

Clark County Development and Redevelopment Flow Control Mitigation Program

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Background

Under the 2007 Western Washington phase I NPDES municipal stormwater permit (Permit), permittees, including Clark County, are required to control stormwater flows from development and redevelopment projects to levels that match historical pre-developed conditions. The standard flow control requirement is described in Appendix 1 of the Permit, and indicates that the pre-developed condition is forested land cover unless certain specified conditions are met. The methods to conduct this analysis are described in the state's 2005 Stormwater Management Manual for Western Washington (SWMMWW). The approach typically followed by permittees to meet the flow control objective is to require developers of development and redevelopment projects that exceed certain thresholds to construct flow control facilities designed to comply with the standard flow control requirement. The Washington Department of Ecology (Ecology) has acknowledged that there are other approaches that can provide an equivalent level of flow control for the protection of aquatic resources and that the Permit allows alternative planning efforts.

Clark County has elected to use an alternative method to provide the level of flow control required by the permit. The County has opted to implement a capital flow control mitigation program which, taken together with development and redevelopment regulations, will meet the Permit's standard flow control requirement as described in Appendix 1 of the Permit.

Purpose

This document describes the framework and criteria for the County's flow control mitigation program. This document is incorporated into Agreed Order No. 7273, a compliance agreement between Ecology and the County, and is a fully enforceable element of the Agreed Order.

The County believes that this approach is the best mechanism for providing flow control benefits where they are most effective. By using this approach, the County believes it will be able to:

- Apply flow controls where they are most effective
- Spend scarce resources where they are most needed
- Provide the level of flow control required by the Permit
- Fix or reduce problems caused by incompletely controlled stormwater flows

Projects Triggering a Flow Control Mitigation Obligation

Development and redevelopment projects that vested on or after April 13, 2009, and trigger minimum requirement #7 Flow Control under Chapter 40.385 Clark County Code will be reviewed to determine if they fail to fully mitigate to historical land cover. These projects will be tracked, and once construction commences on a project, it will cause the County to incur a mitigation obligation (Mitigation Obligation).

A Mitigation Obligation is incurred only for project sites that meet threshold requirements for flow control facilities in Appendix 1 of the Permit. Only the parts of the project site draining to the county MS4 or that include county storm sewer, including road right-of-way, are subject to the Mitigation Obligation.

A project's flow control Mitigation Obligation is for the project site as defined in Appendix 1 of the Permit and not to the entire parcel in cases where a project only develops or redevelops part of a parcel.

Project sites or parts of project sites that meet minimum requirement #7 through full dispersion or on-site stormwater retention for flows up to the 50-year developed peak flow do not incur a Mitigation Obligation.

A Mitigation Obligation accrues to the County when construction or land disturbing activity begins on a project. It is at this point that the county assigns a Development Inspection Number (or DIN) to each project.

Tracking Mitigation Obligation

The County will track its Mitigation Obligation beginning when the stormwater code and manual became effective, April 13, 2009. Development and redevelopment projects vested after this date are subject to the flow control mitigation program if they proceed to construction.

The Mitigation Obligation of each development/redevelopment project is the difference between the flow control provided by the project to existing land cover and the amount of flow control required to meet minimum requirement #7 of Permit Appendix 1. The Mitigation Obligation shall be represented and tracked as acres of pre-project land cover for each of the following land cover categories:

- effective impervious area
- lawn/landscape
- pasture

Conversion of forest land does not create a Mitigation Obligation because County Code requires development projects to fully mitigate for the project's cleared forest.

The area of converted pre-project land cover will be reported by the project applicant as they modeled the site in the Western Washington Hydrology Model (WWHM) and will be verified by Clark County staff. Mitigation Obligation areas will be tracked to the nearest one-tenth acre. For example, a 5-acre development project that mitigates to existing land cover of 1.2 acres of Effective Impervious Area (EIA), 3.3 acres of pasture, and 0.5 acres of forest, would oblige the County to mitigate equal totals of the land cover. The obligation accounted for would be 1.2 acre of EIA and 3.3 acres of pasture; runoff from the forested area would already be fully mitigated by the development project under current county code

Mitigation Obligation for Projects Exceeding County Standards

In cases where development and redevelopment projects provide flow control mitigation beyond that required by county code, the area mitigated to historic conditions would be determined by following methods described in the section on calculating mitigation project benefits. The result will be used to determine the County's Mitigation Obligation from the project.

Mitigation Obligation Table

A table will be maintained for tracking the Mitigation Obligation for each development project by land cover (Table 1). This table will include the following information:

- *Project ID* is a unique ID attached to the project site polygon
- *Project Development Inspection Number (DIN)* is assigned to development projects as they proceed to construction
- *Project Name* is assigned to development projects as their applications are accepted
- *Project Vesting Year* provides the date when county regulations apply. This information provides a leading indicator of potential Mitigation Obligation. It is not a good indicator of when a project is likely to be built. The land cover is noted but not included in the actual Mitigation Obligation, which is counted at the point construction begins
- *Construction Start Year* is the date of the preconstruction conference held before construction work is allowed. It is the year in which the Development Inspection Number is assigned.
- *Construction Completed Year* is specified by Development Engineering as a completion of construction notice
- *Historical Land Cover (forest or prairie)* is the principal predevelopment site land cover determined by best available information. Generally, it is forest but there are historical maps from the mid-19th Century that map prairies in the Vancouver area.
- *Landscaped Area Mitigation Obligation (acres)* is the amount of landscaped area in a development project that must be mitigated
- *Effective Impervious Area Mitigation Obligation (acres)* is the amount of effective impervious area in a development project that must be mitigated
- *Pasture Mitigation Obligation (acres)* is the amount of pasture in a development project that must be mitigated

Allowable Capital Mitigation Projects

In order to satisfy its Mitigation Obligation, the County may build several types of flow control facilities as capital improvement projects (Mitigation Projects).

Only Mitigation Projects that can be simulated in an approved model will be considered for meeting the Mitigation Obligation. The categories of acceptable flow control and reforestation projects under this agreement include:

- Detention
- Infiltration
- Detention with infiltration
- Full dispersion
- Existing facility retrofits or reconstruction
- Structural LID BMPs (Porous pavement and bio-retention basins)
- Reforestation of impervious area, lawn and pasture on land protected by covenant or easement.

Each of these categories except reforestation correlates to facilities with design criteria in Ecology's 2005 Stormwater Management Manual for Western Washington.

LID BMPs may be used to fully achieve the flow control requirement of the NPDES permit (as predicted by an approved continuous runoff model), or may be used to reduce the size of downstream flow control facilities.

Ecology may accept Mitigation Projects other than standard stormwater flow control practices and reforestation projects above if the County can demonstrate quantifiable runoff reduction or control that fully mitigates a defined amount of Mitigation Obligation. Such projects require approval from Ecology in writing before a credit is applied.

Calculating Area Mitigated by Capital Projects

Stormwater Retention and Detention Facilities

The Direct Method proposed by Ecology will be used to calculate the area mitigated by stormwater flow control capital improvement projects or Mitigation Projects. The Direct Method is an approach to estimate the area fully mitigated by a new pond or a retrofitted pond. It uses the WWHM to iteratively test the amount of impervious area, lawn or pasture that is fully mitigated to historical conditions by a specific proposed pond. Recognizing that a new facility may not fully mitigate the area draining to it, the area draining to a facility, as represented in the WWHM is gradually or iteratively reduced until the pond outflow meets the predeveloped duration standard in the WWHM. The method can also be used to aid design of a simple flow control structure. The step-by-step standard procedures are as follows:

A. **Direct Pond Sizing Method for Determining Mitigation Credits in Cases Where There is Not a Pre-existing Pond**

Step 1: Select pond dimensions based upon available space and available depth for water storage.

Step 2: Using WWHM, route the entire drainage basin into the pond. Use the appropriate historical land cover (forest or prairie) as the pre-developed condition for developing the target flow duration curve. Use the actual land cover and soils conditions for the post-developed condition of the drainage basin. Determine an appropriate discharge structure to meet the target flow duration curve.

Step 3: Case 1: If the pond is larger than what is necessary to meet the default flow duration standard, try reducing the pond size and adjusting orifices until just meeting the flow duration standard. The entire drainage area is the flow mitigation credit.

Case 2: If the pond cannot meet the flow duration curve, begin reducing the drainage area that was entered into the WWHM (preferably by first eliminating the lawn area, and then by reducing the impervious area). Continue reducing the drainage area until the available pond volume, in combination with specific orifice sizes that you have chosen, achieves full compliance. The preferred discharge structure design involves three orifices (or an orifice and a rectangular notch) in a standpipe which is open at the top to pass flows that overtop it. The identified drainage area is the first estimate of the mitigation credit.

Step 4: Assuming the pond design arrived at in Case 2 above, use the WWHM to route the entire actual drainage area into the pond. Determine whether the standpipe overflow can manage the most extreme flows so that the emergency overflow (i.e., the armored spillway in the dike) does not engage. If the standpipe is adequate, then no design changes are necessary, and the drainage area identified in Case 2 above is the mitigation credit. If the standpipe is not adequate, increase its diameter, while keeping the orifices at the same heights and circumferences, until the emergency spillway does not engage. Using the adjusted standpipe diameter, the same orifices, and the same pond dimensions, check to see whether the drainage from the area computed as the first estimate of the mitigation credit (in Case 2) can pass through the orifices and standpipe and still meet the flow duration standard. If not, reduce the drainage area until it does. This is the adjusted mitigation credit.

Note 1: In actual practice, all of the drainage area is routed into the pond

Note 2: Where the Clark County version of the WWHM is approved for use by Ecology, it substitutes for the WWHM in the above procedure.

B. Direct Pond Sizing Method for Determining Mitigation Credits in Cases Where There is a Pre-existing Pond that will be expanded.

Step 1: Determine a theoretical drainage basin which could be fully mitigated (i.e., meet the default flow control standard assuming the appropriate historical condition is forested) by the existing pond. The analysis involves changing the discharge structure design—orifice heights and diameters—but using the as-built pond dimensions.

Step 2: Determine a theoretical drainage basin which could be fully mitigated by the proposed, larger pond and a new discharge structure. Subtract the area for Step 1 from Step 2. This is the initial estimate of the mitigation credit represented by the expanded pond.

Step 3: Enter the characteristics (impervious areas, lawn/landscape areas) of the actual (entire) area draining to the expanded pond into the appropriate fields for the basin icon, and route the basin into the pond designed in Step 2. Note that the expanded pond is not mitigating for all of the area that is draining to it. Check to see if the discharge structure overflow (the top of the standpipe) is adequate to pass all of the predicted flows. If the discharge structure passes all flows without engaging the emergency overflow, it is finished. The initial estimate of credit in Step 2 is also the final estimate. If the discharge structure will not pass all flows, enlarge the overflow structure diameter, keeping the orifices at the same diameters and heights (or if using a vertical rectangular notch, the same width), until the discharge structure does pass all flows. Using that discharge structure, re-run the model to determine the acreage that can be fully mitigated by the expanded pond with the revised standpipe. Subtract the area for Step 3 (in the case where the standpipe was enlarged) from the area for Step 1. This is the final estimate of mitigation credit.

Low Impact Development (LID) Retrofit Projects

The LID projects must be structural BMPs (porous pavement or bio-retention basins) owned and maintained by the County. If the LID is a full infiltration BMP, the entire area draining to it is considered to be mitigated.

The facilities will be modeled following guidance the SWMMWW's Appendix C of Volume III.

There are three ways in which LID facilities may be used:

1. For situations in which solely using the LID facilities achieves compliance with the historical flow duration curve, the mitigation credit is the area draining to the LID facilities.
2. For a new retention or detention (R/D) pond where one does not currently exist, LID features may be used to help increase the mitigation credit acreage. By incorporating LID features into the drainage area served by the new R/D pond, more acreage can be completely mitigated by the R/D pond. Where the proposed pond cannot be built large enough to meet the flow duration standard for the entire drainage area, and a smaller, theoretical "credit" area is identified by the Clark County version of the WWHM, LID features in the actual drainage area must serve the same size and type of areas as represented in the theoretical credit area.
3. In existing facility retrofit projects, LID projects can assist in increasing the size of the estimated drainage area that would be fully mitigated by the expanded retention/detention facility. In all cases, the LID facilities must be represented in the model as serving the actual areas for which they are proposed.

Land Cover Conversion to Historical Forest

These are projects that directly convert effective impervious area, landscaped area or maintained pasture to native vegetation that will develop into a forest that is protected as a mitigation site with a conservation covenant or easement granted to the County in cases where the County does not own the land. In this case, the Mitigation Credit is the area of land cover converted to forest.

The mitigation site must meet the following criteria:

- Existing impervious, landscaped, and pasture areas that are intended for conversion back to native conditions must meet the soil quality and depth requirements of BMP T5.13 in Volume V of the Stormwater Management Manual for Western Washington. As allowed by that BMP, where the existing soils meet the ten percent organic quality and eight-inch depth requirements, the County may plant directly without amending and tilling the entire area.
- The new pervious area must be planted with native vegetation, including evergreen trees. For further guidelines, see the Washington State Department of Transportation (WSDOT) *Roadside Classification Plan* and the WSDOT *Roadside Manual*.
- The new pervious area must be designated as a stormwater management area in the Capital Planning database whether or not it receives runoff from adjacent areas.

- The new pervious area must be permanently protected from development. If the area is sited off County right-of-way, it must be protected with a conservation easement or some other legal covenant that allows it to remain in native vegetation.

Mitigation Project Development and Prioritization

Clark County will use its current Stormwater Needs Assessment Program and Stormwater Capital Improvement Program to scope, prioritize, and plan flow control mitigation projects. The Stormwater Needs Assessment Program identifies potential detention and retention facility projects—projects to reconfigure existing facilities to increase flow control characteristics—and structural stormwater LID BMPs, such as rain gardens. The needs assessments may also identify properties where forest conversion is a viable option.

The County believes that one of the key benefits gained from this approach is the ability to place flow control mitigation where it is most effective in preserving and restoring beneficial uses. Past and current work by Clark County's Stormwater Needs Assessment Program includes hydrologic and hydraulic modeling of streams within urban growth area subwatersheds, assessing stream geomorphology and describing riparian conditions. This information will provide the basis for selecting the most suitable areas for flow control mitigation projects.

Specific mitigation project sites will be determined by priorities for flow control mitigation established under a project selection process that considers existing information describing channel conditions, channel hydrology, and subwatershed hydrology.

Within the group of projects deemed most suitable to watershed conditions, highest priority may be given to projects having the best cost/benefit ratios in terms of cost per unit of land cover mitigated.

Geographic Location of Mitigation Projects

Mitigation Projects to address the Mitigation Obligation will be built within the same Water Resource Inventory Area, as mapped by the State of Washington, as the Mitigation Obligation incurred. Specific mitigation project sites will be determined by priorities for flow control mitigation established under a project selection process that considers existing information describing channel conditions, channel hydrology, and subwatershed hydrology.

To the extent feasible, the locations of Mitigation Projects should support identified needs and recommendations in existing resource management plans, and should also align with the County's policies on environmental mitigation. Projects should be prioritized by watershed and then Water Resource Inventory Area, in consideration of the distribution of the County's Mitigation Obligation.

Mitigation Project Timing

Mitigation Obligations will be triggered by the start of construction of a development project and accrue by calendar year regardless of the day of the year when the development project starts construction during a given year.

The Mitigation Obligation must be met within two calendar years from the year that the development project being mitigated began construction. For example, a development project requiring mitigation that began construction in July 2009 must be mitigated by the end of calendar year 2011 and its mitigation reported in the 2011 Permit annual report.

Mitigation Credits from flow control mitigation projects completed after April 13, 2009, will count toward meeting the Mitigation Obligation. Mitigation projects shall be complete and functioning before associated Mitigation Credits can be applied to the Mitigation Obligation. The County will report the mitigation projects completed and the amount of Mitigation Credits generated during the year in the annual report to Ecology. The report will include a statement of whether or not the project timing requirements were met for the reporting year.

Mitigation Project Tracking

Each acre of a specific land cover in the county's Mitigation Obligation database will be fully mitigated to historic land cover conditions. To account for the mitigation obligation met by specific stormwater projects, continuous runoff modeling will be used to define the amount of land cover controlled to the applicable historical conditions by each project.

As Mitigation Projects are built, acres of each land cover type mitigated to historical conditions will be subtracted from the Mitigation Obligation. The net Mitigation Obligation (positive or negative) will be carried over into the next year.

Clark County will track Mitigation Projects in a GIS database. Each Mitigation Project will have a point or polygon location for the project site.

The Capital Planning database will be used to create tables and reports. Clark County will create a table for tracking county Mitigation Projects. An example is included as Table 2 and will include the following information:

- *Project ID* is the county project identification number
- *Project Name* is the county project name
- *Project Status* is the status of the project as planned, designed, under construction or completed at the end of the reporting year
- *Estimated Project Cost* is the estimated cost for the county budget process
- *Actual Project Cost* is the final cost to plan, design and build the project
- *Soil Type* is the type at the Mitigation Project site based on the approved model
- *Historical Land Cover (Forest or Pasture)* is based on the predominant land cover in the area mitigated
- *EIA Mitigated to Historical land cover (acres)* is the amount of effective impervious area calculated to be fully mitigated to historical land cover by the project
- *Landscaped Mitigated to Historical land cover (acres)* is the amount of landscaped area calculated to be fully mitigated to historical land cover by the project
- *Pasture Mitigated to Historical land cover (acres)* is the amount of pasture calculated to be fully mitigated to historical land cover by the project

Yearly Reporting

Clark County will report annually on the status of its Flow Control Mitigation Program in an attachment to the annual report required by the Permit. The report will include a narrative summarizing the program and include information from Table 1 and Table 2 by calendar year and totals to date under the Agreed Order.

Yearly Mitigation Program and financial reporting will be included in the format provided in Table 3. The table will summarize the Mitigation Obligation and Mitigation Projects completed by calendar year for each land cover type. It will also keep a running tally of the Mitigation Obligation. Definitions for the elements included in Table 3 are the following:

- *Year* is the reporting year
- *Beginning Mitigation Obligation Balance* is the Mitigation Obligation by land cover type at the beginning of the reporting year. It is the previous year's Year-End Net Mitigation Obligation Balance.
- *Mitigation Obligation Accrued From Two Years Prior* is the mitigation accrued by development projects that reported start of construction in the annual report two years earlier (taken from Table 1). For example, if the 2009 annual report stated that 35 acres of EIA Mitigation Obligation was incurred, that amount would become Mitigation Obligation Accrued in 2011.
- *Net Mitigation Obligation* is the amount of Mitigation Obligation required to be mitigated that year. It is the sum of Beginning Mitigation Obligation Balance and the Mitigation Obligation Accrued from Two Years Prior. For example if the Beginning Mitigation Obligation Balance is 2 acres and the Mitigation Obligation Accrued from Two Years prior is 12 acres, then the Net Mitigation Obligation is 14 acres.
- *Area Mitigated by Mitigation Projects* is the amount of land cover mitigated in the reporting year by county flow control mitigation projects. It includes only projects that have been completed and are operational. It is the annual total taken from Table 2.
- *Year-End Net Mitigation Obligation Balance* is the difference between the Net Mitigation Obligation land cover and the land cover mitigated by Mitigation Projects. If area mitigated by Mitigation Projects is greater than Net Mitigation Obligation, the Year-End Mitigation Balance is negative.

Financial Reporting

Financial reporting for the program will be included in the annual report to Ecology. The report will also include a narrative describing the funding status of the Flow Control Mitigation Program. The report will clearly identify any anticipated shortfalls in funding that might jeopardize compliance with the terms of the Agreed Order or NPDES permit.

Table 4 provides an annual summary of program expenditures and capital fund balance.

- *Annual Program Cost* is the total capital expenditures for Mitigation Projects during the calendar year
- *Year End Capital Fund Balance* is the stormwater capital fund amount not expended for projects during the current year

Funding

It is anticipated that the County's Clean Water Fund will be used to plan and construct mitigation projects. However, the County may use any allowable funds to pay for Mitigation Projects.

Limitations on WSDOT Projects

Clark County will not incur a Mitigation Obligation for projects proposed by WSDOT, which is covered under its own NPDES Phase I Municipal Stormwater Permit.

Definitions

Fully-mitigated means the land cover areas where a Mitigation Project has matched the flow duration curve of historical land cover for discharges of one-half of the 2-year peak flow to the 50-year peak flow.

Effective impervious area is defined in Volume I of the 2005 SWMMWW as impervious surfaces connected via sheet flow or discrete conveyance to a drainage system.

For the purpose of this agreement, existing impervious surfaces are considered *ineffective* if runoff from them is fully dispersed in accordance with the "full dispersion" guidance in the 2005 SWMMWW. If impervious area is ineffective due to full dispersion through native vegetation, it is defined as fully mitigated.

Table 3. Annual Mitigation Program summary

Effective Impervious Area Mitigation Summary					
Year	Beginning Mitigation Obligation Balance	Mitigation Obligation Accrued 2-Yr Prior	Net Mitigation Obligation	Area Mitigated by County Projects	Year-End Mitigation Obligation Balance
2009	0	0	0		
2010					
2011					
2012					
Totals					
Lawn/Landscaped Area Mitigation Summary					
Year	Beginning Mitigation Obligation Balance	Mitigation Obligation Accrued 2-Yr Prior	Net Mitigation Obligation	Area Mitigated by County Projects	Year-End Mitigation Obligation Balance
2009	0	0	0		
2010					
2011					
2012					
Totals					
Pasture Mitigation Summary					
Year	Beginning Mitigation Obligation Balance	Mitigation Obligation Accrued 2-Yr Prior	Net Mitigation Obligation	Area Mitigated by County Projects	Year-End Mitigation Obligation Balance
2009	0	0	0	0	0
2010					
2011					
2012					

Totals					
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Table 4. Financial summary

Reporting Year	Annual Program Expenses	Year-End Capital Fund Balance
2009		
2010		
2011		
2012		