

- WHAT IS GPR? -

Ground-Penetrating Radar (GPR) is a non-intrusive, non-destructive geophysical reflection technique that provides high-resolution imaging of shallow soil and ground structures. GPR has many uses, such as detecting voids, concrete and pavement assessment, locating subsurface artifacts and utilities, and other numerous potential applications such as outlined and illustrated in this brochure.

GPR data are collected by inducing a pulse of electromagnetic energy at very high frequencies into the ground using portable antennas. A portion of the induced pulse is reflected back to the antenna from each interface between materials (soil, rock, water, artifacts, etc.), having a measurable contrast in electromagnetic properties.

Below is a table listing the available antennas that we currently have in our inventory. Each antenna frequency is specifically designed to obtain optimal data for each given task.

Center Frequency	Depth of Penetration
1600 MHz	to 0.5 m (18 in)
900 MHz	0-1 m (0-3 ft)
400 MHz	0-4 m (0-12 ft)
270 MHz	0-6 m (0-18 ft)
200 MHz	0-9 m (0-30 ft)

Typically, both the 1,600 MHz and 900 MHz antennas are used for evaluation of concrete structures, walls, roadways, etc., with the 400 MHz to 200 MHz antennas designed for deeper imaging such as utilities, void detection, geologic structures, etc.

The GPR data collected is displayed in real time and can also be stored on the internal computer hard-drive. This data can then be displayed, filtered, and plotted in the field, as well as downloaded into a portable or desktop computer for further processing, analyzing and printing.

- ABOUT THE COMPANY -

Terra Geosciences is an independently-owned firm that provides various earth science related consulting services. This firm was established in 1989 by Donn C. Schwartzkopf, and is based in the City of Loma Linda, California. Mr. Schwartzkopf has been performing geologic and geophysical studies since 1980 in the southern California region, and is a State of California Licensed Professional Geologist, Certified Engineering Geologist, and a Professional Geophysicist.

During his professional career, Mr. Schwartzkopf has been involved with numerous geophysical studies involving residential, commercial, school, and industrial projects. Mr. Schwartzkopf has acquired a specialized expertise in performing GPR surveys for all types of geotechnical, environmental, and engineering projects, with respect to both existing and proposed developments.

Terra Geosciences is a firm dedicated to providing quality services with a broad range of applications suited for your project needs. Supplemental information regarding GPR or other geophysical services is available upon your request.

If we can provide you with our professional services or have any questions, please contact us at your earliest convenience.

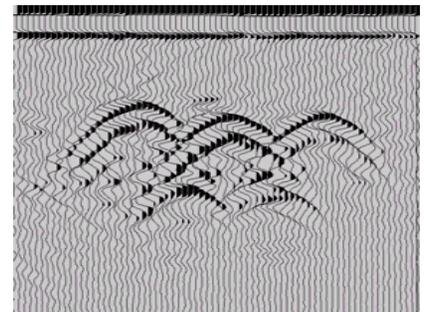
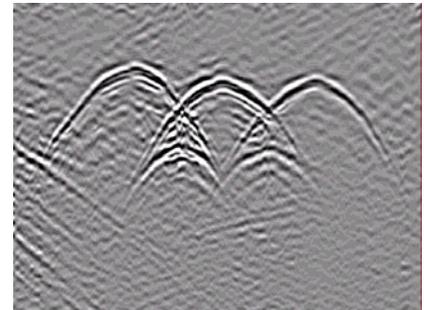
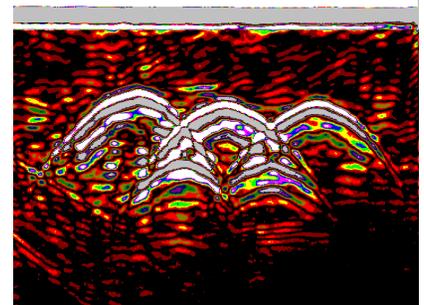
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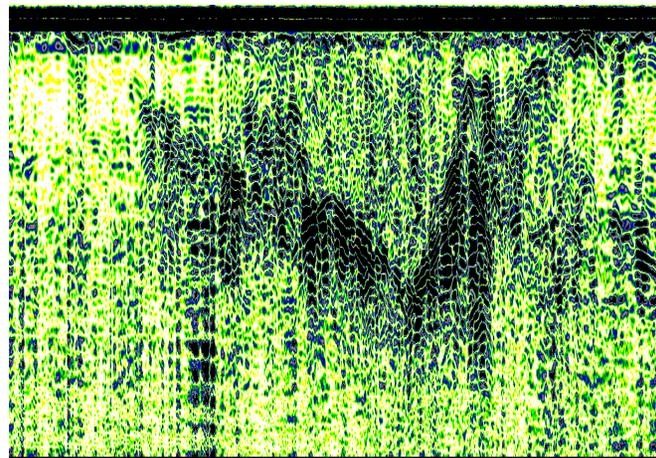
GROUND-PENETRATING RADAR for Geotechnical, Engineering, and Environmental Applications



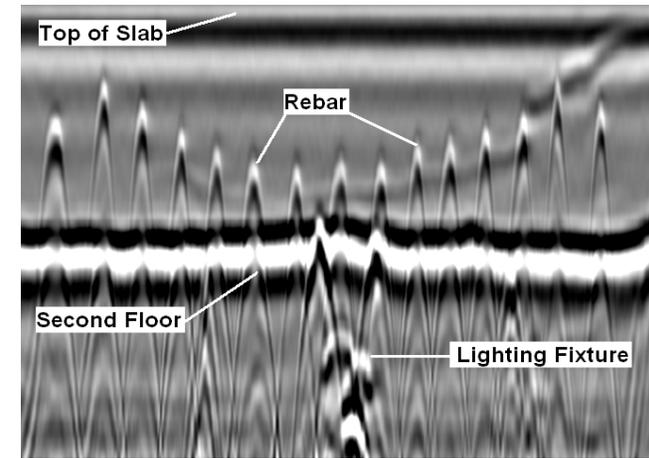
Three Underground Storage Tanks

GEOTECHNICAL APPLICATIONS

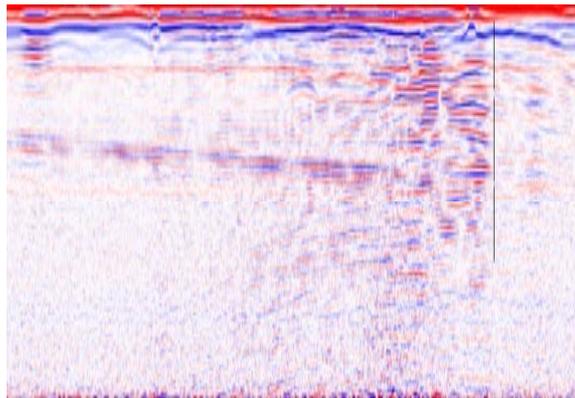
- Stratigraphic Profiling
- Location of Faults
- Landslide Evaluation
- Overburden Thickness
- Depth to Groundwater
- Identify Buried Boulders
- Map Lake Bottoms



Filled-in swimming pool with debris



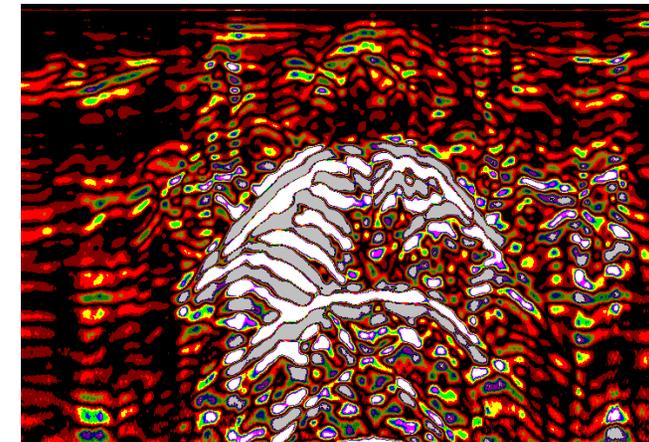
Steel rebar within elevated floor slab



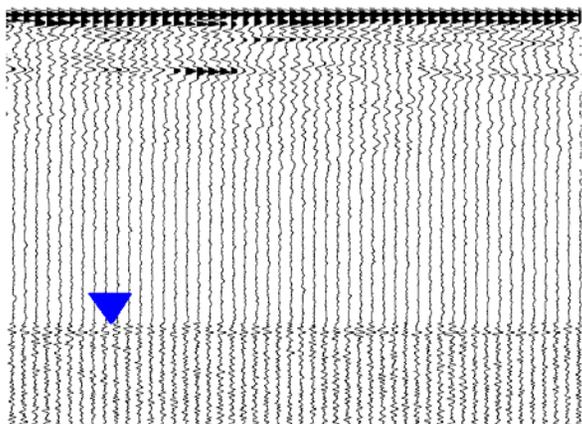
Bedding structure truncated by a fault

ENVIRONMENTAL APPLICATIONS

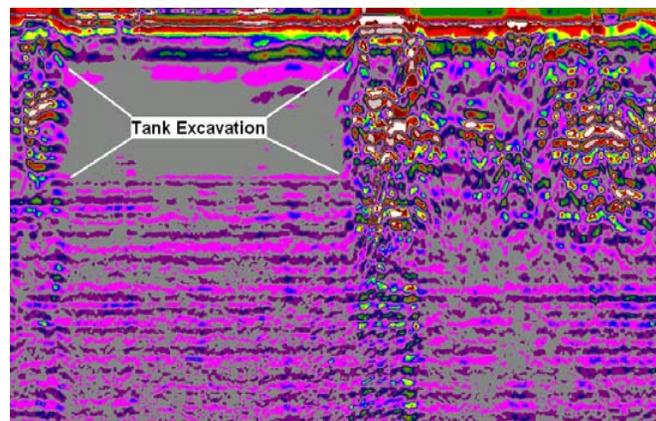
- Locate Buried Drums/Tanks (UST)
- Map Contamination Plumes
- Delineate Landfill Limits
- Locate Leach Lines/Septic Tanks
- Identify Buried Trenches
- Evaluate Grave/Burial Sites
- Locate Unexploded Ordinance (UXO)



Large void (tunnel) below pavement



Groundwater table in sandy soils



Buried trench excavation for UST

ENGINEERING APPLICATIONS

- Determine Pavement Thickness
- Locate and Verify Rebar Position
- Inspection of Concrete Slabs
- Identify Subsurface Voids
- Delineate Saturation Zones
- Locate Utility Lines and Trenches
- Forensic Investigations