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Tuesday, Nov. 10
10:30 AM – 12:00 Noon
SESSION 23: Innovative Technology

Challenges and Lessons Learned from Hydrologic Simulations Using HSPF and SWAT with NEXRAD Rainfall Inputs - Jae Ryu, University of Nebraska-Lincoln, Lincoln, NE (co-author: Mauro Di Luzio)

Hydrologic forecasts are important components in developing early warning systems for extreme hydrologic events, such as floods and droughts. Streamflow forecasts, in particular, provide useful insights to water managers by providing estimates of extra flood control volumes and timing of expected high flows, which allow wise water management during unseasonably dry months. Thanks to cutting-edge hydrologic monitoring technologies such as remote sensing, there is great potential to improve the quality of forecasts supporting critical water decision making. In this study, the Hydrologic Simulation Program-Fortran (HSPF) and the Soil and Water Assessment Tool (SWAT) are utilized to simulate streamflow using next generation radar (NEXRAD) rainfall estimates. The two models showed promising results, but because of modeling structures and limited parameterization, the use of these models for hydrologic simulations integrated with high spatial resolution rainfall estimates at the hourly time-step will be challenging. The key issues and lessons learned during calibration processes are further discussed.

Nichols Brothers Boat Builders – Achieving New Successes in Water Quality - Tom Atkins, Parametrix, Bellevue , WA (co-author: Jim Mothersbaugh)

Since 1964 Nichols Brothers Boat Builders has been operating a ship fabrication facility on Whidbey Island, Washington at the south end of Holmes Harbor. Nichols Brothers set a goal of revamping its stormwater management system and hired Parametrix to evaluate its existing system and develop short- and long-term permitting strategies and stormwater engineering design plans. Parametrix services included: • NPDES and Waste Discharge Permit guidance and assistance, including negotiations with the Department of Ecology • Drainage design including preparation of the Engineering Report for the new stormwater management system • Hydrogeologic and wetland studies • Preparation of the Stormwater Pollution Prevention Plan, Spill Control Plan, and Operations and Maintenance Plan An innovative stormwater management system, featuring a multi-stage electrocoagulation water quality treatment system designed and fabricated by Water Tectonics, Inc., was installed during 2008 that has achieved incredible successes including: (1) copper and zinc levels in stormwater discharged from Nichols' facility have been reduced by over 95 percent; (2) stormwater discharged from the site is now cleaner than stormwater discharged from all other boat and ship builders in Washington; (3) Nichols is the first ship builder in the state to achieve marine water quality criteria with its stormwater discharge (6 ppb copper and 95 ppb zinc); (4) the quality of its stormwater is equivalent to the water quality of local (native) groundwater; and (5) 100 percent of stormwater runoff from Nichols' six-acre fabrication facility is infiltrated following water quality treatment. The Nichols Brothers Stormwater Management Project recently received the American Council of Engineering Companies' 2009 Silver Engineering Excellence Award in the "Future Value to the Profession" category.

Designing Stormwater Treatment Approaches for Fixed Bridge Surfaces - Charlie Wisdom, Parametrix, Bellevue, WA (co-authors: Linda Logan, Paul Bucich, Sheri Lott, Embrey Bronstad, Larry Schaffner)

Confined area road surfaces, such as over water bridges, present unique and specific challenges to the detention and treatment of stormwater runoff generated by these structures. The Innovative Stormwater Treatment (IST) project was conducted as part of the SR 520 Bridge Replacement and HOV Project to

discover, review, and implement innovative and non-traditional stormwater treatments for use on these types of projects. The IST project is being conducted in three phases, with the first Phase identifying and evaluating a range of stormwater treatment techniques and developing a conceptual schematic design that will be further developed in the second phase of the project. An initial review of existing literature and contacting national experts and vendors was conducted to identify potentially applicable stormwater treatment technologies and management options. Along with information on information on bridge characteristics, location hydrology, and local climate, the project team and charrette participants considered performance objectives for safety, feasibility, constructibility, maintainability, treatment performance requirements/goals, anticipated treatment performance based on unit processes, aesthetics, and costs to refine conceptual pre-designs for up to four options. The combined team and stakeholders identified four treatments to carry forward for evaluation - high efficiency street sweeping (tandem sweeping using both broom and vacuum/regenerative air sweepers), permeable friction course pavement (PFC), pier cap media/trickle filter, and pier cap cartridge system. PFC has been most frequently used as "quiet pavement", but is starting to be considered in other studies as a water quality treatment. The Media/Trickle Filter Vault and Cartridge systems are proposed for placement on pier caps, allowing for water to be moved rapidly off of bridge surfaces, but to still be treated prior to discharging to the receiving environment. Apatite, a naturally occurring inorganic mineral and as well as a component of bones in fish and mammals, was identified from the literature search as a treatment media to reduce dissolved metals in both the media trickle filters and cartridge systems. Subsequent phases of this project will develop bench-scale and field pilot testing programs to determine the utility of these proposed treatments in the confined settings of fixed bridge surfaces.

Retrofitting the Seattle-Tacoma International Airport to Meet Stormwater Effluent Limits – Lessons Learned - Kenneth Ludwa, R. W. Beck, Seattle, WA (co-authors: Ralph Nelson, Robert Duffner)

This paper describes results and ongoing adaptive management associated with the Port of Seattle's Comprehensive Stormwater Management Plan (CSMP) for Seattle-Tacoma International Airport (STIA). The CSMP was implemented in 2007 to comply with STIA's NPDES Permit, which requires retrofitting with All Known Available and Reasonable Means of Treatment (AKART), as well as stormwater effluent limits. The current Permit stipulates limits for copper (63.6 µg/L), lead (81.6 µg/L), and zinc (117 µg/L). The CSMP included existing and new source control and treatment best management practices (BMPs). A basin-scale model was developed to guide the implementation of BMPs and predict attainment of effluent limits. The model combined land use data; runoff volume and pollutant concentrations associated with each land use; BMP distribution data; and BMP performance data. Model results were used to identify subbasins in which source control and treatment BMPs beyond AKART were needed to meet effluent limits. The model was used to focus BMP application on areas within each subbasin with the highest pollutant loads. However, in some subbasins, end-of-pipe treatment was determined to be more practicable and effective. Source control BMPs included sweeping, removal of runway tire rubber deposits, and coating of galvanized rooftops and structures. Treatment BMPs included media filters, filter strips, bioswales, extended detention ponds, and wetpools. This paper focuses on CSMP performance, in terms of trends and specific events identified in regular outfall monitoring data, as well as responsive actions. Observations to-date indicate that overall pollutant removals are occasionally less than expected, but effluent limits are generally being attained. Monitoring results are used to guide improvements or alter operations. For example, wet ponds will be modified to avoid re-suspension of particulates. Base flows need to be diverted around media filter systems to prolong the life of the filters. The use of roadway traction sand during icy periods should be taken into consideration in the BMP performance and operation. The timing of runoff combining from different pollution-generating areas can bias effluent samples. Finally, detention ponds, whose primary purpose is flow quantity control, appear to have a significant beneficial effect in pollutant reduction.