GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD.

M.A.R GEOTECHNICAL AND GEOPHYSICAL LABORATORIES CO. LTD.

BRIEF DESCRIPTION OF SERVICES-PROFILE

Website : geotech.marprojects.net
MAR Geotechnical and Geophysical Laboratories Co. Ltd.

TABLE OF CONTENTS

INTRODUCTION

M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. delivers a state-of-the- art complete and optimized solution of specialized services, which include advanced Geophysical and Geotechnical & Surveying Services.

M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. is a delivering cutting- edge subsurface research and surveying services to a variety of industries, including civil engineering, mineral mining, groundwater exploration, groundwater management, and the environment, is a new growing geoscience services company.

Our skilled & qualified personnel works on all the specific stages of your prestigious project working under stringent quality control methods and adhering to the strictest industry standards & rules. We take the time to collect precise data, then reveal the findings in a way that is helpful to our clients.

M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. from the beginning phases of developing proposals for scientific and technical studies through the technical implementation and following up to the final stage of project delivery aspires to give its services to the highest degree of competence and excellence control.

OUR QUALITY

To uphold the greatest degree of professionalism in our services by implementing best practices for quality assurance (QA) and quality control (QC) in our operations, while also being economical and abiding by health and safety regulations.

OUR CORE VALUES

Since its inception M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. have evolved as one of the leading service providers in the field of geophysical and geotechnical engineering in the Kingdom. This has been achieved by:

- Delivering excellence and efficiency to our clients
- Providing its services at the highest level of professionalism and quality control starting from the initial stages of the development of proposals for scientific studies and passing through the stages of follow-up and technical implementation up to the final phase of the project's delivery
  Highly qualified and experienced staff.

OUR STRENGTH

"YOUR BUSINESS IS OUR SUPREME PRIORITY" Professionalism, superior equipment with a focus on growth and development, and affordable pricing continue to be our primary objectives.

OUR WORK ENVIRONMENT

With the aid of the most recent equipment, cutting- edge software, communication, and display devices, we have been able to attract the top technical professionals in the industry and have gained our client's trust. For the effective completion of the projects, project-specific facilities are established on or close to the site and run in collaboration with the head office.

OUR PEOPLE

MAR Company has range of employees that are specialized and very much entrusted to different organization specializing in various disciplines of Geoscience. Some of these are stated below:

SAFETY AND HEALTH

In M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD., health, safety and environment are considered as firsts for any job. Our HSE practices conform to M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. as well as the client's HSE policies.

- Understanding our customer requirements and customizing solution accordingly.
- Taking firm decision as per customer requirements with - think out of the box approach.
- Maintaining the highest standards of quality.
- Adopting the safest means of work execution by adopting M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. HSE policy.
- Possession of latest hardware and the software.
- Maintaining and upgrading resources to keep a pace with latest developments in the methodology, instruments and approach.
- Regular Trainings of our staff.

OUR BUSINESS

Our operations carry out studies in the field of exploration, infrastructure projects, water & environmental projects using geophysiccal and geotechnical studies.

We concentrate on the exploration of groundwater and minerals in exploratory projects. Our products assist infrastructure projects identify and reduce subsurface risk. Water management, aquifer recharge and recovery, hydrology, and hydrogeology are all topics covered by our water business area. Our environmental business identifies maps and forecasts potentially dangerous ground conditions, mostly brought on by human activity. The essence of what we do is meeting the needs of our customers by assisting them in resolving their complex process difficulties and improving their operational sustainability to ensure maximum efficiency in their projects. Our company model is centred on serving the requirements of our customers, and we provide value by doing so.

OUR SERVICES

Geophysics

Exploration Geophysics

- Water Exploration
- Mineral Exploration
- Geothermal Exploration

Engineering Geophysics

- Subsurface Void, Cavity &
- Tunnels detection
- Bedrock Depth & Sediment Thickness
- Landfill Delineation
- Seismic Hazards Assessment
- Lithology & Geological Structure
- Non-Destructive Testing
- Engineering Parameters
- Structural & Concrete Condition Assessment &
- Evaluation

Underground Utility

- Utility Mapping (Pipes, Drums, Cables, etc.)
- Locating Underground StorageTanks (UST)
- Concrete Structures, Foundations, Piles
- Water Leak Detection & Piping Inspection

Geotechnical

Geotechnical Studies

- Onshore & Offshore Site Investigations
- Geotechnical Borehole Drilling & Sampling
- In-situ Properties of Soil & Rock
- Imaging Between & Below Boreholes
- Geotechnical Lab Testing
- Geotechnical Geophysics
- Engineering Geology

Surveying

Land Surveys

- Topographic Survey
- As-Built Surveys
- Boundary Surveys
- Above Ground Utilities
- Pipeline Route Surveys
- Road & Rail Surveys
- 3D Laser Scanning

Hydrographic Surveys

- Hydrographic Surveys
- Bathymetric Surveys
- Port & Coastal Surveys
- Sub-Bottom Surveys
- Side Scan Sonar Surveys

UAS/Drone/Aerial Surveys

- Aerial Photogrammetry
- LiDAR Surveying
- Digital Elevation
- Contour Maps
- Geographic Information Systems (GIS)
- Remote Sensing

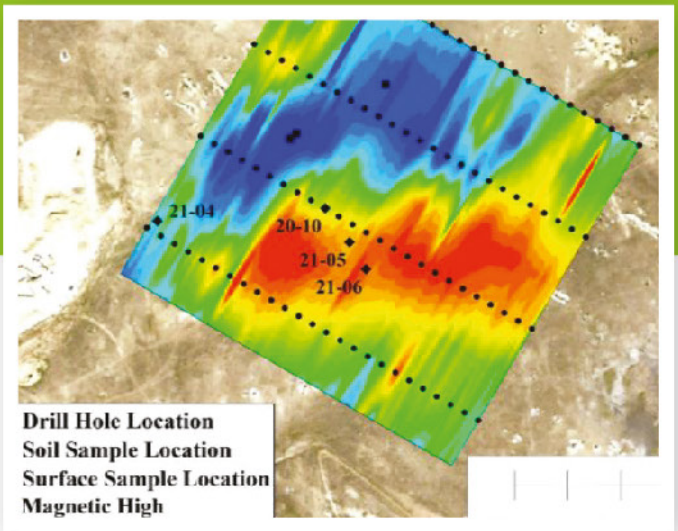
Geodesy Surveys

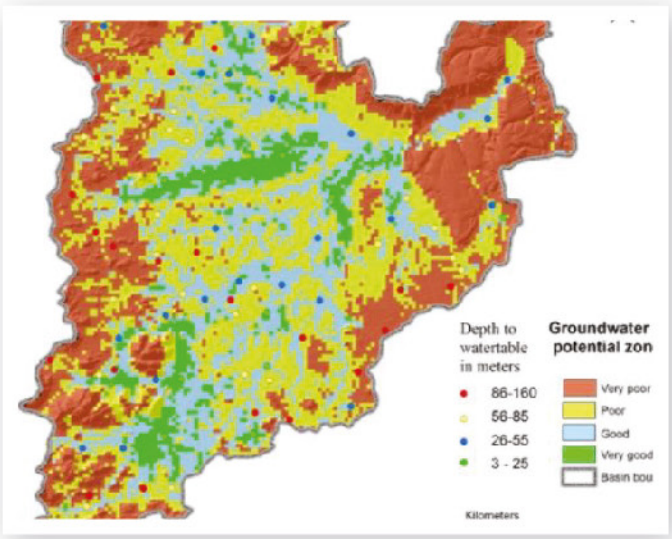
- GPS & Geodetic Control Network Design
- Field Surveying & Attribution
- Establishment of Geoidal Horizontal & Vertical Datum
- Gravity Survey & Geoid Modeling
- Geodetic Transformation.

Geophysical Equipment Rental

- Ground Penetrating Radar (GPR)
- Radio Detection Unit (RD8000)
- Electromagnetic Survey (EM31)
- Electrical Resistivity (ERT)
- Borehole Logging equipment and Borehole Cameras.

GEOPHYSICAL SERVICES
EXPLORATION GEOPHYSICS



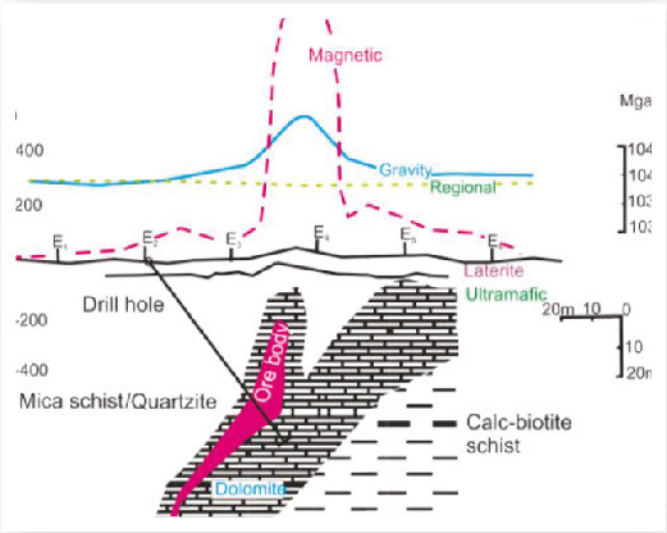


Ground Water Exploration

Water management, aquifer recharge and recovery, hydrology, and hydrogeology are all topics covered by our water business area. Our environmental business identifies maps and forecasts potentially dangerous groundconditions, mostly brought on by human activity. The essence of what we do is meeting the needs of our customers by assisting them in resolving their complex process difficulties and improving their operational sustainability to ensure maximum efficiency in their projects. Our company model is centered on serving the requirements of our customers, and we provide value by doing so.

Minerals Exploration

We are engaged in mineral prospecting activities actively. We offer consulting services that begin with desk research to identify the best locations for reconnaissance investigations (pre-feasibility studies), surface geophysical surveys that assist in identifying the target zones, and follow-up drilling and logging services to determine the size, shape, and depth of the ore bodies.



GEOPHYSICAL SERVICES
ENGINEERING GEOPHYSICS

Cavity Detection

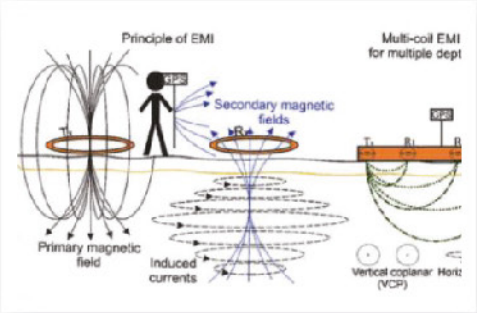
For the community and the infrastructure, subsurface cavities, sinkholes, karstic solutions, and subsidence zones are dangerous. We evaluate such risky environments using a wide range of geophysical techniques, which then inspire concepts for improving the ground and reducing risk to prevent ground failure.

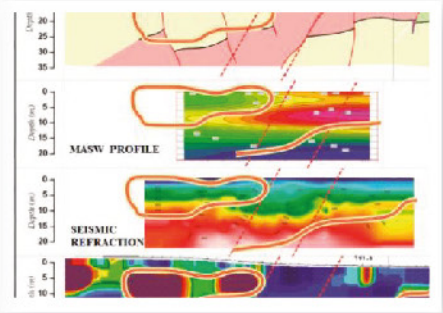
Bedrock Profiling

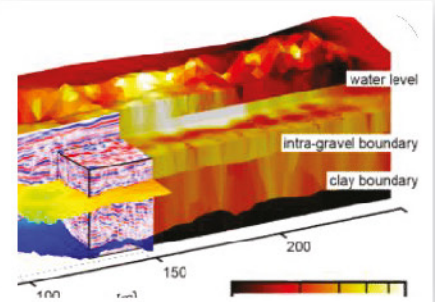
Determining bedrock depth, variations in bedrock topography, and strength are important prerequisites for foundation design; fortunately, we've got that covered thanks to a variety of geophysical applications that can quickly and affordably give us specific properties of the subsurface layers.

Fracture Mapping

Mapping of fracture, fault, and fissure structures is helpful for locating elements that could be infiltration zones or have an impact on prospective groundwater channels. Fracture mapping is also used to identify drainage channels for problems that are difficult to characterize or monitor using conventional techniques like drilling and groundwater sampling.







Method	Measured data	Estimated property
Seismic	Travel time refracted/reflected seismic wave	Density and elastic moduli
Gravity	Gravitational field of the Earth in space and time	Density
Magnetic	Geo magnetic field in space and time	magnetic suspectibility
Nuclear magnetic resonance	Relaxation electromagnetic field	Fluid content and relaxation constants
Geo-electric	Earth resistance	Electrical resistivity
Induced polarization	Voltage decay	Electrical chargeability
Self potential	Electric potential	Electrical resistivity
Electromagnetic	Response to electromagnetic pulses	Electrical resistivity
Radar	Travel time of reflected Radar	Dielectric constant

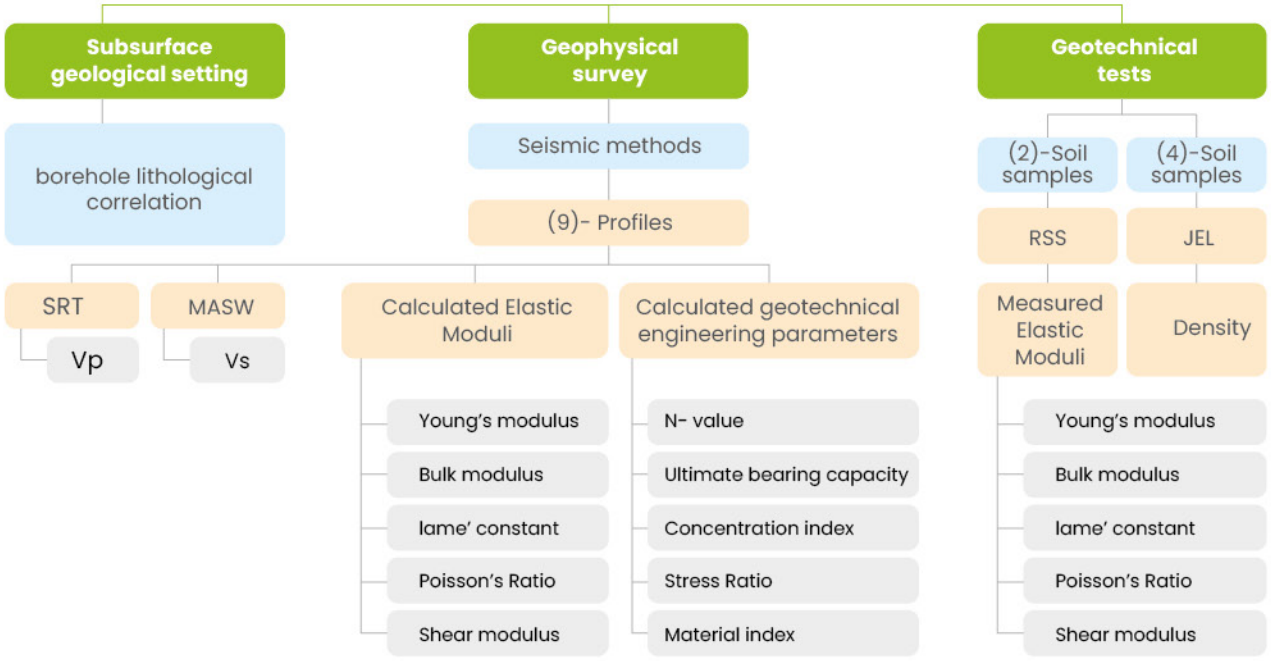
Near Surface Ground

Areas where human activity has dramatically altered the earth surface. Since the near-surface ground conditions are crucial for ongoing development of the sites, artificial or man-made ground is an important part of our understanding of the ground, along with bedrock and superficial deposits.

In-Situ Elastic Properties

In order to optimise the foundation design properties, geotechnical site investigations, geophysical techniques can supply the properties of the ground to the engineer. These properties include:

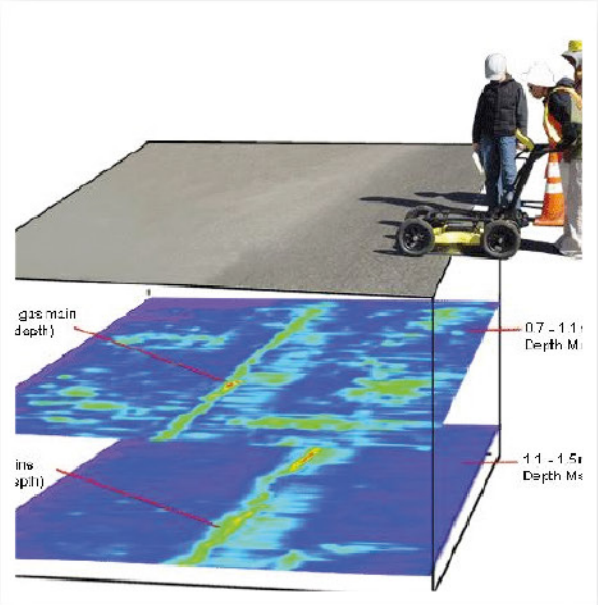
- Shear Modulus
- Bulk Modulus
- Poisson's Ratio
- Young's Modulus
- Damping Ratios
- Rippability.



Soil & Rock Properties

The physical characteristics of soil and rock have geological significance; for instance, resistivity is influenced by porosity, moisture content, clay content, and chemical composition. Seismic velocities and rock strength are connected. The most trustworthy method of determining these qualities is geophysical testing.

GEOPHYSICAL SERVICES
ENGINEERING GEOPHYSICS



Underground Utility Mapping

An underground cable and pipe network's location and identification can be seen on a utility map. Sewers, electric cables, telephone cables, gas mains and water mains are among the items that must be found during the operation. You will receive a complete, thorough map of anything that is hidden underneath or directly related to any above-ground elements if you combine this mapping method with a topographical survey. When breaking ground, utility maps are crucial because they accurately depict the locations of the hidden utilities you will discover. Additionally, it helps to avoid harming or destroying any utilities that could endanger people, facilities, or property. You will receive thorough maps of subsurface infrastructure thanks to our knowledge, skill, and capacity to use a variety of geophysical techniques.

Leakage Detection

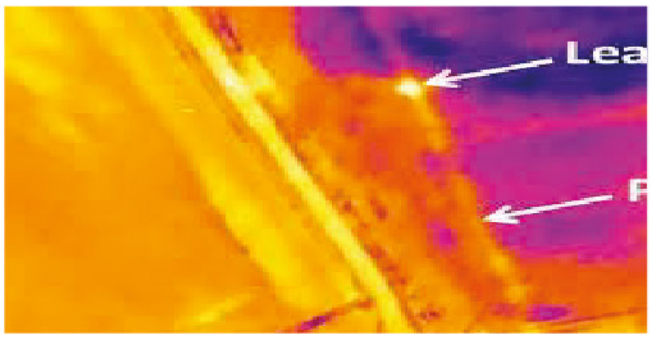
In systems that contain liquids and gases, pipeline leak detection is used to pinpoint the location of a leak.Examples of detection techniques:

- Helium Leak Detector
- Nitrogen Leak Detection
- Thermal Cameras
- Acoustic Microphones
- Infrared Radiometric

Structural (Concrete) Assessment & Evaluation

The structural surface drilling can be done in safer regions due to structural assessment and concrete scanning. Several uses for concrete scanning are shown below:

- Concrete Assessment & Deterioration
- Structural Investigation
- Electrical Wiring in Structures
- Services & Voids in Structures
- Detection of Reinforcing Steel



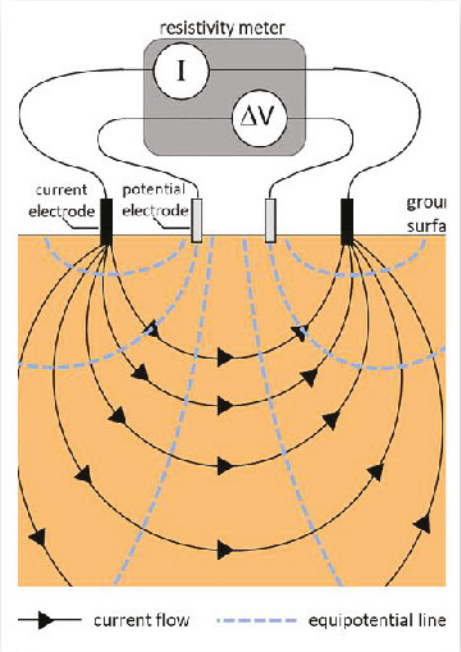
GEOPHYSICAL TECHNIQUES
ELECTRICAL METHODS

Basic Theory

The ground material, the presence and saturation level of fluids, and the presence of buried objects all affect the electrical characteristics of the subsurface. The distribution of these qualities as a function of depth and horizontal distance is described using electrical approaches.

Two metal stakes are used to conduct an electric current into the ground to measure ground resistance. Voltage is the unit of measurement for the electrical potential difference between two extra electrodes (potential electrodes). This voltage can be transformed into a resistance measurement for the ground between the two potential electrodes by applying Ohm's law.

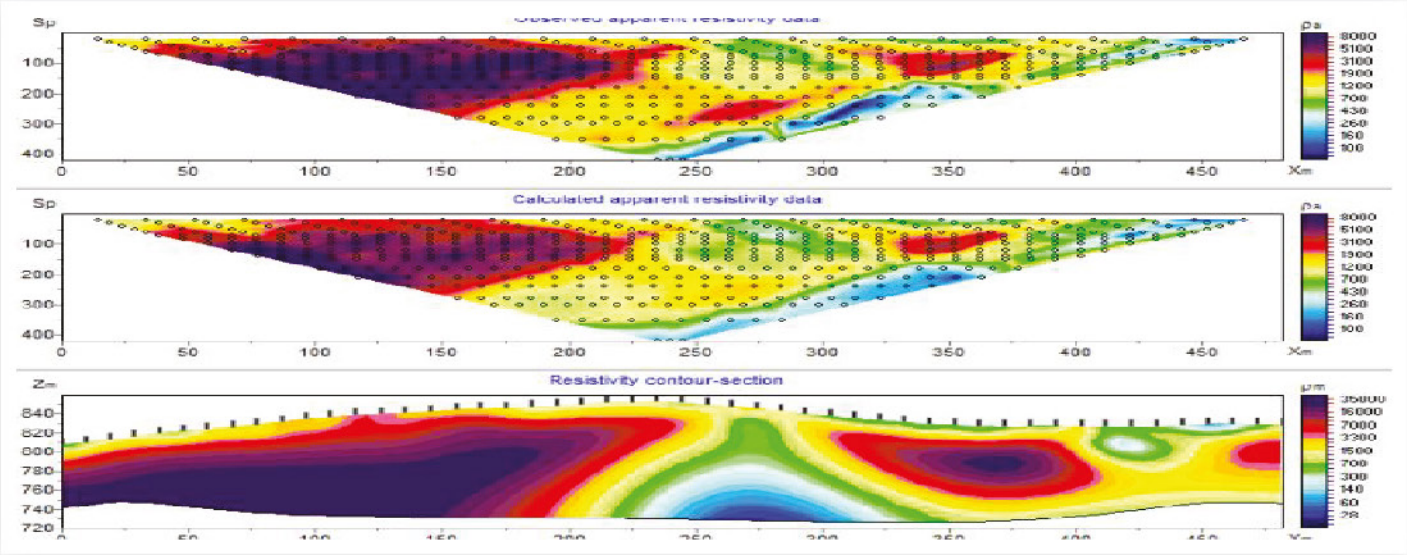
When the electrode spacing is close, the field between the electrodes is only distributed on the surface; however, when the electrode spacing is wider, the electrical flux runs deeper. An electrical profile model of the subsurface can be created using the data set provided by the potential at the surface, which will reflect these path differences.



Applications

- Ground water and mineral exploration
- Geological and Stratigraphic mapping
- Locating Cavities, voids, Tunnels and solution features
- Determination of depth to bedrock
- Buried foundation mapping
- Landfill waste mass Investigation
- Mapping and monitoring of groundwater pollution

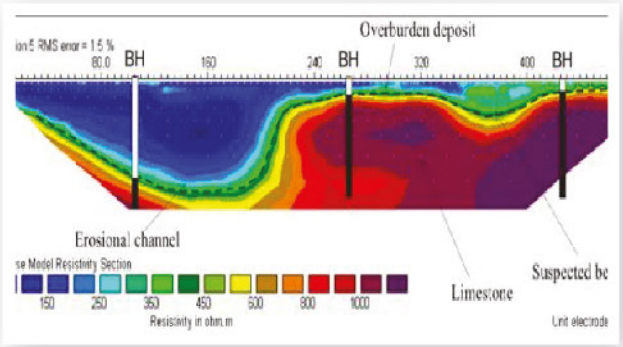
Data Example

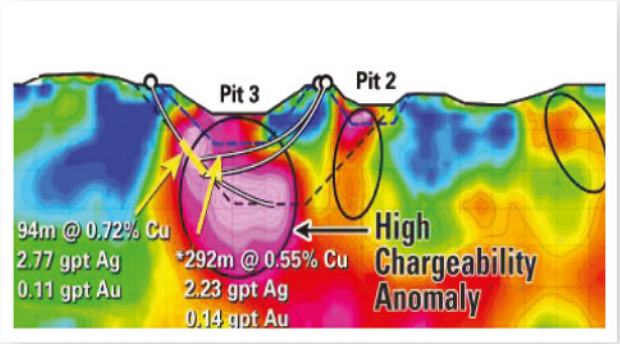


GEOPHYSICAL TECHNIQUES
ELECTRICAL TECHNIQUES

Electrical Resistivity Tomography (ERT)

Direct current is used in the geophysical technique known as electrical resistivity tomography (ERT) to measure the earth's resistivity. Steel electrodes buried in the ground are used to inject current into the subsurface, and a profile or area's apparent resistivity distribution is measured. A two- or three-dimensional resistivity model of the subsurface can be created using data processing and inverse modelling.



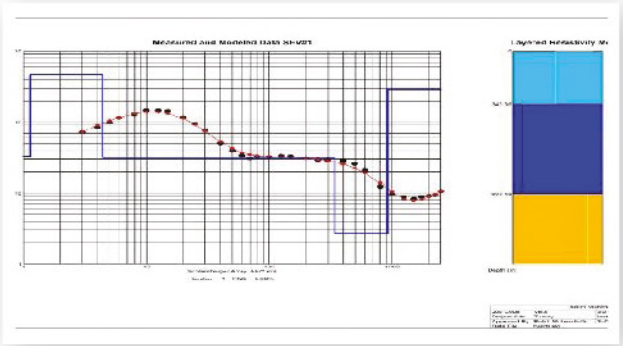


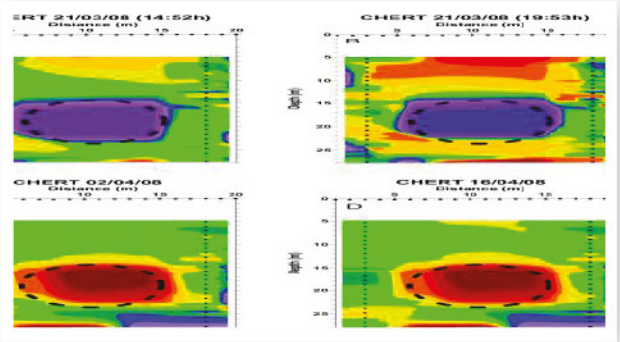
Induced Polarization (IP)

Some minerals exhibit Induced Polarization (IP). When currents are turned on and off, it is analogous to the charge-discharge behavior of capacitors. When the current pulse is turned off, a decline curve can be seen at the receiving electrodes if IP effects are present. This deterioration is measured by the chargeability.

1D Vertical Resistivity Sounding (VES)

The Schlumberger or Wenner electrode arrays are typically used in the electrical resistivity approach known as VES. These resistivity survey setups typically consist of four electrodes and increase in electrode spacing. Longer electrode spacing measures deeper into the subsurface while shorter electrode spacing measures the resistivity distribution in the shallow subsurface.





Cross-HoleResistivity Tomography (CRT)

Cross-hole Resistivity The capacity to do cross-hole surveys is called tomography. Using a conventional surface system, this is operated with the addition of specialized down-hole cables. For the majority of applications, the typical depth restrictions are between 150 and 300 m. Both surface-to-borehole and borehole to-surface surveys are options. Cross-hole data and surface array data can be merged to enhance the image quality.

GEOPHYSICAL TECHNIQUES
SEISMIC METHODS

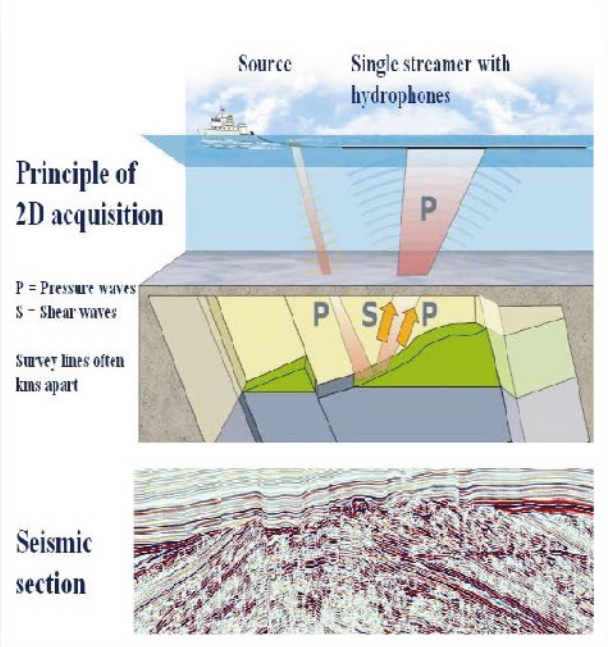
Basic Theory

A source starts a mechanical vibration, which then moves to the vibration's destination. These waves are earthquake vibrations. Simply said, the vibration is a change in stress level brought on by a disturbance. All displacement-supporting directions are affected by the vibration. The vibration easily transfers between different media, from solids to liquids or gases, and vice versa. While electromagnetic waves can pass through a vacuum, mechanical vibratory vibrations cannot. The term "ray," "ray vector," or "ray path" refers to the direction of travel. The location of the first disturbances will create a spherical shell or wave front in a uniform material since a source generates motion in all directions.

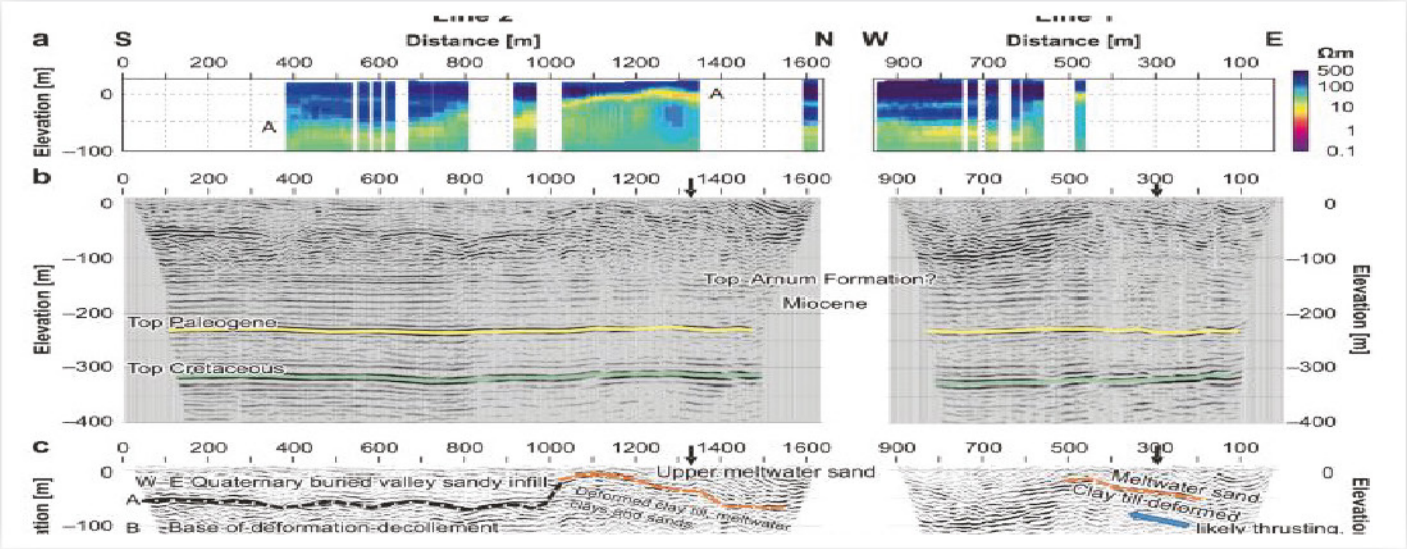
Seismic waves can be divided into two main categories: surface waves, which only occur near boundaries, and body waves, which travel through the entire volume of a material.

Applications

- Bedrock profiling - Engineering Rock head
- Estimation of depth to water table
- Rock rippability and quality
- Engineering parameters:
  - Poisson Ratio
  - Shear Modulus
  - Bulk modulus
  - Young modulus
  - P and S wave velocity
- Mining and subsurface structure delineation
- General geologic structure and Geologic layering
- Locating sinkholes and Buried channels



Data Example



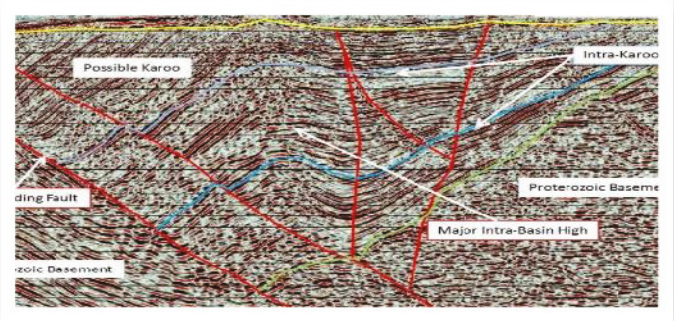
GEOPHYSICAL TECHNIQUES
SEISMIC TECHNIQUES

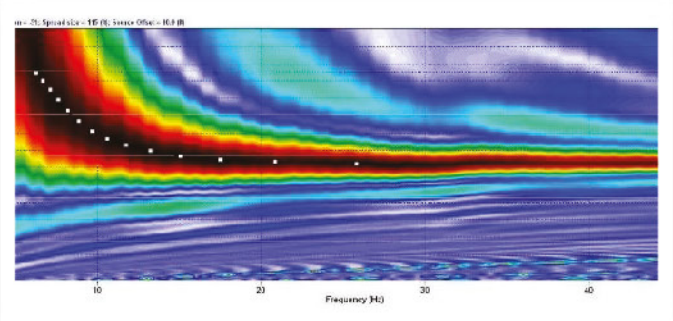
Seismic Reflection Surveys

Seismological concepts are applied in the geophysical exploration technique known as seismic reflection to determine the characteristics of the Earth's subsurface from reflected seismic waves. A controlled seismic energy source is needed for the technique,such as dynamite, a specialized air pistol, or a seismic vibrator, also known by the brand name Vibroseis. It is possible to determine the depth of a feature by noting the amount of time it takes for a reflection to reach a receiver.

Multi-Channel Analysis of Surface Waves (MASW)

The seismic technique known as multi-channel analysis of surface waves (MASW) is used to characterize the shear wave velocity of the subsurface. The MASW method induces a sound wave into the subsurface and records it along a traverse line that has a variety of sensors, similar to seismic refraction. To ascertain how the shear wave velocity varies with depth, MASW uses the dispersive characteristics of Rayleigh-type surface waves.





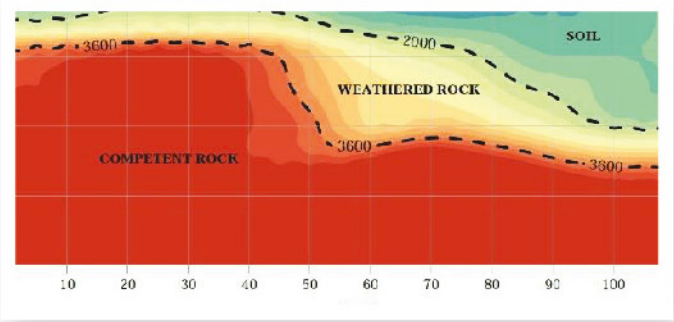
Seismic Refraction Surveys

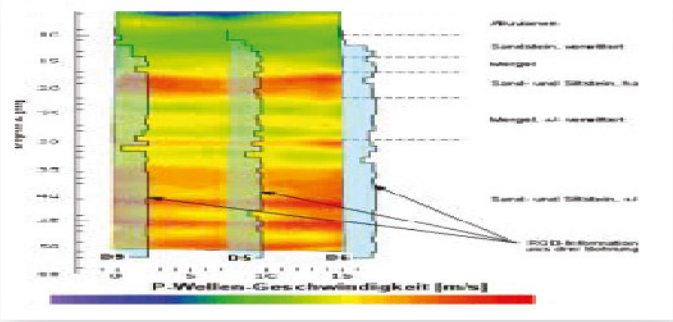
The seismic refraction method is based on the measurement of the time it takes for seismic waves to flow through soil and rock at the interfaces between subsurface layers moving at various speeds. This characteristic often corresponds well with changes in lithology, degree of fracturing, and weathering. It also typically correlates well with rock hardness and density. Under most circumstances, seismic refraction continues to be the best technique for precisely mapping the depth to competent bedrock.

Borehole Seismic Surveys (Down-hole & Cross-hole)

One borehole is all that is needed for down-hole. At a predetermined distance from the top of the borehole, seismic energy is created on the surface. At regular intervals down the hole, the first-arrival seismic wave travel times are monitored.

Cross-hole measurement entails timing the transfer of seismic energy between two boreholes. While the other hole is utilized to track the arrival of the seismic energy, one hole is used to deploy the source.

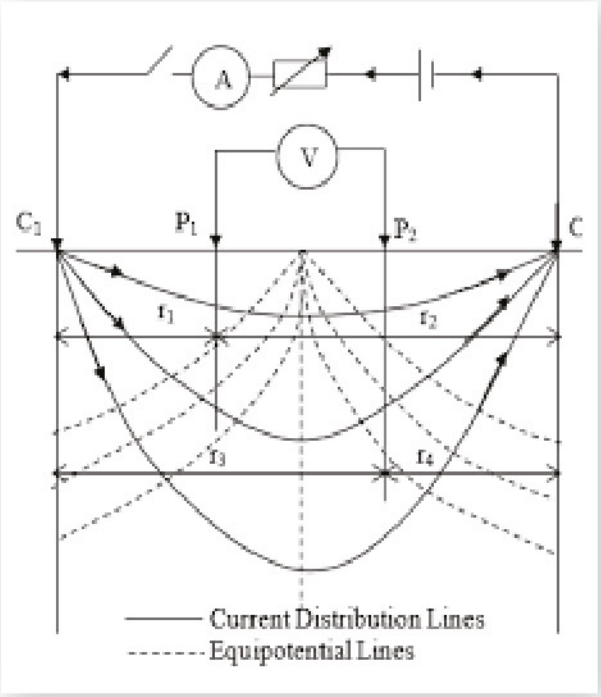




GEOPHYSICAL TECHNIQUES
ELECTROMAGNETIC METHODS

Basic Theory

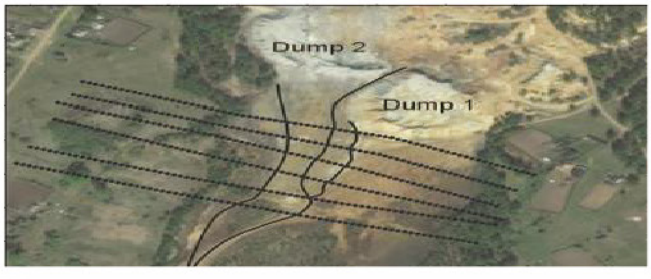
The electrical conductivity of the ground is measured in electromagnetic (EM) surveying as a function of depth and horizontal distance. The electrical conductivity of different rocks varies in value. The electromagnetic approach relies on the magnetic component of electromagnetic waves that are produced at the surface to induce electric currents in the ground. A wire coil (a transmitter coil) is subjected to an alternating current with changeable frequency. Through this method, an alternating primary magnetic field is created, which causes very small eddy currents to form in the earth. The size of these currents is directly correlated with the ground conductivity around the coil. The secondary magnetic field produced by these eddy currents is subsequently partially absorbed by a receiving coil. The voltage produced by the receiver coil's interaction with the primary and secondary magnetic flux is correlated with the subsurface electrical conductivity.

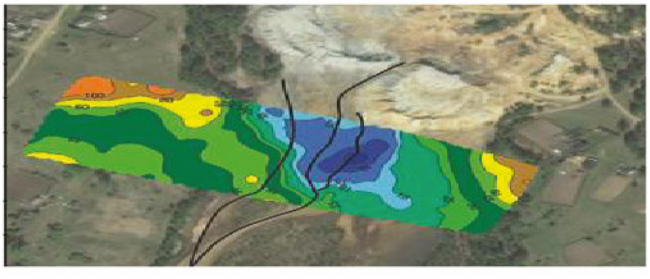


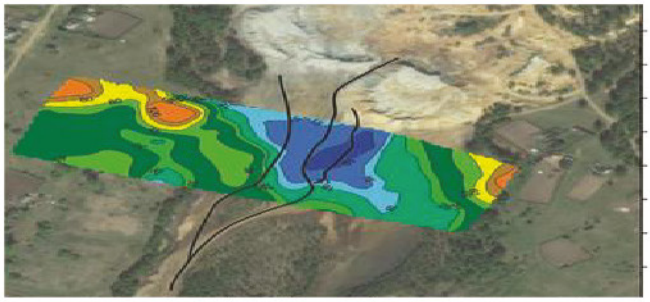
Applications

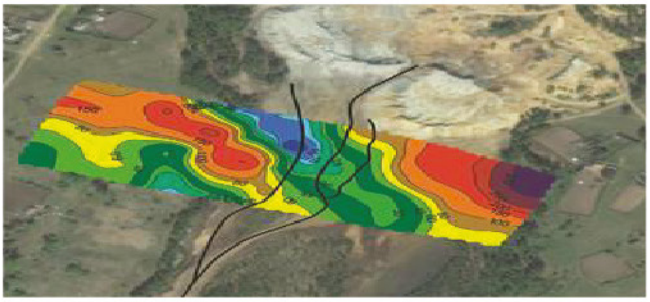
- Geological and hydrogeological studies
- Cavities, voids, weathering and solution feature mapping
- Bedrock and stratigraphy mapping
- Ground water and mineral exploration
- Contaminant plumes
- Utility detection and mapping
- Buried structures

Data Example









GEOPHYSICAL TECHNIQUES
ELECTROMAGNETIC TECHNIQUES

Time Domain Electromagnetic (TDEM)

In TDEM, transient pulses of electric current are used to create electric and magnetic fields, and the response's subsequent decay is measured. The primary electrical field is sent using coils on the ground, while the secondary magnetic field is received using coils on the ground. The size of the transmitting coil on the ground, the strength of the current, and the conductivity of the layers all affect how deep the probe goes.

Frequency Domain Electromagnetic(FDEM)

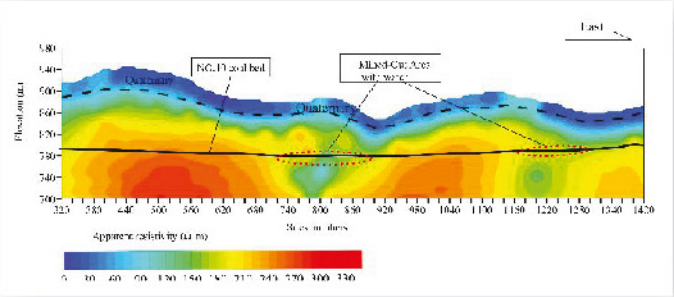
Frequency Domain Electro Magnetic (FDEM) induction involves producing electromagnetic fields that cause currents to flow through the ground, which then trigger secondary magnetic fields to form beneath the surface. Subsurface characteristics and features can be determined by detecting the magnetic fields. The electrical conductivity of the subsurface is connected to the size and phase of the induced currents, which are measured using this technique.

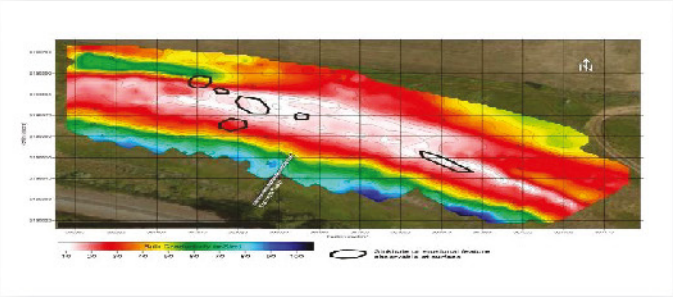
Magnetotellurics (MT AND AMT)

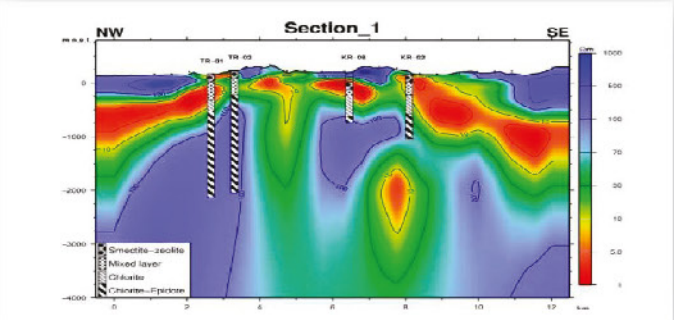
Using passive energy sources such as lightning storms and naturally occurring ionospheric current sheets, the electro-magnetic survey and imaging techniques known as magnetotellurics (MT) and audio-frequency MT (AMT) may map geologic features to depths of 500 metres or more. The MT geophysical survey method incorporates measurements of the earth's magnetic and electric fields across a broad frequency range.

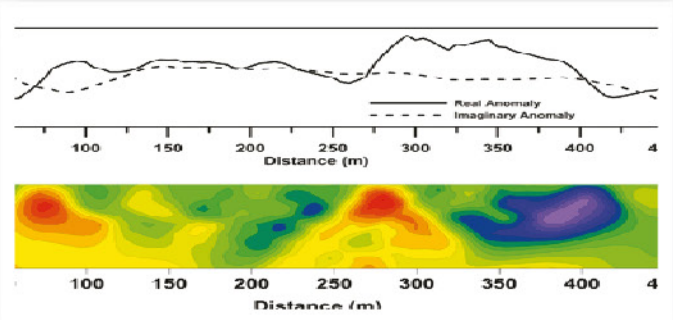
Very Low-Frequency Electromagnetic(VLF)

Low-frequency transmissions are used as the source in the continuous-wave (frequency domain) electromagnetic technique known as very-low-frequency (VLF) surveys. Measurements of this field's orientation are done during VLF surveys. The technique has been effectively utilized in engineering and groundwater surveys to find conductive fault zones and other sub-vertical conductors, while it is mostly used in mineral exploration operations.





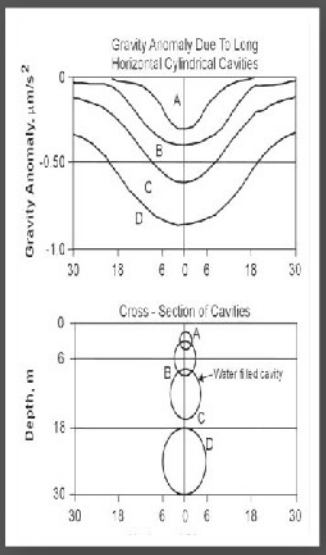




GEOPHYSICAL TECHNIQUES
GRAVITY METHODS

Basic Theory

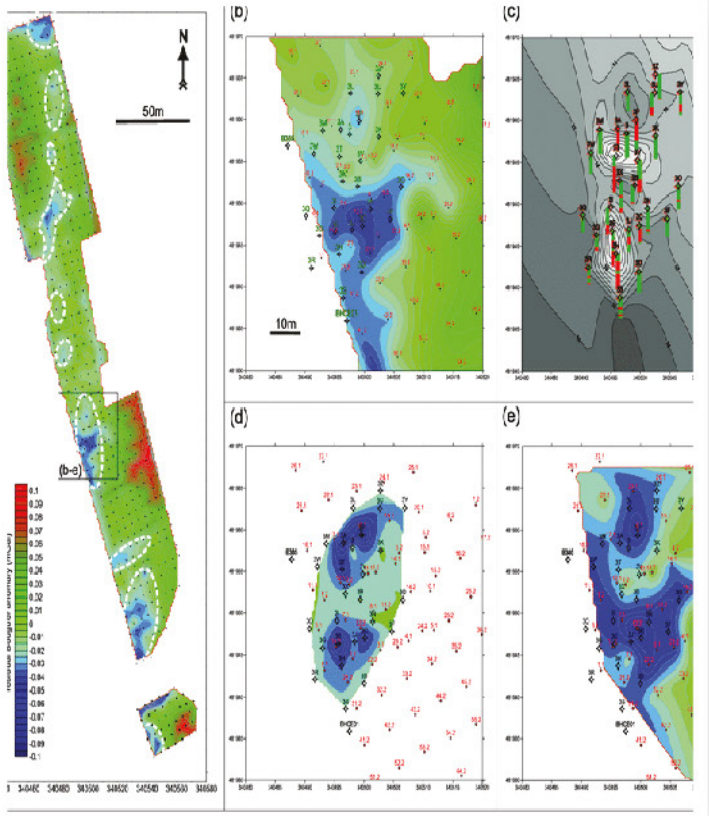
The localized variations in the gravitational attraction at the surface are detected using the gravity method. These variances are related to the densities, weathering, and competence of the rocks as well as the presence of underlying voids and cavities. The observed gravitational field experiences localized highs and lows due to anomalous high- or low-density bodies. The gravity method relies on detecting small-scale variations in the Earth's gravitational field that are brought on by substances with various densities. A localized high (or low) anomaly in the observed gravitational field results from the presence of an anomalously high (or low) density body in the subsurface. Although the stated gravitational effects are very minute, sophisticated instrumentation and data processing methods allow for the detection of both natural and man-made structures and voids.



Applications

- Regional subsurface structures and bedrock litholog
- Detection of voids, caves, mines,basement
- Detection of buried structures,foundations and storage tanks
- Mineral Exploration
- Ground water inventories
- Fault problems Basin Studies

Data Example



Gravity Techniques

Gravity Survey for Regional Structures

On the surface of the Earth, the gravity field is not constant everywhere. It changes depending on how the mass materials underneath are distributed. It is possible to quantify and understand this lateral change in terms of the likely underlying geology. A gravity survey is an indirect (surface) method of figuring out a substance's density. The density of the rock below increases with increasing gravity values.

Microgravity Survey

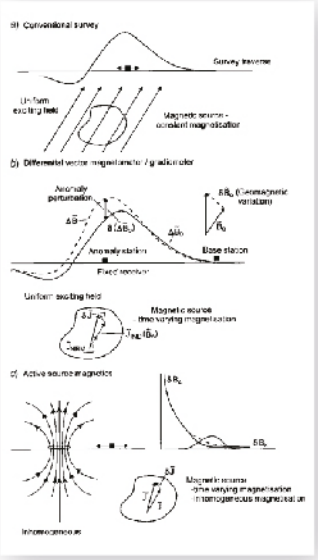
Bulk densities of different subsurface materials vary. By gathering surface measurements of the Earth's gravitational field, microgravity surveys aim to find regions of contrasting or anomalous density. A localized high (or low) anomaly in the observed gravitational field results from the presence of an anomalously high or low density body in the subsoil.

GEOPHYSICAL TECHNIQUES
MAGNETIC METHODS

Basic Theory

In ferrous materials, the magnetic field of the earth creates a secondary magnetic field. While all materials to some level exhibit this vulnerability, iron and steel materials typically have an effect that is quite easy to measure. Geologic components that contain ferrous minerals, most commonly magnetite, are ideal targets. Measurements of the magnetic field are frequently used to look for manufactured iron and steel objects like tanks and barrels. The targeted geologic feature or man-made object must be the proper size and orientation to the earth's field for the magnetic geophysical survey approach to be effective in order to discover the aberrant field.

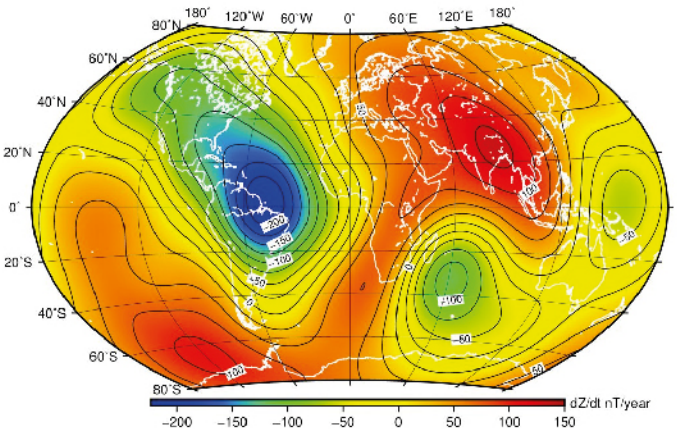
Interference in the near-surface can be caused by structures and their foundations, fences, automobiles, buried storage tanks (known or unknown), utilities, and landfill waste. Note that anyone of these items may also be the target.



Applications

- Locate buried tanks and pipes
- Detect buried unexploded ordnance(UXO)
- Map old waste sites and landfill boundaries
- Map basement faults and geology
- Mineral exploration
- Locating landfills
- Archaeological studies

Data Example



Magnetic Techniques

Total Magnetic Field Intensity (TMI)

In this kind of study, the entire earth's magnetic field is measured using just one magnetometer. The geomagnetic field's strength varies from around 65000 nanoTesla (nT) at the magnetic poles to about 25000 nT in the magnetic equator. Ferromagnetic materials or objects cause localised changes to be superimposed on the broader regional field. Mineral exploration, geothermal and hydrocarbon exploration, lithology, structural geology mapping, and the study of igneous dikes all use total magnetic field surveys.

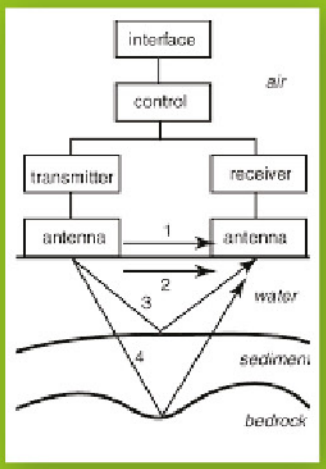
Magnetic Gradiometry

Both the overall magnetic field and its vertical gradient are measured using conventional magnetic equipment. The gradient, which is the quantity recorded by magnetic locators used in land surveying, is particularly helpful for finding things buried at shallow depths. These surveys are frequently used to locate pipes, cables, metallic items, metal drums holding poisonous or contaminated waste, unexploded ordnance, and archaeological artefacts.

GEOPHYSICAL TECHNIQUES
GROUND PENETRATION RADAR (GPR)

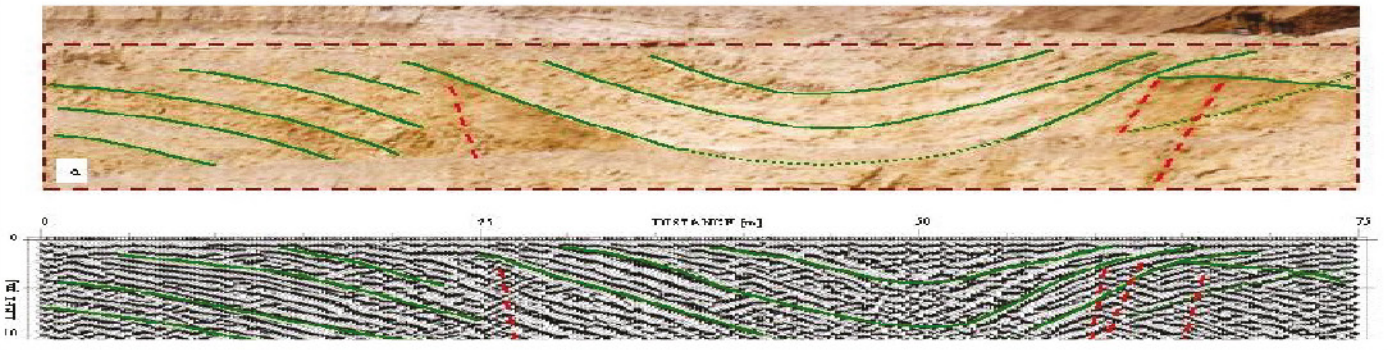
Basic Theory

GPR works by delivering a very small energy pulse into a substance and measuring the power and the amount of time it takes for any reflected signals to return. A scan is defined as a sequence of pulses over a specific area. Every time an energy pulse enters a medium with differing electrical conductivity or dielectric permittivity than the material it left, reflections are created. The contrast between the two materials' dielectric constants and conductivities determines the strength, or amplitude, of the reflection. As a result, a pulse going from dry to wet sand will result in a very strong reflection, but a pulse moving from dry to limestone will result in a reflection that is rather faint. The characteristics of the material that the pulse is going through affect the rate of signal attenuation, which varies greatly.

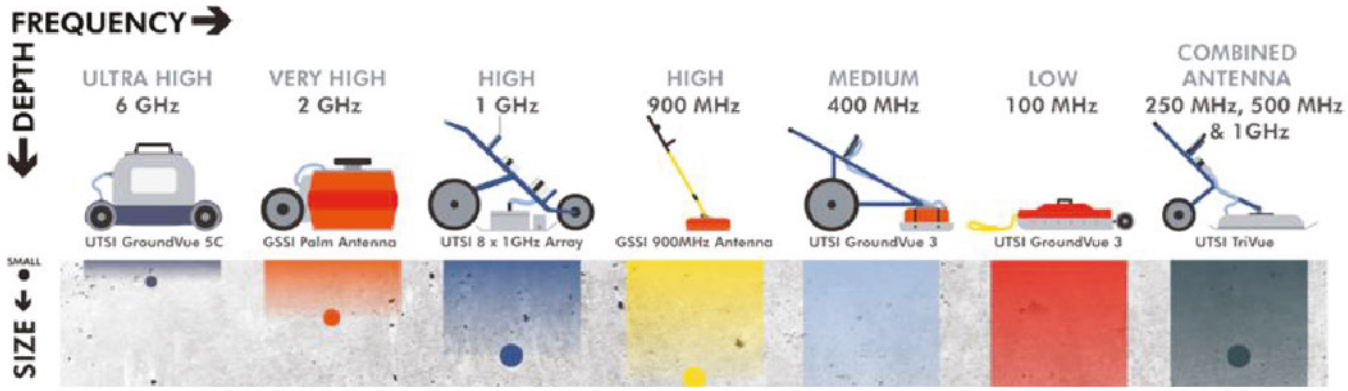


- Detection of voids, caves and mines
- Depth to bedrock, water table and geological Mapping
- Utility Locating and Concrete Inspection
- Detecting buried pipes and Mapping buried Foundations
- Mineral Exploration
- Mapping archaeological features
- Road Inspection and Railway Evaluation
- Contamination and landfill extent mapping

Data Example



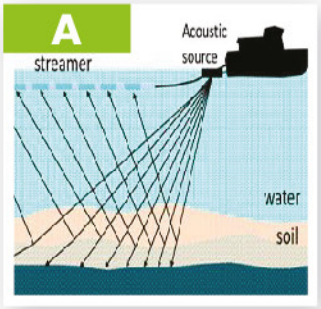
Antenna Frequency, Approximate Depth Penetration And Appropriate Application:

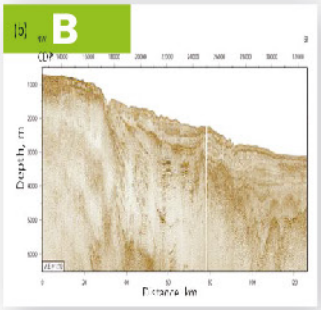


GEOPHYSICAL TECHNIQUES
MARINE SURVEY

Basic Theory

Marine survey is the process of creating maps or charts of the seafloor and the underlying geological structure. Several instruments are used for this mapping, all of which are operated from coastal vessels. The identification of underlying structural elements, geological layers, buried detritus, infrastructure, and utilities is frequently accomplished using marine geophysical techniques. A result of decades of infrastructure construction, deconstruction, and abandonment along metropolitan waterfronts, there are still buildings and utilities close to vital facilities that need to be upgraded or rehabilitated. In many cases, historical plans for these facilities lack precise as-built information to pinpoint the precise placement of remaining undersea subsurface features. Project stakeholders may benefit from marine geophysical surveys to determine subsurface conditions. To detect water depth and subsequently the topography or bathymetry of the seabed, echo sounders are utilized. Additionally, a range of geophysical tools are used to investigate the features of the seabed and the sediments and rocks that lie beneath it. Grabs and coring tools are used to collect seabed samples.

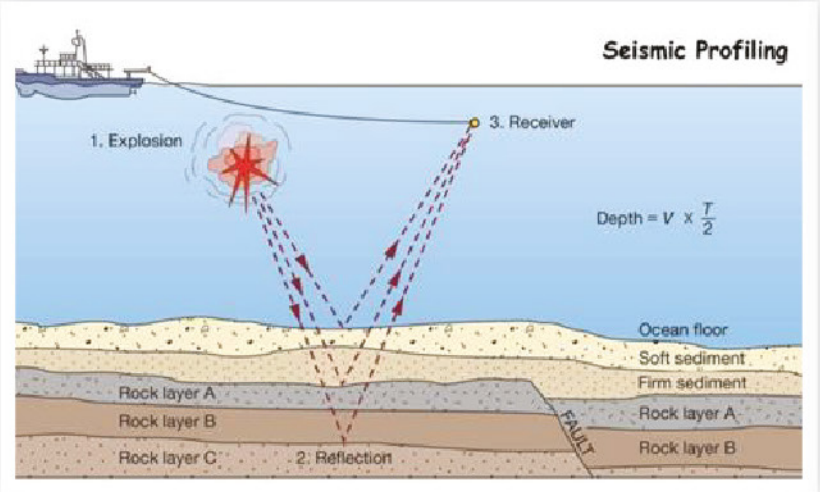


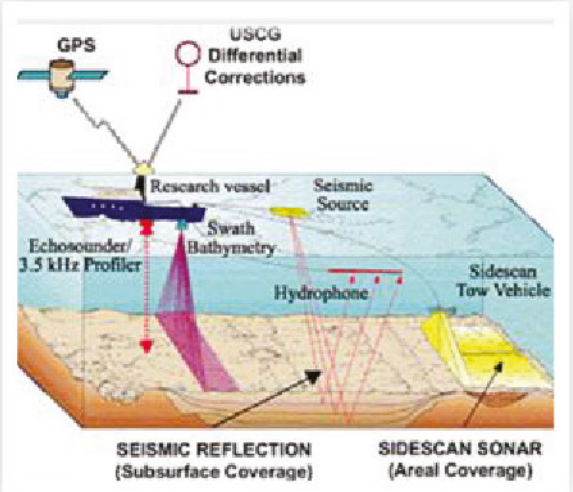


Applications

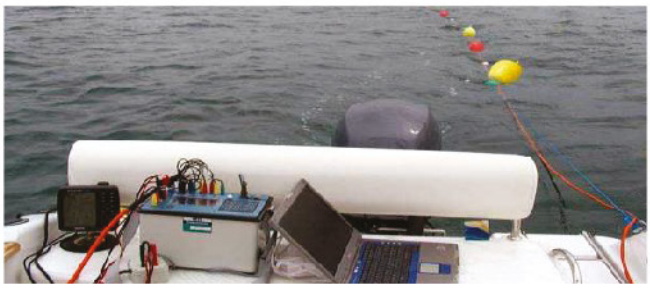
- Geological and Geotechnical for Construction Projects
- Offshore Wind-farm surveys
- Bottom & Sub-bottom Mapping
- Mining and Mineral Exploration
- Pipeline and cable route surveys
- Marine Environmental Projects

Data Example



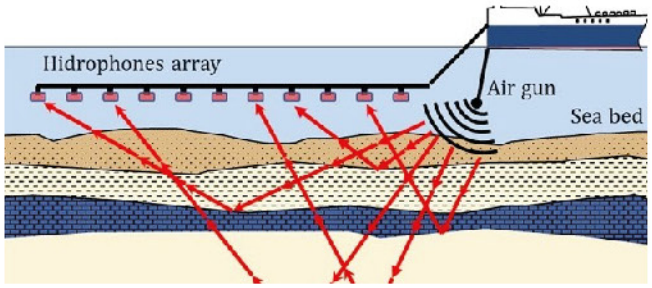


GEOPHYSICAL TECHNIQUES
MARINE SURVEY TECHNIQUES



Marine Electrical Resistivity

The water body's bottom is covered with a marine multi-electrode cable that was specially made for the purpose. There are 25 electrodes in the cable. To calculate electrical resistivity as a function of depth along the electrode array, a control unit applies current, measures the potential from various pairs of electrodes, and applies the appropriate voltage. A programme for two-dimensional inversion is used to process the data. The programme uses a nonlinear least-squares optimization method to find the best fit for the data automatically. Applications include detecting sediment types (clay vs. sand), pinpointing groundwater discharge zones beneath the ocean, mapping geologic structures, and figuring out the geologic conditions below the mudline.



Marine Seismic Techniques

Based on the propagation of seismic waves, marine seismic techniques are geophysical tools for studying the sub-bottom geology. For geotechnical and geological engineering projects where the depth to reliable bedrock and knowledge of fracture or shear zones is crucial, marine seismic refraction data are often gathered. A seismic wave is induced into the seafloor using the seismic reflection technique, and the waves that are reflected from the subsurface strata are then recorded. Geology can be mapped using seismic reflection at depths greater than (50 m).

Marine MASW method, through the measurement of the dispersion characteristics of the surface waves, the Multi-channel measurement of Surface Waves (MASW) seismic method determines the shear-wave velocities of the subsurface materials.

Sub-Bottom Profiling

In this context, the term "sub-bottom profiling" (SBP) refers to the high-resolution characterization of rock and sediments beneath bodies of water. We can identify and map the interfaces between different sedimentary layers or the overburden/bedrock contact beneath a body of water using marine geological profiling. The method is based on seismic reflection theory, which involves sending a seismic wave into the ground and receiving the energy it reflects off of various interfaces..

Side Scan Sonar Surveys

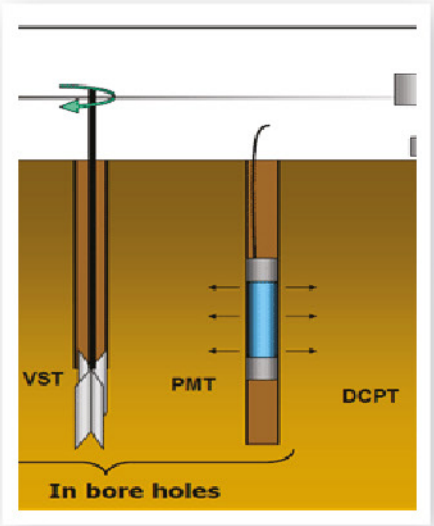
Side scan: A picture or image of the ocean floor is produced by sonar. It creates a picture by measuring the strength of how "loud" the return echo is. In comparison to softer parts like sand, the sea floor's hard surfaces, like rocks, reflect more sound and provide a stronger or louder return signal. Darker than quieter locations are those with loud echoes. Shadows are also produced in the sonar image where no sound was detected by objects or features that rise above the ocean floor. One can estimate the size of the feature by the size of the shadow.

GEOTECHNICAL SERVICES
GROUND INVESTIGATION

The planning of a safe, affordable, and sustainable future use of that site, whether it be for commercial development, residential additions, or public sector projects, requires an investigation into the geology and previous use of a site to learn about its engineering, environmental, and contamination characteristics. Additionally, we perform post-failure analysis and design remediation.

Soil & Rock Samples

Our geotechnical engineering team has a wealth of experience in laboratory and field testing, sampling, and monitoring of soil conditions. We can offer complete geotechnical services to our clients because to our proficiency in laboratory testing and field work. Additionally, we have geotechnical field sampling capabilities, which allow us to do in-situ testing and data collecting as well as swiftly collect high-quality samples for laboratory testing. Our geotechnical engineers and geologists have years of experience conducting field investigations, including geologic mapping and data collection using site reconnaissance and downhole logging, monitoring slope movement with inclinometers, checking groundwater levels, and performing in-situ strength and permeability tests.



In-situ Testing

The capacity to gauge the geographical variability of the deposits and evaluate the geologic materials in their native habitat can both be accomplished by in-situ testing. In order to investigate the soil, we offer a comprehensive and integrated variety of services. The data is gathered utilizing a range of techniques, devices, and sensors, including:

- Cone penetration tests - (CPT)
- Seismic cone penetration tests - (SCPT)
- Plate Loading Test - (PLT)
- Piezocone penetration tests - (CPT-u)
- Dilatometer Marchetti test - (DMT)
- Vane Shear Test - (VST)
- Standard penetration test - (SPT)
- Pressuremeter Test - (PMT)
- Suspension Logging (SL)

Laboratory Testing

We can provide the following services at our lab:

- Soil classification tests
- Soil chemical tests
- Modified Proctor Test
- CBR Tests
- Soil compaction and density tests
- Soil strength and consolidation tests
- Foreign material testing
- Rock Testing

GEOTECHNICAL SERVICES
GEOTECHNICAL GEOPHYSICS

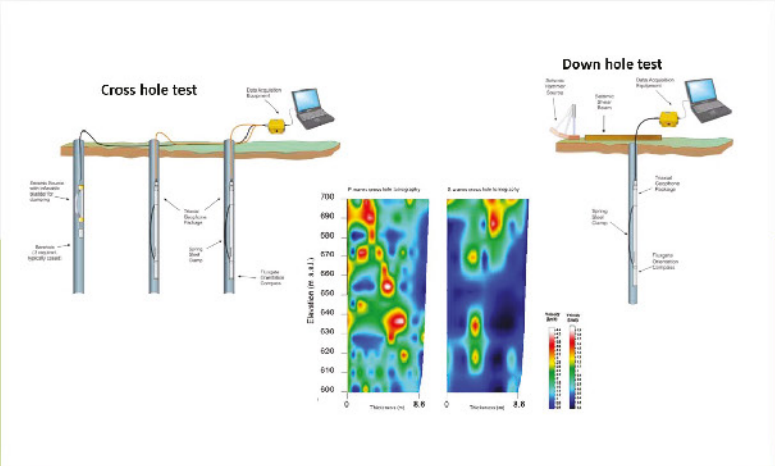
What Is Geotechnical Geophysics

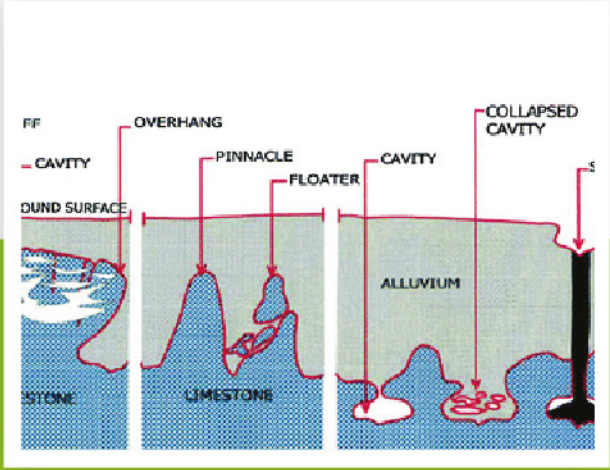
The use of geophysics to problems in geotechnical engineering is known as geotechnical geophysics. For vast study regions, a geotechnical geophysical survey is the most efficient way to gather subsurface data. Geotechnical geophysics can be used to choose the placement of a borehole and can offer trustworthy details about the sub surface's nature and variability between existing boreholes. A successful geophysical survey could identify the presence of the pinnacle and map its height and aerial extent while a normal drilling program might miss an isolated geologic formation like a accessibility. Geophysical equipment can frequently be used in places that drill rigs might find difficult to access, including beneath bridges and power lines, in cities, on steeply sloping terrain, in swampy areas, on pavement or rock, and in other urban settings.

Why Use Geotechnical Geophysics

Any geotechnical study can be optimized by using geotechnical geophysics, which is both affordable and trustworthy as:
Imaging is necessary to identify characteristics such as voids, cavities, cracks, water infiltration, water channels, etc. between and below boreholes where simply geotechnical approaches may be ineffective.

- Providing information on the in-situ characteristics of rock and soil
- Reconnaissance geotechnical geophysics has the potential to greatly reduce the overall number of boreholes necessary, resulting in a cost-efficient, quick, and thorough site research plan.
- Latitudinal and vertical variations provided by geotechnical geophysics can provide information on the dip and strike of the subsurface rocks.
- In geotechnical geophysics, the data can be analysed both qualitatively and quantitatively, and maps of the site's
- overall bearing capacity and shear velocities can be produced.
- Geotechnical geophysics provides crucial assistance in estimating fault position, geometry, and activity.

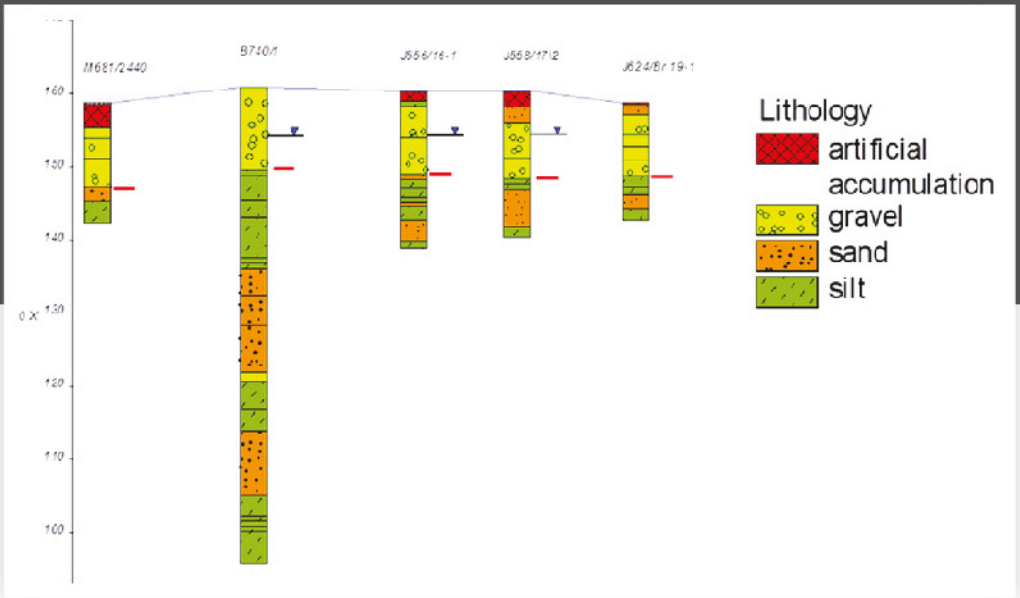




GEOTECHNICAL SERVICES
ENGINEERING GEOLOGY

Recommendations, analysis, and design are provided by engineering geology in relation to human development and many types of constructions.

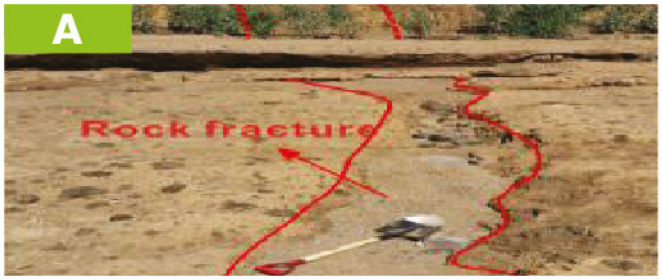
Engineering geology focuses primarily on the interactions between the earth and its structures, or the study of how the earth's processes affect man-made buildings and human activities.

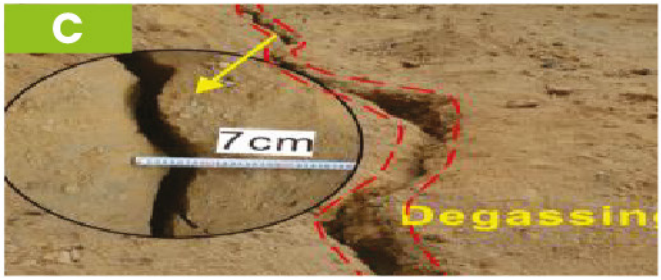


Fractures & Joints

The result of brittle deformation, fractures and joints characterize the strength of rock material and reveal details about its tectonic history.

They serve as crucial fluid channels and give room for minerals to develop. Engineering geology and resource exploration need to understand how fracture orientations result from stress.





GEOTECHNICAL SERVICES
DRILLING SERVICES

Exploration Drilling

In the mineral mining industry, exploration drilling is used to investigate known ore deposits' contents or to scout out possible geological and commercially valuable sites. Geologists can recover and analyze sample core profiles at the surface using exploration drilling at a lesser cost and with less of an impact on the environment. RGS has all the necessary equipment for projects involving the exploration of minerals.

Rotary Drill Rigs (Geotechnical Works)

Auger, mud rotary, air rotary, and diamond core drilling are just a few of the rotary-based drilling techniques that RSC's equipment is capable of completing. The Mud Bay fleet's rotary drill rigs are configured to carry out a variety of various tasks, giving your project more adaptability while only requiring a single piece of equipment.

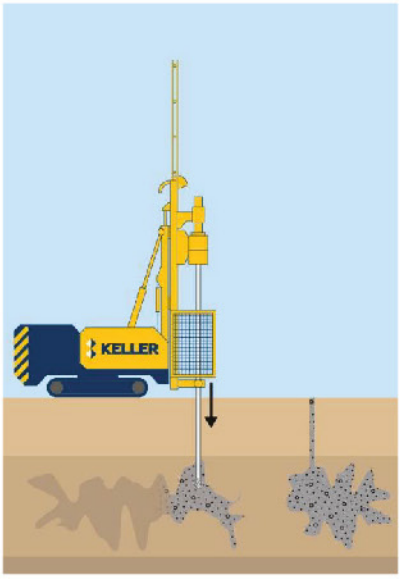
Auger Drills

RGS has a number of auger drill rigs that have been tried and true in the industry and are able to run solid and hollow stem augers with varying diameters up to 12 inches. These rigs are also fully prepared for CPT and other in-situ experiments, whether they are being performed for geotechnical or environmental reasons.

Cavity Probing And Grouting

Cavities and karst features are typical features found in carbonate rocks. Our services include carrying out, supervising, and documenting the cavity probing and grouting work necessary under and around the project site's foundation. To do the probing from the excavated level, we have air percussion drilling rigs.

To ascertain whether there are any voids in the rock formations supporting the proposed structures, cavity probing will be carried out. Measures are taken to ensure that structures placed on top of sub-surface formations will be secure and free from any structural damage caused by settlement or collapse of the sub-surface formations, including determining the nature and extent of any cavities that may be present.After probing, the plan calls for filling cracks in the rock formations with a grout mix that contains sand, water, and bentonite chemicals as well as sand and small pebbles in place of aggregate.



Probe Drilling

Drill, maintain, and keep an eye on probe holes in the tunnel and shaft excavations to look for groundwater inputs.

Pre-Excavation Grouting

Cementation injection To stop water from entering the excavation, grout through holes that were previously dug.

Shot-Crete

Shot-Crete is a method of pouring concrete that produces a product with greater strength, less permeability, and greater durability than typical pumped concrete.

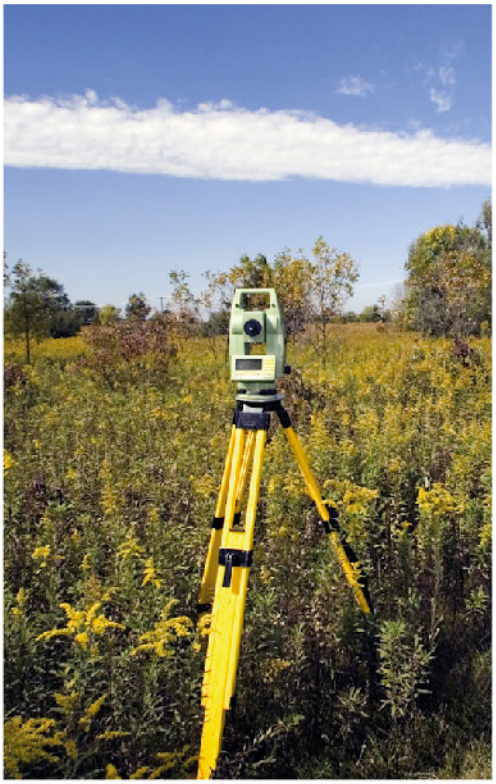
Shot-Crete works well for retaining walls, concrete rehabilitation and repair, new construction, architectural building involving free form designs requiring intricate formwork, and the challenging mining environment.

Spraying is used to apply concrete. Portland cement and aggregate are combined to make Shot-Crete, which is then delivered by compressed air to the spray gun's nozzle along with water. After being sprayed in position, the wet mixture can almost immediately be sculpted or troweled. Shot-Crete is typically put over a framework of reinforcing bars and steel mesh for structural reasons. Shot-Crete is used for a range of fancy concrete constructions, including fake rock walls, zoo enclosures, canopy roofs, refractory linings, pools, and dams because it can take any shape, is easily colored, and may be sculpted after application. In order to stop leaks and tunnel fragmentation, it is occasionally employed to connect the tunnel walls.

LAND SURVEY SERVICES
TOPOGRAPHIC SURVEY SERVICES

A topographic survey identifies every surface feature on a piece of property and shows every elevation and natural feature. In essence, it is a three-dimensional map of a three-dimensional space that displays all of the characteristics and enhancements, both natural and man-made. It displays their precise location, dimensions, height, and any elevation changes.

In-depth attention to detail is necessary when conducting surveys along roadways and major thoroughfares. Along with our standard survey considerations, there are frequently additional factors to take into account, such as traffic and personal safety, particularly when extensive time is needed on the road due to the need for additional detail, such as white lines, yellow lines, lane information, and central reservation information. Although customers occasionally request, with the agreement of property owners, information on building locations of trees and other essential detail when constructing huge 'above road' constructions, roads are often surveyed to the extents of the highway boundary.



Major Sectors of requirement a Topographic Survey

Topographic surveys, commonly referred to as contour surveys, may be needed for pipeline networks, civil engineering design and construction projects, and real estate transactions:

- New construction
- Remodeling projects to existing structures
- Utility design
- Road or bridge design or improvements
- Grading or drainage projects

To identify the current conditions and elevations of a place, many local governmental entities and business developers require topographic surveys. Topographic surveys are used by architects and engineers along with a boundary survey to develop precise and suitable designs based on current conditions.

Data usage of Topographic Surveys

Either an electronic EDM device or a GPS unit of surveying quality are used to take measurements for topographic surveys. The contour lines on a site map that represent the topographic survey's findings are improved by computer tools to offer interactive perspectives. Our CAD experts can use this information to estimate how planned upgrades would affect the topography.

The natural landscape can serve as the inspiration for such changes, and clients can employ topographic surveys to assess and plan elements like drainage ditches, grading, or other features. Prior to a real estate sale or the start of a construction project, hiring a professional surveyor to undertake a topographic survey will guarantee that the land's attributes are appropriate for the use for which it is intended. A topographic survey can also give important information on how a site's past or present use has impacted the land, allowing for better planning for future use. For usage with AutoCAD, digital data is provided in the DWG/DXF and PDF formats.

LAND SURVEY SERVICES

AS-BUILT SURVEY SERVICES

Construction As-Builts are used to depict the work's final state as it was actually built and accepted. A common and significant requirement of construction contracts is the as-built documentation, and the procedure mandates that any modification to the original design be included by drafting the change on one set of contract documents designated specifically for that purpose.

As-built surveys are used in the middle of a construction project, in contrast to typical land surveys, which are carried out either before buildings or other improvements are added to the site or after these additions are finished. As-built depictions of the land's improvements as they looked at a specific period were requested by numerous sectors. As built surveys can be applied to both residential and commercial properties. From the planning stage through actual building and future maintenance, surveys are essential tools in the construction business. A site plan or plot plan, which outlines the project's whole course of action, is the first step in any building project. Any restrictions already in place at a specific location are included in this plan.

Several as-built surveys are carried out over the course of a construction project. The number of surveys conducted and their frequency are determined by the size of the construction project. An as-built survey is used to confirm to local and state boards that the authorized construction work was finished in accordance with the same standards established during the planning stage and displayed in the site plan.

The as-built survey is most frequently used to demonstrate to the building inspector that a project is compliant with zoning requirements. For almost every form of land project, from creating new roads and trails to upgrading existing utilities, as-built surveys may be necessary.

As-built accuracy is crucial for more reasons than just administrative efficiency. A important tool for altering the timeline of a significant construction project is an as-built survey, which details precisely what has been finished up to this point. An essential tool for managing the building both during construction and after it is finished is an as-built survey. As a result, they might be required by the project manager or other people with a stake in the project's success. They could be used, for instance, to calculate payments to contractors or keep track of what needs to be finished by a certain date. They are frequently used to check utility and cable plans, floor layouts, evacuation plans and other later building stages.

Many types of construction surveys, including some as-built surveys, are regarded as civil engineering, necessitating extra degrees in addition to land surveyor certification. There are various survey kinds used for very particular goals in the as-built survey field. For instance, a foundation survey verifies that the foundation has been erected according to the site plan's specifications and in the proper place on the property. A Deformation Survey can establish if a project is changing shape or moving over time while it is being built or after it has been completed by creating a three-dimensional photograph of the structure at two separate periods in time.

For all parties to a building contract, accurate existing condition documentation provides unintended advantages. As-built can provide checks and balances against unbilled work or uncredited deletions if changes are properly documented and referenced.

LAND SURVEY SERVICES
3D LASER SCANNING SERVICES

Consider employing 3D laser scanning technology when planning your next construction project if you want to reduce labor costs, increase material cost estimates, and save time. The newest BIM technique, laser scanning, provides a precise, economical, and highly integrated way to virtually model construction, retrofitting, and restoration projects. This article delves deeper into laser scanning technology, how it may be used in building projects, and the costs and advantages of this cutting-edge new technique.

Contextualizing 3D Laser Scanning

The most precise technique for building information modelling is laser scanning. A point cloud survey, often known as LIDAR (a combination of the words "light" and "radar"), is a method in which a laser scanner quickly and accurately measures the distance between densely scanned points over an item. Companies employ a tripod-mounted high speed laser with an integrated camera. Each time a light ray strikes a surface in the surroundings, the system generates a data point that represents the distance between the laser scanner and that surface. The laser releases light beams at a very rapid pace.

Laser scanners can scan approximately a million different spots per second at a radius of up to 300 meters. For every 100 meters between the scanner and the target surface, the normal error range for a laser scanner is plus or minus two millimeters, resulting in readings that are not only quick but also incredibly accurate.

Traditional surveying techniques that rely on physical measurement and mapping are being increasingly replaced by laser scans. Although useful, these techniques need a lot more man hours to complete successfully and may not be as accurate as laser scanners.

Practical Methods and Integration for 3D Laser Scanning

Any significant construction project should include 3D laser scanning in its budget, and the top companies are constantly developing cutting-edge solutions to achieve the greatest outcomes at the lowest possible price. Companies are mounting laser scanners onto helicopters and drones in addition to the standard laser, camera, and tripod setup to create an even more precise 3D mapping of massive structures.

Up till recently, the construction sectors of renovation and restoration have seen the most success using 3D laser scanning. Laser scanning is one of the best ways to map the area and figure out how to best complete the necessary work without disturbing or harming any other part of the building structure when the job site is a National Heritage Building and you need to upgrade the HVAC and fire protection infrastructure.

In order to plan building projects, engineers and architects employ other software that combines perfectly with laser scanning technologies. All of the major makers of CAD, modelling, and BIM software have created compatibility add-ons that enable the uploading of point cloud data produced by laser scanners into the system, creating 3D images that are excellent for project planning or enabling architects to design building upgrades on top of an image of the existing structure.

Laser scanning users exhibit a retention rate of approximately 100%, indicating that they are unlikely ever to return to conventional survey techniques for their BIM or CAD requirements. However, laser companies aren't just interested in the building industry; they're also employing laser technology to assist police enforcement in developing all-terrain exploratory robots that use thermal imaging to find hazards in their surroundings.survey methods for their BIM or CAD needs.

By comparing the anticipated end state to a point cloud map of the present development, laser scanners and 3D printing could be utilized to quickly produce and replace building components or as a way to assess progress on a specific construction project.

How can we precisely map our work sites to optimize productivity, planning, and coordination? This is a very basic and evident problem that construction firms encounter every day. Laser scanning technology provides a solution. Previously, surveyors might provide the general layout, and architects were left to produce scale drawings or their own visual representations of the location.

Today, we can rapidly and easily create extremely accurate images of job sites using laser scanning. We can then use these images for planning, predicting our material needs, and increasing the productivity and profitability of any construction project.

Key areas for application include:

- Creation up to date as-built documentation
- Complete 3D CAD models from point cloud
- 3D semi-automated modeling
- Aid in inspection
- Clash/Interference checking
- Deformation analysis and weld peaking reports
- Condition and damage assessment
- Tank/vessel volumetric information
- Data exchange with many CAD platforms 2D plan

KEY BENEFITS OF 3D LASER SCANNING

Speed, Accuracy, and Consistency

With the use of 3D laser scanning, it is possible to quickly and precisely gather millions of quantifiable data points in order to deliver consistent pinpoint accuracy.

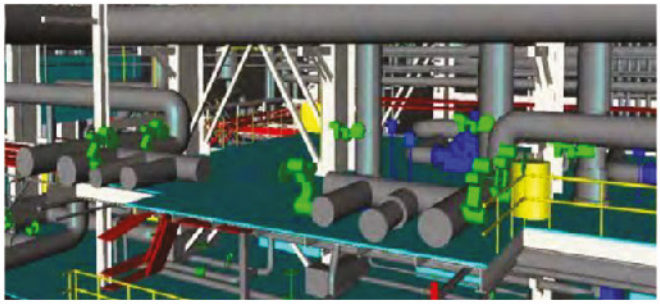
Valuable Data for Design

Datasets are dimensionally precise, measurable, and shareable, so you can do away with all speculation at work.

Works on Retrofits and New Builds

You require a high degree of accuracy for intricate MEP installations. If your project is complicated, requires retrofits, or needs renovation, you can collect accurate data across the whole measurement range.

- Mitigation of risk
- Minimizing shutdown periods
- Minimizing offshore fabrication activities
- Eliminate re-work and reduce the cost of retrospective engineering
- Reduction of installation man-hours
- Maximizing field productivity
- Minimizing field hot-work.



RENTAL GEOPHYSICAL TOLLS
AERIAL SURVEY SERVICES

Aerial Photogrammetry Services

As geospatial and construction organizations understand how much simpler and more affordable it can be to complete surveying and mapping projects with drones, the use of unmanned aerial systems (UAS) is fast growing. Additionally, using drones eliminates the need for people to physically enter challenging and hazardous terrain.

Applications for UAV lidar and photogrammetry images are growing quickly. This is not surprising considering that renting an aircraft with photogrammetry equipment is relatively expensive compared to employing GPS-enabled UAVs for aerial surveys.

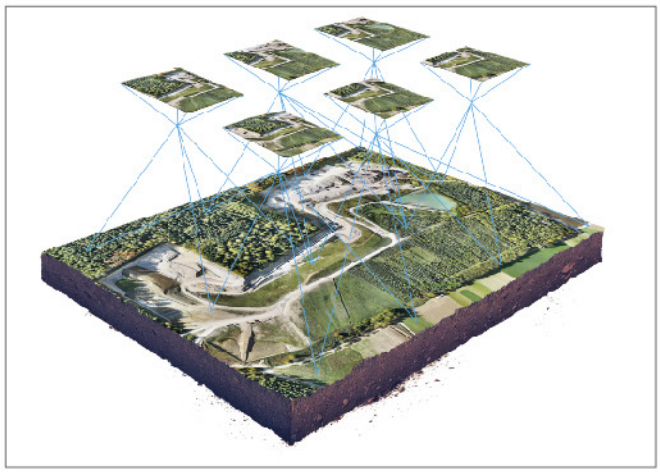
Many organisations will have their own fleets of UAVs because they are commonly affordable, enabling quick surveys over huge geographical areas as needed.

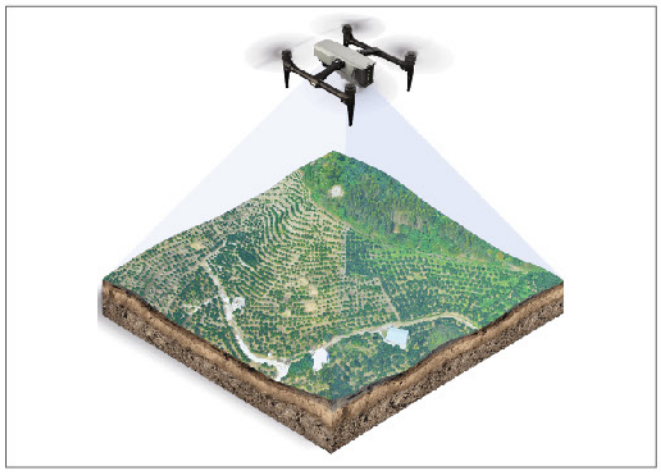
Drones with GPS, digital cameras, and sophisticated processors make it highly feasible to conduct surveys with an accuracy of between 1 and 2 cm.

This article examines this drone mapping technology in its entirety. We also quickly review the industries that stand to gain from the use of UAVs for photogrammetry and LiDAR mapping. Along with the suitable software, we also take a look at some of the top mapping drones now available.

The camera is installed on the drone and is often aimed vertically towards the ground to produce 3D maps using aerial photogrammetry. The camera is placed horizontally on the UAV in order to use photogrammetry to build 3D models of statues or other structures.

As the UAV flies along an autonomously designed flight path known as a waypoint, many overlapping photographs (80 to 90% overlap) of the ground or model are obtained. By using pilot navigation, it would be hard to correctly overlap images of an item or terrain by 80–90%. A UAV equipped with waypoint Navigation technology is necessary.





LiDAR Survey Services

To estimate the height of points in the environment beneath a UAV, UAV LiDAR includes placing a laser scanner on the UAV. Actually, LiDAR stands for light detection and ranging.In a single day, LiDAR scanners may collect data covering hundreds of square km. A extremely accurate digital landscape model can be produced by measuring 10-80 points per square metre.

Because of the measures' accuracy, the resulting 3D models can be used in many different planning, design, and decision-making processes. egetation and the tracking of vegetation change.

RENTAL GEOPHYSICAL TOLLS

We are equipped with the most optimized robust, efficient consistent geophysical apparatus such as borehole cameras and loggers, GPR equipment, ground resistivity meters and electromagnetictools.

All rental instruments are fully examined and feature low operating hours.

All Types of Geophysical Equipment Rental Products

We present state-of-the-art tools:

- Electromagnetic Survey (EM31)
- Borehole Logging equipment and Borehole Cameras
- Radio Detection Unit (RD8000)
- Electrical Resistivity (ERT)
- Ground Penetrating Radar (GPR)

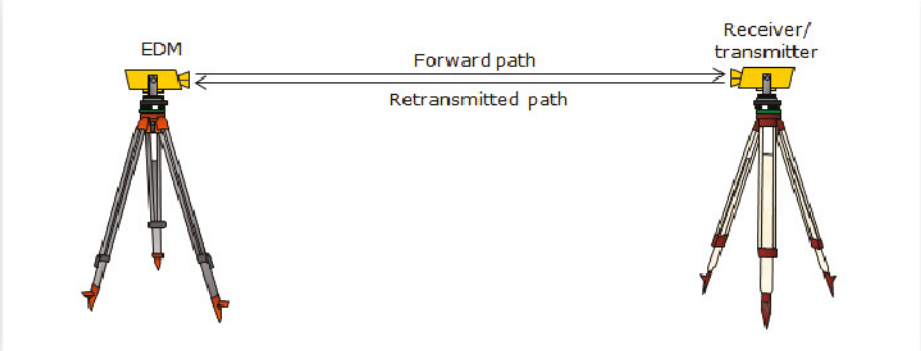
We offer full servicing for our low-hour rental equipment, which are provided by top manufacturers to guarantee the highest level of dependability and quality.

Rentals of Geophysical tools with MAR Have Many Advantages

When you rent geophysical equipment from us, you receive a contemporary product with the finest scientific advancements. This enables you to complete the task at hand more quickly, effectively, and accurately. When you buy equipment, there's a chance that it will quickly become outdated. Renting can also be very cost-effective because you only pay for the equipment you really use and you won't be wasting money that might be utilized to improve other parts of your business operation.

Rental Terms and Competitive Rates for Geophysical Equipment

We are able to serve you whether you need to hire geophysical equipment for a short while or for a long time. Renting options include day, week, or monthly rentals. Additionally, you'll discover that our rental rates are really affordable, which aids in reducing your operational costs.



MAR projects

CONTACT US

- **WEBSITE:** geotech.marprojects.net
- **MAIL:** geotech@marprojects.net
- **CALL:** +966 53 941 9294
- **CALL:** +966 11 810 3676
- **ADDRESS:** Salahuddin Al Ayoubi Road, Al Malaz, PB No-376373, Riyadh- 11335, Saudi Arabia