LOI # 20

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Organization: University of Idaho

Study Title: Field Testing High and Medium Priority BMPs for 6PPD-q Removal

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

19, and possibly 9

What type of project is being proposed?

Environmental sampling study;Laboratory analyses

Short description of the proposed project

This project will assess the effectiveness of high and medium priority stormwater BMP in removing 6PPD-quinone (6PPD-q), advancing regional understanding of treatment approaches across Washington State's diverse precipitation regimes.

Field testing will evaluate currently operational BMPs categorized as high priority (infiltration systems, bioretention facilities with bioretention soil media or compost, dispersion systems, and sorption-based BMPs) and medium priority (sand filters, detention ponds, sedimentation basins, and filtration systems). Testing sites will span Western Washington's wet maritime climate and Eastern Washington's semi-arid conditions to characterize BMP performance under varying precipitation patterns, antecedent dry periods, and seasonal conditions. We will measure influent and effluent concentrations of both dissolved and particulate-bound 6PPD-Q during multiple wet weather events, quantifying removal efficiency across different hydrologic regimes.

Results will clarify which BMP designs effectively treat 6PPD-Q under diverse regional conditions, addressing critical knowledge gaps about contaminant fate during extended dry periods and variable storm intensities. By characterizing removal performance across wet-season coastal storms and semi-arid precipitation events, this research will establish climate-appropriate selection criteria for BMPs statewide.

Findings will enable permittees across Washington to select BMPs appropriate for local precipitation regimes, optimize maintenance schedules based on regional dry-period accumulation patterns, and make cost-effective infrastructure decisions that account for climatic differences between Western and Eastern Washington, directly supporting permit compliance while protecting receiving waters.

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

Data needed to complete this study would include:

Water Quality Data (water and sediment samples needed from target Permittee BMPs before, between, and during rainfall events)

- 6PPD-q concentrations in both influent (incoming stormwater) and effluent (treated outflow) from BMPs
- Phase characterization: dissolved vs. particulate-bound forms of 6PPD-q
- Particle size distribution: concentration of 6PPD-q across different particle size fractions to determine which sizes are captured by each BMP type

Hydrologic and Meteorological Data

- Precipitation patterns: rainfall intensity, duration, and total volume for each monitored storm event
- Antecedent dry period: length of time between precipitation events
- Seasonal variations: timing of samples across different seasons
- Regional climate data: comparative data from Western Washington (wet maritime) vs. Eastern Washington (semi-arid) sites

BMP Performance Metrics

- Removal efficiency: percentage reduction of 6PPD-q from influent to effluent

- Treatment mechanism effectiveness: performance of sedimentation, filtration, sorption, and infiltration processes

- Bioavailability/toxicity reduction: whether effluent concentrations are reduced to non-lethal levels (<0.1 µg/L for sensitive species)

BMP Characteristics (data needed from target Permittees prior to field sampling campaign)

- BMP type categorization: high priority (infiltration, bioretention, dispersion, sorption) vs. medium priority (sand filters, detention ponds, sedimentation basins)

- Design specifications: media composition, hydraulic residence time, infiltration rates

- Operational status: maintenance history and current condition of field-tested BMPs

This comprehensive dataset would enable comparison across BMP types, climate zones, and storm conditions to provide actionable guidance for stormwater managers statewide.

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?

This study will provide the scientific foundation for evidence-based decision-making, enabling cost-effective infrastructure investments that protect salmon populations while meeting regulatory requirements across Washington's diverse climatic regions.

Measurable Outcomes

BMP Performance Metrics

- Removal efficiency percentages for high and medium priority BMPs

- Verification of which BMPs reduce 6PPD-Q to non-lethal concentrations (<1 µg/L)

- Performance comparisons between Western Washington (wet) and Eastern Washington (semi-arid) conditions

Key Deliverables

- Final performance report with statistical analysis across BMP types and climate zones

- BMP selection guidance tailored to regional precipitation patterns

How Permittees Will Use Results

- Select proven BMPs appropriate for local climate
- Prioritize retrofits of existing infrastructure based on field performance data
- Optimize limited budgets by investing in demonstrably effective approaches
- Support permit compliance with regionally-validated treatment strategies

How Ecology Will Use Results

- Update stormwater manuals with field-verified BMP performance data
- Establish 6PPD-Q-specific treatment requirements based on demonstrated capabilities
- Refine permitting standards with climate-appropriate design criteria
- Direct state funding toward BMPs with proven effectiveness
- Address critical knowledge gaps identified in the 2022 BMP Effectiveness Report

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

TBD