US Army Corps of Engineers®
Engineer Research and Development Center

Levee Condition Assessment

Description

Researchers in ERDC's Geotechnical and Structures Laboratory have developed the capability to rapidly assess the condition of levees. The technology integrates information derived from airborne reconnaissance, high-resolution ground surface geophysics, geologic studies, and a project-specific enterprise Geographic Information System (eGIS).

Capabilities

Levees can be investigated rapidly by airborne reconnaissance—helicopter-borne electromagnetic (EM) and magnetic sensors, digital video, and light detection and ranging (LiDAR)—followed by ground surface geophysical surveys in areas where anomalous conditions are identified. Conductivities of the materials comprising levees are measured by the respective EM techniques and are related to physical factors such as material type and moisture content.

Using this approach, LiDAR provides elevation data of the levee surface, accurate to within a few centimeters, followed by a variable-frequency EM survey that will penetrate into the body of the levee and its foundation to depths of 30 meters or more.

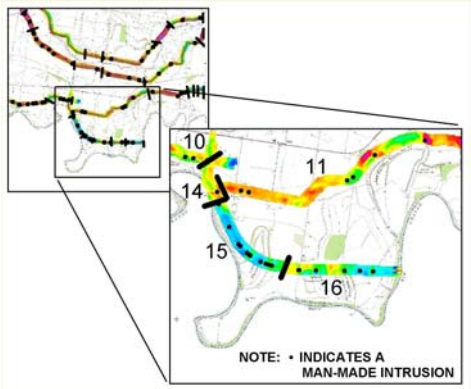
Airborne EM survey

Benefits

This technology provides the capability to assess levee conditions during the dry season, which allows for a baseline to be established and for levee repairs to be made before flooding occurs.

Success Stories

Proof-of-principle testing was successfully performed along 270 miles (435 km) of levees located in the lower Rio Grande Valley. One helicopter pass was sufficient to acquire LiDAR data, while three passes (one along each levee toe and one along the levee center line) were used for EM and magnetic data acquisition. These data were gridded and displayed by color-coded conductivities in both plan and profile views. Levees were then segmented by conductivity, and a 10-point condition assessment criterion was applied for each segment. Factors included in the assessment were past performance, construction records, soil data, a geologic study to identify abandoned river channels, and locations of borrow pits.



Example of GIS layers, showing topography, levees, conductivities, segments, and man-made intrusions

Anomalous conductivity areas were investigated by high-resolution ground surface geophysics and by additional borings using an instrumented cone penetrometer. Analyses of these data were facilitated by an eGIS developed for the test study.

Point of Contact

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