Screening-level breach analyses and hazard classification at large portfolio scales

Jonathan Quebbeman, PhD, PE, PH, Hazen and Sawyer

For State dam safety agencies, it is critical to understand the potential impacts from a dam breach analysis, which ultimately informs the hazard classification of the dam. Tools such as FEMA's DSSWise are aimed at streamlining this analysis through efficient online data processing and hydraulic breach analysis. Another tool has been developed by the USACE Risk Management Center (RMC) called the Dam Screening Tool (DST), which is a cloud-based system used to rapidly create a HEC-RAS model, perform a breach, and conduct a simplified LifeSim approach for life-loss and economic damage estimation. Both of these systems are efficient, but each dam is still evaluated individually. Many states have portfolios with thousands of dams, where using either DSSWise or DST would still require extensive resources. Further, dams that have been previously categorized may be subject to 'hazard creep' from downstream development, potentially elevating previously determined hazard classifications. This presentation introduces an automated approach to screening-level dam breach analyses, where hundreds or thousands of dams may be assessed quickly. The approach automates the process of HEC-RAS model creation for each dam, conducts each unique breach analyses, and then evaluates downstream consequences. Consequences include impacts to structures and estimates of the population at risk. The process results in a collection of dam breach HEC-RAS models that could be further refined if needed, and generates a summary table of dams and results across the portfolio (e.g., PAR, structure impacts, depth-velocity data, or other output variables of interest). Further, by updating the structures inventory accounting for new development downstream, the breaches can be quickly rechecked for changes to impacts or potential hazard classifications. This presentation will review this automated approach, examine example results, and discuss potential applications at broader scales with challenges when operating at the portfolio scale.