Case Study

Microgravity and Cavity Laser Scanning

Briars Lane in Hatfield, April 2008

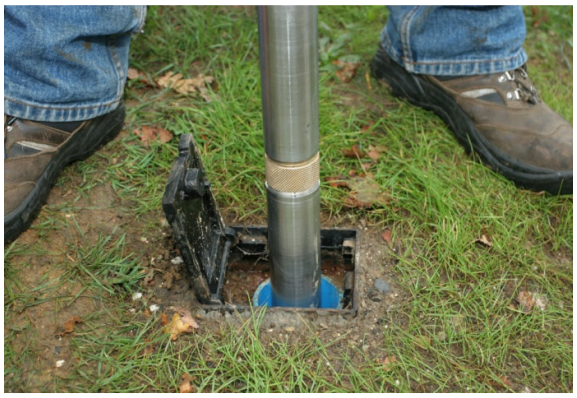
Phone: 01639 775293
Website: www.geotechnology.net
Email: info@geotechnology.net

Geotechnology Limited
Ty Coed, Cefn-Yr-Allt, Aberdulais, Neath, SA10 8HE
Registered in England and Wales No. 6497727

Microgravity and Cavity Laser Scanning

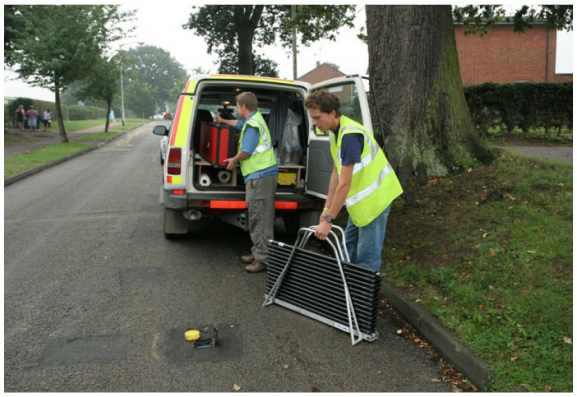
Briars Lane in Hatfield, April 2008

Briars Lane in Hatfield, Hertfordshire is part of a residential area developed in the 1960's and 1970's on gently sloping land. The developers at the time were completely unaware that an extension unrecorded chalk mine lay beneath the area, a fact that escaped detection until a property suffered subsidence damage. Engineers Halcrow Consulting were commissioned to carry out the investigation when the local authority realised that chalk mining or solution features could be responsible.

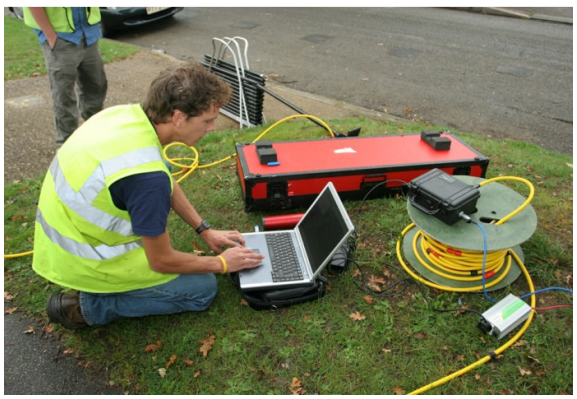


Halcrow Consulting specialises in the investigation, assessment and treatment of abandoned chalk mines and solution features. An initial small scale investigation revealed that chalk mining activity extended beneath the site so a survey of the surrounding area was recommended to determine the extent of the workings.

Geotechnology specialises in sensing the presence of sub-surface cavities using microgravity, so Halcrow commissioned a three phase microgravity survey of the area (measuring some 400m by 300m). The initial survey was carried out to very tight deadlines, with Geotechnology supervising data acquisition by crews from a geophysical contractor and then processing the data to produce both factual and interpretative reports. The remaining two phases were acquired and processed by Geotechnology.



The microgravity survey revealed a pattern of mass deficiencies across the area consistent with chalk mining at 12 to 18m depth. Using the interpretative plan Halcrow was then able to target ground investigation boreholes onto locations where the gravity survey had sensed "mining mass". Like many previous surveys undertaken elsewhere by Geotechnology a very close correlation between voids and gravity anomalies was noted, demonstrating that the technique effective and reliable for cavity detection.



Microgravity and Cavity Laser Scanning

Briars Lane in Hatfield, April 2008

Whilst microgravity is a good targeting method, indicating where voids can be expected, it is of limited use in precisely defining the voids in three dimensions. Traditionally, this has been done by drilling numerous boreholes and using down-hole cameras to carry out remote inspection. However, Geotechnology offers a better solution – the down hole cavity scanning laser.

Prior to insertion into a series of boreholes, each collar position and elevation was established using conventional dGPS surveying. As the probe was lowered into position the verticality and borehole deviation was tracked so that the position co-ordinates of the instrument in the void could be calculated. After deploying the laser, the cavities were scanned automatically to produce three dimensional point clouds, which define the voids with millimetre precision. As each survey produces void survey data to ordnance co-ordinates, surveys from adjacent holes were combined to form a 3 dimensional master plan of the workings. This happens on-site with no post processing. The three dimensional cavity survey is dropped onto a site survey and the distribution of cavities beneath the surface becomes clear, allowing new borehole positions to be set out at locations that will strike void rather than pillar.