CITY OF SNOQUALMIE

ADDENDUM
TO THE
2016
KING COUNTY SURFACE WATER DESIGN MANUAL

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CITY OF SNOQUALMIE

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TO THE
2016
KING COUNTY SURFACE WATER DESIGN MANUAL

City of Snoqualmie
Department of Public Works
38624 Southeast River Street
Snoqualmie, Washington 98065

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1. INTRODUCTION

The City of Snoqualmie (City) has adopted Surface Water and Stormwater Management regulations in Chapter 15.18 of the Snoqualmie Municipal Code (SMC) that establish a hierarchy of controlling documents, which are (from highest to lowest) as follows:

- Appendix 1 of the Western Washington Phase II Municipal Stormwater Permit;
- Appendix I-E, Flow Control Exempt Surface Waters, of the Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2012, amended in 2014;
- This City of Snoqualmie Addendum to the 2016 King County Surface Water Design Manual; and
- The 2016 King County Surface Water Design Manual (KCSWDM).

The purpose of this addendum is to guide applicants and City reviewers in harmonizing the various requirements of the controlling documents. The fundamental principle is that if a project meets the thresholds, definitions, minimum requirements and variance/exception criteria of a higher priority controlling document, any conflicting thresholds, definitions, minimum requirements and variance/exception criteria of a lower priority document shall not apply. Furthermore, if any provision of the 2016 KCSWDM is in conflict with a requirement of Appendix 1 of the Western Washington Phase II Municipal Stormwater Permit, either directly or by implication, it shall not apply.

In addition, the controlling documents use different terminology, and the 2016 KCSWDM contains many references to King County code sections, maps, and other references. Therefore, this addendum also provides tables identifying the equivalent City code provision, reference, or map where applicable. If there is no equivalent City code provision, reference, or map, the provisions citing King County code provisions, references, or maps do not apply within the City.

Addendum Organization

The information presented in this addendum is organized as follows:

1. **Introduction:** This section, which describes the background and purpose of this document.

2. **Terminology:** At times King County and the City use different terminology to describe or to refer to equivalent subject matter. This section identifies these terms and the City's equivalent terminology.

3. **Definitions:** This section provides the definitions for the key terms used in this addendum. Additional terms are defined in the KCSWDM and the SMC.

4. **Key Revisions:** This section specifically identifies the revisions the City has made to the KCSWDM.

5. **Code Reference Table:** King County code is referenced in many places throughout the KCSWDM. This section identifies these code references and equivalent City code where applicable.

6. **Reference Materials:** This section identifies which reference materials provided in the KCSWDM are applicable and which are not. It also identifies if equivalent City reference materials are available.

7. **Mapping:** City equivalents to the maps referenced in the KCSWDM are included in this section.

8. **References:** Key references from this addendum are provided.

9. **Appendix A:** This appendix includes guidelines for implementing the post-construction soil quality and depth best management practice (BMP)

10. **Appendix B:** This appendix includes a table summarizing the applicable requirements for flow control BMP design and hydrologic modeling requirements for each flow control BMP in the KCSWDM and/or allowed by the City.

11. **Appendix C:** This appendix includes a map showing potential direct discharge areas. It is the City equivalent of the Flow Control Applications Map in the KCSWDM.

2. TERMINOLOGY

Certain terminology in the 2016 KCSWDM is specific to King County. Table 1 lists King County terminology and the City equivalent.

Table 1. King County Terminology and City of Snoqualmie Equivalents.

2016 King County Surface Water Design Manual	City of Snoqualmie Equivalent
2013–2018 NPDES Phase I Permit	2013–2018 NPDES Phase II Permit
Critical Drainage Areas (CDAs)	No direct equivalent; not applicable in the City
Department of Natural Resources and Parks (DNRP) [including the Water and Land Resources (WLR) Division]	City of Snoqualmie Community Development Department
Department of Permitting and Environmental Review (DPER)	City of Snoqualmie Community Development Department
Director	City of Snoqualmie Director of Community Development
Drainage facilities restoration and site stabilization guarantee and drainage defect and maintenance guarantee	Performance bond and maintenance/guarantee bond (per SMC 15.18.100)
King County	City of Snoqualmie
King County Code (KCC)	Snoqualmie Municipal Code (SMC)
King County Designated/Identified Water Quality Problem	This determination is made on a case-by-case basis in the City
King County Road Standards	Chapter 12.16 SMC
Sensitive Areas [Map] Folio	City of Snoqualmie Critical Areas Map
Urban Planned Development (UPD)	Any project that involves preparation of a Master Drainage Plan (MDP)

3. DEFINITIONS AND ABBREVIATIONS

The following terminology is used in this addendum. Several definitions listed below are identical to the KCSWDM definitions, but are provided here for ease of use when applying the requirements of this addendum.

"Agricultural project" means any project proposing agricultural uses such as commercial farming (e.g., row, field, tree, and nursery crop cultivation) or animal husbandry (e.g., cows, goats, and hogs). Other agricultural uses such as commercial greenhouses, large animal veterinarian facilities, and agricultural support services (e.g., farm machinery equipment and supplies, sale, and repair) will need to be evaluated on a case-by-case basis to determine if flow control BMP, flow control facility, and/or water quality facility thresholds are triggered.

"Bioretention" means a stormwater best management practice consisting of a shallow landscaped depression designed to temporarily store and promote infiltration of stormwater runoff. Standards for bioretention design, including soil mix, plants, storage volume and feasibility criteria, are specified in Appendix C of the KCSWDM.

"Critical aquifer recharge area" means the recharge areas of aquifers which serve as a source of drinking water for which there is no feasible alternative source and which, due to prevailing geologic conditions characterized by high infiltration rates, are susceptible to contamination from activities on the surface as defined in SMC 19.12.200.

"CULD" means Conditional Use Level Designation, which is assigned to a new stormwater treatment technology through Ecology's TAPE program. Technologies that have a CULD typically have field monitoring performance data from another part of the country; however, the data was not collected per the TAPE protocol, so additional monitoring is needed in Washington.

"Ecology Appendix 1" means Appendix 1 of the Western Washington Phase II Municipal Stormwater Permit.

"Enhanced Basic" means the menu of water quality treatment with the goal to accomplish better removal of heavy metals and potentially other toxic materials than can be achieved by basic treatment, while still meeting the basic treatment goal of 80% TSS removal. The specific target performance is > 30% reduction of dissolved copper and > 60% removal of dissolved zinc.

"FEMA" means Federal Emergency Management Agency.

"FIRM" means Flood Insurance Rate Map.

"Flow control BMP" means a small-scale drainage facility or feature that is part of a development site strategy to use processes such as infiltration, dispersion, storage, evaporation, transpiration,

forest retention, and reduced impervious surface footprint to mimic predeveloped hydrology and minimize stormwater runoff.

"Flow control facility" means a drainage facility designed to mitigate the impacts of increased storm water runoff generated by site development in accordance with the drainage requirements in SMC Chapter 15.18. Flow control facilities are designed either, to hold water for a considerable length of time and then release it by evaporation, plant transpiration, or infiltration into the ground, or to hold runoff for a short period of time and then release it to the conveyance system.

"GULD" means General Use Level Designation, which is a general acceptance of a new stormwater treatment technology through Ecology's TAPE program. Technologies that have received a GULD can be installed as part of a new development, redevelopment, or retrofit project, subject to conditions that Ecology places within the Use Designation document.

"High-use site" means that area within a commercial or industrial site that typically generates or is subject to runoff containing high concentrations of oil due to high traffic turnover, onsite vehicle or heavy or stationary equipment use, or the frequent transfer of liquid petroleum or coal derivative products.

High-use sites include:

1. The area of a commercial or industrial site that:

    a. Has an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area; or

    b. Is subject to petroleum storage or transfer in excess of 1,500 gallons per year, not including heating oil storage or transfer at the end-user point of delivery; or

    c. Is subject to use, storage, or maintenance of a fleet of 25 or more diesel or jet fuel vehicles that are over 10 tons net weight (trucks, buses, trains, airplanes, tugs, mobile and fuel-driven or hydraulic stationary heavy equipment, etc.); or

2. The interior of any road intersection and that portion of lanes leading into the intersection subject to braking, turning, or stopping, with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway. Projects proposing primarily pedestrian or bicycle use improvements are excluded.

"Impervious surface" means a hard surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions before development; or that causes water to run off the surface in greater quantities or at an increased rate of flow compared to the flow present under natural conditions prior to development (see also "new impervious surface"). Common impervious surfaces include, but are not limited to, roof, walkways, patios, driveways, parking lots, or storage areas, areas that are paved, graveled or made of packed or oiled earthen

materials or other surfaces that similarly impede the natural infiltration of surface water or stormwater. For the purposes of applying the impervious surface thresholds and exemptions contained in this manual, permeable pavement, vegetated roofs, and pervious surfaces with underdrains designed to collect stormwater runoff are considered impervious surface while an open uncovered flow control or water quality facility is not. However, for the purposes of computing runoff, uncovered flow control or water quality facilities shall be modeled as impervious surfaces as specified in the KCSWDM.

"KCSWDM" means the King County Surface Water Design Manual.

"Land disturbing activity" means any activity that results in a change in the existing soil cover (both vegetative and non-vegetative and/or the existing soil topography. Land disturbing activities include, but are not limited to demolition, construction, clearing, grading, filling, excavation, and compaction. Land disturbing activity does not include tilling conducted as part of agricultural practices, landscape maintenance, or gardening.

"Landscape Management Plan" means an approved plan for defining the layout and long-term maintenance of landscaping features to minimize the use of pesticides and fertilizers, and to reduce the discharge of suspended solids and other pollutants.

"Low Impact Development (LID)" means a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of onsite natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

"LID Best Management Practices" means distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs are referred to as flow control BMPs in this manual and include, but are not limited to, bioretention, permeable pavements, roof downspout controls, dispersion, soil quality and depth, and minimal excavation foundations.

"New impervious surface" means 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 pre-existing dirt or gravel. Permeable pavement and vegetated roofs are considered new impervious surface for purposes of determining whether the thresholds for application of minimum requirements are exceeded, as are lawns, landscaping, sports fields, golf courses, and other areas that have modified runoff characteristics resulting from the addition of underdrains designed to collect stormwater runoff. Open, uncovered retention/detention facilities shall not be considered impervious surfaces for 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.

"Pollution generating impervious surface (PGIS)" means an impervious surface considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those that are subject to: vehicular use, industrial activities, or storage of erodible or leachable materials, wastes, or chemicals; and that receive direct rainfall or the run-on or blow-in of rainfall. A covered parking area would be included if runoff from uphill could regularly run through it or if rainfall could regularly blow in and wet the pavement surface. PGIS includes metal roofs unless they are coated with an inert, non-leachable material (see Reference 11-E of the KCSWDM). PGIS includes roofs that are exposed to the venting of significant amounts of dusts, mists, or fumes from manufacturing, commercial, or other indoor activities. PGIS includes vegetated roofs exposed to pesticides, fertilizers, or loss of soil. Other roofing types that may pose risk but are not currently regulated are listed in Reference 11-E of the KCSWDM. Lawns, landscaping, sports fields, golf courses, and other areas that have modified runoff characteristics resulting from the addition of underdrains that have the pollution generating characteristics described under the "pollution-generating pervious surface" definition are also considered PGIS.

"Pollution generating pervious surface (PGPS)" means a non-impervious surface considered to be a significant source of pollutants in surface and stormwater runoff. Such surfaces include those that are subject to vehicular use, industrial activities, storage of erodible or leachable materials, wastes, or chemicals, and that receive direct rainfall or the run-on or blow-in of rainfall; or subject to use of pesticides and fertilizers, or loss of soil. Such surfaces include, but are not limited to, the lawn and landscaped areas of a residential, commercial, or industrial site or land use, golf courses, parks, sports fields (natural and artificial turf), cemeteries, and grassed modular grid pavement.

"Project site" means that portion of a site and any offsite areas subject to proposed project activities, alterations, and improvements.

"Rain garden" means a non-engineered shallow, landscaped depression, with compost-amended native soils and adapted plants. The depression is designed to pond and temporarily store stormwater runoff from adjacent areas, and to allow stormwater to pass through the amended soil profile.

"Redevelopment project" means a project that proposes to add, replace, or modify impervious surface (for purposes other than a residential subdivision or maintenance) on a site that is already substantially developed in a manner consistent with its current zoning or with a legal non-conforming use or has an existing impervious surface coverage of 35 percent or more.

"Replaced impervious surface" means any existing impervious surface on the project site that is proposed to be removed and re-established as impervious surface, excluding impervious surface removed for the sole purpose of installing utilities or performing maintenance on underground infrastructure. For structures, removed means the removal of buildings down to the foundation. For other impervious surfaces, removed means the removal down to base course or bare soil. It does not include the removal of pavement material through grinding or other surface modification unless the entire layer of Portland cement concrete (PCC) or asphalt concrete (AC)

is removed. Replaced impervious surface also includes impervious surface that is moved from one location to another on the project site where the following two conditions are met:

a. The area from which the impervious surface is moved from will be restored to the same or better runoff discharge characteristics as the area being covered by the moved impervious surface, and

b. Impervious surface at the new location is either designated as non-pollution generating or the pollution generating characteristics remain unchanged compared to that of the original location

"Single family residential project" means any project that:

a. Constructs or modifies a single-family dwelling unit,

b. Makes improvements (e.g., driveways, roads, outbuildings, play courts, etc.) or clears native vegetation on a lot that contains or will contain a single-family dwelling unit, or

c. Is a plat, short plat, or boundary line adjustment that creates or adjusts lots that will contain single family dwelling units.

"SWMMWW" means the Ecology Stormwater Management Manual for Western Washington.

"TAPE" means Technology Assessment Protocol – Ecology is a program developed by Ecology that provides protocols for monitoring the performance of new stormwater treatment technologies and a process for reviewing manufacturer performance data and assigning a use level designation.

"Target impervious surface" means that portion of a site's existing, new, and replaced impervious surface from which runoff impacts are required to be mitigated by a particular set of drainage requirements.

"Urban Planned Development (UPD)" means any project that involves preparation of a Master Drainage Plan (MDP).

"Water quality facility" means a drainage facility designed to mitigate the impacts of increased pollutants in stormwater runoff generated by site development. A water quality facility uses processes that include but are not limited to settling, filtration, adsorption, and absorption to decrease pollutant concentrations and loadings in stormwater runoff.

4. KEY REVISIONS TO THE KCSWDM

This section summarizes key revisions to the KCSWDM to address the differences between King County's and the City's organization and processes, as well as to ensure equivalency with Ecology Appendix 1.

CHAPTER 1: DRAINAGE REVIEW AND REQUIREMENTS

Section 1.1: Drainage Review

1.1.2 Drainage Review Types and Requirements

Modifications to Figure 1.1.2.A in the KCSWDM are presented with modifications as Figure 1 below. This figure provides a flow chart for determining what type of drainage review is required. The revised requirements are intended to be consistent with Ecology Appendix 1 and for applicability in the city (which does not have any areas that are located outside of the Urban Growth Area).

Section 1.2: Core Requirements

1.2.1 Core Requirement #1: Discharge at the Natural Location

No changes to this Core Requirement from the KCSWDM.

1.2.2 Core Requirement #2: Offsite Analysis

1.2.2.1.2 Downstream Water Quality Problems Requiring Special Attention

Exclude the section titled Downstream Water Quality Problems Requiring Special Attention.

1.2.2.3 Water Quality Problem Impact Mitigation

Exclude the section titled Water Quality Problem Impact Mitigation.

Figure 1. Flow Chart for Determining Type of Drainage Review Required (modification of KCSWDM Figure 1.1.2.A).

Is the project a ***single family residential project*** or ***agricultural project*** that results in:

- ≥ 2,000 sf of new plus replaced impervious surface or ≥ 7,000 sf of land disturbing activity, AND
- < 5,000 square feet of new plus replaced pollution generating impervious surface (PGIS), AND
- < ¾ acre of pollution generating pervious surfaces (PGPS)

AND does the project meet one of the following criteria:

- The project results in < 5,000 square feet of new plus replaced impervious surface, AND < ¾ acre of new pervious surface.
- For projects on predominately till soils: The project results in no more than 7,947 square feet of target impervious surfaces* as defined in the KCSWDM AND proposed pervious area is equal to or less than 14,941 – 1.88 x (total target impervious surfaces)
- For projects on predominately outwash soils: The project results in no more than 6,872 square feet of target impervious surfaces* as defined in the KCSWDM AND proposed pervious area is equal to or less than 20,343 – 2.96 x (total target impervious surfaces)
- Is an ***agricultural project*** that qualifies for the "Impervious Surface Percentage Exemption for Agricultural Projects" detailed in Core Requirement 3 in the KCSWDM?

No

Yes → SIMPLIFIED DRAINAGE REVIEW
Note: The project may also be subject to Targeted Drainage Review as determined below.

Is the project a ***single family residential project*** or ***agricultural project*** that results in ≥ 2,000 sf of ***new*** plus ***replaced impervious surface*** or ≥ 7,000 sf of ***land disturbing activity*** AND is not subject to *Large Project Drainage Review* as defined in the KCSWDM?

Yes → DIRECTED DRAINAGE REVIEW

No

Does the project result in ≥ 2,000 sf of ***new*** plus ***replaced impervious surface*** or ≥ 7,000 sf of ***land disturbing activity***?

No

Does the project have the characteristics of one or more of the following categories of projects (see more detailed threshold language in the KCSWDM)?

1. Projects containing or adjacent to a ***flood***, ***erosion***, or ***steep slope hazard area***; or projects within a Landslide Hazard Drainage Area.
2. Projects proposing to ***construct or modify*** a drainage pipe/ditch that is 12″ or larger or receives runoff from a 12″ or larger drainage pipe/ditch.
3. ***Redevelopment projects*** proposing ≥ $100,000 in improvements to an existing ***high-use site***.

Yes

No → Reassess whether drainage review is required per KCSWDM

Yes → TARGETED DRAINAGE REVIEW

Does the project involve preparation of a Master Drainage Plan (MDP) OR does it result in ≥ 50 acres of ***new impervious surface*** within a subbasin or multiple subbasins that are hydraulically connected, OR does it have a ***project site*** ≥ 50 acres within a ***critical aquifer recharge area***?

No → FULL DRAINAGE REVIEW

Yes → LARGE PROJECT DRAINAGE REVIEW

1.2.3 Core Requirement #3: Flow Control Facilities

1.2.3.2 B. Methods of Analysis and Design

The approved models for hydrologic analysis are HSPF and the Western Washington Hydrology Model (WWHM). Use of MGSFlood may be approved by the City of on a case-by-case basis.

1.2.4 Core Requirement #4: Conveyance System

No changes to this Core Requirement from the KCSWDM.

1.2.5 Core Requirement #5: Construction Stormwater Pollution Prevention

1.2.5.1 CSWPP Measures

Post-construction soil quality and depth (see Appendix A) is required for all projects that:

1. Create 2,000 square feet or more of new impervious surface.
2. Result in 7,000 square feet or more of land disturbing activity.

1.2.6 Core Requirement #6: Maintenance and Operations

The maintenance and operations procedures in the KCSWDM should be used for guidance, but City specific requirements may be applied on a case-by-case basis.

1.2.7 Core Requirement #7: Financial Guarantees and Liability

In addition to the KCSWDM requirements under Core Requirement #7, City specific requirements for financial guarantees and liability are included in SMC 15.18.100 and 15.18.170.

1.2.8 Core Requirement #8: Water Quality

1.2.8.1 A. Basic WQ Treatment Areas

The City does NOT require Enhanced Basic WQ for the following:

- Residential subdivision development in which the density of single-family units is equal to or greater than 8 units per acre of developed area.

1.2.8.1 B. Sensitive Lake WQ Treatment Areas

These areas are not currently mapped within the City, so requirements will be applied on a case-by-case basis.

1.2.8.1 C. Sphagnum Bog WQ Treatment Areas

These areas are not currently mapped within the City, so requirements will be applied on a case-by-case basis.

1.2.9 Core Requirement #9: Flow Control BMPs

The KCSWDM does not fully address continuous modeling for sizing Flow Control (i.e., Low Impact Development [LID]) BMPs. To address this, the design of selected Flow Control (LID) BMPs included in the KCSWDM have been superseded by alternative design and continuous hydrologic modeling requirements. Table B-1 in Appendix B should be used to identify the applicable requirements for each Flow Control BMP based on the type of drainage review applicable to a project. The manual and handbook names used in Table B-1 in Appendix B and in this section include:

- "Rain Garden Handbook." The "Rain Garden Handbook for Western Washington: A Guide for Design, Installation, and Maintenance" by Washington State University Extension and Kitsap County, 2013, or most recent version. The Rain Garden Handbook applies to rain garden designs in projects subject only to Simplified Drainage Review with less than 5,000 square feet of new or replaced impervious surface area.

- "Puget Sound LID Manual." The "Low Impact Development Technical Guidance Manual for Puget Sound" by the Puget Sound Partnership, December 2012, or most recent version. This document applies to projects subject to Full Drainage Review or Large Project Drainage Review. The 2012 version of the Puget Sound LID Manual should be used where specific section references exist in Table B-1 in Appendix B.

- "SWMMWW." Some sections of the Puget Sound LID manual reference the Stormwater Management Manual for Western Washington (SWMMWW). The 2012 (as amended in 2014) version of the SWMMWW should be used where specific section references exist in Table B-1 in Appendix B.

Clarification: The terms bioretention and rain garden are sometimes used interchangeably. However, for the manuals listed above, the term bioretention is used to describe an engineered facility that includes designed soil mixes and perhaps underdrains and control structures. The term, rain garden, is used to describe a landscape feature to capture stormwater on small project sites. Rain gardens have less restrictive design criteria for the soil mix and usually do not include underdrains and other control structures.

Flow control (LID) BMPs from the most recent version of the SWMMWW and the Puget Sound LID Manual are acceptable for use within the City. Applicable requirements for continuous modeling of Flow Control (LID) BMPs are shown in Table B-1 in Appendix B. The approved models for hydrologic analysis are HSPF and WWHM. Use of MGSFlood may be approved by the City of on a case-by-case basis. Flow control BMP sizing credits in the KCSWDM are still allowed for projects qualifying for Simplified Drainage Review.

Section 1.4: Adjustment Process

An adjustment process specific to the City can be obtained through coordination with the Community Development Director.

CHAPTER 2: DRAINAGE PLAN SUBMITTALS

Section 2.3: Drainage Review Plan Specifications

2.3.1 Engineering Plan Specifications

2.3.1.5 Landscape Management Plans (if applicable)

A landscape management plan is an approved plan for defining the layout and long-term maintenance of landscaping features to minimize the use of pesticides and fertilizers, and reduce the discharge of suspended solids and other pollutants. The City of Snoqualmie does not currently allow landscape management plans to be used as an alternative to the requirement to formally treat (with a facility) the runoff from pollution generating pervious surfaces (PGPS) subject to Core Requirement #8.

CHAPTER 3: HYDROLOGIC ANALYSIS & DESIGN

No changes.

CHAPTER 4: CONVEYANCE SYSTEM ANALYSIS & DESIGN

Section 4.2.1: Pipe Systems

4.2.1.1 Design Criteria

The City has the following specific requirements for storm drain pipe:

1. Publicly maintained underdrains shall be polyvinyl chloride (PVC), minimum diameter of 4 inches.

2. Privately maintained underdrains may be acrylonitrile-butadiene-styrene (ABS), minimum diameter of 3 inches.

3. Pipe bends shall be a minimum of 3-foot radius to allow use of jet rodding or cleaning equipment.

4. Minimum storm drain pipe size shall be 12-inch diameter. Eight-inch-diameter pipe may be permitted on cross street laterals less than 66 feet long to avoid utility conflict or meet shallow gradient.

5. All pipe joints shall be rubber gasketed. Joints for high density polyethylene (HDPE) pipe shall be either heat-fusion butt-joint or flanged joint.

6. In general, minimum cover shall be 2 feet from top of pipe to finish grade and shall be increased as required to provide protection from construction traffic. In all cases, a minimum of 1 foot of cover shall be provided to construction subgrade.

7. Minimum cover for PVC pipe shall be 3 feet from top of pipe to finish grade.

8. The pipe materials included in Table 2 are allowed for use in meeting the requirements of this manual. Refer to the current edition of the Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA) for detailed specifications.

9. Proposed developments should conform to Chapter 3 (Storm Drainage) of the Snoqualmie Ridge II Development Standards.

Table 2. Allowable Pipe Materials and Minimum Cover.

Pipe Type	Pipe Specifications	Minimum Cover (feet)	Minimum Diameter (inches)	Ownership	
				Public	Private
ABS	Not specified	2.0	3.0	No	Yes
Corrugated HDPE pipe with smooth interior	AASHTO M-294 S	2.0	12.0	Yes	Yes
Ductile Iron	AWWA C151	2.0	12.0	Yes	Yes
HDPE	AWWA C906	2.0	12.0	Yes	Yes
PCP	AASHTO M86, Class 2	2.0	12.0	Yes	Yes
PVC	ASTM D-3034 SDR 35 (up to 15-inch diameter) ASTM F-789 Type 1 (18- to 27-inch diameter)	3.0	4.0	Yes	Yes
Profile Wall PVC (Ribbed PVC)	ASTM F-794 and AASHTO M304	2.0	12.0	Yes	Yes
Slotted PVC	ASTM D1785 SCH 40	2.0	3.0 (private) 4.0 (public)	Yes	Yes
RCP	AASHTO M170	2.0	12.0	Yes	Yes

ABS = Acrylonitrile-Butadiene-Styrene
AASHTO = American Association of State Highway and Transportation Officials
ASTM = American Society for Testing and Materials
AWWA = American Water Works Association
HDPE = high density polyethylene PCP = plain concrete pipe
PVC = polyvinyl chloride RCP = reinforced concrete pipe

CHAPTER 5: FLOW CONTROL DESIGN

Note: The City will accept all flow control facilities identified in the most recent version of the SWMMWW. Design and sizing guidance provided in the SWMMWW should be implemented for flow control facilities that are included in the SWMMWW, but are not included in the KCSWDM.

Section 5.1: Detention Facilities

5.1.1 Detention Ponds

5.1.1.1 Design Criteria

Table 3 specifies a mix for stormwater tracts and other intermittently wet areas that replaces the Stormwater Tract "Low-Grow" Seed Mix provided in the KCSWDM. The City's stormwater tract seed mix should be applied at a rate of 31 pounds of pure live seed per acre.

Table 3. Stormwater Tract Seed Mix.

Common Name	Species	Percent Species Composition
American sloughgrass	*Beckmannia syzigachne*	15%
Tufted hairgrass	*Deschampsia cespitosa*	20%
Blue wildrye	*Elymus glaucus*	18%
Native red fescue	*Festuca rubra* var. *rubra*	20%
Meadow barley	*Hordeum brachyantherum*	12%
Northwestern mannagrass	*Glyceria occidentalis*	15%

5.1.4 Control Structures

5.1.4.1 Design Criteria

The minimum allowable orifice diameter has been increased from 0.25 to 0.5 inches.

Section 5.2: Infiltration Facilities

5.2.8 Permeable Pavement (new section)

5.2.8.1 Design Criteria

Underdrain systems will be allowed for permeable pavement designed to meet Core Requirements #3, 8, and/or 9. Requirements associated with the underdrain design, as modified from bioretention underdrain design requirements of the SWMMWW, include:

1. The underdrain should be elevated within the aggregate base course.

2. Slotted subsurface drain PVC per ASTM D1785 SCH 40.

3. Slots should be cut perpendicular to the long axis of the pipe and be 0.04 to 0.069 inches by 1 inch long and be spaced 0.25 inches apart (spaced longitudinally). Slots should be arranged in four rows spaced on 45-degree centers and cover ½ of the circumference of the pipe.

4. Underdrain pipe should have a minimum diameter of 4 inches in the public ROW and 3 inches for private property.

5. Underdrain pipe slope should be no less than 0.5 percent unless otherwise specified by an engineer.

6. Pipe should be placed in aggregate bedding and have a minimum cover depth of 12 inches and bedding depth of 6 inches. Cover depth may be reduced up to 6 inches in order to discharge stormwater from the facility under gravity flow conditions while meeting the applicable engineering standards, if approved by the City.

7. Underdrain aggregate bedding should meet the specifications in Table 4.

8. Underdrains should have a maintenance access point (e.g., cleanout, observation port, overflow structure) at each end of a facility and a minimum of every 100 feet along the pipe. Cleanouts and observation ports should have locking cast iron caps and should be constructed of non-perforated pipe (sized to match the underdrain diameter).

9. If an orifice is included in the design, the minimum diameter should be 0.5 inches to minimize clogging and maintenance requirements.

Table 4. Underdrain Aggregate Bedding.

Sieve Size	Percent Passing
3/4 inch	100 percent
1/4 inch	30 to 60 percent
U.S. No. 8	20 to 50 percent
U.S. No. 50	3 to 12 percent
U.S. No. 200	0 to 1 percent

CHAPTER 6: WATER QUALITY DESIGN

Section 6.1: Water Quality Menus

The City will accept all water quality treatment facilities identified in the most recent version of the SWMMWW with the following additions and alterations:

- They City will allow all emerging technologies that have received a General Use Level Designation (GULD) from Ecology's Technology Assessment Protocol Ecology (TAPE) program: (https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies)

- Emerging technologies that have received a Conditional Use Level Designation (CULD) from Ecology's TAPE program will be considered on a case-by-case basis: (https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies)

- Rain gardens are allowed for small projects with less than 5,000 square feet of new or replaced impervious surface area. However, for a rain garden to meet Enhanced Basic WQ treatment, it must be designed, using an approved continuous runoff model, to infiltrate 91 percent of the influent runoff.

Design and sizing guidance provided in the SWMMWW should be implemented for water quality treatment facilities that are included in the SWMMWW, but are not included in the KCSWDM.

Section 6.8: Bioretention Facility Designs (new section)

6.8.1 Design Criteria

Underdrain systems will be allowed for bioretention facilities designed to meet Core Requirement #8. Requirements associated with the underdrain design, as modified from bioretention underdrain design requirements of the SWMMWW, include:

1. Slotted subsurface drain PVC per ASTM D1785 SCH 40.

2. Slots should be cut perpendicular to the long axis of the pipe and be 0.04 to 0.069 inches by 1 inch long and be spaced 0.25 inches apart (spaced longitudinally). Slots should be arranged in four rows spaced on 45-degree centers and cover 1/2 of the circumference of the pipe.

3. Underdrain pipe should have a minimum diameter of 4 inches in the public ROW and 3 inches for private property.

4. Underdrain pipe slope should be no less than 0.5 percent unless otherwise specified by an engineer.

5. Pipe should be placed in aggregate bedding and have a minimum cover depth of 12 inches and bedding depth of 6 inches. Cover depth may be reduced up to 6 inches in order to discharge stormwater from the facility under gravity flow conditions while meeting the applicable engineering standards, if approved by the City.

6. Underdrain aggregate bedding should meet the specifications in Table 4.

7. Underdrains should have a maintenance access point (e.g., cleanout, observation port, overflow structure) at each end of a facility and a minimum of every 100 feet along the pipe. Cleanouts and observation ports should have locking cast iron caps and should be constructed of non-perforated pipe (sized to match the underdrain diameter).

8. When bioretention facilities with underdrains drain to a retention or detention facility, the subsurface gravel reservoir beneath the underdrain pipe should be widened to extend across the entire facility bottom.

9. If an orifice is included in the design, the minimum diameter should be 0.5 inches to minimize clogging and maintenance requirements.

Appendix A: Maintenance Requirements for Flow Control, Conveyance, and WQ Facilities

The City will accept maintenance criteria from the most recent version of the SWMMWW for additional water quality treatment facilities, flow control facilities, or flow control BMPs that are included in the SWMMWW, but are not included in the KCSWDM.

Appendix B: Master Drainage Plan Objective, Criteria and Components, and Review Process

No changes.

APPENDIX C: SIMPLIFIED DRAINAGE REQUIREMENTS

Section C.1: Simplified Drainage Review Requirements

Section C.1.3: Application of Flow Control BMPs

Required Soil Report, Investigation, and Infiltration Rate Testing

A soils report, prepared by a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington, must be provided for all projects requiring flow control. One exception are those projects that qualify for full dispersion and do not use any other onsite Flow Control (LID) BMPs. In addition to the requirements in the KCSWDM , the soils report must meet the requirements of the Puget Sound LID Manual for projects subject to Simplified Drainage Review or Full (or Large Site) Drainage Review respectively.

The soils report requirements in the Puget Sound LID Manual are similar to those required as part of the TIR under the KCSWDM, but have the following additional requirements:

- Underlying soil texture and stratigraphy on the site
- Depth to hydraulic restriction layer

NOTE: Grain size analysis is not an allowable method for determining an infiltration rate for the LID Performance Standard and infiltration facility sizing.

Section C.2: Flow Control BMPs

See Table B-1 in Appendix B for guidance regarding modeling requirements for Flow Control (LID) BMPs.

Section C.2.6: Bioretention

C.2.7.1: Minimum Design Requirements

Underdrain systems will be allowed for bioretention designed to meet Core Requirement #8, but are not allowed for bioretention designed to meet Core Requirements #3 and/or #9. Underdrains should meet the requirements specified under Section 6.8 (Bioretention Facility Designs) in this addendum if included in a bioretention system designed to meet Core Requirement #8.

Water tolerant plants such as those in Table 5 shall be planted in the bottom of the bioretention facility. Plants native to Western Washington are preferred. Trees outside of the saturated zone are allowed as part of bioretention facility designs.

Table 5. Water Tolerant Plants.		
Common Name	**Scientific Name**	**Spacing (on center)**
California brome	*Bromus carinatus*	12 inches
Common camas	*Camassia quamash*	6 inches
Dagger-leaf rush	*Juncus ensifolius*	12 inches
Dewey sedge	*Carex deweyanna*	12 inches
Sawbeak sedge	*Carex stipata*	12 inches
Sedge	*Carex* spp.	12 inches
Slender rush	*Juncus tenuis*	12 inches
Slough sedge	*Carex obnupta*	24 inches
Small-fruited bulrush	*Scirpus microcarpus*	24 inches
Spike rush	*Eleocharis* spp.	12 inches
Spreading rush	*Juncus patens*	12 inches
Tufted hair grass	*Deschampsia cespitosa*	12 inches
Yellow-eyed grass	*Sisyrinchium californicum*	12 inches

Section C.2.7: Permeable Pavement

C.2.7.1: Minimum Design Requirements

Underdrain systems will be allowed for permeable pavement designed to meet Core Requirements #3, 8, and/or #9. Underdrains should meet the requirements specified under Section 5.2 (Infiltration Facilities) in this addendum if included in a permeable pavement design.

C.2.7.2: Porous Concrete

Test Panel

Production placement of pervious concrete shall not occur until the contractor has completed a test panel of porous concrete pavement that is accepted by the engineer. The contractor shall construct a test panel utilizing a minimum of 7 cubic yards of porous concrete. If multiple pavement section depths are shown on the plans, a test panel shall be constructed for each pavement section depth/thickness. The width of the test panel shall have a width no smaller than the greatest width to be used during the construction and installation of the porous concrete onsite. The test panel(s) shall include at least one joint and at the spacing specified on the plans and specifications. Test panels may be placed non-contiguously. The test panel(s) shall be equivalent and representative of the production porous concrete pavement in all aspects including subbase, depth, joints, method of placement, curing, and preparation. See the WSDOT General Special Provisions (GSPs) for additional criteria regarding the test panel.

Infiltration Rate Confirmation

The porous concrete pavement shall be permeable enough to absorb water at a minimum rate of 100 inches per hour immediately after the pavement surface has been wetted continuously for at least 10 minutes. Compliance with this minimum rate shall be checked prior to construction approval of the pavement. Compliance may be checked using a simple bucket test

in which 5 gallons of water are poured onto the pavement surface all at once from a 5-gallon bucket. If nothing but a scant amount of water puddles or runs off the surface, then the pavement is considered to meet the minimum rate of absorption. If this test is not conclusive, use of ASTM C1701 is recommended using a 12-inch ring sealed at the base to the pavement surface shall be used to measure the actual rate of absorption. At least one test should be conducted per 1,000 square feet of permeable pavement. As an alternative for large areas (e.g., parking areas), testing observation may be accomplished while walking behind a slowly moving water truck discharging water at an acceptable rate for the test (observable volume and rate of application similar, at least, to the bucket test).

C.2.7.3: Porous Asphaltic Concrete

Infiltration Rate Confirmation

A simple bucket test or ASTM C1701 is also required for post-construction infiltration rate verification of porous asphaltic concrete. Refer to the minimum infiltration rate and number of tests specified under porous concrete.

C.2.7.4: Permeable Pavers

Infiltration Rate Confirmation

A simple bucket test or ASTM C1781 is also required for post-construction infiltration rate verification of porous asphaltic concrete. Refer to the minimum infiltration rate and number of tests specified under porous concrete.

Section C.3 Construction Stormwater Pollution Prevention (CSWPP) Measures

C.3.10: Seeding

Table 6 provides a recommended mix for landscaping seed that should replace the landscaping seed mix in the KCSWDM. The City's seed mix should be applied at 19 pounds of pure live seed per acre.

Table 6. Landscaping Seed Mix.

Common Name	Species	Percent Species Composition
Sideoats grama	*Bouteloua curtipendula*	20%
California oatgrass	*Danthonia californica*	20%
Native red fescue	*Festuca rubra* var. *rubra*	30%
Prairie Junegrass	*Koeleria macrantha*	30%

APPENDIX D: CONSTRUCTION STORMWATER POLLUTION PREVENTION

Section D.2 General CSWPP Requirements

D.2.1 ESC Measures

D.2.1.2.6: Temporary and Permanent Seeding

Table 6 (in Section C.3 above) provides a recommended mix for landscaping seed that should replace the landscaping seed mix in the KCSWDM. The City's seed mix should be applied at 19 pounds of pure live seed per acre.

Table 7 provides a recommended mix for low-growing turf seed that should replace the low-growing turf seed mix in the KCSWDM. The City's seed mix should be applied at a rate of 10 pounds of pure live seed per acre. This mix is for use in dry situations where there is no need for watering and requires very little maintenance.

Table 7. Low-Growing Turf Seed Mix.

Common Name	Species	Percent Species Composition
Hard fescue	*Festuca brevipila*	25%
Sheep fescue	*Festuca ovina*	30%
Native red fescue	*Festuca rubra* var. *rubra*	25%
Prairie Junegrass	*Koeleria macrantha*	20%

5. CODE REFERENCE TABLE

The King County Code is referenced in many places throughout the KCSWDM. Table 8 identifies these code references and equivalent City code where applicable.

Table 8. King County Code Reference and Snoqualmie Municipal Code Equivalent.

King County Code Reference	Subject of Reference	Snoqualmie Municipal Code Equivalent	Comment
KCC 2.98	Adoption Procedures	Chapter 2.05	
KCC 2.98	Critical Drainage Areas (CDAs)	No equivalent	There are no critical drainage areas within the City of Snoqualmie
Title 9	Surface Water Management	Chapter 15.18	
KCC 9.04	Surface Water Runoff Policy: Variances	Chapter 15.18	
KCC 9.04	Stormwater Runoff and Surface Water and Erosion Control	No equivalent	In the absence of equivalent SMC, the City will use the King County Code for all general references to Section 9.04 KCC
KCC 9.04.030	Definitions: Targeted Drainage Review/ abbreviated evaluation	No equivalent	In the absence of equivalent SMC, the City will use King County's definition
KCC 9.04.030	Drainage Review – when required – type	15.18.050	Thresholds are identified in Figure 1 above
KCC 9.04.030	Full Drainage Review	No equivalent	The SMC does not list additional drainage review requirements and relies on the KCSWDM
KCC 9.04.050	Drainage Review Requirements	No equivalent	See Figure 1 above and the KCSWDM for requirements specific to each type of drainage review
KCC 9.04.070	Engineering plans for the purposes of drainage review	No equivalent	See KCSWDM for description of engineering plans required for drainage review
KCC 9.04.090	Construction timing and final approval	15.18.080	
KCC 9.04.100	Liability insurance required	15.18.170	
KCC 9.04.115	Drainage facilities accepted by King County for maintenance	15.18.110	
KCC 9.04.120	Drainage facilities not accepted by King County for maintenance	15.18.120	

Table 8 (continued). King County Code Reference and Snoqualmie Municipal Code Equivalent.			
King County Code Reference	**Subject of Reference**	**Snoqualmie Municipal Code Equivalent**	**Comment**
KCC 9.05.050	Drainage review requirements	Not applicable	King County Code section does not exist. Presumed typo. See KCC 9.04.05.
KCC 9.12.025	Prohibited, allowable, and conditional discharges	15.18.150	
KCC 9.12	Water Quality	No equivalent	Refer to the King County Stormwater Pollution Prevention Manual and SMC 15.18.150 for illicit discharge regulations
KCC 9.12.035	Stormwater Pollution Prevention Manual	15.18.150	
Title 10	Seattle-King County Department of Public Health solid waste regulations	8.14.010	
KCC 16.62	Erosion and Sediment Control	Not applicable	King County Code section does not exist. Presumed typo. See KCC 16.82 below.
KCC 16.82	Clearing and Grading Code	15.20	
KCC 16.82	Clearing and Grading Code: Bridge Design	No equivalent	In the absence of City standards for bridge design, the City will rely on King County Road Design and Construction standards and the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction.
KCC 16.82	Clearing and Grading Code: Seasonal Limitations	No equivalent	In the absence of City standards for seasonal limitations on clearing and grading, the City will rely on King County standards.
KCC 16.82.095(A)	Erosion and sediment control standards	15.20.070	
KCC 16.82.100(F)	Retain duff layer of top soil	15.20.060 (B.2.a)	
KCC 16.82.100(G)	Restore native soil moisture holding capacity	15.20.060 (B.2.b)	
KCC 16.82.150	Clearing standards for individual lots in the rural zone	No equivalent	Does not apply
KCC 16.82.150(C)	Rural stewardship plan or the farm management plan	19.12.040	The City requires a Farm Plan for agricultural activities conducted in a critical area. The Farm Plan must be approved by the King Conservation District and the City.
KCC 16.85	Clearing and Grading Code: Flood protection facilities	Not applicable	King County Code section does not exist. Presumed typo. See KCC 16.82 above.

Table 8 (continued). King County Code Reference and Snoqualmie Municipal Code Equivalent.			
King County Code Reference	**Subject of Reference**	**Snoqualmie Municipal Code Equivalent**	**Comment**
KCC 20.20 or Title 20.20	Land use review procedures	No equivalent	
KCC 20.70.020	Critical aquifer recharge area	19.12.200	
KCC 21A or Title 21A	Critical Areas Requirements	Chapter 19.12	
KCC 21A.06	Definitions: Erosion Hazard Area	19.12.020	
KCC 21A.06	Definitions: Flood Hazard Area	15.12.040	"Area of special flood hazard" the term used in the SMC.
KCC 21A.06	Definitions: Landslide Hazard Area	19.12.020	
KCC 21A.06	Definitions: Steep Slope Hazard Area	19.12.020	
KCC 21A.06	Definitions: Structure	15.12.040	
KCC 21A.06	Definitions: Critical Aquifer Recharge Area	19.12.020	
KCC 21A.06	Definitions: (Nonconversion) Forest Practices	19.12.100	References a DNR-approved forest practice permit.
KCC.21A.06.1340	Urban Planned Development (UPD) land use designation	No equivalent	The City does not currently have any UPD code language or UPD land use zoning, but would consider these requirements to apply to any project that involves preparation of a Master Drainage Plan (MDP).
Chapter 21A.08 KCC	Definitions: Land Zoned for Agriculture (A zoned lands)	17.55.020	The City does not currently contain an agricultural zone; however, agricultural uses such as commercial greenhouses, commercial farms/U-pick, and large animal veterinarian facilities are allowed in certain zones.
KCC 21.A12	Definitions: Urban Residential Development	17.15.020	The City has a Planned Residential (PR) district.
KCC 21A.12.030	Densities and dimensions – residential zones	17.15.040	
KCC 21A.14.180	On site recreation – space required	17.15.060	
KCC 21A.14.180.D	Indoor recreation space requirements	17.15.060	
KCC 21A.24	Critical Areas Code: 100-Year Floodplain	15.12.040	"Base flood" is used interchangeably with the term "100-year flood" in the SMC.

Table 8 (continued). King County Code Reference and Snoqualmie Municipal Code Equivalent.			
King County Code Reference	**Subject of Reference**	**Snoqualmie Municipal Code Equivalent**	**Comment**
KCC 21A.24	Critical Areas Code: Bridge Design	No equivalent	In the absence of City standards for bridge design, the City will rely on King County Road Design and Construction standards and the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction
KCC 21A.24	Critical Areas Code: Bridge pier and abutment locations	No equivalent	In the absence of City standards for bridge and pier location, the City will rely on King County Road Design and Construction standards and the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction
KCC 21A.24	Critical Areas Code: Critical Area Buffers	Chapter 19.12	
KCC 21A.24	Critical Areas Code: Building Setbacks	19.12.090	
KCC 21A.24	Critical Areas Code: Channel Migration Zone	19.12.140	
KCC 21A.24	Critical Areas Code Definition: Streams	19.12.020	
KCC 21A.24	Critical Areas Code: Requirements of crossing streams	19.12.160	
KCC 21A.24	Critical Areas Code Definition: Wetlands/ Wetland Soils	19.12.020	
KCC 21A.24	Critical Areas Code: Fish Passage Requirements	No equivalent	
KCC 21A.24	Critical Areas Code: Flood Hazard Area regulations	Chapter 15.12	
KCC 21A.24	Critical Areas Code: Floodplain/Floodway Delineation	15.12.120	The City relies on the Flood Insurance Rate Map (FIRM) developed by the Federal Emergency Management Agency (FEMA) which absorbed the Federal Insurance Administration listed in the SMC. The SMC does refer to an appeals process for contested FIRM boundaries.
KCC 21A.24	Critical Areas Code: Flood Protection Facility	15.12.040	The City uses the terminology "flood barrier."
KCC 21A.24	Critical Areas Code: Notice on Title	19.12.080	
KCC 21A.24	Critical Areas Code: Regulation of Wetlands	19.12.170	

Table 8 (continued). King County Code Reference and Snoqualmie Municipal Code Equivalent.			
King County Code Reference	**Subject of Reference**	**Snoqualmie Municipal Code Equivalent**	**Comment**
KCC 21A.24	Critical Areas: zero-rise and compensatory storage provisions	15.12.170	The SMC does not use "zero-rise" or "compensatory storage" terminology, but does require "no increase in flood levels during the occurrence of the base flood discharge."
KCC 21A.24	Definitions: Critical Area Ordinance (CAO)	No equivalent	
KCC 21A.24	Farm Management Plans	19.12.040	The City requires a Farm Plan for agricultural activities conducted in a critical area. The Farm Plan must be approved by the King Conservation District and the City.
KCC 21A.24	Floodplain Development Standards: Bridges	No equivalent	In the absence of City standards for bridge design, the City will rely on King County Road Design and Construction standards and the WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction*.
KCC 21A.24.100	Critical area review	19.12.060	
KCC 21A.24.110	Critical area report requirement	19.12.060	
KCC 21A.24.170	Notice of critical areas	19.12.080	
KCC 21A.24.230	Flood hazard areas – components	Chapter 15.12	
KCC 21A.24.270	Flood hazard areas – certification by land surveyor	15.12.160	
KCC 21A.24.275	Channel migration zones – development standards and alterations	19.12.160	
Title 25	Shoreline Management	Chapter 19.08	
Title 25	Shoreline Management: Bridge Design	Not applicable	

6. REFERENCE MATERIALS

Table 9 identifies which reference materials in the KCSWDM are applicable and which are not.

Table 9. King County Reference Material and City of Snoqualmie Equivalent.

King County Surface Water Design Manual Reference Material Document	King County Reference Document Applicability	Equivalent City of Snoqualmie Reference Document
1. KCC 9.04 Surface Water Runoff Policy	No	Chapter 15.18
2. Adopted Critical Drainage Areas	No	Does not apply
3. Other Adopted Area Specific Drainage Requirements	No	Does not apply
4. Other Drainage Related Regulations and Guidelines		
4.A. Grading Code Soil Amendment Standard	No	Refer to Appendix A of this addendum
4.B. Clearing and Grading Seasonal Limitations	Yes	
4.C. Landscape Management Plan Guidelines	No	
4.D. Shared Facility Maintenance Responsibility Guidance	Yes	
5. Wetland Hydrology Protection Guidelines	Yes	
6. Hydrologic/Hydraulic Design Methods		
6.A. Infiltration Rate Test Methods	Yes	
6.B. Pond Geometry Equations	Yes	
6.C. Introduction to Level Pool Routing	Yes	
6.D. Supplemental Modeling Guidelines	Yes	
7. Engineering Plan Support		
7.A. King County Standard Map Symbols	Yes	
7.B. Standard Plan Notes and Example Construction Sequence	Yes	
7.C. Stormfilter Facility Access and Cartridge Configuration	No	See Resource Tools at Vendor Website: www.conteches.com/products/stormwater-management/treatment/stormwater-management-stormfilter
8. Forms and Worksheets		
8.A. Technical Information Report (TIR) Worksheet	Yes	
8.B. Offsite Analysis Drainage System Table	Yes	
8.C. Water Quality Facility Sizing Worksheets	Yes	
8.D. Flow Control and Water Quality Facility Summary Sheet and Sketch	Yes	

Table 9 (continued). King County Reference Material and City of Snoqualmie Equivalent.		
King County Surface Water Design Manual Reference Material Document	**King County Reference Document Applicability**	**Equivalent City of Snoqualmie Reference Document**
8. Forms and Worksheets (continued)		
8.E. CSWPP Worksheet Forms	Yes	
8.F. Adjustment Application and Process Guidelines	Yes	
8.G. Dedication and Indemnification Clause – Final Reporting	No	
8.H. Bond Quantities Worksheet	Yes	
8.I. Maintenance and Defect Agreement	No	Case-by-case
8.J. Drainage Facility Covenant	No	Case-by-case
8.K. Drainage Release Covenant	No	Case-by-case
8.L. Drainage Easement	No	Case-by-case
8.M. Flow Control BMP Covenant and BMP Maintenance Instructions (recordable format)	No	Case-by-case
8.N. Impervious Surface Limit Covenant	No	Case-by-case
8.O. Clearing Limit Covenant	No	Case-by-case
8.P River Protection Easement	No	Case-by-case
8.Q. Leachable Metals Covenant	No	Case-by-case
9. Interim Changes to Requirements		
9.A. Blanket Adjustments	No	
9.B. Administrative Changes	No	
10. King County-Identified Water Quality Problems	No	
11. Materials		
11.C. Bioretention Soil Media Standard Specifications	Yes	
11.E. Roofing Erodible or Leachable Materials	Yes	
14. Supplemental Approved Facilities		
14.A. Approved Proprietary Facilities	No	
14.B. Approved Public Domain Facilities	No	

7. MAPPING

City of Snoqualmie equivalents to the maps referenced in the KCSWDM are included in Table 10.

Table 10. City of Snoqualmie Map Equivalents Referenced by KCSWDM.

KCSWDM Maps	City of Snoqualmie Map Equivalent
Flow Control Applications Map	City of Snoqualmie Potential Direct Discharge Areas (included in Appendix C of this addendum)
Landslide Hazard Drainage Areas Map	City of Snoqualmie Landslide, Erosion, and Seismic Hazard Areas
Water Quality Applications Map	None available
Flood Hazard area as defined in KCC 21A.06	See Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM)
Erosion Hazard Area as defined in KCC 21A.06	City of Snoqualmie Landslide, Erosion, and Seismic Hazard Areas
King County Critical Aquifer Recharge Area Map	Critical Aquifer Recharge Area shown on the City of Snoqualmie Sensitive Areas Map in the Snoqualmie Comprehensive Plan (Environment element)
King County Comprehensive Plan Land Use Map	City of Snoqualmie Official Zoning Map

8. REFERENCES

Ecology. 2012 (or most recent version). Western Washington Phase II Municipal Stormwater Permit: National Pollutant Discharge Elimination System and State Waste Discharge General Permit. Prepared by the Washington State Department of Ecology. Issued August 2012; effective August 2013; modified January 2014.

Ecology. 2014 (or most recent version). Stormwater Management Manual for Western Washington. Publication No. 14-10-055. Prepared by the Washington State Department of Ecology. 2012 SWMMWW as amended in December 2014.

King County. 2016. Surface Water Design Manual. Prepared by the King County Department of Natural Resources and Parks. April.

WSU and Kitsap County. 2013 (or most recent version). Rain Garden Handbook for Western Washington: A Guide for Design, Installation, and Maintenance. Prepared for the Washington State Department of Ecology by the Washington State University Extension and Kitsap County. June.

WSU and PSP. 2012 (or most recent version). Low Impact Development Technical Guidance Manual for Puget Sound. Prepared by the Washington State University Extension and Puget Sound Partnership. December.

APPENDIX A

Post-Construction Soil Quality and Depth Requirements

POST-CONSTRUCTION SOIL QUALITY AND DEPTH BMP

PURPOSE AND DEFINITION

Naturally occurring (undisturbed) soil and vegetation provide important stormwater functions including: water infiltration; nutrient, sediment, and pollutant adsorption; sediment and pollutant biofiltration; water interflow storage and transmission; and pollutant decomposition.

These functions are largely lost when development strips away native soil and vegetation and replaces it with minimal topsoil and sod. Not only are these important stormwater functions lost, but such landscapes themselves become pollution generating pervious surfaces due to increased use of pesticides, fertilizers and other landscaping and household/industrial chemicals, the concentration of pet wastes, and pollutants that accompany roadside litter.

Establishing soil quality and depth regains greater stormwater functions in the post development landscape, provides increased treatment of pollutants and sediments that result from development and habitation, and minimizes the need for some landscaping chemicals, thus reducing pollution through prevention.

APPLICABLE SURFACES

Establishing a minimum soil quality and depth is not the same as preservation of naturally occurring soil and vegetation. However, establishing a minimum soil quality and depth will provide improved on-site management of stormwater flow and water quality.

Soil organic matter can be attained through numerous materials such as compost, composted woody material, biosolids, and forest product residuals. It is important that the materials used to meet the post-construction soil quality and depth best management practice (BMP) be appropriate and beneficial to the plant cover to be established. Likewise, it is important that imported topsoils improve soil conditions and do not have an excessive percent of clay fines.

INFEASIBILITY CRITERIA

The post-construction soil quality and depth BMP can be considered infeasible on till soil slopes greater than 33 percent.

DESIGN GUIDELINES

- **Soil retention.** Retain, in an undisturbed state, the duff layer and native topsoil to the maximum extent practicable. In any areas requiring grading remove and stockpile the duff layer and topsoil on site in a designated, controlled area, not adjacent to public resources and critical areas, to be reapplied to other portions of the site where feasible.

- **Soil quality.** All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility or engineered as structural fill or slope shall, at project completion, demonstrate the following:

    1. A topsoil layer with a minimum organic matter content of 10% dry weight in planting beds, and 5% organic matter content in turf areas, and a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil. The topsoil layer shall have a minimum depth of eight inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria. Subsoils below the topsoil layer should be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.

    2. Mulch planting beds with 2 inches of organic material

    3. Use compost and other materials that meet these organic content requirements:

        a. The organic content for "pre-approved" amendment rates can be met only using compost meeting the compost specification for Bioretention (refer to Section C.2.6 in the KCSWDM), with the exception that the compost may have up to 35% biosolids or manure.

            The compost must also have an organic matter content of 40% to 65%, and a carbon to nitrogen ratio below 25:1.

            The carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.

        b. Calculated amendment rates may be met through use of composted material meeting "a" above; or other organic materials amended to meet the carbon to nitrogen ratio requirements, and not exceeding the contaminant limits identified in Table 220-B, Testing Parameters, in WAC 173-350-220.

The resulting soil should be conducive to the type of vegetation to be established.

- Implementation Options: The soil quality design guidelines listed above can be met by using one of the methods listed below:

    1. Leave undisturbed native vegetation and soil, and protect from compaction during construction.

    2. Amend existing site topsoil or subsoil either at default "pre-approved" rates, or at custom calculated rates based on tests of the soil and amendment.

    3. Stockpile existing topsoil during grading, and replace it prior to planting. Stockpiled topsoil must also be amended if needed to meet the organic matter or depth requirements, either at a default "pre-approved" rate or at a custom calculated rate.

    4. Import topsoil mix of sufficient organic content and depth to meet the requirements.

More than one method may be used on different portions of the same site. Soil that already meets the depth and organic matter quality standards, and is not compacted, does not need to be amended.

Runoff Model Representation

Areas meeting the design guidelines shall be entered into approved runoff models as "Pasture" rather than "Lawn."

Flow reduction credits can be taken in runoff modeling when the Post-Construction Soil Quality and Depth BMP is used as part of a dispersion design under the conditions described in:

- Full Dispersion (for public road projects) (Section C.2.1 in the KCSWDM)
- Limited Infiltration (Section C.2.3 in the KCSWDM)
- Basic Dispersion (Section C.2.4 in the KCSWDM)

Planning and Permitting

A site-specific Soil Management Plan (SMP) must be approved as part of the clearing and grading or construction permit application.

The Soil Management Plan (SMP) includes:

- A scale-drawing (11" x 17" or larger) identifying area where native soil and vegetation will be retained undisturbed, and which soil treatments will applied in landscape areas.

- A completed SMP form identifying treatments and products to be used to meet the soil depth and organic content requirements for each area (see example provided in Attachment 1).

- Computations of compost or topsoil volumes to be imported (and/or site soil to be stockpiled) to meet "pre-approved" amendment rates; or calculations by a qualified professional to meet organic content requirements if using custom calculated rates. Qualified professionals include certified Agronomists, Soil Scientists or Crop Advisors; and licensed Landscape Architects, Civil Engineers, or Geologists.

- Copies of laboratory analyses for compost and topsoil products to be used, documenting organic matter contents and carbon to nitrogen ratios.

Additional guidance on developing a SMP, calculating required compost or topsoil volumes, and where to find permitted composting facilities can be found in the Building Soil Manual: <http://soilsforsalmon.org/pdf/Soil_BMP_Manual.pdf>.

Inspection and Verification Procedures

Inspection and verification should be performed by appropriate City inspectors or contractors. Some verification may be made by supervising Landscape Architects or Civil Engineers, who submit signed certification that the approved SMP had been implemented.

The following is an outline of a preferred inspection schedule and tasks:

Depending on local resources and procedures, the inspection tasks may be consolidated into fewer visits.

1. Pre-Construction Inspection

    - Verify delineation and fencing off of native soils and vegetation to be left undisturbed, per the SMP.

    - Review the SMP with the general contractor to ensure that topsoil stockpiling and other specified measures are incorporated into the work plan.

2. During Construction Inspection

    - Verify that proper erosion control methods are being implemented.

    - Verify that excavation and stockpiling of native soils follows the SMP.

    - Verify that subgrades are consistent with the SMP.

3. Post-Construction Inspection

   Preferably prior to planting, so that omissions can easily be corrected:

   - Verify that compost, mulch, topsoil and amendment delivery tickets match volumes, types and sources approved in the SMP. If materials other than those approved in the SMP were delivered, submissions by the supplier should verify that they are equivalent to approved products.
   - Check soil for compaction, scarification and amendment incorporation.
   - Verify depth of organic mulch material on all planting beds.

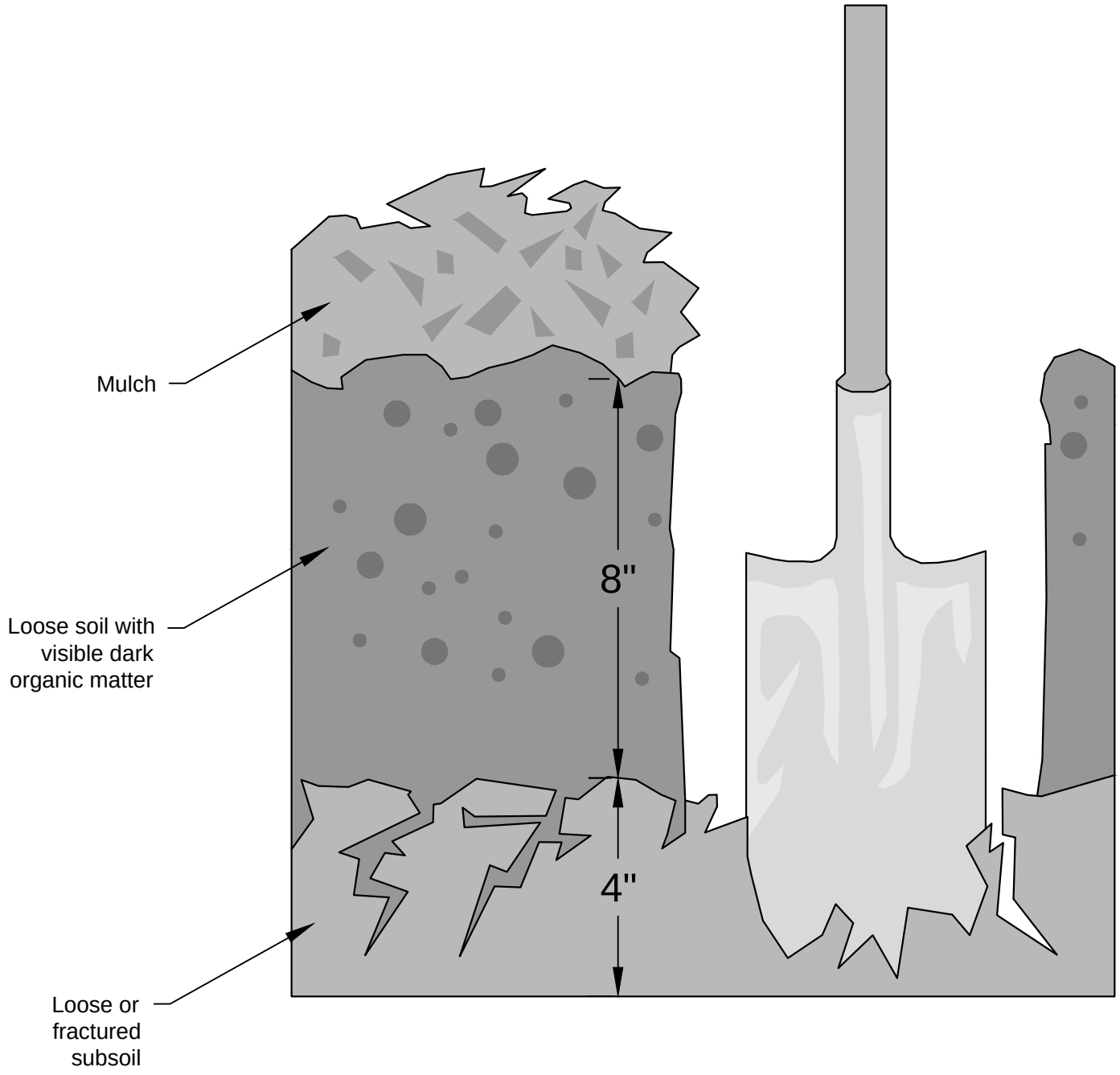
Secondary Verification for Failing Sites

If the inspector believes the installation does not meet the approved permit conditions, additional testing may be ordered to determine whether remediation steps are required prior to final occupancy and payment. An independent City-approved consultant (Certified Soil Scientist, Crop Advisor, or Agronomist; or Licensed Landscape Architect, Civil Engineer, or Geologist) should conduct the following additional sampling and analysis:

- Organic matter content should be verified by an independent soil testing service, using the Loss on Ignition method.
- If necessary, the percentage of fine particles (less than #200 mesh) shall be confirmed by a certified Soil Laboratory using a wet sieve test.
- At present, an analytical method for verifying scarification has not been identified. Verification may be a matter of professional opinion.

MAINTENANCE

- Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.
- Plant vegetation and mulch the amended soil area after installation.
- Leave plant debris or its equivalent on the soil surface to replenish organic matter.
- Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.



Reprinted from *Guidelines and Resources For Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington*, 2010, Washington Organic Recycling Council

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Planting Bed Cross-Section

Revised June 2016

ATTACHMENT 1

Model Soil Management Plan

Model SOIL MANAGEMENT PLAN for BMP T5.13

(available as MS Word file at www.SoilsforSalmon.org)

PROJECT INFORMATION **Page # ____ of ____ pages**

Complete all information on page 1; only site address and permit number on additional pages.

Site Address / Lot No.: _____	
Permit Type:	**Permit Number:**
Permit Holder:	**Phone:**
Mailing Address: _____	
Contact Person:	**Phone:**
Plan Prepared By:	

ATTACHMENTS REQUIRED (*Check off required items that are attached to this plan*)

___ **Site Plan showing, to scale:**	___ Areas of undisturbed native vegetation (no amendment required) ___ New planting beds and turf areas (amendment required) ___ Type of soil improvement proposed for each area
___ **Soil test results (required if proposing custom amendment rates)**	
___ **Product test results for proposed amendments**	

AREA #_____ (*should match Area # on Site Plan*)

PLANTING TYPE ___ Turf ___ Planting Beds	___ Undisturbed native vegetation ___ Other: _____	
SQUARE FOOTAGE OF THIS AREA: _____ square feet		
SCARIFICATION ___ Subsoil will be scarified	___ inches (depth) of scarification needed to achieve finished total 12" loosened depth.	
PRE-APPROVED AMENDMENT METHOD: ___ Topsoil import Amend with compost ___ Stockpile and amend (_____ cu. yds. stockpiled)	____inches of compost or imported topsoil applied X 3.1 (*conversion factor, inches to cubic yards*) _____= cu. yards per 1,000 sq. ft. X ,000s sq.ft. in this area _____ = cubic yards of amendment → → → → → (*needed to cover this area to designated depth*)	PRODUCT:_____ _____ QUANTITY:_____CU. YDS.
CUSTOM AMENDMENT ___ Topsoil import ___ Topsoil & compost lift ___ Amend ___ Stockpile and amend (____ cu. yds. stockpiled)	**Attach test results and calculations.** ____ inches organic matter or topsoil import X 3.1 _____= cu. yards / 1,000 sq. ft. X ___ ,000s sq.ft. in this area ____ = cubic yards of amendment → → → → →	PRODUCT:_____ _____ QUANTITY:_____CU. YDS.
MULCH	___ ,000 sq.ft. X 6.2 (*conversion, to give 2 inch mulch depth*) ____ = cubic yards of mulch → → → → → →	PRODUCT:_____ QUANTITY:_____CU. YDS.

TOTAL AMENDMENT/TOPSOIL/MULCH FOR ALL AREAS (*complete on page 1 only, totaling all areas/pages in this Plan*)

❑ **Product #1:** _____	❑ **Quantity:** _____**cu. yds.**
❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants)	____ **"stable"** (yes/no)
❑ **Product #2:** _____	❑ **Quantity:** _____**cu. yds.**
❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants)	____ **"stable"** (yes/no)
❑ **Product #3:** _____	❑ **Quantity:** _____**cu. yds.**
❑ **Test Results: ___ % organic matter ____C:N ratio <25:1** (except mulch, or <35:1 for native plants)	____ **"stable"** (yes/no)

Date:	**Inspector:**	**Approved:**	**Revisions Required:**
Date:	**Inspector:**	**Approved:**	**Revisions Required:**

COMMENTS: _____

_____

APPENDIX B

Flow Control BMP Design and Hydrologic Modeling Requirements

Table B-1. Flow Control BMP Design References and Hydrologic Modeling Requirements or Credits.				
	Applicable Requirements for Projects within the City of Snoqualmie by Drainage Review Type			
	Simplified Drainage Review		All Other Reviews Requiring BMP Design	
Flow Control BMP	Design Requirement Reference	Hydrologic Modeling Requirement	Design Requirement Reference	Hydrologic Modeling Requirement/Credit
Post-Construction Soil Quality and Depth	City's Addendum Appendix A	Optional	City's Addendum Appendix A	City's Addendum Appendix A
Full Dispersion	KCSWDM Appendix C, Section C.2.1	Optional	KCSWDM Appendix C, Section C.2.1	KCSWDM methods are acceptable unless Flow Control (LID) BMPs in series are discharged to the dispersion device. This is not explicitly permitted in the KCSWDM but may be allowed on a case-by-case basis. In such cases, a written modeling approach that documents how hydrologic modeling will be applied to demonstrate that the flow will be reliably dispersed from the site must be provided. That plan must be approved by the City prior to drainage plan submittal.
Full Infiltration	KCSWDM Appendix C, Section C.2.2	Optional	KCSWDM Section 5.4	KCSWDM Section 3
Limited Infiltration	KCSWDM Appendix C, Section C.2.3	Optional	KCSWDM Appendix C, Section C.2.3	Apply sizing credits from KCSWDM Table 1.2.9.A
Basic Dispersion • Splash blocks • Rock pads • Gravel filled trenches • Sheet flow	KCSWDM Appendix C, Section C.2.4	Optional	KCSWDM Appendix C, Section C.2.4	Apply sizing credits from KCSWDM Table 1.2.9.A

Table B-1 (continued). Flow Control BMP Design References and Hydrologic Modeling Requirements or Credits.

Flow Control BMP	Applicable Requirements for Projects within the City of Snoqualmie by Drainage Review Type			
	Simplified Drainage Review		All Other Reviews Requiring BMP Design	
	Design Requirement Reference	Hydrologic Modeling Requirement	Design Requirement Reference	Hydrologic Modeling Requirement/Credit
Bioretention	KCSWDM Appendix C, Section C.2.6 City's Addendum	Optional	KCSWDM Appendix C, Section C.2.6 City's Addendum	2014 SWMMWW Vol. III, Appendix III-C; WWHM 2012 or equivalent 2019 SWMMWW Vol. V, Section V-5
Rain Garden	Rain Garden Handbook	91% infiltration	Not applicable	Not applicable
Permeable Pavement	KCSWDM Appendix C, Section C.2.7 City's Addendum	Optional	KCSWDM Appendix C, Section C.2.7 City's Addendum	2014 SWMMWW Vol. III, Appendix III-C; WWHM 2012 or equivalent 2019 SWMMWW Vol. V, Section V-5
Rainwater Harvesting	KCSWDM Appendix C, Section C.2.8	Optional	KCSWDM Appendix C, Section C.2.8	2014 SWMMWW Vol. III, Appendix III-C; WWHM 2012 or equivalent 2019 SWMMWW Vol. V, Section V-11
Vegetated Roof	2014 SWMMWW Vol. V, Section V-5.3 2019 SWMMWW Vol. V, Section V-11 Puget Sound LID Manual Section 6.5	Optional	2014 SWMMWW Vol. V, Section V-5.3 2019 SWMMWW Vol. V, Section V-11 Puget Sound LID Manual Section 6.5	2014 SWMMWW Vol. III Appendix III-C; WWHM 2012 or equivalent 2019 SWMMWW Vol. V, Section V-11
Reduced Impervious Surface Credit • Restricted Footprint • Wheelstrip Driveways • Open Grid Decking over Pervious Surface	KCSWDM Appendix C, Section C.2.9	Optional	KCSWDM Appendix C, Section C.2.9	Apply sizing credits from KCSWDM Table 1.2.9.A

Table B-1 (continued). Flow Control BMP Design References and Hydrologic Modeling Requirements or Credits.				
	Applicable Requirements for Projects within the City of Snoqualmie by Drainage Review Type			
	Simplified Drainage Review		All Other Reviews Requiring BMP Design	
Flow Control BMP	**Design Requirement Reference**	**Hydrologic Modeling Requirement**	**Design Requirement Reference**	**Hydrologic Modeling Requirement/Credit**
Reduced Impervious Surface Credit • Minimum Disturbance Foundations	KCSWDM Appendix C, Section C.2.9	Optional	2014 SWMMWW Vol. V, Section V-5.3 2019 SWMMWW Vol. V, Section V-11 Puget Sound LID Manual Section 6.6	2014 SWMMWW Vol. III, Appendix III-C; WWHM 2012 or equivalent 2019 SWMMWW Vol. V, Section V-11
Native Growth Retention Credit	KCSWDM Appendix C, Section C.2.10	Optional	KCSWDM Appendix C, Section C.2.10	Apply sizing credits from KCSWDM Table 1.2.9.A
Perforated Pipe Connection	KCSWDM Appendix C, Section C.2.11	Not applicable	KCSWDM Appendix C, Section C.2.11	Not applicable
Tree Retention and Planting	2014 SWMMWW Vol. V, Section 5.3 2019 SWMMWW Vol. V, Section V-11	Optional	2014 SWMMWW Vol. V, Section 5.3 2019 SWMMWW Vol. V, Section V-11	2014 SWMMWW Vol. III Appendix III-C; WWHM 2012 or equivalent 2019 SWMMWW Vol. V, Section V-11

BMP = Best Management Practice

KCSWDM = King County Surface Water Design Manual

LID = Low Impact Development

SWMMWW = Stormwater Management Manual for Western Washington

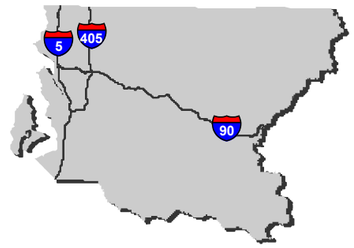
Green highlighted cells indicate a difference in requirements from the KCSWDM.

APPENDIX C

Potential Direct Discharge Areas Map

The entire City of Snoqualmie is a Conservation Flow Control Area. This Potential Direct Discharge Areas map is provided as a convenience to applicants regarding the applicability of the Direct Discharge Exemption as described under Section 1.2.3 of the KCSWDM to a project site. The applicant must demonstrate that all of the conditions listed in the KCSWDM are met before a site shall be considered eligible for Direct Discharge Exemption.

CITY OF SNOQUALMIE



Legend

- Road
- Lake
- City Limits

Direct Discharge Requirement

- Non-Direct Discharge
- Potential Eligibility for Direct Discharge
- Unknown Eligibility for Direct Discharge

Wetland

- Types I, II, III
- Type IV

Drainage Type

- Types S, F, Np (perennial)
- Type Nu (unknown)

Notes:
It is unknown whether Type Nu is a perennial or seasonal stream.

Subbasins draining to a Type Nu stream are determined to be areas of unknown eligibility for direct dicharge.

It is the development applicant's responsibility to determine if a site is eligible for flow control exemption.

Northwest Hydraulic Consultants

SCALE - 1:27,000

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Miles

Coordinate System: NAD 1983 HARN STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

Job: 200102 | *Date: 22-Aug-2018*

Potential Direct Discharge Areas