



United States Department of the Interior

U. S. GEOLOGICAL SURVEY

WATER RESOURCES DISCIPLINE
2329 West Orton Circle
Salt Lake City, UT 84119

MEMORANDUM

September 07, 2011

To: Kathleen Anderson
Regulatory Technician, USACOE

From: Cory E. Angeroth
Hydrologist, U.S. Geological Survey Utah Water Science Center, Salt Lake City, UT

Subject: Potential impacts of a new breach in the Great Salt Lake Causeway

The U.S. Geological Survey Utah Water Science Center (WSC) has previously developed and documented a salt balance model that could be used to simulate the effects of various size openings in the Great Salt Lake Causeway on the salt and water balance of the lake. The report titled "Water and Salt Balance of Great Salt Lake, Utah and Simulation of Water and Salt Movement through the Causeway, 1987-98" (Water-Resources Investigations Report 00-4221) could be used to simulate the potential effects of any new openings, or closure of existing openings, in the causeway. The WSC has not updated or recalibrated the model since the report was published in 2000. In order to simulate any changes to the openings in the causeway, the model would need to be updated with data from 1998 to the present, recalibrated, and simulated openings tested. Barring updating and recalibration, the report does provide some insight of how dimensional changes to the existing breach would potentially affect the salt balance:

"For simulations of several hypothetical breach dimensions with 1987-98 boundary conditions, deepening the breach was more effective in reducing the difference in dissolved-solids concentration between the two parts of the lake than widening without deepening the breach. "

Figure 18 in the report, and copied below, shows what the model predicts the dissolved-solids concentration of the south arm would be, as a percentage of the north arm, with various simulated breach widths and bottom altitudes. The simulated bottom altitudes range from a low of 4,175 feet to a high of 4,198 feet.

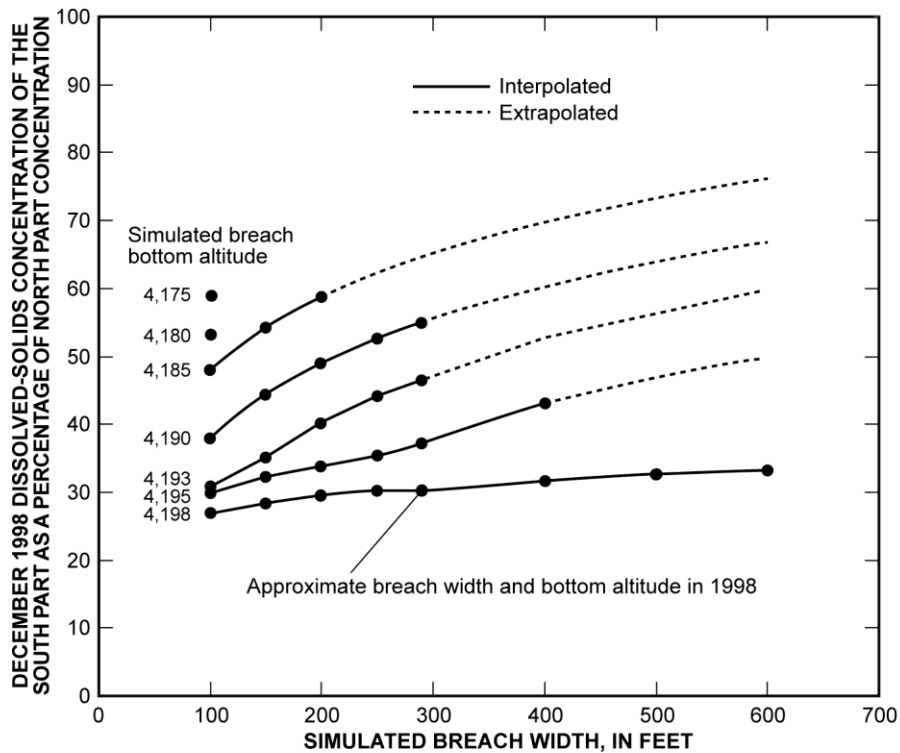


Figure 18. Effects of selected breach widths and bottom altitudes on the dissolved-solids concentration of the south part as a percentage of that of the north part, 1987–98 hydrologic conditions, Great Salt Lake, Utah.

If the existing causeway breach and culvert configuration were to be modified, monitoring of the following parameters would be important to determine the effects of these modifications and to aid any future modeling efforts:

- South to North flows through any new breach
- North to South flows through any new breach
- Salinity at multiple points in the water column at any new breach
- Monitoring flow velocity at the “low” point between the north and south parts of the South Arm of Great Salt Lake
- Collecting vertical profiles of chemical samples from sampling sites in both the North and South arms.

Sincerely,

Cory E. Angerth