American Water Resources Association
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Tuesday, Nov. 10
1:30 PM – 3:00 PM
SESSION 27: Modeling, Mitigation and Adaptation for Change I

Long-Range Future Water Supply Planning in the Face of Global Climate Change - David Blau, AECOM, San Francisco, CA

The East Bay Municipal Utility District (District) is one of the largest water/wastewater management agencies in Northern California, serving over 1.3 million people plus industrial, commercial, and institutional water users in the East Bay region of the San Francisco Bay Area. The District relies heavily on snowpack and runoff in the Mokelumne River Basin in the Sierra Nevada Mountains for its water supply. In light of increasing water demands through 2040 primarily due to infill development and densification and the potential effects of global climate change, it is expected that water supply shortages will worsen in future years. With this in mind, and the overall objective of ensuring reliable water supply to its customers, the District has chosen to update its water supply management program and extend the planning horizon to 2040 (WSMP 2040) in one of the largest, most comprehensive water supply management plans undertaken in California. The planning process for the WSMP 2040 has centered on establishing a series of water supply portfolio alternatives to provide an array of water supply management options that give the District choices as future water conditions play out. The resulting water supply portfolio for WSMP 2040 is designed to respond flexibly to an uncertain water future: rationing is held at a goal of 10%, conservation and recycled water programs are pushed to the maximum point of cost-effectiveness, and a number of supplemental supply components will be pursued simultaneously. The presentation will focus on the advantages and challenges of the flexible portfolio approach to water supply planning in the face of changing climate conditions.

Sustainable Systems Integration Model (SIM) – Gregory A. Hurst, AECOM, Fort Collins, CO

The Sustainable Systems Integrated Model (SSIM™) is a unique modeling platform that goes beyond planning to provide decision support systems that inform design and lead to the most appropriate sustainable development program. The Water Sub-Module of SSIM is used to understand how the development or facility could perform with municipal water, groundwater or other potable water supply.

The National Museum of Natural History (NMNH) water model resides in a spreadsheet that takes into account interior, exterior, and cooling demand; precipitation; evaporation; and pumping power consumption related to the building and grounds. NMNH baseline water demand is calculated and calibrated using visitor counts, existing fixture flow rates, general use water meter readings, landscape water meter readings, cafeteria water meter readings, estimates for cooling tower make-up water, and other demand and supply estimates or data. Exterior demand considers the existing landscaping and potential for alternative schemes that can be developed. The water model has a straightforward interface, and can be used to review the results of the different water conservation strategies in real time. Conservation strategies include water harvesting, water treatment and reuse, green roofs, fixture and irrigation efficiency, Xeriscape, stormwater management, and associated costs for strategy implementation.

Once the model is calibrated to existing or forecasted data, alternative water conservation and reuse strategies can be evaluated to assess overall reduction in water use and potable water demand. The model is useful for a single building or existing and new communities.

Using Uncertain Projections of Extreme Climate Indicators to Quantify the Effects of Climate Change on Extreme Event Flooding in the United States - Joshua Kollat, AECOM Water/Penn State University, State College, PA (co-authors: Joseph R. Kasprzyk, Wilbert O. Thomas)

The recently published Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) concluded that it is very likely that the frequency of heavy precipitation events will increase over many regions as our climate warms over the next century. A concomitant increase in the economic risks associated with this change motivates a thorough analysis of the impact of extreme precipitation and temperature events on flooding in the United States. This study seeks to quantify how the 1-percent chance flood (equivalent to a 100-year return period) may change based on climate model projections through the year 2100. Extreme climate indicators (ECI) have been developed previously as part of the IPCC effort to aid in quantifying the frequency and severity of extremes in temperature and precipitation and are used throughout this study to relate observed climate extremes to future extreme climate projections. The methodology used also estimates the uncertainty of these projections by using multiple climate model data sets. Regression analysis was used to identify major physiographic regions of the United States, relating watershed characteristics such as drainage area, slope, and impervious area, as well as observed extremes in climate, to the current 1-percent chance flood. The observed regression relationships were then used within a Monte Carlo sampling framework to determine distributions of how the 1-percent chance flood may change within sample watersheds throughout each region, given uncertain projections in extreme climate and population growth. Magnitudes of projected changes in flood events were coupled with hydraulic data for the sample watersheds to develop estimates of the future floodplain extent for each watershed. The results of this study show regional projections of changes to the future 1-percent chance flood magnitude and the associated changes in the 1-percent chance floodplain for affected populations across the U.S.

Integration of Water Management Models and Demand Forecasts to Assess Future Water Availability - Blaine Dwyer, AECOM Water, Lakewood, CO

The availability of water to support existing and future consumptive and non-consumptive needs for economic development, human uses and ecosystem management and restoration has become a major concern across the western United States. This paper compares and contrasts several alternative methods to integrate the use of water management models and demand forecasts to assess future water availability. An overview of the use of water allocation models to simulate river basin management based on historic hydrology will be provided for context before addressing the simulation of water availability