MASW and Microgravity – a novel approach to investigating Karstic features in a large Tailings Storage Facility.

*Aaron E Tomkins, GBG Group, Sydney, NSW, Australia*

Multi-channel Analysis of Surface Waves (MASW) is a non-destructive seismic method which uses the elastic properties of subsurface materials to determine the subsurface structure. By analysis of the dispersive properties of varying frequencies from a single seismic source, shear-wave velocity (Vs) and associated geotechnical parameters can be determined. Microgravity is a potential field technique used to accurately record localised variations in the earth’s gravitational field. The variations in gravitational readings are caused by density contrasts of the rocks and sediments beneath the reading location. Both methods are therefore an indicator of low velocity and low-density subsurface units, a common characteristic of karstic features or voiding. When individual readings from both methods are combined, a scientist can interrogate the subsurface in a detailed manner outlining both low velocity and corresponding low-density areas. Through careful interpretation, an accurate image of the subsurface can be inferred. Although both methods have been used independently for karstic investigations, they have not been combined for a large-scale geotechnical investigation and used to constrain the overall 3D geotechnical model.

This paper presents an alternative way of using seismic and gravity investigations with the primary objective to target unconsolidated subsurface strata or voiding, within karstic terrains. The way data is collected and combined within this paper is specifically designed and applicable for Tailings Storage Facilities. The paper introduces the reader to automated GPS corrected MASW data collection, while handling large datasets in excess of 85,000 shots. The paper also provides interpretable results that can be achieved from the combination and display all MASW 1D readings within a 3D inversion, ultimately outlining how modelled seismic data results and findings can be interrogated to plan a secondary Gravity campaign over anomalous areas. Finally, the paper will outline how all datasets can then be used and combined to constrain final 3D models for target identification associated with anomalous unconsolidated subsurface strata or voiding.