



Contaminated site surveying with lasers

Dr Graham Hunter, Managing Director of Nottingham based 3D Laser Mapping examines how laser scanning technology traditionally developed and used around the world within the mining community is being used to monitor and manage waste and contamination in the UK.

The use of laser scanning technology within the mining industry has become relatively well established in recent years. The main uses have been to improve safety and to measure the volume of extraction and deposits of discarded material. Surveyors employed in other industries realised the same laser scanning technology could prove to be a useful aid elsewhere, including the surveying of proposed development sites, contaminated land and waste sites.

One particular pioneer in this area is Mining Surveys (UK), a Chesterfield based specialist survey company whose clients include East Midlands Development Agency, Freedom Group, Scottish Coal and UK Coal Mining. The company has completed a wide range of surveying projects, such as volumetric analysis of one of Europe's most contaminated sites, non contact surveying of live electrical installations and monitoring of slope instability especially in areas prone to landslides.

Mining Surveys is currently working with major waste management firm Viridor Waste Management. With 24 Landfill sites already and consent for a further 84 million cubic metres of void space for future use Viridor employs different resource management technologies in order to maximise operational efficiencies. A 3D survey of a landfill site, undertaken using laser scanning technology, can quickly capture highly accurate measurements that can then be used to calculate volumes of waste and remaining capacity, all without physical contact.

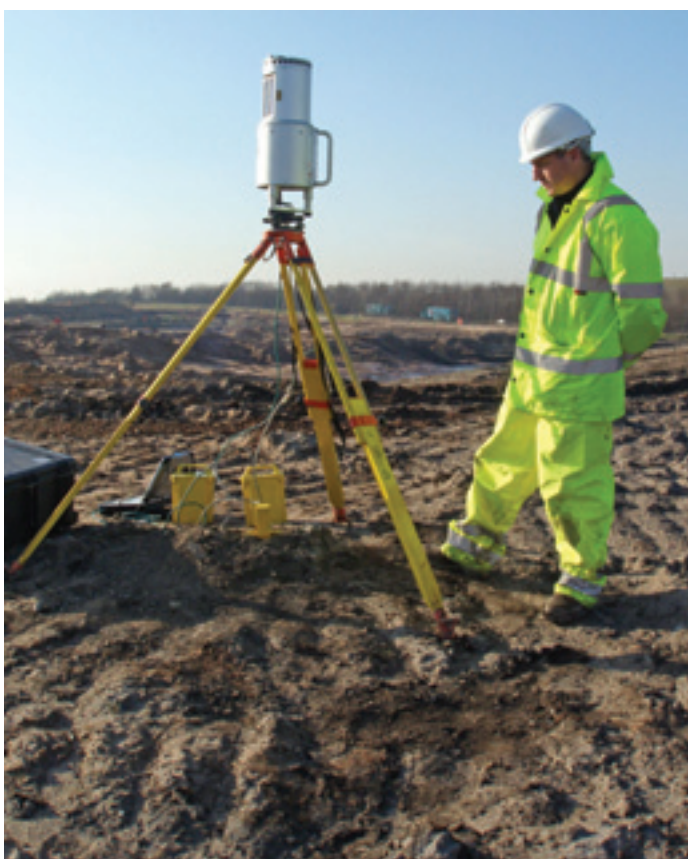
"An operational landfill site can be a dangerous environment," said John Halifax, Principle Director of Mining Surveys (UK). "Using 'non contact' laser scanning we can achieve the same accuracies as more tradi-

tional surveying techniques, from a safe distance and with minimal disruption to operation."

Mining Surveys has also completed a laser scanning survey of one of Europe's most contaminated sites. The Avenue, formerly the Avenue Coking Works, is located at Wingerworth near Chesterfield and is an ambitious project aiming to transform heavily polluted industrial land back into a place that can be enjoyed by both people and wildlife. The Avenue is a huge 240 acre site and the original coking works carbonised 2,175 tons of coal a day, producing 65 tons of Sulphuric Acid, 35 tons of Ammonium Sulphate, 20,000 gallons of crude Benzole and 250 tons of Tar. An area the size of about 200 football pitches the Avenue is thought to be one of the most contaminated sites in Western Europe.

"This was a considerable project," commented Halifax. "If we had used traditional surveying techniques it would have taken more than a year to survey the site. Using laser scanning we surveyed the entire area in just a couple of days, capturing high level resolution surveys at 100 millimetre intervals. This detailed model of the project, including some highly contaminated lagoons and banks was then used to prepare volume measurements from which the remediation contractors were able to manage the ongoing project."

Following the success of these surveys, Mining Surveys recently took delivery of an ultra long-range Riegl laser scanner. Designed to capture millimetre accurate 3D mapping at very high speeds with a range of over one mile, Mining Surveys are planning to utilise the system to expand their operations into new areas.



John Halifax commented, "The new Riegl LMS-Z620 will enable us to expand our operations into new areas while still maintaining the high levels of service and performance our clients have come to expect. In trials earlier this year, where we used the scanner to survey landfill sites, we were able to significantly reduce the time spent on site and survey previously inaccessible and therefore un-surveyed areas."

Site safety is one of the primary concerns around sites containing large dumps and stockpiles. One example of how laser scanning can help is at the world famous Kimberly Diamond mine in South Africa. Owner De Beers is using laser scanning to measure the volume of waste dumps and stockpiles around the mine and to capture highly accurate slope measurements that will help identify potential failures within the pit wall.

Previously the large and complex waste dumps and stockpiles around the mine were measured using airborne laser scanning. The expense and long lead-time for such surveys meant that they could only be carried out periodically and interim surveys were carried out using a low-end vehicle mounted GPS rover system. By using a system called SiteMonitor that uses Riegl laser scanners, the surveyors can



perform fast, highly accurate volume measurements with zero lead-time and at a much lower cost whilst reducing vehicle wear and tear and improving the safety of personnel.

A further development of this technology is SiteMonitor Volumes that creates a dynamic 3D model of the surrounding terrain allowing volume differentials to be automatically calculated. The solution integrates the latest laser scanning hardware with easy to use software to automatically record, calculate and monitor volume measurements. Although first developed for the mining industry, SiteMonitor Volumes has applications in a number of other sectors including archaeological excavations, environmental monitoring and construction projects.

Another interesting development in laser scanning technology may have considerable potential within the waste and contamination sectors. The 3D-R1 remote operated survey vehicle, developed by 3D Laser Mapping in partnership with Jobling Purser RSV LLP, was originally designed for use in underground mining operations to reduce the risk to the survey operator and improve operating efficiencies. It was developed from a prototype vehicle first designed by James Jobling-Purser as part of an undergraduate project at the Camborne School of Mines part of the University of Exeter.

As the 3D-R1 is remotely controlled it is effectively an electronic eye – suitable for use in dangerous or inhospitable environments. This makes it ideal for deployment in areas of high contamination or where site activities do not allow for human presence. The robot is also small enough to enter confined spaces.

Following a recent deployment in a silver mine in Mexico the project manager Owain Morton, Mining Engineer for Arian Silver concluded "3D-R1 is extremely efficient, the speed of data capture is astonishing and the end results far exceed anything that can be produced by conventional surveying techniques."

As the pressure for land increases, urban regeneration and effective waste management will become increasingly important. With laser scanning technology enabling fast, highly accurate surveying and ongoing safety monitoring, the waste and contaminated land sectors will see significant benefits as applications are developed both within and beyond the industry.

Graham Hunter, MD 3D Laser Mapping, Nottingham.