

Landfill Site Characterisation

A CASE STUDY IN HAMPSHIRE



BACKGROUND

In March 1996, Fugro was commissioned to carry out a ground investigation at a landfill site in Hampshire UK, where excessive levels of fatty acids indicative of ground contamination had been recorded in a stream to the south of the site.



SITE INVESTIGATION

A comprehensive investigation of the site and the neighbouring farmland was undertaken. In addition to the geophysical survey, electrical conductivity Static Cone Penetration Tests, push in piezometers, variable head permeability tests and chemical analysis of water samples were also carried out.

The geophysical technique used in this investigation was Electromagnetic Induced Conductivity (EM), employing a Geonics EM31 and a datalogger.

ELECTROMAGNETIC SURVEY

Four EM lines were surveyed around the boundaries of the landfill site, and a fifth traverse was made across the centre of the site. The farmland to the south of the site was surveyed on a 5m x 5m and 10m x 10m grid basis.

RESULTS & INTERPRETATION

The apparent conductivity and in-phase response profiles were plotted for each of the five lines surveyed. It was observed that the apparent conductivity values were notably higher within the confines of the landfill site.

Line 3 (see Figure 1a), which was located along the southern boundary of the site, was of particular interest as the apparent conductivity profile showed a number of wide peaks. These apparent conductivity highs were identified as the optimum location for static Cone Penetrometer Tests (CPTs).

The average apparent conductivity measured over the nearby farmland were gridded and displayed in the form of a contour plot.

From comparison with the data collected along the edges of the landfill, the apparent conductivity highs visible on this plot were identified as anomalous areas of interest.

The anomalous area at the northern edge of this site corresponded exactly with the position of one of the conductivity highs identified along the southern boundary of the landfill. This is shown on Figure 1b.

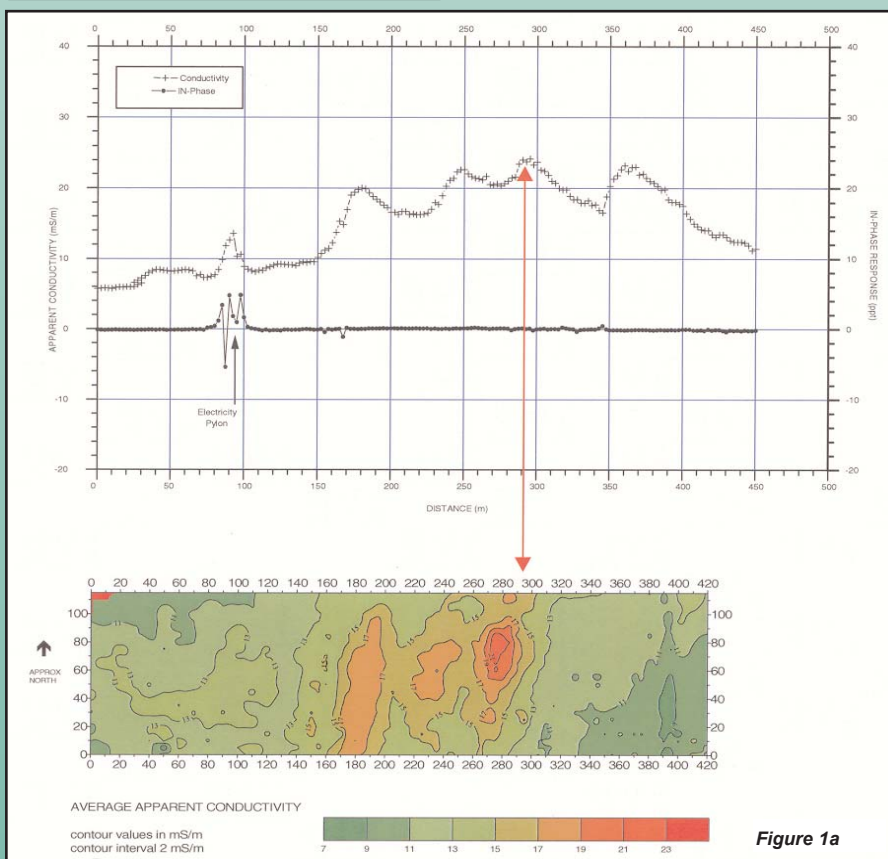


Figure 1a

STATIC CONE PENETROMETER TESTS

A total of 13 CPTs were carried out within the landfill site and the farmland. Some of these tests, such as CPT 106, were carried out in locations identified to be of interest by the geophysical data.

Individual subsurface lithologies were identified from the cone resistance (q_c) and sleeve friction (f_s) CPT results. In the case of CPT 106, which was located at chainage 290m along the south edge of the site, a large peak in conductivity was observed. This area of high apparent conductivity was located within a stratum identified as dense, silty sand at a depth of approximately 3m.

This was interpreted as a localised increase in soil conductivity not associated with a change in lithology. The cone resistance and conductivity plots for CPT 106 are shown in Figure 2 opposite.

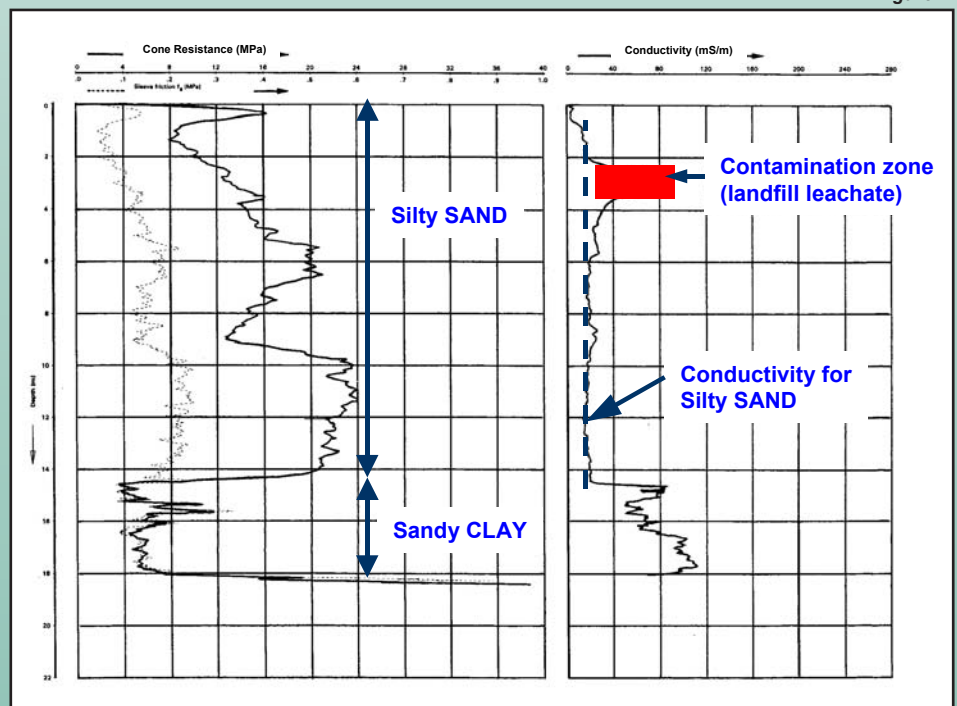
SUMMARY AND CONCLUSION

A number of ground investigation techniques were employed by Fugro at the site of a landfill in Hampshire, UK in 1996. Investigation was also carried out within an area of agricultural land to the south of the site.

Several areas of localised high apparent conductivity along the southern boundary of the landfill were identified by an electromagnetic induced conductivity (EM) survey. CPT results recorded at the location of one of these areas revealed a high conductivity layer, not associated with a lithology change, at a depth of approximately 3m.

The contour plot of apparent conductivity data collected using the EM method on the nearby farmland identified a region of relatively high conductivity which appeared to enter the survey area at a point on the northern edge which corresponded to the anomalous zone identified at the southern edge of the landfill. This pattern of conductivity is consistent with that expected to be associated with a leachate plume migrating from a point on the southern edge of the landfill into neighbouring farmland. Soil permeability tests and chemical analysis of water samples taken in the areas identified as anomalous showed evidence of leachate contamination.

Figure 2



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.

Details of services and specifications may change without notice.

© Copyright January 2005

Ref: B8-Case Study in Hampshire

Fugro Engineering Services Limited

Fugro House
Hithercroft Road
Wallingford
Oxfordshire OX10 9RB
Tel: +44 870 4021 400
Fax: +44 870 4021 499
Email: wallingford@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

