TECHNICAL MEMORANDUM

November 15, 2019

TO: Stormwater Interested Parties

FM: Jeff Burkey, Hydrologist, Water and Land Resources Division, Department of Natural Resources and Parks

RE: <u>Crowdsourcing Analyses to Evaluate Impacts of Climate Change on Stormwater BMP Designs</u>

Background

Recent analysis by the King County Department of Natural Resources and Parks, University of Washington Climate Impacts Group, and Washington State Department of Ecology suggests that projected changes in heavy rain events may require larger BMPs. In short, a suite of BMPs evaluated for changes in rainfall at Sea-Tac were shown to need larger capacities to mitigate future projections of rainfall using current design standards. However, the identified relative increases needed were variable and counter-intuitive at times when considering soil infiltration capacities, levels of development, and sources of rainfall. Moreover, aside from the orographic effect of the Cascade Mountains on rainfall in the Puget Sound, a casual review of downscaled rainfall in a few other locations within King County suggests results may be different than what has been evaluated using projections associated with the Sea-Tac area. Additional research is needed to develop a more robust set of scenarios and verify these results.

Why does it matter?

Regional stormwater facilities are typically designed to last several decades. This means that stormwater infrastructure built today will experience changes in heavy precipitation due to climate change. Understanding the range of possible outcomes is critical to ensuring that stormwater systems can meet current and future service loads and mitigate future rainfall projections. It may also help reduce the need for future retrofitting, which can be less efficient and often insufficient and/or infeasible without incurring substantially more costs because of surrounding constraints.

Crowdsourcing Proposal Overview

King County is proposing a crowdsourcing approach to increase the number of locations and climate scenarios available for the stormwater analysis. Available now, there are a total of thirteen downscaled climate scenarios (one using RCP 4.5 and twelve using RCP 8.5) at 145 locations spread across King and Thurston counties and Cities of Seattle and Everett. Crowdsourcing can be a very efficient means to analyze conditions if analyses can be parallel processed. For this effort, the steps needed to evaluate the impacts on BMP designs would be repeated many times over.

The concept is to develop an informal collaboration where labor hours are shared among participating members. The collaboration would establish templates to facilitate analyses by defining scenarios that include:
- Best Management Practices (e.g., detention ponds, bioretention cells, etc)
- Geographic locations
- Levels of development to be mitigated (e.g., rural residential, urban residential, commercial, etc)
- Background soil conditions (e.g., till, outwash, saturated, etc.)
- Global Climate Model scenarios (ACCESS1-0, GFDL-CM3, etc.)

To facilitate this sharing of effort, King County would set up a clearing house repository of resources needed. This would include rainfall time series processed for inputs into Ecology's approved stormwater BMP design software, Western Washington Hydrology Model (WWHM) 2012. Among many materials, results would be summarized in a tabular format and posted for display to the collaboration members. Sizing the BMPs using WWHM2012 does include some elements of subjectivity. Hence, a quality control method would be established to capture variability/biases among members performing the analyses. This may be something like a common set of sizing scenarios to elucidate any tendencies among individuals when designing BMPs.

Other Analyses

Other possible analyses of value could include:
- Looking at stormwater infrastructure and conveyance capacities and how projections of future rainfall may exceed existing design standards.
- Looking into the sensitivities BMPs may have under certain characteristics of the rainfall continuum.
- Downscaling climate model outputs over a broader geographic area.

Interest and capacity to conduct these additional assessments will be evaluated once the collaboration is organized and operating.

Level of Effort

The amount of effort depends on the number of sizing scenarios performed. For a frame of reference, sizing 100 BMPs would take about 40 hours of time. This is based on the assumption that a person is familiar with WWHM and workbooks have already been setup to expedite the design method processes that are not fully completed within WWHM. Participants are also asked to participate in periodic meetings/conference calls and help with data analysis and summarizing results. I would envision this effort occurring during the 2020 calendar year. Details will be worked out with interested parties closer to launch of this effort.

Contact Info

If you are interested in participating in this collaboration, please contact me via email (Jeff.Burkey@KingCounty.gov, capitalization only for readability). We've already recruited a few folks from the October 2019 workshop held in Redmond, but could use more. This effort will start up in early 2020, probably with a kick-off workshop to go over and refine scope, procedures, concerns, etc.

Regards,

Jeff Burkey
King County, Science and Technical Support, Water and Land Resources Division

cc:

      Guillaume Mauger, Climate Expert, University of Washington, Climate Impacts Group
      Peter Holte, Senior Program Manager, City of Redmond, Public Works Department
      Laurie Larson, Program Manager, Washington State University Stormwater Center
      Lara Whitely Binder, Climate Preparedness Specialist, King County
      Mark Wilgus, Stormwater Expert, DNRP, Water and Land Resources Division (WLRD)
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