

# Chapter I – Submittal Requirements Language

Version 3 Review Draft  
December 11, 2013

1.7	Stormwater Site Plan Submittals for a Site Plan Review or Subdivision .....	1
1.7.1	Preliminary Stormwater Plan.....	2
	Modification of Content Requirements .....	2
	Existing Conditions Plan .....	2
	Preliminary Development Plan.....	3
	Preliminary Technical Information Report (TIR).....	4
	Section A – Project Overview .....	5
	Section B – Minimum Requirements.....	6
	Appendices .....	10
1.7.2	Final Stormwater Plan .....	11
	Purpose .....	11
	Modification of Content Requirements .....	11
	Final Stormwater Plan Submittal.....	11
	Final Development Plan .....	12
	Final Technical Information Report (TIR) .....	13
1.7.3	Stormwater Plan Changes.....	20
1.7.4	Soils Report.....	21
1.7.5	Construction Stormwater Pollution Prevention .....	23
1.7.6	Stormwater Site Plan Submittals for a Small Project .....	24

## 1.7 Stormwater Site Plan Submittals for a Site Plan Review or Subdivision

In accordance with Minimum Requirement 1, a **Stormwater Site Plan** is required for all new development and redevelopment projects that must comply with either Minimum Requirements 1 through 5, or Minimum Requirements 1 through 9. The purpose of the submittal is to allow Clark County to determine whether the stormwater management plan proposed for the development project will meet the requirements of Clark County Code Chapter 40.385.

Plans and reports must be submitted by a licensed engineer in the state of Washington.

Clark County’s requirement for meeting Minimum Requirement 1 involves two submittals: a

Preliminary Stormwater Plan and a Final Stormwater Plan. This section describes the components of each plan, and the information that must be provided with each component.

## **1.7.1 Preliminary Stormwater Plan**

The preliminary stormwater plan shall identify how stormwater runoff that originates on the site or flows through the site is currently controlled and how this will change with the proposed development or redevelopment project. The preliminary stormwater plan shall be submitted with the land use application.

The project engineer shall include a statement that all the required information is included in the preliminary stormwater plan and that the proposed stormwater facilities are feasible. All plans, studies, and reports that are part of the preliminary stormwater plan shall be signed and dated by the professional civil engineer(s) (registered in the state of Washington) responsible for the preparation of the preliminary stormwater plan.

The preliminary stormwater plan submittal shall consist of:

- 1) Existing Conditions Plan**
- 2) Preliminary Development Plan**
- 3) Preliminary Technical Information Report (TIR)**
- 4) Soils Report**

The goal of the preliminary stormwater plan process is to develop and provide a preliminary stormwater report describing the design strategies that will be used to meet stormwater management requirements. A primary objective of the stormwater plan is to manage runoff created by the project to evaporate, transpire, and infiltrate stormwater, and to achieve the goal of mimicking the pre-development natural hydrologic conditions on the site.

### **Modification of Content Requirements**

The responsible official may waive in writing some or all of the content requirements in the preliminary stormwater plan if:

- The development project is included in an approved final stormwater plan that meets the requirements of this manual; or
- A basin plan exists that makes some of the information irrelevant.

The waiver of some or the entire preliminary stormwater plan does not relieve the applicant of the requirement to prepare a final stormwater plan.

### **Existing Conditions Plan**

The Existing Conditions Plan shall consist of 22-inch x 34-inch or 24-inch x 36-inch drawings; single family residence plans can be at 11-inch x 17-inch. Electronic submittals (in PDF) are encouraged. The Existing Conditions Plan shall include:

1. Existing property boundaries, easements, and rights-of-way.
2. Location of the 100-year floodplain and floodways and shoreline management areas on the site.
3. Existing contours with a 2-foot maximum contour interval, unless the responsible official determines a lesser interval is sufficient to show drainage patterns and basin boundaries.
4. Offsite areas contributing runoff to the site.
5. Natural drainage features on and adjacent to the site, including streams, wetlands, springs, and closed depressions.
6. Manmade drainage features on and adjacent to the site, including existing water quality or flow control BMPs and conveyance systems.
7. Areas of the site identified as geologic hazards as defined in CCC 40.430.
8. Existing onsite water wells, known agricultural drain tiles, structures, utilities, and septic tanks and drain fields.
9. Existing drainage flow routes for each threshold discharge area (TDA) to and from the site, including bypass flows.
10. Locations of existing hard surfaces.
11. Locations of existing pervious surfaces.
12. Existing areas of the site predominantly covered by native vegetation (i.e., native trees, shrubs, and herbaceous plants as defined by the Washington State Department of Ecology [Ecology]) and areas of native vegetation to be preserved under proposed conditions.
13. The delineated wetland boundary (for sites that discharge stormwater to a wetland, either directly or indirectly through a conveyance system, and must meet Minimum Requirement 8, Wetlands Protection).

## **Preliminary Development Plan**

The Preliminary Development Plan shall consist of 22-inch x 34-inch or 24-inch x 36-inch drawings; single family residence plans can be 11-inch x 17-inch. Electronic submittals (in PDF) are encouraged. The Preliminary Development Plan shall include:

1. Proposed property boundaries, easements, and rights-of-way.
2. Location of the 100-year floodplain and floodways and shoreline management area limits on the site.
3. Proposed contours with a 2-foot maximum contour interval, unless the responsible official determines a lesser interval is sufficient to show drainage patterns and basin boundaries.
4. Offsite areas contributing runoff to the site.
5. Proposed drainage flow routes for each threshold discharge area (TDA) to and from the site, including bypass flows.
6. Locations of proposed hard surfaces.
7. Locations of proposed pervious surfaces.
8. Show the limits of the developed threshold discharge areas.
9. Show the proposed location of structural source control BMPs per Minimum Requirement 3.
10. Show the proposed point of discharge locations from the project site that preserve the natural drainage patterns and existing outfall locations, per Minimum Requirement 4.
11. Show the areas of the project site where onsite stormwater management BMPs will be effectively implemented, in accordance with Minimum Requirement 5, including LID BMPs.
12. Show the approximate location and size of proposed runoff treatment facilities.
13. Show the approximate location and size of proposed flow control facilities.
14. Include a conceptual grading plan that verifies the constructability of the proposed stormwater facilities.
15. Show the delineated on-site wetland boundary, and off-site wetland boundaries where stormwater is being discharged to a wetland, either directly or indirectly through a conveyance system.
16. The responsible official may require additional site or vicinity information if needed to determine the feasibility of the stormwater proposal.

## **Preliminary Technical Information Report (TIR)**

The preliminary TIR shall contain all technical information and analyses necessary to determine how applicable minimum requirements are being met and that the proposed stormwater facilities are

feasible. The required contents of the preliminary TIR are identified below.

## Section A – Project Overview

### Section A.1: Site Information

Site information shall include:

- The location of the site, either with a parcel number, an address, or adjacent streets and distance to the nearest cross street.
- A description of the topography, natural drainage patterns, vegetative ground cover, and presence of critical areas, which include Critical Aquifer Recharge Areas (CCC 40.410), Flood Hazard Areas (CCC 40.420), Geologic Hazard Areas (CCC 40.430), Habitat Conservation Areas (CCC 40.440), Wetland Protection Areas (CCC 40.450) and Shoreline Master Program Areas (CCC 40.460). Critical areas that receive runoff from the site shall be described to a minimum of ¼ mile away from the site boundary.
- A description of existing onsite stormwater systems and their functions, including drainage patterns to and from adjacent properties. Identify the primary discharge point or points from the site.
- A general description of proposed site improvements, including the size of improvements and proposed methods of mitigating stormwater runoff quantity and quality impacts.
- ? Do we include a description of suitability for LID BMPs?

### Section A.2 – Determination of Applicable Minimum Requirements

Based upon the preliminary site layout, determine whether Minimum Requirements 1 through 5 or 1 through 9 apply to the project. Include the following information in table format:

- The amount of existing hard surface.
- The amount of new hard surface.
- The amount of replaced hard surface.
- The amount of native vegetation converted to lawn or landscaping.
- The amount of native vegetation converted to pasture.
- The total amount of land-disturbing activity.

- If a redevelopment project, a cost basis.
- The total amount of pollution generating surfaces.
- The total amount of non-pollution generating surfaces.

Provide a statement that confirms which minimum requirements apply to the development activity. Trace on the flowchart (Figure xx) to show how applicable Minimum Requirements were determined.

For development or redevelopment where Minimum Requirements 1 through 9 must be met:

- Provide the amount of effective impervious area in each TDA, and document through an approved continuous runoff simulation model (e.g., the Western Washington Hydrologic Model [WWHM]) the increase in the 100-year flood frequency from pre-developed to developed conditions for each TDA.
- List the TDAs that must meet the runoff control requirements listed in Minimum Requirement 6.
- List the TDAs that must meet the flow control requirements listed in Minimum Requirement 7.
- List the TDAs that must meet the wetlands protection requirements listed in Minimum Requirement 8.
- Include the developed threshold discharge areas and flow routing on the proposed preliminary development plan. TDA labels must be cross-referenced to computer input screens and printouts or calculation sheets.

## **Section B – Minimum Requirements**

This section shall discuss how each minimum requirement applicable to the project (as identified in Section A.2) will be met.

### **Minimum Requirement 1 – Preparation of Stormwater Site Plans**

All projects meeting the thresholds in **Section XX** shall submit a Stormwater Site Plan for review by Clark County. Stormwater Site Plans shall use site-appropriate development principles [in compliance with...] to retain native vegetation and minimize impervious surfaces to the extent feasible.

### **Minimum Requirement 2 – Construction Stormwater Pollution Prevention**

Projects that result in 2,000 square feet or more of new plus replaced hard surface area or that

disturb 7,000 square feet or more of land must prepare a Construction Stormwater Pollution Prevention Plan (SWPPP) with the Final Stormwater Site Plan. See **Section XX** for information on preparing a SWPPP.

Projects that result in less than 2,000 square feet of new plus replaced hard surface area or that disturb less than 7,000 square feet of land must submit an Erosion Control Plan worksheet, available from Clark County Building Safety with the land use application or building permit application.

### **Minimum Requirement 3 – Source Control of Pollution**

If the development activity includes any of the activities listed in Chapter 4, identify the source control BMPs to be used with the land-disturbing activity.

Include on the preliminary development plan the proposed location of structural source control BMPs implemented in accordance with this minimum requirement.

### **Minimum Requirement 4 – Preservation of Natural Drainage Systems and Outfalls**

Describe how natural drainage patterns are being maintained, and how discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties. All outfalls require energy dissipation.

Include on the preliminary development plan the proposed point of discharge locations from the project site that preserve the natural drainage patterns and existing outfall locations.

### **Minimum Requirement 5 – Onsite Stormwater Management BMPs**

Include on the preliminary development plan the areas of the project site where onsite stormwater management BMPs will be effectively implemented, in accordance with this minimum requirement, including LID BMPs. The plan must show the areas of retained native vegetation, required flow lengths, and vegetated flow paths to demonstrate proper implementation of these BMPs.

#### **1. General**

- On the preliminary development plan, show the areas where onsite stormwater management BMPs (including LID BMPs) will be effectively implemented. The plan must show the areas of retained native vegetation and required flow lengths and vegetated flow paths, as required for proper implementation of each onsite stormwater BMP. Arrows must show the stormwater flow path to each BMP.
- Describe the suitability of the site for the selected BMPs, including hydrologic soil groups, geologic media, infiltration rates, slopes, and groundwater elevations.
- List and describe the pertinent results from geotechnical studies or other information

used to complete the design of each onsite stormwater BMP.

- Identify the design criteria in this manual for each on-site stormwater management BMP selected, and describe how the criteria will be met.

## 2. LID

- Indicate whether a mandatory list is being used or if the LID performance standard option will be used.
- If using List #1 or List #2 (necessary for threshold discharge areas where Minimum Requirements #1 - #9 are triggered, but do not exceed the thresholds in Minimum Requirements #6, #7) to comply with Minimum Requirement #5, provide written justification, including citation of site conditions identified in the soils report, for any onsite stormwater management BMPs that are determined to be “infeasible” for the project site.
- If using the LID performance standard option, provide:
  - Design details of all BMP’s that are used to achieve the standard.
  - A complete computer model report including input files and output files. Projects taking an impervious surface reduction credit for newly planted or retained trees must provide those calculations and the locations of the trees on the preliminary development plan. Projects using full dispersion or full downspout infiltration BMPs must provide information to confirm conformance with design requirements that allow removal of the associated drainage areas from computer model input.

### **Minimum Requirement 6 – Runoff Treatment Analysis and Design**

For land-disturbing activities where the thresholds within Minimum Requirement 6 indicate that runoff treatment facilities are required:

- Document the level of treatment required (basic, enhanced, phosphorus, oil/water separation), based on procedures in Chapter 5.
- Identify the BMPs used in the design, and their sources.
- Include an analysis of initial implementation costs and long-term maintenance costs.
- Show the approximate location and size of proposed runoff treatment facilities on the preliminary development plan.

## Minimum Requirement 7 – Flow Control Analysis and Design

For land-disturbing activities where the thresholds within Minimum Requirement 7 indicate that flow control facilities are required:

- Identify the site’s suitability for stormwater infiltration for flow control, including tested infiltration rates, logs of soil borings, and other information.
- If infiltration is infeasible for flow control, provide the following additional information:
  - Identify the areas where flow control credits can be obtained for dispersion, LID, or other measures, per the requirements in Chapter 3 of this manual.
  - Provide the approximate sizing and location of flow control facilities for each TDA, per Chapter 3 of this manual.
  - Identify the criteria (and their sources) used to complete the analyses, including pre-developed and post-developed land use characteristics.
  - For sites considered to be historical prairie, submit a project site report prepared by a wetland scientist or horticulturist experienced in identifying soils, plant, and other evidence associated with historic prairies to demonstrate the existence of historic prairie on the project site. Areas within Clark County that were historically prairie are identified in Appendix B. Bear, Fourth Plain, Mill Plain, and Lacamas prairies are identified as historic prairies. The maps should be used only as an indicator of historic prairie, not for specific prairie boundaries.
  - Complete a hydrologic analysis for existing and developed site conditions, in accordance with the requirements of CCC 40.385 and Chapter 3 of this manual, using an approved continuous runoff simulation model (the Clark County version of WWHM). Compute existing and developed flow durations for all subbasins. Provide an output table from the continuous flow model.
  - Include and reference all hydrologic computations, equations, graphs, and any other aids necessary to clearly show the methodology and results.
  - Include all maps, exhibits, graphics, and references used to determine predevelopment and developed site hydrology.
- Show the approximate location and size of proposed flow control facilities on the preliminary development plan.

## Minimum Requirement 8 – Wetlands Protection

For projects with stormwater discharges to a wetland, either directly or indirectly through a

conveyance system, the preliminary TIR shall describe wetland protection measures to be implemented in accordance with Minimum Requirement 8. The narrative shall describe the measures that will maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses.

Show the delineated wetland boundary for sites that discharge stormwater to a wetland, either directly or indirectly through a conveyance system, and must meet this minimum requirement.

## Minimum Requirement 9 – Operation and Maintenance

Provide information on who will own, operate, and maintain the stormwater facilities including LID BMPs that are considered in the design of treatment and flow control facilities meeting MR #6 and MR #7.

## Appendices

### Map Submittals

The following maps shall be included with the TIR. All maps shall contain a scale and north arrow.

- **Vicinity Map:** All vicinity maps shall clearly show the project site.
- **Soils Map:** This map shall show soils mapped by the Natural Resources Conservation Service (NRCS) within the contributing area that drains to the site itself. Soils maps may be obtained from the following sources:
  - Updated version of the Soil Survey of Clark County, Washington, originally published in 1972, and updated by the NRCS.
  - Geographic information system (GIS) maps of soils from Clark County GIS.
  - Washington soil survey data as available on the NRCS website (<http://websoilsurvey.nrcs.usda.gov>).
  - If the maps do not appear to accurately represent the soils for the site, the applicant's geologist or geotechnical engineer is responsible for verifying the actual soils for the site.
- **Other Maps**

The following additional maps shall be required in the situations noted:

- Critical Aquifer Recharge Areas and Wellhead Protection Areas. If the site lies within a Category I or II critical aquifer recharge area (CARA), a map showing the zones of contribution that overlap the site is required. See Clark County

Code Chapter 40.410 for CARA regulations.

- Floodplains. If a floodplain mapped by the Federal Emergency Management Agency (FEMA) exists on or adjacent to the site, a map showing the floodplain is required. See Clark County Code Chapter 40.420 for Flood Hazard Areas regulations.
- Shoreline Management Area. If the site contains or is adjacent to a water body regulated under the Washington Shorelines Management Act, a map showing the boundary of the shoreline management area in relation to the site is required. See Clark County Code Chapter 40.460 for Shoreline Management Area regulations.

## Other Submittals

1. **Soils Report:** See Section X.

## 1.7.2 Final Stormwater Plan

### Purpose

In accordance with Minimum Requirement 1, the final stormwater plan provides final engineering design and construction drawings for the stormwater aspects of a proposed new development or redevelopment project. The final stormwater plan shall be submitted and approved by the responsible official before construction of the development can begin.

All plans, studies, and reports that are part of the final stormwater plan shall be signed and dated by the professional civil engineer(s) (registered in the state of Washington) responsible for the preparation of the final stormwater plan.

### Modification of Content Requirements

The responsible official may waive in writing some or all of the content requirements in the final stormwater plan if:

- The development project is included in an approved final stormwater plan that meets the requirements of this manual and county code; or
- A basin plan exists that makes some of the information irrelevant.

### Final Stormwater Plan Submittal

The final stormwater plan submittal shall include the following:

1. Any easements, covenants, or agreements necessary to permit construction and maintenance, including for each on-site stormwater management BMP.

2. Design details, figures, and maintenance instructions for each post construction Stormwater Management BMP. These documents must be suitable to serve as a recordable document that can be attached to a declaration of covenant and grant of easement associated with each lot.
3. Final engineering plans that provide sufficient detail to allow construction of the stormwater facilities. These plans shall be stamped, signed, and dated by the engineer(s), registered in the state of Washington, responsible for hydrologic, hydraulic, geotechnical, structural and general civil engineering design and by the project engineer responsible for the preparation of the final stormwater plan. The final engineering plan shall show all utilities to ensure that conflicts between proposed utility lines do not exist.
4. The approved preliminary stormwater plan, with an explanation of any differences between the design concepts included in the preliminary and final stormwater plans. If a final stormwater plan differs from the approved preliminary stormwater plan in a manner that, in the opinion of the responsible official, raises significant water quality or quantity control issues, it shall require another SEPA determination (if subject to the State Environmental Policy Act [SEPA]) and a post-decision review, in accordance with CCC Section 40.520.060.
5. A final development plan (which may be a part of the final engineering plans or a separate plan). See the requirements identified below.
6. A final technical information report (TIR). See the requirements identified below.
7. A construction stormwater pollution prevention plan (SWPPP). See Section XX below.

## Final Development Plan

The final development plan shall be consistent with the preliminary development plan and may be combined with the final engineering plans. In addition to the information required in the preliminary development plan, the final plan requires the following information:

1. Threshold discharge area (TDA) delineations, and hard surface and pervious area delineations and area by TDA.
2. The acreage of pollution-generating pervious surfaces (PGPS) and pollution-generating hard surfaces (PGHS) used in the hydraulic/hydrologic calculations both onsite and offsite that contribute surface runoff.
3. Directions and lengths of overland, pipe, and channel flow.
4. Outfall points from each TDA and overflow routes for the 100-year storm.
5. Onsite conveyance systems, including pipes, catch basins, channels, ditches, swales, and culverts.

6. Primary flow path arrows for drainage under developed conditions, with the calculated flow rates. Cross-reference the flow rates to the hydrological model output file used to calculate the flow rates.
7. The site's Point of Compliance (POC)
8. The responsible official may require additional site or vicinity information if needed to determine the feasibility of the stormwater proposal.

## **Final Technical Information Report (TIR)**

The final TIR shall be a comprehensive report, supplemental to the final engineering plans, that contains all technical information and analyses necessary to complete final engineering plans based on sound engineering practices and appropriate geotechnical, hydrologic, hydraulic, and water quality design.

The final TIR shall be stamped, signed, and dated by the professional engineer(s), registered in the state of Washington, responsible for hydrologic, hydraulic, geotechnical, structural and general civil engineering design.

The required contents of the final TIR, which is part of the final stormwater plan, are identified below.

### **Section A – Project Overview**

Provide the information from the preliminary TIR, with the following additional elements:

1. Reference the conceptual design proposed in the preliminary stormwater plan, and identify revisions contained within the final engineering plans.

### **Section B – Minimum Requirements**

Provide the information from Section B of the preliminary TIR, revised as necessary for the final design. Confirm the applicable minimum requirements identified in the preliminary TIR. For land-disturbing activities where Minimum Requirements 1 through 9 must be met, provide the required information listed in Section B of the preliminary TIR, revised to reflect the final design.

#### **Minimum Requirement 3 – Source Control**

See the preliminary TIR requirements in Section XX.

#### **Minimum Requirement 4 – Preservation of Natural Drainage Systems and Outfalls**

See the preliminary TIR requirements in Section XX.

#### **Minimum Requirement 5 – Onsite Stormwater Management BMPs**

Provide the information from the preliminary TIR, with the following additional elements:

1. Reference the conceptual design proposed in the preliminary stormwater plan, and identify revisions contained within the final engineering plans.
2. For bioretention systems, provide the following:
  - a. The proposed soil matrix for the facility.
  - b. The planting plan, listing proposed plant types and locations.
  - c. Detail drawings, including the following:
    - If an underdrain is used, show drain rock, pipe, and filter fabric specifications.
    - All stormwater piping associated with the facility, including manholes, catch basin, pipe materials, sizes, slopes, and invert elevations.
    - Width, length, side slopes, and maximum design water depth for all facilities.
    - Irrigation system, if installed.
    - Designs for any retaining walls proposed. Structural walls shall meet county building permit requirements.
3. For porous pavements, provide supporting design calculations showing adequate infiltration rates to accommodate flows from all impervious surfaces directed onto any porous pavement. Reference standard details used in the design.
4. For reversed slope sidewalks, provide details on the planting plan for areas receiving water from reversed slope sidewalks.

### **Minimum Requirement 6 – Runoff Treatment Analysis and Design**

For land-disturbing activities where the thresholds within Minimum Requirement 6 indicate that runoff treatment facilities are required, provide the information from the preliminary TIR, with the following additional elements:

1. Reference the conceptual runoff treatment design proposed in the preliminary stormwater plan.
2. Identify revisions to the conceptual runoff treatment design contained in the preliminary stormwater plan.
3. Complete a detailed analysis and design of all proposed runoff treatment system elements, in

accordance with CCC Section 40.385.020(B) and this manual. Reference runoff treatment system elements to labeled points shown on the site location map or final development plan.

4. Include and reference all computations, equations, charts, nomographs, detail drawings, and other tabular or graphic aids used to design water quality system elements in the technical appendix.
5. Summarize the results of the runoff treatment design and describe how the proposed design meets the requirements of CCC Chapter 40.385 and this manual.

### **Treatment System Plan**

1. Provide an illustrative sketch of the treatment facilities and appurtenances.
2. The sketch shall correspond with final engineering plans. Alternatively, a final site grading plan that incorporates the above information may be included as an attachment to the final stormwater plan.
3. Provide electronic copies of the drawings used for analysis, measurement, and design inputs for the hydrologic analysis submitted with the final drawing in Portable Document Format (.pdf) format.

### **Minimum Requirement 7 – Flow Control**

For land-disturbing activities where the thresholds within Minimum Requirement 7 indicate that flow control facilities are required:

1. Identify revisions to the conceptual design proposed in the preliminary stormwater plan.
2. Identify initial conditions, including stream base flows, beginning water surface elevations, hydraulic or energy grade lines, initial groundwater elevations, beginning storage volumes, and other data or assumptions used to complete the analyses of initial conditions. Reference the sources of information.
3. Describe any assumptions used to complete the analysis, including flow credits through the use of onsite stormwater BMPs or LID measures.
4. Complete a detailed hydrologic analysis for existing and developed site conditions, in accordance with the requirements of Chapter 3, using an approved continuous runoff simulation model (the Clark County version of WWHM). Compute pre-developed and developed flow durations for all sub-basins. Provide an output table from the continuous flow model, including the following:
  - a. Flow rates for the 2-, 10-, and 100-year return periods for pre-developed and developed conditions.

- b. A table listing the pass/fail rates for each flow level where duration statistics were calculated.
  - c. A graph showing the flow rate on the y axis and percent time exceeding on the x axis for pre-developed conditions and post-developed mitigated conditions, from 50 percent of the 2-year flow rate through the 50-year flow rate.
5. Provide a hydraulic analysis of pipes and/or channels that lead to and/or from the outlet structure. The analysis should confirm the capacity of pipes and channels to convey the peak flow rates for the 2-, 10-, 50-, and 100-year return period flow rate with the water surface elevation of the pond at the elevation for those return period flow rates.
  6. Submit electronic copies of the WWHM project files to allow reviewers to run the model and confirm the model results.
  7. Include and reference all hydrologic and hydraulic computations, equations, rating curves, stage/storage/discharge tables, graphs, and any other aids necessary to clearly show the methodology and results.
  8. Include all maps, exhibits, graphics, and references used to determine pre-development and developed site hydrology.

### **Flow Control System Plan**

9. Provide an illustrative sketch of the flow control facilities and appurtenances.
10. Show basic measurements necessary to confirm storage volumes.
11. Show all orifice, weir, and flow restrictor dimensions and elevations.
12. The sketch shall correspond with final engineering plans. Alternatively, a final site grading plan that incorporates the above information may be included as an attachment to the final stormwater plan.
13. Provide electronic copies of the drawings used for analysis, measurement, and design inputs for the hydrologic analysis submitted with the final drawing in Portable Document Format (.pdf) format.

### **Minimum Requirement 8 – Wetlands Protection**

For projects with stormwater discharges to a wetland, either directly or indirectly through a conveyance system, [do we need to include water being routed around or intercepted from discharging to a wetland which can affect the hydro-period?] the TIR shall describe wetland protection measures to be implemented in accordance with Minimum Requirement 8. The narrative shall describe the analysis performed to define the measures that will maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and

designated uses.

### **Minimum Requirement 9 – Operation and Maintenance**

Provide information on who will own, operate, and maintain the stormwater facilities.

An operations and maintenance manual shall be prepared that includes O&M procedures for each stormwater control or treatment facility to be privately maintained, and for those that constitutes an experimental system to be maintained by the county.

The manual shall be written in an orderly and concise format that clearly describes the design and operation of the facility. The manual shall also provide an outline of required maintenance tasks, with recommended frequencies at which each task should be performed. The manual shall contain or reference procedures from the latest version of Clark County's *Stormwater Facility Maintenance Manual*.

### **Section C – Conveyance Systems Analysis and Design**

1. Reference the conceptual drainage design proposed in the preliminary stormwater plan.
2. In the technical appendix, include and reference all computations, equations, charts, nomographs, detail drawings, and other tabular or graphic aids used to design conveyance system elements.
3. Identify revisions to the conceptual drainage design contained in the preliminary stormwater plan.
4. Identify and discuss initial conditions, including water surface elevations, hydraulic or energy grade lines, beginning storage elevations, and other data or assumptions used to complete the analyses of initial conditions. Reference the sources of information.
5. Describe any assumptions used to complete the analyses.
6. Complete a detailed hydraulic analysis of all proposed collection and conveyance system elements, including flow splitters, outfall structures, and outlet protection in accordance with Chapter X (Conveyance Systems) of this manual. Compute and tabulate the following:
  - a. Identify design flows and velocities and conveyance element capacities for all conveyance elements within the development.
  - b. Identify the 10-year recurrence interval stage for detention facility outfalls (See Chapter X). Provide stage-frequency documentation from WWHM.
  - c. Compute existing 100-year floodplain elevations and lateral limits for all channels, and verify no net loss of conveyance or storage capacity from development.

- d. Reference conveyance system elements to labeled points shown on the site location map or development plan.
- e. Verify the capacity of each conveyance system element to convey design flow and discharge at non-erosive velocities. Verify the capacity of the onsite conveyance system to convey design flows that result from ultimate build-out of upstream areas.
- f. Include and reference all hydraulic computations, equations, pipe flow tables, flow profile computations, charts, nomographs, detail drawings, and other tabular or graphic aids used to design and confirm the performance of conveyance systems.
- g. Summarize the results of system analyses, and describe how the proposed design meets the requirements of this manual.

## **Section D Additional Requirements**

### **Section D.1 – Off-site Analysis**

If applicable, provide the results of an offsite analysis prepared in accordance with Chapter X (Offsite Analysis and Mitigation) of this manual. (See exemptions in Chapter X.)

#### Section D... - Closed Depression Analysis

If applicable, provide the results of an closed depression analysis prepared in accordance with Chapter X (xxxxxx) of this manual. (See exemptions in Chapter X.) [may need to use the section from 1992 Puget Sound Manual, III-1.5 page 41]

### **Section D.2 – Other Permits**

Construction of roads and stormwater facilities may require additional permits from other agencies. These permits may contain requirements that affect the design of the stormwater system. This section lists the titles of other possible required permits, the agencies that require the permits, and the permit requirements, if known, that may affect the final stormwater plan. Approved permits that are critical to the feasibility of the stormwater facility design shall be included in this section.

1. Onsite sewage disposal: Clark County Health Department or Washington Department of Health
2. Developer/local agency agreement: Washington State Department of Transportation (WSDOT) (connection license)
3. Short-term water quality modification approval: Washington State Department of Ecology (Ecology)??
4. An Ecology general construction stormwater permit for projects that disturb over an acre.

5. An Ecology general stormwater permit for industrial activities
6. Hydraulic project approval: Washington Department of Fish and Wildlife (WDFW)
7. Dam safety permit: Ecology
8. Section 10, 404, and 103 permits: U.S. Army Corps of Engineers
9. Surface mining reclamation permits: Washington Department of Natural Resources
10. Clark County critical aquifer recharge area (CARA) permit: CCC Chapter 40.410
11. Clark County floodplain permit: CCC Chapter 40.420
12. Clark County geohazard permit: CCC Chapter 40.430
13. Clark County habitat permit: CCC Chapter 40.440
14. Clark County wetland permit: CCC Chapter 40.450
15. Clark County shoreline management permit: CCC Chapter 40.460
16. Underground injection control (UIC) well registration: Ecology

### **Section D.3—Approval Conditions Summary**

List each preliminary approval condition related to stormwater control, wetlands, floodplains, and other water-related issues, and describe how the final design addresses or conforms to each condition.

### **Section D.4 – Special Reports and Studies**

Where site-specific characteristics, such as steep slopes, wetlands, and sites located in floodplains or wellhead protection areas, present difficult drainage and water quality design problems, the responsible official may require additional information or the preparation of special reports and studies that further address the specific site characteristics, the potential for impacts associated with the development, and demonstrate the proposed measures to mitigate impacts. Special reports shall be prepared by professionals with expertise in the particular area of analysis, who shall date, sign, stamp, and otherwise certify the report. Subjects of special reports may include, but are not be limited to:

1. Geotechnical
2. Wetlands
3. Floodplains and floodways

4. Groundwater
5. Structural design
6. Fluvial geomorphology (erosion and deposition).

All special reports and studies shall be included in the technical appendix.

### **Section D.5 – Groundwater Monitoring Program**

Where required by this manual<sup>5</sup>, a groundwater monitoring program shall be included in the final stormwater plan. The groundwater monitoring program shall be prepared by a person licensed as a geologist, hydrogeologist or qualified engineer with expertise in groundwater contamination investigation, prevention, and monitoring. The plan shall clearly describe a comprehensive groundwater testing and evaluation program designed to ensure compliance with federal and state of Washington laws and the requirements of CCC Chapter 40.385. The responsible official will review proposed groundwater monitoring programs on a site-specific basis.

## **Appendices**

### **Map Submittals**

See the preliminary TIR requirements in Section XX.

### **Technical Data**

All TIRs shall contain a technical appendix that includes all computations completed in the preparation of the TIR, together with copies of referenced data, charts, graphs, nomographs, hydrographs, stage-storage discharge tables, maps, exhibits, and all other information required to clearly describe the stormwater flow control and runoff treatment design for the proposed development activity. The format of the technical appendix shall follow as closely as possible the section format of the TIR and shall be adequately cross-referenced to ensure that the design may be easily followed, checked, and verified. The technical appendix shall also contain all special reports and studies.

## **1.7.3 Stormwater Plan Changes**

If the designer must make changes or revisions to the final stormwater plan after final approval, the proposed revisions shall be submitted to Clark County prior to construction. The submittals shall include the following:

1. Substitute pages for the originally approved final stormwater plan, identifying the proposed changes.
2. Revised drawings, showing any structural changes.

3. Any other supporting information that explains and supports the reason for the change.

All revisions shall be stamped, signed, and dated by the professional engineer(s), registered in the state of Washington, responsible for hydrologic, hydraulic, geotechnical, structural and general civil engineering design.

## 1.7.4 Soils Report

For projects subject to engineering review triggering Minimum Requirements 1-5 or Minimum Requirements 1-9, a soils report is required. This report must be prepared by a professional soil scientist certified by the Soil Science Society of America (or an equivalent national program), a locally licensed on-site sewage designer, or by other suitably trained persons working under the supervision of a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington.

The requirements for this report differ, depending upon which minimum requirements are triggered. For sites triggering Minimum Requirements 1-5, the following is required.

- The report shall identify:
  - Underlying soils on the site utilizing soil surveys, soil test pits, soil borings, or soil grain analyses (see <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm> for soil survey information).
  - The results of saturated hydraulic conductivity (Ksat) testing to assess infiltration capability and the feasibility of rain gardens, bioretention, and permeable pavement. Grain size analyses may substitute for infiltration tests on sites with soils unconsolidated by glacial advance.

Note: The author may exercise discretion concerning Ksat testing if in their judgment information exists confirming that the site is unconsolidated outwash material (high infiltration rates) and there is adequate depth to ground water (1 foot minimum from bottom of a rain garden, bioretention, or permeable pavement installation). [move this paragraph to an appropriate technical chapter/section]

- The results of testing for an hydraulic restriction layer (ground water, soil layer with less than 0.3 in/hr Ksat, bedrock, etc) under possible sites for a rain garden, bioretention facility, or permeable pavement. Testing with a monitoring well or an excavated pit must extend to a depth at least 1 foot below the estimated bottom elevation of a rain garden/bioretention excavation and at least 1 foot below the subgrade surface of a permeable pavement. This analysis should be performed in the winter season (December 21 through March 21). The optimum time to test for depth to ground water is usually late winter and shortly after an

extended wet period. Site historic information and evidence of high ground water in the soils can also be used. [move this paragraph to an appropriate technical chapter/section]

For sites triggering Minimum Requirements 1-9, include the above information, plus the following additional items:

- Soil stratigraphy shall be assessed for low permeability layers, highly permeable sand/gravel layers, depth to ground water, and other soil structure variability necessary to assess subsurface flow patterns. Soil characterization for each soil unit (soil strata with the same texture, color, density, compaction, consolidation and permeability) shall include:
  - Grain size distribution
  - Textural class
  - Percent clay content
  - Cation exchange capacity
  - Color/mottling
  - Variations and nature of stratification
- The results of saturated hydraulic conductivity (Ksat) testing to assess infiltration capability and the feasibility of bioretention, and permeable pavement. Use Clark County approved soil testing methods (See Section X). Grain size analyses may substitute for infiltration tests on sites underlain by unconsolidated sediment.
- Placement of Ksat tests should be carefully considered to reduce cost. A few strategically placed soil test pits and saturated hydraulic conductivity test sites are generally adequate for initial site assessment and for smaller sites (e.g. less than an acre). On larger project sites, a more detailed soil assessment and additional Ksat testing may be necessary to direct placement of impervious surfaces such as structures away from soils that can most effectively infiltrate stormwater, and placement of permeable pavement roads, parking lots, driveways, walks, and bioretention/rain gardens over those soils. The Ksat tests are also necessary as input to the runoff model to predict the benefits of LID BMPs which infiltrate.

Note: The investigator can exercise discretion concerning Ksat testing if in their judgment information exists confirming that the site is unconsolidated outwash material (high infiltration rates) and there is adequate depth to ground water (1 foot minimum from bottom of a rain garden, bioretention, or permeable pavement installation).

- The results of testing for an hydraulic restriction layer (ground water, soil layer with less than 0.3 in/hr Ksat, bedrock, etc) under possible sites for a bioretention

facility, or permeable pavement. If the general site assessment cannot confirm that the seasonal high ground water or hydraulic restricting layer is greater than 5 feet below the bottom of the bioretention or permeable pavement (subgrade surface) monitoring wells or excavated pits should be placed strategically to assess depth to ground water. This analysis should be performed during the wet season prior to construction. Monitoring with a continuously logging censor between Dec. 21 and Mar. 21 provides the most thorough information. Monitoring for lesser time periods can be accepted but increases risk. Site historical data regarding ground water levels can be used in lieu of field testing if the data are reliable and sufficient. Also, soil evidence of historical ground water elevations may be used. [move this paragraph to an appropriate technical chapter/section]

- Special considerations are necessary for highly permeable gravel areas. Signs of high ground water will likely not be present in gravelly soils lacking finer grain material such as sand and silt. Test pit and monitoring wells may not show high ground water levels during low precipitation years. Accordingly, sound professional judgment, considering these factors and water quality treatment needs, is required to design multiple and dispersed infiltration facilities on sites with gravel deposits. [move this paragraph to an appropriate technical chapter/section]
- If on-site infiltration may result in shallow lateral flow (interflow), the conveyance and possible locations where that interflow may re-emerge should be assessed by a professional engineer, geologist, hydrogeologist, or engineering geologist registered in the State of Washington. This will likely require placement of ground water monitoring wells to determine existing ground water gradients and flow. In general, a minimum of three wells associated with three hydraulically connected surface or ground water features, are needed to determine the direction of flow and gradient. [move this paragraph to an appropriate technical chapter/section]

## 1.7.5 Construction Stormwater Pollution Prevention

In accordance with Minimum Requirement 2, a Construction Stormwater Pollution Prevention Plan (SWPPP) is required for all project sites where the new, replaced, or new plus replaced impervious surfaces total 2,000 square feet or more or where 7,000 square feet or more of land is disturbed. Single-family projects less than 1 acre may submit the Erosion Control Worksheet that addresses the 13 elements.

All SWPPPs submitted by a construction contractor shall be prepared by a person who holds a valid Certified Erosion and Sediment Control Lead (CESCL).

The Construction SWPPP or Erosion Control Worksheet shall be submitted to the responsible

official and approved before undertaking any land-disturbing activity. The [engineering related portion of the] Chapter X of this manual lists the requirements of the 13 elements of the Construction SWPPP.

## **I.7.6 Stormwater Site Plan Submittals for a Small Project**

Add a section on the submittals for small projects?

DRAFT