Effectiveness of Stormwater Retrofits for Treating Highway Runoff to Echo Lake: Detailed Scope of Work

A. BACKGROUND

There is a need for regional field studies to monitor potential water quality improvements in a receiving water body in response to stormwater retrofits designed to SWMMWW standards. This study is based on the following question proposed by the Stormwater Work Group: Which combinations of retrofit BMPs and LID in a basin are most effective at reducing stormwater impacts in receiving waters? To address this question, the following hypotheses are proposed:

1. Stormwater retrofits along the Aurora corridor will effectively remove contaminants from highway runoff.
2. Stormwater retrofits along the Aurora corridor may result in measureable water quality improvements in the receiving water body, Echo Lake.

These hypotheses will be evaluated by comparing contaminant concentrations before and after treatment in individual features, and comparing pre- and post-retrofit contaminant concentrations in the combined stormwater system and in the ambient waters of Echo Lake. The retrofit includes bioretention planters (built to 2005 SWMMWW specifications), Filterra® (providing phosphorus treatment) and a corrugated metal pipe underground detention system that incorporates all stormwater (treated and untreated) before the Echo Lake outfall.

Short-term Outcomes:

- Measured effectiveness of various stormwater treatment technologies in removal of suspended solids, nutrients, bacteria, total and dissolved metals, diesel and motor oil range hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs) from highway runoff. Toxicity reduction and treatment effectiveness of PCBs will also be considered.
- Measured effectiveness of a functioning retrofitted stormwater BMP in reducing stormwater flow rates delivered to a receiving water body.
- Possible benefits to receiving water quality (nutrients and bacteria) from a collective stormwater retrofit project.

Long-term Outcomes:

The results of this project can be used to guide recommendations and requirements in future SWMMWW. Results can also be used to refine expectations about the performance of stormwater treatment facilities. Furthermore, these results could help inform the design of future stormwater retrofits in urban areas and provide guidance for future effectiveness studies.

The remainder of this scope of work describes the work to be completed for each task, with the total estimated cost and schedule. Note that the sampling schedule is dependent on construction completion and is subject to change. Deliverables not requiring Ecology approval (e.g., agendas, data summary tables, photos) will be delivered only as part of a semi-annual billing package as needed to provide documentation of work performed (i.e., "Documenting Progress" deliverables shown below). "Documenting Progress" deliverables will be delivered in the month following the period end (i.e., January and July). Deliverables needing Ecology approval will be submitted as completed. All deliverable costs are included within the cost of each task. Target budget percentages are estimates provided for

Ecology planning purposes only and do not represent a maximum allowable limit. Amounts billed above these estimates will not result in an increase in total project cost.

B. SCOPE OF WORK

Task 1.0: Planning – ($56,680; October 2014 – May 2015)
This task will include project team meetings for project design planning and delegation, status updates, and problem-solving. The planning phase will also include King County Environmental Lab (KCEL) field and lab staff coordination on sampling and analysis phases of the project, site visits, and equipment purchasing. The final project design details will be described in a quality assurance project plan (QAPP) following Ecology guidance. A draft QAPP will be reviewed by King County and City of Shoreline and one final draft QAPP will be reviewed by Ecology (target date: March 2015). After revisions are made, based on the Ecology review, a final QAPP will be submitted to Ecology for approval.

Deliverables:

D 1.1: Documenting Progress – Target: January 2015; target budget 10% of task total
This deliverable may include: results from discussions with KCEL staff on sampling and analysis (i.e., draft summary tables of sample numbers by station, equipment needs and analytical methods), photos from site visits, etc. to document progress during the prior 6-month period.

D 1.2: Documenting Progress – Target: July 2015; target budget 30% of task total
See deliverable description above.

D 1.3: Draft QAPP – Target: March 2015; target budget 45% of task total

D 1.4: Final QAPP – Target: May 2015; target budget 15% of task total
If the target completion date is not met, interim documentation of progress during the prior six months will include: draft summary tables of sample numbers by station, equipment needs and analytical methods, photos from site visits, review comments on draft text, etc., as completed.

Task 2.0: Field Sampling and Analysis – ($271,522, February 2015 – December 2016)
Flow meters will be installed at the inlet and outlet of the detention tank system and will record continuous flow from installation (target date: February 2015) through the end of the sampling period (approximately June 2016). This task also includes inlet and outlet sampling at six bioretention features (four rain gardens and two Filterra) and the detention tank system in the 2015/2016 storm season, after construction of the Aurora Corridor from 192nd to 200th St. is complete. At the six bioretention features, composite grab samples will be collected with peristaltic pumps at each inlet and outlet for 6 to 8 storms. Flow-weighted samples will be collected at the inlet and outlet of the detention tank system using ISCO autosamplers for 12 to 14 storms. The KCEL will conduct all chemical and toxicity analysis, except PCBs which will be analyzed by a contract laboratory.

Deliverables:

D 2.1: Documenting Progress – Target: July 2015; target budget 5% of task total
This deliverable will include: flow data summary to document progress during the prior 6-month period.

D 2.2: Documenting Progress – Target: January 2016; target budget 10% of task total
This deliverable will include: flow data summary to document progress during the prior 6-month period. If construction is complete, and samples collected, this deliverable will include the components described in deliverable D 2.3.

D 2.3: Documenting Progress – Target: July 2016; target budget 60% of task total
This deliverable will include: flow data summary, a record of any maintenance visits, summaries of quantity of samples collected at each location, status of sample analysis by analytical group,

status of toxicity tests, and unvalidated data from KCEL or contract laboratory, if available, to document progress during the prior 6-month period.

D 2.4: Documenting Progress – Target: January 2017; target budget 25% of task total
See deliverable description above (D 2.3).

Task 3.0: Summary of Echo Lake Historical Data – ($12,274, July –November 2015)
The purpose of this task is to summarize all existing pre-retrofit ambient water quality data to establish the baseline for Echo Lake. This will include compiling nutrient and bacteria data from the King County database, organizing and summarizing the historical data in preparation for analyzing changes in Echo Lake water quality as it relates to changes in the stormwater system. A draft technical memo will be reviewed by King County and City of Shoreline and a final draft memo will be reviewed by Ecology. The final technical memo will be submitted for approval by Ecology.

Deliverables:

D 3.1: Draft Historical Data Summary Memo – Target: September 2015;
target budget: 75% of task total

D 3.2: Final Historical Data Summary Memo – Target: November 2015:
target budget; 25% of task total

Task 4.0: Final Report – ($83,433, August 2016 – July 2017)
This task will include data management (storing data in a secure database and organizing data for analysis), data validation for KCEL data (conducted by project manager) and data validation for PCB data (conducted by an outside contractor). This will also include data analysis (comparing inlet and outlet concentrations, flow and toxicity) and summarizing data for use in the final report. The final report will describe the study design, field and laboratory methods, data analysis methods and findings of the study. A draft report will be reviewed by King County and City of Shoreline and a final draft will be reviewed by Ecology. The final report will be submitted for approval by Ecology.

Deliverables:

D 4.1: Documenting Progress – Target: January 2017; target budget: 50% of task total
This deliverable will include: an outline for the entire report, summary data tables, draft figures, data analysis and completed draft text sections.

D 4.2: Draft Report – Target: May 2017; target budget: 35% of task total

D 4.3: Final Report – Target: July 2017; target budget: 15% of task total
If the target completion date is not met, interim documentation of progress during the prior six months will include: data analysis and completed draft text sections not submitted in January 2017, review comments on draft report components, final data tables, final figures, and completed final text sections.

Task 5.0: Distribution of Findings – ($12,320, January 2017 – December 2017)
This task will include EIM submittal for ambient lake data, National BMP database submittal for system data, at least two presentations of results to permittees and other interested parties, and the development of a project website to provide electronic access to project documents and results.

Deliverables:

D 5.1: Ambient lake data submitted to EIM – Target: December 2017;
target budget: 20% of task total

D 5.2: System data submitted to National BMP Database – Target: December 2017;
target budget: 30% of task total

D 5.3: Copies of presentations – Target: December 2017; target budget: 30% of task total
D 5.4: Posting of QAPP to project website – Target: June 2015;
target budget: 13% of task total
D 5.5: Posting of Historical Data Memo to project website – Target: December 2015;
target budget: 2% of task total
D 5.6: Posting of Final Report to project website – Target: December 2017;
target budget: 5% of task total

Task 6.0: Project Management – ($33,339, Throughout Project)
This task will take place throughout the project and include coordination with KCEL staff in the field and laboratory (this will be critical during Tasks 1.0 and 2.0), budget management and staff management. Semi-annual project reports will be created and submitted to Ecology to communicate project status.

Deliverables:
D 6.1: Semi-annual Project Report – July 2015; target budget: 30% of task total
D 6.2: Semi-annual Project Report – January 2016; target budget: 20% of task total
D 6.3: Semi-annual Project Report – July 2016; target budget: 10% of task total
D 6.4: Semi-annual Project Report – January 2017; target budget: 10% of task total
D 6.5: Semi-annual Project Report – July 2017; target budget: 15% of task total
D 6.6: Semi-annual Project Report – December 2017; target budget: 15% of task total

C. SCHEDULE DETAIL BY TASK

Schedule for Tasks and Deliverables	2014	2015		2016		2017	
	Q3/Q4	Q1/Q2	Q3/Q4	Q1/Q2	Q3/Q4	Q1/Q2	Q3/Q4
Task 1.0 – Planning							
D 1.1 Documenting Progress							
D 1.2 Documenting Progress							
D 1.3 Draft QAPP							
D 1.4 Final QAPP							
Task 2.0 - Field Sampling and Analysis							
D 2.1 Documenting Progress							
D 2.2 Documenting Progress							
D 2.3 Documenting Progress							
D 2.4 Documenting Progress							
Task 3.0 – Summary of Echo Lake Historical Data							
D 3.1 Draft Memo							
D 3.2 Final Memo							
Task 4.0 – Final Report							
D 4.1 Documenting Progress							
D 4.2 Draft Report							
D 4.3 Final Report							
Task 5.0 – Distribution of Findings							
D 5.1. Ambient data submitted to EIM							
D 5.2 System data submitted to database							
D 5.3 Copies of presentations							
D 5.4 Posting of QAPP to website							
D 5.5 Posting of Memo to website							
D 5.6 Posting of Final Report to website							
Task 6.0 – Project Management							
D 6.1 Semi-annual Project Report							
D 6.2 Semi-annual Project Report							
D 6.3 Semi-annual Project Report							
D 6.4 Semi-annual Project Report							
D 6.5 Semi-annual Project Report							
D 6.6 Semi-annual Project Report							

D. BUDGET DETAIL BY TASK

	Task 1.0 Planning	Task 2.0 Sampling & Analysis	Task 3.0 Historical Data	Task 4.0 Final Report	Task 5.0 Distrib. Of Findings	Task 6.0 Proj. Mgmt.	Totals
King County WLR salary & benefits	$23,064		$9,819	$65,477	$9,856	$26,671	$134,887
KCEL Laboratory Analyses		$138,972					$138,972
Subcontracts		$40,250		$1,587			$41,837
Field Equipment	$27,850						$27,850
KCEL Field Labor		$92,300					$92,300
King County WLR staff indirect costs	$5,766		$2,455	$16,369	$2,464	$6,668	$33,722
Total Task	$56,680	$271,522	$12,274	$83,433	$12,320	$33,339	$469,568