Kevin Ruswick

The City of Plattsburgh, NY is faced with managing aging water supply infrastructure including Mead Reservoir Dam, a high hazard facility. An Engineering Assessment (EA) was performed that included hydrologic modeling predicting the dam would overtop by two feet during the Spillway Design Flood (SDF). A spillway rehabilitation project including replacement of the existing 40-ft wide ogee spillway with a 2-cycle labyrinth and enlarged chute/stilling basin was designed and bid. Bids between $5.9M and $8.5M were received, all exceeding the owner's allocated $4M budget.

A subsequent study was initiated to re-evaluate the hydrology and need for spillway improvements. The previous modeling utilized the SCS Unit Hydrograph Methodology which is often considered conservative in the prediction of peak flows. The refined modeling utilized the Snyder Unit Hydrograph methodology and focused on model validation for significant historic floods, including Hurricane Irene. Hourly precipitation data was available from land-based gaging stations but rainfall depths and accuracy were inconsistent due to significant sustained wind and gust speeds. To overcome this and to assess the storm's spatial and temporal variations, the National Weather Service's (NWS) multi-sensor hourly gridded rainfall data was utilized in the refined hydrologic analyses. This data incorporates both Doppler radar and land-based gage data to develop rainfall depth estimates on an hourly time step basis with a spatial resolution of 4km x 4km.

Using the multi-sensor gridded rainfall data set, the pool elevations predicted from the refined hydrologic modeling along with pool elevations predicted from previous modeling were compared to lake level readings collected during Hurricane Irene. The model results using the Snyder methodology correlated much better with observed reservoir levels when compared to the SCS unit hydrograph methodology. The refined hydrologic modeling approach with the Snyder methodology was then applied to the 50% PMF storm event and resulted in an approved SDF that is less than half of the previously utilized SCS based value. This will result in the design and construction of a more appropriately sized new spillway at a significantly lower cost; ultimately demonstrating the benefit of leveraging multi-sensor hydrologic data for spillway design flood evaluation.