

# Research Proposal

## Phosphorus Control

**Problem Title.** Which highway runoff BMPs or modifications of existing BMPs are most suitable for treating phosphorus?

**Problem Statement.** Algal blooms and excessive plant growth commonly plague lacustrine systems due to the buildup of phosphorus. While phosphorus is not a principal component in highway runoff, there may be areas where WSDOT is required to reduce phosphorus levels in its runoff, such as areas where TMDLs have been developed. Conventional stormwater BMPs do not capture phosphorus very efficiently, generally having capture rates of less than 50 percent. BMP designs that target phosphorus removal are needed to meet regulatory mandates in areas where highway runoff drains to lacustrine systems.

- Other associated questions that this proposal could address:
- Which BMPs, if any, should be avoided because they produce phosphorus?
- How can standard BMPs be modified or redesigned to preferentially remove phosphorus?

Would these modifications specifically designed for phosphorus removal affect the treatment performance for other constituents?

**Literature Search.** Many stormwater BMPs, including source controls such as fertilizer restrictions, have been evaluated for their ability to reduce phosphorus discharges to surface waters. Other than infiltration, none have been shown to be particularly effective, and some may actually export phosphorus, such as compost filters. The phosphorus control menu in the *Stormwater Management Manual for Western Washington* relies heavily on sand filtration, which tends to have very intensive maintenance requirements. Historically, stormwater BMPs were not designed with phosphorus removal as a primary objective, but as a “side benefit”. The options for phosphorus removal need to be expanded so that sand filtration is not specifically needed.

**Research Methods.** Continue to evaluate phosphorus removal as part of experimental BMP evaluations. Conduct technical literature searches to evaluate whether precipitation (as phosphates or using flocculants such as Catfloc, chitosan, or polyacrylamide) or ion exchange (anionic exchange) unit operations for phosphorus capture is feasible for highway runoff and linear transportation systems. Examine low impact development methods, such as bioretention and pervious pavement, for their ability to reduce phosphorus loadings in runoff. After completion of Ecology Embankment (EE) monitoring, evaluate the phosphorus capture data and, if applicable, petition Ecology for use of the EE as a phosphorus control BMP.

**Partnering Opportunities.** Substantial within Washington and nationally. TMDL development in lake basins may provide inducements for future phosphorus BMP development.

**Estimate of Costs and Research Duration.** Estimated costs have not been developed, but are expected to be greater than \$100,000.

**Urgency, Payoff Potential, and Implementation.** Could provide more cost-effective BMPs for phosphorus removal in areas where this level of treatment is required.

**Research Proposer**

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**Research Monitor (to be assigned, as needed, by the research program administrator)**

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