; these greater fluctuations are termed **stage excursions**. The guidelines set limits on the frequency and duration of excursions, as well as on overall water level fluctuation, after development.

   - To determine existing hydroperiod use one of the following methods, listed in order of preference:

- Estimation by a continuous simulation computer model--The model should be calibrated with at least 1 year of data taken using a continuously recording level gage under existing conditions and should be run for the historical rainfall period. The resulting data can be used to express the magnitudes of depth fluctuation, as well as the frequencies and durations of surpassing given depths. [Note: Modeling that yields high quality information of the type needed for wetland hydroperiod analysis is a complex subject. Providing guidance on selecting and applying modeling options is beyond the scope of these guidelines but is being developed by King County Surface Water Management Division and other local jurisdictions. An alternative possibility to modeling depths, frequencies, and durations within the wetland is to model durations above given discharge levels entering the wetland over various time periods (e.g., seasonal, monthly, weekly). This option requires further development.]

- Measurement during a series of time intervals (no longer than 1 month in length) over a period of at least 1 year of the maximum water stage, using a crest stage gage, and instantaneous water stage, using a staff gage—the resulting data can be used to express water level fluctuation (WLF) during the interval as follows:

  - Average base stage = (Instantaneous stage at beginning of interval + Instantaneous stage at end of interval)/2

  - WLF = Crest stage – Average base stage

  - Compute mean annual and mean monthly WLF as the arithmetic averages for each year and month for which data are available.

- To forecast <u>future hydroperiods</u>, use one of the following methods, listed in order of preference:

  - Estimation by the continuous simulation computer model calibrated during predevelopment development analysis and run for the historical rainfall period—the resulting data can be used to express the magnitudes of depth fluctuation, as well as the frequencies and durations of surpassing given depths. [Note: Postdevelopment modeling results should generally be compared with predevelopment development modeling results, rather than directly with field measurements, because different sets of assumptions underlie modeling and monitoring.

Making pre- and postdevelopment comparisons on the basis of common assumptions allows cancellation of errors inherent in the assumptions.]

- Estimation according to general relationships developed from the Puget Sound Wetlands and Stormwater Management Program Research Program, as follows (in part adapted from Chin 1996):

  - Mean annual WLF is very likely (100 percent of cases measured) to be less than 20 centimeter (8 inches or 0.7 feet) if total impervious area cover in the watershed is less than 6 percent (roughly corresponding to no more than 15 percent of the watershed converted to urban land use).

  - Mean annual WLF is very likely (89 percent of cases measured) to be more than 20 centimeters if total impervious area in the watershed is more than 21 percent (roughly corresponding to more than 30 percent of the watershed converted to urban land use).

  - Mean annual WLF is somewhat likely (50 percent of cases measured) to be more than 30 centimeters (1.0 feet) if total impervious area in the watershed is more than 21 percent (roughly corresponding to more than 30 percent of the watershed converted to urban land use).

  - Mean annual WLF is likely (75 percent of cases measured) to be more than 30 centimeters, and somewhat likely (50 percent of cases measured) to be 50 centimeters (20 inches or 1.6 feet) or higher, if total impervious area in the watershed is more than 40 percent (roughly corresponding to more than 70 percent of the watershed converted to urban land use).

  - The frequency of stage excursions greater than 15 centimeters (6 inches or 0.5 feet) above or below predevelopment development levels is somewhat likely (54 percent of cases measured) to be more than six per year if the mean annual WLF increases to more than 24 centimeters (9.5 inches or 0.8 feet).

- The average duration of stage excursions greater than 15 centimeters above or below predevelopment development levels is likely (69 percent of cases measured) to be more than 72 hours if the mean annual WLF increases to more than 20 centimeters.

2. The following hydroperiod limits characterize wetlands with relatively high vegetation species richness and apply to all zones within all wetlands over the entire year. If these limits are exceeded, then species richness is likely to decline.

   - If the analysis described above forecasts exceedances, one or more of the management strategies listed in Step 5 should be employed to attempt to stay within the limits.

     - Mean annual WLF (and mean monthly WLF for every month of the year) does not exceed 20 centimeters. Vegetation species richness decrease is likely with: (1) a mean annual (and mean monthly) WLF increase of more than 5 centimeters (2 inches or 0.16 feet) if predevelopment development mean annual (and mean monthly) WLF is greater than 15 centimeters, or (2) a mean annual (and mean monthly) WLF increase to 20 centimeters or more if predevelopment development mean annual (and mean monthly) WLF is 15 centimeters or less.

     - The frequency of stage excursions of 15 centimeters above or below predevelopment development stage does not exceed an annual average of six. Note: A short-term lagging or advancement of the continuous record of water levels is acceptable. The 15 centimeters limit applies to the temporary increase in maximum water surface elevations (hydrograph peaks) after storm events and the maximum decrease in water surface elevations (hydrograph valley bottoms) between events and during the dry season.

     - The duration of stage excursions of 15 centimeters above or below predevelopment development stage does not exceed 72 hours per excursion. Note: A short-term lagging or advancement of the continuous record of water levels is acceptable. However, the 15 centimeters limit applies throughout the entire hydrograph, not just the peaks and valleys.

     - The total dry period (when pools dry down to the soil surface everywhere in the wetland) does not increase or decrease by more than 2 weeks in any year.

- Alterations to watershed and wetland hydrology that may cause perennial wetlands to become **vernal** are avoided.

3. The following hydroperiod limit characterizes **priority peat wetlands** (bogs and fens as more specifically defined by the Washington Department of Ecology) and applies to all zones over the entire year. If this limit is exceeded, then characteristic bog or fen wetland vegetation is likely to decline.

   - If the analysis described above forecasts exceedance, one or more of the management strategies listed in Step 5 should be employed to attempt to stay within the limit.

     - The duration of stage excursions above the predevelopment development stage does not exceed 24 hours in any year.

     - Note: This guideline is in addition to the guidelines in #2 directly above. To apply this guideline a continuous simulation computer model needs to be employed. The model should be calibrated with data taken under existing conditions at the wetland being analyzed and then used to forecast postdevelopment duration of excursions.

4. The following hydroperiod limits characterize wetlands inhabited by breeding native amphibians and apply to breeding zones during the period 1 February through 31 May. If these limits are exceeded, then amphibian breeding success is likely to decline.

   - If the analysis described above forecasts exceedances, one or more of the management strategies listed in Step 5 should be employed to attempt to stay within the limits.

     - The magnitude of stage excursions above or below the predevelopment development stage should not exceed 8 centimeters for more than 24 hours in any 30-day period.

     - Note: To apply this guideline a continuous simulation computer model needs to be employed. The model should be calibrated with data taken under existing conditions at the wetland being analyzed and then used to forecast postdevelopment magnitude and duration of excursions.

5. If it is expected that the hydroperiod limits stated above could be exceeded, consider strategies such as:

   - Reduction of the level of development;

- Increasing runoff infiltration [Note: Infiltration is prone to failure in many Puget Sound Basin locations with glacial till soils and generally requires **pretreatment** to avoid clogging. In other situations infiltrating urban runoff may contaminate groundwater. Consult the stormwater management manual adopted by the jurisdiction and carefully analyze infiltration according to its prescriptions.];

- Increasing runoff storage capacity; and

- Selective runoff bypass.

6. After development, monitor hydroperiod with a continuously recording level gauge or staff and crest stage gauges. If the applicable limits are exceeded, consider additional applications of the strategies in Step 5 that may still be available. It is also recommended that goals be established to maintain key vegetation species, amphibians, or both, and that these species be monitored to determine if the goals are being met.

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Appendix I-D –
Guidance for Altering the Minimum Requirements Through Basin Planning

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Basin Planning Applied to Source Control

Minimum Requirement #3

Basin plans can identify potential sources of pollution and develop strategies to eliminate or control these sources to protect beneficial uses. A basin plan can include the following source control strategies:

1. Detection and correction of illicit discharges to storm sewer systems, including the use of dry weather sampling and dye-tracing techniques

2. Identification of existing businesses, industries, utilities, and other activities that may store materials susceptible to spillage or leakage of pollutants into the storm sewer system or to the ground via wells, drains, or sumps

3. Elimination or control of pollutant sources identified in (2)

4. Identification and control of future businesses, industries, utilities, and other activities which may store materials susceptible to spillage or leakage of pollutants into the storm sewer system

5. Training and public education.

Basin Planning Applied to Runoff Treatment

Minimum Requirement #6

Basin plans can develop different runoff treatment requirements and performance standards to reduce pollutant concentrations or loads based on an evaluation of the beneficial uses to be protected within or downstream of a watershed. Consideration must be given to the antidegradation provisions of the Clean Water Act and implementing state water quality standards. The evaluation should include an analysis of existing and future conditions. Basin specific requirements and performance standards can be developed based on an evaluation of pollutant loads and modeling of receiving water conditions.

The basic treatment level is viewed as a minimum technology-based requirement that must be applied regardless of the quality of the receiving waters. Additional levels of control beyond the basic treatment level of

Minimum Requirement #6 may be justified in order to control the impacts of future development.

Runoff treatment requirements and performance standards developed from a basin plan should apply to individual development sites. Regional treatment facilities can be considered an acceptable substitute for onsite treatment facilities if they can meet the identified treatment requirements and performance standards. A limitation to the use of regional treatment systems is that the conveyances used to transport the stormwater to the facility must not include waters of the state that have existing or attainable beneficial uses other than drainage.

Basin Planning Applied to Flow Control

Minimum Requirement #7

Basin planning is well-suited to control stream channel erosion for both existing and future conditions. Flow control standards developed from a basin plan may include a combination of onsite, regional, and stream protection and rehabilitation measures. Onsite standards are usually the primary mechanism to protect streams from the impacts of increased high flows in future conditions. Regional flow control facilities are used primarily to correct existing stream erosion problems. Basin plans can evaluate retrofitting opportunities, such as modified outlets for existing stormwater detention facilities.

Stream protection and rehabilitation measures may be applied where stream channel erosion problems exist that will not be corrected by onsite or regional facilities. However, caution is urged in the application of such measures. If the causes of the stream channel erosion problems still exist, repairs to the physical expression of those problems may be short-lived. In some instances, it may be prudent to apply in-stream measures to reduce impacts until the basin hydrology is improved.

Another potential outcome of basin planning is the identification of a different flow control standard. Ecology's flow duration standard is based upon a generalization that the threshold of significant bedload movement in western Washington streams occurs at 50 percent of the 2-year recurrence interval stream flow. Through field observations and measurements, a local government may estimate a more appropriate threshold – higher or lower- for a specific stream. The alternative threshold can become the lower limit for the range of flows over which the duration standard applies. For instance, if the threshold is established at 70 percent of a 2-year recurrence interval flow, the alternative standard would be to match the discharge durations of flows from the developed site to the range of predeveloped discharge rates from 70 percent of the 2-year recurrence interval peak flow up to the full 50-year peak flow.

Basin Planning Applied to Wetlands and other Sensitive Areas

Minimum Requirement #8

Basin planning can be used to develop alternative protection standards for wetlands and other sensitive areas, such as landslide hazard areas, wellhead protection areas, and groundwater quality management areas. These standards can include source control, runoff treatment, flow control, stage levels, and frequency and duration of inundations.

Glossary and Notations

Glossary and Notations

The following terms are provided for reference and use with this manual.

American Association of State Highway and Transportation Officials (AASHTO) Classification	The official classification of soil materials and soil aggregate mixtures for highway construction, used by the American Association of State Highway and Transportation Officials.
Abbreviated Plan	A plan for small sites to implement temporary BMPs to control pollution generated during the construction phase only, primarily erosion and sediment.
Absorption	The penetration of a substance into or through another, such as the dissolving of a soluble gas in a liquid.
Administrator	See Director.
Adsorption	The adhesion of a substance to the surface of a solid or liquid; often used to extract pollutants by causing them to be attached to such adsorbents as activated carbon or silica gel. Hydrophobic, or water-repulsing adsorbents, are used to extract oil from waterways when oil spills occur. Heavy metals such as zinc and lead often adsorb onto sediment particles.
Aeration	The process of being supplied or impregnated with air. In waste treatment, the process used to foster biological and chemical purification. In soils, the process by which air in the soil is replenished by air from the atmosphere. In a well aerated soil, the soil air is similar in composition to the atmosphere above the soil. Poorly aerated soils usually contain a much higher percentage of carbon dioxide and a correspondingly lower percentage of oxygen.
Aerobic	Living or active only in the presence of free (dissolved or molecular) oxygen.
Agricultural Activities	The normal and routine actions associated with the production of crops: such as plowing, cultivating, minor drainage, and harvesting, and/or raising or keeping of livestock, including O&M of farm and stock ponds, drainage ditches, irrigation systems, and normal operation, maintenance, and repair of existing serviceable agricultural structures, facilities, or improved areas. The term “agricultural activities” as used within this Title does not include the practice of aquaculture. Forest practices regulated under Chapter 76.09 RCW and Title 222 WAC are not included in this definition.

Algal Bloom	Proliferation of living algae on the surface of lakes, streams or ponds; often stimulated by phosphate over-enrichment. Algal blooms reduce the oxygen available to other aquatic organisms.
American Public Works Association (APWA)	The Washington State Chapter of the American Public Works Association.
Anti-Seep Collar	A device constructed around a pipe or other conduit and placed in a trench or through a dam, levee, or dike for the purpose of reducing seepage losses and piping failures.
Applicant	Means the person, party, firm, corporation, or other legal entity that proposes to develop property in Gig Harbor by submitting an application for any of the activities covered by these regulations on a form furnished by the city and paying the required fees.
Appurtenances	Machinery, appliances, or auxiliary structures attached to a main structure, but not considered an integral part thereof, for the purpose of enabling it to function.
Aquifer	A geologic stratum containing groundwater that can be withdrawn and used for human purposes and must be protected from pollutants.
Areas Of Special Flood Hazard	Land in a floodplain within Gig Harbor subject to a 1 percent or greater chance of flooding in any given year. Designations on FEMA maps will include the letter “A” or “V.” Areas of Special Flood Hazard will also include “shaded X” zones (formerly called “B” zones by FEMA).
As-Built Drawings	As-constructed engineering plans that include all changes made to a project during construction and submitted to the city. All drawing changes shall be made by a professional engineer or land surveyor. Also referred to as record drawings.
Assessed Value	The value of the existing improvements excluding land as listed in current records at the Pierce County Assessor's Office. Alternately, the applicant may provide current appraisal information and request that it be substituted for the Assessor's records.
Assignment Of Funds	Retention of funds by a bank to guarantee that work is completed in compliance with the project's site development plan and in compliance with all Gig Harbor requirements.
Average Daily Traffic	Means the general unit of measurement for traffic defined as the total volume during a given time period (in whole days) greater than 1 day and less than 1 year divided by the number of days in that time period.

Background	A description of pollutant levels arising from natural sources, and not because of man's immediate activities.
Backwater	Water upstream from an obstruction or conveyance roughness which is deeper than it would normally be without the obstruction or roughness.
Baffle	A device to check, deflect, or regulate flow.
Base Flood	The flood having a 1 percent chance of being equaled or exceeded in any given year, also referred to as the "100-year flood."
Base Flood Elevation (BFE)	The water surface elevation, in feet, above mean sea level for the base flood and referenced to the NGVD of 1929 or North American Vertical Datum of 1988.
Basin	An area from which surface runoff is concentrated, usually to a single point such as the mouth of a stream.
Bedrock	The more or less solid rock in place either on or beneath the surface of the earth. It may be soft, medium, or hard and have a smooth or irregular surface.
Bench	Means a relatively level step excavated into natural earth or fill material.
Berm	A constructed barrier typically made of compacted earth, rock, or gravel. In a stormwater facility, a berm may serve as a vertical divider.
Best Management Practice (BMP)	The schedules of activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices, that when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington.
Biochemical Oxygen Demand (BOD)	An indirect measure of the concentration of biologically degradable materials present in organic wastes. Also called biological oxygen demand.
Biodegradable	Capable of being readily broken down by biological means, especially by microbial action.
Bioengineering	The combination of biological, mechanical, and ecological concepts (and methods) to control erosion and stabilize soil through the use of vegetation or in combination with construction materials.
Biofilter	A designed treatment facility using a combined soil and vegetation system for filtration, infiltration, adsorption, and biological uptake of pollutants in stormwater when runoff flows over and through. Vegetation growing in these facilities acts as both a physical filter which causes gravity settling of particulates by regulating velocity of

	flow, and also as a biological sink when direct uptake of dissolved pollutants occurs.
Biofiltration	The process of reducing pollutant concentrations in water by filtering the polluted water through biological materials.
Bioretention Areas	Small-scale, shallow retention/detention facilities dispersed through the development site that utilize specific soil mixes and plant species to infiltrate and filter runoff from developed sites.
Biological Control	A method of controlling pest organisms by means of introduced or naturally occurring predatory organisms, sterilization, the use of inhibiting hormones, or other means, rather than by mechanical or chemical means.
Bollard	A post (may or may not be removable) used to prevent vehicular access.
Bond	A surety bond to guarantee that work is completed in compliance with the project's site development plan and all Gig Harbor requirements.
Buffer	The zone contiguous with a sensitive area that is required for the continued maintenance, function, and structural stability of the sensitive area.
Building Setback Line	A line measured parallel to a property, easement, drainage facility, or buffer boundary, that delineates the area (defined by the distance of separation) where buildings or other obstructions are prohibited.
Catch Basin	A chamber or well, usually built at the curb line of a street, for the admission of surface water to a stormwater drainage system, having at its base a sediment sump designed to retain grit and detritus below the point of overflow.
Catch line	The point where a steeper slope intercepts a different, gentler slope.
Catchment	Surface drainage area or basin.
Cation Exchange Capacity (CEC)	Cations are positively charged ions such as calcium (Ca2+), magnesium (Mg2+), and potassium (K+), sodium (Na+) hydrogen (H+), aluminum (Al3+), iron (Fe2+), manganese (Mn2+), zinc (Zn2+) and copper (Cu2+). The capacity of the soil to hold on to these cations called the cation exchange capacity (CEC).
Certification	Means a written engineering opinion, stamped, signed, and dated by an engineer, concerning the progress or completion of work.

Certified Erosion and Sediment Control Lead (CESCL)	An individual who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by the Department (see BMP C160 in the *Stormwater Management Manual* for *Western Washington* (2005)). A CESCL is knowledgeable in the principles and practices of erosion and sediment control. The CESCL must have the skills to assess site conditions and construction activities that could impact the quality of stormwater and, the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges. Certification is obtained through an Ecology approved erosion and sediment control course. Course listings are provided online at Ecology's web site.
Channel	A feature that conveys surface water and is open to the air.
Channel, Constructed	Channels or ditches constructed (or reconstructed natural channels) to convey surface water.
Channel, Natural	Streams, creeks, or swales that convey surface/groundwater and have existed long enough to establish a stable route and/or biological community.
Channelization	Alteration of a stream channel by widening, deepening, straightening, cleaning, or paving certain areas to change flow characteristics.
Check Dam	Small dam constructed in a channel or other small watercourse to decrease the streamflow velocity, minimize channel scour, and promote deposition of sediment.
Chemical Oxygen Demand (COD)	A measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water. The COD test, like the BOD test, is used to determine the degree of pollution in water.
City, the	"City" means the City of Gig Harbor Public Works Director or designee; also Gig Harbor, its duly authorized representatives, and the jurisdictional boundaries of Gig Harbor.
Civil Engineer	see professional engineer
Civil Engineering	The application of the knowledge of the forces of nature, principles of mechanics and the properties of materials to the evaluation, design and construction of civil works for the beneficial uses of mankind.
Clearing	The destruction and/or removal of vegetation by manual, mechanical, or chemical methods

Closed Depression	An area which is low-lying and either has no, or such a limited, surface water outlet that during storm events the area acts as a retention basin.
Cluster Subdivision	A residential subdivision or division of land in which residential building lots are reduced in size and concentrated in specified portions(s) of the original lot, tract or parcel.
Cohesion	The capacity of a soil to resist shearing stress, exclusive of functional resistance.
Coliform Bacteria	Microorganisms common in the intestinal tracts of man and other warm-blooded animals; all the aerobic and facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35 degrees Celsius. Used as an indicator of bacterial pollution.
Compaction	The densification, settlement, or packing of soil in such a way that permeability of the soil is reduced. Compaction effectively shifts the performance of a hydrologic group to a lower permeability hydrologic group. Compaction may also refer to the densification of a fill by mechanical means.
Compost	Organic residue or a mixture of organic residues and soil, that has undergone biological decomposition until it has become relatively stable humus. Compost used should meet specifications for grade A or AA compost in Ecology publication 94-038.
Composted Mulch	Mulch prepared from decomposed organic materials that have undergone a controlled process to minimize weed seeds. Acceptable feedstocks include, but are not limited to, yard debris, wood waste, land clearing debris, brush, and branches.
Composting	A controlled process of degrading organic matter by microorganisms. Present day composting is the aerobic, thermophilic decomposing of organic waste to relatively stable humus. Composting is the process of making usable, organic matter that is beneficial to plants and has converted nutrients into slow-release forms (versus mineralized water-soluble forms found in fertilizer).
Comprehensive Planning	Planning that takes into account all aspects of water, air, and land resources and their uses and limits.
Conservation District	A public organization created under state enabling law as a special-purpose district to develop and carry out a program of soil, water, and related resource conservation,

	use, and development within its boundaries, usually a subdivision of state government with a local governing body and always with limited authority. Often called a soil conservation district or a soil and water conservation district.
Constructed Wetland	Those wetlands intentionally created on sites previously without wetlands for the primary purpose of stormwater treatment and managed as such. Constructed wetlands are normally considered as part of the stormwater collection and treatment system and are subject to maintenance requirements. (These wetlands are not the same as wetlands created for mitigation purposes, which are typically viewed in the same manner as natural, regulated wetlands.)
Construction Stormwater Pollution Prevention Plan (SWPPP)	A document that describes the potential for pollution problems on a construction project and explains and illustrates the measures to be taken on the construction site to control those problems.
Contour	An imaginary line on the surface of the earth connecting points of the same elevation.
Conveyance	A mechanism for transporting water from one point to another, including but not limited to: pipes, ditches, channels, culverts, gutters, manholes, weirs, man-made and natural channels, water quality filtration systems, dry wells, etc.
Conveyance system	The drainage facilities, both natural and man-made, which collect, contain, and provide for the flow of surface and storm water from the highest points on the land down to a receiving water. The natural elements of the conveyance system include swales and small drainage courses, streams, rivers, lakes, and wetlands. The human-made elements of the conveyance system include gutters, ditches, pipes, channels, and most retention/detention facilities.
County, the	"County" means the Pierce County Executive or designee; also Pierce County, its duly authorized representatives, and the jurisdictional boundaries of Pierce County.
Critical Areas	As defined by Chapter 18.08 Critical Areas GHMC.
Critical Tree Root Zone	The area surrounding the tree trunk where the roots of the tree should not be disturbed. The radius of the area is usually based on trunk diameter at diameter breast height and tree species.

Culvert	Pipe or concrete box structure that drains open channels, swales or ditches under a roadway or embankment. Typically with no catch basins or manholes along its length.
Cut	Portion of land surface or area from which earth has been removed or will be removed by excavating; the depth below original ground surface to excavated surface.
Cut Slope	A slope formed by excavating overlying material to connect the original ground surface with a lower ground surface created by the excavation. A cut slope is distinguished from a bermed slope, which is constructed by importing soil to create the slope.
Cut-And-Fill	Process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.
Dead Storage	The volume available in a depression in the ground below any conveyance system, or surface drainage pathway, or outlet invert elevation that could allow the discharge of surface and stormwater runoff.
Dedication	Is the deliberate appropriation of land by an owner for any general and public uses, reserving to himself no other rights than such as are compatible with the full exercise and enjoyment of the public uses to which the property has been devoted. The intention to dedicate land within a subdivision or short subdivision shall be evidenced by the owner by the presenting for filing a final plat or short plat showing the dedication thereon; and the acceptance by the public shall be evidenced by the approval of such plat for filing by the appropriate governmental unit. See RCW 58.17.020(3).
Degradation	The breakdown (biological or chemical) of complex organic or other chemical compounds into simpler substances, usually less harmful than the original compound, as with the degradation of a persistent pesticide. The (geological) wearing down by erosion. (Water) The lowering of the water quality of a watercourse by an increase in the pollutant loading.
Degraded (Disturbed)) Wetland (Community)	A wetland (community) in which the vegetation, soils, and/or hydrology have been adversely altered, resulting in lost or reduced functions and values; generally, implies topographic isolation; hydrologic alterations such as hydroperiod alteration (increased or decreased quantity of water), diking, channelization, and/or outlet modification;

	soils alterations such as presence of fill, soil removal, and/or compaction; accumulation of toxicants in the biotic or abiotic components of the wetland; and/or low plant species richness with dominance by invasive weedy species.
Design Engineer	See professional engineer
Design Storm (Design Event)	A prescribed hyetograph and total precipitation amount (for a specific duration recurrence frequency) used to estimate runoff for a hypothetical storm of interest or concern for the purposes of analyzing existing drainage, designing new drainage facilities or assessing other impacts of a proposed project on the flow of surface water.
Design Year Average Daily Traffic	The planned average daily traffic five years after the road is scheduled to be built.
Detention	The release of stormwater runoff from the site at a slower rate than it is collected by the stormwater facility system, the difference being held in temporary storage.
Detention Facility	An above or below ground facility, such as a pond or tank, that temporarily stores stormwater runoff and subsequently releases it at a slower rate than it is collected by the drainage facility system. There is little or no infiltration of stored stormwater.
Detention Pond	A detention facility in the form of an open pond.
Detention Time	The theoretical time required to displace the contents of a stormwater treatment facility at a given rate of discharge (volume divided by rate of discharge).
Developer	The person or legal entity that holds title to the property or has a sufficient interest in the project to propose the project. The developer of the project.
Development	Any man-made change to improved or unimproved real estate including, but not limited to, buildings or other structures, placement of manufactured home/mobile home, mining, dredging, clearing, filling, grading, paving, excavation, drilling operations, or the subdivision of property. See also the definitions for new development, redevelopment and land disturbing activities.
Director	The Gig Harbor Public Works Director; or his/her designee.
Discharge	Runoff leaving a new development or redevelopment via overland flow, built conveyance systems, or infiltration facilities. A hydraulic rate of flow, specifically fluid flow; a volume of fluid passing a point, per unit of time,

	commonly expressed as cubic feet per second, cubic meters per second, gallons per minute, gallons per day, or millions of gallons per day.
Dispersed Discharge (Dispersion)	The release of surface and stormwater runoff from a drainage facility system such that the flow spreads over a wide area and is located so as not to allow flow to concentrate anywhere upstream of a drainage channel with erodible underlying granular soils.
Disturbed Area	An area inside project boundaries altered from its natural state.
Disturbed Soils	An area inside the project boundaries where the soils have reduced infiltration, retention, and soil permeability than what would be present in a forested or prairie state due to previous development or land use.
Ditch	A long narrow excavation dug in the earth for drainage with its top width less than 10 feet at design flow.
Drain	A buried pipe or other conduit (closed drain). A ditch (open drain) for carrying off surplus surface water or groundwater.
(To) Drain	To provide channels, such as open ditches or closed drains, so that excess water can be removed by surface flow or by internal flow. To lose water (from the soil) by percolation.
Drainage	Refers to the collection, conveyance, containment, and/or discharge of surface and stormwater runoff.
Drainage Plan	A required submittal detailing existing and proposed drainage conditions for a proposed development or land-disturbing activity.
Drainage Basin	A geographic and hydrologic subunit of a watershed.
Drainage Channel	A drainage pathway with a well-defined bed and/or banks indicating frequent conveyance of surface and stormwater runoff.
Drainage Course	A pathway for watershed drainage often intermittent in flow.
Drainage Easement	A legal encumbrance that is placed against a property's title to reserve specified privileges for the users and beneficiaries of the drainage facilities contained within the boundaries of the easement.
Drainage Pathway	The route that surface and stormwater runoff follows downslope as it leaves any part of the site.
Drainage Review	An evaluation by the city of a proposed project's compliance with the drainage requirements in this manual

	or its technical equivalent.
Drainage System	Refers to the combination of BMPs, collection, conveyance, retention, detention, treatment and outfall features or structures on a project.
Drawdown	Lowering of the water surface (in open channel flow), water table or piezometric surface (in groundwater flow) resulting from a withdrawal of water.
Driveway	An access facility between the driveway approach point on a roadway, shared access facility, or emergency vehicle access and the abutting private property used by vehicular traffic.
Driveway Approach	Any area, construction, or facility between the roadway and the driveway, shared access facility, or emergency vehicle access serving the abutting private property which provides access for vehicular traffic.
Drop Structure	A structure for dropping water to a lower level and dissipating its surplus energy; a fall. A drop may be vertical or inclined.
Dry Pond	A detention facility which drains dry after a storm.
Earth / Earth Material	Means naturally occurring rock, soil, stone, dirt, or a combination thereof.
Earthwork	Means any operation involving the excavation, grading, filling, or moving of earth materials.
Easement	The legal right to use a described piece of land for a particular purpose. It does not include fee ownership, but may restrict the owner's use of the land. All easements granted pursuant to the manual shall be legally recorded with the county Auditor.
Easement, Private	Means an interest in the land of someone else, usually for the benefit of one or more individuals, and constitutes an encumbrance on another's land.
Effective Impervious Surface	Those impervious surfaces that are connected via sheet flow or discrete conveyance to a drainage system.
Embankment	A structure of earth, gravel, or similar material raised to form a pond bank or foundation for a road, building pad, or similar fill for a particular use.
Emergency Spillway	A channel used to safely convey flood discharges in excess of the capacity of the principal outlet.
Emergent Plants	Aquatic plants that are rooted in the sediment but whose leaves are at or above the water surface. These wetland plants often have high habitat value for wildlife and waterfowl, and can aid in pollutant uptake.

Emerging Technology	Treatment technologies that have not been evaluated with approved protocols, but for which preliminary data indicate that they may provide a necessary function(s) in a stormwater treatment system. Emerging technologies need additional evaluation to define design criteria to achieve, or to contribute to achieving, state performance goals, and to define the limits of their use.
Energy Dissipater	Any means by which the total energy of flowing water is reduced. In stormwater design, they are usually mechanisms that reduce velocity prior to, or at, discharge from an outfall in order to prevent erosion. They include rock splash pads, drop manholes, concrete stilling basins or baffles, and check dams.
Energy Gradient	The slope of the specific energy line (i.e., the sum of the potential and velocity heads).
Engineer	A professional engineer currently licensed in the state of Washington in civil engineering, retained by and acting on behalf of the applicant. The term "engineer" also means design engineer and project engineer.
Engineered Abbreviated Plan	A plan and reports required for development in or near: a critical area, a critical area buffer, a critical area management area, an area that has erosion potential, a drainage course or drainage channel, or an area that requires special grading controls, that addresses stormwater quantity, quality, temporary erosion control, permanent stabilization, and critical area standards, which must be prepared by a licensed professional engineer.
Engineered Soil/ Landscape System	This is a self-sustaining soil and plant system that simultaneously supports plant growth, soil microbes, water infiltration, nutrient and pollutant adsorption, sediment and pollutant biofiltration, water interflow, and pollution decomposition. The system shall be protected from compaction and erosion. The system shall be planted and/or mulched as part of the installation. The engineered soil/plant system shall have the following characteristics: a) Be protected from compaction and erosion. b) Have a plant system to support a sustained soil quality. c) Possess permeability characteristics of not less than 6.0, 2.0, and 0.6 inches/hour for hydrologic soil groups A, B, and C, respectively (per ASTM D 3385). D is less than 0.6 inches/hour.

	d) Possess minimum percent organic matter of 12, 14, 16, and 18 percent (dry-weight basis) for hydrologic soil groups A, B, C, and D, respectively (per ASTM D 2974).
Engineering Geology	The application of geologic knowledge and principles in the investigation and evaluation of naturally occurring rock and soil for use in the design of civil works.
Engineering Plan	A plan prepared and stamped by a professional civil engineer.
Enhancement	To raise value, desirability, or attractiveness of an environment associated with surface water.
Environmental Impact Statement (EIS)	A document that discusses the likely significant adverse impacts of a proposal, ways to lessen the impacts, and alternatives to the proposal. They are required by the national and state environmental policy acts when projects are determined to have significant environmental impact.
Environmentally Sensitive Area (Sensitive Area)	As defined by ordinance or resolution by the city.
Erodible Granular Soils	Soil materials that are easily eroded and transported by running water, typically fine or medium grained sand with minor gravel, silt, or clay content. Such soils are commonly described as Everett or Indianola series soil types in the SCS classification. Also included are any soils showing examples of existing severe stream channel incision as indicated by unvegetated streambanks standing over 2 feet high above the base of the channel.
Erosion	The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Also, detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of water erosion: a) Accelerated erosion – Erosion much more rapid than normal or geologic erosion, primarily as a result of the influence of the activities of man or, in some cases, of the animals or natural catastrophes that expose bare surfaces (e.g., fires). b) Geological erosion – The normal or natural erosion caused by geological processes acting over long geologic periods and resulting in the wearing away of mountains, the building up of floodplains, coastal plains, etc. Synonymous with natural erosion.

	c) Gully erosion – The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 1 to 2 feet to as much as 75 to 100 feet. d) Natural erosion – Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by man. Synonymous with geological erosion. e) Normal erosion – The gradual erosion of land used by man which does not greatly exceed natural erosion. f) Rill erosion – An erosion process in which numerous small channels only several inches deep are formed; occurs mainly on recently disturbed and exposed soils. See Rill. g) Sheet erosion – The removal of a fairly uniform layer of soil from the land surface by runoff. h) Splash erosion – The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff.
Erosion and Sedimentation Control (ESC)	Any temporary or permanent measures taken to reduce erosion; control siltation and sedimentation; and ensure that sediment-laden water does not leave the site.
Erosion and Sediment Control Facility	A type of drainage facility designed to hold water for a period of time to allow sediment contained in the surface and stormwater runoff directed to the facility to settle out so as to improve the quality of the runoff.
Erosion and Sedimentation Control Plan	A required submittal detailing erosion and sedimentation control plan BMPs for a proposed development or land-disturbing activity will be administered at the site.
Erosive Soils	See Erodible Granular Soils.
Estuary	An area where fresh water meets salt water, or where the tide meets the river current (e.g., bays, mouths of rivers, salt marshes and lagoons). Estuaries serve as nurseries and spawning and feeding grounds for large groups of marine life and provide shelter and food for birds and wildlife.
Eutrophication	Refers to the process where nutrient over-enrichment of water leads to excessive growth of aquatic plants, especially algae.

Evapotranspiration	The collective term for the processes of evaporation and plant transpiration by which water is returned to the atmosphere.
Excavation	The mechanical removal of earth material.
Exfiltration	The downward movement of runoff through the bottom of an infiltration BMP into the soil layer or the downward movement of water through soil.
Existing Site Conditions	Existing site conditions may be described as follows: a) For previously developed sites with stormwater facilities that have been constructed to meet the standards of this manual, this shall mean the current conditions on the site. b) For previously developed sites that do not have stormwater facilities that meet the standards of this manual, existing site conditions shall be considered under redevelopment regulations c) For undeveloped sites, this shall mean the condition of the site prior to the influence of Euro-American settlement. The predeveloped condition shall be assumed to be forested land cover unless reasonable, historic information is provided that indicates the site was prairie prior to settlement. ***Exception: If the site is located in a critical and/or sensitive area that affects drainage as defined by city ordinances, the Director may require that a more restrictive definition of existing site conditions be utilized for the purpose of calculating runoff characteristics.***
Experimental Best Management Practice (BMP)	A BMP that has not been tested and evaluated by the Department of Ecology in collaboration with local governments and technical experts.
Fertilizer	Any material or mixture used to supply one or more of the essential plant nutrient elements.
Fill	A deposit of earth material placed by artificial means.
Filter Fabric	A woven or non-woven, water-permeable material generally made of synthetic products such as polypropylene and used in stormwater management and erosion and sedimentation control applications to trap sediment or prevent the clogging of aggregates by fine soil particles. See the WSDOT standard specifications and amendments, specifically, Section 9-33 Construction Geotextiles.

Filter Fabric Fence	A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched. The filter fence is constructed of stakes and synthetic filter fabric with a rigid wire fence backing where necessary for support. Also commonly referred to in the Washington Department of Transportation standard specifications as "construction geotextile for temporary silt fences."
Filter Strip	A grassy area with gentle slopes that treats stormwater runoff from adjacent paved areas before it concentrates into a discrete channel.
Flocculation	The process by which suspended colloidal or very fine particles are assembled into larger masses or floccules which eventually settle out of suspension. This process occurs naturally but can also be caused through the use of such chemicals as alum.
Flood	An overflow or inundation that comes from a river or any other source, including (but not limited to) streams, tides, wave action, storm drains, or excess rainfall. Any relatively high stream flow overtopping the natural or artificial banks in any reach of a stream.
Flood Control	Methods or facilities for reducing flood flows and the extent of flooding.
Flood Frequency	The frequency with which the flood of interest may be expected to occur at a site in any average interval of years. Frequency analysis defines the "n-year flood" as being the flood that will, over a long period of time, be equaled or exceeded on the average once every "n" years.
Flood Fringe	The area subject to inundation by the base flood, but outside the limits of the floodway, and which may provide needed temporary storage capacity for flood waters.
Flood Hazard Areas	Those areas subject to inundation by the base flood. Includes, but is not limited to streams, lakes, wetlands, and closed depressions. Also referred to as special flood hazard areas.
Flood Insurance Rate Map (FIRM)	The official map on which the Federal Emergency Management Agency (FEMA) has delineated many areas of flood hazard, floodway, and the risk premium zones.
Flood Stage	The stage at which overflow of the natural banks of a stream begins.
Floodplain	The total area subject to inundation by the base flood including the flood fringe and floodway.
Flood-proofing	Structural provisions or adjustments to nonresidential

	buildings for the purpose of eliminating flood damages to those structures including their utilities and contents.
Flood Routing	An analytical technique used to compute the effects of system storage dynamics on the shape and movement of flow represented by a hydrograph.
Floodway	The channel of the river, or other watercourse, and the adjacent land areas that must be reserved in order to convey and discharge the base flood without cumulatively increasing the water surface elevation by more than 1 foot, and those areas designated as deep and/or fast-flowing water or mapped at severe risk of channel migration.
Flow Control Facility	A drainage facility designed to mitigate the impacts of increased surface and stormwater runoff flow rates generated by development. Flow control facilities are designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration, and/or infiltration into the ground, or to hold runoff for a short period of time, releasing it to the conveyance system at a controlled rate.
Flow duration	The aggregate time that peak flows are at or above a particular flow rate of interest. For example, the amount of time that peak flows are at or above 50 percent of the 2-year recurrence interval peak flow rate for a period of record.
Flow Frequency	The inverse of the probability that the flow will be equaled or exceeded in any given year (the exceedance probability). For example, if the exceedance probability is 0.01 or 1 in 100, that flow is referred to as the 100-year recurrence interval flow.
Flow Path	The route that stormwater runoff follows between two points of interest.
Forebay	An easily maintained, extra storage area provided near an inlet of a BMP to trap incoming sediments before they accumulate in a pond or wetland BMP.
Forest Practice	Any activity conducted on or directly pertaining to forest land and relating to growing, harvesting, or processing timber, including but not limited to: Road and trail construction, Harvesting, final and intermediate, Precommercial thinning, Reforestation, Fertilization, Prevention and suppression of diseases and insects, Salvage of trees, Brush control.
Forest Practices Permit	Means a permit issued by the Washington State

	Department of Natural Resources for the removal of timber and construction of necessary roads.
Forested Wetlands	In general terms, communities (wetlands) characterized by woody vegetation that is greater than or equal to 6 meters in height; in this manual the term applies to such communities (wetlands) that represent a significant amount of tree cover consisting of species that offer wildlife habitat and other values and advance the performance of wetland functions overall.
Freeboard	The vertical distance between the design water surface elevation and the elevation of the barrier that contains the water.
Frequency Of Storm (Design Storm Frequency)	The anticipated period in years that will elapse, based on average probability of storms in the design region, before a storm of a given intensity and/or total volume will recur; thus a 10 recurrence interval storm can be expected to occur on the average once every 10 years. Sewers designed to handle flows that occur under such storm conditions would be expected to be surcharged by any storms of greater amount or intensity.
Gabion	A rectangular or cylindrical wire mesh cage filled with rock and used as a protecting agent, revetment, etc., against erosion. Soft gabions, often used in streambank stabilization, are made of geotextiles filled with dirt, in between which cuttings are placed.
Gage Or Gauge	A measuring device for registering precipitation, water level, discharge, velocity, pressure, temperature, etc. Also, a measure of the thickness of metal.
Geologist	A person who has earned a degree in geology from an accredited college or university or who has equivalent educational training and has at least 5 years of experience as a practicing geologist or 4 years of experience and at least 2 years postgraduate study, research or teaching. The practical experience shall include at least 3 years work in applied geology and landslide evaluation, in close association with qualified practicing geologists or geotechnical professional/civil engineers.
Geometrics	The mathematical relationships between points, lines, angles, and surfaces used to measure and identify areas of land.
Geotechnical Professional	A person with experience and training in analyzing, evaluating, and mitigating any of the following: landslide, erosion, seismic, and/or mine hazards, or fluvial geomorphology and river dynamics. A geotechnical

	professional shall be licensed in the State of Washington as an engineering geologist or professional engineer. In accordance with Washington Administrative Code 308-15-140 and 196-27-020, engineering geologists and professional engineers shall affix their signatures or seals only to plans or documents dealing with subject matter in which they are qualified by training or experience.
Geotechnical Professional Civil Engineer	A practicing, geotechnical/civil engineer licensed as a professional Civil Engineer with the State of Washington who has at least 4 years of professional employment as a geotechnical engineer in responsible charge, including experience with landslide evaluation.
Grade	The slope of a road, channel, or natural ground. The finished surface of a canal bed, roadbed, top of embankment, or bottom of excavation; any surface prepared for the support of construction such as paving or the laying of a conduit.
(To) Grade	To finish the surface of a canal bed, roadbed, top of embankment or bottom of excavation.
Gradient Terrace	An earth embankment or a ridge-and-channel constructed with suitable spacing and an acceptable grade to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a stable nonerosive velocity.
Grading	Means any excavating, filling, clearing, or creating of impervious surfaces or combination thereof.
Grassed Waterway	A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to conduct surface water from an area at a reduced flow rate. See also biofilter.
Ground Water	Water in a saturated zone or stratum beneath the land surface or a surface water body.
Ground Water Recharge	Inflow to a groundwater reservoir.
Ground Water Table	The free surface of the groundwater, that surface subject to atmospheric pressure under the ground, generally rising and falling with the season, the rate of withdrawal, the rate of restoration, and other conditions. It is seldom static.
Grubbing	Means the removal and disposing of all unwanted vegetative matter from underground, such as sod, stumps, roots, buried logs, or other debris.
Gully	A channel caused by the concentrated flow of surface and stormwater runoff over unprotected erodible land.

Habitat	The specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be protected from harmful biological, chemical, and physical alterations.
Hardpan	A cemented or compacted and often clay-like layer of soil that is impenetrable by roots. Also known as glacial till.
Harmful Pollutant	A substance that has adverse effects to an organism including immediate death, chronic poisoning, impaired reproduction, cancer or other effects.
Head (Hydraulics)	The height of water above any plane of reference. The energy, either kinetic or potential, possessed by each unit weight of a liquid, expressed as the vertical height through which a unit weight would have to fall to release the average energy possessed. Used in various compound terms such as pressure head, velocity head, and head loss.
Head Loss	Energy loss due to friction, eddies, changes in velocity, or direction of flow.
Heavy Metals	Metals of high specific gravity, present in municipal and industrial wastes that pose long-term environmental hazards. Such metals include cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc.
High-Use Site	a) High-use sites are those that typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil. High-use sites include: b) An area of a commercial or industrial site subject to an expected average daily traffic count equal to or greater than 100 vehicles per 1,000 square feet of gross building area; c) An area of a commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil; d) An area of a commercial or industrial site subject to parking, storage or maintenance of 25 or more vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.); A road intersection with a measured count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.
Hog Fuel	See wood-based mulch.

Hydrological Simulation Program—Fortran (HSPF)	A continuous simulation hydrologic model that transforms an uninterrupted rainfall record into a concurrent series of runoff or flow data by means of a set of mathematical algorithms which represent the rainfall-runoff process at some conceptual level.
Humus	Organic matter in or on a soil, composed of partly or fully decomposed bits of plant tissue or from animal manure.
Hydraulic Conductivity	The quality of saturated soil that enables water or air to move through it. Also known as permeability coefficient
Hydraulic Gradient	Slope of the potential head relative to a fixed datum.
Hydro Period	A seasonal occurrence of flooding and/or soil saturation; it encompasses depth, frequency, duration, and seasonal pattern of inundation.
Hydrograph	A graph of runoff rate, inflow rate or discharge rate, past a specific point over time.
Hydrologic Cycle	The circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages or processes as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transpiration.
Hydrologic Soil Groups	A soil characteristic classification system defined by the SCS in which a soil may be categorized into one of four soil groups (A, B, C, or D) based upon infiltration rate and other properties. Type A: Low runoff potential. Soils having high infiltration rates, even when thoroughly wetted, and consisting chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission Type B: Moderately low runoff potential. Soils having moderate infiltration rates when thoroughly wetted, and consisting chiefly of moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission. Type C: Moderately high runoff potential. Soils having slow infiltration rates when thoroughly wetted, and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures. These soils have a slow rate of water transmission. Type D: High runoff potential. Soils having very slow infiltration rates when thoroughly wetted, and consisting chiefly of clay soils with a high swelling potential, soils

	with a permanent high water table, soils with a hardpan, till, or clay layer at or near the surface, soils with a compacted subgrade at or near the surface, and shallow soils or nearly impervious material. These soils have a very slow rate of water transmission.[1] [1] Vladimir Novotny and Harvey Olem. *Water Quality Prevention, Identification, and Management of Diffuse Pollution*, Van Nostrand Reinhold: New York, 1994, p. 109.
Hydrology	The science of the behavior of water in the atmosphere, on the surface of the earth, and underground.
Hydroperiod	A seasonal occurrence of flooding and/or soil saturation; it encompasses depth, frequency, duration, and seasonal pattern of inundation.
Hyetograph	A graph of rainfall intensity (often in inches per hour) over time at a single point.
Illicit Discharge	All non-stormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality or groundwater quality standards, including but not limited to sanitary sewer connections, industrial process water, interior floor drains, car washing, and greywater systems.
Impervious	A surface which cannot be easily penetrated. For instance, rain does not readily penetrate paved surfaces.
Impervious Surface	A hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for the purposes of determining whether the thresholds for application of minimum requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling.
Impoundment	A natural or man-made containment for surface water.

Improvement	Shall mean any thing or structure constructed for the benefit of all or some residents of the subdivision or the general public such as but not limited to roads, alleys, stormwater drainage systems and ditches, sanitary sewer pipes or main lines, and storm drainage containment facilities.
Improvement	Streets (with or without curbs or gutters), sidewalks, crosswalks, parking lots, water mains, sanitary and storm sewers, drainage facilities, street trees and other appropriate items.
Industrial Activities	Material handling, transportation, or storage; manufacturing; maintenance; treatment; or disposal. Areas with industrial activities include plant yards, access roads and rail lines used by carriers of raw materials, manufactured products, waste material, or by-products; material handling sites; refuse sites; sites used for the application or disposal of process wastewaters; sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater.
Infiltration	Means the downward movement of water from the surface to the subsoil.
Infiltration Facility (Or System)	A drainage facility designed to use the hydrologic process of surface and stormwater runoff soaking into the ground, commonly referred to as a percolation, to dispose of surface and stormwater runoff.
Infiltration Rate	The rate, usually expressed in inches/hour, at which water moves downward (percolates) through the soil profile. Short-term infiltration rates may be inferred from soil analysis or texture or derived from field measurements. Long-term infiltration rates are affected by variability in soils and subsurface conditions at the site, the effectiveness of pretreatment or influent control, and the degree of long-term maintenance of the infiltration facility.
Ingress/Egress	The points of access to and from a property.
Inlet	A form of connection between surface of the ground and a drain or sewer for the admission of surface and

	stormwater runoff.
Insecticide	A substance, usually chemical, that is used to kill insects.
Interception (Hydraulics)	The process by which precipitation is caught and held by foliage, twigs, and branches of trees, shrubs, and other vegetation. Often used for "interception loss" or the amount of water evaporated from the precipitation intercepted.
Interflow	That portion of rainfall that infiltrates into the soil and moves laterally through the upper soil horizons until intercepted by a stream channel or until it returns to the surface, for example, in a roadside ditch, wetland, spring or seep. Interflow is a function of the soil system depth, permeability, and water-holding capacity.
Intermittent Stream	A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from melting snow or other sources. It is dry for a large part of the year, ordinarily more than 3 months.
International Building Code (IBC)	Means the most recent version of the International Building Code adopted by Gig Harbor.
Invasive Weedy Plant Species	Opportunistic species of inferior biological value that tend to out-compete more desirable forms and become dominant; applied to non-native species in this manual.
Invert	The lowest point on the inside of a pipe or other conduit.
Invert Elevation	The vertical elevation of a pipe or orifice in a pond that defines the water level.
Isopluvial Map	A map with lines representing constant depth of total precipitation for a given return frequency and duration.
Junction	Point where two or more drainage pipes or channels converge (e.g., manhole).
Jurisdiction	For purposes of this manual, a governmental body which has adopted this manual.
Lag Time	The interval between the center of mass of the storm precipitation and the peak flow of the resultant runoff.
Lake	An area permanently inundated by water in excess of 2 meters deep and greater than 20 acres in size as measured at the ordinary high water marks.
Land-Disturbing Activity	Any activity that results in a movement of earth or a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction that

	is associated with stabilization of structures and road construction shall also be considered a land-disturbing activity. Vegetation maintenance practices are not considered land-disturbing activity.
Landscaping	Means the improvement or installation on a parcel or portion thereof of objects or vegetation for decorative or ornamental effect. Examples include: trees, bushes, shrubs, flowers, grass, weeds, ornamental rocks or figures, and low-lying ground cover, sprinkler systems, sidewalks, and lighting fixtures.
Landslide	Episodic downslope movement of a mass of soil or rock that includes but is not limited to rockfalls, slumps, mudflows, and earthflows. For the purpose of these rules, snow avalanches are considered to be a special case of landsliding.
Lattice Block Pavement	A pavement, either cast in place or interlocking paving bricks, with interstices allowing infiltration and the growth of vegetation.
Leachable Materials	Those substances that, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff. Examples include erodible soils, uncovered process wastes, manure, fertilizers, oil substances, ashes, kiln dust, and garbage dumpster leakage.
Leachate	Liquid that has percolated through soil and contains substances in solution or suspension.
Leaching	Removal of the more soluble materials from the soil by percolating waters.
Legume	A member of the legume or pulse family, Leguminosae, one of the most important and widely distributed plant families. Practically all legumes are nitrogen-fixing plants.
Level Pool Routing	The basic technique of storage routing used for sizing and analyzing detention storage and determining water levels for ponding water bodies. The level pool routing technique is based on the continuity equation: Inflow – Outflow = Change in storage.
Level Spreader	A device used to spread out stormwater runoff uniformly over the ground surface as sheet flow (i.e., not through channels). The purpose of level spreaders is to prevent concentrated, erosive flows from occurring, and to

	enhance infiltration.
Live Storage	The amount of storage in a detention facility that is intended to completely drain after a storm event.
Local Government	Any county, city, town, or special purpose district having its own incorporated government for local affairs.
Lot	A designated parcel, tract, or area of land established by plat, subdivision, or as otherwise permitted by law, to be used, developed, or built upon as a unit.
Low Flow Channel	An incised or paved channel from inlet to outlet in a dry basin which is designed to carry low runoff flows and/or baseflow, directly to the outlet without detention.
Low Impact Development (LID)	A land use development strategy that emphasizes protection and use of onsite natural features integrated with engineered, small-scale hydrologic controls at the parcel and subdivision scale to manage stormwater and more closely mimic predevelopment development watershed hydrologic functions. LID techniques may be considered an alternative to traditional, structural stormwater management solutions.
Maintenance	Repair and maintenance includes activities conducted on currently serviceable structures, facilities, and equipment that involves no expansion or use beyond that previously existing and resulting in no significant adverse hydrologic impact. It includes those usual activities taken to prevent a decline, lapse, or cessation in the use of structures and systems and includes replacement of disfunctioning facilities, including cases where environmental permits require replacing an existing structure with a different type structure, as long as the functioning characteristics of the original structure are not changed.
Manning's Equation	An equation used to predict the velocity of water flow in an open channel or pipelines: $V = \frac{1.486R^{2/3}S^{1/2}}{N}$ where: V is the mean velocity of flow in feet per second R is the hydraulic radius in feet S is the slope of the energy gradient or, for assumed uniform flow, the slope of the channel in feet per foot; and n is Manning's roughness coefficient or retardance factor of the channel lining.
Manual, The	This Stormwater Management and Site Development

	Manual, its adopting ordinance, and all documents included by reference.
Manufactured Home/Mobile Home	Means a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities.
Manufactured Home/Mobile Home Park Or Subdivisions	Means a parcel (or contiguous parcels) of land divided into two or more manufactured home/mobile home lots for rent, lease, or sale.
Material	Any solid or semi-solid substance.
Metals	Elements, such as mercury, lead, nickel, zinc and cadmium, which are of environmental concern because they can be toxic to life in high enough concentrations and do not degrade over time. Although many are necessary nutrients, they are sometimes magnified in the food chain. They are also referred to as heavy metals.
Microbes	The lower trophic levels of the soil food web. They are normally considered to include bacteria, fungi, flagellates, amoebae, ciliates, and nematodes. These in turn support the higher trophic levels, such as mites and earthworms. Together they are the basic life forms that are necessary for plant growth. Soil microbes also function to bioremediate pollutants such as petroleum, nutrients, and pathogens.
Mitigation	Means, in the following order of preference: a) Avoiding the impact altogether by not taking a certain action or part of an action; b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts; c) Rectifying the impact by repairing, rehabilitating or restoring the affected environment; d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and e) Compensating for the impact by replacing, enhancing, or providing substitute resources or environments.
Modification, Modified (Wetland)	A wetland whose physical, hydrological, or water quality characteristics have been purposefully altered for a management purpose, such as by dredging, filling,

	forebay construction, and inlet or outlet control.
Monitor	To systematically and repeatedly measure something in order to track changes.
Monitoring	The collection of data by various methods for the purposes of understanding natural systems and features, evaluating the impacts of development proposals on such systems, and assessing the performance of mitigation measures imposed as conditions of development.
Municipality The	Gig Harbor government or any jurisdiction adopting this manual for control of stormwater quantity and quality.
National Pollutant Discharge Elimination System (NPDES)	The part of the Clean Water Act which requires point source dischargers to obtain permits. These permits are referred to as NPDES permits and, in Washington, are administered by the Department of Ecology.
Native Growth Protection Easement	An easement granted for the protection of native vegetation within a sensitive area or its associated buffer. The native growth protection easement shall be recorded on the appropriate documents of title and filed with the county Auditor.
Native Vegetation	Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site
Natural Buffer Area	A parcel or strip of land that is designated to permanently remain in an undisturbed and untouched condition. No building, clearing, filling, or grading is permitted within this area, except for minor firewood harvest and watercourse maintenance when applicable. Roads, septic tank drainfield areas, and reserved drainfield areas are not permitted in natural buffer areas.
Natural Channel	Stream, creek, river, lake, wetland, estuary, gully, swale, ravine, or any open conduit where water will concentrate and flow intermittently or continuously.
Natural Hydrologic Function	Refers to the processing of precipitation over and through the landscape in a forest or prairie condition. Includes evapotranspiration by onsite vegetation, storage of rainfall in the soil structure or on the soil surface within depressions in the topography, and the release of stormwater either through infiltration, interflow, or surface flow off the site.
Natural Location	Means the location of those channels, swales, and other non-manmade conveyance systems as defined by the first documented topographic contours existing for the subject

	property, either from maps or photographs, or such other means as appropriate. In the case of outwash soils with relatively flat terrain, no natural location of surface discharge may exist.
Natural Resource Protection Areas	Areas set aside after the site assessment where development is not to occur.
National Environmental Policy Act (**NEPA)**	National Environmental Policy Act, a federal law.
New Development	Land disturbing activities, including Class IV general forest practices that are conversions from timber land to other uses; structural development, including construction or installation of a building or other structure; creation of impervious surfaces; and subdivision, short subdivision and binding site plans, as defined and applied in Chapter 58.17 RCW. Projects meeting the definition of redevelopment shall not be considered new development.
New Impervious Surface	Impervious surface created on or added to a site or structural development including construction, installation, or expansion of a building or other structure. Includes the addition of a hard or compacted surface like roofs, pavement, gravel, or dirt; or the addition of a more compacted surface, like paving over predevelopment existing dirt or gravel. New impervious surface may also include existing impervious surface that is removed and replaced. To be considered new, the removal and replacement activity must result in significant changes in impervious surface locations, grade, and/or drainage system features, and/or must involve construction, installation, or expansion of a building or structure after complete or substantial intentional demolition thereof by or for the benefit of the applicant.
Nitrate (NO_3)	A form of nitrogen which is an essential nutrient to plants. It can cause algal blooms in water if all other nutrients are present in sufficient quantities. It is a product of bacterial oxidation of other forms of nitrogen, from the atmosphere during electrical storms and from fertilizer manufacturing.
Nitrogen, Available	Usually ammonium, nitrite, and nitrate ions, and certain simple amines available for plant growth. A small fraction of organic or total nitrogen in the soil is available at any time.
Nonpoint Source Pollution	Pollution that enters a water body from diffuse origins on the watershed and does not result from discernible, confined, or discrete conveyances.

Non-Stormwater Discharge	Wash down water and other wastewater that enters the drainage system.
NPDES	The National Pollutant Discharge Elimination System as established by the Clean Water Act.
NRCS Method	See SCS method.
Nephlometric Turbidity Unit (NTU)	A measure of turbidity for stormwater.
Nutrients	Essential chemicals needed by plants or animals for growth. Excessive amounts of nutrients can lead to degradation of water quality and algal blooms. Some nutrients can be toxic at high concentrations.
Off-Line Facilities	Water quality treatment facilities to which stormwater runoff is restricted to some maximum flow rate or volume by a flow-splitter.
Offsite	Any area lying upstream of the site that drains onto the site and any area lying downstream of the site to which the site drains.
Off-System Storage	Facilities for holding or retaining excess flows over and above the carrying capacity of the stormwater conveyance system, in chambers, tanks, lagoons, ponds, or other basins that are not a part of the subsurface sewer system.
Oil/Water Separator	A vault, usually underground, designed to provide a quiescent environment to separate oil from water.
On-Line Facilities	Water quality treatment facilities which receive all of the stormwater runoff from a drainage area. Flows above the water quality design flow rate or volume are passed through at a lower percent removal efficiency.
Onsite	The entire property that includes the proposed development.
Onsite Stormwater Management BMPs	Site development techniques that serve to infiltrate, disperse, and retain stormwater runoff onsite.
Operational BMPs	Operational BMPs are a type of source control BMP. They are schedules of activities, prohibition of practices, and other managerial practices to prevent or reduce pollutants from entering stormwater. Operational BMPs include formation of a pollution prevention team, good housekeeping, preventive maintenance procedures, spill prevention and cleanup, employee training, inspections of pollutant sources and BMPs, and record keeping. They can also include process changes, raw material/product changes, and recycling wastes.
Ordinary High Water Mark	The term ordinary high water mark means the line on the

	shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of soil destruction on terrestrial vegetation, or the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding area. As defined applied in Chapter 90.58 RCW.
Organic Matter	Organic matter is decomposed animal or vegetable matter.
Orifice	An opening with closed perimeter, usually sharp-edged, and of regular form in a plate, wall, or partition through which water may flow, generally used for the purpose of measurement or control of water.
Original Tract	Means a unit of land which the applicant holds under single or unified ownership, or in which the applicant holds controlling ownership and the configuration of which may be determined by the fact that all land abutting said tract is separately owned by others, not including the applicant or applicants; provided that where a husband and wife own contiguous lots, both such lots shall constitute the original tract.
Outfall	The point where water flows from a manmade conduit, channel, or drain into a water body or other natural drainage feature. (See Natural Channel.)
Outlet	Point of water disposal from a stream, river, lake, tidewater, or artificial drain.
Outlet Channel	A waterway constructed or altered primarily to carry water from man-made structures, such as terraces, tile lines, and diversions.
Outwash Soils	Soils formed from highly permeable sands and gravels.
Overtopping	To flow over the limits of a containment or conveyance element.
Parcel	Means any portion, piece, or division of land. Fractional part or subdivision of block, according to plat or survey; portion of platted territory measured and set apart for individual and private use and occupancy.
Particle Size	The effective diameter of a particle as measured by sedimentation, sieving, or micrometric methods.
Paved Road	Means a road that has been treated or covered with asphalt to create an oil mat surface; a road that has a bituminous surface treatment, asphalt, or cement concrete surface.
Peak Discharge	The maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event.

Percolation	The movement of water through soil.
Percolation Rate	The rate, often expressed in inches/hour, at which clear water, maintained at a relatively constant depth, will seep out of a standardized test hole that has been previously saturated. The term percolation rate is often used synonymously with infiltration rate (short-term infiltration rate).
Permanent Stabilization	Permanent site stabilization shall mean the covering of exposed surfaces through paving, gravels, landscaping materials, sodding, seeding, etc. but shall not mean the temporary use of erosion/sediment control materials unless used in conjunction with the above measures to aid in seed or landscaping vegetation establishment.
Permanent Stormwater Control (PSC) Plan	A plan which includes permanent BMPs for the control of pollution from stormwater runoff after construction and/or land-disturbing activity has been completed
Permeable Soils	Soil materials with a sufficiently rapid infiltration rate so as to greatly reduce or eliminate surface and stormwater runoff. These soils are generally classified as SCS hydrologic soil types A and B.
Person	Any individual, partnership, corporation, association, organization, cooperative, public or municipal corporation, agency of the state, or local government unit, however designated.
Pervious Materials	Materials for surfacing roads, driveways, pedestrian paths, parking lots, etc. that allows water to infiltrate through the surface.
Pesticide	A general term used to describe any substance – usually chemical – used to destroy or control organisms; includes herbicides, insecticides, algicides, fungicides, and others. Many of these substances are manufactured and are not naturally found in the environment. Others, such as pyrethrum, are natural toxins that are extracted from plants and animals.
pH	A measure of the alkalinity or acidity of a substance which is conducted by measuring the concentration of hydrogen ions in the substance. A pH of 7.0 indicates neutral water. A 6.5 reading is slightly acid.
Plan	For purposes of this manual, a Plan shall mean the Drainage Control Plan, Erosion and Sediment Control Plan, Engineered Abbreviated Plan, or Abbreviated Plan as defined in Chapter 3.
Plan Approval Authority	The Plan Approval Authority is defined as that department within a local government that has been

	delegated authority to approve stormwater site plans.
Planned Unit Development (PUD)	A special classification authorized in some zoning ordinances, where a unit of land under control of a single developer may be used for a variety of uses and densities, subject to review and approval by the local governing body. The locations of the zones are usually decided on a case-by-case basis.
Plat	A map or representation of a subdivision showing the division of a tract or parcel of land into lots, blocks, streets, or other divisions and dedications.
Point Discharge	The release of collected and/or concentrated surface and stormwater runoff from a pipe, culvert, or channel.
Point Of Compliance	The location at which compliance with a discharge performance standard or a receiving water quality standard is measured.
Pollution	Contamination or other alteration of the physical, chemical, or biological properties, of waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Pollution-Generating Impervious Surface (PGIS)	Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities (as further defined in this glossary); or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the runon or blow-in of rainfall. Erodible or leachable materials, wastes, or chemicals are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff. Examples include erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage. Metal roofs are also considered to be PGIS unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating). A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles. The following are considered regularly-used surfaces: roads, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, vehicular equipment storage yards, and airport runways. The following are not considered regularly-used surfaces: a) Paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles b) Fenced fire lanes c) Infrequently used maintenance access roads
Pollution-Generating Pervious Surface (PGPS)	Any non-impervious surface subject to use of pesticides and fertilizers or loss of soil. Typical PGPS include lawns, landscaped areas, golf courses, parks, cemeteries, and sports fields.
Postdevelopment Conditions	The condition of site after the project has been constructed.
Pothole	A closed basin. See also closed depression and/or basin.
Predeveloped Condition	The native vegetation and soils that existed at a site prior to the influence of Euro-American settlement. The predeveloped condition shall be assumed to be forested land cover unless reasonable, historic information is provided that indicates the site was prairie prior to settlement.
Preliminary Plat	Is a neat and approximate drawing of a proposed subdivision showing the general layout of streets and alleys, lots, blocks and restrictive covenants to be

	applicable to the subdivision which shall furnish a basis for the approval or disapproval of the general layout of a subdivision.
Pretreatment	The removal of material such as solids, grit, grease, and scum from flows prior to physical, biological, or physical treatment processes to improve treatability. Pretreatment may include screening, grit removal, settling, oil/water separation, or application of a basic treatment BMP prior to infiltration.
Private Road	A roadway facility in private ownership providing private access and used for travel of vehicles by the owner(s) or those having express or implied permission from the owner(s), but not by other persons.
Professional Engineer	A person currently licensed and registered in the State of Washington as a professional engineer in civil engineering.
Project	The proposed action of a permit application or an approval which requires a Drainage Control Plan, Erosion and Sediment Control Plan, Engineered Abbreviated Plan, or Abbreviated Plan.
Project Engineer	Professional Engineer.
Project Site	That portion of a property, properties, or right-of-way subject to land disturbing activities, new impervious surfaces, or replaced impervious surfaces.
Properly Functioning Soil System	Equivalent to engineered soil/landscape system. This can also be a natural system that has not been disturbed or modified.
Public Storm Drainage Facility	A conveyance, system of conveyances, or stormwater control facility(ies) (including roads with drainage systems, catch basins, curbs, gutter, ditches, man-made channels, storm drains, retention/detention facilities and infiltration facilities) owned and operated by the city, which is (are) designed or used for collection, storage, conveyance and treatment of stormwater.
Rare, Threatened, Or Endangered Species	Plant or animal species that are regional relatively uncommon, are nearing endangered status, or whose existence is in immediate jeopardy and is usually restricted to highly specific habitats. Threatened and endangered species are officially listed by federal and state authorities, whereas rare species are unofficial species of concern that fit the above definitions.
Rain Garden	Similar to bioretention areas except these are smaller stormwater facilities located on individual lots that

	receive stormwater from roofs, driveways, and possibly sidewalks only.
Rational Method	A means of computing storm drainage flow rates (Q) by use of the formula Q = CIA, where C is a coefficient describing the physical drainage area, I is the rainfall intensity and A is the area. This method is no longer used in the technical manual.
Reach	A length of channel with uniform characteristics.
Receiving Waters	Bodies of water or surface water systems to which surface runoff is discharged via a point source of stormwater or via sheet flow.
Recharge	The addition of water to the zone of saturation (i.e., an aquifer).
Recommended BMPs	As used in Volume IV, recommended BMPs are those BMPs that are not expected to be mandatory by local governments at new development and redevelopment sites. However, they may improve pollutant control efficiency, and may provide a more comprehensive and environmentally effective stormwater management program.
Redevelopment	On a site that is already substantially developed (i.e., has 35 percent or more of existing impervious surface coverage), the creation or addition of impervious surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure; replacement of impervious surface that is not part of a routine maintenance activity; and land disturbing activities.
Regional	An action (here, for stormwater management purposes) that involves more than one discrete property.
Regional Detention (or Retention) Facility	A stormwater quantity control structure designed to correct existing surface water runoff problems of a basin or subbasin. The area downstream has been previously identified as having existing or predicted significant and regional flooding and/or erosion problems. This term is also used when a detention or retention facility is sited to detain or infiltrate stormwater runoff from a number of new developments or areas within a catchment.
Release Rate	The computed peak rate of surface and stormwater runoff from a site.
Replaced Impervious Surface	For structures, the removal and replacement of any exterior impervious surfaces or foundation. For other impervious

	surfaces, the removal down to bare soil or base course and replacement.
Residential Density	The number of dwelling units per unit of surface area. Net density includes only occupied land. Gross density includes unoccupied portions of residential areas, such as roads and open space.
Restoration	Actions performed to reestablish wetland functional characteristics and processes that have been lost by alterations, activities, or catastrophic events in an area that no longer meets the definition of a wetland.
Retention	The process of collecting and holding surface and stormwater runoff with no surface outflow.
Retention Facility	A facility with no outlet to surface water and which is intended to discharge to groundwater and/or evaporation.
Retention Pond	A retention facility that is an open pond.
Retention/Detention Facility	A facility with an outlet to surface water but which is intended to primarily discharge to groundwater and evaporation.
Retrofitting	The renovation of an existing structure or facility to meet changed conditions or to improve performance.
Return Frequency	A statistical term for the average time of expected interval that an event of some kind will equal or exceed given conditions (e.g., a stormwater flow that occurs every 2 years).
Revetments	Facing used to sustain an embankment.
Right-of-Way	Means that area of land dedicated for public road uses including all road appurtenances, secured by the city or the public for purposes of public traffic, drainage, and/or franchised utilities.
Rill	A small intermittent watercourse with steep sides, usually only a few inches deep. Often rills are caused by an increase in surface water flow when soil is cleared of vegetation.
Riparian	Pertaining to the banks of streams, wetlands, lakes, or tidewater.
Riparian Areas	Transition zones between water bodies and upland areas that exhibit vegetation or soil characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas.

Riprap	A facing layer or protective mound of rocks placed to prevent erosion or sloughing of a structure or embankment due to flow of surface and stormwater runoff.
Riser	A vertical pipe extending from the bottom of a pond BMP that is used to control the discharge rate from a BMP for a specified design storm.
Roadway Width	Means the sum of the traveled way width and the shoulder width measured at its narrowest location.
Rodenticide	A substance used to destroy rodents.
Runoff	Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes and wetlands as well as shallow groundwater. As applied in this manual, it also means the portion of rainfall or other precipitation that becomes surface flow and interflow.
Salmonid	A member of the fish family Salmonidae. Chinook, coho, chum, sockeye, and pink salmon; cutthroat, brook, brown, rainbow, and steelhead trout; Dolly Varden, kokanee, and char are examples of salmonid species.
Sand Filter	A man-made depression or basin with a layer of sand that treats stormwater as it percolates through the sand and is discharged via a central collector pipe.
Saturation Point	In soils, the point at which a soil or an aquifer will no longer absorb any amount of water without losing an equal amount.
Scour	Erosion of channel banks due to excessive velocity of the flow of surface and stormwater runoff.
SCS	Soil Conservation Service (now the Natural Resources Conservation Service), USDA.
SCS Method	A single-event hydrologic analysis technique for estimating runoff based on the curve number method. The curve numbers are published by NRCS *in Urban Hydrology for Small Watersheds, 55 TR, June 1976*. With the change in name to the Natural Resource Conservation Service, the method may be referred to as the NRCS Method.
Sediment	Fragmented material that originates from weathering and erosion of rocks or unconsolidated deposits, and is transported by, suspended in, or deposited by water.
Sedimentation	The depositing or formation of sediment.

Sensitive Area	Means those areas designated by resolution or ordinance of the Gig Harbor City Council pursuant to Washington Administrative Code 197-11-908 and Chapter 18.08 GHMC or the most recent amendments thereto. See Environmentally Sensitive Area.
SEPA	See State Environmental Policy Act.
Settleable Solids	Those suspended solids in stormwater that separate by settling when the stormwater is held in a quiescent condition for a specified time.
Shared Access Facility	A privately-owned drivable surface which serves up to and including four lots in the rural area or two lots in the urban area for access to single family and two family dwelling units.
Sheet Erosion	The relatively uniform removal of soil from an area without the development of conspicuous water channels.
Sheet Flow	Runoff that flows over the ground surface as a thin, even layer, not concentrated in a channel.
Shoreline Development	The proposed project as regulated by the Shoreline Management Act. Usually the construction over water or within a shoreline zone (generally 200 feet landward of the water) of structures such as buildings, piers, bulkheads, and breakwaters, including environmental alterations such as dredging and filling, or any project which interferes with public navigational rights on the surface waters.
Short Circuiting	The passage of runoff through a BMP in less than the design treatment time.
Short Plat Or Short Subdivision	As defined in the Title 16 Gig Harbor Municipal Code (GHMC), or most recent version thereof.
Shoulder Width	Means the improved and maintained area between the edge of the traveled way and the point of intersection of shoulder slope with the fore slope or ditch slope.
Siltation	The process by which a river, lake, or other water body becomes clogged with sediment. Silt can clog gravel beds and prevent successful salmon spawning.
Single-Family Residential Structure	Means a structure used to house one or two families, including appurtenant structures such as a garage, storage shed, or other structure not used for living purposes, all for the private, non-commercial use of the property owner or renter.
Site	The legal boundaries of a parcel or parcels of land that is (are) subject to new development or redevelopment. For

	road projects, the length of the project site and the right-of-way boundaries define the site.
Site Development Permit	Means a permit issued by the city of Gig Harbor titled "Civil Permit" authorizing the applicant to access the property; fill, grade and create an impervious surface or any combination thereof.
Site Development Plan	Means the set of civil drawings submitted by the applicant to request a site development permit. Site development plans shall include the following, as specifically required by the city in each instance: Site plan, Drainage Control Plan, Erosion and Sediment Control Plan, Engineered Abbreviated Plan, Abbreviated Plan, grading plan, soils report, flood study, road construction plans, entering sight distance variances and verifications, and other documents required in the review of proposed development of the property.
Slope	Degree of deviation of a surface from the horizontal; measured as a numerical ratio, percent, or in degrees. Expressed as a ratio, the first number is the horizontal distance (run) and the second is the vertical distance (rise), as 2:1. A 2:1 slope is a 50 percent slope. Expressed in degrees, the slope is the angle from the horizontal plane, with a 90-degree slope being vertical (maximum) and 45-degree being a 1:1 or 100 percent slope.
Sloughing	The sliding of overlying material. It is the same effect as caving, but it usually occurs when the bank or an underlying stratum is saturated or scoured.
Soil	The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. See also topsoil, engineered soil/landscape system, and properly functioning soil system.
Soil Group, Hydrologic	A classification of soils by the SCS into four runoff potential groups. The groups range from A soils, which are very permeable and produce little or no runoff, to D soils, which are not very permeable and produce much more runoff.
Soil Horizon	A layer of soil, approximately parallel to the surface, which has distinct characteristics produced by soil-forming factors.
Soil Permeability	The ease with which gases, liquids, or plant roots penetrate or pass through a layer of soil.

Soil Profile	A vertical section of the soil from the surface through all horizons, including C horizons.
Soil Stabilization	The use of measures such as rock lining, vegetation or other engineering structures to prevent the movement of soil when loads are applied to the soil.
Soil Structure	The relation of particles or groups of particles which impart to the whole soil a characteristic manner of breaking; some types are crumb structure, block structure, platy structure, and columnar structure.
Soil Texture Class	The relative proportion, by weight, of particle sizes, based on the USDA system, of individual soil grains less than 2 mm equivalent diameter in a mass of soil. The basic texture classes in the approximate order of increasing proportions of fine particles include: sand, loamy sand, sandy loam, loam, silt loam, silt, clay loam, sandy clay, silty clay, and clay.
Soils Professional	A person who demonstrates proficiency in the practice of the science of soils, including their origin, character, and utilization for stormwater treatment and disposal. This proficiency shall be demonstrated through the soils professional's ability to complete the Soils Evaluation Report forms in a precise and accurate manner.
Sorption	The physical or chemical binding of pollutants to sediment or organic particles.
Source Control BMP	A structure or operation that is intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. This manual separates source control BMPs into two types. *Structural source control BMPs* are physical, structural, or mechanical devices or facilities that are intended to prevent pollutants from entering stormwater. *Operational BMPs* are non-structural practices that prevent or reduce pollutants from entering stormwater. See Volume IV for details.
Spill Control Device	A T-section or turned-down elbow designed to retain a limited volume of pollutant that floats on water, such as oil or antifreeze. Spill control devices are passive and must be cleaned-out for the spilled pollutant to actually be removed.
Spillway	A passage such as a paved apron or channel for surplus water over or around a dam or similar obstruction. An open or closed channel, or both, used to convey excess water from a reservoir. It may contain gates, either

	manually or automatically controlled, to regulate the discharge of excess water.
Standard Plans And Standard Specifications	The most recent edition of the *Standard Plans for Road, Bridge, and Municipal Construction* and the *Standard Specifications for Road, Bridge, and Municipal Construction* by WSDOT in cooperation with the APWA and as amended by Gig Harbor.
State Environmental Policy Act (SEPA)	The Washington law (RCW 43.21c) intended to minimize environmental damage. SEPA requires that state agencies and local governments consider environmental factors when making decisions on activities, such as development proposals over a certain size and comprehensive plans. As part of this process, environmental documents are prepared and opportunities for public comment are provided.
Steep Slope	Slopes of 20 percent gradient or steeper, with 10 feet of vertical relief.
Storage Routing	A method to account for the attenuation of peak flows passing through a detention facility or other storage feature.
Stormwater Drainage System	Refers to the system of gutters, pipes, streams, or ditches used to carry surface and stormwater from surrounding lands to streams, lakes, or Puget Sound.
Storm Drains	The enclosed conduits that transport surface and stormwater runoff toward points of discharge (sometimes called storm sewers).
Storm Sewer	A sewer that carries stormwater and surface water, street wash and other washwaters or drainage, but excludes sewage and industrial wastes. Also called a storm drain.
Stormwater	That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.
Stormwater Drainage System	Constructed and natural features which function together as a system to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat or filter stormwater.
Stormwater Facility	A constructed component of a stormwater drainage system, designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include, but are not limited to, pipes, swales, ditches, culverts, street gutters, detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins,

	oil/water separators, and biofiltration swales.
Stormwater Management Manual for Western Washington (Stormwater Manual)	The Stormwater Manual prepared by Ecology intended to provide guidance on measures necessary in western Washington to control the quantity and quality of stormwater runoff from new development and redevelopment.
Stormwater Program	Either the basic stormwater program or the comprehensive stormwater program (as appropriate to the context of the reference) called for under the Puget Sound Water Quality Management Plan.
Streambanks	The usual boundaries, not the flood boundaries, of a stream channel. Right and left banks are named facing downstream.
Streams	Those areas where surface waters flow sufficiently to produce a defined channel or bed. A defined channel or bed is an area that demonstrates clear evidence of the passage of water and includes, but is not limited to, indicated by hydraulically sorted sediments or the removal of vegetative litter or loosely rooted vegetation by the action of moving water. The channel or bed need not contain water year-round. This definition is not meant to include irrigation ditches, canals, stormwater runoff devices or other entirely artificial watercourses unless they are used to convey streams naturally occurring prior to construction. Those topographic features that resemble streams but have no defined channels (i.e., swales) shall be considered streams when hydrologic and hydraulic analyses done pursuant to a development proposal predict formation of a defined channel after development.
Structural Source Control BMPs	Physical, structural, or mechanical devices or facilities that are intended to prevent pollutants from entering stormwater. Structural source control BMPs typically include: a) Enclosing and/or covering the pollutant source (building or other enclosure, a roof over storage and working areas, temporary tarpaulin, etc.) b) Segregating the pollutant source to prevent runon of stormwater, and to direct only contaminated stormwater to appropriate treatment BMPs.
Structure	A catch basin or manhole in reference to a stormwater drainage system.
Stub-Out	A short length of pipe provided for future connection to a stormwater drainage system.
Subbasin	A drainage area which drains to a point contained within a

	larger basin.
Subdivision	Is any voluntary or involuntary division or redivision of land into five or more lots, tracts, parcels, sites or division for the purpose of sale, lease, or transfer of ownership.
Subgrade	A layer of stone or soil used as the underlying base for a BMP.
Subsoil	The B horizons of soils with distinct profiles. In soils with weak profile development, the subsoil can be defined as the soil below the plowed soil (or its equivalent of surface soil), in which roots normally grow. Although a common term, it cannot be defined accurately. It has been carried over from early days when "soil" was conceived only as the plowed soil and that under it as the "subsoil."
Substrate	The natural soil base underlying a BMP.
Surcharge	The flow condition occurring in closed conduits when the hydraulic grade line is above the crown of the sewer.
Surface and Stormwater	Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands as well as shallow groundwater.
Surface and Stormwater Management System	Drainage facilities and any other natural features that collect, store, control, treat and/or convey surface and stormwater.
Suspended Solids	Organic or inorganic particles that are suspended in and carried by the water. The term includes sand, mud, and clay particles (and associated pollutants) as well as solids in stormwater.
Swale	A shallow drainage conveyance with relatively gentle side slopes, generally with flow depths less than 1 foot.
Terrace	An embankment or combination of an embankment and channel across a slope to control erosion by diverting or storing surface runoff instead of permitting it to flow uninterrupted down the slope.
Threshold Discharge Area	An onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath). The examples in Volume I, Figure 4.1 illustrate this definition. The purpose of this definition is to clarify how the thresholds of this manual are applied to project sites with multiple discharge points.

Tightline	A continuous length of pipe that conveys water from one point to another (typically down a steep slope) with no inlets or collection points in between.
Tile, Drain	Pipe made of burned clay, concrete, or similar material, in short lengths, usually laid with open joints to collect and carry excess water from the soil.
Till	A layer of poorly sorted soil deposited by glacial action that generally has very low infiltration rates.
Time of concentration	The time period necessary for surface runoff to reach the outlet of a subbasin from the hydraulically most remote point in the tributary drainage area.
(To) Grade	To finish the surface of a canal bed, roadbed, top of embankment or bottom of excavation.
Toe of Slope	A point or line of slope in an excavation or cut where the lower surface changes to horizontal or meets the existing ground slope.
Top of Slope	A point or line on the upper surface of a slope where it changes to horizontal or meets the original surface.
Topography	General term to include characteristics of the ground surface such as plains, hills, mountains, degree of relief, steepness of slopes, and other physiographic features.
Topsoil	Topsoil shall be per ASTM D5268 standard specification, and water permeability shall be 0.6 inches per hour or greater. Organic matter shall have not more than 10 percent of nutrients in mineralized water-soluble forms. Topsoil shall not have phytotoxic characteristics.
Total dissolved solids	The dissolved salt loading in surface and subsurface waters.
Total Impervious Area	The total amount of actual impervious surface on a site or within a drainage area, basin, or subbasin (see "impervious surface").
Total Maximum Daily Load (TMDL) – Water Cleanup Plan	A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL (also known as a water cleanup plan) is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The Clean Water Act, Section 303, establishes the water quality standards and TMDL programs.
Total Solids	The solids in water, sewage, or other liquids, including the dissolved, filterable, and nonfilterable solids. The residue left when the moisture is evaporated and the

	remainder is dried at a specified temperature, usually 130-degrees Celsius.
Total Suspended Solids	That portion of the solids carried by stormwater that can be captured on a standard glass filter.
Toxic	Poisonous, carcinogenic, or otherwise directly harmful to life.
Tract	Any parcel of land that is designated or restricted as to use. Examples include parcels of land where uses are restricted due to sensitive areas such as wetlands or steep slopes, and parcels dedicated to the public for roads, utility or other public purposes. A tract may be buildable or unbuildable, depending upon the facts surrounding the creation of the designation or restrictions.
Trash Rack	A structural device used to prevent debris from entering a spillway or other hydraulic structure.
Travel Time	The estimated time for surface water to flow between two points of interest.
Traveled Way	That portion of the roadway used for the movement of vehicles exclusive of the portion of the roadway width which is used, or available for parking of vehicles. The traveled way does not include curbs and gutters.
Treatment BMP	A BMP that is intended to remove pollutants from stormwater. A few examples of treatment BMPs are detention ponds, oil/water separators, biofiltration swales, and constructed wetlands.
Treatment Liner	A layer of soil that is designed to slow the rate of infiltration and provide sufficient pollutant removal so as to protect groundwater quality.
Turbidity	Dispersion or scattering of light in a liquid, caused by suspended solids and other factors; commonly used as a measure of suspended solids in a liquid.
U.S. Environmental Protection Agency (U.S. EPA)	The U.S. Environmental Protection Agency.
Underdrain	Plastic pipes with holes drilled through the top, installed on the bottom of an infiltration BMP, which are used to collect and remove excess runoff.
Undisturbed Buffer	A zone where development activity shall not occur, including logging, and/or the construction of utility trenches, roads, and/or surface and stormwater facilities.
Uninterruptible Services	Those services to the public which the city has identified as important enough to merit a higher standard of protection against flooding such as hospitals, police, and fire stations.

Unpaved Road	Means a road that consists of gravel, crushed surfacing top course, or other dirt surface that has not received a surfacing coat of asphalt. A road treated with only a dust preventative or dust treatment shall be considered an unpaved road.
Unstable Slopes	Those sloping areas of land which have in the past exhibited, are currently exhibiting, or will likely in the future exhibit, mass movement of earth.
Utility Line	Pipe, conduit, cable or other similar facility by which services are conveyed to the public or individual recipients. Such services shall include but are not limited to water supply, electric power, gas, communications, and sanitary sewers.
Variance	Relief from the application of a Minimum Requirement to a project. See Section 12.16.010 GHMC.
Vegetation	All organic plant life growing on the surface of the earth.
WSDOT Specifications	Means the requirements or standards of the latest edition of the WSDOT Standard Plans and Specifications.
Water Body	Surface waters including rivers, streams, lakes, marine waters, estuaries, and wetlands.
Water Cleanup Plan	See total maximum daily load.
Water Quality	A term used to describe the chemical, physical, and biological characteristics off water, usually in respect to its suitability for a particular purpose.
Water Quality BMP	A BMP specifically designed to control the quality of runoff.
Water Quality Design Storm	For event-based modeling analyses, the 24-hour rainfall amount with a 6-month return frequency. Commonly referred to as the 6-month, 24-hour storm. Continuous modeling does not use individual storm events.
Water Quality Standards	Minimum requirements of purity of water for various uses; for example, water for agricultural use in irrigation systems should not exceed specific levels of sodium bicarbonate, pH, total dissolved salts, etc. In Washington, the Department of Ecology sets water quality standards.
Water Quantity BMP	A BMP specifically designed to control the quantity of runoff.
Water Table	The upper surface or top of the saturated portion of the soil or bedrock layer, indicates the uppermost extent of groundwater.
Water body	Surface waters including rivers, streams, lakes, marine waters, estuaries, and wetlands.

Watercourse	A river, stream, creek, or other course of flowing water which flows intermittently or perennially and discharges into another watercourse or body of water.
Watershed	A geographic region within which water drains into a particular river, stream, or body of water. Watersheds can be as large as those identified and numbered by the State of Washington Water Resource Inventory Areas (WRIAs) as defined in Chapter 173-500 WAC.
Wet Pond	A stormwater treatment pond designed to maintain a continuous or seasonal water level below the pond outlet elevation.
Wetlands	As defined by Title 18 Environment GHMC.
Wet Ponds And Wet Vaults	Drainage facilities for water quality treatment that contain permanent pools of water that are filled during the initial runoff from a storm event. They are designed to optimize water quality by providing retention time in order to settle out particles of fine sediment to which pollutants such as heavy metals absorb, and to allow biologic activity to occur that metabolizes nutrients and organic pollutants.
WSDOT Specifications	Means the requirements or standards of the latest edition of the WSDOT Standard Plans and Specifications.

ACRONYMS

APWA	American Public Works Association (Washington State Chapter)
API	American Petroleum Institute
ADA	Americans with Disabilities Act
APWA	American Public Works Association
ASTM	American Society for Testing and Materials
BFE	Base Flood Elevation
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CEC	Cation Exchange Capacity
CESCL	Certified Erosion and Sediment Control Lead
CIP	Capital Improvement Project or Program
COD	Chemical Oxygen Demand
CWA	Clean Water Act
DNS	Determination of Nonsignificance
EIA	Effective Impervious Areas
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
EIS	Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GHMC	Gig Harbor Municipal Code
HPA	Hydraulic Project Approvals
HSPF	Hydrological Simulation Program—Fortran
IBC	International Building Codes (also I Codes)
JARPA	Joint Aquatic Resources Permit Application
LID	Low Impact Development
MSDS	Material Safety Data Sheets
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NGVD 29	National Geodetic Vertical Datum of 1929
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	Nephlometric Turbidity Unit

O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PAHs	Polyacrylamide Aromatic Hydrocarbons
PAM	Polyacrylamide
PCB	Polychlorinated Biphenyls
PCCD	Pierce County Conservation District
PDD	Planned Development District
PUD	Planned Urban Development
PGIS	Pollution-Generating Impervious Surface
PGPS	Pollution-Generating Pervious Surfaces
PWU	Public Works and Utilities (Gig Harbor)
PGPS	Pollution-Generating Pervious Surface
RCW	Revised Code of Washington
SCS	Soil Conservation Service
SBUH	Santa Barbara Urban Hydrograph method
SEPA	State Environmental Policy Act
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UGA	Urban Growth Area
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
U.S. EPA	The United States Environmental Protection Agency
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WSDOT	Washington State Department of Transportation
WISHA	Washington Industrial Safety and Health Act
WRIA	Water Resource Inventory Area
WWHM	Western Washington Hydrology Model

NOTATIONS

This list of notations is provided only as a guide to some of the notations to be used in a submittal. The exact definition and units are listed when the symbol is used. Since the same symbol can be used for different design methods, the exact definition should be described in the appropriate section of the submittal.

A	=	drainage area (square miles), also full cross-sectional area of culvert barrel (square feet)
A_b	=	top surface area of basin (square feet), also area of pond bottom (square feet)
A_d	=	drainage area
A_s	=	surface area of swale (square feet), also average surface area for detention BMP
A_t	=	total area (acres)
C	=	estimated runoff coefficient
CN	=	SCS runoff curve number
CN	=	change in curve number
D	=	interior height of culvert barrel (feet)
D_{50}	=	median stone diameter (riprap)
d	=	average permanent pool depth of a detention BMP
d_b	=	basin depth (feet)
d_c	=	critical depth (feet)
d_s	=	depth of swale check dam (feet)
d_t	=	time interval in minutes
d_x	=	a mixture of riprap sizes where the percent of stone by weight is less than x (the specified diameter)
E	=	designated fraction of particulates to be removed by a BMP
f	=	final infiltration rate of soil (in/hr)
f_d	=	infiltration rate including a safety factor of two

g	=	acceleration due to gravity, 32.2 ft/sec^2
H	=	stage height (feet) or water depth above pond bottom, also $H=H_f+H_e+H_{ex}$; head on orifice
H_c	=	specific head at critical depth ($d_c + V_c^2/2g$) (feet)
H_d	=	design depth of pond
H_e	=	entrance head loss (feet) = K_c ($V^2/2g$)
H_{ex}	=	exit head loss (feet) = $V^2/2g$)
H_f	=	Friction loss (feet) = $V^2n^2L/2.22R^{1.33}$ Note: if (H_f+TW-L*S) less than D, adjust H_f such that (H_f+TW-L*S) = D. This will keep the analysis simple and still yield reasonable results (erring on the conservative side)
HW	=	headwater depth above inlet invert (feet)
h_b	=	height from the hydraulic grade line at the 2-year recurrence interval flow on the outflow pipe to the overflow elevation
I	=	inflow at time 1 and time 2
I(t)	=	instantaneous hydrograph, in cubic feet per second, (Santa Barbara Urban Hydrograph [SBUH] method)
I	=	hydraulic gradient (ft/ft)
K_e	=	entrance loss coefficient
k	=	time of concentration velocity factor (feet/second)
k_c	=	time of concentration velocity factor; channel flow
k_s	=	time of concentration velocity factor; shallow flow
L	=	distance of flow across a given segment, also length of culvert (feet), also width of emergency overflow weir
MB_{el}	=	mean tributary basin elevation above sea level (feet)
M_s	=	potential average snowmelt during storms (in)
m	=	number of flow segments

N_s = number of check dams along total length of swale

n = Manning's “n”, effective roughness coefficient

n_s = sheet flow; Manning's effective roughness coefficient

O = outflow at time 1 and time 2

P = rainfall depth (inches), total for a storm event

P_R = the total precipitation at a site for the 24-hour design storm event for the given return frequency (R)

Q = flow or discharge (cubic feet per second)

Q_a = after development depth of runoff (inches)

Q_b = before development depth of runoff (inches)

Q_c = depth of runoff from contributing area (feet)

Q_d = runoff depth in inches over a given area

Q_o = average release rate from detention BMP

Q_s = depth of runoff controlled by vegetated swale (inches)

Q_t = release rate for orifice

Q_{total} = total flow at maximum head

Q(t) = the routed flow of the runoff hydrograph (SBUH method)

$Q_{10\%}$ = the flow that is not exceeded more than 10 percent of the time during the months of adult salmonid migration

_Q = change in runoff depth (inches)

_q = change in peak discharge (cubic feet per second)

R = hydraulic radius (feet) in Manning's Equation, equals the cross-sectional area divided by the wetted perimeter

R(t) = the total runoff depth at time increment dt, in inches; also known as precipitation excess

S	=	storage, also culvert barrel slope (ft/ft)
S(H)	=	storage (ft^3) at stage height (H)
S_d	=	the largest volume from an initial pond sizing
s_f	=	friction slope = $n^2V^2/2.22R^{4/3}$
s_o	=	slope of flow path (ft/ft), also bottom slope
T	=	width of swale or vegetated filter strip
T_c	=	time of concentration (hrs)
T_t	=	travel time of overland flow across separate flow path segments
$T_{1,2,n}$	=	the consecutive flow paths of different land cover categories having significant differences in flow path slope
TW	=	tailwater depth above invert of culvert outlet (feet) Note: if TW is less than $(D+d_c)/2$, set $TW=(D+d_c)/2$
t_d	=	design detention time of a BMP
_t	=	time interval; time 2 - time 1
V	=	average velocity across the land cover (ft/sec), also barrel velocity (fps), also mean velocity
V_c	=	flow velocity at critical depth (fps)
V_{max}	=	maximum allowed velocity of runoff in a Biofilter
V_{pp}	=	permanent pool volume
V_r	=	void ratio
V_{sed}	=	settling velocity of the design soil particle
W_{50}	=	the median stone size (riprap)
w	=	settling velocity of target particle
y	=	depth of flow

y_n = normal flow depth

Z = basin side slope ratio (h:v)

Z^1,Z^2 = side slope ratio of swale cross-section (h:v)

_Z = energy coefficient which corrects for the non-uniform distribution of velocity over the channel cross-section