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Enhancement of SRT And ERT Interpretations Using Time-lapse Measurements and Cross-plot Analysis

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SUMMARY

According to the 2013 ASCE report card for America's infrastructure, dams and levees in the U.S. are in a poor to fair condition and exhibit signs of deterioration with strong risk of failure.

According to the 2013 ASCE report card for America's infrastructure, dams and levees in the U.S. are in a poor to fair condition and exhibit signs of deterioration with strong risk of failure. The estimated 100,000 miles of levees in the U.S. protect 43% of the nation's population but an astonishing 91% of these levees are not in an acceptable condition(a). The above statistics is an indication that these structures need to be regularly monitored in a cost effective way. This will most likely require some type of remote sensing or geophysical method. Furthermore, internal seepage, seepage in the foundation, and internal erosion require special attention because they are not easily identified by visual inspection. Seismic refraction tomography (SRT) and electrical resistivity tomography (ERT) have been widely used for the investigation of the internal structure of dams and levees. In this study, the use of time-lapse SRT and ERT surveys with the application of cross-plot analysis on a model and an actual dam are presented. Seismic anomalies associated with compromised zones are at the correct lateral location but at a shallower depth than expected. The lateral and vertical locations of the ERT anomalies are closer to the compromised zones. The location of compromised zones inferred from geophysical anomalies can be significantly improved by conducting time-lapse surveys and combining results with the use of cross-plot analysis. This approach integrates the strength of SRT and ERT methods and provides a time-lapse plan view of the lateral location of the compromised zones. This plan view can be used to guide engineers in further investigations. [This research was funded by the department of Homeland Security- sponsored Southeast Region Research Initiative (SERRI) at the Department of Energy's Oak Ridge National Laboratory.] (a)<http://www.infrastructurereportcard.org/>