



LOI # 1

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Organization: University of Washington

Study Title: Floating Treatment Wetland/Biomedica Module Field Installation & Monitoring

Which topics from the SWG's priority list (Appendix A) do you propose to address?

1, 9, 19, 20

What type of project is being proposed?

Environmental sampling study

Short description of the proposed project

For highly urbanized sites, we propose the field evaluation of Floating Treatment Wetland/Biomedica (FTW) modules as an in-situ treatment strategy and retrofit for stormwater ponds. These modules differ from the conventional floating wetlands as they are designed to operate as a vehicle to integrate biomedica into the impacted stormwater ponds. The new module design enables vertical extension of biomedica to the pond bottom, with containerized biomedica systems tailored to site-specific pond dimensions and depth. Previous mesocosm studies demonstrated that this biomedica mix removed 6PPD Q by 86% and 79% and provided 100% survival of juvenile coho. These modules will be deployed to assess their performance in reducing stormwater contaminants (focusing on 6PPD-Q) under field conditions.

Site Selection: Identify up to six stormwater ponds of similar size and depth, inlet and outlet configuration, residence time, contaminant loading levels and surrounding impervious area.

Pre-Treatment Water Quality Monitoring for Baseline Data and Benchmark Information: Collect baseline stormwater samples within each stormwater pond during and after rain events. Sampling protocols will follow the established EPA and DOE protocols. Samples will be analyzed by an accredited laboratory for stormwater contaminants.

Module Installation: Deploy 2–4 modules (3-4 FTWs per module) in each selected pond.



Vegetation Establishment: Plant each FTW module with emergent wetland species optimized for floating wetland systems. Plant selection will also prioritize species with proven phyto-remediative properties.

Water Quality Monitoring: Collect pre and post treatment stormwater samples during and after rain events. Samples will be analyzed by an accredited laboratory for stormwater contaminants.

What type of information will be collected or analyzed for this proposed study?

Baseline water quality data will be collected at each selected stormwater pond for one full rainy season (approximately 8 months) prior to the installation of treatment modules. During this pre-installation phase, grab samples will be collected at a minimum frequency of twice per month, yielding at least 16 samples per site. This sampling effort will fulfill the Washington State Technology Assessment Protocol – Ecology (TAPE) requirement of 15 qualifying events for stormwater treatment evaluation.

All samples will be analyzed for a comprehensive suite of conventional and trace stormwater contaminants, including:

Physicochemical parameters – pH, DO, temperature, TSS, suspended sediment concentration, total organic carbon, dissolved organic carbon, and alkalinity.

Nutrients – ammonia nitrogen, nitrate, orthophosphate, and total phosphorus.

Major ions and hardness contributors – bromide, hardness (as CaCO_3), calcium, and magnesium.

Metals – aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium (including hexavalent chromium), cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

Organic pollutants – diesel-range organics (DRO), heavy oil, and 6PPD-quinone (6PPD-Q).

Following the installation of the biomedial treatment modules in each pond, sampling will continue at the same frequency (twice monthly) for a period of three years. Post-installation samples will be analyzed for the same suite of parameters to assess contaminant removal performance over time.



Both statistical and qualitative analyses will be employed to evaluate changes in water quality and quantify the treatment efficacy of the floating treatment wetland (FTW) modules. Special emphasis will be placed on the reduction of 6PPD-quinone.

What are the anticipated measurable outcomes and key deliverables that will be produced by the proposed study and how will they be used by Permittees and the Washington State Department of Ecology?

Contaminant Reduction: Demonstrated reduction in concentrations of stormwater contaminants (focusing on 6PPD Q) discharging into urban creeks and rivers within the study areas.

Comparative Dataset: A dataset capturing pre- and post-treatment concentrations of stormwater contaminants among a range of stormwater ponds.

Qualitative analyses of water quality parameters and pre and post stormwater contaminant levels: Evaluation of the treatment efficacy of FTW/biomeia modules for stormwater contaminant removal, focusing on 6PPD-Q uptake and removal.

Design Specifications for FTW/Biomeia Modules and Biomeia-to-Stormwater Ratios for Effective Contaminant Removal: This project will establish optimized design specifications for Floating Treatment Wetland (FTW) and biomeia modules, including the required biomeia volume and the biomeia-to-stormwater ratio necessary to achieve effective removal of stormwater contaminants. Particular emphasis will be placed on the removal efficiency of 6PPD-quinone.

Final Report: A detailed technical report summarizing methods, results, and management recommendations, submitted to the Department of Ecology.

Scientific Publication: Preparation and submission of at least one peer-reviewed manuscript to a relevant environmental science journal.

List the permittees or agencies you are proposing to coordinate with.

Dept. of Ecology - Rhea Smith and Shelby Giltner

City of Seattle - Nathan Hart - Stormwater specialist

King County - Chelsea Mitchell - 6PPD quinone specialist



Biomatrix Water - Galen Fulford - CEO and Wetland Biologist

Einhorn Engineering - Mike Einhorn - Engineer

National Environmental Management - Erick McWayne - Environmental Chemist