Pre and Post Construction Characterization of Earthen Dams in Central Texas Using Various Geophysical Methods

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Abstract

Earthen Dams located in central Texas are key structures in the control of flooding in both rural and metropolitan areas. Texas has over 7,000 nonfederal dams which is more than any other state in the country. In more complex geologic environments the use of geophysical methods can help in pre-construction geotechnical assessment and design of these dams. Additionally due to the growth in urban areas many aging dams require reevaluation and upgrades to manage increased runoff due to urbanization.

Geophysics can play a key role in assessing current conditions of these existing dams, assessing geologic structure, depth to bedrock, and potential areas of seepage. Along with site geotechnical borings the geophysical information can prove invaluable to the engineers making assessments and recommendations for these structures helping to reduce risk of potential dam failures. This presentation focuses on the characterization of earthen dams using geophysical methods.

Geophysical methods applied to earthen dam characterization typically include a combination of seismic and electrical methods. Typical Seismic methods utilized include P and S wave seismic refraction tomography (SRT) and multichannel analysis of surface waves (MASW). Typical electrical methods include electrical resistivity tomography (ERT), self-potential (SP), and electromagnetics (EM).

Three case studies are presented showing the application of seismic and electrical geophysical methods to the characterization of bedrock depth, potential karst features, fracture and fault zones, and seepage areas at earthen dam sites in Texas. These geophysical studies were designed with close coordination with the project engineers to meet specific data needs and to help fill in data gaps identified by the engineer. The geophysical data in these case studies provided geological information regarding subsurface conditions and structure not obtainable by geotechnical borings alone. Additionally, the geophysical data are correlated with existing geotechnical borings and also utilized to site additional borings for characterization supporting the engineering designs.