



Utility Locating Terminology & Equipment Guide

Utility Survey Corp.



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“Utility Locating” is a very general description. It is probably the most commonly used term but there are also several others – which can be confusing. The following will explain these terms and help you be clear about what you should expect to be getting when asking for an Underground Utility Locating Survey.

Utility Locating

- “Utility Locating” is also often referred to as a “Locate” or a “Markout”. However, none of these three common descriptions calls for, or implies, any specific methodology or the use of any particular piece of equipment. And that could result in two particular problems occurring for the unwary:

1. The client doesn’t fully understand what it is exactly he or she will be getting. They could believe they will be getting a comprehensive utility locating service when in fact they’re not - and that could lead to something really bad happening.



2. An apples-for-apples service provider comparison is impossible because there isn’t enough information with which to make a comparison. This could lead to someone showing up to do a job they’re not equipped for, trained for, or capable of doing in the way a professional [utility locating](#) project should be carried out. This could also result in a bad outcome.

Toning or Scoping

- “Toning” or a “Tone-out” and “Scoping” are terms that tend to refer specifically to Electro-Magnetic Radio Frequency (EM/RF) locating instruments. These instruments can only find utilities made of metal; i.e. a steel water pipe, an electric cable, telephone wire etc. The instrument sounds off a tone when it detects a utility; hence the term.

It's usually those who are familiar with the public utility One-Call type locating service, such as contractors and excavators for example, who tend to use the term “tone” or “tone-out” or “scoping”. This is because the One-Call industry only uses EM/RF-type locators.

A typical One-Call locator may only have one EM/RF-type locator when they go out to “tone a line”. If that particular instrument's operational frequency is not able to find the “line” that is all they are able to provide. This is a serious limitation in the quality of service a client can expect.



Utility Locating Terminology

Scanning

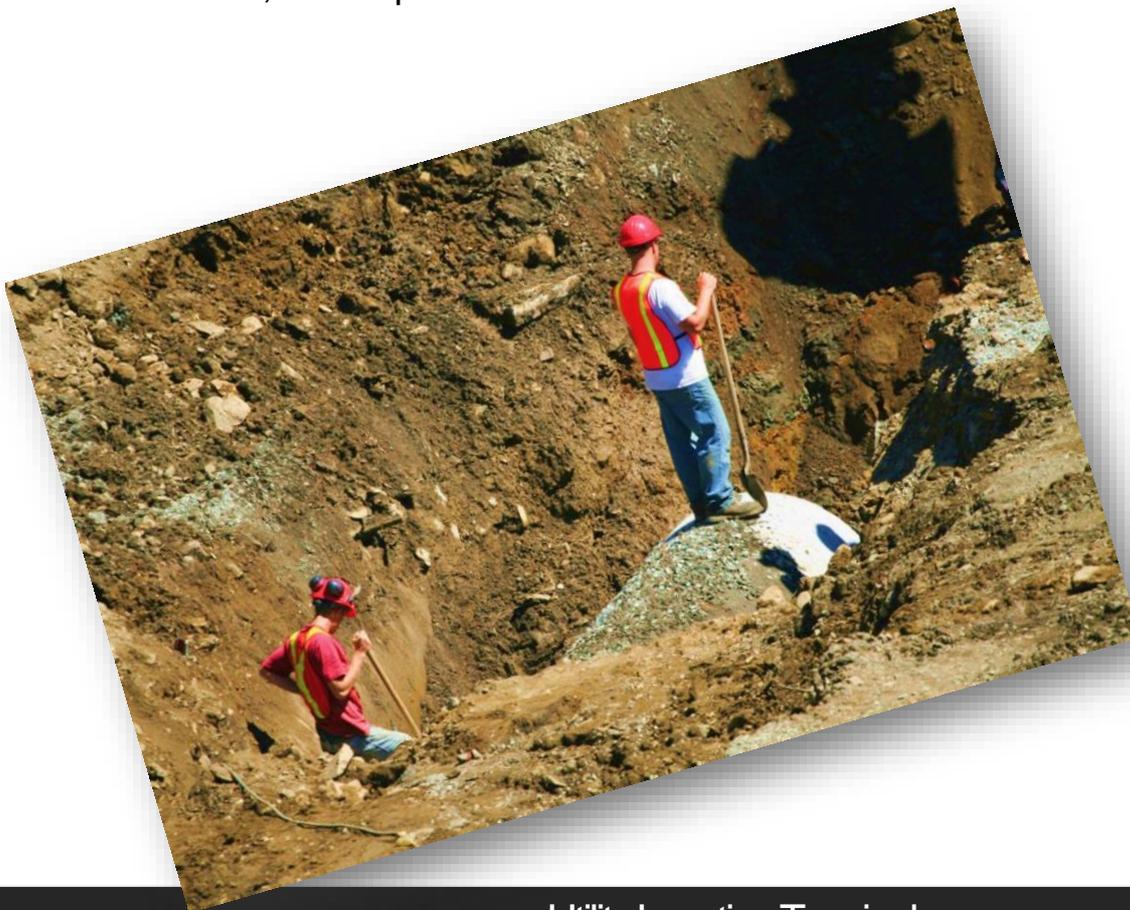
- The term “Scanning” is about as close as it gets to a reasonable description when the client understands they need a thorough, professional, utility locating service.

However, the question, “Scan with what?” isn’t usually covered or thought out. And, that’s a very important omission. Scanning with just [Ground Penetrating Radar](#) isn’t enough. Scanning with just an EM/RF locator isn’t enough either.

A comprehensive utility “Scan” should be, and can only be carried out effectively by using a combination of Ground Penetrating Radar and EM/RF locators – that must be operated by professional technicians who are trained, skilled, and experienced in their use.



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Our experienced utility locating team provides services to excavators, concrete and construction professionals, environmental and engineering consultants and property owners throughout NY, NJ, CT, PA and the whole northeast.

Utility Locating Terminology

X-ray the Ground

- “X-raying” is what prospective clients typically confuse with Ground Penetrating Radar. We wish we could “X-ray the Ground” and see what’s there” but it’s impossible.

Even if it was possible to x-ray, the radiation given off would make for too hazardous a work environment to be practical.

Ground Penetrating Radar is the only locating technology that has the ability to “look” into the ground. But, as good as GPR is at what it can do, it does come with its own limitations too.



Ground Penetrating Radar (GPR)

The most often misstated description we hear when people call US for a utility locating survey is to ask for a “Ground Penetrating Radar Survey” or “GPR Survey” or simply, a “Radar Survey”.

These descriptions are misstated because there is an incorrect assumption that [Ground Penetrating Radar \(GPR\)](#) is all that’s needed to successfully find all utilities. However, GPR cannot be guaranteed to do that.

GPR is a very expensive, high-tech, piece of equipment but it should never be used as a stand-alone to undertake a comprehensive utility locating survey. It cannot and will not find all utilities all of the time. To believe it will is a potentially dangerous misconception.

Electro-Magnetic/Radio Frequency Technology (EM/RF)

EM/RF locators are designed specifically for finding underground utilities made from metal such as steel/iron gas and water pipes, and electric and communications cables etc.

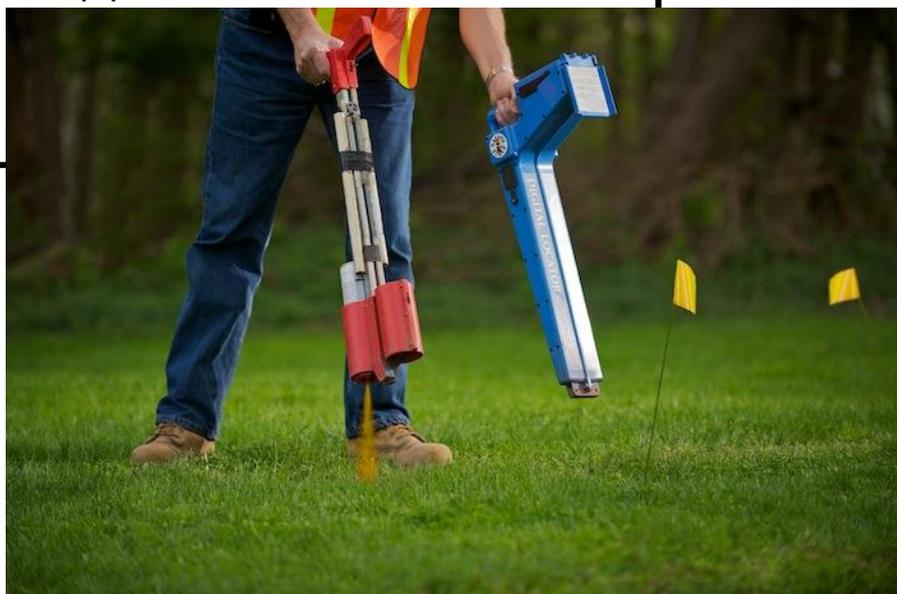
EM/RF Locators work in two ways as follows:

i) Conductive: A radio signal is transmitted onto the pipe or cable to be located by making a direct connection to it at some accessible point. This access point will be a valve or hydrant on a water system for example. The path of the utility is then identified by an audible tone on the receiver component of the locator.

ii) Inductive: This mode is used when no accessible points to the utility are available. Instead, the radio signal is transmitted into the open environment. The path of the utility is identified by an audible tone on the receiver component in the same way as it is in the Conductive mode.

Most EM/RF locating instruments have a depth readout feature. For those that don't, the depth of a utility can be determined by a technique known as triangulation.

It is important to note that there is no one EM/RF locator that will detect all pipes and cables all of the time. This is due to the differing physical attributes of each individual pipe or cable and the environment in which they live.



Utility Locating Equipment

Electro-Magnetic/Radio Frequency Technology (EM/RF) (Cont.)

Utility Survey Corp. service vehicles carry locating instruments from several different manufacturers that operate on a wide range of radio frequencies. These vary from 10Hz to specialty locators at 480kHz.

Some locators are of a single-frequency design while others operate on multiple-frequencies. The knowledge, skill, and experience, of the Utility Survey Corp. technician will determine what will be the most effective locator for any given job.

Utility Survey Corp.'s locating professionals carry at least three different types of EM/RF locating instruments. This is because there isn't any one EM/RF instrument that will work effectively in all conditions. Different instruments come with different operational frequencies and one instrument may find the pipe or cable when another cannot.

Cable Avoidance Technology (C.A.T.)

The name of the instrument "Cable Avoidance" is a little misleading because, as well as being a very capable cable/wire locator, it is also extremely effective at detecting metal pipes too.

Just as with our EM/RF locators, the Radio Detection C.A.T. is also used in conjunction with a transmitter (Genny) in conductive or inductive modes. However, the C.A.T is unique in that it can also be used as a stand-alone receiver in two separate passive modes; Power and Radio.

It is in these two operating modes that the C.A.T. is used as a primary locating instrument by Utility Survey Corp. technicians for a first scan of the survey area. By sweeping the job site in a grid pattern in both modes, the technician can gain a fairly quick indication of the general layout of any metal utility pipes and cables.

This first scan with the C.A.T. will then be followed up with the GPR and EM/RF instruments for further verification and accurate positioning of the buried utilities.



Ferro-Magnetic Technology (FM)

Ferro-Magnetic Center-Mass type instruments are commonly known as metal detectors or box locators. They're not however, the traditional type of metal detector we use to search for hidden treasure, but instruments designed specifically for the utility locating industry.

Typical targets for our applications will be buried metal manhole and valve covers/boxes and steel USTs and drums.

Utility Survey Corp. utilizes FM instruments from several manufacturers such as the CST Magna Trak 102 and MetroTech 880B. The instruments are hand-held, highly portable and designed to detect ferrous metal-mass objects down to a depth of 15 feet depending on object size, environmental conditions, signal penetration, etc.

The procedure is to sweep the survey area with the FM instrument in an x-y grid pattern. A tone will be generated when a ferrous metal-mass object is detected indicating its position beneath the ground.



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Utility Locating Equipment

Ground Penetrating Radar (GPR) successfully detects metal-based utilities but its wider application is for non-metallic ones such as plastic gas and water pipes, fiberglass USTs, and hollow voids etc.

There are two types of Ground Penetrating Radar systems used in utility locating:

- i) a cart-based design for finding utilities, objects, and features buried under the ground, and,
- ii) a portable hand-held design for finding utilities, rebar, post-tension cables, and voids concealed inside concrete structures.

The GPR antenna sends a radio signal into the ground or concrete structure which then bounces off any target it detects. The signal is received back at the antenna for processing.

Utility Survey Corp.'s cart systems operate on frequencies of 250/270MHz or 500MHz.



For [concrete structure scanning](#) our portable systems operate on frequencies of 1GHz, 1.6GHz, and 2.6GHz. We also have a very compact system for getting into tight corners with a frequency of 2GHz.

Utility Survey Corp. uses the latest cart and portable GPR systems with antenna configurations optimized for both ground and concrete scanning.

Both cart and portable GPR systems display a target's information on an integrated computer in real time showing its horizontal position and depth.

Utility Locating Equipment

Utility Locating Case Study

Recently, one of our technicians was asked to locate utilities at a site that another utility locating company had already been called to for a utility mark-out. However, the contractor, found he was hitting unmarked utilities while excavating.

Following our “10 Step Utility Locating Protocol™”, our technician performed a comprehensive utility mark-out of the work area. Our client was pleased that we located more utilities than were marked by the previous utility locating company. This included a water line the client knew was in the area but they had been unable to find.

At the end of the first day, the client wanted to test the validity of our technician’s marks. He did this by hand-digging, which revealed site-lighting electric wires, the markings of which were right on the money.

On the second day of the job, our technician located another water line which was running directly along the path of the client’s proposed excavation

A most interesting and unusual find on this project was a set of railroad tracks “seen” by our advanced Ground Penetrating Radar system (GPR). Again, these were running directly through the client’s proposed area of excavation.

As can be seen from this job site, things other than those typically classified as a utility (i.e. objects, hazards, and any variety of obstructions) can still present a problem for the contractor if they’re not detected and marked-out.

The lesson from this site is that there is always the potential for hidden surprises and that by following our “10 Step Utility Locating Protocol™” our technicians will locate these dangers before the excavator does.

*Download our
“10 Step
Utility
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today to
learn the
process our
technicians
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*We Give
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with
Confidence”*