Letter of Intent to
Submit an NPDES Effectiveness Study Proposal

All fields must be completed

1. Proposed Study Title: Optimizing soil moisture/saturation conditions for nutrient removal in bioretention systems

2. Short Description of Proposed Study:

   This study will use bioretention mesocosms located at the WSU-Puyallup LID test facilities to quantify nutrient removal efficiencies as a function of hydraulic retention, soil moisture conditions. Emerging research shows nutrient removal from stormwater is dependent on hydraulic retention and moisture conditions e.g. denitrification requires extended exposure within anoxic (fully saturated) zones. We will measure nutrient removal rates for a replicated regime of soil moisture and saturation levels by manually controlling variable-depth-outlet controls that are currently built into the mesocosms at the WSU-Puyallup LID test facilities.

2. What specific Stormwater Management Program condition(s) or other permit condition(s) in the NPDES W. WA. Phase I and/or Phase II Municipal Stormwater Permit does your study address?

   Phase I Permit: S5.C.5: "Controlling Runoff from New Development, Redevelopment & Construction Sites"; S5.C.6: "Structural Stormwater Controls"; S5.C.7: "Source Control Program for Existing Development"; S5.C.9: "Operations & Maintenance Program"; S5.C.10 "Education & Outreach Program"

   Phase II Permit: S5.C.4: "Controlling Runoff from New Development, Redevelopment and Construction Sites" AND S5.C.5 "Municipal Operations and Maintenance"

3. How will this study inform, assess effectiveness and/or support implementation of the specified NPDES permit conditions (e.g., project goal) and future permit conditions?
   This study will provide information on how seasonally and storm-specific variations in hydraulic loads alter nutrient removal in bioretention systems. The work will give Phase I & II permittees critical information for managing soil moisture and hydraulic within bioretention systems through simple outlet control that will maximize nutrient removal from influent stormwater. As a consequence of this work, it will also be possible to assess the effectiveness of bioretention systems that do not have outlet control mechanisms in place, and how nutrient removal from these systems likely vary on a temporal scale.

4. What are the anticipated measurable outcomes or deliverables of this proposed study?
   Measurable outcomes from this project are: A) nutrient removal rates for standard BSMs as a function of soil moisture and hydraulic retention parameters; B) design guidelines for outlet control to ensure optimal nutrient removal. Project deliverables are a final report, peer-reviewed fact sheets, peer-reviewed journal articles, one masters thesis, and multiple research/outreach presentations at state and national level.

5. How does this study advance regional understanding for stormwater management?

   The focus of most bioretention work in western Washington has been on determining appropriate bioretention soil mixes (BSM) for most efficacious nutrient removal, However, with temporally varying soil moisture conditions, storm volumes and nutrient concentrations, choosing an appropriate BSM is only one of several factors that influence nutrient removal. Ultimately, the work would help to creating "smart" bioretention outlets that automatically adjust hydraulic retention and soil moisture conditions based on measured seasonal and storm-specific parameters.

6. Applicant(s) Contact Information:

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7. Permittees you are coordinating with (Provide contact information):

   Joy Rodriguez, <JRodriguez@ci.puyallup.wa.us>, City of Puyallup, 333 S Meridian, Puyallup, WA 98371, (253) 841-5549

Dana Deleon City of Tacoma, Center for Urban Waters, 326 East D Street,Tacoma, WA 98421, (253) 502-2109
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8. Select Stormwater Work Group study category (select all that apply):

☐ Source Control	☑ Retrofits	☑ Education & Outreach
☑ LID	☐ O&M	☐ Other:

Submit LOI to Brandi Lubliner (WA Department of Ecology) via email at Brandi.Lubliner@ecy.wa.gov