

Fugro Engineering Services Limited

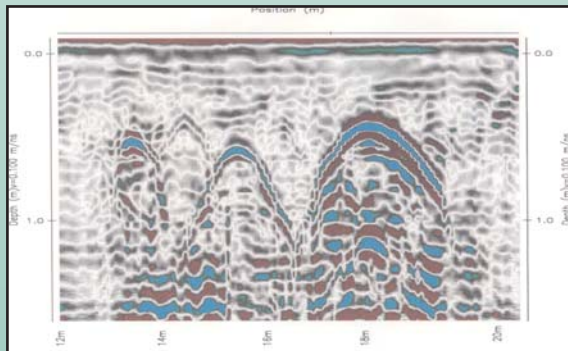
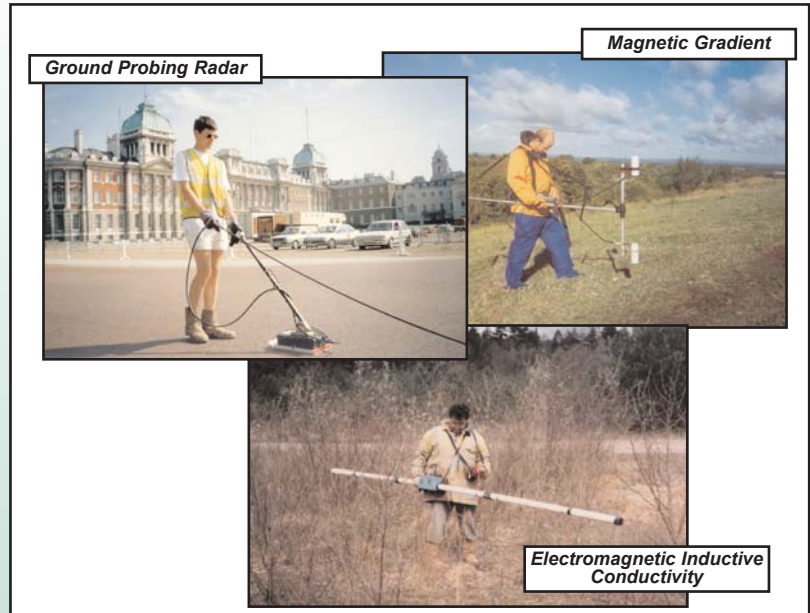
GEOPHYSICAL SERVICES FOR UNDERGROUND UTILITY / OBSTACLE DETECTION



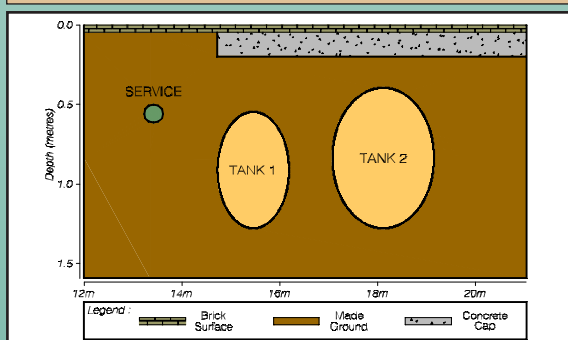
INTRODUCTION

Are you undertaking work on brownfield sites or sites where records are incomplete or inaccurate? If so, you will be aware of the possibility of encountering underground services, storage tanks, or old foundations. Without a comprehensive site evaluation you could be risking significant costs through utility or storage tanks damage, or delays through encountering unforeseen obstacles.

Fugro can provide you with a suite of geophysical techniques to fully evaluate the physical characteristics of your site. Our geophysical techniques are non-intrusive, quick to use and can cover large areas in one survey. Providing a base map we can produce a detailed utility and obstacle map giving you confidence in your proposed works.



Ground Probing Radar Plot above with schematic interpretation below showing two buried tanks, concrete slab and service pipe.



COMBINED TECHNIQUES

Radiodetection

The C.A.T. and Genny system can be used to detect electromagnetic fields round buried pipes and cables. Three different types of signal can be detected, to provide assurance that an area is clear of buried underground utilities. Equipment is rapid and easy to use. Outlines of tanks can sometimes be detected where associated pipes can be induced with a signal.

Electromagnetic Inductive Conductivity

This non-intrusive technique measures changes in the electrical properties of the subsurface e.g. the presence of buried structures. Equipment used is the EM31. Measurements are typically conducted on a grid and results are presented as contour plots.

(See contour example overleaf)

Magnetic Gradient

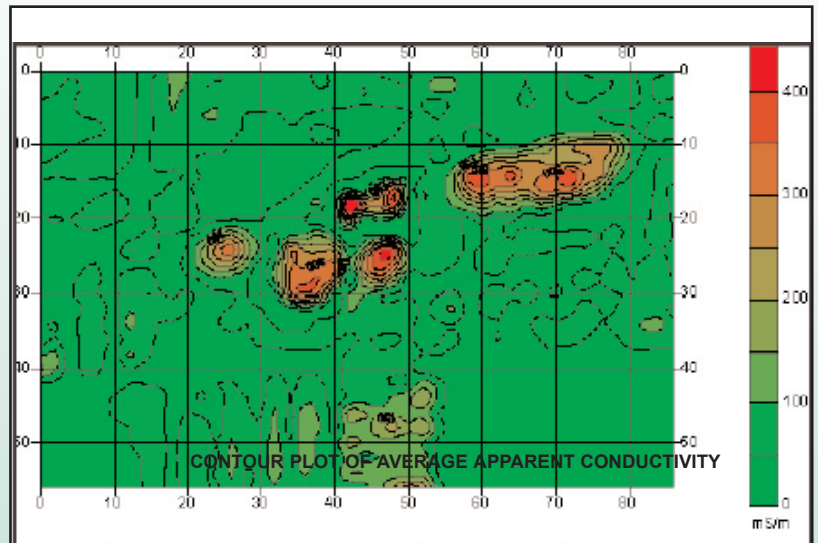
This method measures variations in the earth's magnetic field and is therefore, strongly affected by metallic objects such as reinforcement in foundations. This technique is often used in conjunction with the EM technique.

Ground Penetrating Radar (GPR)

Indicated changes in the structure or electrical properties of the shallow subsurface by means of transmitting and receiving pulses of high frequency electromagnetic radiation. Radiation is reflected from various interfaces such as geologic, foundation or pipework within the subsurface. This is a quick method of imaging shallow subsurface anomalies such as buried pipes and services, foundations and other obstructions on brownfield sites. Approximate depths can be determined from the radar data.

ADVANTAGES

- Geophysical methods are non intrusive, therefore no drill cuttings or spoil to dispose of
- No migration of possible contaminants
- Ease of calibration with other Fugro investigation techniques
- Cost effective and fast
- Geophysical equipment is compact and can be utilised by just one professional
- Variety of complementary geophysical techniques available
- Provides a detailed integrated survey enabling an informed choice of optimum location for subsequent probing and boreholes.

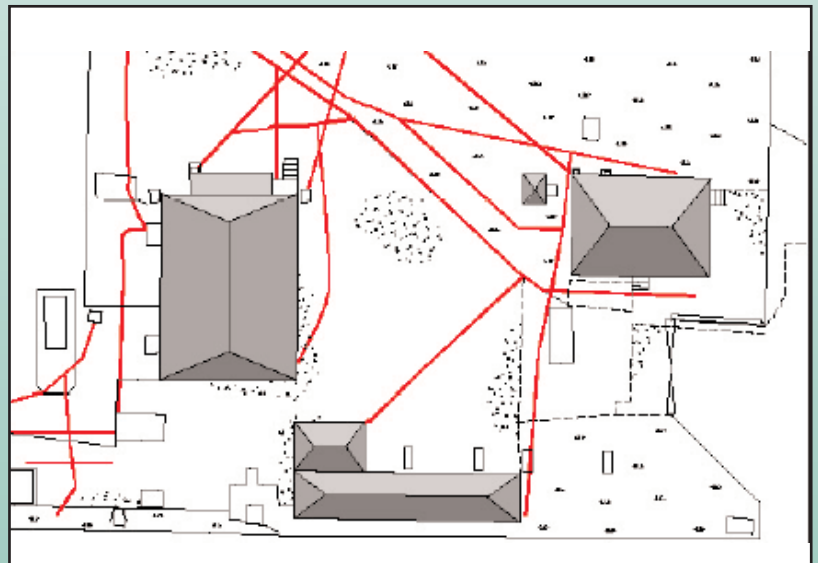


Above - Conductivity Contour plot with location of buried foundation sin red

OTHER SERVICES

Fugro can also offer you additional services to calibrate your results with. These include:

- Geophysical Borehole Logging
- Geoprobe Soil Sampling
- Cone Penetration Testing
- Other Geophysical techniques:
 - Magnetic Gradient
 - Resistivity Imaging
 - Seismic Refraction & Reflection
 - Sonic Pulse
 - High Speed Pavement Radar
 - Gravity & Microgravity



Above - Autocad plan of service location

The Fugro Group is an international organisation with around seven thousand staff in over fifty countries. Our major disciplines are Geotechnics, Environmental Services and Survey.

Fugro Engineering Services Limited

Fugro House
Hithercroft Road
Wallingford
Oxfordshire OX10 9RB
Tel: +44 870 4021 400
Fax: +44 870 4021 499
Email: wallingforde@fes.co.uk

Armstrong House, Unit 43
Number One Industrial Estate
Medomsley Road, Consett
Co. Durham DH8 6TW
Tel: +44 1207 581120
Fax: +44 1207 581609
Email: consett@fes.co.uk