

Flood Hazard Analysis

Overview

Land use activities, such as urban and industrial development, mining, and agriculture can impact existing hydrologic and sedimentation processes. Some of the key issues in floodplain management are the delineation of flood hazards, and the identification of possible measures to mitigate potential impacts. Another key issue is floodplain delineation with respect to Federal Emergency Management (FEMA) criteria; FEMA analysis methods do not necessarily result in floodplains identical to those delineated by purely physical processes. Conversely, a floodplain analysis using purely physical processes does not necessarily result in a floodplain meeting FEMA criteria. A case in point is an area protected by a levee not meeting FEMA certification criteria.



Exponent's engineers and scientists have considerable experience using proven approaches for investigating flood hazards. A multidisciplinary approach is often adopted, integrating elements of geologic mapping, mapping of geomorphic features, detailed topographic data using Light Detection and Ranging (LiDAR) technology, hydrologic analysis to determine flood frequencies and peak discharges, hydraulic analysis of offsite and onsite drainage channels and flood control pathways, retention/detention basin analysis, sediment transport, and numerical simulations of flood propagation. For projects involving delineation of FEMA special flood hazard areas, Exponent's engineers can include FEMA methodology. We bring a high level of expertise with an array of accepted and appropriate modeling tools and analysis techniques, supplemented with focused field and laboratory investigations, geographic information systems, and pre- and post-processing tools.

Our services include:

- » Floodplain mapping using US Geological Survey (USGS) topography and LiDAR data
- » Geomorphology and historical flood analysis
- » Simulation of flood propagation
- » Development of potential flood hazard mitigation measures
- » Hydraulic analysis of offsite and onsite flood corridors and pathways
- » Detention/retention basin analysis
- » Levee analysis
- » Sediment transport analysis
- » Channel stabilization analysis
- » Scour analysis
- » Coordination with FEMA regulatory agencies, and flood control districts

Models and analysis techniques used:

- » Steady flow, one-dimensional: HEC-2, HEC-RAS, WSPG, pipe and culvert flow hydraulics
- » Unsteady flow, one-dimensional: HEC-RAS, UNET
- » Unsteady flow, two-dimensional: FLO-2D
- » Hydrology and sediment transport: HEC-1, HEC-HMS, HEC-6, agency-approved rational method and unit hydrograph methods
- » Alluvial fan: FAN, stochastic alluvial fan flow calculations, FLO-2D, HEC-RAS network

