

## Stormwater Retrofit Cost-Effectiveness and Feasibility (RCEF) Analysis Methods and Timing

The *Highway Runoff Manual (HRM) Section 3-4.1* requires projects in the Puget Sound basin that add 5,000 square feet or more of new impervious surface to retrofit all the existing impervious surfaces for runoff treatment and flow control in high and medium stormwater retrofit priority locations. Projects in low priority locations are required to transfer 20% of the cost of treating the new impervious surfaces to fund standalone stormwater retrofit projects offsite. Projects use this assessment process (referred to as the “RCEF analysis”) to determine the amount of money to request during scoping and again during the design phase. As such, it has two distinct phases:

- **Phase 1** occurs during project scoping. This phase involves estimating how much additional funding needs to be programmed by the project to meet the requirements of retrofitting the existing impervious surfaces falling within the project limits.
- **Phase 2** occurs during project development near 60% project design completion. This phase refines the cost estimate generated in Phase 1. This information will be used to help further refine the percentage factors used to generate estimates in Phase 1. In addition, for projects falling in a high or medium stormwater retrofit priority location, this information will be used to:
  - Determine if treating the existing impervious surfaces within the project limits is feasible and cost effective, or
  - Determine how much funding will need to be transferred to the standalone stormwater retrofit fund where it is not feasible or cost effective to treat the new impervious within the project limits
  - To further refine the percentage factors used in Phase 1.

This procedure, prepared under the direction of the Stormwater Policy Committee (SPC), provides guidelines for complying with mandatory retrofit requirements for the Puget Sound Basin described in *Section 3-4.1* of the HRM.

### RCEF Phase 1

The *RCEF Phase 1* Analysis generates an estimate of the amount of funding that should be added to the total project cost to meet the requirements of *Section 3-4.1* of the HRM. The scoping team shall use *Equation 1* during the project’s scoping phase to calculate the amount of funding to commit to meet the project’s stormwater retrofit obligation. The cost amount determined from *Equation 1* shall be added to the scoping estimate and reported in the project summary.

$$\left( \frac{(A \times B)_{\text{urban}}}{100} + \frac{(A \times B)_{\text{semi-urban}}}{100} + \frac{(A \times B)_{\text{rural}}}{100} \right) \times C = \text{additional stormwater retrofit cost} \quad (\text{Equation 1})$$

A = Predominant land use percentage factor

B = Percentage of total project area

C = Project's total PE, Construction, and ROW estimated cost

Table 1 provides the predominant land use percentage factors to use in the Equation 1 calculation.

**Table 1 Predominant Land Use Percentage Factor**

Percentage Factor	Project's Predominant Land Use
0.02	Urban
0.01	Semi-urban
0.005	Rural

*Urban* refers to areas within city limits. *Semi-urban* refers to areas beyond the city limits, but within an Urban Growth Area (UGA). *Rural* refers to areas outside the UGA. The UGA is available in ArcGIS on the environmental workbench.

WSDOT will use the percentage factors shown in Table 1 for the first five projects in each land use group (i.e., urban, semi-urban, and rural). Tracking will begin for projects required to meet the conditions of HRM Section 3-4.1 after January 1, 2012. The percentage factors in Table 1 will be refined based upon the stormwater retrofit costs generated during the RCEF Phase 2 Analysis from five projects in each land use group.

## RCEF Phase 2

The project office will complete the RCEF Phase 2 Analysis for all projects prior to completing the Master Deliverables List (MDL) Milestone PE.PD.22.05 "Hydraulic Report Approved", which generally occurs around the 60% project design completion per the Deliverable Expectations Matrix found at: [http://www.wsdot.wa.gov/publications/fulltext/ProjectMgmt/DEM/DE\\_Matrix.pdf](http://www.wsdot.wa.gov/publications/fulltext/ProjectMgmt/DEM/DE_Matrix.pdf).

The RCEF Phase 2 Analysis prepares an estimate of the total cost for providing flow control and runoff treatment for the project's new impervious surfaces and the total cost for providing flow control and runoff treatment for the existing impervious surfaces within the project limits. Both estimates are based on meeting the project's HRM Minimum Requirements. Retrofitting within the project limits is considered cost-effective when the cost to retrofit the existing impervious surfaces does not exceed 20% of the cost to meet the HRM's runoff treatment and flow control requirements for the new impervious surfaces. If the cost to retrofit the existing impervious surfaces exceeds 20% of the cost of treating the new impervious surfaces, refer to HRM Section 3-4.1 for instructions on how to proceed.

The RCEF Phase 2 Analysis shall include costs for items in the project for the stormwater flow control and runoff treatment BMP design as well as those conveyance costs directly related to the stormwater design. It shall also include stormwater costs associated with PE, construction, and right of way (ROW). Stormwater conveyance costs include bid items associated with the conveyance of stormwater to the BMP and to the eventual discharge point. For example, costs

would include the catch basins, pipes, and excavation for those structures conveying stormwater to the BMP and then to the eventual discharge location, which could be a city or county conveyance (e.g., storm sewer) system (pipe or ditch), receiving water body, dispersion area, or infiltration BMP.

Costs to exclude from the *RCEF Phase 2 Analysis* include those dealing with the designs of culverts passing off-site flow, pipe and ditch systems passing offsite flow, and fish passage barriers.

For projects in high and medium stormwater retrofit priority locations<sup>1</sup>, the project team shall use the *RCEF Phase 2 Analysis* to determine if sufficient funds exist in the project budget to meet the project's retrofit obligation (see *Example 2*). The project will need to submit a funds request if the amount programmed into the project as a result of the *RCEF Phase 1 Analysis* is insufficient. If the amount of money programmed into the project as a result of the *RCEF Phase 1 Analysis* exceeds that which is needed to fulfill the project's retrofit obligation, then the project office would follow standard procedures for posting positive budget variances.

The project team shall report the *RCEF Phase 2 Analysis* results to the Headquarters Hydraulics Office Stormwater Unit Manager. As more *RCEF Phase 2 Analyses* become available, WSDOT's SPC will review the results in determining whether adjustments need to be made to the *Percentage Factors* in *Table 1*.

### **Transferring Funds to the Subprogram I-4, Stormwater Retrofit**

Funds need to be transferred from the project to the Subprogram I-4 Stormwater Retrofit Account when: 1) The project is in a low priority stormwater retrofit area: or 2) It is not feasible or cost effective to treat the existing impervious surfaces within the project limits for projects in high or medium stormwater retrofit priority areas. The transfer of funds shall occur when the project goes to AD.

For projects in low priority stormwater retrofit locations, the cost determination calculated using *Equation 1* shall determine the amount to be transferred to the *Subprogram I-4, Stormwater Retrofit Account*. This cost obligation will not change during the life of the project.

For projects in medium or high priority stormwater retrofit locations, if the *RCEF Phase 2 Analysis* shows retrofitting is not feasible or not cost effective, AND when the option for transferring an amount of money is chosen, then the appropriate amount of stormwater retrofit funds (i.e., equal to 20% of the cost to meet stormwater requirements for the new impervious surfaces on the project) shall be transferred to the *Subprogram I-4, Stormwater Retrofit Account*.

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<sup>1</sup> Contact the HQ ESO Stormwater and Watersheds Program for a list of high, medium, and low priority stormwater retrofit locations.

## Example 1: Semi-Urban/Rural Highway Roundabout Project

### RCEF Phase 1 Analysis

Scenario: Total project cost estimate at scoping (i.e., PE, Construction, and ROW phases) = \$6,500,000. The project's predominant land uses are semi-urban (40%) and rural (60%), the project limits lie within the Puget Sound Basin in a low priority stormwater retrofit location, and the project will add more than 5,000 square feet of new impervious surface.

Determine the total additional cost that needs to be added to the scope of work to meet the Puget Sound stormwater retrofits obligation per the HRM.

Solution: Select the appropriate percentage factor in *Table 1* based on the predominant land use results in the following calculation:

$$\left( \frac{(0.02 \times 0)\text{urban}}{100} + \frac{(0.01 \times 40)\text{semi-urban}}{100} + \frac{(0.005 \times 60)\text{rural}}{100} \right) \times \$6,500,000 = \$45,500$$

\$45,500 needs to be added to the scoping estimate to account for the Puget Sound stormwater retrofit obligation (i.e., runoff treatment and flow control) for the existing impervious surfaces on the project. This amount shall be transferred to the *Subprogram I-4, Stormwater Retrofit Account*, when the project goes to AD.

## Example 2: Urban/Semi-urban Highway Roundabout Project

### RCEF Phase 1 Analysis

Scenario: Total project cost estimate at scoping (i.e., PE, Construction, and ROW phases) = \$6,500,000. The project's predominant land uses are *Urban* (60%) and *Semi-Urban* (40%), the project limits lie within the Puget Sound Basin in a high priority stormwater retrofit location, and the project will add more than 5,000 square feet of new impervious surface.

Determine the total additional cost that needs to be added to the scope of work to meet the Puget Sound stormwater retrofit obligation per the HRM.

Solution: Select the appropriate *percentage factor* in *Table 1* based on the predominant land use results in the following calculation:

$$\left( \frac{(0.02 \times 60)\text{urban}}{100} + \frac{(0.01 \times 40)\text{semi-urban}}{100} + \frac{(0.005 \times 0)\text{rural}}{100} \right) \times \$6,500,000 = \$104,000$$

\$104,000 needs to be added to the scoping estimate to account for the Puget Sound stormwater retrofit obligation (i.e., runoff treatment and flow control) for the existing

impervious surfaces on the project. This amount shall be verified in the *RCEF Phase 2 Analysis*.

### *RCEF Phase 2 Analysis*

Scenario: Assume the total cost for runoff treatment and flow control (i.e., stormwater management) of the new impervious surfaces on the project (30,000 square feet) per HRM Minimum Requirements = \$600,000. Assume the total cost for runoff treatment and flow control of all existing impervious surfaces on the project (70,000 square feet for full retrofit) = \$150,000. The total cost for treating the new plus the existing impervious (100,000 square feet) is \$750,000.

Determine the following:

- 1) Is the amount scoped in the *RCEF Phase 1 Analysis* adequate? If not, secure additional funding.
- 2) Is the full retrofit feasible and cost-effective? See HRM *Section 3-4.1* if a full retrofit is not feasible or cost-effective.

Solution: Providing a full retrofit for the existing impervious surfaces within the project boundary **is feasible**; however, providing a full retrofit for the existing impervious surfaces on the project **is not cost-effective** (i.e., ratio of total cost of existing/total cost of new must be less than 0.2).

Cost-Effective stormwater management = (Total stormwater management cost for existing impervious)/(HRM Minimum Requirement stormwater cost for new impervious) < 0.2

$\$150,000/\$600,000 = 0.25$  (therefore, not cost-effective)

Since the full retrofit is not cost-effective, the additional funds the project office needs to request from program management is  $(\$600,000 \times 0.2) - \$104,000 = \$16,000$ . This is the additional funding needed to make up the shortfall between the amount of money determined in *RCEF Phase 1 Analysis* vs. the cost determined in *RCEF Phase 2 Analysis*.

The full retrofit is feasible, but not cost-effective. Following *HRM Section 3-4.1*, the designer has three options:

1. Retrofit the amount of existing impervious surface within the project limits that can be retrofitted for the amount of money equal to 20% of the cost to meet the HRM requirements for the new impervious surfaces, as outlined in the paragraphs above. For this example, provide flow control and runoff treatment for as much existing pavement as possible for  $(\$600,000 \times 0.2) = \$120,000$ .
2. Retrofit an equivalent amount of existing impervious surface off-site, at a high priority stormwater retrofit location, at a cost of up to 20% of the cost to meet the HRM requirements for the new impervious surfaces as outlined in the paragraphs

above. For this example, the designer would contact program management to find a scoped high-priority retrofit project(s) that retrofits at least 70,000 square feet of impervious surface. The cost of the scoped project(s) should not exceed \$120,000.

3. Transfer an amount of money, equal to 20% of the cost to meet the HRM requirements for the new impervious surfaces ( $\$600,000 \times 0.2 = \$120,000$ ), as outlined in the paragraphs above, to fund stand-alone stormwater retrofit projects (*Subprogram I-4 Stormwater Retrofit Account*). This shall be when the project goes to AD.