

## Handheld Pipe Locator

**Description:** An alternative locate tool using ground penetrating radar (GPR) and providing real-time image identification to mark out underground plastic pipes and other facilities.

**Status:** Successful GPR prototype field tests. Commercial optimization is underway.

### BENEFITS

The handheld pipe locator offers significant benefits related to the costs of third party damage, repeat locates and excavations to verify the presence or absence of underground facilities, and improved safety.

Specific areas of potential benefits include:

1. Reduced number of hits and costs to repair damaged pipe
2. Alternative tool when troublesome facilities can not be found with traditional tools
3. Reduced repeat locates
4. Savings over current pipe location surveys; improved productivity
5. Savings reduction in personnel required for traffic management where needed
6. Reduced number of test pits for new construction (stakeouts for new construction)
7. Reduction in construction costs from more accurate pre-engineering
8. Avoidance of damage penalties
9. Reduced system downtime and customer disruption; ability to use keyhole over full size excavation
10. Increased safety with confirmatory locates

A conservative and rough estimate of savings from deployment of the handheld pipe locator for the group of NYSEARCH member companies is approximately \$3.0 million per year.

### BACKGROUND

Improving locating techniques remains a high priority for underground utility operators. Following a technology scan and brainstorming session conducted by NYSEARCH and others for long-term research needs, NYSEARCH developed a project that sought a low-end

construction crew check tool used strictly for on-site markout of facilities. The tool is targeted to be portable, operable by one field person, address facilities of a wide range of materials ranging in diameter size of ½” to 30”, and provide high accuracy. Through its prior work and evaluation of ongoing projects, the committee acknowledged that, unlike current and recently commercialized pipe location devices, a handheld tool must make a quantum leap and overcome a collection of technical barriers such as: use of a free floating antenna that does not require contact to the ground, is low cost, is low in weight and is low in power requirements, and provides data easily useable by a technician.



Figure 1: Demonstrating Prototype GPR Bistatic Antenna

The field tests of two different generations of the bistatic antenna design, and then a first generation of the monostatic antenna design, indicated that the product is meeting specifications and that the users are accepting this tool.

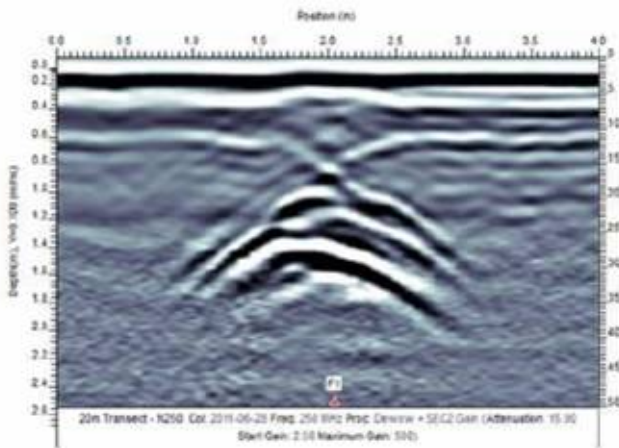


Figure 2: GPR Raw Image Response to Underground Facility

## TECHNICAL APPROACH

NYSEARCH contracted PipeHawk plc to develop a low-end construction crew check tool that can be widely applicable among utilities, construction companies and others who excavate near underground facilities.

In Phase I, working with the NYSEARCH sponsors and a prospective commercial partner, detailed product specifications were established. PipeHawk set out to establish proof-of-concept for an air coupled antenna, define a position sensing system, establish a processing and software approach that would provide target identification in real time, and assure that power and cost targets could be met. PipeHawk researched and tested several ground penetrating radar (GPR) antennas and selected the most promising for use. Demonstration of the handheld prototype GPR unit has proven successful in finding underground facilities, as shown in Figure 1.

In Phase II, the work included design, assembly and functional tests on two “demonstrator” prototypes. Detailed analysis was performed to fully address functional, mechanical, power, and software requirements.

The GPR imaging response is highly interpretive and requires training and experience to fully utilize. Software developed to ease the interpretation of the raw imaging data has eased the interpretation of the location of underground facilities. Figures 2 and 3 illustrate the raw GPR data and the interpretive display identifying underground facilities.

FCC issues pertaining to radiation limitations for new GPR antennas were addressed. In addition, to reduce the bistatic antenna size, a second antenna design, a monostatic head with the receiver and transmitter in one unit instead of two, was designed and field tested. It not only met FCC requirements but also demonstrated sufficient performance.

Efforts to expose the successes of the GPR Handheld unit were made in 2009 during a NYSEARCH/NY One Call series of tests and field demonstrations. Display and validation of GPR performance were conducted at four (4) utility field locations.

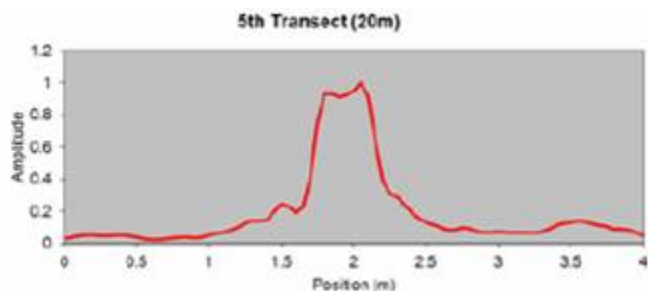


Figure 3: User Display with Curve Peak Indicating Underground Facility

## PROGRAM STATUS

NYSEARCH is currently working with a commercializer to consider handheld optimization and ergonomics. Formal market assessments, unit price points and manufacturing costs are being reviewed to determine the practicality of this device.

### Highlights

- Locate PE pipe without tracer wire
- Avoid “day lighting” costs for pipe location confirmation
- Ergonomic handling, simple to use, complements existing locate methods

For more information contact:  
[admin@NYSEARCH.org](mailto:admin@NYSEARCH.org)