

# Getting to the bottom of it

UK-based site-investigation specialist Rogers Geotechnical Services (RGS) met with topographical challenges on a recent job site in northern England

The consultant structural engineers working on a nine-plot housing development in Huddersfield recently contracted RGS with the ground investigation for the project.

There were a number of interesting issues to deal with, the most obvious of which was the topography. The site was a narrow strip of land located on a plateau 4m below a road and 10m above a stream. In addition, the site ended at a railway embankment, with a gabion-basket retaining wall adjoining the boundary of the neighbouring property, beyond which was a further retaining wall of considerable age.

Below the plateau was a steep partially vegetated slope that appeared to have been steepened, using end-tipped material, to increase the width of the site/plateau. At the base of the slope was a 3m-high stone retaining wall showing signs of bulging and distress. Some trees on the slope were leaning over, indicating historical slope movement.

## EVALUATION

Geotechnical information was needed for foundation and retaining-wall design, which included establishing the rock profile; assessing the stability of the slopes and retaining structures; and contamination testing and risk assessment of the fill, together with a full interpretive report and remediation strategy.

Initially, historical mapping was used to identify the previous layout of the site to aid borehole



The rig used on-site pictured with operations director Chay Rogers

positioning. Machine-excavated trial pits were undertaken, and due to the extended depth of made ground, it was decided that further investigation was necessary. A series of dynamic probes were then conducted to profile the rock-head and to obtain data on the strength of the fill and weathered fraction of rock. This was followed by windowless sampled boreholes using rotary core drilling of the rock-head with a Dando Terrier drilling rig.

Other investigations comprised standard penetration testing; and geotechnical laboratory testing including moisture-content determinations, index property tests, particle-size distribution, uniaxial compressive strength testing, point load strength index tests, sulphate and pH suite.

## OUTCOME

The investigation results indicated that made ground was present in variable conditions across the site. Cellars from historical properties were also revealed at some of the trial-pit locations. While rock-head was established, variations in the depth to this stratum meant that each part of the site needed to be

considered discretely. As such, strip and spread foundations were considered appropriate away from the slope crest, but would need to be at differing depths.

The access road was to be constructed along the crest of the slope, which was not ideal.

Therefore, retaining structures would need to be built to support the construction, should the plans remain the same. The report detailed retaining-wall suggestions, including gravity or cantilever structures, reinforced earth and embedded pile retaining walls. It was also suggested that ground anchors could be used to improve the retaining wall.

On the basis that testing revealed contamination at this site, a remediation strategy was provided. Additionally, information relating to the requirements of the governing bodies surrounding imported materials and verification of any remedial measures implemented was included.

It is considered that the problems associated with the development of this site have been fully realised, and it is expected that the works can now proceed with some surety.♥



Gurdev Singh, field and lab technician, at work in the laboratory

This article was written by RGS technical director Steve Rogers

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