Report on the Test Results of the Handheld Pipe Locator Demonstration May 2009

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Submitted by:
Daphne D'Zurko
Executive Director, NYSEARCH
Phone: 1.973.265.1900 x214
ddzurko@northeastgas.org

Mohamad Hatef
PipeHawk plc

EXECUTIVE SUMMARY

Drivers for continued R & D of a pipe location tool to find all facilities and be sold to facility locate companies, general contractors, construction equipment firms, utilities, etc stem from the growing problem and costs associated with third party damage. The overall objective of the NYSEARCH Handheld Pipe Locator program has been to develop a low-end construction crew check tool that can be widely distributed among utilities, construction companies and other companies who excavate near underground facilities. The tool is targeted to be portable, accurate and low cost ($10,000 or less) and used for on-site markout of facilities that range in diameter size of ½" to 30".

The objectives of the subject field tests and demonstrations are to: 1) display and validate the current performance of the handheld pipe locator prototypes that were originally developed and tested in the 2001- 2005 time period, and, 2) introduce the tool to additional stakeholders to demonstrate how this tool can aid damage prevention initiatives.

Three main requirements were considered central to the success of the handheld pipe locator product development program: the portable, off-ground nature of the device, the low cost and the ease of use. The units that were used for the May 2009 demonstrations were originally built as alpha and beta prototypes in the 2001 – 2005 time period to demonstrate in two different series of tests the feasibility of the major components of the handheld unit product and in particular to evaluate the performance of the new horn antenna in its two versions. For the May 2009 tests, the two units had to go through testing and refurbishment in order to be utilized during the field demonstrations.

A test plan was drafted to help prospective demonstration site hosts and test participants understand the boundaries of the test and the suggested means for selecting the sites. After delivery of the test plan for review and use by the host companies, several prospective sites were selected at four host companies, New York State Electric and Gas (NYSEG), National Fuel Gas (NFG), National Grid and Con Edison.

A total of (20) sites were visited over a two-week period and (36) targets were examined. A majority of the targeted utilities to detect were plastic pipe; however, some were steel and some were not gas pipe but nearby facilities such as water pipe or electric lines. Sites visited included rural, suburban and dense areas. For the most part, blind tests were performed by the PipeHawk plc operator. In some cases, the location of some of the targeted facilities were known. In other sites, targeted facilities were unknown. A goal of the test was to validate through other means and particularly through digging the actual locations of the facilities. In some cases, actual validation was not possible. Of the (36) targets that were evaluated, (28) facilities were verified through digging or use of other locating equipment.

During the two weeks of testing and demonstrations, the end users and observers had mixed reviews because of inconsistency in some sites as to signal predictions, multiplicity of signals and 'prediction lines'. In the case of one company, end users were

excited about the positive outcome for most of the sites tested. Yet in other companies, the end users and project manager also observed a lack of confidence by the unit operator in the information coming from the tool. Reflecting on tests performed in 2002 and 2004/2005, the unit operators did not have the same ease or confidence in using the tool as they did in those tests during the R & D phases of the project.

Quantitative results suggest a more positive outcome. From the numerical results, while 19% of counted targets were not detected (not including some that could not be counted because scan area and actual utility location were not in same area), 54% of those counted targets were within 6" accuracy, 69% were within 12" accuracy and 81% were within 18" accuracy and the same percentage for accuracy to within 24". One could also argue that the demonstration showed a high success rate given the accuracy and the fact that the prototypes were old and only partially upgraded.

The quantitative results do not account for varying depths of the targets. Comparing to our original specification with ideal targets, a +- 6" accuracy was expected for depths down to 24" and +/- 9" accuracy was originally expected for depths down to 6'. In general, the performance during the May 2009 tests was better for targets at 3' depths or shallower and could detect deeper targets but did not show encouraging results for depths down to 6' as was originally envisioned in the specification and shown in earlier prototype tests.

One of the challenges that was evident and discussed during the tests was the fact that there had been little use of the handheld pipe locator equipment since 2005 by the PipeHawk plc operators. This resulted in the lack of operator confidence and multiple and sometimes confusing predictions. Based on the project manager's and end users' observations of previous tests that had more concise and fewer predictions, there have been some setbacks in operator performance because of factors such as the passing of time, personnel focusing on other different types of locators, differing locate procedures and shift in focus to other tools or R & D projects. Other challenges included previously-identified issues that were left for a commercializer to address such as ergonomics of the tool, mechanical robustness, and variation during the scanning process in the height and angle of the antenna unit.

As an industry group who owns the commercial rights to this technology, the NYSEARCH/NGA sponsors (both within and outside New York State) will be discussing next steps to commercialization. The use of a portable, low cost and light-weight pipe locator, particularly for plastic, remains a priority and this handheld pipe locator has shown to provide innovation and in-roads to damage prevention.

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REPORT ON THE TEST RESULTS OF THE HANDHELD PIPE LOCATOR DEMONSTRATION

MAY 2009

1 BACKGROUND

Drivers for continued R & D of a pipe location tool to find all facilities and be sold to facility locate companies, general contractors, construction equipment firms, utilities, etc stem from the growing problem and costs associated with third party damage. In response to the continued strong need by the gas LDCs to develop and implement more accurate pipe location, NYSEARCH/NGA issued a Request for Proposal (RFP) in 2001 to select a novel means for advancing pipe location to a low-cost, low weight unit that could detect the lateral position of plastic pipe in real time.

The overall objective of the NYSEARCH Handheld Pipe Locator program has been to develop a low-end construction crew check tool that can be widely distributed among utilities, construction companies and other companies who excavate near underground facilities. The tool is targeted to be portable, accurate and low cost ($10,000 or less) and used for on-site markout of facilities that range in diameter size of ½" to 30". After completing evaluation of proposals from a widely-distributed RFP, in the first phase of the NYSEARCH/NGA R & D effort, the feasibility of the PipeHawk plc Handheld antenna design concept was proven. Then in a second phase, the full handheld unit prototype system was designed, developed and tested in the laboratory and in the field. Further, in an extension to the Phase II effort, a second monostatic antenna head design was completed along with system changes so that the development team and independent test houses could establish two means for meeting FCC emissions requirements, one with the original PipeHawk Handheld bistatic antenna head design and one with the single transmit/receive antenna that embodied the monostatic handheld unit.

At the end of the Phase IIb effort, through two sets of live field testing, the funders had proven that the monostatic and bistatic handheld pipe locator units had met the product specifications and test objectives. There were recommendations made both by the developer, PipeHawk plc, to improve the performance of the monostatic antenna and by the FCC lawyer to change test procedures so that the bistatic antenna unit would, like the monostatic unit, also meet FCC emissions. However, based on field test data and validation, the funders decided to focus on what was acceptable performance of the monostatic antenna design and move forward with technology transfer so that the commercial partner could fully evaluate the design choices for the unit to meet FCC emissions and so that the prototypes could be re-engineered for optimal ergonomic use by the company that would ultimately need to market the tool. The funders completed the Phase II b in early 2006 with high expectations and support for ongoing commercial licensing discussions.

Following intensive discussions with one leading Ground Penetrating Radar company who took serious interest in the tool and conducted licensing negotiations in a period from 2004 – 2006, negotiations ended in no agreement because that company was re-directed by their Board of Directors to focus only on several of their own new internally-researched products. This resulted in a long delay in completing the search for a commercial partner. In early 2008, two prospective commercial companies (one large and not directly involved in the gas industry and one medium-sized company who serve the gas industry) took interest in the Handheld Pipe Locator product. However, after some initial lab evaluation, due to the age and wearing of the prototypes, these prospective commercializers could not be convinced that the system was performing at a sufficient level; citing reliability as the main problem. Thus, in mid-2008, when the New York One-Call agency was searching for innovative technologies that would aid future tools to minimize damage prevention, the NYSEARCH funders decided to use their remaining funds for this project, to: 1) co-sponsor a series of tests and demonstrations to re-introduce this product, and 2) to give visibility to other end users and advocates from NY One-Call and DOT/PHMSA. [With the aid of NY One-Call, DOT/PHMSA provided cofunding for the test effort.]

While the paperwork was approved in 2008 to conduct the tests for the subject report, scheduling with the original PipeHawk plc engineers who could best operate the Handheld pipe locator units meant that the tests could not be performed until spring 2009. It was agreed by all co-sponsors to conduct the tests in that timeframe.

2 OBJECTIVES OF THE FIELD TRIAL

The objectives of the field tests and demonstrations are to: 1) display and validate the current performance of the handheld pipe locator prototypes, and, 2) introduce the tool to additional stakeholders to demonstrate how this tool can aid damage prevention initiatives.

3 BRIEF DESCRIPTION OF THE HANDHELD TECHNOLOGY AND THE PROGRAM LEADING TO THE AVAILABILITY OF TEST PROTOTYPES

Three main requirements were considered central to the success of the handheld pipe locator product development program: the portable, off-ground nature of the device, the low cost and the ease of use. Each of these requirements has its own impact on the overall design and in some cases were in conflict with each other. Thus a majority of the early R & D focused on the capabilities and modifications of various unique GPR antenna designs and proof that the selected design could meet the funders' product specifications.

When the program started, the general perception of the handheld was very much influenced by the existing portable detection systems such as the metal detector and radio detection devices. This meant that the handheld was not only required to be lightweight for the purpose of transport and storage but also was required to be light enough to be hand operated and utilize state-of-the art batteries that are lightweight and can operate for at least (4) hours. Being handheld meant

that a special antenna had to be designed so that the system could work off-ground. The third major impact of this concept is upon the radar triggering mechanism. No ground contact means that no wheel sensor can be used to control the radar triggering. Instead, there were the possibilities of either using a system that tracks the position of the radar (global or local position) or otherwise triggering the radar irrespective of the actual position by triggering at regular time intervals in free running fashion. Free running operation demands that the operator has to maintain a constant speed during scanning and within certain speed limits, which in turn means more complication to the scanning procedure. Thus, all of these constraints and requirements were addressed in the design and development stages of the program. In 2005, the developer had proven through several tests with different prototypes in two different stages that the design constraints had been met. Additional requirements produced by FCC regulations on emissions from GPR units added additional product development considerations that were addressed but that were approachable at the end of the funded project in multiple ways.

4 EQUIPMENT USED DURING MAY 2009 TESTS

Two handheld unit prototype units were deployed during the May 2009 demonstration. One is bistatic antenna and the other is a monostatic version.

The prototypes were built during the earlier phases of the GPR handheld unit project that were funded by NYSEARCH/Northeast Gas Association from 2001 to 2005. The units were built as alpha and beta prototypes to demonstrate in two different series of tests the feasibility of the major components of the handheld unit product and in particular to evaluate the performance of the new horn antenna in its two versions.

The two units had to go through testing and refurbishment in order to bring it up to the job of lengthy utilization that the equipment would go through during the field trial. RF circuitry is very sensitive to the several years of mechanical and physical impact and that is especially true given that the units were built as prototypes and not as a commercial unit.

5 TEST PLAN

The test plan was drafted as part of this project and provided to NYSEARCH/NGA funders, the NY One Call agency and DOT/PHMSA in late March 2009 for review and comment prior to the tests. The final draft of the test plan is included in the Appendix.

The test plan was intended to help prospective demonstration site hosts and test participants to understand the boundaries of the test and the suggested means for selecting the sites, conducting the tests and validating the predictions.

After delivery of the test plan for review and use by the host companies, several prospective sites were selected and visited by the test team as planned for the two-week test period. Four gas companies who were originally part of the NYSEARCH/NGA funding group for the development and previous testing of the Handheld Pipe Locator project agreed to host the

demonstrations. Those companies were New York State Electric and Gas, National Fuel Gas, National Grid (formerly Keyspan), and Con Edison.

6 ORIGINAL HANDHELD PRODUCT – TARGETED PERFORMANCE

During the R & D project, the end users from the funding companies established a performance specification for the unit. For the demonstrations performed here, one could compare the current performance to those specifications as shown in the Test Plan in the Appendix and provided here:

Handheld Product Targets:

- Light weight: 15 lbs or less
- Real-time mark-out
- Survey perpendicular OR parallel to the pipe
- Locate plastic, steel, cast iron and other facilities as small as ½" to as large as 24" in diameter
- Battery-operated device with a minimum of 4 hours of use without re-charging
- For an air-coupled antenna, plan position accuracy of +/- 6" for pipe depths up to 24", +/- 9" for pipe depths from 24" to 6'
- For a ground-coupled antenna, plan position accuracy of +/- 3" for depths up to 24" and +/- 8" for pipe depth from 24" to 8'
- Low cost and easy to use

Note that we did not specify a percentage accuracy rate for the positioning specifications. In the past field tests of the prototypes, we saw accuracies ranging from 60 – 90% for the air-coupled antenna. Various users target accuracy rates of 75% or higher but ease of use, cost, applicability and other factors weigh heavily in overall acceptance and perception of required accuracy rate.

7 EQUIPMENT OPERATION

The following provides a list of steps that were generally used during the tests for operating the equipment:

1. The operator stands as much as possible close to the center of the known utility with the handheld antenna ready to be operated and facing in the direction of the utility if known.

2. The unit is switched on and after the initial stage of self-checking the unit is ready to start a new scan. The sweep (arc) scan is the scan to be adopted by default.

3. As it is arc scan, the antenna will be positioned to the left at about 60-70 degrees from the center. This is usually the most comfortable position for starting the scan.

4. Once the trigger button is pressed, the radar is triggered in response to the position sensor as long as the boom is moving to the right. The radar stops triggering after completing one scan (by default after moving 100 degree to the right from the start position).

5. Once the scan is complete the result is displayed after about 500 msec (it takes longer if in data saving mode). The user can then examine the peaks in the energy profile and move the system to the point where the curson or the screen aligns with the peak. The user can then mark in real-time the position of the identified target at the matched location. [The centerline of the antenna corresponds to peak on energy profile.]

6. After a number of scans along the direction of the pipe, a linear feature should appear in the map view.

7. In some cases, the quality of the map view detection may not be so good. In these cases it might be worth examining the scan data offline after downloading it into a computer. All the software utilities will be provided by PipeHawk plc during the trial to enable such examination on a laptop computer.

8 SITE TEST INFORMATION

Site 1

8.1 SITE 1 (NYSEG)

Date:	Time:	Town	Site Name
May 4th 2009 – Day 1	Am	Binghamton	Corporate Drive
Handheld unit Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Bistatic	1	Possible PE	Unknown
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Grass	Mixed	Overcast	None

8.1.1 Site Description

This is the first site NYSEG that wanted to investigate but unfortunately there was little guidance or clues on the ground to start the tracing process for the possible underground utility. The handheld unit relies on some ground information to serve as a guidance with which the peaks in the energy profile can be interpreted as a possible target or otherwise just clutter in the GPR data.

The handheld locator did not give a consistent reading. One possible reason for that is the depth of the buried pipe was in access of 6 feet, which is outside the expected limit of the handheld radar.

8.1.2 Target Verification

No verification has been carried out during or after the trial on that site.

8.2 SITE 2

Date:	Time:	Town	Site Name
May 4th 2009 – Day 1	Am	Binghamton	NYSEG HQ (Plant Parking Lot)
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Bistatic	1	Possible PE	Unknown
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Grass	Mixed	Overcast	None

8.2.1 Site Description

The area is outside the main office at NYSEG Headquarters where the plant parking is. It is grass surface where a possible service line was suspected to pass through.

8.2.2 Location Prediction

This site is very similar to the previous one in that the pipe is known to be very deep (over 6 feet deep) and therefore it was determined quickly on-site that the handheld unit could not yield consistent detection indication.

The pipe location was roughly known from maps that were available from the past. It was felt that since the depth was known to be outside the level of the handheld unit's range of depth

(typically 5 feet), and since the location was known from previous maps, no verification was performed during or after the trial day.

8.3 SITE 3 (NYSEG)

Date:	Time:	Town	Site Name
May 4th 2009 – Day 1	Am	Binghamton	Barlow Road
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Bistatic	1	unknown	Unknown
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Grass	Mixed	Overcast	Dig/expose

8.3.1 Site Description

The area was near a building demolition site adjacent to Barlow Rd. The task was to locate a 2" plastic gas pipe through rough ground. The pipe was felt to be within a few feet of the fence and roughly parallel to it. This was based on drawings and a valve located in the street.

8.3.2 Location Prediction

Using the bistatic antenna, the handheld radar detected a possible utility line that extends roughly parallel with the fence around 7'5" apart.

Although the gas pipe was not found by the handheld unit, it was later determined by the NYSEG crew that the search was in the wrong area where the gas pipe was expected. Instead, upon digging, a water pipe was found that coincided with the line indicated by the handheld radar survey and within 12" location accuracy.

Site 3 Valve Location


Site 3 Mark-out

8.4 SITE 4 (NYSEG)

Date:	Time:	Town	Site Name
May 4th 2009 – Day 1	Am	Binghamton	Ballard St
Handheld unit Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Bistatic	1	PE	4”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Dirt	Mixed	Overcast	Heath SureLock Dig/expose

8.4.1 Site Description

The target to be traced was a recently laid 4” plastic pipe near the curb of Ballard Street. The pipe was known to be within the recently dug area parallel to road.

8.4.2 Location Prediction

The pipe was located 2’9” to 2’5” from the vegetation and 6’9” to 6’5” from the fence. Before the site was dug, the marks by the fence were erased and two new locates were performed in slightly different locations placing the pipe 7”0’ to 6’5” from the fence.

Initially the location was confirmed with a Heath SureLock Induction locator locating the pipe 2'10" to 2'9" from the vegetation and 7'1" to 6'9" from the fence. (Pipehawk's prediction was stated at 2'5" for one line and 7'0" for the second line.)

Later test pits were dug. The first located the pipe 2'7" from the vegetation and 2'9" deep. The second located the pipe 7'1" from the fence. The trial hole was dug between the two location marks, about six feet along the pipe). Both PipeHawk predictions were found within 6" of what was located.

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Site 4 First Test Pit Location

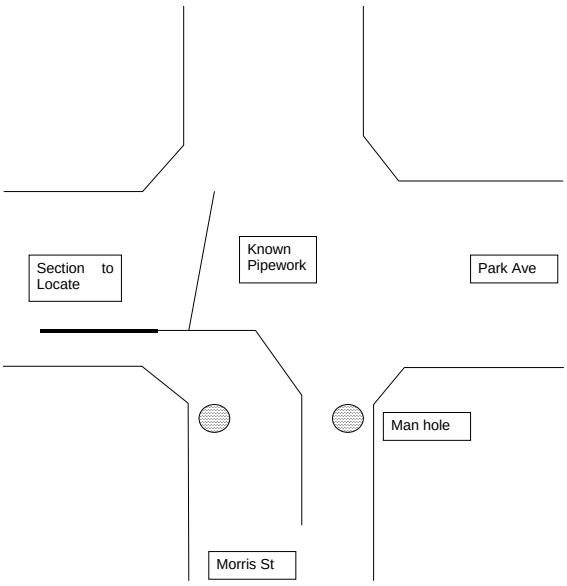
Site 4 Second Test Pit Location

8.5 SITE 5 (NYSEG)

Date:	Time:	Town	Site Name
May 4th 2009 – Day 1	pm	Binghamton	Park Ave
Handheld unit Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Bistatic	1	PE	2"
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Mixed	Overcast	Dig/expose

8.5.1. Site Description

The area is at the junction of Park Ave and Morris St. The task is to locate what is thought to be a difficult area to detect a 4" stub around the junction area.



8.5.2 Location Prediction

An attempt to scan the whole junction area was made to find the stub in the junction. The search was narrowed down to a section of the road near the curb at the left side of the junction in Park Ave as shown in the figure above as a bold line. The utility was found to be at around 2'1" from the curb of Park Ave.

No verification has been reported.

8.6 SITE 6 (NYSEG)

Date:	Time:	Town	Site Name
May 5th 2009 – Day 2	am	Binghamton	Rano Blvd
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Bistatic	1	PE	3"
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Grass	Mixed	Overcast	Dig/expose

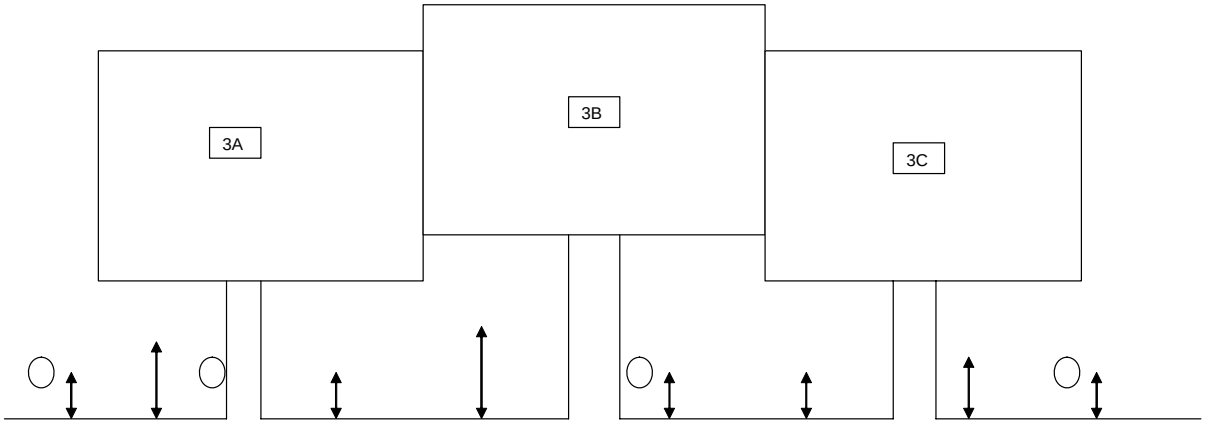
8.6.1 Site Description

The site is the lawn area outside the front building number 200, Apartment 3A, 3B and 3C where a gas main with 3" diameter is thought to cross through as shown in the figure below.

8.6.2 Location Prediction

Four sections over grass were scanned. The section in front of buildings 3A and 3B was scanned first. Although points were detected 5' and 6' from the sidewalk, it was felt (from drawings and valve locations) that the pipe was located by the marks 2'9" and 2'5" from the walk. The section in front of building A was scanned next, producing some points at 3'0" and 2'6" but also many points at 4'10" from the sidewalk. The section in front of buildings 3B and 3C was scanned next, producing consistent results between 2'6" and 3'0" from the walk.
Finally the section in front of building 3C was scanned, producing results at 2'6" and 2'7" and 3'10" from the footpath (sidewalk).

Test pits were dug in front of buildings 3A, 3B and 3C. These located the pipe 3'0" from the path for buildings A and B, closing to 2'3" for building 3C. The pipe was 2'0" to 2'7" deep.



Site 6 Test pit in front of building 3A

Site 6 Test pit in front of building 3C

8.7 SITE 7 (NFG)

Date:	Time:	Town	Site Name
May 6th 2009 – Day 3	AM-PM	Buffalo	Orchard Park
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Bistatic	1	PE	2”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Grass/Tarmac	Mixed	Sunny/Overcast	Dig/expose

8.7.1 Site Description

A plastic pipe is passing from one side of the Orchard Park Service Center to the other, passing under the driveway at the side, in front of the building, across the car park and under the bank at the far side.

8.7.2 Location Prediction

From the marker post, a line was traced seeming to pass under the flagpole.
A single point was identified beyond the flagpole. In front of the building some targets were found in the sidewalk, these were discounted as the drawing showed the pipe closer to the building. Possible targets were located within the flowerbed. The pipe was traced across the parking lot. An attempt was made to trace the pipe up the bank and along it. There was only confidence in the location in the area where the bank was narrow between the woods and a gully.

Site 7 Suggested and actual location near flag pole

Site 7 Suggested location and locating hole beyond the flag pole. The pipe was within the hole

Site 7 Empty trial hole in flower bed

Site 7 Actual location on bank adjacent parking lot

Site 7 Actual and predicted location along bank

The predicted location approaching the flag pole was off by 12”-18”. Beyond the flag pole, the pipe was located within the trial hole; the location was accurate to within 6”. No pipe was found in the flower bed. On the bank near the building side of the parking lot, the pipe was not locatable. In the bank (at the far end of the parking lot), the predicted location was within 6”.

8.8 SITE 8 (NFG)

Date:	Time:	Town	Site Name
May 7th 2009 – Day 4	am	Buffalo	Route 20
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1	PE	
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Dirt / Grass	Mixed	Rain	

8.8.1 Site Description

The site was on a secondary highway known as Route 20. A main gas pipe was suspected to be going across the road within a width of about 20 feet.

8.8.2 Location Prediction

The area scanned with the handheld unit was limited to the part of the road that is nearer to the edge of the road "shoulder". This is due to the heavy traffic that deemed it unsafe to follow the normal trace scan procedure followed when using the handheld radar.

Because of the traffic and because of the wide area where the pipe was expected to be, it was not possible to reach a conclusion about the pipe location. No verification has been carried out during the test and none has been reported after test.

8.9 SITE 9 (NFG)

Date:	Time:	Town	Site Name
May 6th, 7th 2009 - Day 3/4	am	Buffalo	Camp Road
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic and Bistatic	1	PE	1"
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Mixed	Wet	Dig/expose

8.9.1 *Site Description*

A 1” service pipe was traced from the gas meter to the sidewalk with the monostatic antenna. The end near the sidewalk was re-scanned using the bistatic antenna for comparison.

8.9.2 Location Prediction

The pipe was traced from the meter up the center of the driveway. At the sidewalk, the pipe was located 19’7” from the utility pole.

Site 9 Possible traces from meter

Site 9 Mono-Static Results (dots), Bi-static Results

For the small area scanned with both antennas, the monostatic appeared to give a more consistent location. The most likely reason is that as the depth of penetration of the bistatic antenna is greater than the monostatic, in certain situations, it may detect other targets that are not otherwise seen by the monostatic version. However, in shallow targets the monostatic antenna produced cleaner and less noisy results than that of the bistatic.

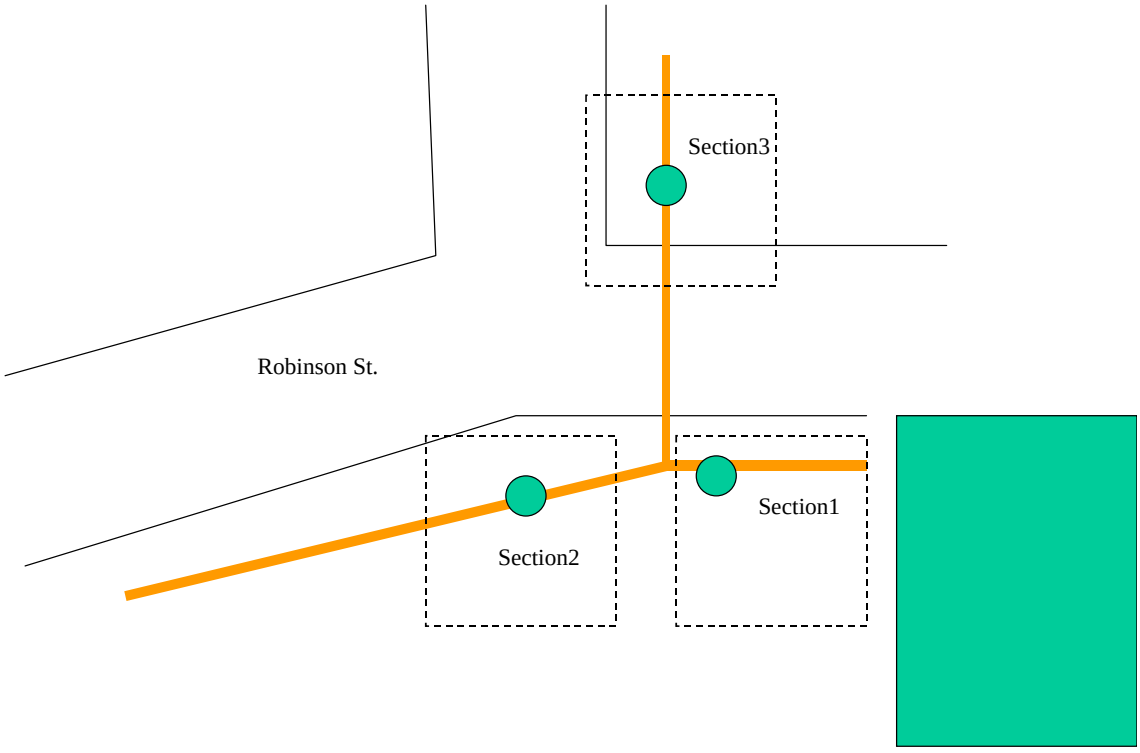
Through digging, the pipe was found at 18’3” from the pole. The difference between predicted and actual location is was approximately 16”.

8.10 SITE 10 (NYSEG)

Date:	Time:	Town	Site Name
May 8th 2009 – Day 5	am	Binghamton	Robinson St
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	2	PE	4” + 1.25”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Dirt / Grass	Mixed	Sunny	SureLock Dig/expose

8.10.1. Site Description

At the end of the first week of tests, it was decided that NYSEG had more interest and available sites so the test team returned to the Binghamton area for an additional site evaluation. At Robinson Street, there was a newly laid 4” plastic main and a 1.25” plastic service pipe crossing the road to pass under a lawn.



Layout of the Robinson Street site

8.10.2 Location Prediction

Section 1 in the figure above was first scanned and an attempt was made to locate the main beyond the point where the service pipe branches off the main. However, no consistent results were achieved by the handheld unit in that area, probably due to the large number of clutter in data that was caused by the loose material within the soil.

In Section 2 of the main, the handheld unit provided consistent signal detection and a line was drawn where the pipe is thought to run through.

Section 3 search also concluded a possible utility line on the other side of Robinson St.

Site 10 Section 1 Actual location of pipe above service; pipe depth at 26” in one area and 36” in a higher area of embankment

Site 10 Pipe located within trial hole below the service Pipe depth was 32”
Section 3

Site 10 Service located within trial hole
Section 2

The actual location of the pipe in Section 1 was found to be at depth between 26” at the top of the road, and 36” at the bottom of the road in this section.

In Section 2 of the site, the pipe was located within the trial hole that was dug at the location where the scan had indicated. It was found at a depth of 32”. Therefore it can be safely assumed that the handheld unit radar had found the pipe within 6” accuracy.

The Section 3 trial hole also found the 1.25” diameter, 30” deep service pipe within less than 6” where the handheld unit had indicated.

8.11 SITE 11 (National Grid on Long Island)

Date:	Time:	Town	Site Name
May 11th 2009 – Day 6	8:35 am	Long Island	Power drive
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1	PE	2”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Grass	Mixed fill	Sunny	Dig/expose

8.11.1. Site Description

The area to be scanned was a grass area in a quiet residential neighborhood. A gas main pipe was suspected to be running parallel to the curb as in the picture below.

Site 11

8.11.2 Location Prediction

By deploying the handheld unit with the monostatic antenna, two parallel lines were formed through the use of yellow flags (as shown in the picture above). The first line was at about 1’5” from the edge while the second line was at around 3’5” from the edge.
The area was excavated to verify the handheld unit findings. A 2” PE gas pipe was found at around 1’4” from the edge with a depth of approximately 30”.

It can be concluded that handheld unit was successful in detecting the gas main and within 6” lateral accuracy. For the second line prediction, the handheld unit detected the edges of the trench rather than the pipe itself which can happen because sometimes, GPRs signals from trench edges are stronger than that caused by the target which lays deeper than the trench edge.

Site 11

8.12 SITE 12 (National Grid on Long Island)

Date:	Time:	Town	Site Name
May 11th 2009 – Day 6	10:30 am	North Babylon	Weeks Road
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Mono + Bistatic	2	PE	2”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Grass	Clay/Sand	Sunny	Metrotech Dig/expose

8.12.1 Site Description

In this site, the task was to locate a gas pipe (Target 1) in an area where the service had been probably been abandoned and new line was provided. It was therefore not clear where to start the scan with the handheld unit radar. The area surface was grass and was on the wet side. We lacked confidence in our findings and attribute some of the problem to the wet soil.

The Metrotech Induction Locator A10dx detected a utility at around 6” of the sidewalk edge and after digging a sprinkler pipe with the control wire was found at a depth of 1 foot (Target 2). The handheld unit system could not detect a consistent signal in the sprinkler area and much of the signal activities were attributed to being close to the edge of the grass area where nearby concrete edge effects could occur.

Target 1 was not detected initially due to the lack of information about where to start investigation. However, the vertical section was detected within 12”-24” location accuracy with the actual target of the 2” gas main at 4’ depth being verified at around 6’ from the sidewalk.

Target 2 was not detected.

Site 12

8.13. SITE 13 (National Grid on Long Island)

Date:	Time:	Town	Site Name
May 11th 2009 – Day 6	1:30 pm	Bay Shore	2nd place
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1	PE	4”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Sand	Sunny/Overcast	Metrotech Dig/expose

Site 13

Site 13 4” PE main found at 2’2” depth

8.13.1 Site Description

The site is a tarmac road in a quiet residential area where gas main is to be traced starting from a gas valve located at around 14” from the edge of the road.

8.13.2 Location Prediction

The monostatic antenna was used to follow the path of the suspected utility and the signal indications were spread around a straight line. The majority of the indications were at an average distance of around 15’6” from the edge.

Upon digging the suspected area, a 4” PE main gas was found at depth of 2’2” and at approximately 14’ from the edge of the road. Therefore, the accuracy of PH prediction against the actual was within 18”.

8.14 SITE 14 (National Grid on Long Island)

Date:	Time:	Town	Site Name
May 12th 2009 – Day 7	8:40 am	Islandia	Islandia village town hall
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1 in four different sections	PE	1”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Concrete, Tarmac, Grass and Dirt	Sand	Sunny/Overcast	Metrotech Dig/expose

8.14.1 Section 1

8.14.1.1 Site Description

The site searched was an area just outside the side entrance of the building. It is a concrete paved ground that stretches to the stairs that lead to the nearby parling lot. A gas meter was used as a guide to guess the path of the gas pipe that was followed as described next.

Note: Unfortunately we missed taking a picture of the area, and a video taken to the target spots was too close to give any idea about the scene.

8.14.1.2 Location Prediction

The monostatic antenna was used to trace the pipe starting near where the meter is. A consistent linear pattern has been formed using the handheld unit to mark the ground where the energy profile of the handheld unit gives the peaks.

The Metrotech Induction locator was used and marked the tracer wire in the ground for the plastic pipe. The handheld unit detected the pipe within 6” from the Metrotech marked line.

This is likely to mean that the prediction was within 9” from the PE pipe (assuming 3” distance between tracer wire and PE pipe).

8.14.2 Section 2

Site 14 Section 2

8.14.2.1 Site Description

This section falls in the grass part behind the curb near the concrete area described in Section 1.

8.14.2.2 Location Prediction

The handheld unit predicted indications that formed a linear pattern but in this case one indication was almost 12” away from the central line.

The Handheld unit indications were mostly within 6” from the Metrotech unit location of the tracer wire except for one indication that is almost 12” away from the line. Overall, it can be concluded that the accuracy of the handheld unit is still within 6” in the lateral position.

8.14.3 Section 3

8.14.3.1 Site Description

In this section, the scanned area falls within the parking lot outside the town hall building. The whole length of the scanned section was over 200ft.

8.14.3.2 Location Prediction

Due to some cars that were parked in the area, the handheld unit could not be deployed along the whole section.

The tracer wire for the pipe was already marked from previous search using the Metrotech unit. Among the whole stretch of the section where it was possible to perform the handheld unit scanning, the radar results coincided (6) times within 12” with that located by the Metrotech unit, (3) times within 24” and in (2) cases the indications were further than 24” from the pipe location as marked by the Metrotech locator.

8.14.4 Section 4

8.14.4.1. Site Description

The section under investigation was where the pipe is thought to pass through a dirt area from the parking lot into the main road outside the town hall site (Old Nickels Rd).

8.14.4.2 Location Prediction

The indications shown by the handheld unit did not give a reliable pattern to indicate the position or direction of the pipe. The most likely reason is that the handheld unit was detecting the edge of the trench.

The area just outside the dirt area was excavated and it confirmed the existence of 1” main gas pipe that is 1 ft deep. Because of scatter in the handheld prediction pattern, no handheld prediction was considered accurate.

Site 14 Section 4

8.15 SITE 15 (National Grid on Long Island)

Date:	Time:	Town	Site Name
May 12th 2009 – Day 7	10:40 am	Islandia	Powel avenue
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Mono / bi-static	1	Steel main gas	2”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Sand	Sunny/Overcast	Metrotech Dig/expose

8.15.1 Site Description

The site is in a relatively quiet residential area in Powel Avenue, Islandia. The task was to follow the path of a main gas pipe starting from a valve cover around 3 feet from the edge of the road.

Site 15

8.15.2 Location Prediction

The handheld monostatic unit found two parallel lines. One is at around 6 ft from the edge and the other at around 8 ft from the edge. The initial assumption was that these lines represent trench edges. At certain areas, the indications become more random and hard to draw a line out of the pattern on the ground.

The Metrotech induction locator indicated that there is a tracer wire or utility line at about 5 ft from the side of the edge.

Upon excavating the area, it was found that a steel pipe of 2” is laid at depth of 3 ft. No utility was found to explain the presence of facilities beneath the two lines of indications as indicated by the handheld unit.

The bistatic antenna unit was also deployed but the results did not change.

Site 16

8.16 SITE 16 (National Grid on Long Island)

Date:	Time:	Town	Site Name
May 12th 2009 – Day 7	2:00 pm	Brentwood	NatGrid office parking lot
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1	PE	2”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Sand	Sunny/Overcast	Metrotech

8.16.1 Site Description

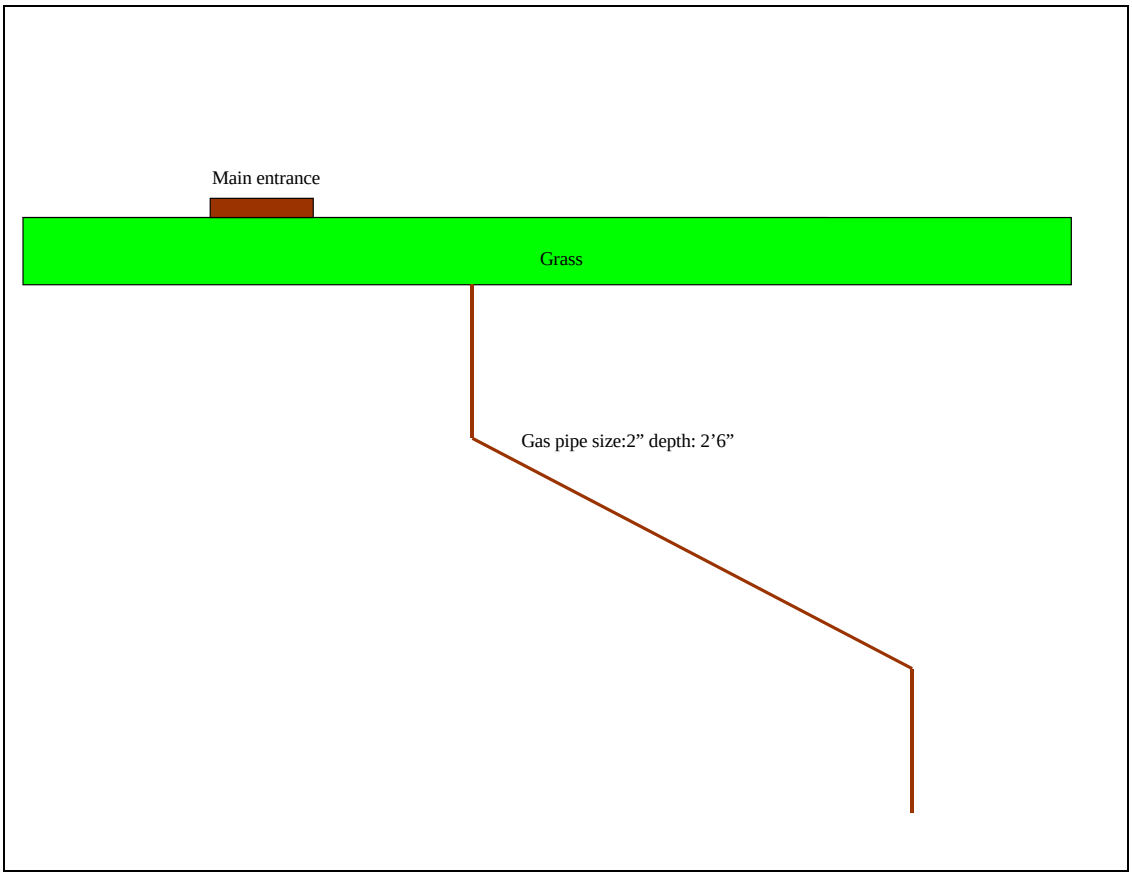
A gas pipe was targeted across a grass area just outside the main entrance of the NatGrid office in Brentwood.

Previously marked signs based on the Metrotech equipment were already on the ground and they indicated a line that runs across then changes the path at an angle of almost 45 degrees. (as shown in figure below)

Site 16

8.16.2 Location Prediction and Verification Results

The handheld unit survey started on the far end of the parking lot, and in most cases the indications were at within 6” to 12” from mark or lines as indicated by the Metrotech equipment.



Site 16

Site 16

8.17 SITE 17 (ConEd)

Date:	Time:	Town	Site Name
May 13th 2009 – Day 8	10:00 am	Queens	185, Northern union
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1	PE	2”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Unknown	Overcast	Metrotech

8.17.1 Section 1

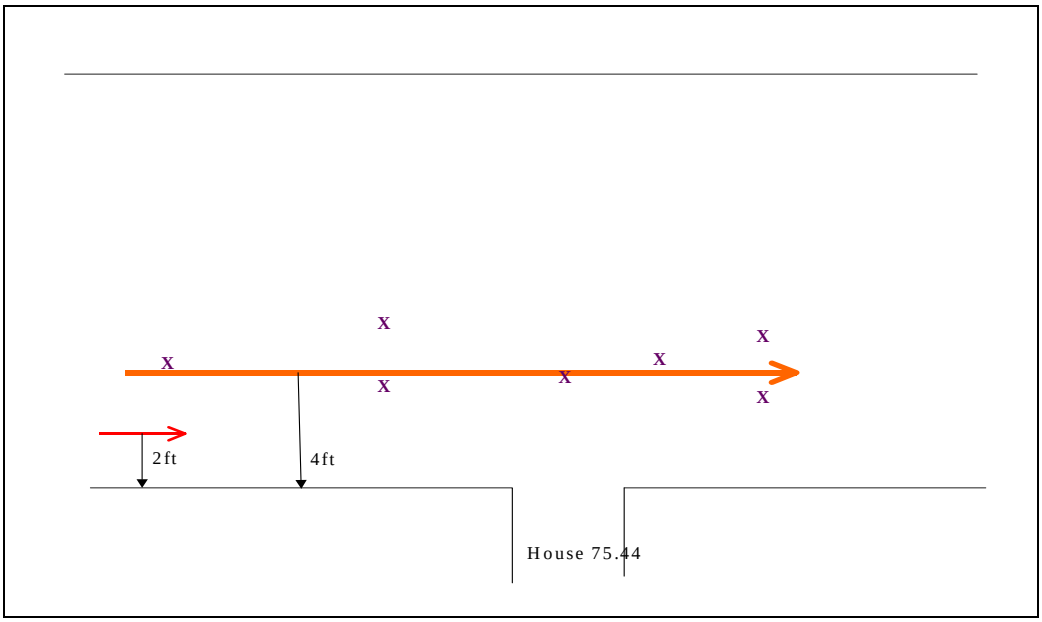
8.17.1.1.Site Description

The section is tarmac road near house 75-44 parallel to the south curb. An already marked, the trace of gas pipe can be seen from previous ConEd search. There was also an indication of a possible PE gas pipe and steel pipe of diameter 7” and 2” respectively at about 2’ depth. Con Ed could not confirm these indications.

8.17.1.2 Location Prediction

Upon utilizing the mono-static handheld unit, two groups of indications have been formed on the ground that can indicate two parallel utility lines. The first line was predicted at about 2 ft from the south curb and that is what is thought was corresponding to the electric line. The second line was predicted at approximately 4-5 ft from the curb and was predicted to be the gas pipe.

The only verification available for this section was a previous scan as marked on the ground. The marks indicate an electric cable at around 2’ from the curb and a 2” gas pipe at around 4.5’ from the curb.



Site 17 Section 1

8.17.2 Section 2

8.17.2.1 Site Description

The section is tarmac road near house 75-40 (the house is at the south side of the road) and the area to be scanned is parallel to the south curb starting from the manhole on the left of the entrance of house 75-40.

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8.17.2.1 Location Prediction

Upon utilizing the mono-static handheld unit, similar pattern of the two lines that were found in section 1 has been repeated here. And in the same manner as in section 1, the first line was at about 2 ft from the south curb and that is what is thought corresponding to the electric line. The second line was predicted to be at approximately 4-5 ft from the curb and was thought to be the PE gas pipe.

The verification that was available were previous scans as marked on the ground. The marks indicate an electric cable at around 2’ from the curb, and a 2” gas pipe at around 4.5’ from the curb.

Site 17 Section 2

8.18 SITE 18 (ConEd)

Date:	Time:	Town	Site Name
May 13th 2009 – Day 8	1:25 pm	Queens	80/242
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1	PE, Elec. cable	2”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Unknown	Overcast	Metrotech

8.18.1 Section 1

8.18.1.1 Site Description

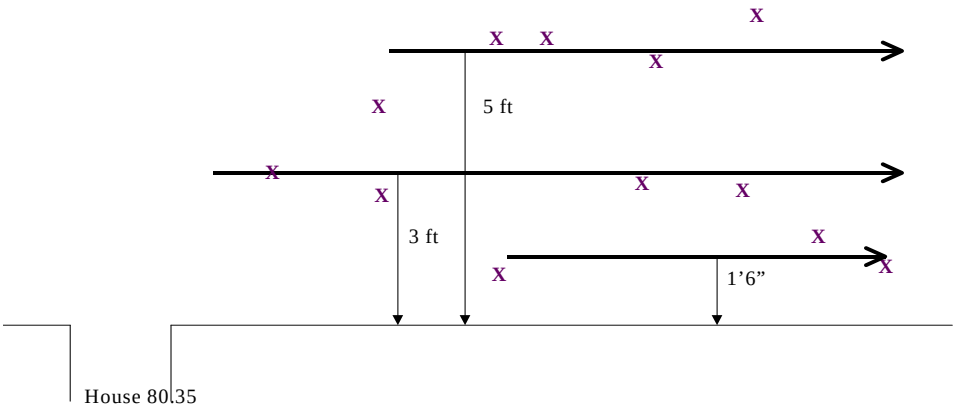
The section is tarmac road outside house 80-35 (the house is at the south side of the road) and the area to be scanned is parallel to the south curb.

8.18.1.2 Location Prediction

Three possible utility lines were identified by the handheld unit as possible targets as in the figure below. The potential target lines as indicated by the figure are at 1'6", 3ft and 5 ft north of the curb respectively.

No verification was available.

Site 18 Section 1



Site 18 Section 1

8.18.2 Section 2

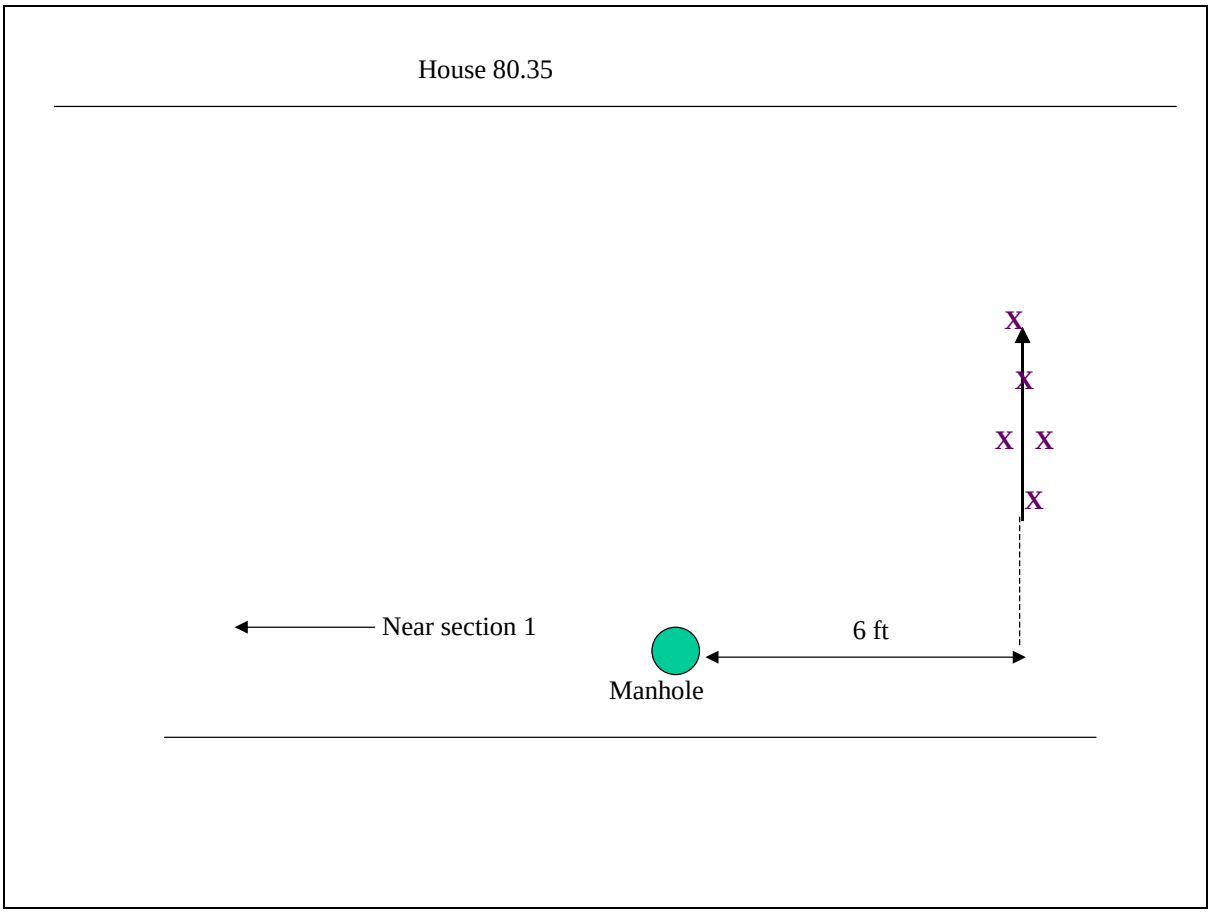
8.18.2.1 Site Description

The section is tarmac road outside house 80-32 (the house is at the south side of the road) and the area to be scanned is across the road. This section is to the left of section 1 of this site.

8.18.2.2 Location Prediction

The handheld unit signals detected a consistent line at about 6ft to the left of the manhole that is located on the other side of house 80-32 as in the diagram above.

The suspected utility was a 0.5" diameter gas pipe but no specific location could be provided by ConEd. No verification was made available.



8.18.3 Section 3

8.18.3.1 Site Description

The section is tarmac road opposite 80-24 to the right of section 1 on the same side of the road (south curb). The section is closer to a large tree which might have some effect on the handheld unit results due to the possible existence of large roots in the area.

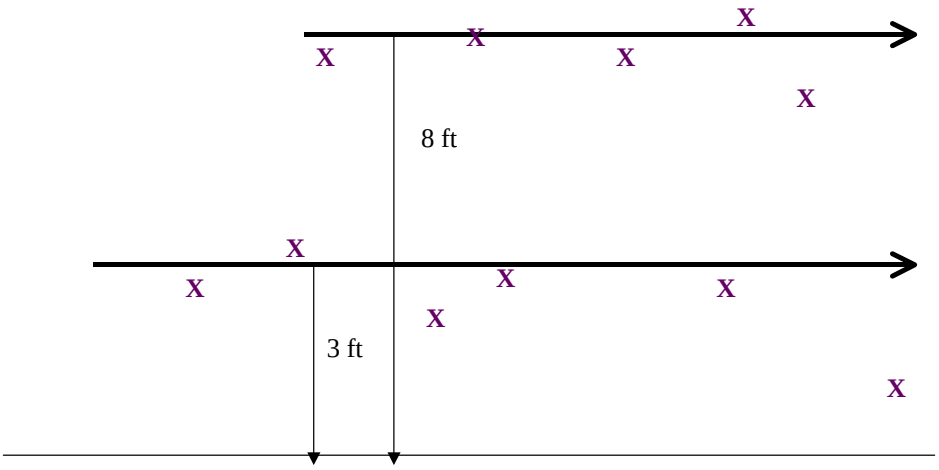
8.18.3.2 Location Prediction

The monostatic handheld unit radar scans have revealed two groups of indications. The first one was about 8 feet north of the south curb, while the other one is at around 3 feet from the same curb.

Upon excavation, the 2" steel gas line was found directly under a bank of concrete electric ducts at 5' 5" north of the south curb. The concrete ducts had 2' 10" of cover. The predictions were 2’7” away from actual.

Site 18 Section 3

House 80.24



Site 18 Section 3 Scan directions

8.19 SITE 19 (ConEd)

Date:	Time:	Town	Site Name
May 14th 2009 – Day 9	9:20 am	Queens	Maple Av.
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	1 pipe, 1 electric cable	Electric cable, PE gas	6”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Unknown	Raining/Overcast	digging

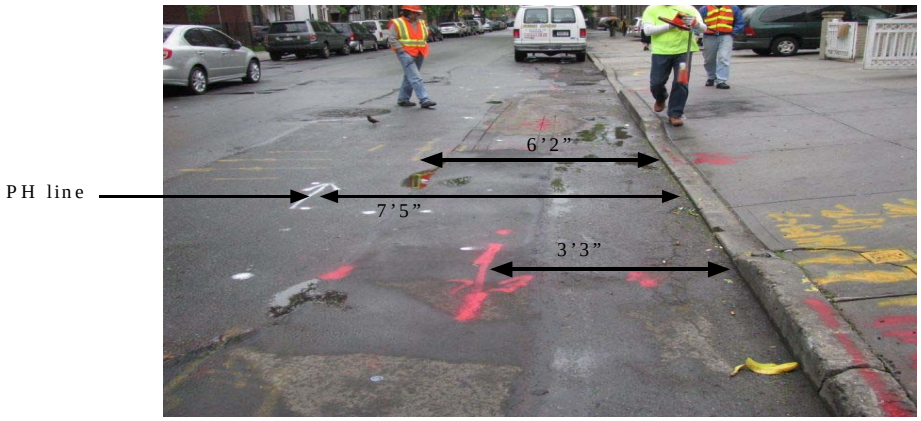
8.19.1 Site Description

The site is a tarmac road in a relatively busy but manageable road. The area seemed to already been surveyed before and a yellow gas pipe mark was at about 6’2” from the north curb. There was also a red mark as indication of electric cable at around 3’3” from the north curb.

8.19.2 Location Prediction

The handheld unit didn’t find consistent signals around the marked gas yellow line but at around 16” away from it there was a consistent pattern that can be interpreted as utility line. This was marked as a prediction at 7’5” north of the south curb.

Upon excavation, a 6" plastic gas main was found at 7' - 0" north of the south curb, with 3' - 5" of cover. In addition, an electric concrete duct bank was found at 4' - 0" north of the south curb, with 3' - 0" of cover. For the first prediction, the accuracy was within 6”.



Site 19

8.20 SITE 20 (ConEd)

Date:	Time:	Town	Site Name
May 14th 2009 – Day 9	1:40 pm	Queens	Vernon blvd
Handheld Version:	Number of Pipes:	Pipe Material:	Pipe Size(s):
Monostatic	2	Steel	10” and 5”
Surface Conditions:	Soil Type/Condition:	Weather:	Verification Method:
Tarmac	Unknown	Overcast	digging

8.20.1 Site Description

The site is near a construction site and a sub-station.
According to an existing map of the area, there should be two steel pipes, of which the 10” carries a cable and cooling oil, and the other is 5” containing cooling oil but no cable (return oil).

Site 20

8.20.2 Location Prediction

Starting from the “gas” valve at around 5ft from the pavement, the area was scanned with the handheld unit, and a possible path was identified from the most prominent signal indications. See photo above.

Con Ed reported that several 1/4" thick steel "protection" plates were found directly over the two feeder pipes where the survey was conducted. The steel plates, which had only 13" of cover, were apparently installed because the two feeder pipes had only 19" of cover where they exited the substation onto 36 Ave. Unfortunately, the protection plate condition created an inappropriate site for a field test.

9 RESULTS SUMMARY

Target	Utility	Diameter	Material	PH accuracy	Depth	Soil	Verification	Ant	Notes
1	Gas	na	PE	Na	> 6’	Tarmac	Not Verified NV)	Bi	
2	Poss Gas	Na	PE	Na	>6’	Tarmac	NV	Bi	
3	Water	Na	PE	<12”	Na			mo	
4	Gas	4”	PE	<6	2’9”	Mixed	digging	mo	
5	Gas	4”sub	PE	Na	Na	Tarmac	NV		
6	Gas	3”	PE	<6”	2’-2’7”	Dirt	Digging	Mo	
7-1	Gas	2”	PE	<18”			Digging		
7-2	Gas	2”	PE	<6”			Digging		
7-3	Gas	2”	PE	Na			NV		
7-4	Gas	2”	PE	<6”			NV		
8	Gas	Na	Na	Na	Na	Tarmac	NV		Street unsafe to scan
9	Gas	1”	PE	<18”			Digging	Mo+bi	
10-1	Gas	4”	PE	NT	26”-36”		Digging	mo	
10-2	Gas	4”	PE	<6”	32”		Digging		
10-3	Gas	1.25”	PE	<6”	30”		Digging		
11	Gas	2”	PE	<6”	30”		Digging		
12-1	Gas	2”	PE	NT	4’		Digging		
12-2	Gas	2”	PE	NT	4’		Digging		
13		4”		<18”	2’2”		Digging		
14-1		1”		<6”			Digging		
14-2				<6”			Digging		
14-3				<12”			Tracer Wire Mark		
14-4				NT	12”		Digging		
15		2”	Steel	Na			Digging		
16		2”	PE	<12”			Metrotech		
17-1-a	Elec			<6”			Prev. survey		
17-1-b	Gas	2”	PE	<6”	2’		Prev. survey		

Target	Utility	Diameter	Material	PH accuracy	Depth	Soil	Verification	Ant	Notes
17-2-a	Elec			<6”			Prev. survey		
17-2-b	Gas	2”		<6”	2’		Prev. survey		
18-1				Na			NV		PH found three lines but not verified
18-2				Na			NV		PH found one line but not verified
18-3	Gas	2”	Steel	>24”			Digging		
19-a	Gas	6”	PE	<6”			Digging		
19-b	Elec			Na			Digging		Electric Duct was not subject of consistent predictions
20-a	Cooling pipe	10”	Steel	Na			Digging		Steel protection plate over the pipes stopped PH from working
20-b	Cooling pipe	10”	Steel	Na			Digging		=

Table 1 summary result of all sites

# Sites	# Targets	#Verified Targets
20	36	28

Table 2 target statistics

Detect within 6”	Detect within 12”	Detect within 18”	Detect within 24”	Not detected
14	4	3	0	5

Table 3 detected targets

<24” Accumulated % Accuracy	<18” Accumulated % Accuracy	<12” Accumulated % Accuracy	<6” Accumulated % Accuracy	Not detected % Accuracy
81	81	69	54	19

Table 4 performance regions

10 CONCLUSIONS

During the tests, both the NYSEARCH project manager and some of the host participants were both encouraged by the handheld unit's accuracy in some cases as well as discouraged because of the inconsistency in some sites as to signal predictions, multiplicity of signals and 'prediction lines' . We also observed a lack of confidence by the unit operator in the information coming from the tool. Reflecting on tests performed in 2002 and 2004/2005, the unit operators did not have the same ease or confidence in using the tool as they did in those tests during the R & D phases of the project. Thus, this test program suffered from loss of familiarity with the handheld prototype handling. Further, while PipeHawk plc did 'refurbish' the bistatic prototype, the NYSEARCH project manager witnessed fittings on the monostatic antenna that were still loose and that could have been addressed during the preparation part of this effort. The amount of work to upgrade the prototypes was less than expected and therefore, it is fair to assert that age and degradation issues still limited the prototypes under tests. It is also noted that while NYSEARCH/NGA have full incentive to find a commercializer for this product, the PipeHawk plc organization is focused on R & D and this project did not include any R & D work. Their work was simply to upgrade the existing prototypes, practice using them (which they did back in at their facilities prior to the test), conduct the tests, analyze the results and report on findings.

From PipeHawk plc's point of view, they concluded that the handheld unit radar was shown to be useful tool in areas where the conventional cart-based Ground Penertrating Radar pipe locator cannot be used. The benefits of the handheld were particularly evident when the utility line passed through different types of surfaces such as grass to dirt then to pavement. Also, PipeHawk plc concluded that like any type of GPR, false alarm is the main issue with the performance. Therefore, other clues on the ground are often very important part of the scanning procedure. In some sites in the rural or suburban areas, there were clear ground clues. In some of the dense suburban sites or even in some rural sites, there were little clues and those conditions affected performance. Further, there were sites that had to be discounted because the pipes were at a depth that go outside the specification of the use of this tool (greater than 5' depth). PipeHawk plc also concluded that there were only marginal differences in terms of performance between the bistatic and the monostatic antennas and especially when the target is located at shallow depth.

From the numerical results, while 19% of counted targets were not detected (not including some that could not be counted because scan area and actual utility location were not in same area), 54% of those counted targets were within 6" accuracy, 69% were within 12" accuracy and 81% were within 18" accuracy. These results are positive. Yet, only one of the host companies was excited about the results. This may be from the fact that when the process was observed in the field, there was operator indecision and multiplicity of signals in several cases. However, at several of the sites, the conditions such as pipe depth or knowledge of vicinity or type of line were not favorable.

Our experience as R & D program managers also shows that many times, prospective users at these tests expect commercial and flawless performance. But, until the unit is commercialized, the level of consistency, confidence and ease of use are still in a dynamic state of change.

11 CHALLENGES ENCOUNTERED DURING THE FIELD TEST

Observers commented during the tests about the slow speed with which the equipment is deployed. This is due to a number of current factors including the level of care needed for handling the current prototype. The final product should take the mechanical robustness of the system into account. The other reason for slower scanning is the fact that the user has to be careful during each scan in case the rear part of the radar may hit an object or a nearby person.

The effect of false alarms within the scan data may have a greater impact on the energy profile type of the display. Clutter in data is sometimes generated by anomalies in the signal path through ground. Also, because of the current condition of the prototypes as well as the lack of ergonomic design in this current product state, there was a variation in the height and angle of the antenna as it was swept through each scan. The varying height and angle of the antenna during the scan introduces signal clutter, which is accumulated by the transformation of the 2-D scan data into the 1-D energy profile form.

A more general challenge that was addressed in some ways but not in others was the lack of use of the handheld pipe locator equipment (since 2005) and the confidence of the operator. Based on observation of previous tests, there have been some setbacks that factor in such as the passing of time, personnel focusing on other different types of locators and locate procedures and shift in focus to other tools or R & D projects. Thus, if there were no time setbacks, confidence would have been higher and the positive numerical results shown above would be deemed more significant by more participating companies. [One could also assert that fewer predictions would have been made.] This is an example of how delay in Technology Transfer can impact the perceived and actual success of an R & D product.

12 ACKNOWLEDGEMENTS

The authors would like to acknowledge the extensive in-kind contributions of the host companies that were New York State Electric & Gas, National Fuel Gas, National Grid and Con Edison. Field testing and demonstration is critical to proper evaluation and advancement of innovative technology. The time and efforts of the primary liasons are also greatly appreciated. The company representatives and their helpful crews include: Allen Peterson (NYSEG), Mark Hooper (NFG), Dan McGarry, Doug Rogers, Joseph Vitelli (National Grid), and Phil Fowles (Con Edison).

The authors would also like to aknowledge the co-sponsors who are the New York One-Call Agency and their liason, Kevin Hopper, and well as DOT/PHMSA.

APPENDIX

Handheld Demo Test Plan

Handheld Pipe Locator Test/Demonstration Project for NYSEARCH/NY One-Call/PHMSA
Draft Test Plan – DCD 3/13/09, Final 3/27/09

Background:
As part of previous pipe locator product development efforts, the NYSEARCH group of numerous LDC member companies has formed a consensus on the desired features and performance for a state-of-the-art pipe locator.

Key elements include:

- Light weight: 15 lbs or less
- Real-time mark-out
- Survey perpendicular OR parallel to the pipe
- Locate plastic, steel, cast iron and other facilities as small as ½" to as large as 24" in diameter
- Battery-operated device with a minimum of 4 hours of use without re-charging
- For an air-coupled antenna, plan position accuracy of +/- 6" for pipe depths up to 24", +/- 9" for pipe depths from 24" to 6'
- For a ground-coupled antenna, plan position accuracy of +/- 3" for depths up to 24" and +/- 8" for pipe depth from 24" to 8'
- Low cost and easy to use

Objectives: The objective of the field tests/demonstrations are to: 1) display and validate the current performance of the handheld pipe locator prototype, and, 2) introduce the tool to additional stakeholders to demonstrate how this tool can aid damage prevention initiatives.

Description of Intended Sites: The sites will be jobs and/or training facilities selected by potential LDCs/users of the tool. Some of the users have prior experience in testing the prototype and some users will not have had prior experience. It is preferred that any sites that are picked can either be validated through direct assessment/exposure or through proven maps of the area surveyed. Given that each of the three – four companies will have access to the tool for 2 – 3 days of demonstrations, it is suggested that anywhere from 5 – 10 sites are selected by each company. It is also recommended that, if possible, the site characteristics (not actual maps) are reviewed prior to the visit(s) by the contractor.

Overall Vision of Conduct of Multiple Tests:

The handheld pipe locator operator will be a skilled technician from the original contracting company, PipeHawk plc that designed the unit. There will be one to two PROTOTYPE units that have recently been re-furbished that will be used. The idea is to circulate equipment and conduct the tests/demonstrations around to three to four NYSEARCH member companies who are funders of the technology and to conduct all tests in a two-week period while the PipeHawk plc personnel are in the country. Currently, the two week time period is slated for the weeks of May 4 and May 11. From initial discussions, all tests will be conducted in New York State and preference so far has been indicated to start in upstate New York and finish in downstate New York. A tentative plan for companies to visit from start to finish are: New York State Electric

and Gas, National Fuel Gas, National Grid (NY/Long Island), and Con Edison. Site visits to all four companies will take place over the 10-day period in the two weeks. Work over the weekend will only be chosen if the host company prefers to conduct tests in the overtime period and if the PipeHawk plc operator can fit that into his/her schedule.

Proposed Procedure

Initial Setup:

- If possible, sites should be selected ahead of the day of the test. The host needs to determine whether the site predictions can be validated by excavations or by verified maps.
- It is preferred that sites with different characteristics are selected. Sites could vary by pipe size, pipe depth, soil type, surface type and traffic activity.
- Visits to multiple sites should be coordinated for the finite time period of one to two days in company territory.
- Plans should be made to avoid downtime during the business day due to battery charging or other equipment calibration procedures.
- Based on experience in other pipe locator tests, if possible, it is helpful to mark “lanes” for data collection in selected areas.

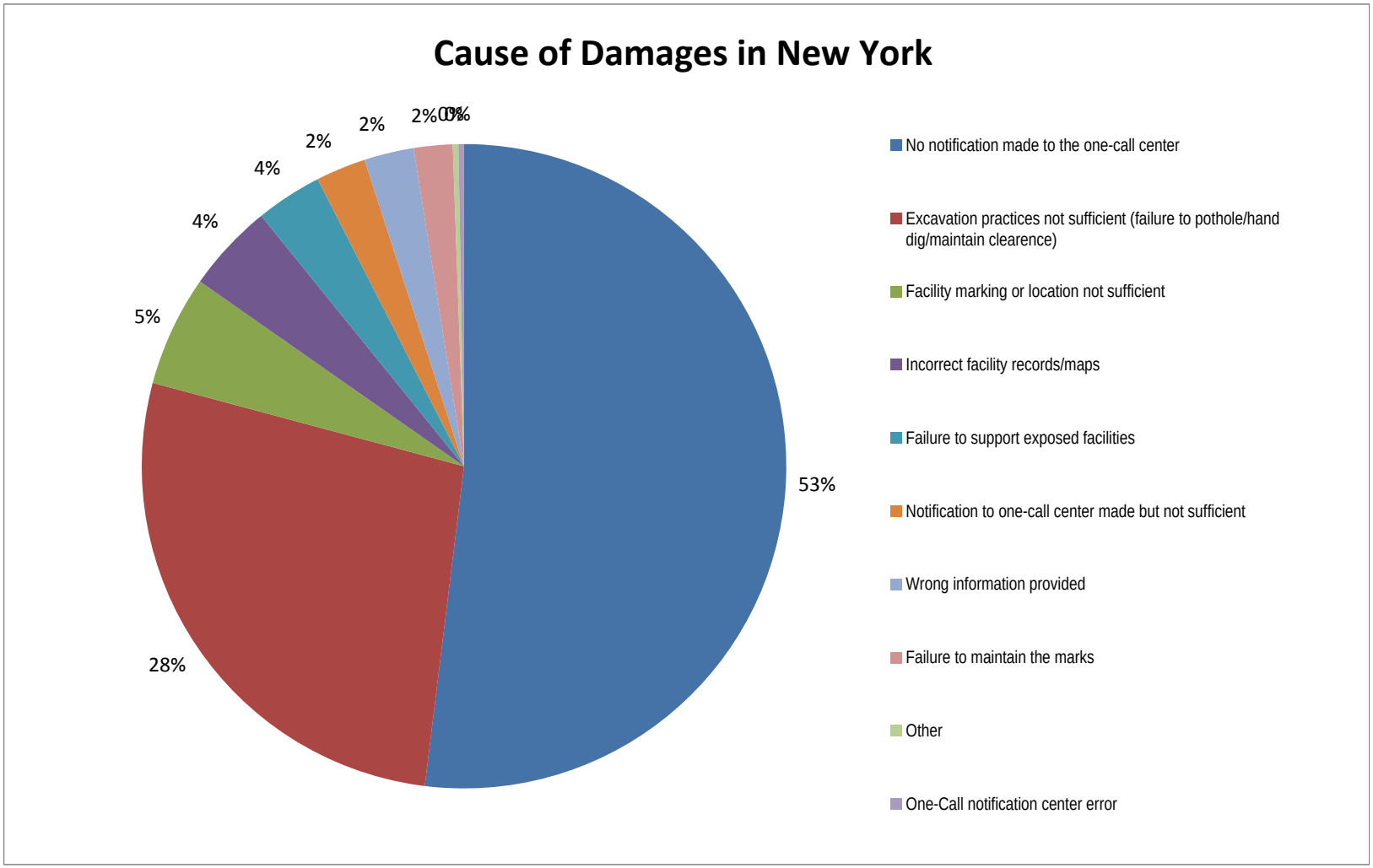
PE Pipe Location Tests:

- In general, like a traditional markout or locate job, the operator could be given reference information that would help put the investigation in the correct general area. Above-ground site information is traditionally used by all locators in terms of narrowing the field of investigation.
- Data should be collected with careful attention to reference points and markers on lanes (team participants on site should agree to stated landmarks)
- It is noted that while there are many other facilities of different types in the areas near the PE pipes, the focus should remain on the PE pipe.
- After initial runs on each section, it is recommended that the test observers be shown the images on the screen that give positive indications of pipe location
- There may be areas where PE pipe converts into sections of other types of pipe. Wherever possible, it is requested that the host utility provide such information in advance of work commencing on those particular sections

Validation Plans:

- It is requested that each host utility prepare in advance of finalizing which sites to visit an approach for validating the predicted facility location. Sometimes, verified maps are sufficient. Preferably, pot-holing or other direct validation measures are used.
- The tests will be kept blind to the operator until after the predictions are made. If the particular group at a host company wants to deviate from that approach, given group consensus on site, the operator may be given some information to help set a reference for a prediction.
- As part of the funded effort, NYSEARCH staff will work with PipeHawk plc to prepare a report of findings. At present, there are two report deadlines. The first is an interim report containing the field test data that NYSEARCH staff, host utilities and PipeHawk plc must agree to and complete by May 25. The second report is a comprehensive narrative and

summary of the test conduct, results and findings that will be prepared as a final report. The Final Report due date will be agreed to by June 15.


Cause of Damages in New York
53%
28%
5%
4%
4%
2%
2%
2%
0%
No notification made to the one-call center
Excavation practices not sufficient (failure to pothole/hand dig/maintain clearence)
Facility marking or location not sufficient
Incorrect facility records/maps
Failure to support exposed facilities
Notification to one-call center made but not sufficient
Wrong information provided
Failure to maintain the marks
Other
One-Call notification center error

Activity Summary By County Including Damages and Location Requests

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
NY, ALBANY			**24**	**705**	**77**	**15376**	0.50%
	DPC		1	72			
		Excavator Breakfast	1	72			
			CRDPC Excavator Breakfast - Albany	72			
	Excavator Training		23	633			
		DSNY Presentation	22	404			
			753 Presentation - BOCES Capital Region	6			
			753 Presentation - BOCES Capital Region	17			
			753 Presentation - Building Bridges Albany	12			
			753 Presentation - Dekatherm	5			
			753 Presentation - Dept of Labor	24			
			753 Presentation - Eastern Contractors Assoc	21			
			753 Presentation - Flach Industries	17			
			753 Presentation - Gas Pipeline Group Albany	35			
			753 Presentation - Groundworks Utilities, LLC	12			
			753 Presentation - Iroquois Gas Albany	25			
			753 Presentation - National Grid	6			
			753 Presentation - NESCA	26			
			753 Presentation - Paridym Gas Albany	48			
			753 Presentation - Sano Rubin	22			
			753 Presentation - Shaw Environmental	6			
			753 Presentation - Straight Line Industries	33			
			753 Presentation - Syracuse utilities	9			
			753 Presentation - T O Bethlehem DPW	27			
			753 Presentation - Wade Electric	3			
			Design Ticket - ASCE Hudson Mohawk Chapter	17			
			Design Ticket - Shaw Environmental	15			
			Design Ticket Presentation - CT Male Assoc	18			
		Excavator Safety	1	229			

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
			Excavator Safety Seminar - Albany	229			
NY, ALLAGANY			**0**	**0**	**2**	**3058**	0.07%
NY, BROOME			**8**	**236**	**35**	**9125**	0.38%
	DPC		1	68			
		Excavator Breakfast	1	68			
			STDPC Excavator Breakfast - Endicott	68			
	Excavator Training		7	168			
		DSNY Presentation	7	168			
			753 presentation for Binghamton University	30			
			753 Presentation for Christa Construction	29			
			Binghamton University	30			
			Christa Construction	29			
			NYSEG Line Crews	21			
			Southern Tier Home Builders Association	24			
			Tra Gen Concrete	5			
NY, CATTARAUGUS			**3**	**223**	**5**	**5848**	0.09%
	Excavator Training		3	223			
		DSNY Presentation	3	223			
			NYSDOL	65			
			NYSDOL	70			
			PIPELINE SAFETY DINNER PRESENTATION	88			
NY, CAYUGA			**0**	**0**	**10**	**4836**	0.21%
NY, CHAUTAUQUA			**1**	**51**	**4**	**8592**	0.05%
	DPC		1	51			
		Excavator Breakfast	1	51			
			WNYDPC Excavator breakfast - Mayville	51			
NY, CHEMUNG			**3**	**211**	**4**	**5103**	0.08%
	Excavator Training		3	211			
		DSNY Presentation	2	81			
			Chemung County BOCES	55			
			Streeter Associates	26			
		Excavator Safety	1	130			
			Excavator Safety Seminar - Horseheads	130			
NY, CHENANGO			**0**	**0**	**0**	**2638**	
NY, CLINTON			**2**	**68**	**1**	**4092**	0.02%
	Excavator Training		2	68			
		DSNY Presentation	2	68			

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
			753 Presentation - CVTEC pm session	37			
			753 Presentaton - CVTEC am session	31			
NY, COLUMBIA			**3**	**108**	**11**	**2204**	0.50%
	Excavator Training		3	108			
		DSNY Presentation	3	108			
			753 Presentation Colarusso & Son, Inc	51			
			753 Presentation Department of Labor	20			
			753 Presentation OSHA Partner	37			
NY, CORTLAND			**5**	**243**	**2**	**3128**	0.06%
	DPC		1	37			
		Excavator Breakfast	1	37			
			STDPC Excavator Breakfast - Cortland	37			
	Excavator Training		4	206			
		DSNY Presentation	4	206			
			753 presentation for Cortland County Water Ops	44			
			753 Presentation for Vector Construction	59			
			cORTLAND cOUNTY wATER oPERATORS	44			
			Vector Construction	59			
NY, DELAWARE			**0**	**0**	**0**	**2802**	
NY, DUTCHESS			**12**	**317**	**10**	**11613**	0.09%
	Excavator Training		12	317			
		DSNY Presentation	12	317			
			753 Presentation Central Hudson	6			
			753 Presentation Central Hudson	6			
			753 Presentation Central Hudson	9			
			753 Presentation Central Hudson	25			
			753 Presentation Central Hudson	31			
			753 Presentation Department of Labor	71			
			753 Presentation Dept of Labor	59			
			753 Presentation Lovell Safety	45			
			753 Presentation Mr. Rooter	1			
			753 Presentation Mr. Rooter	11			
			753 Presentation NYS DOT	42			
			Design Presentation Mid-Hudson Civil Eng. Society	11			
NY, ERIE			**9**	**564**	**24**	**74649**	0.03%
	Excavator Training		9	564			

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
		DSNY Presentation	8	378			
			Buffalo Laborers Training Center	19			
			City of Buffalo Water Department	38			
			NYSDOT Buffalo Headquarters	36			
			NYSDOT Northern Erie Maintenance Division	113			
			Town and Village of Orchard Park	42			
			Union Concrete Construction	86			
			Verizon Locator Training	24			
			Visone Construction	20			
		Excavator Safety	1	186			
			Excavator Safety Seminar - Hamburg	186			
NY, ESSEX			**2**	**38**	**0**	**1512**	0.00%
	Excavator Training		2	38			
		DSNY Presentation	2	38			
			753 Presentation - Steve Fuller Excavation	6			
			753 Presentation - US Olympic Training Center	32			
NY, FRANKLIN			**0**	**0**	**0**	**1399**	
NY, FULTON			**0**	**0**	**5**	**1914**	0.26%
NY, GENESEE			**2**	**69**	**6**	**4084**	0.15%
	Excavator Training		2	69			
		DSNY Presentation	2	69			
			DOT PRESENTATION	50			
			Keeler Construction Co.	19			
NY, GREENE			**2**	**39**	**0**	**1505**	0.00%
	Excavator Training		2	39			
		DSNY Presentation	2	39			
			753 Presentation Central Hudson	26			
			753 Presentation Village of Catskill	13			
NY, HAMILTON			**0**	**0**	**0**	**349**	
NY, HERKIMER			**0**	**0**	**6**	**3306**	0.18%
NY, JEFFERSON			**5**	**168**	**30**	**6279**	0.48%
	DPC		1	70			
		Excavator Breakfast	1	70			
			CNYDPC Excavator Breakfast - Watertown	70			
	Excavator Training		4	98			
		DSNY Presentation	4	98			
			Actus Land Lease	36			
			Army Corps of Engineers	19			
			Lawman Heating & Air Conditioning	11			
			NYS DOL OSHA 10 Hr	32			

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
NY, LEWIS			**0**	**0**	**0**	**1418**	
NY, LIVINGSTON			**7**	**318**	**15**	**3201**	0.47%
	Excavator Training		7	318			
		DSNY Presentation	7	318			
			DOT PRESENTATION	42			
			DOT PRESENTATION	42			
			PIPELINE DINNER PRESENTATION	65			
			Presentation	9			
			Presentation	29			
			PRESENTATION	106			
			Presentation for IAEI	25			
NY, MADISON			**2**	**121**	**3**	**3640**	0.08%
	DPC		1	100			
		Excavator Breakfast	1	100			
			CNY/MV DPC Joint Excavator Breakfast - Canastota	100			
	Excavator Training		1	21			
		DSNY Presentation	1	21			
			SUNY Morrisville	21			
NY, MONROE			**18**	**771**	**95**	**38041**	0.25%
	Excavator Training		18	771			
		DSNY Presentation	17	537			
			BOCES, HEAVY EQUIP	43			
			DOT PRESENTATION	43			
			DOT PRESENTATION	50			
			DOT SPRING SAFETY MEETING PRESENTATION	32			
			PIPELINE SAFETY DINNER PRESENTATION	34			
			Presentation	9			
			Presentation	14			
			Presentation	15			
			Presentation	22			
			Presentation	29			
			Presentation	35			
			Presentation @ Contractor lunch	6			
			Presentation for DOT	8			
			PRESENTATION FOR REDITUS	14			
			Presentations	37			
			TIME WARNER CABLE, PRESENTATION	20			
			VILLAGER CONST PRESENTATION	126			
		Excavator Safety	1	234			
			Excavator Safety Seminar - Pittsford	234			

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
NY, MONTGOMERY			**0**	**0**	**15**	**2565**	
NY, NIAGARA			**4**	**291**	**3**	**11034**	0.03%
	Excavator Training		4	291			
		DSNY Presentation	4	291			
			NYSDOT Niagara Region Maintenance Division	59			
			PIPELINE SAFETY SEMINAR PRESENTATION	194			
			Presentation	28			
			Town of Pendleton Public Works	10			
NY, ONEIDA			**11**	**395**	**3**	**10113**	0.03%
	DPC		1	69			
		Excavator Breakfast	1	69			
			MVDPC Excavator Breakfast - New Hartford	69			
	Excavator Training		10	326			
		DSNY Presentation	10	326			
			753 Presentation for Mohawk Valley Builders	21			
			753 presentation for The Pipeline Group	26			
			NYS DOL OSHA 10 hr	18			
			NYS DOL OSHA 10 Hr	41			
			NYS DOT Region 2 Safety Day	100			
			NYSDOL Onsite Consultation	13			
			NYSDOL OSHA 10 hr	42			
			Oneida County Town Highway Employees	24			
			Pipeline Group Safety Meeting	26			
			Schumaker Engineering	15			
NY, ONONDAGA			**28**	**932**	**145**	**26303**	0.55%
	Excavator Training		28	932			
		DSNY Presentation	27	681			
			753 presentation for ABC/ Reller Risk Managment	31			
			753 presentation for APWA inspectors	12			
			753 presentation for ASSE	22			
			753 presentation for Bat Con	26			
			753 Presentation for NYS Parks Dept	26			
			753 presentation for the Pipeline Group	30			
			APWA Central NY Chapter	35			
			ASSE PDC Annual Meeting	136			
			Bat Con	13			
			Bat Con	26			

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
			C&S Companies	15			
			City of Syracuse Water	25			
			Dekatherm	4			
			Elderlee Construction	6			
			NYS DOL Osha 10 Hr	11			
			NYS DOL OSHA 10 Hr	52			
			NYS Parks Dept	27			
			NYSDOL OSHA 10hr	34			
			OCM BOCES OSHA 10 Hr	32			
			Onondaga County Soil & Water Conservation District	11			
			Peerless Insurance	22			
			Pipeline Group Safety Meeting	31			
			RG&E Call Center Tour & Presentation	6			
			Salt City Site Works	2			
			SBGA Central NY Chapter Annual Workshop	20			
			StanTec	12			
			Syracuse University	14			
		Excavator Safety	1	251			
			Excavator Safety Seminar - Syracuse	251			
NY, ONTARIO			**5**	**413**	**25**	**7750**	0.32%
	Excavator Training		5	413			
		DSNY Presentation	5	413			
			DOT PRESENTATION	31			
			ONTARIO COUNTY SAFETY MEETING	297			
			PIPELINE SAFETY DINNER PRESENTATION	45			
			Presentation	8			
			Presentation	32			
NY, ORANGE			**16**	**336**	**13**	**13451**	0.10%
	Excavator Training		16	336			
		DSNY Presentation	16	336			
			753 Presentation Actis Lend Lease	13			
			753 Presentation Boyce Excavation	5			
			753 Presentation Cental Hudson	13			
			753 Presentation Central Hudson New Contractor	9			
			753 Presentation Hudson Valley Master Plumbers	8			
			753 Presentation J. Mullens	13			
			753 Presentation Local 825	12			
			753 Presentation Local 825	15			

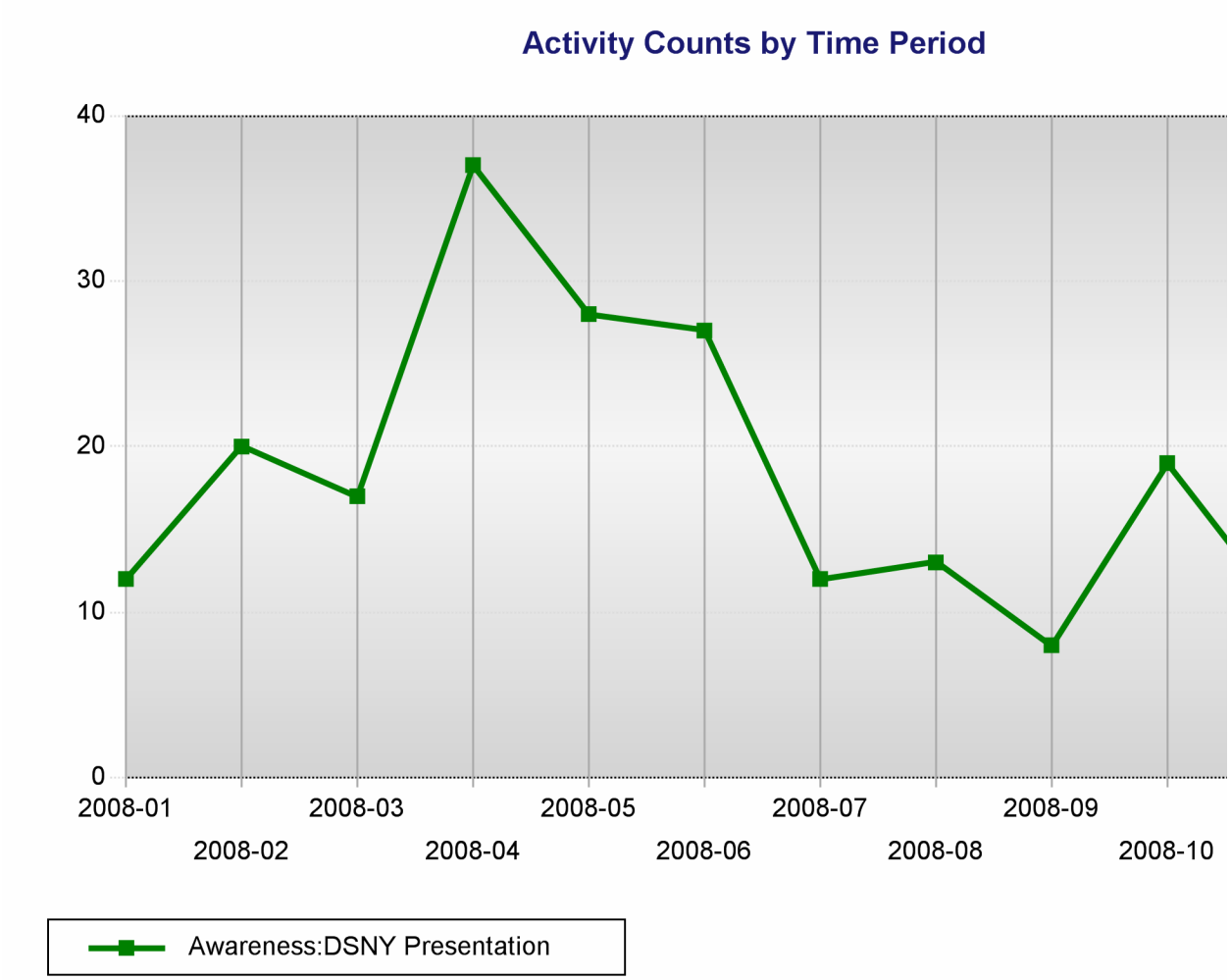
State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
			753 Presentation Local Union 825	12			
			753 Presentation NYS Thruway Authority	28			
			753 Presentation Orange County Highway Assoc.	91			
			753 Presentation Pine Bush Equipment	44			
			753 Presentation Pine Bush Training Center	7			
			753 Presentation Pipeline Meeting	35			
			753 Presentation Precise Landscaping	8			
			753 Presentation Well Drillers Assoc	23			
NY, ORLEANS			**0**	**0**	**1**	**2278**	
NY, OSWEGO			**1**	**61**	**25**	**7276**	0.34%
	Excavator Training		1	61			
		DSNY Presentation	1	61			
			Oswego County BOCES	61			
NY, OTSEGO			**2**	**131**	**0**	**3106**	0.00%
	Excavator Training		2	131			
		DSNY Presentation	2	131			
			NYSDOT Region 9 Safety Day	71			
			Otsego County BOCES	60			
NY, PUTNAM			**2**	**31**	**1**	**3211**	0.03%
	Excavator Training		2	31			
		DSNY Presentation	2	31			
			753 Presentation Arborscape Landscaping	7			
			753 Presentation Lovell Safety	24			
NY, RENSSELAER			**5**	**93**	**25**	**6661**	0.38%
	Excavator Training		5	93			
		DSNY Presentation	5	93			
			753 Presentation - Doug Empie	1			
			753 Presentation - Questar III	16			
			753 Presentation - Rifenburg Construction	34			
			753 Presentation - Rifenburg Contracting Corp	33			
			Design Ticket - Chazen Company	9			
NY, ROCKLAND			**5**	**344**	**13**	**17102**	0.08%
	Excavator Training		5	344			
		DSNY Presentation	4	147			
			753 Presentation CCG LLC,	98			
			753 Presentation DeSimone	4			
			753 Presentation MCM Paving	3			

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
			753 Presentation Raines & Welsh	42			
		Excavator Safety	1	197			
			Excavator Safety Seminar - Suffern	197			
NY, SARATOGA			**5**	**114**	**60**	**11440**	0.52%
	Excavator Training		5	114			
		DSNY Presentation	5	114			
			753 Presentation - AGC/DOT Tech Conference	22			
			753 Presentation - DeCrescente Dist ctr	36			
			753 Presentation - DeCrescente Dist. Co.	42			
			753 Presentation - Northway Estates	3			
			753 Presentation - Professional Landscapers	11			
NY, SCHENECTADY			**4**	**103**	**58**	**6018**	0.96%
	Excavator Training		4	103			
		DSNY Presentation	4	103			
			753 Presentation - Minority Contractors Tech Prog	38			
			753 Presentation - Sch'dy Minorities Group	18			
			753 Presentation - Youth Build	22			
			753 Presentation - Youth Built	25			
NY, SCHOHARIE			**5**	**223**	**0**	**1261**	0.00%
	Excavator Training		5	223			
		DSNY Presentation	5	223			
			753 Presentation - gas pipeline group, schoharie	58			
			753 Presentation - Iroquios Pipeline Cobleskill	72			
			753 Presentation - Paridym Gas Schoharie	49			
			753 Presentation - SUNY Cobleskill, am session	16			
			753 Presentation - SUNY Cobleskill, pm session	28			
NY, SCHUYLER			**0**	**0**	**0**	**1332**	
NY, SENECA			**3**	**227**	**58**	**2027**	2.86%
	Excavator Training		3	227			
		DSNY Presentation	3	227			
			4H SAFETY AND CAREER EVENT	171			
			PIPELINE SAFETY DINNER PRESENTATION	43			
			Presentation	13			

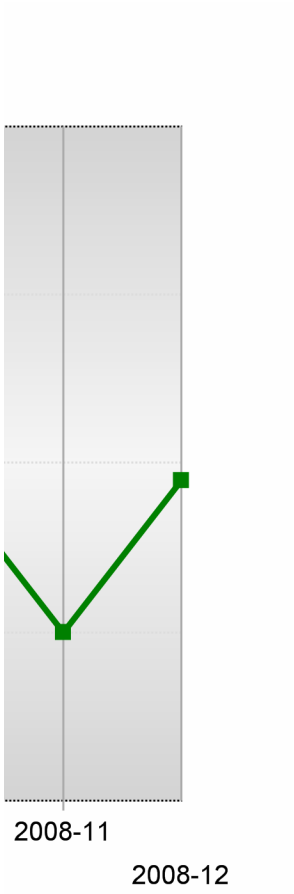
State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
NY, ST. LAWRENCE			**1**	**85**	**3**	**4754**	0.06%
	Excavator Training		1	85			
		Excavator Safety	1	85			
			Excavator Safety Seminar - Canton	85			
NY, STEUBEN			**6**	**302**	**2**	**7314**	0.03%
	Excavator Training		6	302			
		DSNY Presentation	6	302			
			BOCES HEAVY EQUIP	68			
			BOCES HEAVY EQUIP.	64			
			PIPELINE SAFETY PRESENTATION	50			
			Presentation	12			
			Presentation	13			
			Southern Tier Water Works Conference	95			
NY, SULLIVAN			**1**	**77**	**0**	**3199**	0.00%
	Excavator Training		1	77			
		Excavator Safety	1	77			
			Excavator Safety Seminar - Monticello	77			
NY, TIOGA			**0**	**0**	**0**	**2268**	
NY, TOMPKINS			**4**	**211**	**5**	**5696**	0.09%
	Excavator Training		4	211			
		DSNY Presentation	4	211			
			753 Presentation for The Pipeline Group	70			
			NYSDOL Ithaca	26			
			The Pipeline Group	70			
			Tompkins County BOCES	45			
NY, ULSTER			**4**	**129**	**2**	**5204**	0.04%
	Excavator Training		4	129			
		DSNY Presentation	4	129			
			753 New Employee Training	5			
			753 Presentation Central Hudson	25			
			753 Presentation New York Rual Water Assoc	83			
			753 Presentation Town of LLoyd	16			
NY, WARREN			**3**	**122**	**19**	**3486**	0.55%
	Excavator Training		3	122			
		DSNY Presentation	3	122			
			753 Presentation - Galusha Excavation	52			
			753 Presentation - Queensbury	23			
			753 Presentation Department of Labor	47			
NY, WASHINGTON			**0**	**0**	**15**	**2723**	

State And County	Category	Awareness Type	Activities	# People Reached	Damages	Location Requests	% of Damages Per Location Request
NY, WAYNE			**1**	**55**	**11**	**5118**	0.21%
	Excavator Training		1	55			
		DSNY Presentation	1	55			
			DOT PRESENTATION	55			
NY, WESTCHESTER			**12**	**419**	**18**	**35463**	0.05%
	Excavator Training		12	419	419	419	
		DSNY Presentation	12	419	419	419	
			753 Presentation Aqua Turf	13	13	13	
			753 Presentation Communication Constructon Group	22	22	22	
			753 Presentation Con Edison	35	35	35	
			753 Presentation Con Edison	69	69	69	
			753 Presentation Croton On Hudson DPW	23	23	23	
			753 Presentation Lovell Safety	30	30	30	
			753 Presentation Lovell Safety	35	35	35	
			753 Presentation Lovell Safety	36	36	36	
			753 Presentation Lovell Safety	44	44	44	
			753 Presentation Lower Hudson APWA	12	12	12	
			753 Presentation OSHA Partner	83	83	83	
			753 Presentation Town of New Castle DPW	17	17	17	
NY,WYOMING			**0**	**0**	**2**	**3014**	0.07%
NY, YATES			**0**	**0**	**2**	**1427**	0.14%

Awareness Data Analysis Report



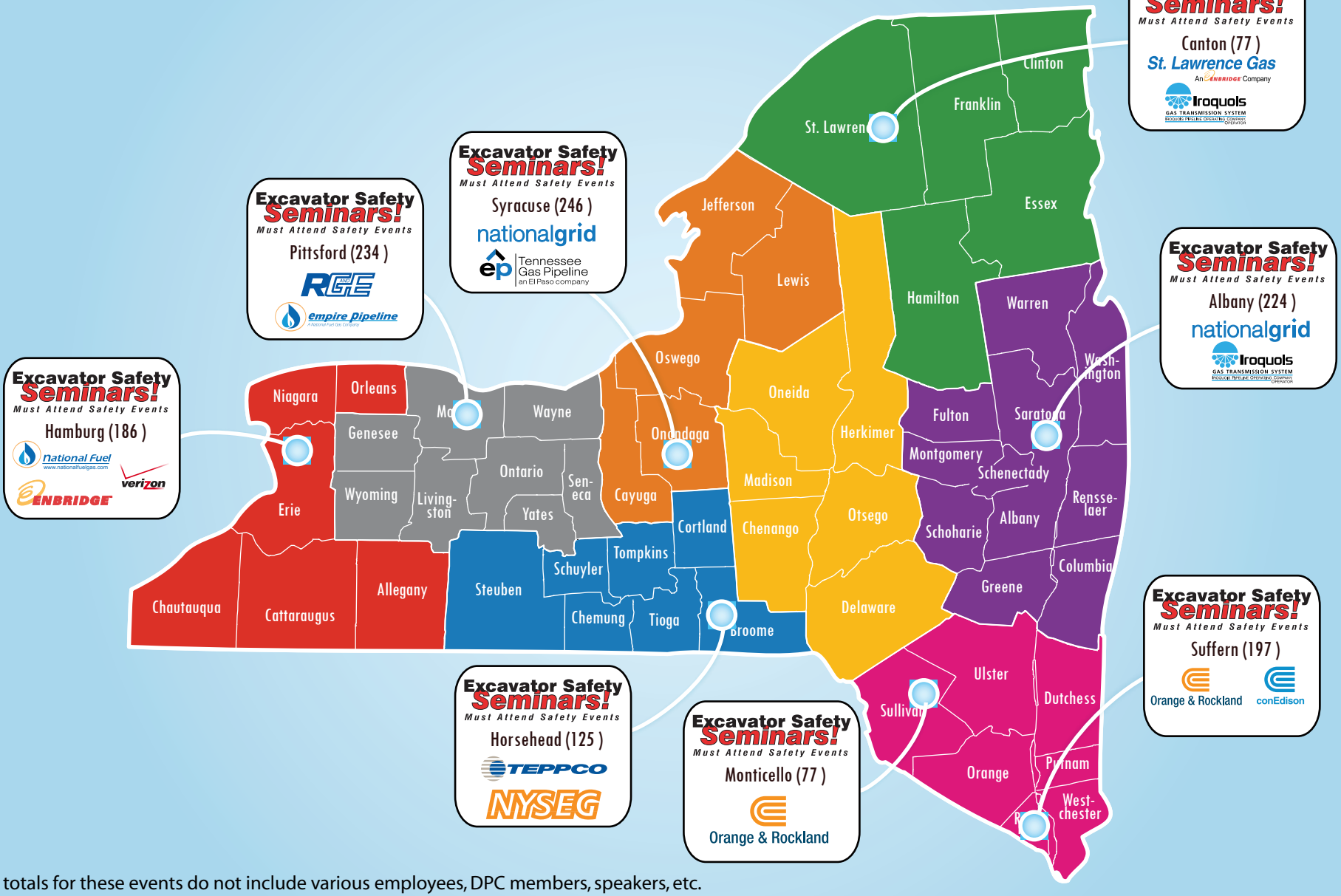
Awareness Data Analysis Report



Excavator Seminar Report

Category	Awareness Type	Activities	# People Reached
Excavator Training		**8**	**1389**
	Excavator Safety Seminar	8	1389
		Excavator Safety Seminar - Albany	229
		Excavator Safety Seminar - Canton	85
		Excavator Safety Seminar - Hamburg	186
		Excavator Safety Seminar - Horseheads	130
		Excavator Safety Seminar - Monticello	77
		Excavator Safety Seminar - Pittsford	234
		Excavator Safety Seminar - Suffern	197
		Excavator Safety Seminar - Syracuse	251

2008 Dig Safely New York Excavator Safety Seminars



The totals for these events do not include various employees, DPC members, speakers, etc.

DSNY Presentation Report

Category	Awareness Type	Activities	# People Reached
Excavator Training		**225**	**7507**
	DSNY Presentation	225	7507
		4H SAFETY AND CAREER EVENT	171
		753 - Presentation Joe Caracciolo Electric	2
		753 New Employee Training	5
		753 Presentation - AGC/DOT Tech Conference	22
		753 Presentation - BOCES Capital Region	17
		753 Presentation - BOCES Capital Region	6
		753 Presentation - Building Bridges Albany	12
		753 Presentation - CVTEC pm session	37
		753 Presentation - DeCrescente Dist ctr	36
		753 Presentation - DeCrescente Dist. Co.	42
		753 Presentation - Dekatherm	5
		753 Presentation - Dept of Labor	24
		753 Presentation - Doug Empie	1
		753 Presentation - Eastern Contractors Assoc	21
		753 Presentation - Flach Industries	17
		753 Presentation - Galusha Excavation	52
		753 Presentation - Gas Pipeline Group Albany	35
		753 Presentation - gas pipeline group, schoharie	58
		753 Presentation - Groundworks Utilities, LLC	12
		753 Presentation - Iroquios Pipeline Cobleskill	72
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		753 Presentation - Minority Contractors Tech Prog	38
		753 Presentation - National Grid	6
		753 Presentation - NESCA	26
		753 Presentation - Northway Estates	3
		753 Presentation - Paridym Gas Albany	48
		753 Presentation - Paridym Gas Schoharie	49
		753 Presentation - Professional Landscapers	11
		753 Presentation - Queensbury	23
		753 Presentation - Questar III	16
		753 Presentation - Rifenburg Construction	34
		753 Presentation - Rifenburg Contracting Corp	33
		753 Presentation - Sano Rubin	22
		753 Presentation - Sch'dy Minorities Group	18
		753 Presentation - Shaw Environmental	6
		753 Presentation - Steve Fuller Excavation	6
		753 Presentation - Straight Line Industries	33
		753 Presentation - SUNY Cobleskill, am session	16
		753 Presentation - SUNY Cobleskill, pm session	28
		753 Presentation - Syracuse utilities	9
		753 Presentation - T O Bethlehem DPW	27
		753 Presentation - US Olympic Training Center	32
		753 Presentation - Wade Electric	3
		753 Presentation - Youth Build	22
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		753 Presentation Actis Lend Lease	13
		753 Presentation Aqua Turf	13
		753 Presentation Arborscape Landscaping	7
		753 Presentation Boyce Excavation	5
		753 Presentation CCG LLC,	98
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		753 Presentation Central Hudson	31
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753 Presentation Colarusso & Son, Inc	51
753 Presentation Communication Constructon Group	22
753 Presentation Con Edison	69
753 Presentation Con Edison	35
753 Presentation Croton On Hudson DPW	23
753 Presentation Department of Labor	71
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753 Presentation Department of Labor	47
753 Presentation Dept of Labor	59
753 Presentation DeSimone	4
753 presentation for ABC/ Reller Risk Managment	0
753 presentation for APWA inspectors	12
753 presentation for ASSE	22
753 presentation for Bat Con	26
753 presentation for Binghamton University	30
753 Presentation for Christa Construction	29
753 presentation for Cortland County Water Ops	44
753 Presentation for Mohawk Valley Builders	21
753 Presentation for NYS Parks Dept	26
753 presentation for The Pipeline Group	26
753 presentation for the Pipeline Group	30
753 Presentation for The Pipeline Group	70
753 Presentation for Vector Construction	59
753 Presentation Hudson Valley Master Plumbers	8
753 Presentation J. Mullens	13
753 Presentation Local 825	12
753 Presentation Local 825	15
753 Presentation Local Union 825	12
753 Presentation Lovell Safety	45
753 Presentation Lovell Safety	30
753 Presentation Lovell Safety	36
753 Presentation Lovell Safety	44
753 Presentation Lovell Safety	35
753 Presentation Lovell Safety	24
753 Presentation Lower Hudson APWA	12
753 Presentation MCM Paving	3
753 Presentation Mr. Rooter	1
753 Presentation Mr. Rooter	11
753 Presentation New York Rual Water Assoc	83
753 Presentation NYS DOT	42
753 Presentation NYS Thruway Authority	28
753 Presentation Orange County Highway Assoc.	91
753 Presentation OSHA Partner	37
753 Presentation OSHA Partner	83
753 Presentation Pine Bush Equipment	44
753 Presentation Pine Bush Training Center	7
753 Presentation Pipeline Meeting	35
753 Presentation Precise Landscaping	8
753 Presentation Raines & Welsh	42
753 Presentation Town of LLoyd	16
753 Presentation Town of New Castle DPW	17
753 Presentation Village of Catskill	13
753 Presentation Well Drillers Assoc	23
753 Presentaton - CVTEC am session	31
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BOCES HEAVY EQUIP	68
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Buffalo Labor Union Training Center	13
Buffalo Laborers Training Center	19
C&S Companies	15
Capital Fence Company	12
Chemung County BOCES	55
Christa Construction	29
City of Buffalo Water Department	38
City of Syracuse Water	25
cORTLAND cOUNTY wATER oPERATORS	44
Dekatherm	4
Design Presentation Mid-Hudson Civil Eng. Society	11
Design Ticket - ASCE Hudson Mohawk Chapter	17
Design Ticket - Chazen Company	9
Design Ticket - Shaw Environmental	15
Design Ticket Presentation - CT Male Assoc	18
DOT PRESENTATION	42
DOT PRESENTATION	55
DOT PRESENTATION	31
DOT PRESENTATION	43
DOT PRESENTATION	50
DOT PRESENTATION	50
DOT PRESENTATION	42
DOT SPRING SAFETY MEETING PRESENTATION	32
Elderlee Construction	6
Erie County & FEMA	23
Keeler Construction Co.	19
Lawman Heating & Air Conditioning	11
NYS DOL OSHA 10 hr	18
NYS DOL OSHA 10 Hr	32
NYS DOL OSHA 10 Hr	41
NYS DOL Osha 10 Hr	11
NYS DOL OSHA 10 Hr	52
NYS DOT Region 2 Safety Day	100
NYS Parks Dept	27
NYSDOL	70
NYSDOL	65
NYSDOL Ithaca	26
NYSDOL Onsite Consultation	13
NYSDOL OSHA 10 hr	42
NYSDOL OSHA 10hr	34
NYSDOT Buffalo Headquarters	36
NYSDOT Niagara Region Maintenance Division	59
NYSDOT Northern Erie Maintenance Division	113
NYSDOT Region 9 Safety Day	71
NYSEG Line Crews	21
OCM BOCES OSHA 10 Hr	32
Oneida County Town Highway Employees	24
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ONTARIO COUNTY SAFETY MEETING	297
Oswego County BOCES	61
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PIPELINE DINNER PRESENTATION	65
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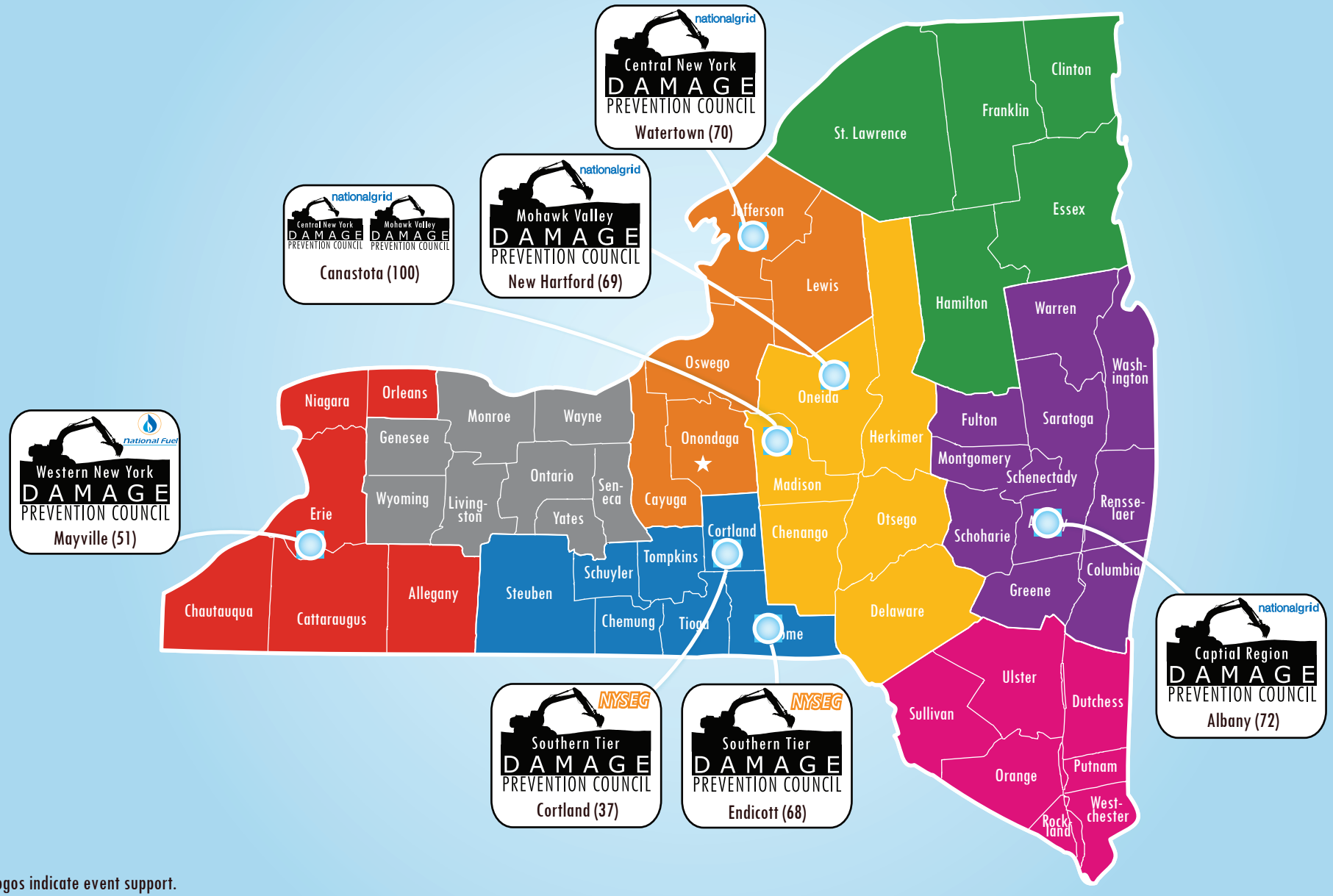
PIPELINE SAFETY DINNER PRESENTATION	45
PIPELINE SAFETY PRESENTATION	50
PIPELINE SAFETY SEMINAR PRESENTATION	194
PRESENTATION	106
Presentation	9
Presentation	22
Presentation	32
Presentation	9
Presentation	28
Presentation	29
Presentation	35
Presentation	14
Presentation	8
Presentation	15
Presentation	13
Presentation	29
Presentation	12
Presentation	13
Presentation @ Contractor lunch	6
Presentation for DOT	8
Presentation for IAEI	25
PRESENTATION FOR REDITUS	14
Presentations	37
RG&E Call Center Tour & Presentation	6
Salt City Site Works	2
SBGA Central NY Chapter Annual Workshop	20
Schumaker Engineering	15
Southern Tier Home Builders Association	24
Southern Tier Water Works Conference	95
StanTec	12
Streeter Associates	26
SUNY Morrisville	21
Syracuse University	14
The Pipeline Group	70
TIME WARNER CABLE, PRESENTATION	20
Tompkins County BOCES	45
Town and Village of Orchard Park	42
Town of Pendleton Public Works	10
Tra Gen Concrete	5
Union Concrete Construction	86
Vector Construction	59
Verizon Locator Training	24
VILLAGER CONST PRESENTATION	126
Visone Construction	20

DPC Excavator Breakfast Report

Category	Awareness Type	Activities	# People Reached
DPC		**7**	**467**
	Excavator Breakfast	7	467
		CNY/MV DPC Joint Excavator Breakfast - Canastota	100
		CNYDPC Excavator Breakfast - Watertown	70
		CRDPC Excavator Breakfast - Albany	72
		MVDPC Excavator Breakfast - New Hartford	69
		STDPC Excavator Breakfast - Cortland	37
		STDPC Excavator Breakfast - Endicott	68
		WNYDPC Excavator breakfast - Mayville	51

2008 Dig Safely New York Damage Prevention Council Events



Logos indicate event support.