BY Matthew J. Wolf

UTILITIES ARE NOT THE ONLY CONFLICT LURKING UNDERGROUND

Advances in array tech data collection and software processing are mainstreaming the platform for use by a diverse range of professionals such as geomatics/geospatial surveyors, engineers, and geoscientists as the technology provides a comprehensive "view" of the underground. In fact, coming soon is ASCE 38-21 which is the long-anticipated update to 38-02. The title for 38-21, Standard Guideline for Investigating and Documenting Existing Utilities increases the scope for Subsurface Utility Engineering (SUE) investigations to include additional conflict information regarding the subsurface. An important addition is the inclusion of Multi-Channel GPR (MCGPR) and its integration into the process. The use of MCGPR arrays is proven to be the most effective method to obtain information of the overall utility corridor rapidly and there is no equivalency to any 2D GPR process-period.

Yes, it can be argued that MCGPR is a geophysical instrument, but with any technology as it advances the early adoption phase is ephemeral. The method is no longer a tool only to be mastered by geophysicists any different than an optical physicist is needed to collect LiDAR data. The proliferation of LiDAR in recent history was made possible with advancements in GPS and inertial technology so that millions of measurement points are spatially correct from down range. If one looks at arrays and its corresponding data collection processes it is also heavily dependent on absolute positioning. Similar to LiDAR, RTK GPS and robotic total stations are essential to the ultimate solution. A GPR trace and its return energy is arguably more complex than a laser, but with arrays and advanced processing this nuance is more opaque than ever to the user and that is the natural progression of any tech. How many people reading this knew ten years ago they would be able to fly a drone with precision inertial stabilization systems, the origins of which were developed for aerospace.

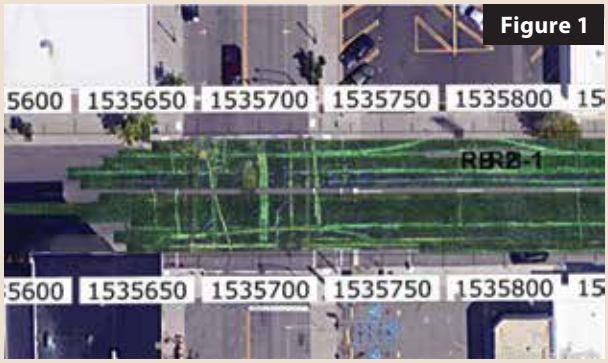

Figure 1

Figure 1, Osprey View 3D view of portion of street corridor Spokane, WA. Data courtesy of GEL Solutions LLC and David Evans & Associates.

Circling back (pun intended) to 38-21, the level of imaging from MCGPR arrays can effectively image the very features added to the standard. In the example in ***Figure 1*** there is clearly a duct bank and associated vault. Both are easy to extract into the CAD deliverable, but the added value is the ability to accurately measure the dimensions in seconds. Imaging in many instances is so robust the pipe joint ***(Figure 2)*** can be measured! These and other subsurface features are a few examples of the additional information that are included into the utility report for 38-21.

The timing of the release of 38-21 perfectly coincides with this revolution. New to the standard will be the documentation of other features in the underground. This includes, but is not limited to, thrust blocks, buried foundations, vaults and their respective dimensions, or any other relevant conflicts that may be identified to aid in the overall goal of a SUE investigation and that is mitigation of conflicts pre-design pre-construction.

Visualization processing tools for MCGPR array data takes minutes rather than hours and the staffing of the proverbial rocket scientist just a year ago! Within this revolution is a visualization tool loosely named Thick Slice Processing that is changing the streetscape in terms of ease of interpretation and extraction of utility and other subsurface features. The level of detail that can be extracted from data such as these is not remotely achievable with any other subsurface utility method. This is a bold statement but any casual inspection of the data set in ***Figure 1*** backs this up. The section is from an actual MCGPR survey in Spokane, WA and is a portion of the two miles surveyed. The MCGPR data is from a portion of a full block that was surveyed at posted speeds in about 20 minutes; processing time to this image is ten minutes. The representation is a comprehensive view of all utilities detectable with MCGPR from the surface to the maximum penetration depth of the GPR signal. The lighter green and yellow are near surface and the darker greens and blues are the deeper utilities. The process is aptly named Osprey View as it mimics the venerable aerial predator peering through the water column to secure a piscatorial meal in its talons!

Safe Site Utility Services LLC, a Glendale, Arizona based company, provides advanced subsurface utility mapping services throughout the southwestern U.S. One of their ongoing major projects requires the designating of utilities for the design of solar power generating systems for a local school district. The company was hired by a design firm to locate potential solar sites at 22 school campuses that had been renovated and redeveloped over the years. The design firm was unable to obtain good utility records for these properties and hired Safe Site to locate and map all active, abandoned, unknown, and non-metallic utilities to avoid surprises and the associated cost overruns and delays during the construction phase.

As company owners Tim Story and Dan Bradley describe it, "we had just acquired the MCGPR unit and offered it as a possible solution

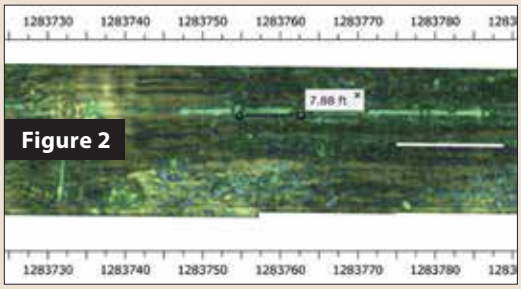

Figure 2

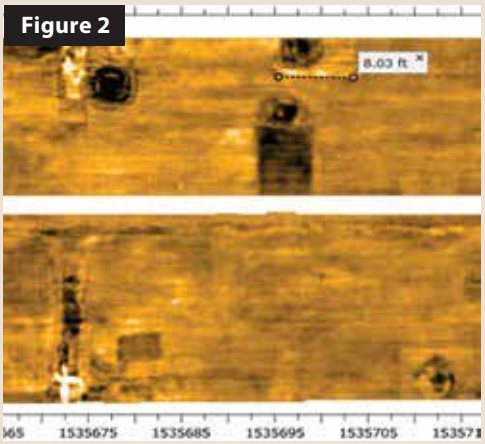

Figure 2

Figures 2, Osprey View 3D and standard 3D array image illustrating ancillary information such as vault exterior dimensions and pipe joints.

to their problem. We used it along with our other systems and at many of the schools we found unknown/undocumented active utilities or abandoned facilities. We were extremely impressed with the results. The effectiveness of 3D GPR is site-specific and soil-dependent, but we have had great results finding non-metallic pipes, storage tanks, fiberglass fuel lines, trench lines/excavations, buried structures, etc." ***(Figure 3)***

The soon to be replaced 38-02 did not clearly address other potential conflicts for future design and construction but a conflict is a conflict whether an unknown utility, abandoned tank, remnant foundation, or other unknown structure/facility. The addition of MCGPR arrays is logical as it is not fringe technology anymore and as illustrated here is unmatched in its ability to provide comprehensive GPR information without any need for street closures and/or having personnel in the street corridor. One could easily make the case that using a 2D GPR on large scope, or a very dense utility corridor project, is not the best solution available if the goal is to provide the best information or best practice.

An additional unforeseen conflict may actually be lurking within your respective organization itself as the old guard just has not caught on to MCGPR due to past inefficiencies in both data collection and particularly the data processing. This is akin to climbing on top of a ladder or rooftop to get that aerial photo of the project site rather than using a drone. A better solution has arrived. DP

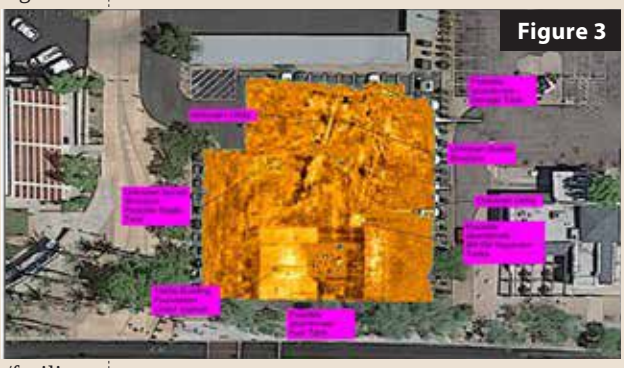

Figure 3

Figure 3, Multiple subsurface conflicts in addition to utilities discernable with MCGPR.

Matthew J. Wolf is President of ImpulseRadar USA, Inc.

Note: ASCE 38 Updated Information Courtesy of Jim Anspach P.G. PG (r), Dist.M.ASCE Chair, ASCE 38 UESI Pres 2018

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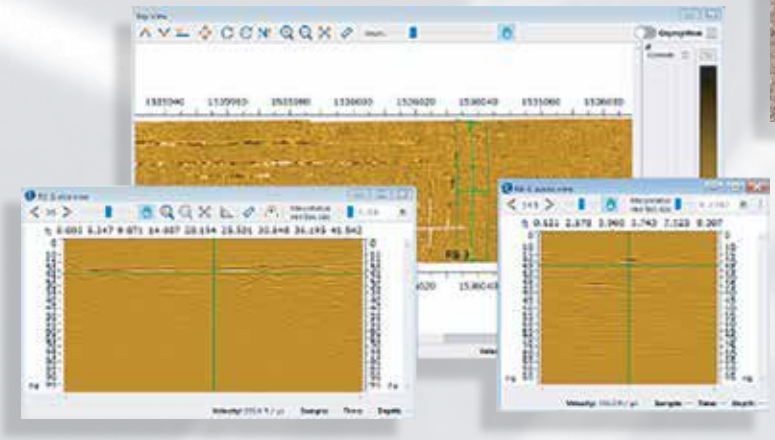

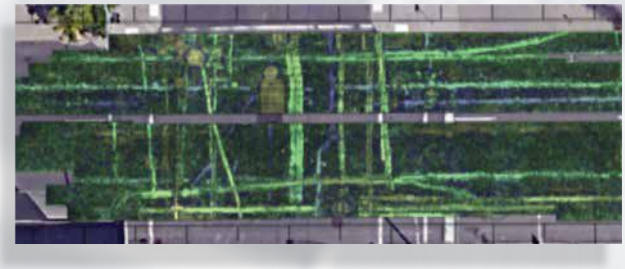

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www.impulseradargpr.com
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ImpulseRadar Sweden AB Storgatan 78 SE 939 32 Malå, Sweden | +46 953 100 08
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