WHY SUBSURFACE UTILITY ENGINEERING (SUE) AND NOT JUST 811?

We've all heard this sentence before: "We don't need to spend money on SUE when we can just use 811 marks!"

Well...that depends on what you are trying to accomplish.

I have over 23 years of combined experience spanning both the 811 Industry and the SUE Industry - and I have a huge amount of respect for both - but the two industries *could not* be more different. One is used for designing and planning projects, while the other is used for immediate excavation damage prevention.

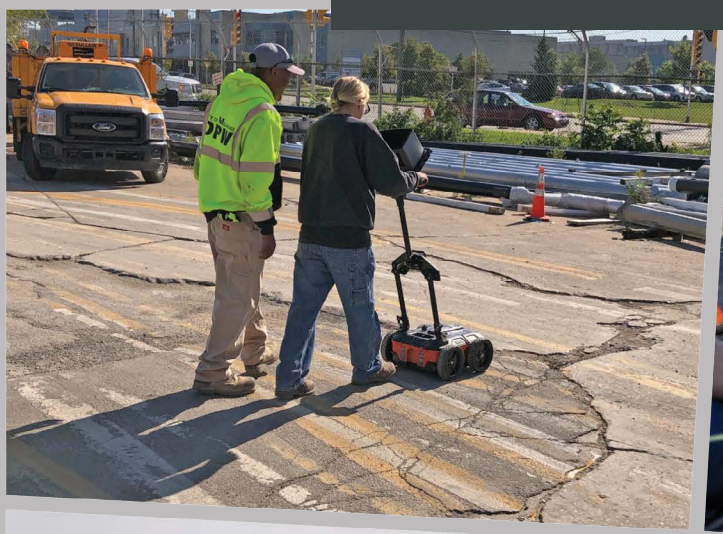
They are both extremely important...just different.

Which one is needed in each situation depends on several factors, such as:

- State law requirements
- When excavation is taking place
- Whether the data will be used in the design/planning process or as a direct precursor to excavation
- *Many more...*

BUILT TO LOCATE AND MAP UTILITIES

EASILY AND ACCURATELY



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SCAN ME FOR MORE INFORMATION

811

The 811 industry's purpose is to *increase excavation safety* and *reduce dangerous and expensive damage* to vital underground utilities. It protects excavators, homeowners, the public, and others from project delays, injuries, and even death.

A technician working directly for a utility company (or working for a company *hired* by a utility company) will receive a ticket that is "called in" to 811 by the individual performing the excavation. The technician has, at most, 48 hours to mark the utilities they are responsible for within the requested work area - regardless of the magnitude of the ticket. They will still have to mark all applicable utilities within 48 hours, whether they are *at one single address* or span an *area 10 miles long*!

The technician will use electromagnetic Pipe and Cable Locators (PCLs) to identify the location of the utility they are responsible for within a certain tolerance zone (typically 18" to 36" horizontally, depending on state law). The path of the utility is marked on the ground with paint and flags using standard American Public Works Association (APWA) colors.

Tools Used:

- PCLs (usually only one type instead of a full suite).
- Records from utility owners.

Pros:

- Completed within 48 hours.
- Used to give excavator paint and flags on the ground to avoid utilities.
- Increases the chances of safe excavation in nearly all cases.

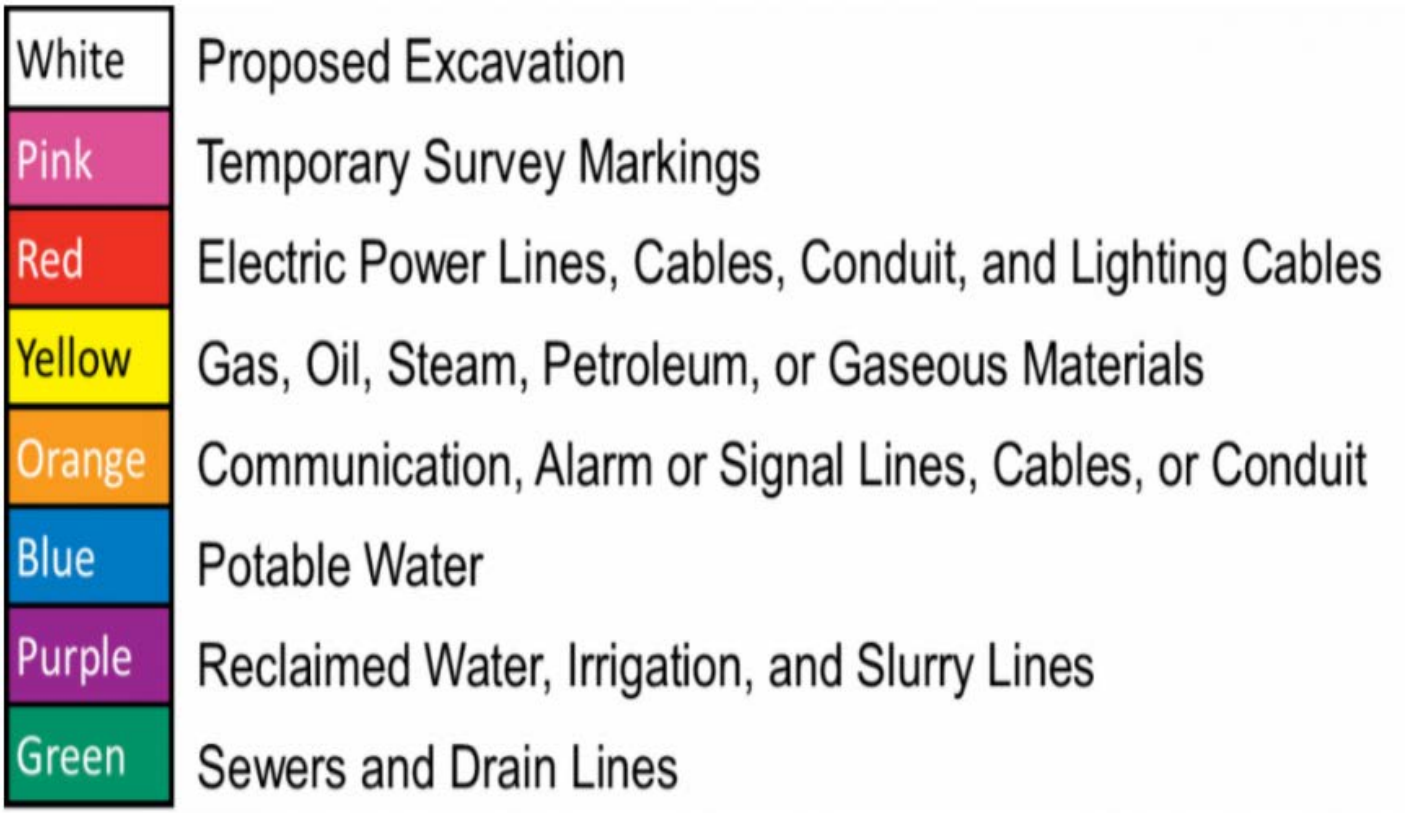
Cons:

- Primarily a production-based industry technique because this method is based on "per ticket pricing." This results in the field technician often being rushed, which can cause the quality and accuracy of the work to diminish.
- Only utility owners who have signed up for the 811 service will be notified; any utility owners who have not signed up for this service will have unmarked utilities in the field that are in danger of a strike.
- A field technician's training is often limited to *2 to 4 weeks*, at most.

Subsurface Utility Engineering (SUE)

As discussed in *ASCE/UESI/CI 38-22 "Standard Guideline for Investigating and Documenting Existing Utilities,"* the Subsurface Utility Engineering (SUE) industry's purpose is to acquire, process, characterize, assess quality, and present utility information for project development, led by a professional engineer in responsible charge who is subject to relevant liabilities and statutes regulating professional engineering.

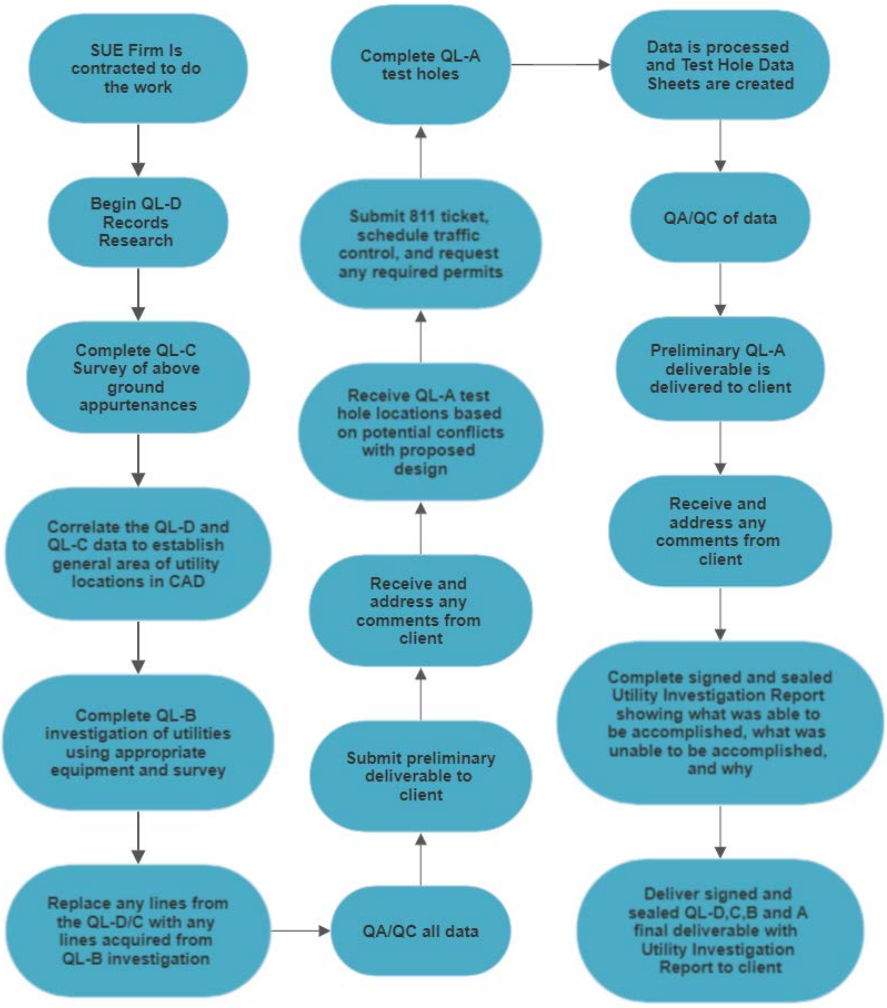
SUE uses civil engineering practices to collect data about existing utilities. This includes the use of traditional and emerging



collection and documentation with advances in geophysical investigation and data management technologies, design and construction knowledge of past and current utility systems, and scientific concepts for assessing and defining the quality and relative uncertainty of utility information. The practice of SUE leads to deliverables that are signed and sealed by responsible professionals who directly oversee the Utility Investigation and develop the resulting documentation of existing subsurface utilities at their achieved Utility Quality Levels.

SUE Quality Levels

- **Quality Level D (QL-D)** — This Level is the most uncertain as to a utility's location or existence. The SUE data is derived from records research, as-builts, oral recollection, Texas811, etc.
- **Quality Level C (QL-C)** — Collecting QL-C SUE data involves using QL-D data and surveyed surface visible utilities features (valves, handholes, pedestals, manholes, etc.) to obtain a better understanding of the potential horizontal alignment of the subsurface utility. QL-C SUE data is *less* uncertain than QL-D SUE, as it is tied to visible surface indications. However, whether the utility passes directly through or is offset from the surface indications is part of the uncertainty. To reduce this uncertainty all access points should be opened - except those that present concerns for safety or security.
- **Quality Level B (QL-B)** — Collecting QL-B SUE data involves the use of surface geophysical methods, coupled with QL-D and QL-C SUE data, to "designate" the approximate horizontal alignment of utilities. QL-B SUE data is less uncertain than QL-C or QL-D SUE data. The uncertainty of the applied geophysical method, such as using a PCL, is affected by depth and soil types (moisture content, metallic salts, etc.) and can be distorted by other electromagnetic fields or other conductive utilities in the area. The PCL geophysical method has two parts — first, a "transmitter" creates a signal that is fed into a conductive element of the utility (found at valves, handholes, manholes, etc.) and then a "receiver" can then follow along on the ground for the strongest emanations of that signal. These points are then flagged, surveyed, and mapped.



- **Quality Level A (QL-A)** — This is the *least* uncertain Quality Level for a specific location. Collecting QL-A SUE data involves utilizing non-destructive methods to directly expose and measure the utility both horizontally and vertically. One uncertainty for Test Holes that needs to be addressed is to make sure you are measuring the intended utility. QL-A SUE data is typically collected using high pressure air or water and vacuum excavation. It can also be performed by hand-digging on shallow utilities. In either case, it must be non-destructive to the utility.

Tools Used:

- Multiple PCLs (RadioDetection, Vivax-Metrotech, Subsite, etc.)
- Survey GPS Units with Data Collector
- Survey Total Stations
- Ground Penetrating Radar (GPR)
- Acoustic Locators
- Sonde
- Schonstedt Magnetic Locator
- Witching Sticks
- Tonable Rodder
- Grade Rods (for inverts and test hole depths)
- Vacuum Excavation Trucks
- Coring Machine
- Rock Bar
- Traffic Control (signage, attenuator truck, etc., based on roadway regulation requirements)
- CAD Software (Autocad, Microstation, etc.)
- 3D Scanner for vault mapping

Pros:

- Field technicians are given the necessary time to properly investigate utilities in and around the project limits.
- Field technicians typically utilize a full suite of necessary tools to properly investigate.
- Field technicians document access points, equipment used, frequencies, etc. to ensure all data is repeatable.
- The methods utilized typically result in more precise utility locations.
- Utility locations are surveyed in for future use by designers.
- QL-A test holes provide most accurate location of utility.
- A documented QA/QC process ensures deliverables are as accurate and complete as possible.
- The entire SUE investigation process is under the responsible charge of a Professional Engineer.

Cons:

- Can be costly*.
- Requires more time to complete due to the thoroughness of the investigation performed.

*Although SUE requires upfront costs that are not always accounted for in project budgeting, multiple studies between 1999 and 2012 by USDOT, ASCE, the Ontario Sewer and Watermain Contractors Association, PennDOT, and the Region of Lombardy show that in many cases, the total project savings incurred by using SUE *greatly* outweigh the cost. For example, a 2012 study by PennDOT of 22 SUE and 8 non-SUE projects showed an *11.39:1* Return on Investment (ROI) for the projects that used SUE. In other words, the study showed that $11.39 can be saved in project costs for every $1 spent on SUE on road projects[1].

ABOUT THE AUTHOR

Marc Hendricks has over 23 years of experience in the Utilities industry. He started his career as a field technician and has served as a SUE professional for the last 7 years. He serves as the Director of Utilities overseeing Texas and Colorado for ARS Engineers Inc.