

Flood Modeller Pro

Dam-breach modelling for the Lane City Reservoir in Texas, USA

CH2M performed dam-breach modelling using the 1D and 2D solvers within Flood Modeller Pro to confirm hazard classification of the Lane City Reservoir dam and develop dam-failure inundation maps for an Emergency Action Plan.

Lane City Reservoir (LCR) is a proposed off-channel reservoir owned and operated by the Lower Colorado River Authority (LCRA). It was designed by CH2M. Existing and proposed conveyance facilities will move water in and out of the reservoir, including pump stations, canals and a river outlet.

The undeveloped project site is relatively flat, and the reservoir will be ringed on four sides of a rectangle by a 45-foot-high embankment dam that encloses nearly 1,100 acres of farmland to store 40,000 ac-ft of water. By optimising reservoir operations, LCRA projects that the new reservoir will add 90,000 ac-ft of firm water supply.

During design, CH2M performed dam-breach modelling using Flood Modeller Pro to confirm hazard classification of the dam and develop dam-failure inundation maps for an Emergency Action Plan (EAP).

Due to the flat terrain, a variety of split flow paths and complex hydraulic interactions between multiple watersheds, channels and floodplains were modelled. Dam-failure floods were also modelled for breaches on each side of the rectangular ring-embankment using a 1D-2D linked model.

Flood Modeller Pro was selected as it provided a range of tools which enabled the modelling team to help avoid model instabilities that can occur within complex hydrodynamic dam-failure models.

Flood Modeller Pro can be used for a range of applications, including:

- 1D and 2D floodplain modelling
- Floodplain mapping
- Flood forecasting
- Hydrological analysis
- Embankment/levee failure
- Dam-breach analysis
- Options' appraisal
- Detailed design
- Structure blockage



Artist's rendering of Lane City Reservoir embankment

Contact us

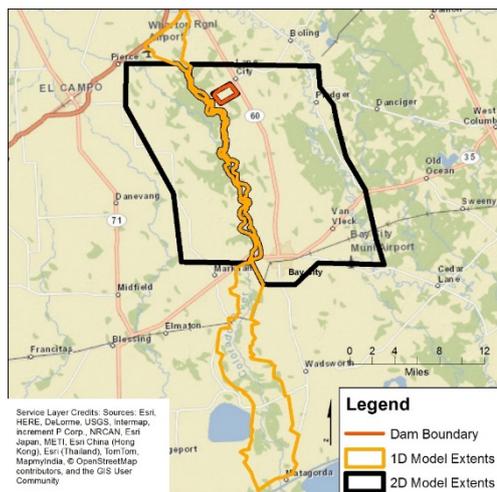
Sales: +44 (0)845 094 7990
Support: +44 (0)845 094 7994
www.floodmodeller.com

JACOBS

With a legacy stretching back 40 years, Flood Modeller allows users to model rivers, floodplains and urban areas, using our powerful 1D and 2D solvers.

“Flood Modeller Pro was selected due to its integrated 1D and 2D modelling capabilities, robust and proven algorithms, ability to accurately and quickly model rapidly changing flow conditions, user-friendly interface, and strong technical support.”

Duane McClelland
Water Resources Senior Technologist
 CH2M



Areas modelled using the 1D and 2D solvers within Flood Modeller Pro

The LCR project provided an opportunity to leverage the software’s integrated 1D and 2D solvers, particularly the 2D TVD Solver which has been specifically developed to model “shock” waves produced by a rapid dam breach. It allows the complex hydraulics of steep changes in velocity and water level to be calculated more accurately, and provides increased stability when compared to other 2D solvers. This feature is especially important for modelling a dam breach flood wave across a flat terrain surface, like that surrounding LCR.

The project also allowed CH2M to further validate Flood Modeller Pro by comparing its 1D output to parallel results using HEC-RAS.

Model development

Using Flood Modeller Pro, two 1D and two 2D hydrodynamic models were coupled. The 1D models represented discharge through the dam breach and flows within the Colorado River, exclusive of its floodplains. The 2D models represented flow across overland areas east and west of the Colorado River, including its floodplains and the adjacent eastern watershed.

Complex interactions between flow areas can be represented by linked 1D and 2D models. The 1D breach model was influenced by 2D tailwater effects; 2D overland flow on both sides of the Colorado River were influenced by 1D elevations within the Colorado River channel; 1D flow within the Colorado River channel exchanged 2D flows with its eastern and western floodplains; and regions east and west of the eastern watershed divide communicated internally within the eastern overland 2D model. Each model seamlessly passed flows to the connecting models, responding dynamically to adjacent water depths and flows.

The 1D Flood Modeller Pro model of the Colorado River channel was developed by importing cross sections and other data from two existing, sequential 1D HEC-RAS models of the Colorado River. The first model began well upstream of LCR and extended downstream to Bay City. The second model extended from there to the Gulf Coast. The first model used results from the second model as a downstream boundary condition, so the two models were readily linked together without affecting their hydraulic performance.

The 2D models were developed using digital elevation models (DEMs) with a combined spatial domain that covered over 300 square miles. The finest DEMs were available with a 3m grid size, but a coarser resolution was selected for modelling most areas.

Contact us

Sales: +44 (0)845 094 7990
 Support: +44 (0)845 094 7994
www.floodmodeller.com

JACOBS

With a legacy stretching back 40 years, Flood Modeller allows users to model rivers, floodplains and urban areas, using our powerful 1D and 2D solvers.