

Projecting Economic Consequences of Urban Canal Breaches

Adapting risk management techniques for dams to canals

Bottom Line

This research project adapted HAZUS software to determine potential economic damages from canal breaches.

Better, Faster, Cheaper

We can now provide information to local Reclamation offices to help prioritize preventative maintenance and resources. Previous damages from a canal breach have reached over \$10 million dollars. Using this method could help minimize future canal breach losses.

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Problem

Reclamation is responsible for managing more than 8,000 miles of canals. As the population of the West has grown, many miles of these canals have been incorporated into urban areas. While an irrigation canal breach in an originally unpopulated area might have caused little damage, recent canal breaches have flooded new residential developments. Reclamation managers need current and comprehensive information about the potential consequences of a canal breach in these urbanized areas so that maintenance and repair operations can focus on areas of greatest risk. Economic consequences typically include downstream property damages, lost water delivery benefits, repair/replacement costs, and secondary or indirect impacts.

Evaluating the potential property damages due to a canal breach is a good first step in determining the overall economic consequences. Reclamation's Dam Safety Program has developed procedures for calculating consequences of dam failure and resulting floods. However, canal breach floods are different in several important ways and, therefore, require new procedures.



Landside, left canal bank, about 240 feet downstream from the Truckee Canal breach. Collapse feature associated with downhill sediment transport. Three muskrat burrows on the canal side of the embankment near high water line. See the Truckee Canal breach information on the following page.

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Solution

This Science and Technology research project developed a method to identify and quantify potential downstream property damages due to a canal breach scenario. We use damage parameters that are less like a dam failure and more like a rapid rise river flood to simulate the potential damages from a canal breach.

Our analysis adapts the Federal Emergency Management Agency's (FEMA) HAZUS-MH software now being used to estimate economic consequences for dam failure scenarios. HAZUS is a nationally applicable standardized methodology and risk assessment software program for analyzing potential losses from floods, hurricane winds, and earthquakes. HAZUS reports the locations and types of major infrastructure that would be inundated by the flood as well as the estimated damages. The Technical Service Center's Economic and Resource Planning Team can now use these data, together with a Geographic Information System (GIS) to produce a report that shows potential damages for canal breaches. For any urbanized canal system, tools are used to:

1. Perform an infrastructure inventory and economic value analysis of the area surrounding the canal system
2. Determine valuations for the affected infrastructure
3. Create a geospatially referenced economic value database of the information

We use the HAZUS-MH database along with the Homeland Security Infrastructure Program (HSIP Gold) database as sources of infrastructure information.

Application

As a proof of concept, this Science and Technology research project analyzed a hypothetical situation based on previous canal breaches. We examined:

- Essential facilities (e.g., fire stations, hospitals, police stations, and schools)
- Transportation lifelines (e.g., roads, bridges, airports)
- Utility infrastructure (e.g., water, wastewater, power, communications)
- Buildings and infrastructure (e.g., residential, commercial)
- Agriculture (i.e., exposure and potential losses)

Future Development Plans

Reclamation is inventorying our canals and identifying canals in urban areas. This first step can lead to an overall estimation of economic consequences, including lost benefits, repair/replacement costs, and indirect impacts due to a canal breach scenario. We can use this information to further pinpoint areas of potential significant economic consequences.

More Information

HAZUS software is available at www.fema.gov/hazus.

“We can use this analysis to help our efforts to protect the public and the environment from the risks posed by potential canal breaches.”

**Bill Goettlicher,
Co-Investigator**

Canal Breach Example



At approximately 4:30 a.m. on Saturday, January 5, 2008, a breach occurred in the Truckee Canal, a Newlands Project facility in northern Nevada, owned by Reclamation and operated and maintained by the Truckee Carson Irrigation District. As a result of the breach, an uncontrolled release of water flowed into irrigated lands and a portion of the city of Fernley, located some 30 miles east of Reno. About 590 homes were flooded.

**For more information about this canal breach, see Truckee Canal Breach Hydraulic Model Results for Truckee Canal Breach Evaluation, Fernley, Nevada, January 5, 2008.
www.usbr.gov/mp/truckee_canal.html**

