

**CITY OF KIRKLAND**

123 FIFTH AVENUE • KIRKLAND, WASHINGTON 98033-6189 • (425) 587-3800

---

**DEPARTMENT OF PUBLIC WORKS  
PRE-APPROVED PLANS POLICY**

**Policy D-10:           ADDENDUM TO THE 2021 KING COUNTY  
SURFACE WATER DESIGN MANUAL**

This addendum to the 2021 King County Surface Water Design Manual (KCSWDM) applies to development and redevelopment proposals within the City of Kirkland. This Addendum includes minor revisions to the KCSWDM to address the differences between King County's and the City's organization and processes. No major substantive changes have been made to the KCSWDM in order to maintain equivalency in review requirements and level of protection provided by the manual. It is our intent to maintain equivalency with the 2019 Ecology Stormwater Management Manual for Western WA.

The 2021 KCSWDM and the attached Addendum were adopted by Council in June 2022 with an effective date of July 1, 2022. All subsequent KC addendums to the 2021 KCSWDM are assumed to be adopted unless otherwise stated.



# **Addendum to the 2021 King County Surface Water Design Manual**

Effective date: July 1, 2022

## Introduction

This addendum to the 2021 King County Surface Water Design Manual (KCSWDM) applies to development and redevelopment proposals within the City of Kirkland. The KCSWDM has adopted requirements of the Clean Water Act, the Endangered Species Act, and the State Growth Management Act. This addendum includes minor revisions to the KCSWDM to address the differences between King County's and the City's organization and processes. No major substantive changes have been made to the KCSWDM in order to maintain equivalency in review requirements and level of protection provided by the manual. It is the City of Kirkland's intent to maintain equivalency with the 2019 Ecology Stormwater Management Manual for Western WA (Ecology Manual).

## Addendum Organization

The information presented in this addendum is organized as follows:

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

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

**III. Code Reference Tables:** King County code is referenced in many places throughout the KCSWDM. This section identifies these county code references and states the equivalent city code where applicable.

**IV. Mapping:** The City of Kirkland equivalents to the Flow Control Applications map, Landslide Hazard Drainage Areas map, and Sensitive/Critical Areas map are available online at:

[http://www.kirklandwa.gov/depart/Information\\_Technology/GIS.htm](http://www.kirklandwa.gov/depart/Information_Technology/GIS.htm)

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

**Note:** Clarifications and interpretations to the KCSWDM or this addendum are documented and made available through City Regulatory Code and the Public Works Pre-Approved Plans.

## I. Terminology

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

- **Critical Drainage Area (CDA).** This definition does not apply in the City of Kirkland.
- **Department of Permitting and Environmental Review (DPER).** All references to DPER conducting drainage reviews or determinations shall refer to City of Kirkland Development Services.
- **Department of Natural Resources and Parks (DNRP).** All references to DNRP shall refer to City of Kirkland Parks, Planning and Community Development and/or Public Works Departments.
- **Director.** All references to the Director shall refer to the City of Kirkland Public Works Director.
- **King County.** All references to King County shall refer to the City of Kirkland (COK).
- **King County Code (KCC).** All references to the KCC shall refer to the City of Kirkland Municipal Code (KMC). Check code reference table for equivalent code sections.
- **King County Designated/Identified Water Quality Problem.** This determination is made on a case-by-case basis in the City of Kirkland.
- **King County Road Standards.** All references to the King County Road Standards shall refer to the City of Kirkland Public Works Pre-Approved Plans.
- **Overflow Pipe:** A pipe shall be considered an overflow if sufficient storage is provided below the invert of the pipe to meet flow control BMP requirements. In these situations, the flow control BMP will be allowed the credit associated with the BMP. Per the new impervious surface definition in the 2021 KCSWDM, if the pipe is used as an underdrain, the area will be counted as new or replaced impervious surface area.
- **Project Size.** The project size is based on the parcel(s) and/or right-of-way included in the project scope. It will be assumed the area disturbed by development will encompass the entire parcel(s) and right-of-way, unless there is an easement, defined stream/wetland and buffer, NGPE, or other condition which limits the amount of developable area.
- **Sensitive Area Folio.** Refer to City of Kirkland Sensitive Areas Map at: [http://www.kirklandwa.gov/depart/Information\\_Technology/GIS.htm](http://www.kirklandwa.gov/depart/Information_Technology/GIS.htm)
- **Water and Land Resources (WLR) Division.** All references to the WLR Division shall refer to the City of Kirkland Surface Water Management Group.
- **Zoning Classifications: Where the KCSWDM references Agricultural (A) Zoning, Forest (F) Zoning, or Rural (R) Zoning.** These zoning classifications are intended for areas outside of the Urban Growth Boundary, therefore the City of Kirkland contains no equivalent zoning. Refer to city zoning maps to determine which zoning classifications apply to your project. The City of Kirkland Land Use Map can be found at: [http://www.kirklandwa.gov/depart/Information\\_Technology/GIS.htm](http://www.kirklandwa.gov/depart/Information_Technology/GIS.htm)

## II. Key Revisions

This section includes minor revisions and clarifications to the 2021 KCSWDM to address the differences between King County's and the City of Kirkland's organization and processes, as well as to ensure equivalency with the 2019 Ecology Manual. Unless specifically noted as a clarification, the items below are minor revisions.

### **Chapter 1: Drainage Review and Requirements**

Applies with the revisions stated below:

If a project uses multi-family zoning and density, then multi-family stormwater requirements apply to the entire project even if the project includes detached single family homes.

#### **1.1 Drainage Review**

Criteria for review levels are defined in the COK Public Works Pre-Approved Plans, Policies D-2 and D-3. Drainage review levels used in the City of Kirkland are listed below:

- Basic drainage review
- Simplified drainage review
- Targeted drainage review
- Full drainage review

When determining the level of drainage review, the following items apply:

- Clarification: Areas that change from existing gravel to paved surface will be counted as new impervious surface area, not replaced impervious area.
- Clarification: Flow control BMPs cannot be used to reduce the level of drainage review, but can be used to reduce the amount of flow control required. For example, proposed driveways and roads will always be counted as fully impervious for the drainage review level, but permeable pavement can be used to meet flow control requirements.
- Clarification: Target impervious surfaces for the determination of drainage review (found in section 1.1.2.1) are different than target impervious surfaces that require mitigation under a simplified drainage review in Appendix C. After determining drainage review, if the project falls under a simplified drainage review, target impervious surfaces = all new and replaced impervious surfaces and must evaluate flow control BMPs to the maximum extent feasible.
- Projects that are solely utility projects (ex: replace water or sewer main, upsize water or sewer main, or similar) that replace the ground surface with in-kind material or materials with similar runoff characteristics are only subject to Core Requirement #5, Construction Stormwater Pollution Prevention.
- KCSWDM triggers a full drainage review for non-single family residential projects that create more than 2,000 sf of new plus replaced impervious surface. The City has the ability to reduce the drainage review to a simplified review if the City classifies the work as maintenance activity (ex: structural repair to pavement, sidewalk maintenance. etc) and the following criteria for the project can be met:
  - Creates less than 5,000 sf of replaced impervious surface
  - Does not create any new impervious surface

## **1.2 Core Requirements**

### **1.2.2 Core Requirement #2: Offsite Analysis**

#### **1.2.2.1.1 Downstream Drainage Problems Requiring Special Attention**

For item 4, Potential Impacts to Wetland Hydrology problem, refer to COK Public Works Pre-Approved Plans, Policy D-13, to determine the level of review needed for the wetland, reporting information required, and potential modelling to determine impacts.

#### **1.2.2.3 Water Quality Project Impact Mitigation**

Exclude Bacteria from mitigation. Bacteria problems are addressed through educational programs and source control.

Phosphorus Problem – Forbes Lake is listed as a Category 5 water body for phosphorus. All projects that drain to Forbes Lake that trigger water quality treatment shall be assumed to be located within a designated Sensitive Lake WQ Treatment Area for the purposes of applying area-specific water quality treatment requirement in Section 1.2.8.1.

### **1.2.3 Core Requirement #3: Flow Control**

Clarification: Historic (forested) conditions will be used for pre-developed runoff modeling of all projects in Level 2 flow control areas.

A City of Kirkland flow control map is located at:

[http://www.kirklandwa.gov/depart/Information\\_Technology/GIS.htm](http://www.kirklandwa.gov/depart/Information_Technology/GIS.htm)

The City will accept non-infiltrating bioretention (planter boxes) for Basic Flow Control (Level 1), provided the design meets the criteria set forth in the City of Seattle Stormwater Manual, Volume 3, Section 5.8.2) and does not drain to Forbes Lake. The hydraulic restriction layer for planters shall be made of concrete. The planters shall contain plants from the Seattle Green Factor Plant List.

Projects triggering a Full Project Drainage Review proposing infiltration/bioretention facilities or pervious pavement to meet Level 1 or 2 flow control or for onsite flow control BMPs require a soils report per COK Pre-Approved Plans, Policy D-8.

Pumping systems are not allowed downstream of flow control unless approved. Steady state pump systems do not meet duration discharge requirement of flow control.

#### **1.2.3.1 Area-Specific Flow Control Facility Requirement**

For projects that trigger Core Requirement #3: Flow Control Facilities, facility design shall be as follows:

- Projects shall start with a maximum impervious coverage permitted by the Kirkland Zoning Code (KZC) plus an additional 10% as referenced in Section 3.2.2.1 in this Policy.
- If a project can't meet an exemption or exception within this section and a detention facility is required, flow control BMP credits per 1.2.3.2 D are not allowed to reduce the size of the vault unless a project can meet full dispersion as outlined in 1.2.3.2 C or full infiltration. Refer to Table 1.2.9.A in this Policy for additional criteria for full

infiltration. Projects are still required to meet Core Requirement #9: Flow Control BMPs to the maximum extent feasible.

- Flow control BMP credits per 1.2.3.2.D are allowed to be used if a project can meet an exemption or exception within this section. In addition, refer to Table 1.2.9.A in this Policy for additional criteria for full infiltration. If a project can meet an exemption or exception within this section, flow control BMP credits are allowed per 1.2.3.2 D. Refer to Table 1.2.9.A in this Policy for additional criteria for full infiltration.

Regarding Exceptions to Flow Control Requirements in both Basic (#1) and Conservation (#2) Flow Control Areas, flow control can be waived if a threshold discharge area generates less than a 0.15 cfs increase in 100-yr peak flows using a 15-minute time step. The intent to still allow the 0.10 cfs increase at the 100-yr peak flow with a 1-hour time step were for areas that do not include a 15-minute time step in the approved model. All areas in Kirkland have a 15-minute time step, and therefore must use 15-minute time step for the exception.

Commercial and industrial redevelopment projects within conservation flow control areas must include calculations within the TIR to show how the assessed value of the existing project site improvements was determined.

Clarification: Areas that are proposed to be protected through planning easements (grove easements, PNAs, etc.) may only be modeled as forest if an NGRA is also placed over the areas. Planning easements either do not protect the land (such as grove easements) or do not require monitoring (PNAs). NGRA easements shall not overlap NGPEs. Below is a table for modeling allowances:

<b>Easement Type</b>	<b>Modeled As:</b>
Native Growth Retention Area (NGRA)	Forest
Native Growth Protection Easement (NGPE)	Forest
Preserved Grove Easement	Grass
Landscape Easement	Grass
Protective Native Areas (PNA)	Grass
Shoreline Planting	Grass
Preserved Grove Easement + NGRA Overlap	Forest
Landscape Easement + NGRA Overlap	Forest
PNA + NGRA Overlap	Forest
Shoreline Planting + NGRA Overlap	Forest

Clarification: Only BMPs listed on Table 1.2.9.A (page 1-95) can be used on a threshold discharge area to meet the 0.15 cfs limit unless otherwise approved through the adjustment process, Policy D-11. For example, products like infiltrator chambers are not equivalent to gravel filled infiltration trenches in Appendix C and shall submit an adjustment to the manual per Policy D-11 in the COK Public Works Pre-Approved Plans to show equivalence.

Clarification: To meet the requirements of the 0.15 cfs exception, total pre-developed and post-developed areas must match (unless full infiltration is used).

Clarification: Regarding Target Surfaces in Conservation Flow Control Areas to be mitigated, vegetated areas in easements and/or tracts must be modeled from forested in the pre-developed condition to lawn in the developed condition, unless the area is placed in a tract or easement that will preserve the native vegetation during and after construction.

Clarification: Threshold and modeling calculations of pervious and impervious areas, turf areas, including lawn or synthetic turf, that do not have an underdrain are considered 100% pervious. Areas that have an underdrain are considered 100% impervious.

### **1.2.3.2 Flow Control Facility Implementation Requirements**

#### **G. Mitigation Trade**

Projects that would like to use the mitigation trade option (area swap) must use an area that is within the public right of way. Mitigation trade areas can't be from private property.

### **1.2.4 Core Requirement #4: Conveyance System**

#### **1.2.4.3 Conveyance System Implementation Requirements**

##### **G. Spill Control**

City of Kirkland will only require spill control requirements on commercial and multifamily projects that do not require flow control. Single family residential will install a tee/turn down elbow per (COK D.45).

### **1.2.6 Core Requirement #6: Maintenance and Operations**

Refer to KMC 15.52.070 for City Acceptance of new drainage facilities.

If the project proposes a propriety system not covered in the 2021 KCSWDM, the applicant shall submit an adjustment to the manual per Policy D-11 in the COK Public Works Pre-Approved Plans. The adjustment should include inspection and maintenance standards, including frequency of inspections and a log of maintenance activity.

### **1.2.7 Core Requirement #7: Financial Guarantees and Liability**

This section is replaced by KMC 15.52.080, Bonds.

### **1.2.8 Core Requirement #8: Water Quality**

#### **1.2.8.1 A. Basic WQ Treatment Areas**

Reductions of water quality treatment level from Enhanced to Basic, Exception #4, is not allowed in the City of Kirkland. Projects in Kirkland cannot reduce the level of required water quality treatment by prohibiting the use of leachable metals on the property.

For a bioretention to meet enhanced basic water quality treatment, it must be designed, using an approved continuous runoff model, to infiltrate 91% of the influent runoff, consistent with the 2019 Ecology Manual, and designed per 2019 Ecology Manual BMP T7.30. Bioretention facilities that will be drain to Forbes Lake must be designed with no underdrain.



The City will accept all water quality treatment facility-types identified in the 2019 Ecology Manual, with the following additions and alterations:

- Emerging technologies will be considered on a case-by-case basis, via adjustment process, Policy D-11 in the COK Public Works Pre-Approved Plans, provided the product has received a level of use designation from WA State Dept. of Ecology (see the following website):  
<http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html>
- Only Filterra systems are pre-approved in addition to the approved King County Water Quality facilities for publicly maintained enhanced basic systems and do not need an adjustment process.

#### **1.2.8.1 C. Sphagnum Bog WQ Treatment Areas**

This section does not apply to the City of Kirkland.

#### **1.2.8.2 Water Quality Implementation Requirements**

##### **C. Treatment Trade**

Projects that would like to use the treatment trade option (area swap) must use an area that is within the public right of way. Treatment trade areas can't be from private property.

#### **1.2.9 Core Requirement #9: Flow Control BMPs**

Clarification: All proposed projects that are 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, meet soil amendment requirements per Pre-Approved Plan COK.E-12. [Any project that is subject to Core Requirement #9 will be required to provide soils that meet Pre-Approved Plan E.12 within the clearing limits, i.e. in all disturbed areas.] Note that the definition of New Pervious Surface includes areas where alteration of soil characteristics has occurred. In Kirkland this will include all areas within the clearing limits of a site.

When evaluating BMPs within the right of way to the maximum extent feasible, the BMPs must be evaluated in the following order for:

##### Sidewalk (that is a target surface):

1. Slope sidewalk (5') to landscape strip (4.5') – See Pre-Approved Plan CK-R.08 for implementation details
2. Bioretention
3. Pervious Concrete
4. Limited Infiltration

##### Road Widening (that is a target surface):

1. Bioretention
2. Porous Concrete Parking Strip (if applicable)
3. Limited Infiltration
4. Porous Asphalt

#### **1.2.9.1 Flow Control BMP Requirements Overview**

##### **A. Target Surfaces**

If a project or threshold discharge area of a project meets the Direct Discharge Exemption per Section 1.2.3.1, soil amendment is required for

new pervious areas and flow control BMPs need to be evaluated in the following order for impervious areas:

1. Full Infiltration
2. Basic Dispersion

If basic dispersion is found to be a feasible BMP, limited infiltration, bioretention and/or permeable pavement may be used instead of basic dispersion to meet the flow control BMP requirement. If basic dispersion is found to be infeasible, perforated pipe connection is not required in the City and the flow control BMP requirement is considered met.

### **1.2.9.2 Individual Lot BMP Requirements**

Requirement #5, implementation of Reduced Impervious Surface Credit and Native Growth Retention Credit, for both Small Lot BMP Requirements and Large Lot BMP Requirements is not required in the City of Kirkland. King County has high lot coverage so the reduction of 10% lot coverage to meet the flow control BMP requirement is achievable. The City of Kirkland justifies meeting this requirement for implementation with an already lower lot coverage than King County (typically 70% lot coverage in King County compared to 50% lot coverage in Kirkland).

Requirement #7, installation of perforated pipe connection, is not required in the City of Kirkland. If the applicant has reached this level, it is viewed that LID is infeasible on the site and do not want to introduce additional water into the ground.

#### **1.2.9.2.3 Large Rural Lot BMP Requirements**

This section does not apply to the City of Kirkland.

#### **1.2.9.4.1 Use of Credit by Subdivision Projects**

A. Subdivision Implementation of BMPs within Road Right-of-Way Item #3: If the road right-of-way will be maintained by the City of Kirkland, the flow control BMPs must be approved by the public works department. Refer to section 1.2.9.2, Requirement #3, in the Addendum for the order of BMP evaluation in the right-of-way.

### **1.2.9.4 Requirements for use of BMP Credits**

Regarding Table 1.2.9.A Flow Control BMP Facility Sizing Credits:

Footnote (3) regarding full infiltration – For any project subject to Basic or Simplified Drainage Review, and for any single family residential project subject to Directed, Full or Large Project Drainage Review, the design requirements and specifications in Appendix C, Section C.2.2 may be used for design of full infiltration on individual lots. In addition, refer to section C.1.3 in this Policy for additional criteria for full infiltration. For all other projects, including any project where full infiltration is proposed to serve more than one lot, full infiltration must be designed in accordance with infiltration facility standards in Section 5.2. In addition, to receive a full infiltration credit in the City of Kirkland, the geotechnical engineer must classify the soil as outwash conditions (medium sands or better) and provide an infiltration test per Section 5.2.1 the 2021

KCSWDM along with any additional requirements within this Policy to show a measured infiltration rate of 8 inches / hour or greater to qualify for the full infiltration credit.

Credits for Restricted Footprint – Restricted footprint shall include all surfaces that are impervious on the property, including eaves on rooftops over pervious surfaces. Also, impervious surface limit must be reduced by 5% or greater and the restricted footprint area shall be rounded up or down to the nearest 100 square feet, to receive the facility sizing credit. If additional restrictions are needed they shall be in 100 square foot increments.

Example:

If a lot has an area of 7200 SF and is situated in a 50% max lot coverage zone, then the maximum allowable impervious surface area for surface water mitigation purposes is  $7200 \text{ SF} \times (0.50 + 0.10) = 4320 \text{ SF}$  (additional 10% per Section 3.2.2.1).

A 5% minimum reduction implies  $7200 \text{ SF} \times 0.55 = 3960 \text{ SF}$  impervious surface. The Restricted Footprint shall be rounded up or down and recorded as 4000 SF, or additional reductions at 100 SF increments if so desired (3900 SF, 3800 SF, and so on).

### **1.3.1 Special Requirement #1: Other Adopted Area-Specific Requirements**

Projects located in the Holmes Point Area must also comply with lot coverage and other standards included in the Kirkland Zoning Code, *Chapter 70 – Holmes Point Overlay Zone*.

### **1.3.3 Special Requirement #3: Flood Protection Facilities**

This section does not apply to the City of Kirkland.

### **1.3.4 Special Requirement #4: Source Controls**

With regard to threshold for triggering this requirement, if the proposed project requires a non-single family residential site development permit, then water quality source control is applicable. Required source control BMPs should be called out in TIR and structural BMPs called out in plans. Some highlighted sections common to projects in Kirkland are:

- Cleaning and maintaining stormwater drainage system (A-1);
- Storage and use of pesticides and fertilizers (A-5);
- Storage of solid waste and food wastes (A-8);
- Parking Lots, Driveways and Outside Storage Areas (A-31);
- Animal Waste (A-34)
  - Covered waste containers and waste collection services required at properties with designated dog exercise areas.

## **1.4 Adjustment Process**

Refer to the Surface Water Adjustment Process defined in COK Public Works Pre-Approved Plans, Policy D-11.

## **Chapter 2 Drainage Plan Submittal**

Applies with the revisions stated below:

### **2.1 Plans Required for Drainage Review**

Refer to the COK Public Works Pre-Approved Plans, Policies G-7, D-2, and D-3.

### **2.2 Plans Required with Initial Permit**

Refer to the COK Public Works Pre-Approved Plans, Policies G-7, D-2, and D-3.

### **2.3 Drainage Review Plan Specifications**

#### **2.3.1.1 Technical Information Report**

An Operation and Maintenance Manual is required for all privately maintained stormwater detention and water quality facilities, and is submitted as part of the permit application.

#### **2.3.1.2 – Site Improvement Plan**

Refer to the COK Public Works Pre-Approved Plans, Policies G-7, D-2, and D-3.

#### **2.3.1.3 – ESC Plan Section**

Refer to the COK Public Works Pre-Approved Plans, Policies G-7, D-2, and D-3.

#### **2.3.1.4 – Stormwater Pollution Prevention and Spill (SWPPS) Plan**

Refer to the COK Public Works Pre-Approved Plans, Policies G-7, D-12.

#### **2.3.2 – Projects in Targeted Drainage Review (TDR)**

Refer to the COK Public Works Pre-Approved Plans, Policies G-7, D-2, and D-3.

### **2.4 Plans Required After Drainage Review (pg 2-35)**

Refer to the COK Public Works Pre-Approved Plans, policies G-7, D-2, and D-3.

## **Chapter 3 Hydrologic Analysis & Design**

Applies with the revisions stated below:

### **3.2.2.1 Generating Time Series**

#### **Calculation of Impervious Area**

For calculating impervious coverage for proposed residential and commercial development must be estimated for each specific proposal. Impervious coverage for frontage layouts – streets, sidewalks, trails, etc – shall be taken from the layouts of the proposal. House/driveway or building coverage shall be as follows:

- For residential development, the assumed impervious coverage shall be the maximum impervious coverage permitting by the Kirkland Zoning Code (KZC) plus an additional 10%.
- For commercial or multi-family development, the impervious coverage shall either:
  - Assume the maximum impervious coverage permitted by the KZC plus an additional 10% OR
  - Estimate impervious coverage from layouts of the proposal. If estimated from the layouts of the proposal, the impervious coverage shall include

calculations of all impervious surfaces, including eaves. This option may require a Reduced Impervious Surface Limit to be recorded on the property.

If an existing home is proposed to remain in this development, there are the following options to address the storm drainage from that house/lot:

1. Evaluate the proposed lot as new/replaced impervious at the required lot coverage as part of the subdivision TIR, OR
2. Remove the lot from calculations as non-targeted surfaces. If this method is taken, the existing home cannot be redeveloped within 5 years of the recording of the short plat. If the home is redeveloped within that time period, a storm drainage analysis must be provided for the entire subdivision including the lot at full lot coverage as part of the building permit. The following note must be included on the subdivision:

*Redevelopment of Lot\_: Since the home currently constructed on the existing parcel that is proposed to remain as Lot \_ has not been evaluated as part of the storm drainage analysis, the existing home cannot be redeveloped within 5 years of the recording of this plat. If the home is redeveloped within that time period, a storm drainage analysis must be provided for the entire subdivisions including Lot \_\_ at the redeveloped impervious coverage.*

### **3.3.2 Flow Control Design Using the Runoff File Method Evaluating Flow Control Performance**

Clarification: If having difficulties meeting the lower part of the duration curve (50% of the 2-year to the 2-year), refer to footnote 10 in the 2021 KCSWDM.

## **Chapter 4 Conveyance System Analysis & Design**

Applies with the revisions stated below:

### **4.2.1 Route Design**

Permanent drawdown pumping of the groundwater table that would result in a continuous discharge to the City's stormwater system is not allowed within the City of Kirkland.

### **4.2.1 Design Criteria**

#### **Pipe Cover**

18-inch pipe cover minimum is allowed.

## **Chapter 5 Flow Control Design**

Applies with the revisions stated below:

Refer to Policy R-16 for gate requirements to publicly maintained drainage systems.

### **5.1 Detention Facilities**

Use details located in the COK Public Works Pre-Approved Plans, if available.

#### **5.1.1.1 Construction of Access Roads**

Maintenance access road(s) per Pre-Approved Plan CK-D.37 shall be provided to the control structure and other drainage structures associated with the detention facility (e.g., inlet, access openings, emergency overflow or bypass structures). Vehicular access to the drainage structures associated with the detention facility shall not be

obstructed on a temporary or permanent basis without prior approval from the City. Location of parking stalls shall not obstruct maintenance access. Where maintenance access is required on a driveway that shares access to residential units, a min. 16' wide drive line is required to accommodate two-way traffic.

### **5.1.2 Detention Tanks**

#### **5.1.2.1 Design Criteria**

Setbacks: Refer to Policy G-1 Easement Width Policy. For vaults and tanks deeper than 10' measured from finished grade to bottom of facility, a 1:1 easement width to facility depth ratio is required (e.g., a 13' deep tank measured from finished grade to bottom of pipe would require a 13' easement).

Dead Storage: The maximum allowable dead storage within a detention tank is 1 foot, unless a gravity system can be provided to the sanitary sewer or stormwater system.

Riser: Maximum length on notch is 24 inches and minimum width is ¼-inch.

Materials: Bottomless pipe arches are not allowed within the public right of way. Pipe arches with a bottom must be approved by the City prior to being installed within the public right of way.

Materials: Pipe materials for publicly maintained detention tanks are restricted to the following:

1. Coated Corrugated Metal Pipe (CMP): Contech ULTRA FLO, or Equal
2. Aluminum Alloy Pipe: Contech CORLIX, or Equal
3. Steel-Reinforced Polyethylene Pipe (SRPE): Contech DuroMaxx, or Equal

See CK-D.34 and STORM DRAINAGE - DESIGN CRITERIA for more information.

Maximum depth for all detention tank systems shall be 15 feet from rim to tank invert.

### **5.1.3 Detention Vaults**

#### **5.1.3.1 Design Criteria**

Setbacks: Refer to Policy G-1 Easement Width Policy

#### **5.1.4.1 Control Structures Design Criteria**

A removable screen is required when the bottom orifice size is 1" or less. The screen shall be made from stainless steel mesh, 8 inch depth, and attached with a minimum of 3 stainless steel screws. The size of the mesh openings must be less than the orifice diameter (0.25 inch mesh typical).

### **5.1.5 Parking Lot Detention**

Parking lot detention is not allowed in the City of Kirkland.

### **5.2.1 General Requirements for Infiltration Facilities**

#### **Testing Procedure**

In addition to the small and large PIT, EPA falling head percolation test (follow test procedure in 2021 KCSWDM, Reference 6-A) is an acceptable testing procedure for determining a design infiltration rate. The correction factor for determining the design infiltration rate is  $F(\text{testing}) = 0.30$ . Refer to the table below for what type of infiltration

test is acceptable for meeting the LID Performance Standard or for designing infiltration facilities.

A large PIT will be required for infiltration facilities that will infiltrate more than 1 acre of impervious area.

**Allowable Infiltration Testing Methods**

	Small PIT	Large PIT	Single Ring Infiltrometer	EPA Falling Head
LID Performance Standard	Accepted	Accepted	Accepted	Accepted
Inf Facility serving < 1 acre of impervious area	Accepted	Accepted	Not Accepted	Accepted
Inf Facility serving > 1 acre of impervious area	Not Accepted	Accepted	Not Accepted	Not Accepted

The single ring infiltrometer and EPA falling head test will require a minimum of 3 tests (arrayed in a triangle) per infiltration BMP or facility location. The lowest measured rate shall be used in determining the design infiltration rate.

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

**Chapter 6 Water Quality Design**

Applies with the revisions stated below:

Refer to Policy R-16 for gate requirements to publicly maintained drainage systems.

Use details located in the COK Public Works Pre-Approved Plans, if available.

**6.1.2 Enhanced Basic Water Quality Menu**

For a bioretention to meet enhanced basic water quality treatment, it must be designed, using an approved continuous runoff model (WWHM 2012) to infiltrate 91% of the influent runoff per Ecology Manual BMP T7.30. Bioretention facilities that will be located within the Forbes Lake subbasin must be designed with no underdrain.

**Appendix A: Maintenance Requirements for Flow Control, Conveyance, and Water Quality Facilities**

If the project proposes a propriety system not covered in the 2021 KCSWDM, the applicant shall submit and adjustment to the manual per Policy D-11 in the COK Public Works Pre-Approved Plans. The adjustment should include inspection and maintenance standards, including frequency of inspections and a log of maintenance activity.

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

This Appendix does not apply to projects in the City of Kirkland.

## **Appendix C: Small project Drainage Requirements**

Applies with the revisions stated below:

### **C.1.3 Application of Flow Control BMPs**

For any soil investigation or reporting information, refer to COK Public Works Pre-Approved Plans, Policy D-8.

In addition to Policy D-8, if a project would like to claim full infiltration in the City of Kirkland, the geotechnical engineer must classify the soil as outwash conditions (medium sands or better) and provide an infiltration test per Section 5.2.1 of the 2021 KCSWDM along with any additional requirements within this Policy to show a measured infiltration of 4 inches / hour or greater to qualify.

### **C.2.2.3 Use of Gravel Filled Trenches for Full Infiltration**

Products like infiltrator chambers are not equivalent to gravel filled infiltration trenches in Appendix C. If the project would like to use proprietary items, the applicant shall submit an adjustment to the manual per Policy D-11 in the COK Public Works Pre-Approved Plans.

### **C.2.3.3 & C.2.3.4 – Use of Gravel Filled Trenches for Limited Infiltration**

Clarification: The minimum length requirement per 1,000 sf of tributary surface must be met regardless of width of trench.

Drywells have a maximum surface area of 100 sf, minimum 4' per side.

### **C.2.6 Requirements for Use of Bioretention**

Cells shall be designed to drain within 24 hours. Water storage volume in cubic feet shall be equal to 0.25 times the square footage of the impervious surface or per Section C.2.6.4 of the 2021 KCSWDM, whichever is greater, or sized using WWHM 2012 or another approved continuous runoff model.

Do not place geotextile fabric between the Bioretention Soil Mix (BSM) layer and the subgrade. Geotextile fabric for non-woven soil separation may be used with City approval. Wrapping an optional under-drain pipe with filter fabric is not permitted.

### **C.2.7.2 – C.2.7.4 Permeable Pavement: Pervious Concrete, Porous Asphalt, Permeable Pavers**

Permeable pavement shall not be located over cisterns, utility vaults, underground parking, in high volume intersections, under solid waste dumpsters, or where there is a high risk of chemical spillage.

Groundwater must be at least 3 feet below the aggregate base course layer if designing with an infiltration rate. One foot of separation may be used to meet Core Requirement #9 in the 2021 KCSWDM.

Protect pervious pavement from fines and other sediment during construction by covering with visqueen or similar impervious material.



For areas that transition from pervious concrete or porous asphalt to traditional impervious concrete or asphalt, install a concrete divider or extend the pervious reservoir base course under the impervious surface to account for settling.

Sand is not allowed in between or below permeable pavers in the City of Kirkland. See permeable paver detail CK-L.09 for aggregate size approved for use between and below pavers.

For additional requirements of this BMP, refer to the COK Public Works Pre-Approved Plans, Detail CK-L.09. Other proprietary systems may be allowed with Surface Water Engineer approval.

#### **C.2.7.6 Grassed Modular Grid Pavement**

Modular grid pavement with grass planted in the openings or in a thin layer of soil over the grid material cannot be used for single family residential driveways that are used on a daily basis in the City of Kirkland. Past performance shows the grass does not grow well when subject to vehicular traffic on a daily basis.

Modular grid pavement must be designed to meet H-20 loading.

#### **C.2.9 Reduced Impervious Surface Credit**

##### **C2.9.2 Restricted Footprint**

In addition to the criteria listed, impervious surface limit must be reduced by 5% or greater and the restricted footprint area shall be rounded up or down to the nearest 100 square feet, to receive the facility sizing credit.

Example:

If a lot has an area of 7200 SF and is situated in a 50% max lot coverage zone, then the maximum allowable impervious surface area for surface water mitigation purposes is  $7200 \text{ SF} \times (0.50 + 0.10) = 4320 \text{ SF}$  (additional 10% per Section 3.2.2.1).

A 5% minimum reduction implies  $7200 \text{ SF} \times 0.55 = 3960 \text{ SF}$  impervious surface. The Restricted Footprint shall be rounded up or down and recorded as 4000 SF, or additional reductions at 100 SF increments if so desired (3900 SF, 3800 SF, and so on).

#### **C.2.10 Native Growth Retention Credit**

For additional implementation requirements of this BMP, refer to COK Public Works Pre-Approved Plans, Policy D-15.

### **Appendix D: Construction Stormwater Pollution Prevention Standards**

Use details located in the COK Public Works Pre-Approved Plans, if available.

#### **D.2.4.2 Wet Season Requirements**

Refer to ESC Notes in the COK Public Works Pre-Approved Plans.

### III. Code Reference Tables

King County Code is referenced in many places throughout the KCSWDM. The following table identifies the county code references and states the equivalent City of Kirkland code where applicable (Kirkland Municipal Code is KMC and Kirkland Zoning Code is KZC). Policies are located in the Public Works (PW) Pre-Approved Plans.

<b>King County Code Reference</b>	<b>Subject of Reference</b>	<b>COK Code/Policy Equivalent</b>	<b>Comment</b>
KCC 2.98	Adoption procedures and Critical Drainage Areas	KZC Chapter 90	
Title 9	Surface Water Management	KMC 15.52	
KCC 9.04	Surface Water Run-off policy	KMC 15.52	
KCC 9.04.020	Definitions	KMC 15.04	
KCC 9.04.030	Drainage Review	PW Pre-Approved Plans	Policy D-2, D-3
KCC 9.04.050	Drainage Review-requirements	PW Pre-Approved Plans	Policy D-2, D-3
KCC 9.04.060	Critical drainage and/or erosion areas	KZC 85, KZC 90	
KCC 9.04.070	Engineering plans for the purposes of drainage review	KMC 15.52.050, KMC15.52.060 and PW Pre-Approved Plans	Policy D-2, D-3, D-11
KCC 9.04.090	Construction timing and final approval	KMC 15.52.060	Policy D-12
KCC 9.04.095	Vesting for lots in final short plats	KMC 22.20.370	
KCC 9.04.100	Liability Requirements	KMC 15.52.080	
KCC 9.04.115	Drainage Facilities accepted by King County	KMC 15.52.070	
KCC 9.04.120	Drainage Facilities NOT accepted by King County	KMC 15.52.070	
KCC 9.12.025	Prohibited discharges in the water quality section	KMC 15.52.090	Policy D-4
KCC 9.12	Water Quality	KMC 15.52.090 – 15.52.110	
KCC 9.12.035	Water Quality: Stormwater Pollution Prevention Manual Adoption	KMC, 15.52.090, KMC 15.52.100	Policy D-4
KCC 16.82	Erosion and Sediment Control, Clearing and Grading	KMC 15.52.060	
KCC 16.82.095(A)	ESC standards: seasonal limitation period	PW Pre-Approved Plans	Erosion/Sediment Control Plan Notes
KCC 16.82.100(F)	Grading standards: preservation of duff layer	KZC Chapter 95	
KCC 16.82.100(G)	Grading Standards: soil amendments	KZC Chapter 95, Pre-approved Plans	
KCC 16.82.150	Clearing standards in rural zone	Not applicable	COK does not contain rural zones
KCC 20.70.020	Critical Aquifer recharge area	Not applicable	No critical aquifer recharge areas in COK
KCC 21A.24	Critical Areas Requirements	KZC Chapters 85 and 90	
KCC 21A.14.180.D	On-site recreation space required	No equivalent City code exists	On-site recreation space is not required

KCC 21A.24	Critical Areas Code	KZC Chapter 90	
KCC 21A.38	Property specific development standards or special district overlays	KZC Chapter 70, KZC Chapter 90	
KCC 23.20	Code compliance: citations	KMC 1.12.030	
KCC 23.24	Code compliance: notice and orders	KMC 1.12.040	
KCC 23.28	Code compliance: stop work orders	KMC 1.12.070	
KCC 23.40	Code compliance: liens references on declaration of covenants form	KMC Title 15	

## IV. Mapping

Below is a list of City of Kirkland maps to be used during drainage design. The maps can be viewed on-line or viewed at the Public Works counter at City Hall.

The maps are available on the following website:

[http://www.kirklandwa.gov/depart/Information\\_Technology/GIS.htm](http://www.kirklandwa.gov/depart/Information_Technology/GIS.htm)

1. Base Map
2. Flow Control Map
3. Sensitive Areas Map
4. Land Use Map

## V. Reference Materials

This section identifies which reference materials provided in the 2021 KCSWDM are applicable and which are not. Reference materials that have been struck through (i.e., ~~struck through~~) are not applicable to projects in the City of Kirkland.

- ~~1. KCC 9.04—Surface Water Runoff Policy~~
- ~~2. Adopted Critical Drainage Areas~~
- ~~3. Other Adopted Area Specific Drainage Requirements~~
  - ~~A. RA Zone Clearing Restrictions~~
4. Other Drainage Related Regulations and Guidelines
  - A Grading Code Soil Amendment Standard
  - B Clearing & Grading Seasonal Limitations
  - C Landscape Management Plan Guidelines
  - ~~D Shared Facility Maintenance Responsibility Guidance~~
5. Wetland Hydrology Protection Guidelines
6. Hydrologic/Hydraulic Design Methods
  - A Infiltration Rate Test Methods
  - B Pond Geometry Equations
  - C Introduction to Level Pool Routing
  - D Supplemental Modeling Guidelines
- ~~7. Engineering Plan Support~~
  - ~~A King County Standard Map Symbols~~
  - ~~B Standard Plan Notes and Example Construction Sequence~~
  - ~~C Stormfilter Facility Access and Cartridge Configuration~~
8. Forms and Worksheets
  - A Technical Information Report (TIR) Worksheet
  - B Offsite Analysis Drainage System Table

- C Water Quality Facility Sizing Worksheets
- D Flow Control and Water Quality Facility Summary Sheet and Sketch
- E CSWPP Worksheet Forms
- ~~F Adjustment Application Form and Process Guidelines~~
- ~~G Dedication and Indemnification Clause – Final Recording~~
- ~~H Bond Quantities Worksheet~~
- ~~I Maintenance and Defect Agreement~~
- ~~J Drainage Facility Covenant~~
- ~~K Drainage Release Covenant~~
- ~~L Drainage Easement~~
- ~~M Flow Control BMP Covenant and BMP Maintenance Instructions (Recordable format)~~
- ~~N Impervious Surface Limit Covenant~~
- ~~O Clearing Limit Covenant~~
- ~~P River Protection Easement~~
- ~~Q Leachable Metals Covenant~~
- 9. Interim Changes to Requirements
  - ~~A Blanket Adjustments~~
  - ~~B Administrative Changes~~
- 10. King County Identified Water Quality Problems
- 11. Materials
  - ~~A (VACANT)~~
  - ~~B (VACANT)~~
  - C Bioretention Soil Media Standard Specifications
  - ~~D (VACANT)~~
  - E Roofing Erodible or Leachable Materials
- ~~12. (VACANT)~~
- ~~13. (VACANT)~~
- 14. Supplemental Approved Facilities
  - A Approved Proprietary Facilities
  - B Approved Public Domain Facilities