Subsurface Utility Engineering

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A Clearer View Beneath the Earth

Locating and identifying underground facilities, especially in large or highly congested areas, has just gotten easier. A new technology, called 3-D underground imaging, lets you see in three dimensions what lies beneath the ground. Clear pictures and maps of structures such as buried utility lines, trenches, storage tanks, rock formation, even voids.

3-D underground imaging adds another dimension to already robust Subsurface Utility Engineering (SUE) locating and mapping capabilities. In fact, in some situations, especially in areas with few anticipated underground facilities, the more conventional subsurface utility 2-D designating, locating and mapping services are all that's necessary. However, in areas with a known high volume of underground facilities - such as in highly urbanized areas with multiple buried lines - 2-D technology may miss some features due to heavy congestion. That's when 3-D underground imaging excels, because it sees in three dimensions, not just two, providing a full, not flat, view of what is there.

The 3-D underground imaging unit, which measures eight feet wide by three feet deep by 2 1/2 feet high, is pulled by a small all-terrain vehicle and can scan approximately one acre per day.

Unlike conventional ground penetrating radar (GPR), 3-D underground imaging includes 14 radio-wave channels, not just one. It collects underground data in 5.12-foot-wide swaths, recoding in one-inch increments, for 100 percent coverage of the area being investigated. While traditional designating and locating efficiently finds underground utilities in many situations, 3-D underground imaging is an ideal alternative in larger or wider areas.

In the post-processing phase, special software converts the captured data to standard CAD/GIS format, which can be customized for compatibility with clients' internal databases. The pictures are so distinct and well defined, it's hard to believe the facilities can be up to more than ten feet below ground not above it. Not only does it capture an accurate view, but because it works in three-dimensional cubes instead of two-dimensional slices, the 3-D technology is able to locate and map features that may be missed by traditional 2-D technology, providing a more accurate and comprehensive view of below-ground structures. Thus, 3-D underground imaging is an ideal alternative in areas with a high degree of underground congestion.

The equipment is convenient and easily transportable. The unit itself measures eight feet wide by three feet deep by 2 1/2 feet high. It is pulled by a small all-terrain vehicle and can cover a large amount of ground - approximately one acre per day. Because of its 14-channel capability, 3-D underground imaging is much quicker that its 2-D counterpart in identifying below-ground structures, making it potentially more cost-effective when working in larger areas. Its border coverage enhances the ability to map what's located underground providing much more information about what lies beneath. On a one-acre site, for example, 3-D underground imaging collects 1.6 million radar scans, which takes about one day. Using conventional 2-D technology to collect the same data on a one-acre site would take about four weeks. Furthermore, all of the captured information can be viewed as one picture, providing a comprehensive view and making decision making much easier.

Because of the increased information 3-D underground imaging provides, it may be more cost-effective than other investigative methods and may also eliminate the need exploratory test holes... or at least reduce the number. What's more, it's fully GPS-integrated to produce accurate coordinate maps.

"We recently used the technology and our TBE processes at an energy plant that was retrofitting its facility," said John Harter, TBE Group Vice President, who oversees engineering and operations in the firm's utilities division. "USing 3-D underground imaging, our crew discovered numerous underground utilities and other structures, previously unknown, that would have

remained undetected if we had used only traditional designating procedures and technologies. Rather than risk hitting these underground facilities, the energy company decided on a redesign."

Using 3-D underground imaging can enhance the accuracy of project designs and cost estimates and can streamline the construction phase of any project. It captures the total picture of what's located underground.. in all three dimensions.

Credits

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The Georgia Engineer
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Reducing Utility Risks

A partnership led by the Virginia Dept. of Rail and Public Transportation (DRPT) is planning a 23-mile extension of its Metrorail, from the Orange Line, near Falls Church, to Route 772 in Loudoun County, beyond Dulles Airport. The $4-billion dollar public private partnership. Known as Dulles Corridor Metrorail Project, is one of the most complex projects ever undertaken in the Northern Virginia area. The planned alignment will encounter nearly every utility that supports one of the largest commercial areas in the United States.
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