

# Research Proposal

## Maintenance in Lieu of Structural BMPs

**Problem Title.** Are there difficult physiographic settings (ferry docks, bridges, etc.) where intensive maintenance and source controls can entirely supplant conventional structural stormwater treatment systems?

**Problem Statement.** In some instances, unusual circumstances make construction of LID BMPs or end-of-pipe treatment systems infeasible. Bridges are the most common, but ferry docks as well as some highways close to shorelines also are problematic. For ferries and bridges, there is also a nearly continuous maintenance presence at these facilities. It may be possible to prevent polluted runoff near its source through intensive facility maintenance, including vacuum street sweepers, catch basin cleaning, catch basin inserts, litter pickup, and general housekeeping. It is recognized that these maintenance/source control actions most likely need to be performed very regularly if they were to perform as well as conventional BMPs. If regular maintenance can successfully supplant most or all of the pollutant-removing function of conventional BMPs such as wet vaults, it is possible to save significant sums of money from not having to construct wet vaults or other conventional BMPs.

Other associated questions that could be addressed by this proposal:

How often do source control practices need to occur to completely protect water quality?

Which WSDOT-implemented source controls (sweeping, catch basin cleaning, spray restrictions, etc.), if any, can have a measurable influence on runoff quality?

**Literature Search.** The Nationwide Urban Runoff Program (NURP) studies of street sweeping effects on stormwater quality published in 1983 concluded that street sweeping proved to be largely unable to effectively reduce the event mean concentration of pollutants found in urban runoff. This conclusion is largely based on the fact that the street sweepers used and tested were not able to effectively pick up very fine accumulated sediments that have been found to be highly contaminated with most of the pollutants observed in urban runoff. Broom sweepers of that era were effective at picking up litter and large dirt particles, but a high percentage of surface contaminants are concentrated primarily in the fines – particles less than 63 microns. Not only were these fine particles left behind in the pavement after broom sweeping, but once the heavy covering of sediment was gone, the fines and their contaminants were even more likely to wash into storm drains during the next rain. Catch basin cleaning, catch basin inserts, and adsorbent pillows are other source control options that have promise for replacing the function of conventional BMPs.

Street sweeper technology has advanced rapidly in the past decade, with regenerative air and vacuum sweepers becoming state of the art for pollutant capture. A study conducted at the Port

of Seattle in 2000 concluded that weekly pavement sweeping of a container storage facility with the vacuum sweepers could replicate the pollutant capture capacity of wet vaults for sediments and nutrients and higher capture rates for soluble metals.

<http://www.americansweeper.com/v6n2/v6n2PortSeattle.html>

<http://www.americansweeper.com/topics/efficient/sutherland2.html>

(Note: The above web addresses are not current. Check <http://www.schwarze.com/americansweeper/> for the Port of Seattle and Sutherland study results. This updated site was under construction when this proposal was updated)

**Research Methods.** In the past, Ecology has been reticent to allow use of maintenance practices such as high efficiency vacuum sweepers in lieu of structural controls because 1) equipment and vehicles parked on the paved surface may prevent sweepers from cleaning large sections, and 2) equipment failures or altered maintenance schedules may prevent frequent enough sweeping rates to provide adequate pollutant capture. WSDOT has a few facilities that would benefit from intensive maintenance whereas many municipalities with “built out” conditions may benefit greatly. WSDOT’s role in any applied research in this subject area would necessarily be as a minor partner in a pooled fund study with other (multiple) agencies and municipalities.

**Partnering Opportunities.** Significant both in Washington and nationwide since municipalities would benefit. The relatively small number of uses for WSDOT probably would limit its participation to a nominal contribution to the research effort or donation to a pooled research fund.

**Estimate of Costs and Research Duration.** An estimate of research cost has not been developed, but the cost of vacuum sweepers is high (\$400,000 to \$500,000). Maintenance of the sweepers would be an additional cost because they are very prone to breakdown.

**Urgency, Payoff Potential, and Implementation.** Potential cost reduction if maintenance measures are shown to be as effective as structural BMPs in locations where there is limited space for BMP placement.

### **Research Proposer**

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

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