



Technology Update

Shane Ayers

Safety Program Manager

Division of Utility and Railroad Safety

Integrity Management for Gas Distribution Report for the Pipeline and Hazardous Material Safety Administration (Dec. 2005)

Comprehensive damage prevention programs that include effective enforcement have a significantly lower risk of excavation damage and the potential for incidents.

Elements of a comprehensive damage prevention program include:

- Enhanced communication between operators and excavators
- Fostering support and partnership of all stakeholders in all phases (enforcement, public education, etc.) of the program
- Operator's use of performance measures regarding persons performing location and pipeline construction
- Partnership in employee training

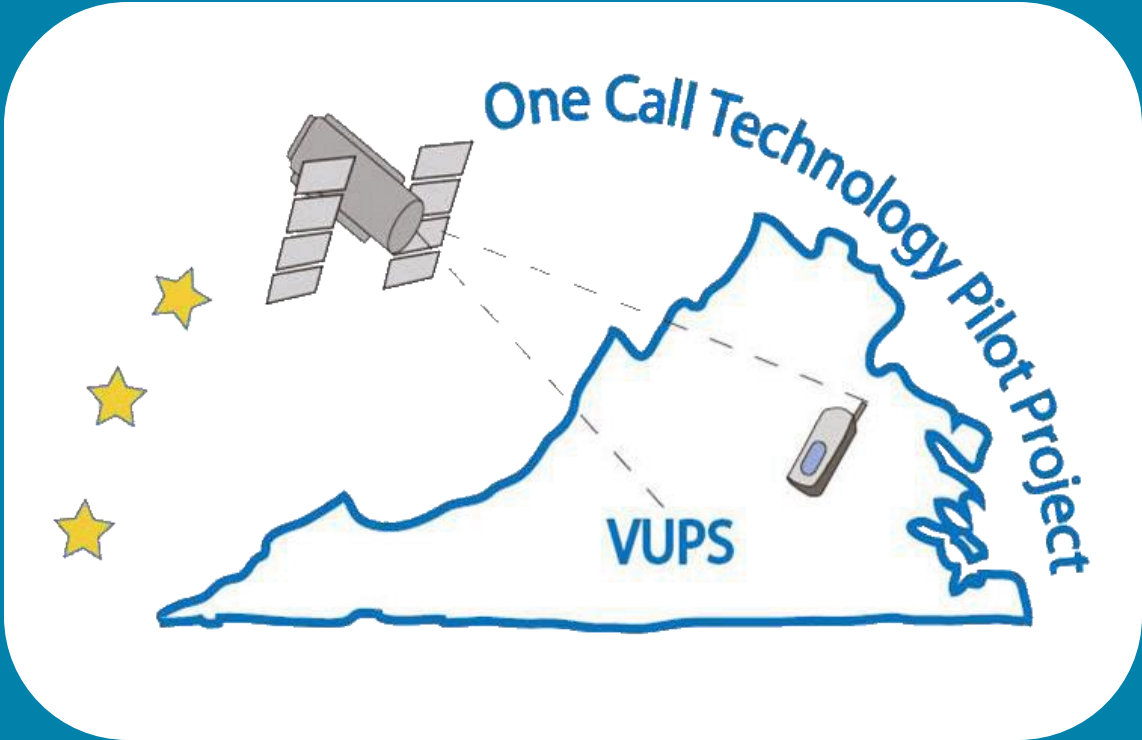
Integrity Management for Gas Distribution Report for the Pipeline and Hazardous Material Safety Administration (Dec. 2005)

- (continued) Elements of a comprehensive damage prevention program :
 - Partnership in public education
 - Enforcement agency's role as a partner and facilitator to help resolve issues
 - Fair and consistent enforcement of the law to all stakeholders
 - Use of technology to improve all parts of the process
 - Analysis of data to continually evaluate/improve program effectiveness



GPS Early Adoption in Virginia

- City of Richmond initiated a project to incorporate GPS locations of all critical valves and included photographs of the site locations in their mapping systems. They were among the first operators in Virginia to adopt such technologies on a large scale...

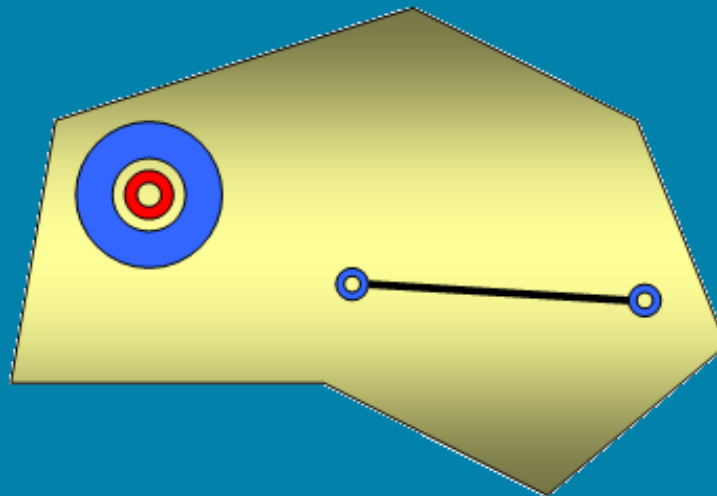


One Call Technology Pilot Project

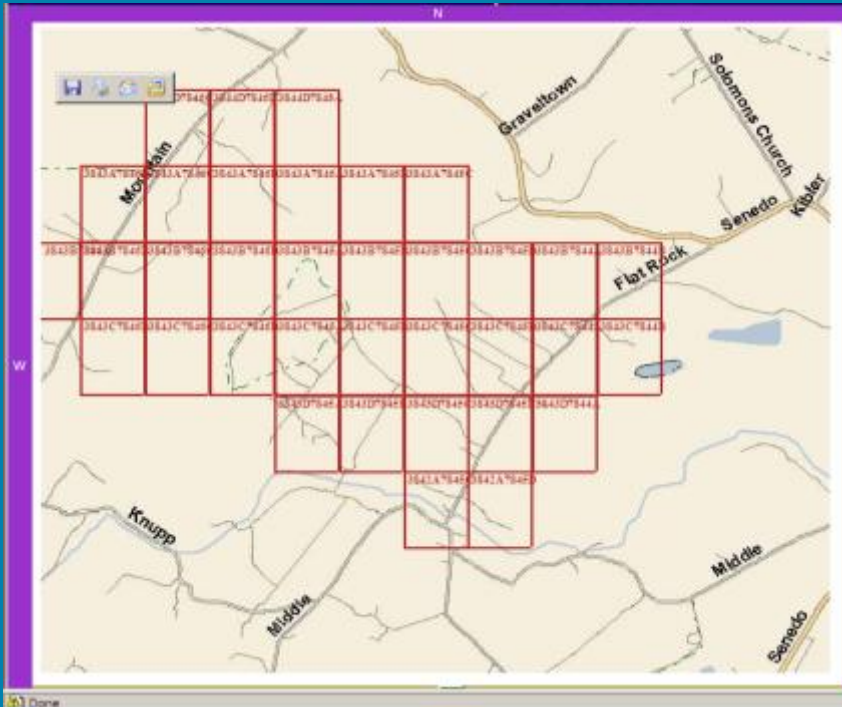
VUPS

Virginia One Call Technology Pilot Project

- Phase I: Electronic white lining
 - Excavator using hand-held device gathered GPS coordinate data at proposed excavation site and transmitted electronic locate request ticket to VUPS
 - Excavation areas were: Single point (bulls eye); line; or polygon area
 - Automated map selection by VUPS upon locate request ticket entry based on GPS coordinates



Results from Phase I



Pilot Projects tickets were 89% smaller in size



Virginia One Call Technology Pilot Project Phase II

- Locate Facilities and collect GPS data to create electronic manifest
- Provide manifest to excavators with Positive Response System data
- Provide data to operators for verification of maps and plans

Phase II was Largely Supported by the efforts of the City of Charlottesville



An example of how the Locate Industry has adopted similar technology as explored in the Virginia Pilot Project for One Call Technology is currently being used in northern Virginia...

Electronic Marking Wand



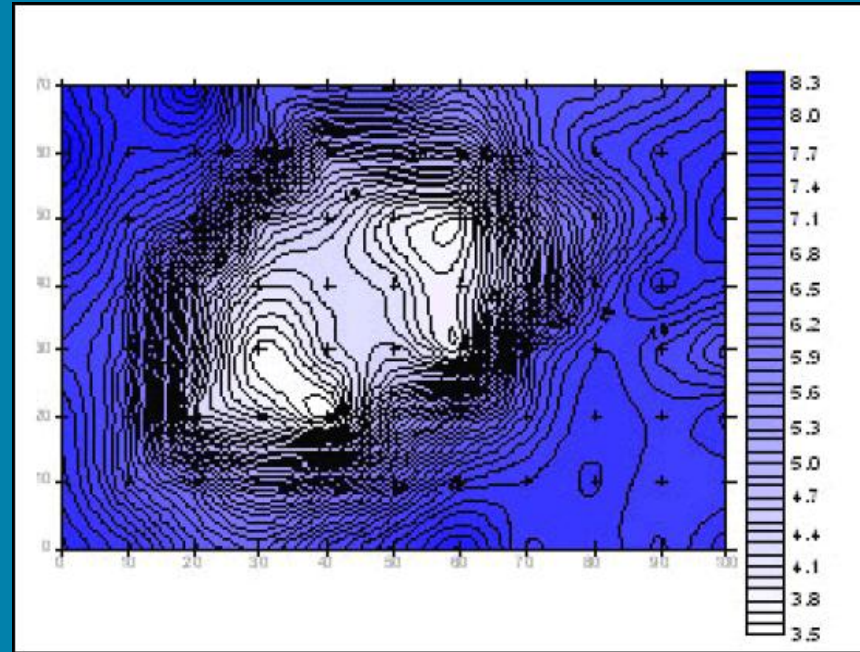
Virginia One Call Technology Pilot Project Phase III

- Phase III: Electronic Excavation – Utilize GPS with excavation equipment to prevent facility hits
 - Operator's view



Broadband Electromagnetic Technology

- BEM identifies evidence of ferrous (i.e., steel, CI and ductile-iron) pipe wall loss or other structural defects.
- This technology is in the final development stages at GTI and the Rock Solid Group with OTD funding.
- The BEM tool can be inserted down a keyhole for externally performed pipeline assessments around the complete circumference of the pipe.



BEM

- BEM tools can be assembled for most any size pipe
- Antennas are as small as 1-inch
- BEM smart pig attachments start at 6 inches
 - Pigs are not intrinsically safe, so pipe segment would have to be out of service
- Data can be linked to a company's existing GIS using Esri or other GIS systems, such as GE Smallworld.
- Main and service evaluation these can be plotted on company maps.



Electro-Fusion and Bar Coding





Data May be Stored, Retrieved, and Incorporated into Records

- Serial number of the electro-fusion unit
- Job number
- Operator Identity
- Date/Time of welding cycle
- Fusion cycle number
- Error number
- Fitting manufacturer
- Fitting type
- Fitting size
- Fitting resistance
- Ambient temperature
- Starting primary voltage
- Data input
- Fusion voltage applied
- Fusion time
- Fusion current
- Cooling time
- Pipes prepared
- GPS Coordinates

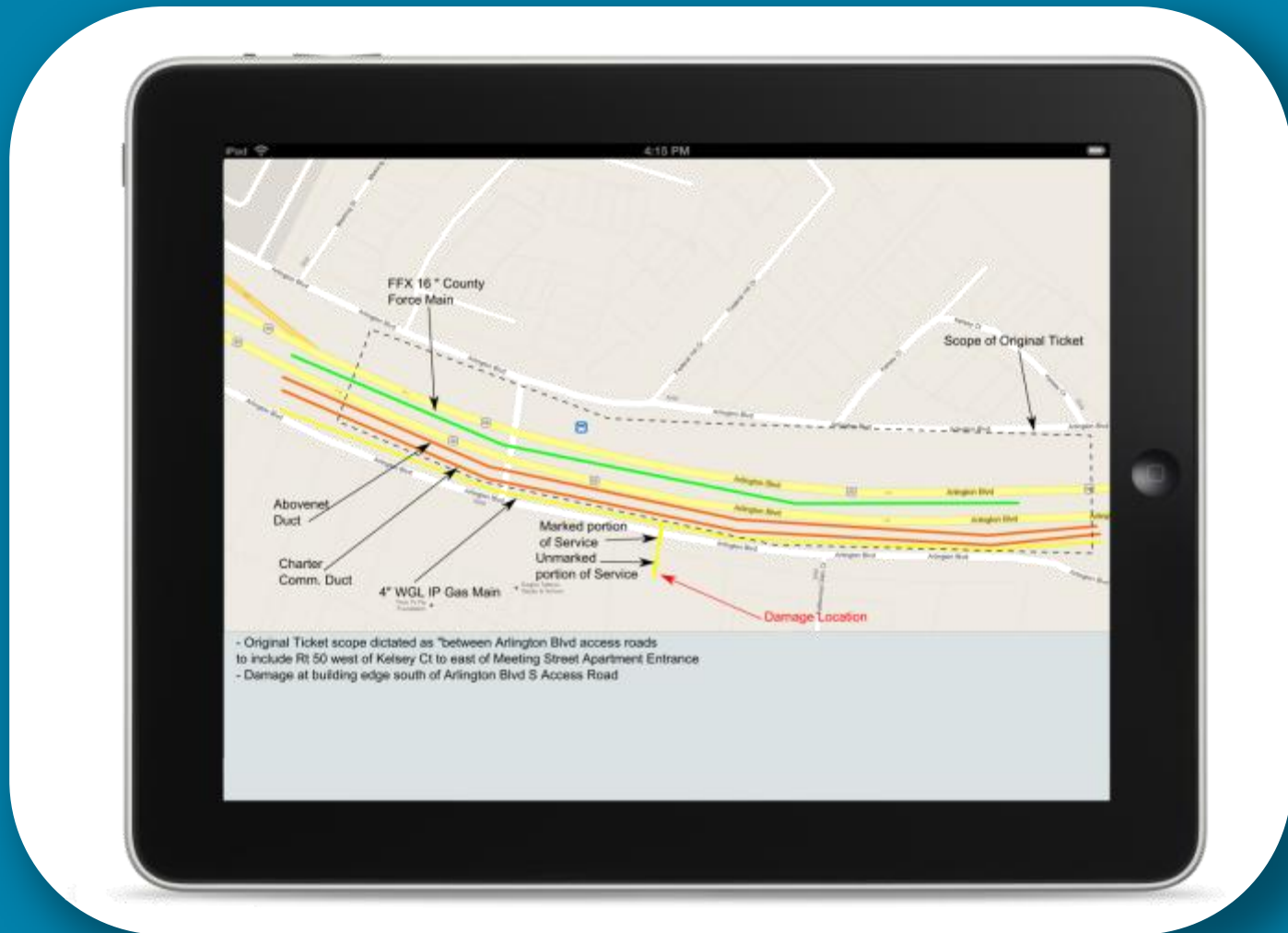
Training and Inspection

- Use the data to guide efforts for greatest impact
- Focus inspection, outreach and education efforts on large threats first
- Mitigate threats through a better understanding of what causes damages
- Share with others what works/ doesn't
- Coordinate inspection, outreach and education efforts with other stakeholders

Risk Based Excavation Inspection Tool



Field Inspection Documentation Using iPads



Location Enhanced Ticket Search ("LETS")



The screenshot shows a Windows Internet Explorer browser window displaying the LETS website. The address bar shows the URL <http://lets.va811.com/>. The browser's Favorites bar includes links to Knowledge Centre - Login, Code of Virginia, Google, Richmond, RichmondGov.com, SCC CITRIX, and SCC faces. The website header features the "LETS" logo in large orange and yellow letters, with "Location Enhanced Ticket Search" written below it. A small image of a yellow excavator is visible in the top right corner. The main content area contains a "GPS Search" button, followed by input fields for "Long:" and "Lat:", and a "Buffer:" dropdown menu set to "500". Below these is a "Phone/Ticket Number:" input field and a "Ticket Search" button. At the bottom left, there is a question mark icon, and at the bottom center, the "va811.com" logo with the tagline "Dig With CARE". The browser's status bar at the bottom shows "Done", "Internet", and a zoom level of "105%".

Location Enhanced Ticket Search ("LETS")

LETS - Location Enhanced Ticket Search - Windows Internet Explorer

http://lets.va811.com/default.aspx

GPS Search Long: Lat: Buffer:

Phone/Ticket Number: Ticket Search

Ticket #	Rev	Type	Name	Completed	Address	Work Type	Responses
A206601020	00A	NEW	NEW LOOK CONSTRUCTION	3/6/2012 12:08:50 PM	0 E BROAD ST ST	LANDSCAPING	Responses
A206601033	00A	NEW	NEW LOOK CONSTRUCTION	3/6/2012 12:16:35 PM	0 W BROAD ST ST	LANDSCAPING	Responses
A206700143	00A	UPDT	HENKELS & MCCOY INC	3/7/2012 8:20:02 AM	0 E MAIN ST ST	GAS MAIN - INSTALL	Responses
A206700144	00A	UPDT	HENKELS & MCCOY INC	3/7/2012 8:20:49 AM	0 10TH ST ST	TEST HOLE - CHECK UTILITY DEPTH OR LOCATION	Responses
A206700149	00A	UPDT	HENKELS & MCCOY INC	3/7/2012 8:21:42 AM	0 10TH ST ST	TEST HOLE - CHECK UTILITY DEPTH OR LOCATION	Responses
A206901058	00A	NEW	CONSULTANTS UNLIMITED INC	3/9/2012 12:42:52 PM	0 VIRGINIA ST ST	COMMUNICATIONS CABLE - INSTALL	Responses
A206901060	00A	NEW	CONSULTANTS UNLIMITED INC	3/9/2012 12:43:35 PM	0 VIRGINIA ST ST	COMMUNICATIONS CABLE - INSTALL	Responses
A206901065	00A	NEW	CONSULTANTS UNLIMITED INC	3/9/2012 12:44:46 PM	0 E CANAL ST ST	COMMUNICATIONS CABLE - INSTALL	Responses
A206901068	00A	NEW	CONSULTANTS UNLIMITED INC	3/9/2012 12:46:06 PM	0 E CANAL ST ST	COMMUNICATIONS CABLE - INSTALL	Responses
A206901069	00A	NEW	CONSULTANTS UNLIMITED INC	3/9/2012 12:46:45 PM	0 E CANAL ST ST	COMMUNICATIONS CABLE - INSTALL	Responses

123456

Error on page.

Location Enhanced Ticket Search ("LETS")

Company	MBR Code	Response	Responded
CITY OF RICHMOND	CRT358	10	3/7/2012 8:49:19 AM
FIBERLIGHT LLC	FBL410	10	3/7/2012 9:10:36 AM
ZAYO BANDWIDTH CENTRAL LLC	ZAY828	30	3/7/2012 9:19:35 AM
PAETEC COMMUNICATIONS INC	PAE487	10	3/7/2012 10:36:46 AM
WOODLAWN COMMUNICATION LLC	WCC798	10	3/8/2012 5:09:28 PM
MCI	MCII81	10	3/9/2012 10:20:32 AM
VERIZON	VZN310	10	3/9/2012 10:26:10 AM
CITY OF RICHMOND	CRWR04	96	3/9/2012 2:54:02 PM
CITY OF RICHMOND	CIRS04	11	3/9/2012 2:54:02 PM
CITY OF RICHMOND	CRGR04	96	3/9/2012 2:54:02 PM
CITY OF RICHMOND	CRST03	10	3/9/2012 2:54:02 PM
AT&T	ATT392	70	3/9/2012 4:14:00 PM
DOMINION VIRGINIA POWER	DOM010	10	3/9/2012 5:13:26 PM
COMCAST	CMC590	30	3/9/2012 5:13:26 PM

Done

Location Enhanced Ticket Search ("LETS")

Ticket number:

Month: Street:

VUPSA 03/07/12 08:20:02 A206700143-00A UPDATE

Ticket No: A206700143-00A UPDT GRID NORM LREQ
Transmit Date: 03/07/2012 Time: 08:20 AM Op: WBBUTLER
Call Date: 03/07/2012 Time: 08:19 AM
Due By Date: 03/12/2012 Time: 07:00 AM
Update By Date: 03/26/2012 Time: 11:59 PM
Expires Date: 03/29/2012 Time: 07:00 AM
Old Tkt No: B204700326
Original Call Date: 02/16/2012 Time: 08:46 AM Op: WBBUTLER

City/Co: RICHMOND CITY Place: State: VA
Address: Street: E MAIN ST
Cross 1: 11TH ST

Type of Work: GAS MAIN - INSTALL

Location: CAST IRON RENEW WE WILL BE REPLACING THE GAS MAIN ON E MAIN ST FROM 11TH ST TO 12TH ST THIS IS TO INCLUDE ALL INTERSECTIONS FOR 150' IN ALL DIRECTIONS

Instructions:

Whitelined: N Blasting: N Boring: Y

Company: HENKELS & MCCOY INC

Contact Name: BILL BUTLER

Field Contact: KEITH DOWNEY

Mapbook: DNG13
Grids: 3732D7726D-03 3732D7726D-04 3732D7726D-14

Members:
ATT392 = AT&T CIRS04 = CITY OF RICHMOND
CMC590 = COMCAST CRGR04 = CITY OF RICHMOND
CRST03 = CITY OF RICHMOND CRT958 = CITY OF RICHMOND
CRWR04 = CITY OF RICHMOND DOM010 = DOMINION VIRGINIA POWER
FBL410 = FIBERLIGHT LLC MCII81 = MCI
FAE487 = PAETEC COMMUNICATIONS INC VZN310 = VERIZON
WCC798 = WOODLAWN COMMUNICATION LLC ZAY828 = ZAYO BANDWIDTH CENTRAL LLC

Ticket Info Has Been Condensed

Done 100%

Locating Advancements in Acoustics



Acoustic Locating



What if you perform acoustic locating inductively? Stay tuned...

Broken Tracer Wires



Utility Congestion

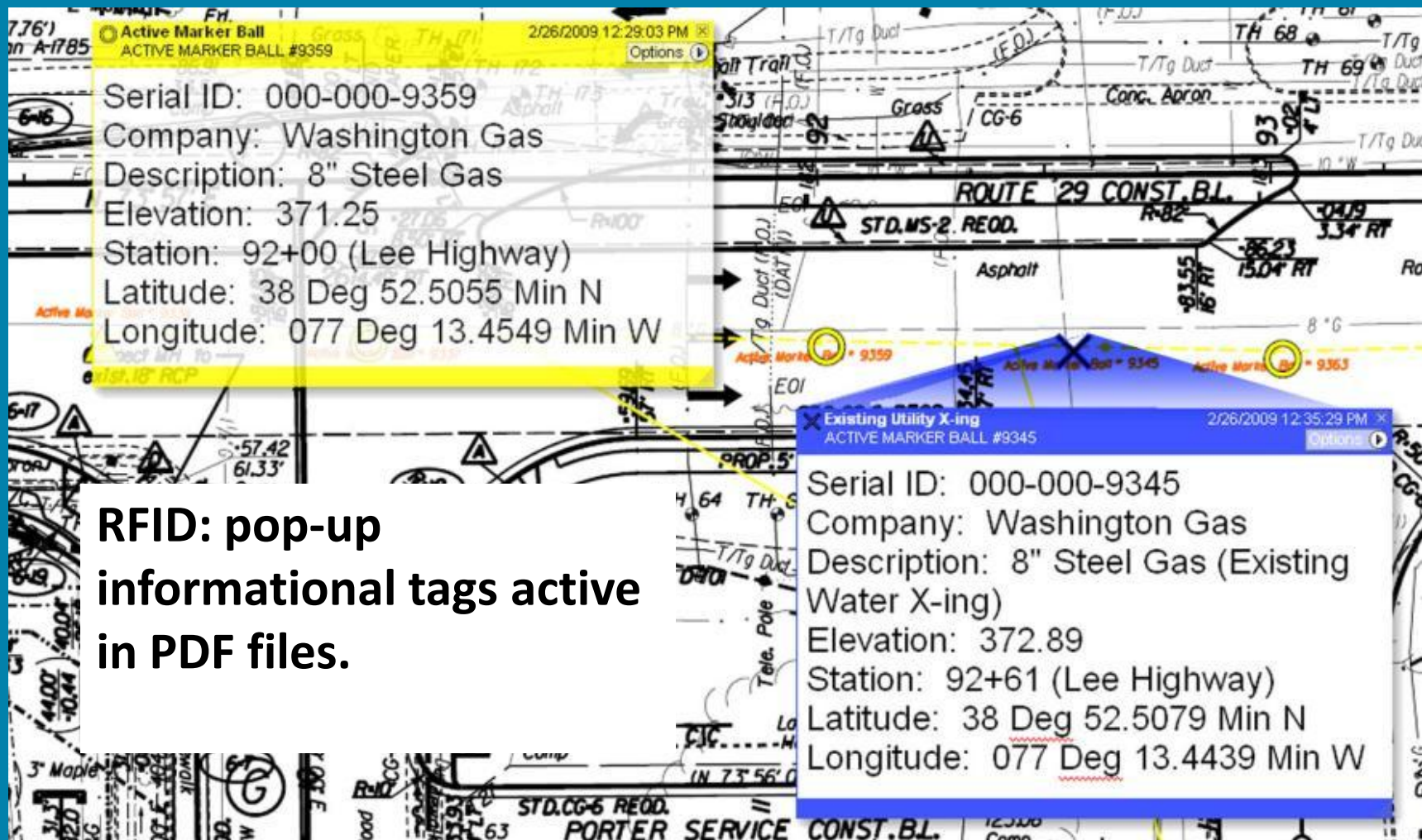


Utility Congestion



Rte. 29/Gallows Rd.





Active Marker Ball
ACTIVE MARKER BALL #9359
2/26/2009 12:29:03 PM
Options

Serial ID: 000-000-9359
Company: Washington Gas
Description: 8" Steel Gas
Elevation: 371.25
Station: 92+00 (Lee Highway)
Latitude: 38 Deg 52.5055 Min N
Longitude: 077 Deg 13.4549 Min W

Existing Utility X-ing
ACTIVE MARKER BALL #9345
2/26/2009 12:35:29 PM
Options

Serial ID: 000-000-9345
Company: Washington Gas
Description: 8" Steel Gas (Existing Water X-ing)
Elevation: 372.89
Station: 92+61 (Lee Highway)
Latitude: 38 Deg 52.5079 Min N
Longitude: 077 Deg 13.4439 Min W

**RFID: pop-up
informational tags active
in PDF files.**

Data Collection



The Value of Location

- Regularly spaced RFID markers ensure that you are keeping track of what's in the ground.
- Tied in with GPS, RFID markers allow automatic as-built creation and easier locating
 - Provide unique ID for each piece of inventory



Every Accident can be Catastrophic



Multiple Signals



Problem Becomes Clearer



4/19/2011 12:04

Abandoned 2" Main Parallels Active 4"

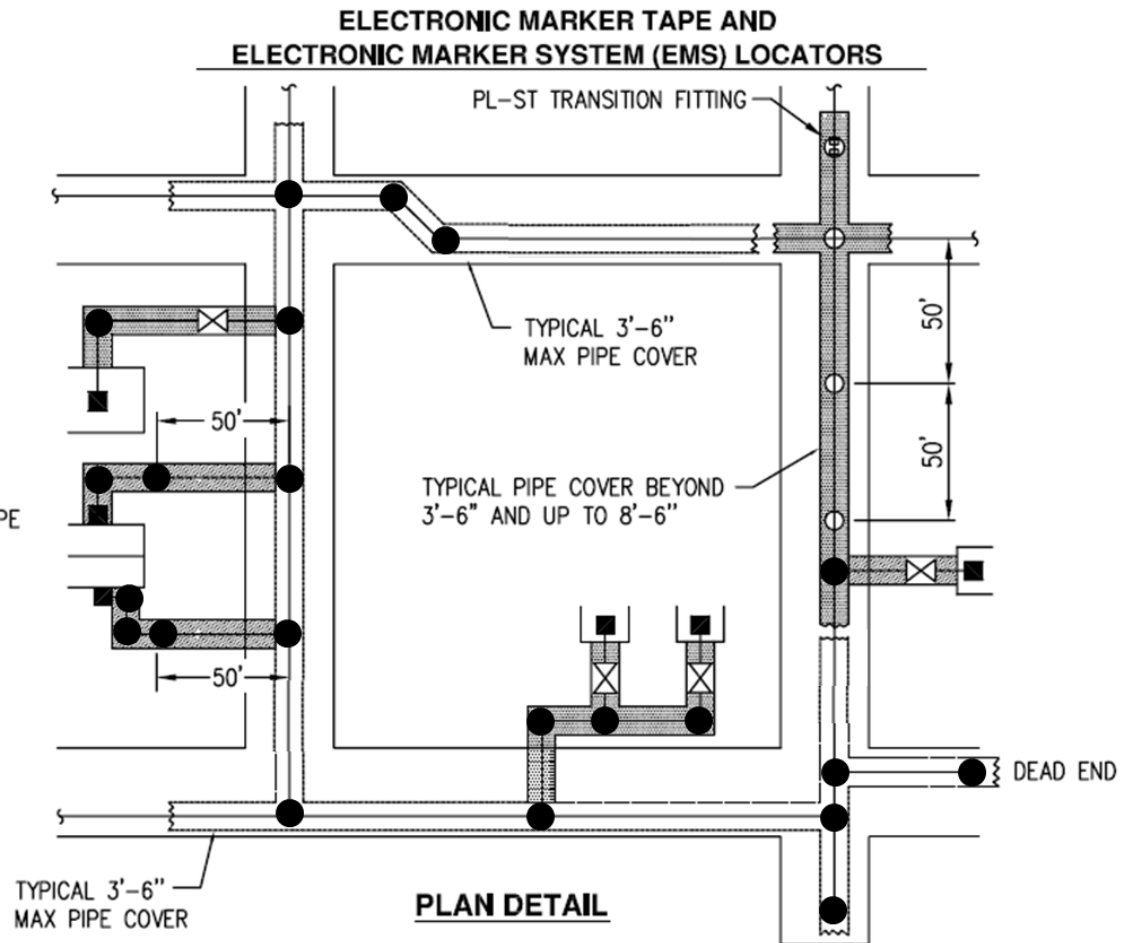
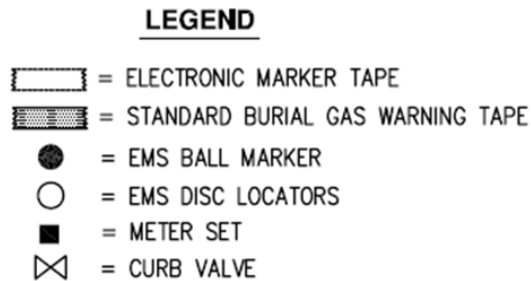


Issue is Identified



New Construction and Renewal Projects

- Open Trench – Marker Tape will be installed
- Trenchless and existing will have disk and ball type markers installed



Leveraging New Technologies

- One Large LDC will be installing about 5 miles of Tracer Tape in 2012
- Another will be installing Tracer Tape on all new open trench installations
- A number of utility operators, including municipal systems, plan to use both programmable and non-programmable EMS devices
 - Gas
 - Power
 - Telecommunications
 - Water
 - Sewer
- Installations are done parallel to conventional tracer systems
 - (18 gauge or thicker, braided or Neptco Tracer wire systems)
- A study will be conducted and a white paper will be published in 2013

In Summary...

- Technology can greatly assist in dealing with known issues and forecasting future problems
- Technology solutions can be low cost and still be effective
- Technology can assist in analyzing data from multiple legacy systems
- Focus efforts on large threats first
- Share with others what works/ doesn't

- We must not become complacent. The minimum requirement may not prevent the next catastrophic incident.



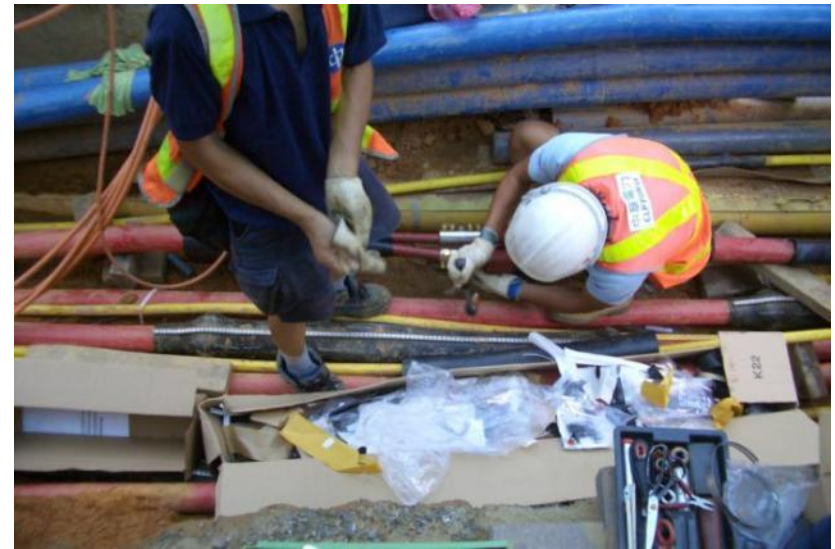
Advancements in Plastic Pipe Locating



Corey Willson
3M Locating and Marking Solutions
Austin, Tx

The challenges for utilities globally are three fold:

Where are my assets?

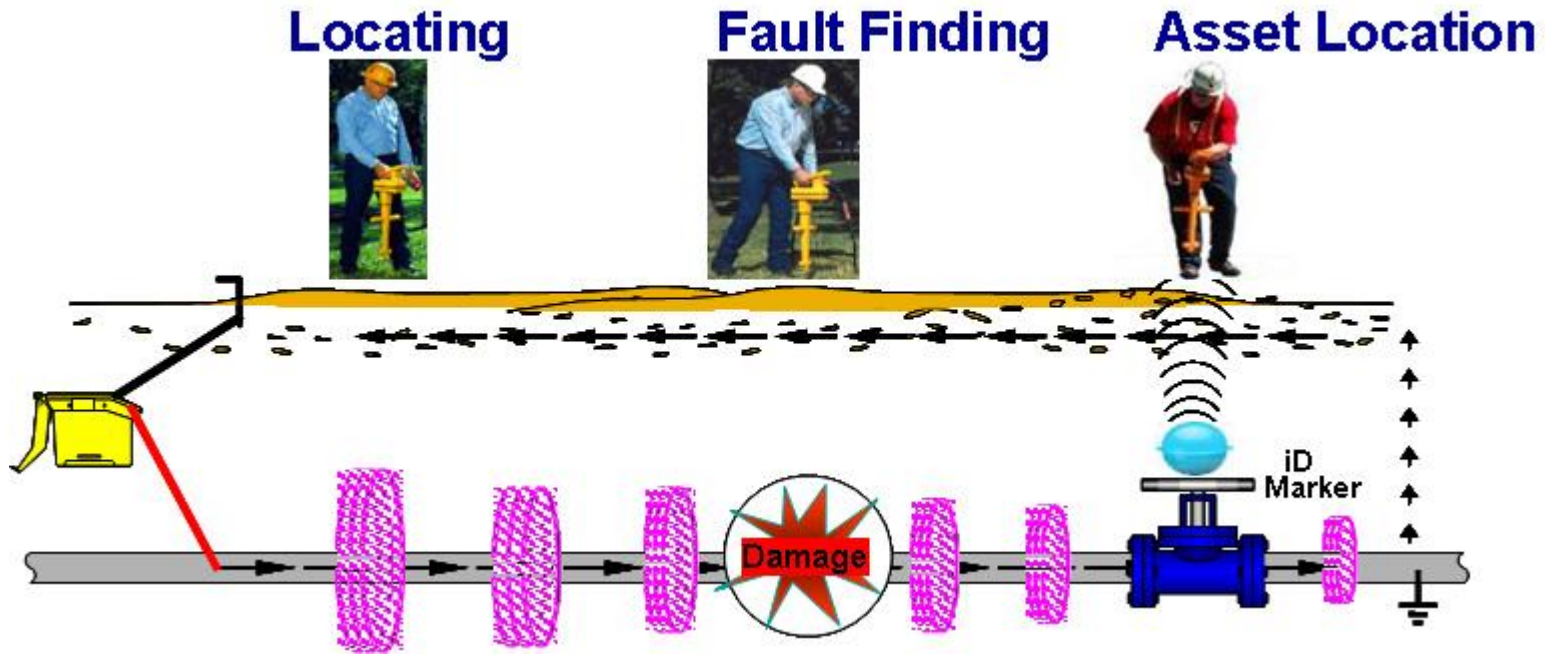


How do I know they are mine?

How do I protect them?

EM Locating The Benchmark

Locating & Marking



Provides solutions for locating, fault finding, and accurate marking of buried utilities for companies committed to ensuring safety, quickly restoring outages, minimizing operating costs and efficiently managing assets.



Telephone

Gas

CATV

Power

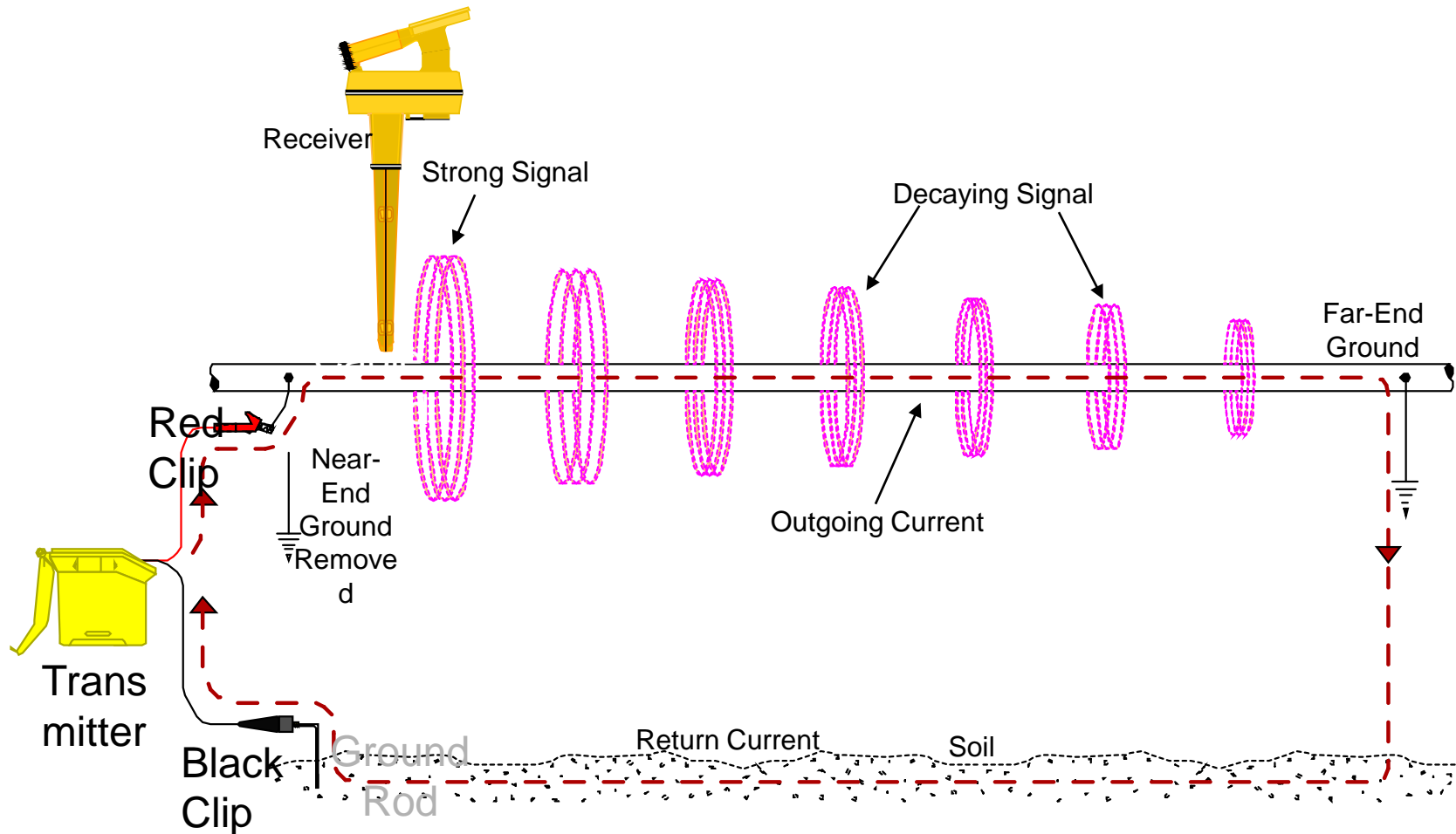
Water

Wastewater

GP/Rec Wtr

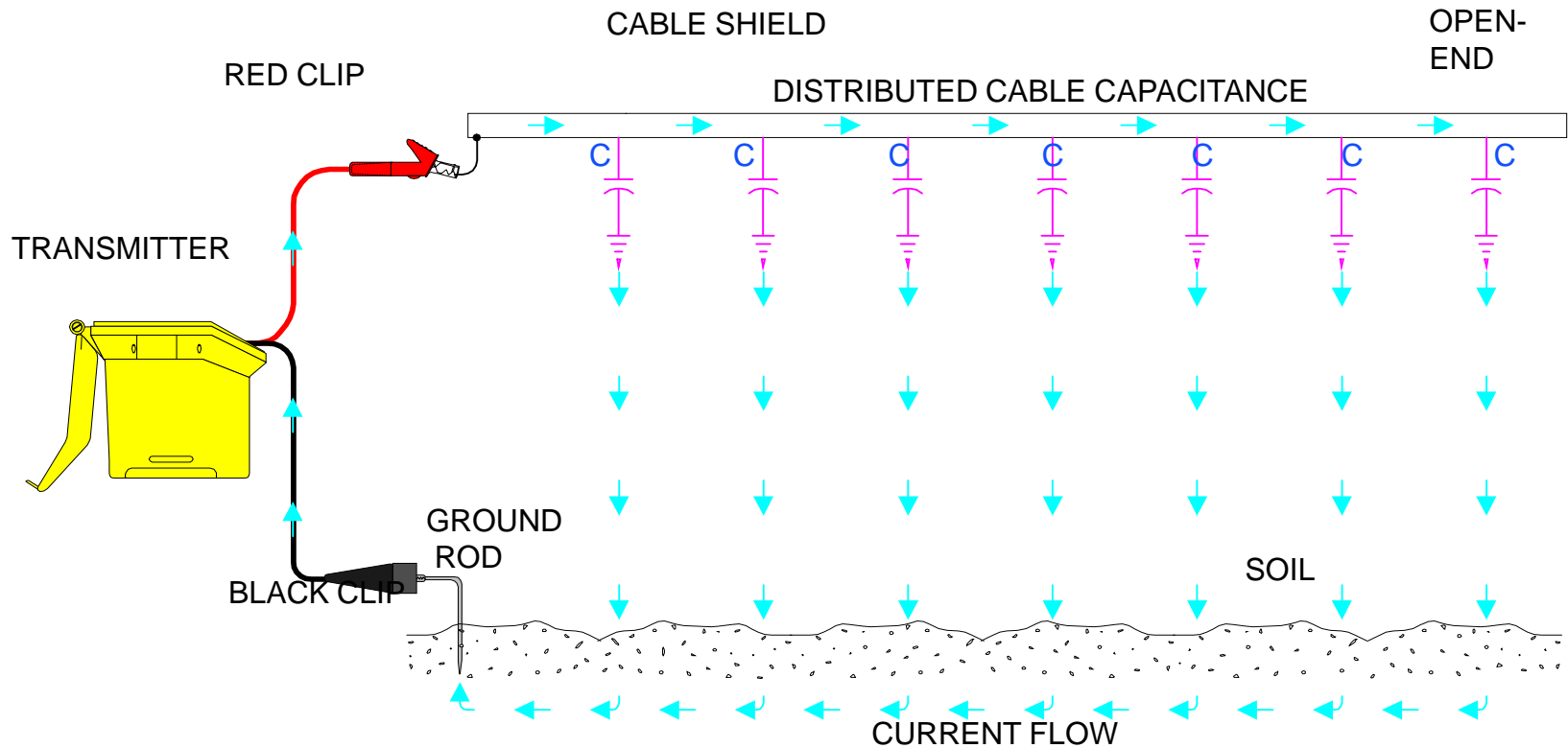


Locating – Basic Concept



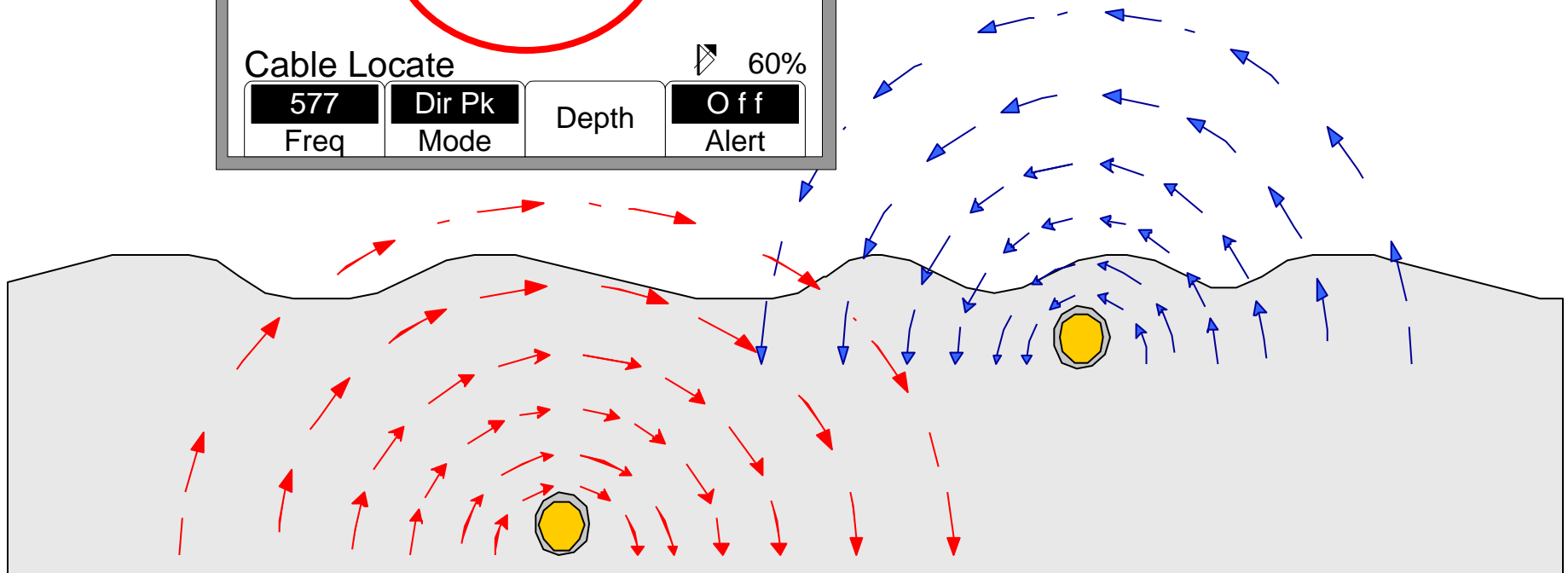
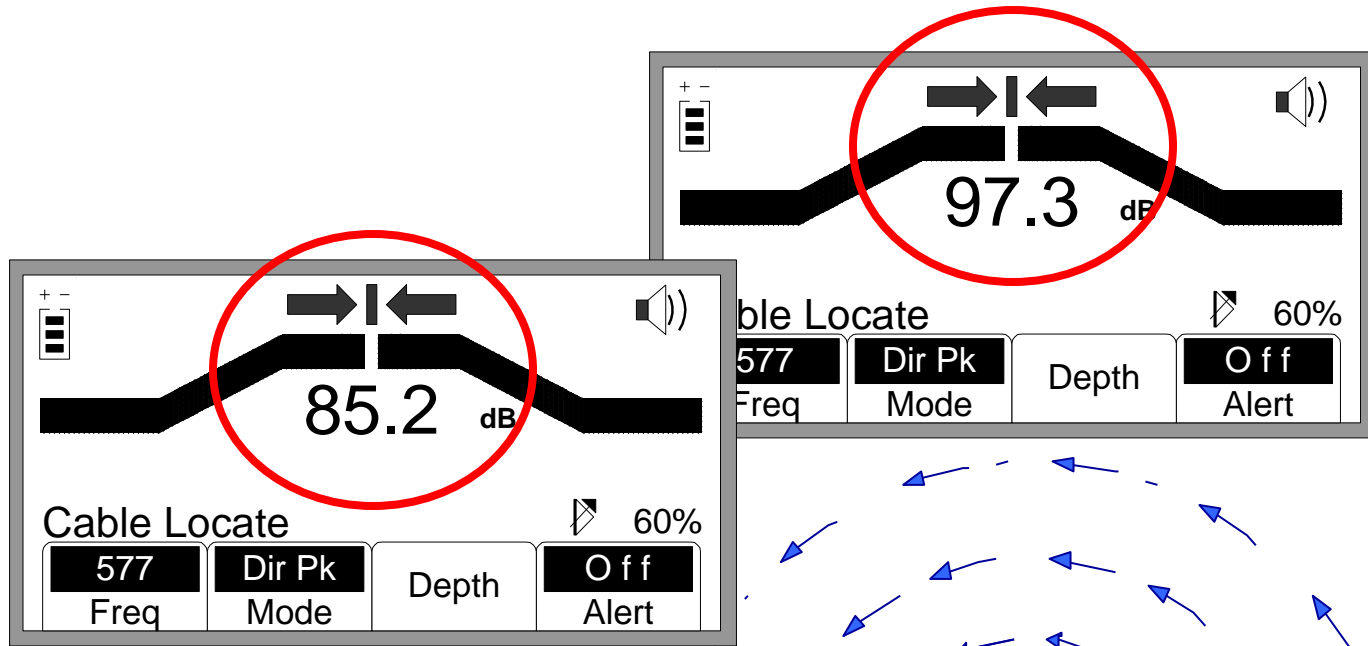
The cable must radiate or transmit an electrical signal so it can be located and traced by a Signal Receiver

Capacitive Coupling to Ground



Current flow created by capacitive coupling to ground

Issues with Congestion of Utilities using EM Locating



Locator Products

- Selectable frequencies to create optimum current flow
- Selectable power output levels to create optimum current flow
- Antenna configurations to improve accuracy
- Filtering algorithms to reject harmonics

What is the best locator in the world ?

The person who is using the locator



Electronic Marking Products



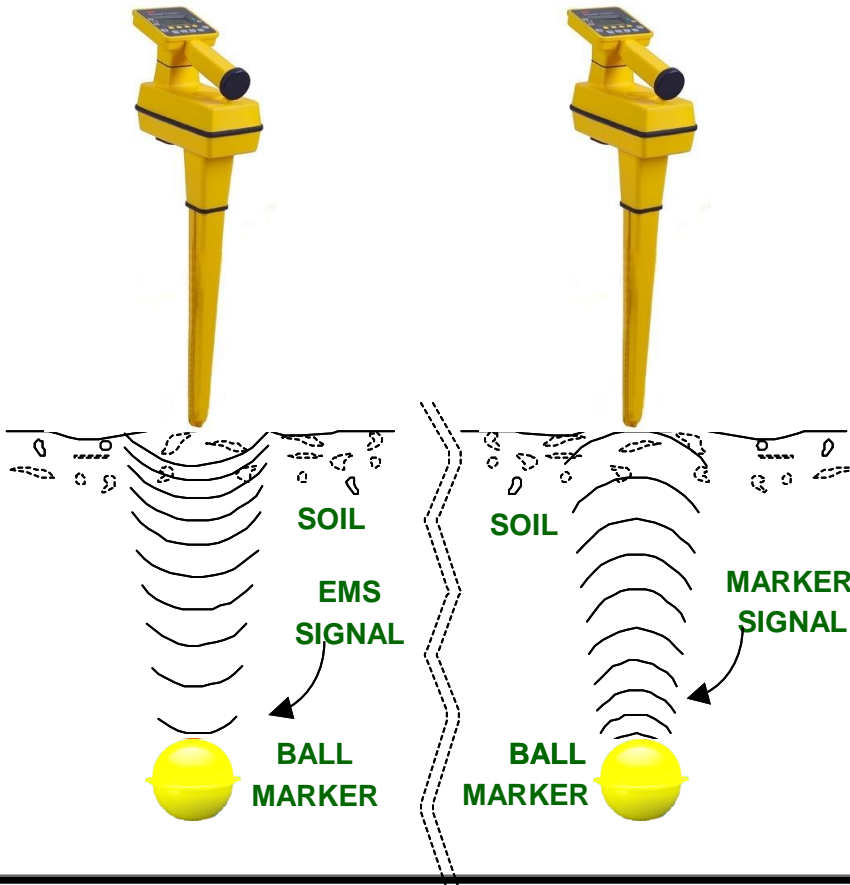
RFID Marker Technology



Electronic Marking

Locator Energizes
RFID Marker

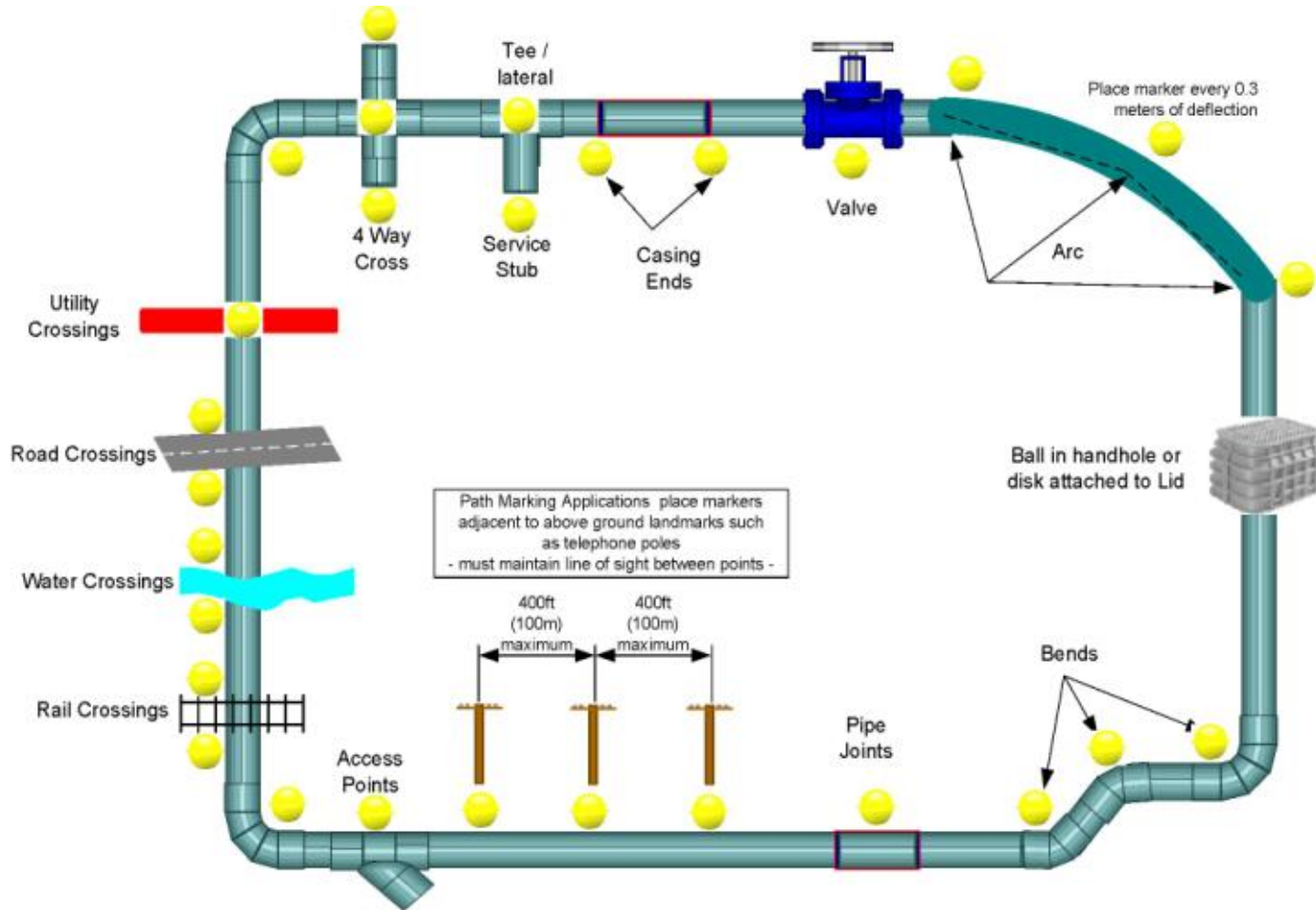
RFID Data
read by Locator



User Input Data

- Facility information
- Owner information
- Location information
- Unique Serial No. pre-programmed

Oil & Gas Marking



Crossings

- Water
- Major roads
- Rail
- Other Utilities

Service Stubs

- Repair Points
- Squeeze points
- Valves
- Valve Boxes

Non-metallic pipe

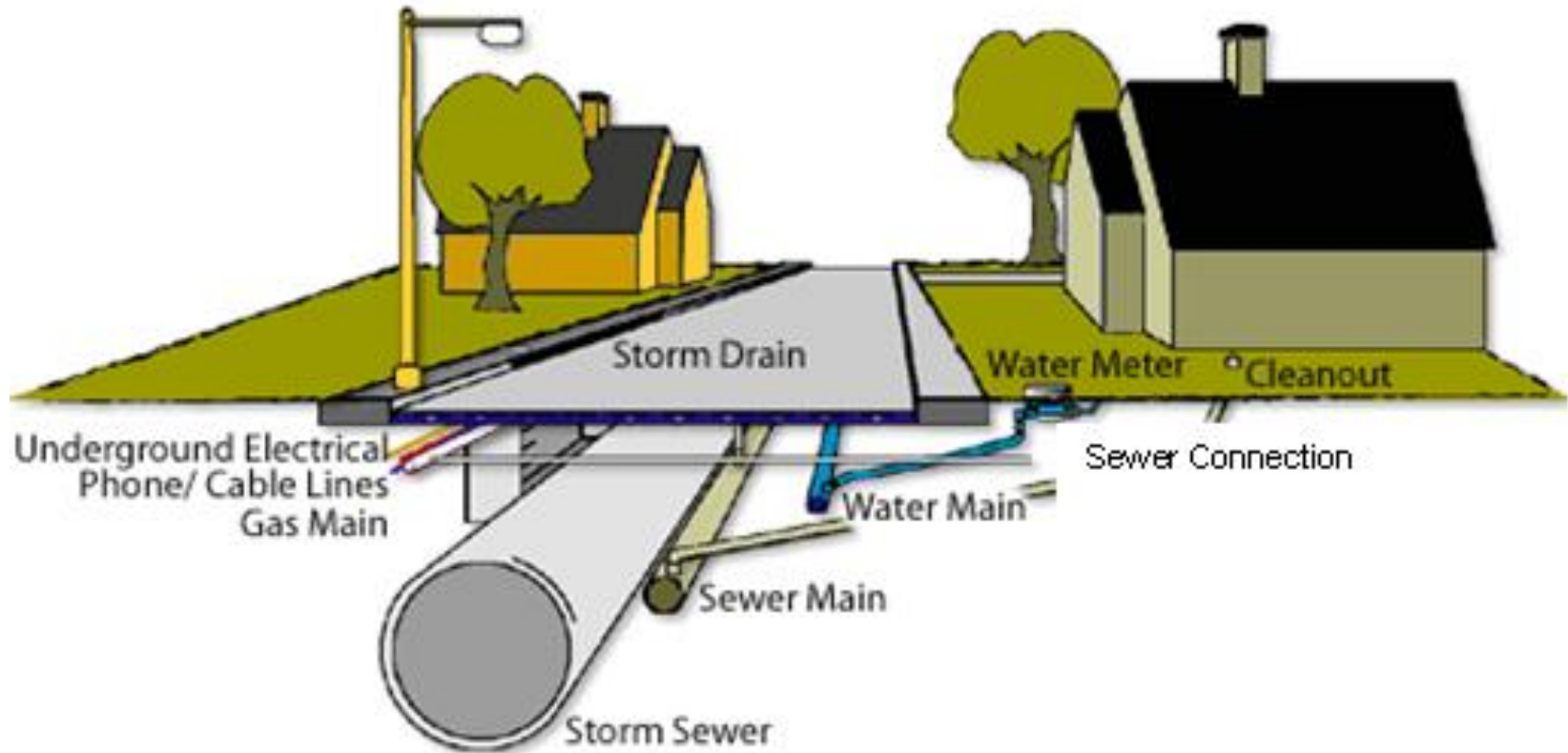
- Path on straight sections
- Bends & Arcs
- Depth Changes
- Laterals / Tee's

Annode Electrodes,

- Test points for CPS/CPM
- Encasement ends
- Access points

Locating Plastic Pipe

Locatable Pipe and Caution Tape



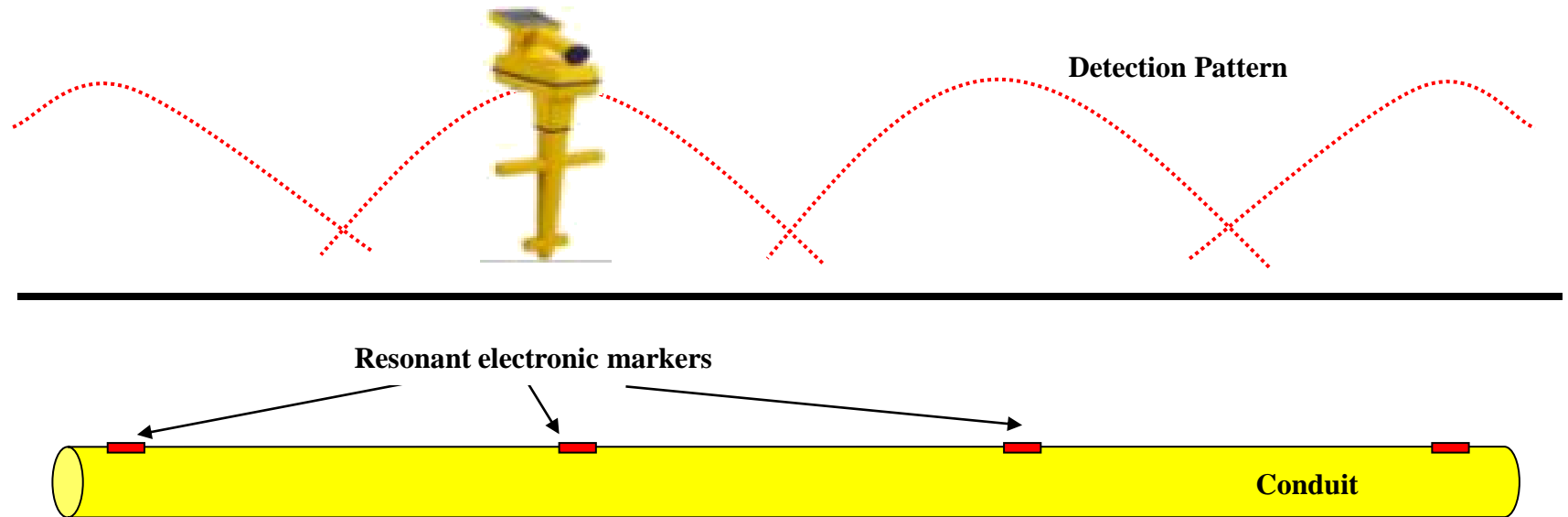
Transforming L&M to Infrastructure Asset Management Solutions



The Dream . . .

- **Tracer wire was not required for non-metallic facilities**
 - No maintenance to maintain a wireline network that doesn't carry revenue
 - Reduced material cost
- **No installation costs**
 - No more issues with breakage, corrosion, access points getting lost
- **No issues with metallic wires that could attract lightning or cause other safety issues**
- **No need for locator transmitters and reduced labor for location**
- **No issues associated with electromagnetic locating and congestion of utilities and bleed over**
- **No issues with congestion in public right of ways**
- **No interference from**
 - Nearby utilities
 - Chain link fences, guardrails, cars/vehicles, above ground objects

How does it work ?

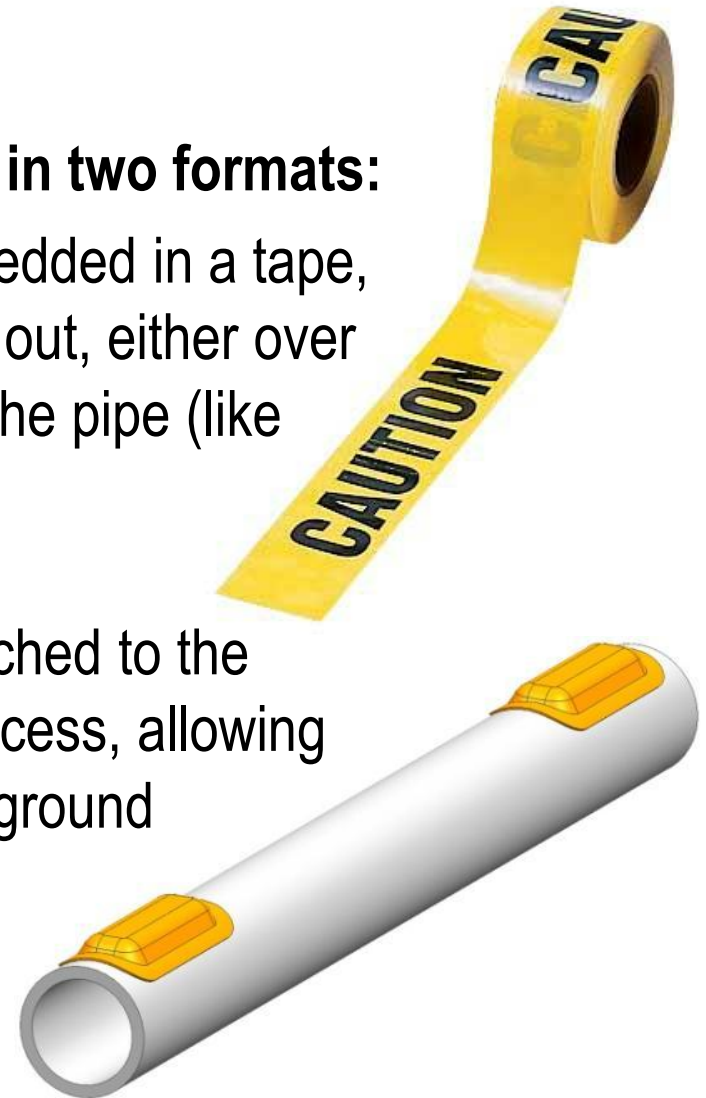


- **Detection method:**

- Electronic resonant markers are placed 1 - 2m spacing
- Detector based on integrated unit that locates existing marker frequencies and RFID markers, cable/pipe locator option
- Different frequencies will be created for each utility, allowing for differentiation in detection

Form Factors

- **Plastic Pipe Locating Solutions will come in two formats:**
 - **On-Tape:** electronic markers will be imbedded in a tape, similar to warning tape, that will be rolled out, either over the pipe (similar to tracer wire) or above the pipe (like caution tape)
 - **On-Pipe:** Electronic markers will be attached to the actual pipe, during the manufacturing process, allowing for pipe to be “locatable” once it is in the ground



Benefits . . .

- **Training on locator is reduced to 10 minutes and location is always exact even in harsh field conditions.**
 - Reduced complexity of locator and training requirements
 - Easier to learn for field technicians, more accurate in difficult field conditions
- **Tracer wire not required**
 - No maintenance to maintain a wireline network that doesn't carry revenue
 - Reduced cost
 - No installation costs
- **Eliminates problems with**
 - Tracer wire breakage
 - Access points getting lost or damaged
 - Lightning, does not provide a conductive path
 - Corrosion
- **Locator transmitter not required**
 - Reduced labor to perform a locate since there is no hook up
- **No interference from nearby utilities or issues with congestion**

Major breakthrough in improving underground safety

Thank You !