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1:30 PM – 3:00 PM
SESSION 30: Modeling

Components of a Successful Flow Monitoring Program - Michael Hinson, Seattle Public Utilties, Seattle, WA (co-authors: Ben Marré, Laura Reed, John Barton)

In response to the City of Seattle's (City's) National Pollutant Discharge Elimination System (NPDES) permit, the City is developing a Long-Term Control Plan (LTCP) to evaluate a range of combined sewer overflow (CSO) control alternatives and create an implementation plan to address meeting water quality standards and designated uses on CSO-impacted receiving water bodies. The City's LTCP includes development of a detailed hydrologic and hydraulic computer model of the City's large combined sewer system. The Flow Monitoring Program for the LTCP is a two-year comprehensive study of the performance of the combined sewer system during dry and wet weather. The data collected during the Flow Monitoring Program will not only provide the information necessary to calibrate the computer model and design future CSO control facilities, but will also provide the information needed to improve operations and maintenance of the existing combined sewer system. The goal of the Flow Monitoring Program is to collect high quality and complete data in the combined sewer system. The following steps were followed to achieve this goal: A team approach to leading the study that consisted of subject matter experts in modeling, data quality, and technical management. Integration of the modeling team early in the program provided focus and helped the team to avoid errors that otherwise would have made use of the data more difficult. Development of a Quality Assurance Project Plan (QAPP) that specifies quality objectives, criteria, and methods of the flow monitoring endeavor. A three-step process to select monitoring sites suitable for collecting quality data that included location inspection, and technical review and approval phases. A technical review phase that included a review of upstream and downstream photographs that proved to be a quick way to identify characteristics of the monitoring location that would reduce data quality. Biweekly screening reviews of collected data to identify anomalies, ensure data completeness, and spot system issues likely to prevent collection of good data. Monthly team reviews of the collected monitoring data. This paper presents key aspects of the organization, methods, and resources that contributed to Flow Monitoring Program's successful first year.

Near-Real-time Lake Profiling Systems for Lake Washington and Lake Sammamish - Bob Kruger, King County Environmental Laboratory, Seattle, WA (co-authors: Curtis DeGasperi, Charlie Zeng)

A number of aquatic ecosystem responses to changing climate have been documented in Lake Washington (Seattle, Washington) and other lakes around the world. These responses could only have been detected and understood in the context of climate change as the result of consistent long-term monitoring of physical, chemical, and biological components of the ecosystem. Further understanding of the effects of changing climate will come from continued comprehensive routine monitoring – specifically more frequent sampling (daily to sub-daily). In 2008 King County purchased 2 Endeco/YSI lake profiling systems, which are currently deployed on Lake Washington and Lake Sammamish. The systems are solar powered and equipped with meteorological stations and are capable of conducting up to 6 profiles per day recording temperature, conductance, dissolved oxygen, pH, chlorophyll fluorescence, and turbidity every meter from the surface to the bottom of the lake. A SQL database and web portal has been developed that provides public access to the data in near real-time (http://green.kingcounty.gov/lake-buoy/). Post-deployment calibration checks and automated range checking have been developed that also provide the public with information on the quality of data collected. The sub-daily profiling data, in conjunction with other components of King County's lake monitoring program, will improve our understanding the response of these lake ecosystems to climate change – for example links between earlier onset of stratification and the timing and magnitude of the spring phytoplankton bloom.

The New Hydrographic Paradigm: Rivers, Lakes & Watershed Boundaries - Stephen Daw, U.S. Geological Survey, Denver, CO (co-author: Karen Hanson)

With the completion of the certified Watershed Boundary Dataset (WBD) the Natural Resource Conservation Service (NRCS) and U.S. Geological Survey (USGS) are now moving forward to integrate WBD into the same geodatabase as used by the National Hydrography Dataset (NHD). Users of the NHD and WBD are realizing that data analysis results are best achieved when both datasets are used together. This integration will allow scientists and other users of The National Map to more easily view and utilize the relationship between the NHD and the WBD. As this integration develops over time, the surface water features and watershed boundaries of these two datasets will better function together in a GIS. Not only will this lead to better interoperability of the two datasets, but it will also encourage cross use of the data and lead to better data integration. The NHD and WBD were initially developed separately and have a fairly distinct set of users. The NHD is a fundamental component of The National Map and is updated via a data stewardship program. Now that the WBD has been recently completed for the entire nation as a certified dataset, it will now also become an integral part of The National Map and utilize the NHD stewardship process. WBD data certification involved a standardized review process at several levels for adherence to a national standard. As changes are made in one geographic area, or as accuracy is improved, the other dataset should be updated to reflect these changes as well. The results of such geospatial integration are evident in examples in the Pacific Northwest, Florida, and Texas.

State-of-the-Art Review on Real-Time Reservoir Operational Forecasting Models - Henry Hu, WEST Consultants, Inc., Bellevue, WA (co-author: Henry Tang)

Seattle Public Utilities recently conducted a state-of-the-art review on hydrologic models with forecasting capabilities and real-time reservoir operations for a potential application to the Cedar River and Tolt River watersheds in King County, Washington. The Cedar and South Fork Tolt Reservoirs are the primary water supply source for the metropolitan Seattle area. A reservoir operational forecast system for these two watersheds with adequate accuracy and lead time for short- and long-term forecasts is essential in providing reliable and sustainable water supplies under changing climate conditions and increasing water demands. This paper describes the review process, models reviewed, and comparisons of features and capabilities. Common features for all models and special features for each model are discussed, including rainfall-runoff component, reservoir representation, operation optimization, computational time step, licensing requirement and software cost, water quality component, and probabilistic streamflow prediction. In particular, the paper discusses if the models are able to adequately simulate conditions in the Cedar and Tolt River basins, especially the highly spatial and temporal variability in precipitation, temperature, and snow accumulation and snowmelt. The review results presented in this paper are also expected to be useful in other similar watersheds.