

Monitoring Threats

Are Your Leaks Attached to Your Pipes?

Cindi Salas
Manager - GIS

csalas@centerpointenergy.com

(excused for Ike recovery!)

Tony Sileo
Product Manager

tsileo@opvante.com



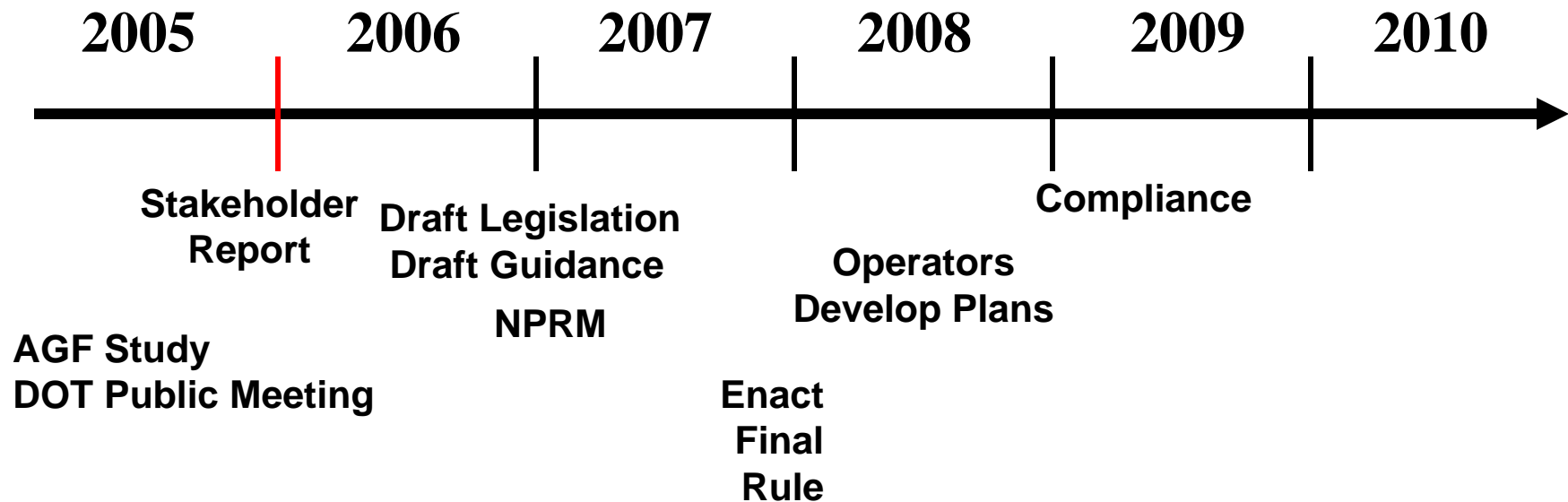
Overview

- Why do I care about DIMP?
- Locating Leaks
- Leak Management at Centerpoint Energy
- Legacy Leak Geocoding and Pipe Association



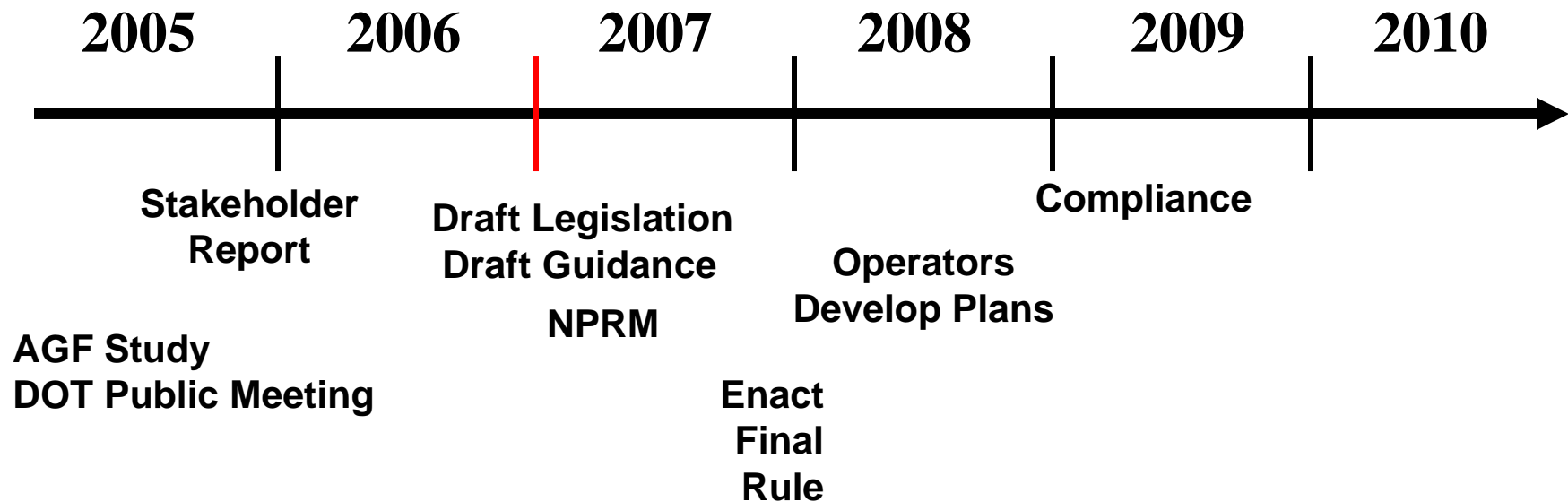
DIMP Timeline

- Draft legislation and guidance by
 - December 2006
- Public comment and enactment by end of 2007
- Write and implement plans in 2008
- Compliance by 2009



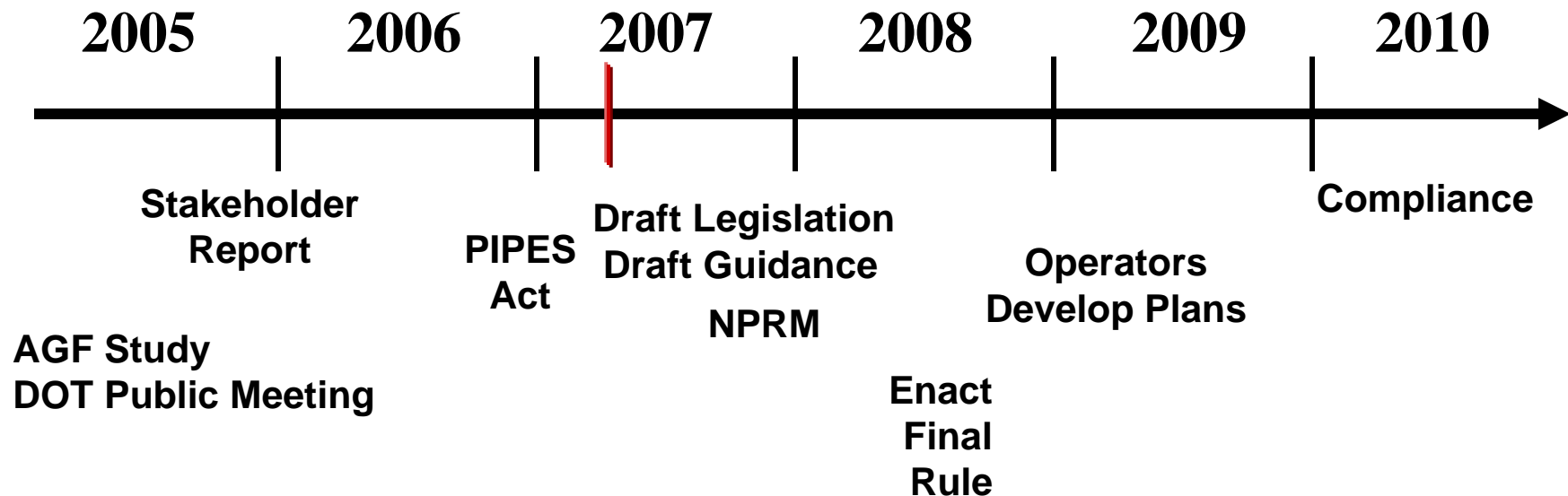
DIMP Timeline

- Draft legislation and guidance by
 - ~~December 2006~~, April 2007
- Public comment and enactment by end of 2007
- Write and implement plans in 2008
- Compliance by 2009



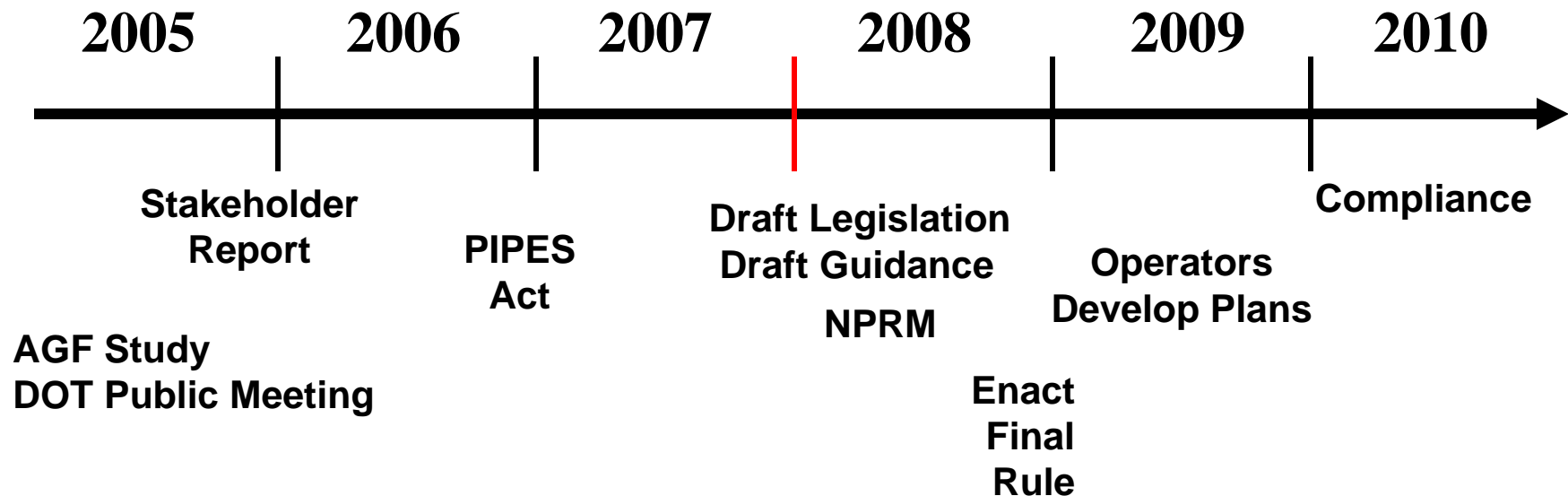
DIMP Timeline

- Draft legislation and guidance by
 - ~~December 2006~~, ~~April 2007~~, October 2007
- Public comment and enactment by mid ~~2007~~ 2008
- Write and implement plans in ~~2008~~ 2009
- Compliance by ~~2009~~ 2010



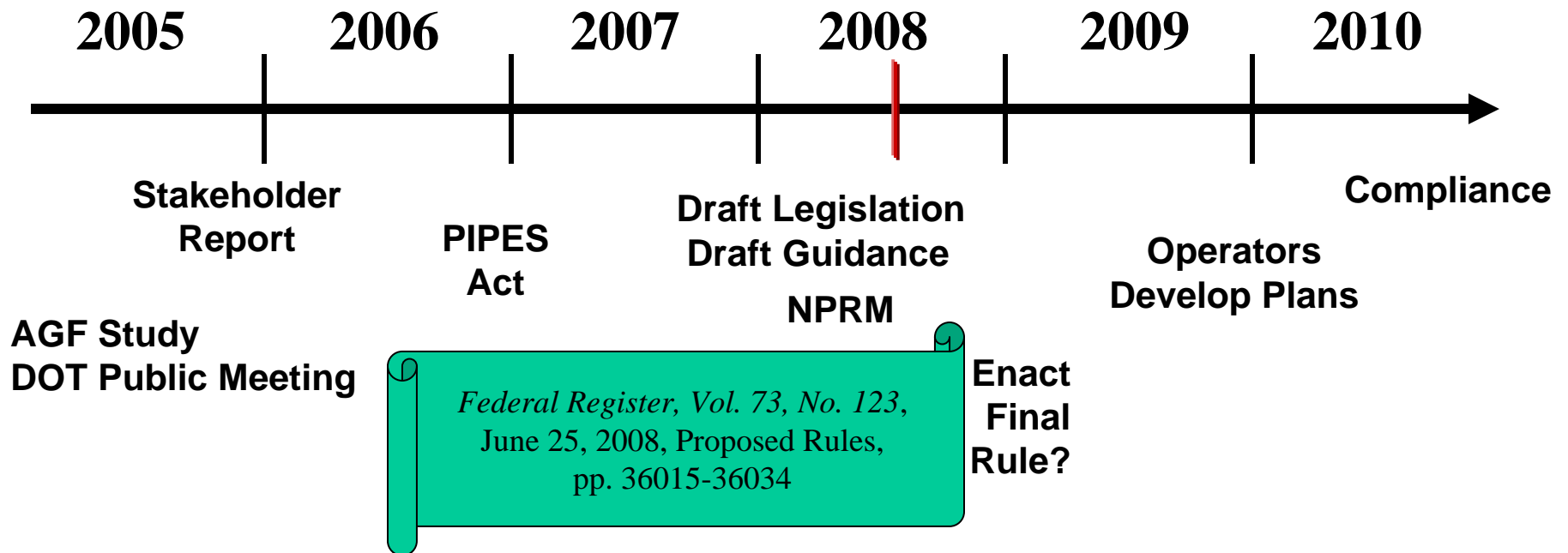
DIMP Timeline

- Draft legislation and guidance by
 - ~~December 2006~~ ~~April 2007~~ ~~October 2007~~ April 2008
- Public comment and enactment by end of ~~2007~~ 2008
- Write and implement plans in ~~2008~~ 2009
- Compliance by ~~2009~~ 2010



DIMP Timeline

- Draft legislation and guidance by
– ~~December 2006~~ ~~April 2007~~ ~~October 2007~~ June 2008
- Public comment and enactment by end of ~~2007~~ 2008
- Write and implement plans in ~~2008~~ 2009/2010
- Compliance by ~~2009~~ 2010/2011



Understanding Your Infrastructure

- An enterprise GIS can be the primary source of infrastructure knowledge
- DIMP can justify geospatial investments
 - Software acquisition
 - Data conversion
 - Landbase re-alignment
 - Legacy system consolidation



How Do I Assess Risk?

Probability of Failure

X

Consequences of Failure



Use infrastructure knowledge and threats

What's Spatial About That?

Effective Leak Management

Source: Integrity Management for Gas Distribution, [Report of Phase 1 Investigations](#), Dec 2005

- An effective leak management program is an important risk control practice
- The essential elements are:
 - L**ocate the leak
 - E**valuate its severity
 - A**ct appropriately to mitigate the leak
 - K**eeP records
 - S**elf-assess to determine if additional actions are necessary for system safety

What Threats Does My System Face?

- Where are leaks occurring? Do we know which specific facilities?
- Where have we collected Pipe Condition Reports?
- Where are we having protection problems?
- Where are people damaging our pipes?
- What information is collected? Where is it stored?

*Threat Indications Are More Valuable When
Integrated With Infrastructure Knowledge*

Where are your leaks?



Repair/Inspection Form

- No city
- No zip code
- Hand sketch and free-form text
- Main ID Number - atypical

Political Subdivision: UPPER SAUCON TWP Pol. Sub: 204 WRF: 124024 00 = Inspection or nonleak related maintenance

House/Blg #: 6374 Dir: Street Name: NEW STREET Apt: Street Type: Suffix: Date (MMDDYY): 012605

General Location or Reference to Closest Cross Street (Ex. 50 ft. West of Maple Street): 409 FT SOUTH OF STATION AVE

Reasons for Inspection: 1 - Leak 2 - Service Cont. 3 - Service Cont. 4 - Main Cont. 5 - Pressure Integrity Piping Inspected: 6 - Above Ground 7 - Inside Building Pressure: No Low High Depth of Cover - inches: Main: 036

of Lk. Site Map, Anode Inst. No. Size Lbs.

Maintenance Replacement Data: Main Replaced With PE - Plastic, ST - Steel Feet:

A. Type	B. Condition	C. Corrosion	D. Friction	E. Lin. Leaks	F. Noise	G. Damage	H. Action
2	2	3	1	2	2	1	0
1	0	1	0	1	0	5	5
0	1	2	9	9	5	0	2

Main I.D. Number: 2231221015501299502

A. Coating Type: 1 Not Observed, 2 None, 3 Prime, 4 B. Dry Coat, 5 Coat For Ground, 6 Epoxy, 7 Tape, 8 Coat Applied, 9 Master, 0 Other (Comment)

B. Coating Condition: 1 Not Observed, 2 None, 3 Good, 4 Damaged, 5 Detached

C. External Corrosion: 1 None, 2 General Corrosion, 3 Localized Pitting, 4 None

D. Facility: 1 Man, 2 Service, 3 Regulator Station, 4 (Including House Regulator), 5 Other (Comment)

E. Location of Leak: 01 Cast Iron Main Street, 02 Piping, 03 Valve, 04 Corrosion Leak Clamp, 05 Cracked Bell Joint, 06 Joint - Bell & Spout, 07 Joint - Bell Flange

F. Cause of Leak: 01 Bell Joint, 02 Cracked, 03 Material or Work, 04 Other Outside Force, 05 Leak Of Grease, 06 Other, 07 Operations

H. Action Taken: 01 Leak Clamp, 02 Bell Joint Leak Clamp, 03 Repaired, 04 Greased, 05 Heat Shock Device, 06 Replaced Main Section, 07 Replaced Service, 08 Replaced Whole Component, 09 Abandoned, 10 Other (Comment), 11 Encapsulation

Sketch: Show size, material, & pressure of mains & services and work done. Includes a hand-drawn diagram of a pipe layout with labels like 'STATION AVE', 'NEW STREET', '4" x 12" PULLER', and '24"'. A north arrow is also present.

Existing Paving Mat: MACADAM Depth of Paving: 4" Size of Cut: 3' x 6'

Comments: INSTALLED ① 4" x 12" h689 # FULL SEPT OVER LEAK ② 4" x 2" HAND-BAND OVER PIT HOLE

DMV #: 2655044303 Detail #: Crew Foreman: L. RITCHIE MILLER PIPE Employee Number: 35011 Contractor Code: Supervisor Initials:

Tacks on the Wall?



Tabular Data

Main Leaks Analyzer

Records: Batch: Columns

Man Leaks Load Filter New 500 Last AZ ZA Filter Files... Print Done Exit

Total Records: 7 Showing 500 records unsorted

LEAK_ID	STATUS	U/GR	LEAK FOUND ON	CLEAR D	STREET ADDRESS	SIZE	MATL	FAULT TYPE	LEAK LOC	CORREXTENT	FITTING	LEAK CAUSE	COVERTYPE	DEPTH	INSTALLED CLAMPS	LEAK ORIGIN
A20026	CLOSED	1	3/22/1990	3/25/1990	13 SHADY LN	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		12	1	CUSTOMER C
A20037	CLOSED	2	10/21/1990	5/15/1991	462 NEW ORCLE	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		50	2	SUPPLEMENT
A21945	CLOSED	2	1/23/1990	2/13/1990	401 HART RD	1/4	ST	LEAK	FITTING	FITTED	DEEP	COMPONENT WEAR		15	2	FOLLOW UP B
A21947	CLOSED	2	2/5/1990	2/26/1990	1728 BLUE RIDGE	1/4	ST	CORR	BODY OF PIPE	GEN	DEEP	CORROSION - BARE		40	2	FOLLOW UP B
A21950	CLOSED	2	2/19/1990	3/11/1990	241 BARBARY	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		40	8	SUPPLEMENT
A30026	CLOSED	2	11/17/1991	6/14/1992	400 E MAIN ST	6-8	CI	JOINT	MECHANICAL	NONE	NONE	COMPONENT WEAR		48	1	CUST SERV U
A30007	CLOSED	2	1/17/1993	4/18/1993	117 VICTORY AV	1/4	ST	JOINT	THREADED	FITTED	SHALLOW	COMPONENT WEAR		24	1	SUPPLEMENT
A34790	CLOSED	1	5/27/1992	5/31/1992		1/8	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		48	1	SERVICE DEP
A34904	CLOSED	2	6/7/1992	10/7/1992		1/8	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		40	1	PROGRAMME
A38702	CLOSED	1	2/14/1993	2/25/1993	1023 JANE ST	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		24	5	SUPPLEMENT
A34787	CLOSED	2	5/7/1992	5/18/1992	521 N BROADWAY	1/4	CI	JOINT	MECHANICAL	NONE	NONE	COMPONENT WEAR		30	2	SUPPLEMENT
A18633	CLOSED	2	6/3/1990	6/11/1990	WINCHESTER RD	1/8	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		30	2	PROGRAMME
A18030	CLOSED	2	6/4/1990	2/23/1991	60 U S ROUT	1/8	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		30	1	PROGRAMME
A20040	CLOSED	2	10/13/1990	3/25/1991	304 W 3RD ST	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		40	1	PROGRAMME
A03084	CLOSED	2	6/20/1979	12/31/1979	HUSE ST	1/4	CI	JOINT	BELL AND	NONE	NONE	COMPONENT WEAR		36	2	PROGRAMME
A21969	CLOSED	2	4/1/1990	4/15/1990	1144 CLARIDGE	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION -		18	1	PROGRAMME
A21970	CLOSED	2	3/27/1990	3/31/1990	5 BROADWAY	6-8	ST	JOINT	MECHANICAL	NONE	NONE	COMPONENT WEAR		18	0	PROGRAMME
A20941	CLOSED	2	3/25/1990	4/24/1991	5 LIMESTONE ST	1/4	CI	JOINT	BELL AND	NONE	NONE	COMPONENT WEAR		24	1	PROGRAMME
A20906	CLOSED	2	3/5/1990	3/25/1991	EASEMENT RD	6-8	ST	LEAK	VALVE			COMPONENT WEAR		0	0	RECLASSIFICA
A20901	CLOSED	2	5/29/1990	1/21/1991	1016 CHURCHILL	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		24	7	SERVICE DEP
A20929	CLOSED	1	3/6/1991	3/26/1991	MARIEMONT DR	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		40	2	SUPPLEMENT
A21946	CLOSED	1	1/21/1990	1/29/1990	1494	6-8	ST	CORR	BODY OF PIPE	FITTED	SHALLOW	CORROSION - BARE		18	1	SUPPLEMENT
A21953	CLOSED	1	2/21/1990	2/26/1990	128 FORD PL	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		18	1	CUSTOMER C
A21906	CLOSED	2	2/8/1990	7/29/1990	101 VENICE PR	1/4	ST	LEAK	FITTING	FITTED	DEEP	COMPONENT WEAR		30	0	FOLLOW UP B
A21943	CLOSED	2	1/16/1990	1/23/1990	753 W PINE ST	1/4	ST	CORR	BODY OF PIPE	GEN	DEEP	CORROSION - BARE		23	2	CUSTOMER C
A21942	CLOSED	1	1/21/1990	1/30/1990	1700	6-8	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		40	5	SUPPLEMENT
A21915	CLOSED	2	3/7/1990	5/20/1990	LINCOLN AV	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		10	1	SUPPLEMENT
A22849	CLOSED	2	12/26/1979	1/18/1980	436 CURRY AV	1/4	ST	LEAK	VALVE	GEN	SHALLOW	COMPONENT WEAR		14	0	FOLLOW UP B
A25641	CLOSED	2	5/14/1990	5/22/1990	2128	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION -		24	1	PROGRAMME
A25644	CLOSED	2	5/14/1990	5/15/1990	2071 TAMARACK	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION -		18	1	PROGRAMME
A25625	CLOSED	2	5/20/1990	12/22/1990	W LEE SWAY DR	1/4	ST	CORR	BODY OF PIPE	FITTED	DEEP	CORROSION - BARE		36	7	PROGRAMME
A25640	CLOSED	2	4/21/1990	6/30/1990	410 LOUDON AV	1/8	ST	LEAK	VALVE	NONE	NONE	COMPONENT WEAR		36	0	CUSTOMER C
A25642	CLOSED	2	4/22/1990	10/9/1990	1485	6-8	ST	LEAK	TAP FITTING	NONE	NONE	COMPONENT WEAR		24	2	PROGRAMME

Grouped by Block and Pipe Type

Description: BARE STEEL ACTIVE MAINS, INDIVIDUAL

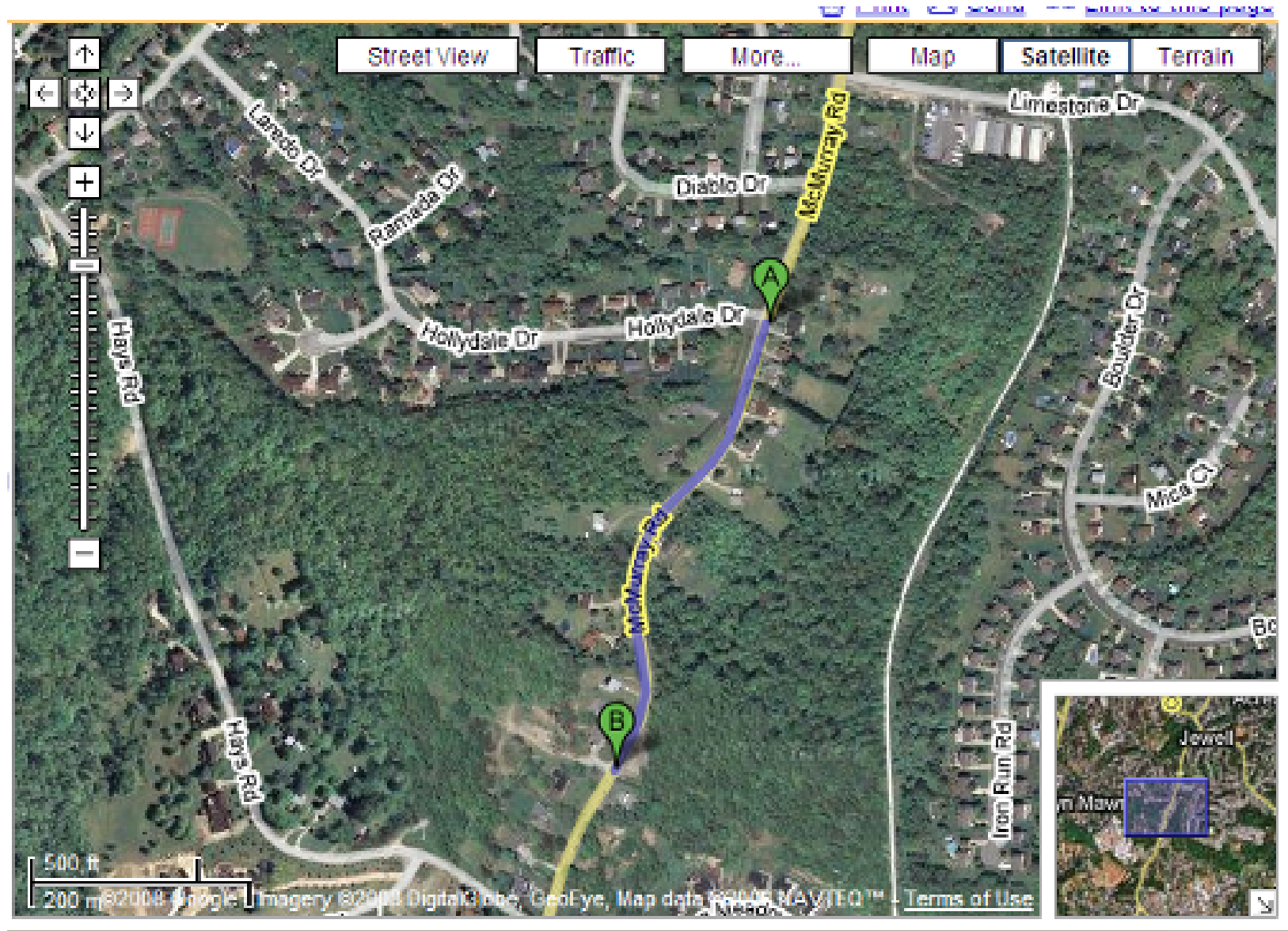
Definition		Plan		Results		Details		Main		Services						
Leak		Sub-Project		164 record(s) Records												
LEAK_ID	STATUS	LN	LEAK_FOUND_DT	CLEAR_DT	STREET ADDRESS	SIZE	MATL	FAULT TYPE	LEAK LOC	CORROD IDENT	FITTING	LEAK CAUSE	COVERTYPE	DEPTH	INSTALLED CLAMPS	LEAK ORIGIN
849006	CLOSED	2	4/17/2008	5/1/2008	717 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	SHALLOW	CORROSION - BARE	ASPHALT	48		1 POLICE OR FIRE
848009	OPEN	2	4/11/2008	12:00:00 AM	723 MCMURRAY RD	6.8	ST	CORR					ASPHALT			SERVICE DEPT
805985	OPEN	2	11/19/2007	12:00:00 AM	723 MCMURRAY RD	6.8	ST	CORR					CURB	0		0 SUPPLEMENTAL SUR
809646	CLOSED	2	11/19/2007	5/2/2008	717 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	SHALLOW	CORROSION - BARE	SOIL	47		1 SUPPLEMENTAL SUR
850374	CLOSED	2	3/22/2006	6/9/2006	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	DEEP	CORROSION - BARE	ASPHALT	48		2 FOLLOW-UP INSPECT
850348	CLOSED	2	2/15/2006	3/1/2006	700 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	GEN	DEEP	CORROSION - BARE	BERM	48		1 PROGRAMMED PLAN
850349	CLOSED	2	2/15/2006	3/1/2006	730 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	GEN	DEEP	CORROSION - BARE	BERM	48		1 PROGRAMMED PLAN
862187	CLOSED	2	2/11/2006	2/27/2006	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	GEN	DEEP	CORROSION - BARE	ASPHALT	48		1 CUSTOMER CALL
858458	CLOSED	2	2/11/2006	2/25/2006	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	GEN	DEEP	CORROSION - BARE	ASPHALT	48		1 CUSTOMER CALL
8582013	CLOSED	2	2/10/2006	2/24/2006	719 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	GEN	DEEP	CORROSION - BARE	ASPHALT	48		2 CUSTOMER CALL
8582563	CLOSED	2	1/9/2006	2/1/2006	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	DEEP	CORROSION - BARE	ASPHALT	48		5 POLICE OR FIRE
8582487	CLOSED	2	4/12/2005	7/19/2005	717 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	DEEP	CORROSION - BARE	LAWN	48		2 CUSTOMER CALL
8582397	CLOSED	2	9/28/2004	4/30/2005	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	SHALLOW	CORROSION - BARE	ASPHALT	48		2 FOLLOW-UP INSPECT
8582137	CLOSED	2	8/13/2004	8/24/2004	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	SHALLOW	CORROSION - BARE	ASPHALT	48		1 CUSTOMER CALL
8296788	CLOSED	2	1/21/2004	6/5/2004	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	DEEP	CORROSION - BARE	ASPHALT	48		1 CUSTOMER CALL
8221845	CLOSED	1	2/05/2001	2/21/2001	723 MCMURRAY RD	6.8	ST	CORR	BODY OF PIPE	PITTED	DEEP	CORROSION - BARE	ASPHALT	36		2 SERVICE DEPT

ACTIVE Calculated Project 857365

On the Maps



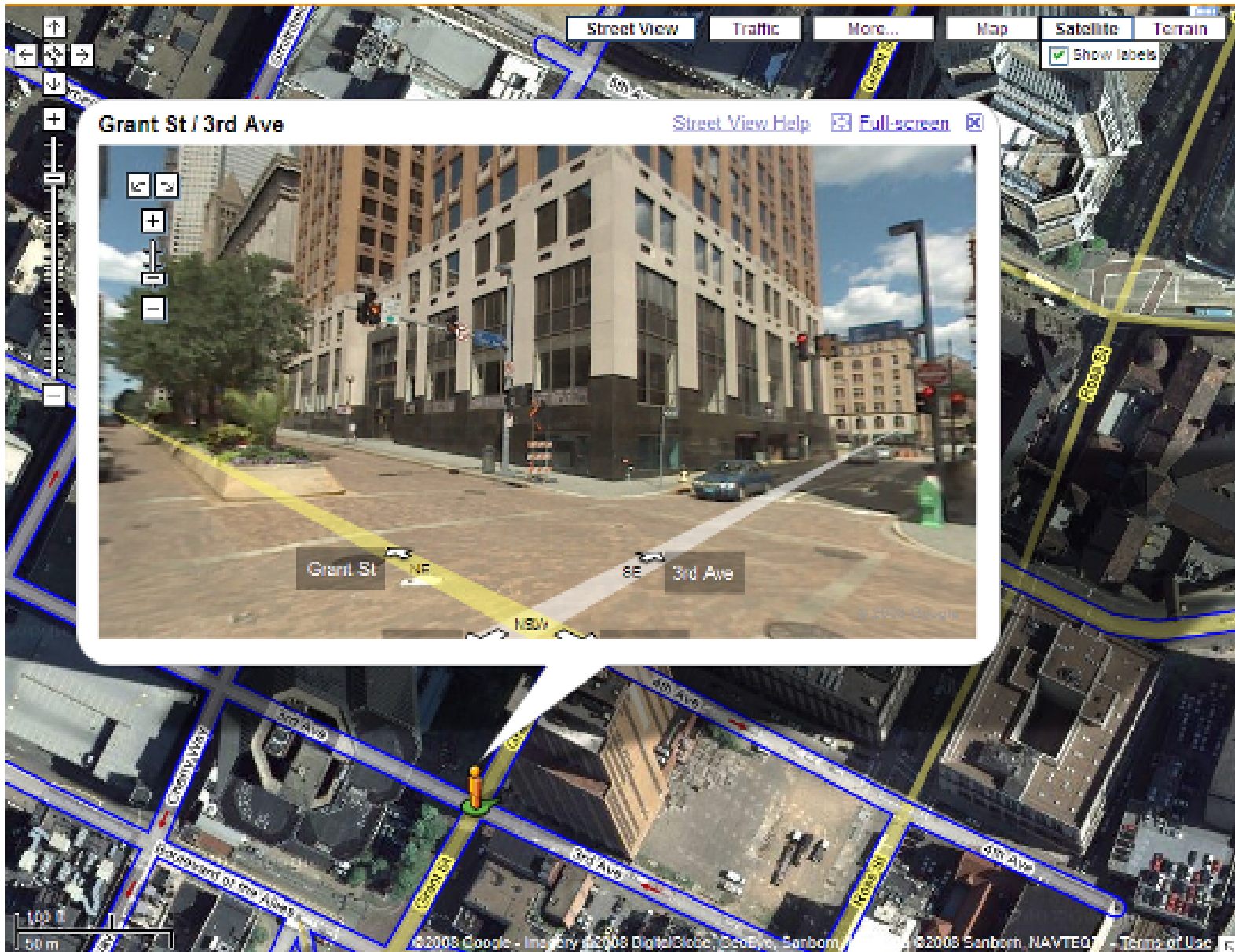
View in the (virtual) World



Is there more risk here?



Or Here?



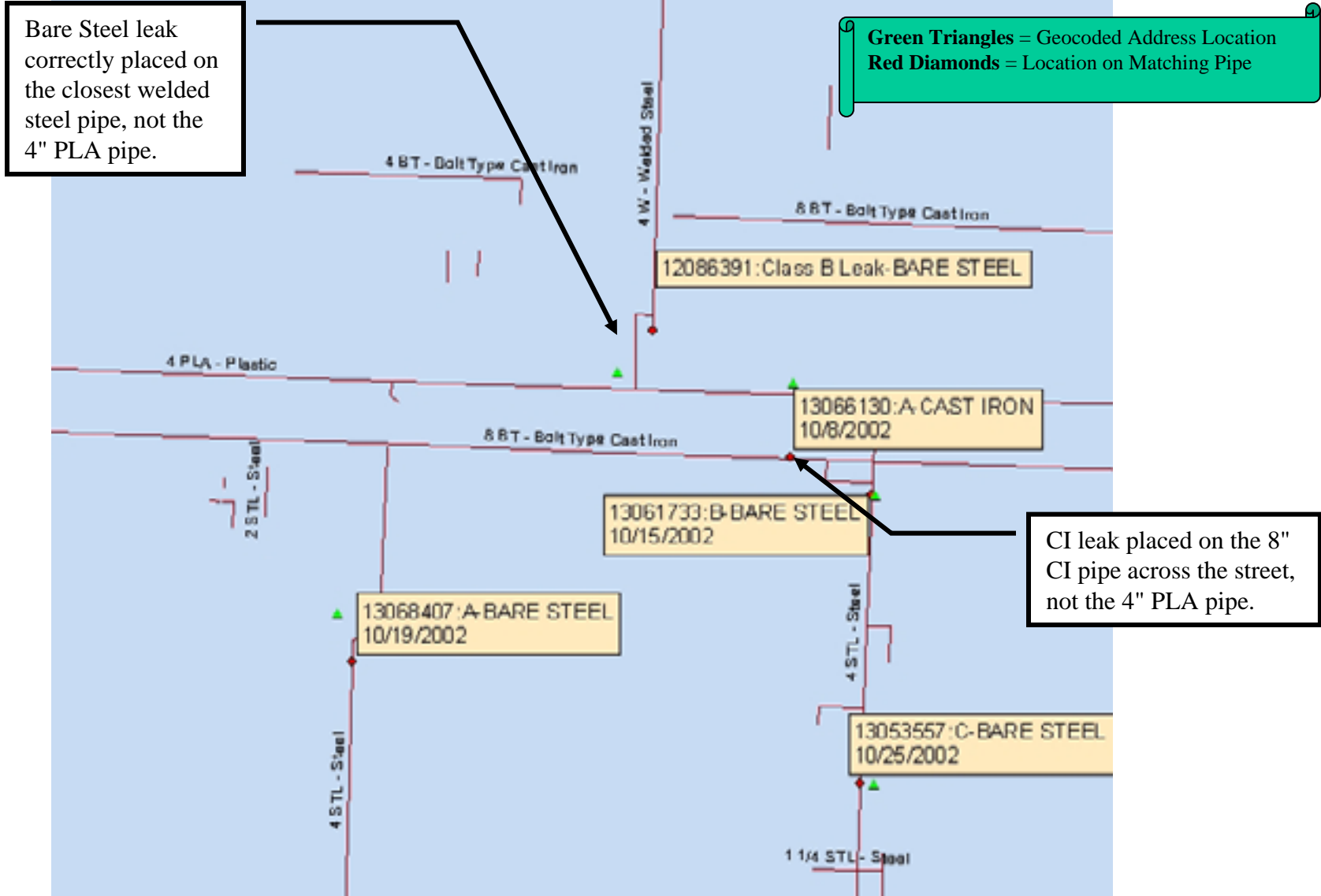
Should We Map Our Leaks?

- Yes! – establish an on-going process
 - Capture on mobile devices (GPS?)
 - Open Leaks – place on nearest main or service
 - Repairs – adjust location to correct facility
- Legacy Leak Geocoding and Pipe Association
 - Find candidate coordinates for the leak address
 - Find nearby facility that best matches attributes of the leak and leak repair
- Consider Specialized Leak Placement Tools
 - For data entry efficiency and quality control

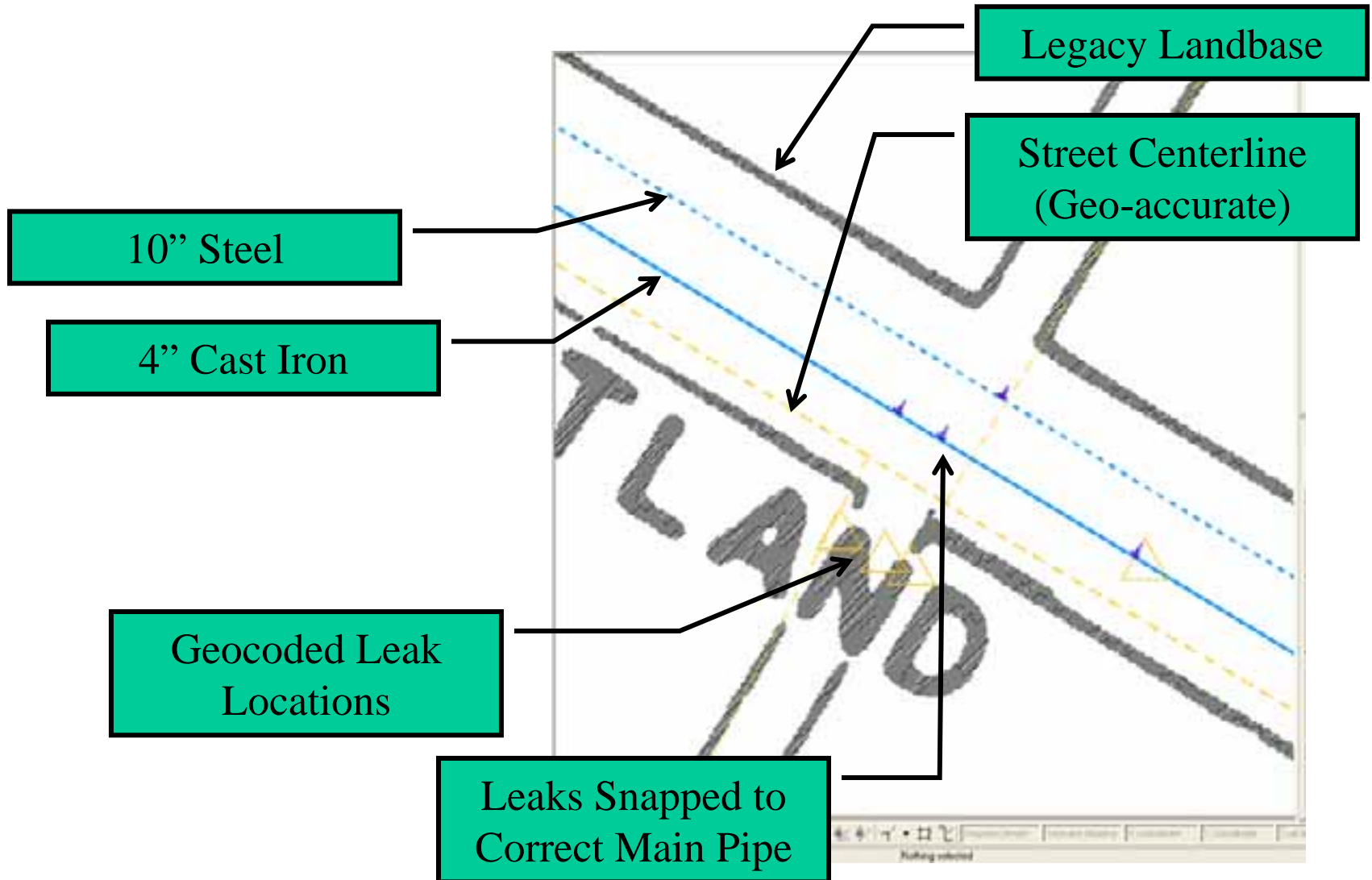
Leak Geocoding and Pipe Association Process

- Construct candidate addresses
 - Combine street address plus zipcodes (from map grids?)
- Geocode to get candidate locations
- Find candidate facilities
 - Search radius based on legacy landbase accuracy
- Calculate confidence score for each candidate facility
 - Compare repair & inspection attributes with facility attributes
- Select location with highest confidence facility
- Snap leak to closest point on facility
- Save the confidence score for reference!

Getting Leaks on the Right Facility



Getting Leaks on the Right Facility



East Coast Small Utility

- Data from legacy mainframe system
- Many records with poor quality addresses or incomplete pipe attributes
- 50% confidence or better was deemed good enough to assume a match
- Note many pipes had been replaced and were no longer present in the Smallworld GIS (with no way to determine this from the leak record)

Description	Count	% of All Main Leaks
Total Leaks	32,046	
Main Leaks	15,336	100%
Main Leaks Not Geocoded	1,935	13%
Main Leaks Geocoded	13,320	87%

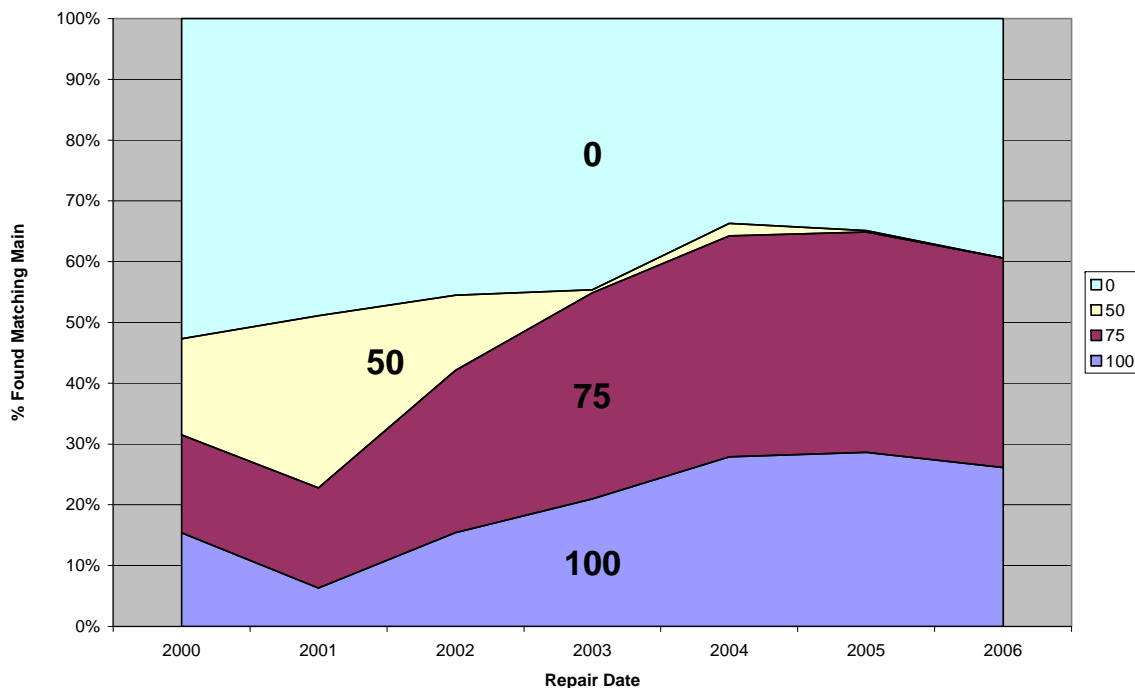
Description	Count	% of All Main Leaks	% of Geocoded Leaks	Comments
No Main Found	5,245	34%	25%	3,295 geocoded w/ no main
Main Found	10,093	66%	76%	
Main Found w/ Confidence \geq 90%	3,351	22%	25%	
Main Found w/ Confidence \geq 75%	6,584	43%	49%	
Main Found w/ Confidence \geq 60%	8,570	56%	64%	
Main Found w/ Confidence \geq 50%	10,093	66%	76%	

Arkansas Results

- Leaks from acquired company, single state only
- Attempted to capture at least two 3-year survey cycles
- Improving results for more recent leaks (better data, pipe more likely to still exist in ESRI GIS)
- 17,361 Main Repairs, 11,615 geocoded successfully (67%)
- 9,745 (84%) of those matched to a pipe with confidence > 50%
- Overall success close to 60%

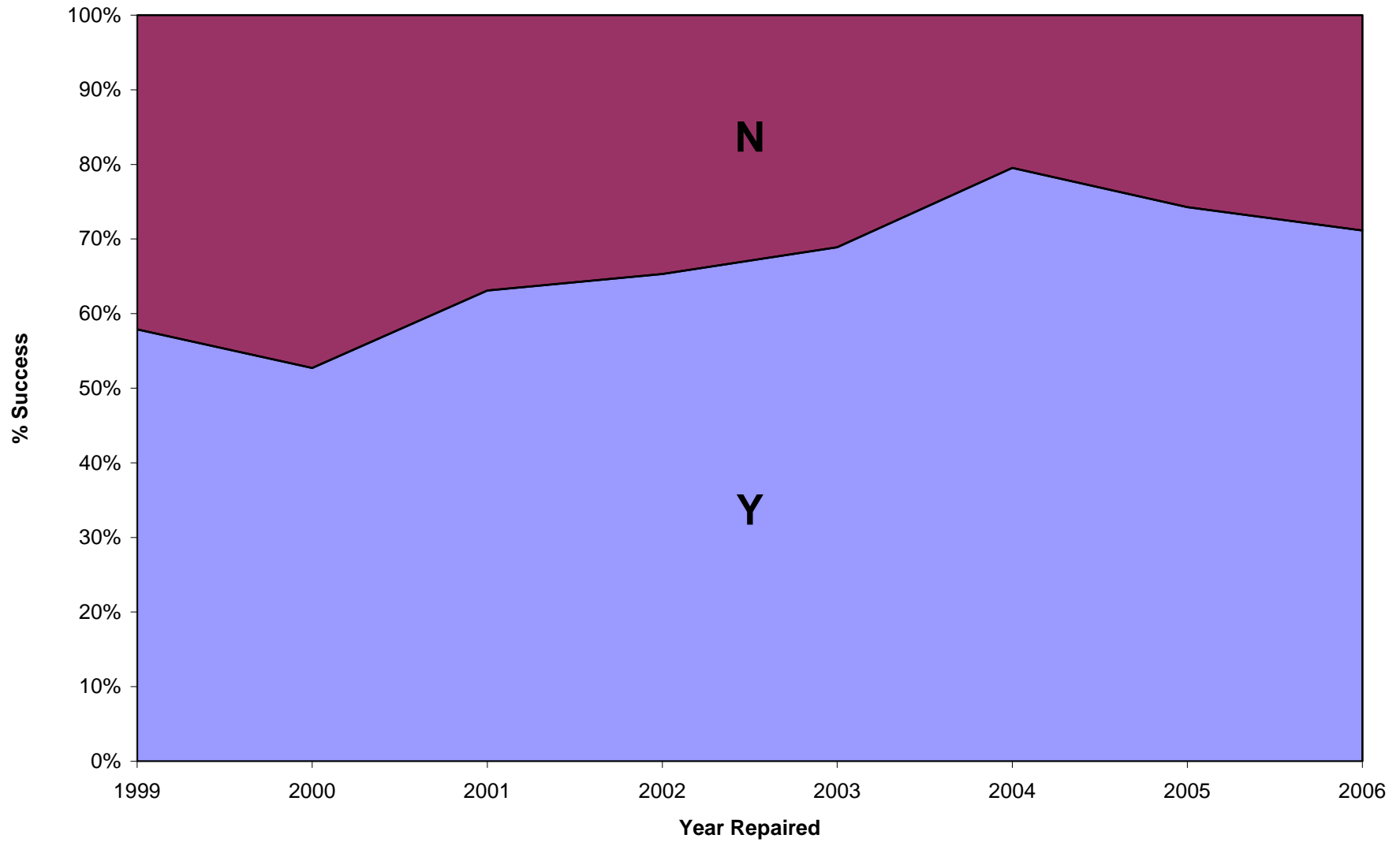


Success Rate by Confidence Threshold



Steel Corrosion Leaks

Steel Corrosion Leaks



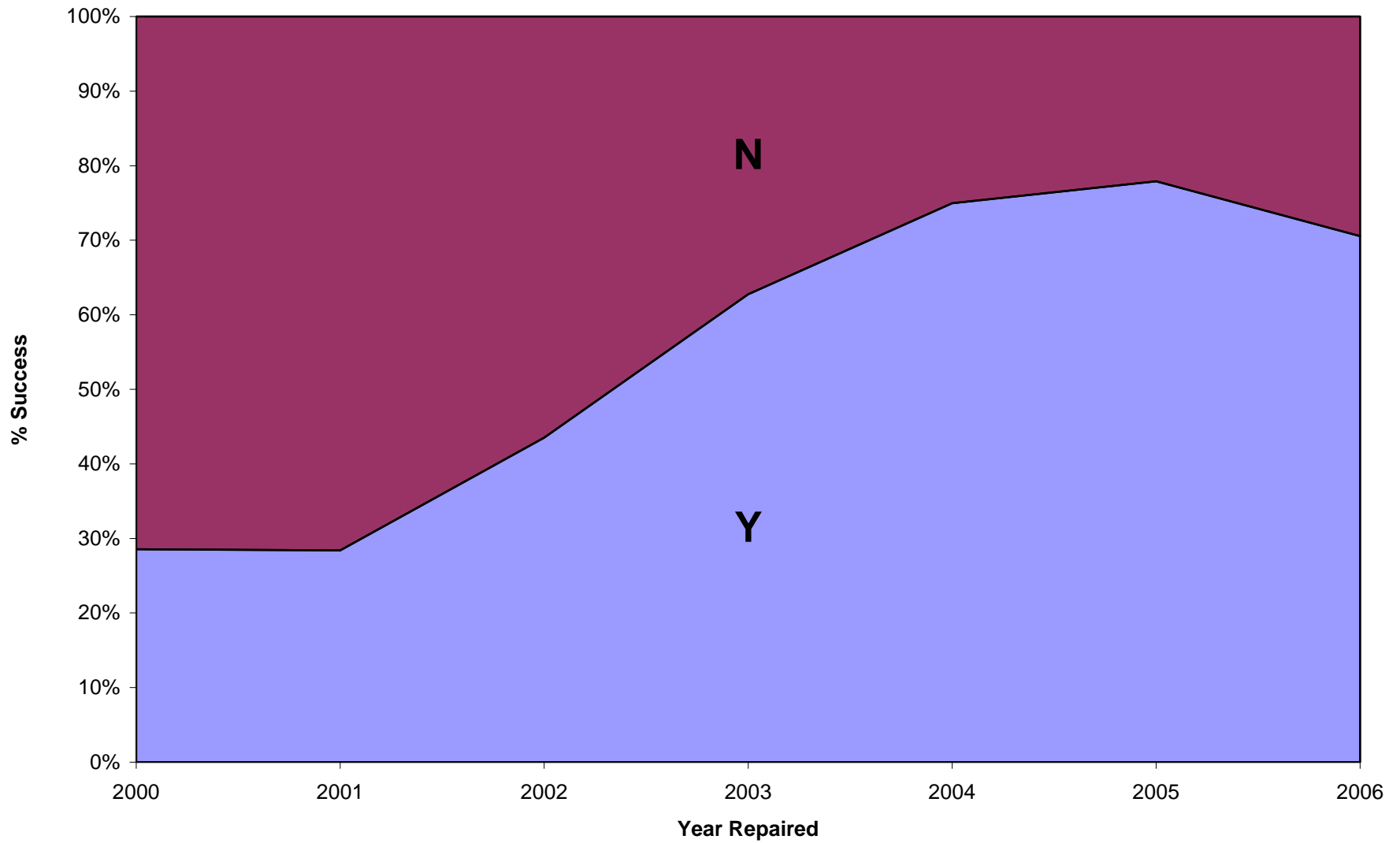
CI Breaks

CI Breaks



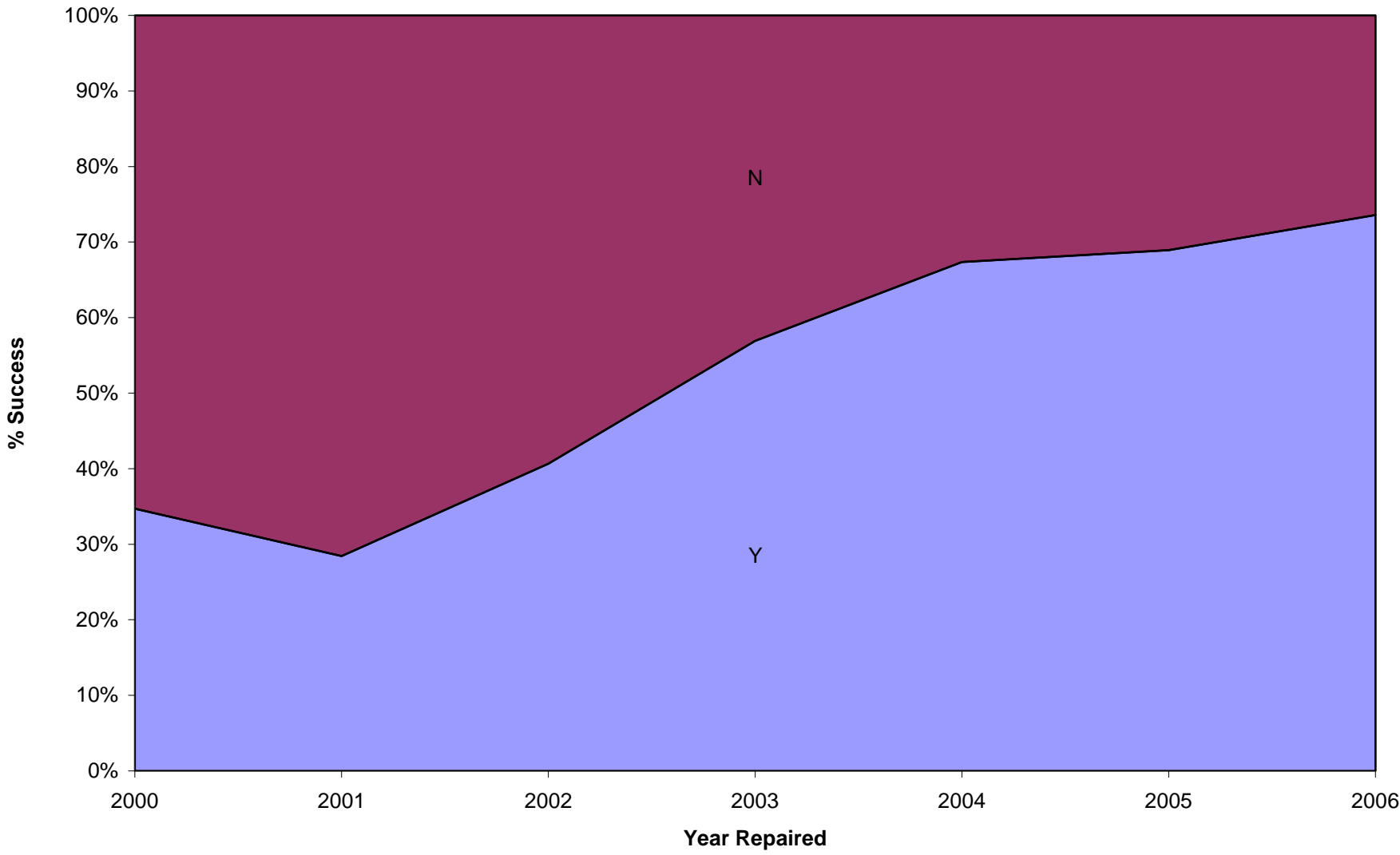
CI Joint and Other Leaks

CI Joint and Other



Plastic Leaks

Plastic Leaks



Other CenterPoint Energy Plans

- Posting ~60k legacy repairs in TX to GIS
- Scanned repair forms, manual placement using offshore resources
- 80%+ success so far
- Anticipate completion by early next year
- Results will be available to support DIMP plan, risk assessments, and other mapping applications

Questions?



Or visit Booth 101...