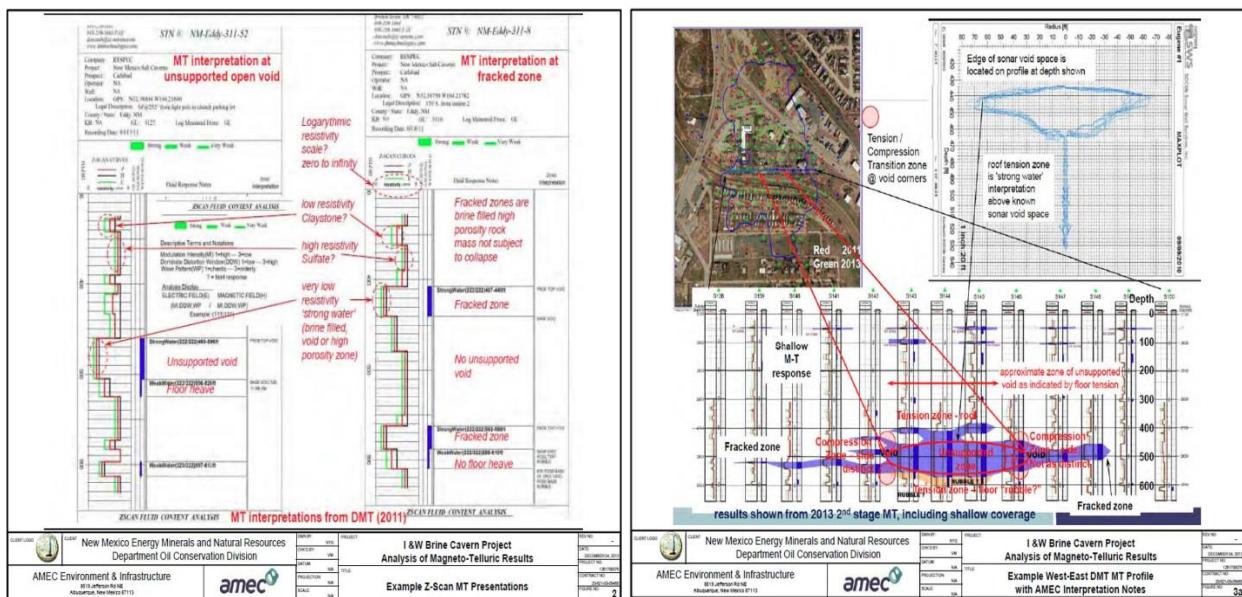


# Digital Magneto-telluric Technologies (DMT)

## Z-scan; A Tool in Assessing Cavern Integrity

DMT began noninvasive surface-based imaging of solution caverns in 1997 as an extension of our oil and gas exploration services. In 1999, DMT presented the results of cavern imaging to The Solution Mining Research Institute. The presentation compared the Z-scan high resolution Magneto-telluric imaging system results to a downhole Sonar at the same site. This led to approval of our Technology **for delineating the dimensions and volume of subsurface caverns** by the Railroad Commission of Texas. To date, we have evaluated over 110 caverns for 17 companies in the USA, Canada and Mexico including Morton Salt, BHP, AMEC, IMC, Koch and Enbridge International resolving questions specific to their solution caverns, **each without the need for a borehole and the use of invasive downhole tools**. AMEC, in their integration of our data at the I&W site at Carlsbad New Mexico, states "**High resolution Z-scan MT results have provided geometric characterization of brine-filled open void and high porosity regions of the site subsurface at an apparent resolution that is a profound improvement over other surface-based geophysical methods**". Note below the thickening of water zones due to formation slump above the thickest portion of the cavern; a sign of cavern roof flexing and weakening of the formations above.



"The Z-Scan provided the most detailed information for estimating geometry and states of stress of the brine cavern".... "The mechanical stress-strain model was developed using the most recent interpretation of the cavern shape, as extrapolated from Z-scan analysis" (AMEC report "I&W Feasibility Study\_Final\_081114" on the New Mexico OCD website).

Survey results can include cavern volume and influence limits, connectivity, evidence of "roof fall", estimates of rubble thickness, base of original leaching, and evidence of formation slumping above the salt. Also, the Z-scan can differentiate layered contaminants within the fluid column. DMT is available now to help you with your cavern imaging needs. Please call to discuss the Z-scan Technology and /or your project. We will be happy to develop a Z-scan "Scope of Work" and "Cost Estimate" to help with your cavern imaging needs.

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