

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. The following question proposed by the Stormwater Work Group will be addressed by this study: 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:

- Effectiveness of retrofitted stormwater BMPs in removal of suspended solids, nutrients, bacteria, total and dissolved metals, diesel and motor oil range hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and PCBs from highway runoff. Toxicity reduction will also be considered.
- 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 for each task the work to be completed with the total estimated cost and schedule. Note that the schedule is dependent on the date of signature of the project Interagency Agreement between King County and Ecology 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 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 be not result in an increase in total project cost.

B. SCOPE OF WORK

Task 1.0: Planning – (\$49,217; October 2014 – January 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: December 2014). After revision 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 30% 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 10% of task total

See deliverable description above.

D 1.3: Draft QAPP – Target: December 2014; target budget 45% of task total

D 1.4: Final QAPP – Target: January 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 – (\$249,254, January 2015 – September 2016)

This task will include inlet and outlet sampling at six bioretention features (one storm season) and the detention tank system, where flow will also be monitored (two storm seasons). Composite grab samples will be collected with peristaltic pumps at all sites for 6 to 8 storms per season, unless preliminary flow monitoring at the detention tank system suggests it is a long term detention system. If the retention time is in the order of hours the Technology Assessment Protocol-Ecology (TAPE) protocol for Long Detention Best Management Practice (BMP) Monitoring should be followed at the inlet and outlet of this feature, at which point Optional Task 7.0 would be implemented for both sampling seasons. KCEL will conduct all chemical and toxicity analysis, except PCBs will be analyzed by a contract laboratory.

Deliverables:

D 2.1: Documenting Progress – Target: July 2015; target budget 30% of task total

This deliverable will include: 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 2.2: Documenting Progress – Target: January 2016; target budget 15% of task total

See deliverable description above.

D 2.3: Documenting Progress – Target: July 2016; target budget 40% of task total

See deliverable description above.

D 2.4: Documenting Progress – Target: January 2017; target budget 15% of task total

See deliverable description above.

Task 3.0: Summary of Echo Lake Historical Data – (\$12,274, July –November 2015)

This purpose of this task is to summarize all pre-retrofit 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. 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 – (\$87,564, July 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, 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 – (\$12,454, 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 – (\$33,143, 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 – January 2015; target budget: 15% of task total
- D 6.2: Semi-annual Project Report – July 2015; target budget: 20% of task total
- D 6.3: Semi-annual Project Report – January 2016; target budget: 15% of task total
- D 6.4: Semi-annual Project Report – July 2016; target budget: 10% of task total
- D 6.5: Semi-annual Project Report – January 2017; target budget: 10% of task total
- D 6.6: Semi-annual Project Report – July 2017; target budget: 15% of task total
- D 6.7: Semi-annual Project Report – December 2017; target budget: 15% of task total

Task 7.0: Optional Sampling Following TAPE Protocol for Long Detention BMP Monitoring – (Additional \$140,118, January 2015 – September 2016)

This task would be implemented if the initial flow monitoring at the detention tank system inlet and outlet suggests a retention time of several hours. For both sampling seasons, flow-weighted autosamplers would be used at the detention tank system for 12 to 14 storms each season. TAPE protocol for Long Detention BMP Monitoring would be followed for sampling methods and data analysis. KCEL will conduct all chemical and toxicity analysis, except PCBs will be analyzed by a contract laboratory.

Deliverables:

- D 7.1: Documenting Progress – Target: July 2015; target budget: 35% of task total
This deliverable will include: summaries of quantity of samples collected at each location, status of sample analysis by analytical group, unvalidated data from KCEL or contract laboratory, if available, to document progress during the prior 6-month period.
- D 7.2: Documenting Progress – Target: January 2016; target budget: 15% of task total
See deliverable description above.
- D 7.3: Documenting Progress – Target: July 2016; target budget: 35% of task total
See deliverable description above.
- D 7.4: Documenting Progress – Target: January 2017; target budget: 15% of task total
See deliverable description above.

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							

Schedule for Tasks and Deliverables	2014	2015		2016		2017	
	Q3/Q4	Q1/Q2	Q3/Q4	Q1/Q2	Q3/Q4	Q1/Q2	Q3/Q4
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 6.7 Semi-annual Project Report							
Task 7.0 – Optional TAPE Protocol for Long Term Detention BMP Monitoring							
D 7.1 Documenting Progress							
D 7.2 Documenting Progress							
D 7.3 Documenting Progress							
D 7.4 Documenting Progress							

D. BUDGET DETAIL BY TASK

	Task 1.0	Task 2.0	Task 3.0	Task 4.0	Task 5.0	Task 6.0	Optional Task 7.0	Totals (with Task 7.0)
King County WLR salary & benefits	\$22,512		\$9,819	\$67,630	\$9,963	\$25,693	NA	\$135,617 (same)
City of Shoreline salary & benefits	\$1,427			\$927		\$1,027	NA	\$3,381 (same)
KCEL Laboratory Analyses		\$163,587					\$20,345	\$163,587 (\$183,932)
Subcontracts		\$42,000		\$2,100			NA	\$44,100 (same)
Field Equipment	\$19,650						\$9,000	\$19,650 (\$28,650)
KCEL Field Labor		\$43,667					\$110,773	\$43,667 (\$154,440)
King County WLR staff indirect costs	\$5,628		\$2,455	\$16,907	\$2,491	\$6,423	NA	\$33,904 (same)
Total Task	\$49,217	\$249,254	\$12,274	\$87,564	\$12,454	\$33,143	\$140,118	\$443,906 (\$584,024)

NA = No additional cost.