Characterization and Delineation of Karst Geohazards along RM652 Using Electrical Resistivity Tomography, Culberson County, Texas

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ABSTRACT

The Delaware Basin of West Texas and southeastern New Mexico is the major western subdivision of the Permian Basin and a northern extension of the Chihuahuan Desert and is commonly referred to as the Gypsum Plain. The major evaporite unit within the study area is the Castile Formation, which consists of gypsum/anhydrite and is highly susceptible to dissolution and karsting by meteoric and groundwater flow. Manifestations of karst within the Castile outcrop are abundant and include sinkholes, karren, and caves, including both epigene and hypogene in origin. The stretch of road in focus, RM652, is widely used for commercial transportation; however, due to the nature of the evaporite karst terrain, several zones of failure along and directly beneath the road have occurred with recent increases in heavy vehicle traffic and poses a significant geo-hazard risk. Several sites were selected based on GPR surveys, repeated road failures and visual inspection. A 2D electrical resistivity survey in a dipole-dipole array configuration was conducted at each site to characterize and delineate karst related hazards both laterally and vertically along the road. One-meter electrode spacing with a rolling SuperSting R8 56 Electrode System was used in each survey. Data collected was processed using EarthImager 2D to create pseudosections of each site. Electrical resistivity tomography has been shown to be effective in detecting cavities and void spaces in the shallow subsurface within the study area. The dipole-dipole array configuration at 1-meter electrode spacing is ideal given the shallow depth of investigation in this study (<10 meters) and offered high quality resolution to adequately interpret the spatial distribution of karst geohazards.

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