RANK	Stormwater Management Program Element	Effectiveness Study Topic Null Hypothesis (H_o)	Potential Questions for Request for Proposals
1	Source Control	Construction site inspections are not effective at controlling sediments and turbidity from permitted construction sites.	• Are the temporary erosion and sediment control Best Management Practices (BMPs) required during development or redevelopment adequate to control erosion and sediment from construction sites? • Are the temporary erosion and sediment control BMPs used at construction sites effective at reducing turbidity/TSS for compliance with water quality standards? • What frequency of construction erosion and sediment control inspections are most effective for achieving compliance with codes/ordinance requirements at new development and redevelopment project sites?
2	Source Control	Education and inspection of private stormwater facilities does not affect water quality.	• Do more frequent site visits and contact with private facility owners improve compliance with operation and maintenance (O&M) requirements? • What is the optimum frequency of inspections to maintain the functionality of private stormwater facilities?
3	Public Education	Permit-required public education programs do not result in decreased levels of pollutants in stormwater.	• Are fecal coliform levels in stormwater reduced after an extensive pet waste education program? • Are nutrient levels in stormwater reduced following an extensive natural yard care education program? • Are pesticide concentrations and number of hits reduced in an urban stream following general awareness? • Does establishing a spill hotline result in reduced stormwater pollutants? • Does a fundraiser car washing education program result in reduced surfactants in stormwater?
4	Illicit Discharge Detection and Elimination (IDDE)	IDDE program components are not effective at reducing pollutants.	• Which combination of methods; smoke testing, dye testing, CCTV, flow monitoring and outfall screening (wet and dry season) work best for detection of illicit connections? • How effective is wet weather screening as a tool to detect illicit connections? • Which parameters should be measured during dry weather screening to improve the ability to detect illicit connections?

5	O&M-Pollution Prevention	Frequency of inspecting and cleaning catch basins is not dependent on land use or road size.	• Do catch basins on arterial streets require more frequent cleaning vs. non-arterial streets? • Can land use or road size/type be used to set an optimal frequency for inspection and cleaning catch basins? • Does the land use surrounding a catch basins influence the rate of sediment accumulation in catch basins? • Can catch basin maintenance frequency be determined by land use surrounding the catch basin?
6	Low Impact Development (LID)	LID measures are not effective at reducing storm flows.	• Which LID measures are most effective at reducing flow from developed areas? • Will retrofitting porous pavement in alleys and road rights-of-way with rain gardens substantially reduce runoff? • Does amending landscapes with compost significantly reduce flows during small and medium storms? • Is LID more effective than traditional BMPs for improving hydrology at the basin scale? • Will a developed basin with a high density of LID measures have measurable differences in hydrology and pollutant loads compared to a similar basin with a low density of LID measures? • How well can a calibrated and verified stormwater model (*e.g.*, SUSTAIN and EPA SWMM5) function as a replacement for a control in a paired watershed study design?
7	LID	LID measures are not effective at reducing pollutant loads.	• Does the installation of bioretention, bioinfiltration, biofiltration, rain gardens, and other LID measures have a measurable effect on water quality? • Which LID measures are most effective at improving water quality from developed areas? • Can compost mixes and plant species be tailored to enhance removal of specific pollutants (*i.e.*, phosphorus, metals, bacteria)? • Is LID more effective than traditional BMPs for improving water quality at the basin scale? • Will a developed basin with a high density of LID measures have measurable differences in pollutant loads compared to a similar basin with a low density of LID measures? • Does bioretention treat runoff sufficiently to allow for infiltration without violating groundwater quality standards? • What type and frequency of maintenance is needed to ensure the long-term performance of bioretention facilities?

8	Source Control	Business inspection and outreach are not effective source control techniques.	• Are businesses that receive an in-person visit/inspection more likely to implement source control BMPs? • What frequency of business inspections is most effective for implementing and maintaining source control requirements/BMPs at businesses?
9	Public Education	Permit-required public education programs promoting behavior change do not result in increased awareness and behavior change.	• What is the increase or decrease over time of various target audiences willing to make a simple change in their daily lives to help Puget Sound? • What is the increase or decrease over time of various target audiences willing to invest over $1,000 to make a change in their property to help Puget Sound? • What is the increase or decrease over time of car owners to fix leaks? • What is the increase or decrease in stormwater drain awareness of various business sectors involved in commercial property maintenance inspections? • Does a fundraiser car wash education program decrease the number of fundraiser car wash events?
10	Traditional BMPs	Retrofitting using water quality treatment devices does not reduce pollutant loads	• Which combinations of retrofit BMPs in a basin are most effective at reducing pollutants to receiving waters? • To what extent does retrofitting using water quality treatment devices reduce urban stormwater pollution to receiving water bodies? • Once installed, do model predicted quantities of stormwater controls in a basin reduce stormwater impacts enough to support the receiving water's designated beneficial uses?
11	LID	LID measures are not feasible in areas with tight soils or shallow groundwater.	• What, if any, LID measures are feasible in areas with tight soils? • What, if any, LID measures feasible in areas with shallow groundwater?
12	Traditional BMPs	Reducing the size of a filter strip does not alter its effectiveness at reducing pollutant concentrations.	• Are existing sizing criteria for vegetative filter strips (based on bioswales) overly conservative? • Which combinations of length, width, slope, soil types and vegetation types result in greatest removal of sediment by vegetative filter strips?
13	LID	Permeable pavement will fail on high-speed roads.	• Is permeable pavement feasible over the long-term for applications on high-speed roads?
14	LID	Recycled concrete cannot be used to provide storage under permeable pavement.	• Can recycled concrete be used as storage under permeable pavement?

15	O&M-Pollution Prevention	Catch basins do not contribute sufficient fecal coliform bacteria to exceed water quality standards.	• Are catch basins a significant source of fecal coliform or other pollutants? • What frequency of catch basin maintenance is needed to reduce the level of fecal coliform to meet Total Maximum Daily Load (TMDL) requirements?
16	Public Education	Public Education of lake property owners about residential pollutants will not reduce summer algae blooms.	• Are summer algae blooms due to excess runoff or recycling of nutrients? • Can education and prevention of phosphorus loads from runoff influence the frequency and duration of lake algae blooms?
17	Public Education	Storm drain stenciling does not raise awareness about where stormwater goes or that it is not treated.	• What is the level of awareness of adjacent land owners to storm drain stencils compared to landowners with no storm drain stencils?
18	Traditional BMPs	There are no differences in ecological or intrinsic human benefits derived from maintained versus unmaintained stormwater ponds.	• Are water quality benefits increased by letting ponds take a more natural, successional path rather than continual maintenance? • Do humans value the unmaintained pond for the "wildness" it can introduce to their neighborhood (trees, shrubs, wildlife, etc.)
19	Source Control	Nutrient and Integrated Pest Management (IPM) programs do not improve water quality in receiving water bodies.	• Does implementation of nutrient management result in the reduction of nutrients in stormwater? • Does implementation of IPM result in the reduction of pesticides in stormwater?
20	Traditional BMPs	Toxics are not transferred to the nearshore from uplands by stormwater infrastructure.	• Will installation of devices to restrict tidal influence on stormwater systems reduce the transfer of toxics to Puget Sound?
21	Traditional BMPs	Oil/water separators are not effective in driveway applications.	• What is the lowest threshold of paved surface that makes it cost/treatment effective to install an oil/water separator? • Are there other methods (*i.e.*, LID) that would be as effective in improving water quality as oil/water separators?
22	IDDE	Receiving water body sampling does not confirm removal of an illicit connection or successful IDDE program.	• How well does receiving water body sampling confirm the elimination of illicit connections? • Are there measurable differences in the concentration of fecal coliform in a receiving water body when illicit connections are removed?