



Preventing Cross Bores

Solutions & Progress

February, 2012

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Cross Bores - Recognized in 1976

- 2 persons killed”
- 4 persons injured
- Punctured 2-inch plastic main...
- Entered house through 6” sewer lateral...

NATIONAL TRANSPORTATION SAFETY BOARD WASHINGTON, D.C.

FOR RELEASE: 6:30 A.M., E.S.T., NOVEMBER 12, 1976

(202) 426-8787

ISSUED: November 12, 1976

Forwarded to:
Mr. C. S. McNeer
President
Wisconsin Natural Gas Company
233 Lake Avenue
Racine, Wisconsin 53401

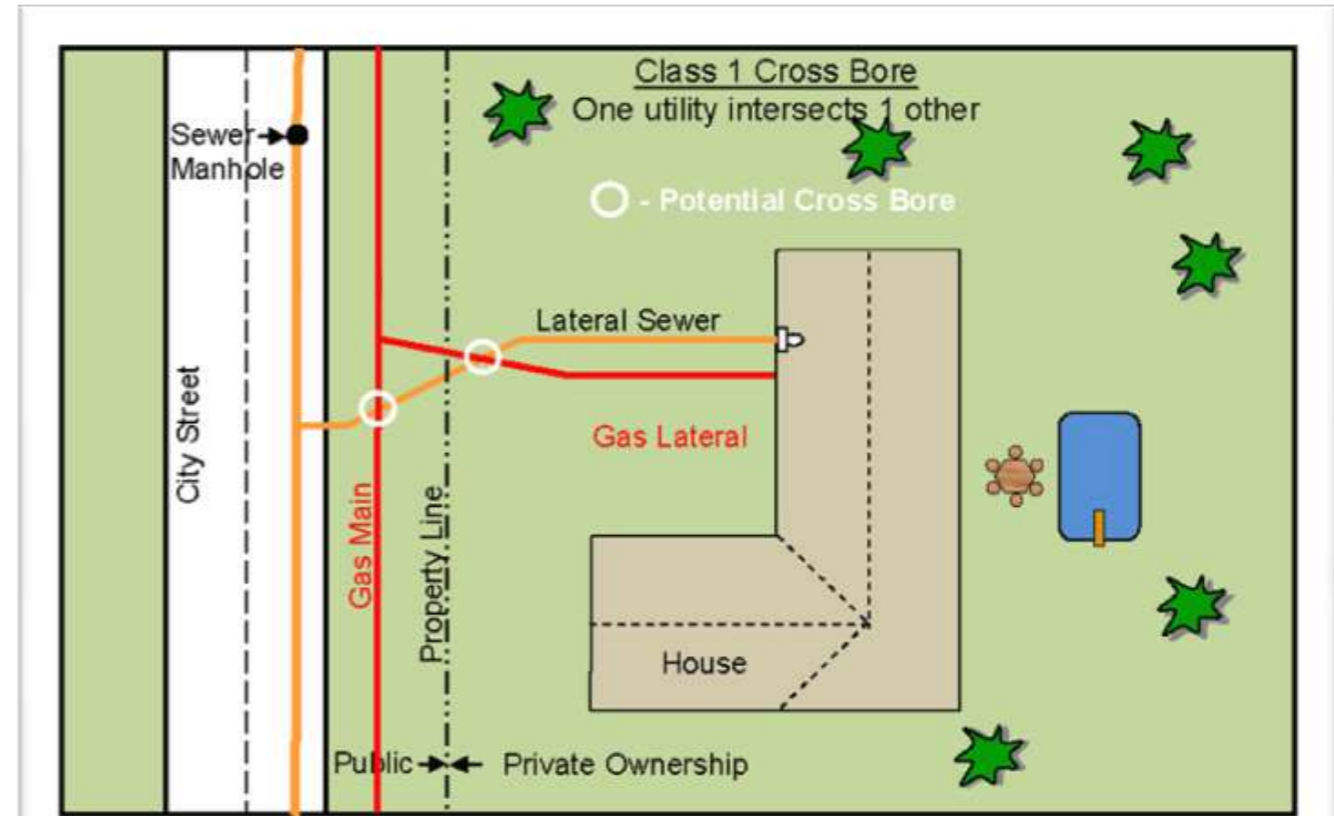
SAFETY RECOMMENDATION(S)
P-76-83 through P-76-86

At 8:53 a.m., on August 29, 1976, an explosion and fire destroyed a house at 6521 20th Avenue in Kenosha, Wisconsin. Two persons were killed, four persons were injured, and two adjacent houses were damaged. The destroyed house was not served by natural gas. However, natural gas, which was escaping at 58 psig pressure from a punctured 2-inch plastic main located 39 feet away, had entered the house through a 6-inch sewer lateral. The gas was ignited by an unknown source. After the accident, the National Transportation Safety Board's investigation disclosed that the gas main had been installed by boring through the bottom of the sewer tile; the gas main was perpendicular to the sewer tile. 1/

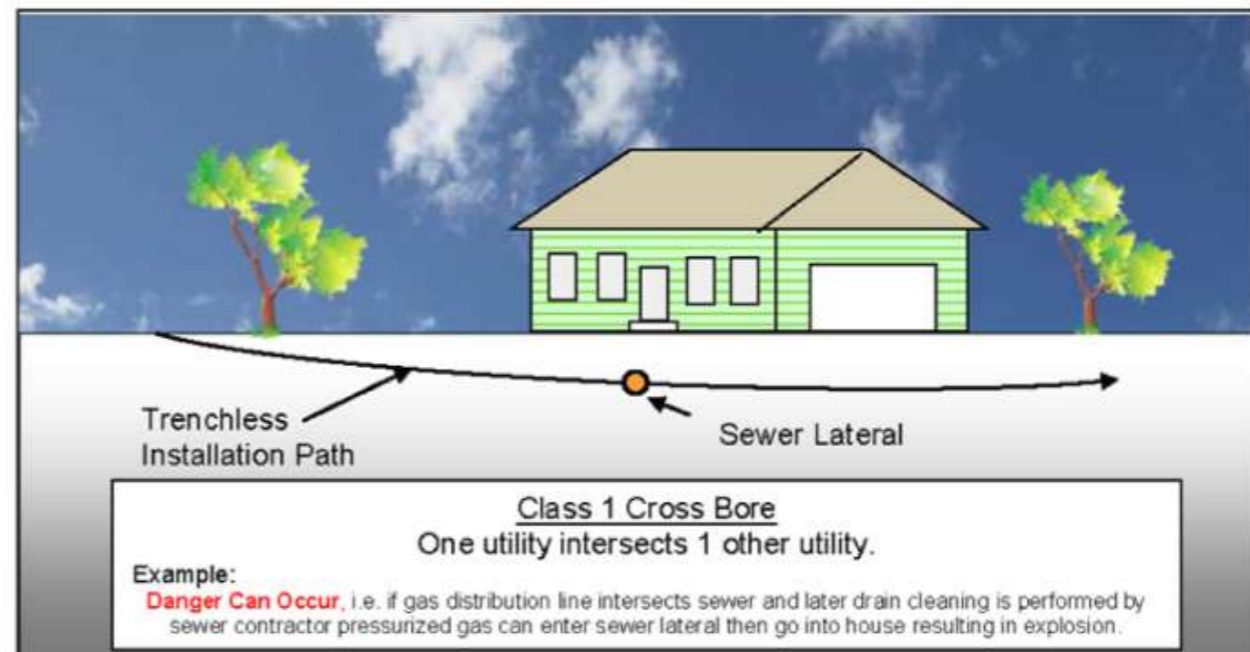
Class 1 Cross Bore

New utility directly into one existing utility:

- Sewer drain cleaning / plumber can cut line if sewer is cleaned.
- Explosion can result when pressurized gas flows into house and contacts ignition source.



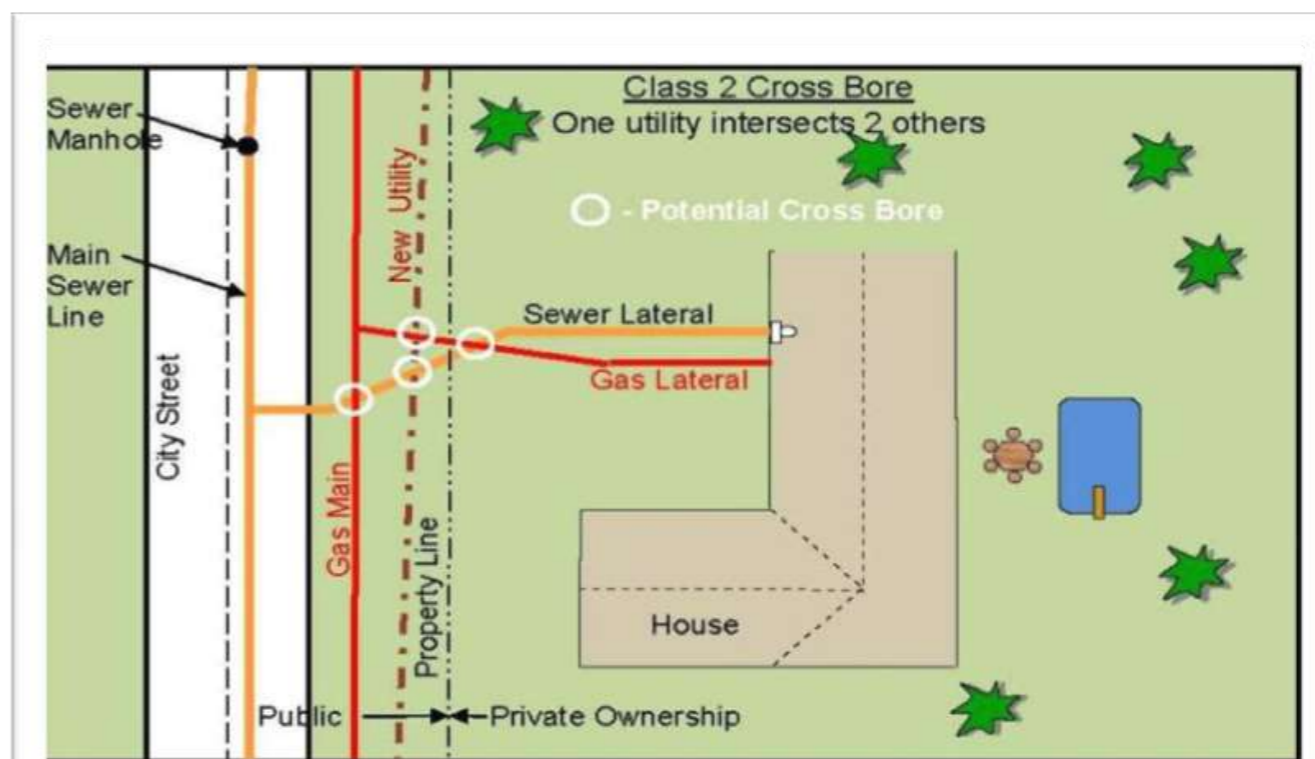
Class 1 Cross Bore Illustration



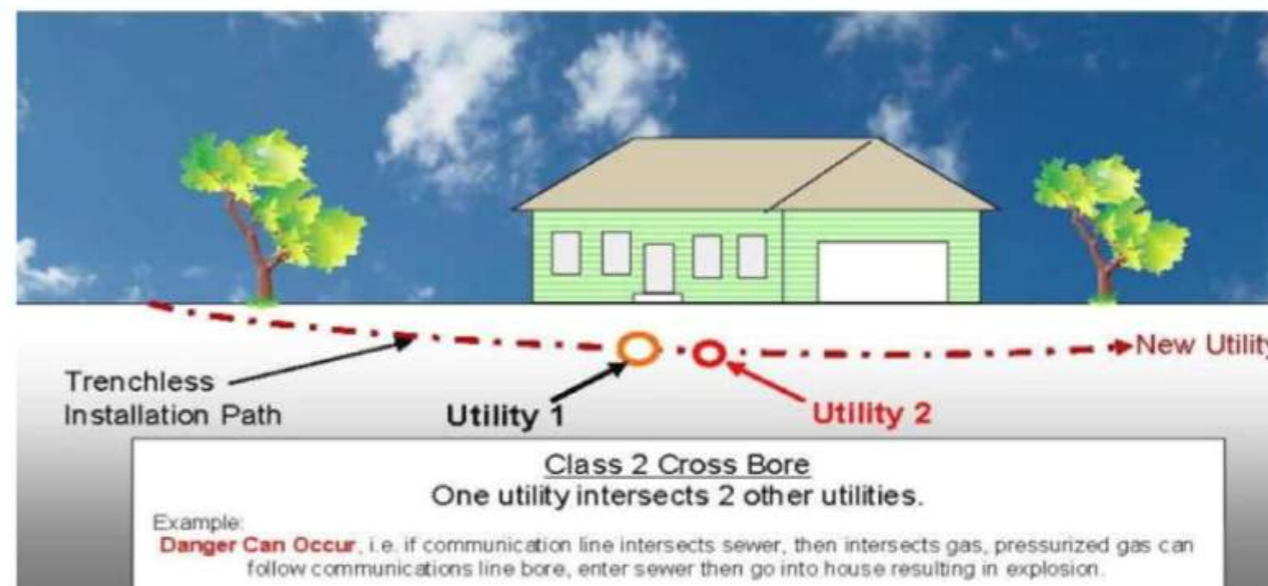
Class 2 Cross Bore

New utility directly into two utilities.

- Pressurized utility 2 could flow around bore path annulus space to Utility 1.
- If utility 1 is a gravity sanitary sewer lateral, and utility 2 is gas distribution utility, gas can enter home immediately.



Class 2 Cross Bore Illustration



Cross Bore From CCTV Inspections



Residential Gas Cross Bore Explosion - Ohio



Injured Worker from Cross Bore Explosion



Photo Courtesy Walt Kelly, Inc •

Cross Bore Repair

- Costly
- Dangerous
- Lack of System Integrity



Quantifying the Cross Bores Problem

- Legacy elimination projects have resulted in up to a maximum of 3 cross bores found per mile in high risk areas.
- Cross bores have been found at a hospital and at a school



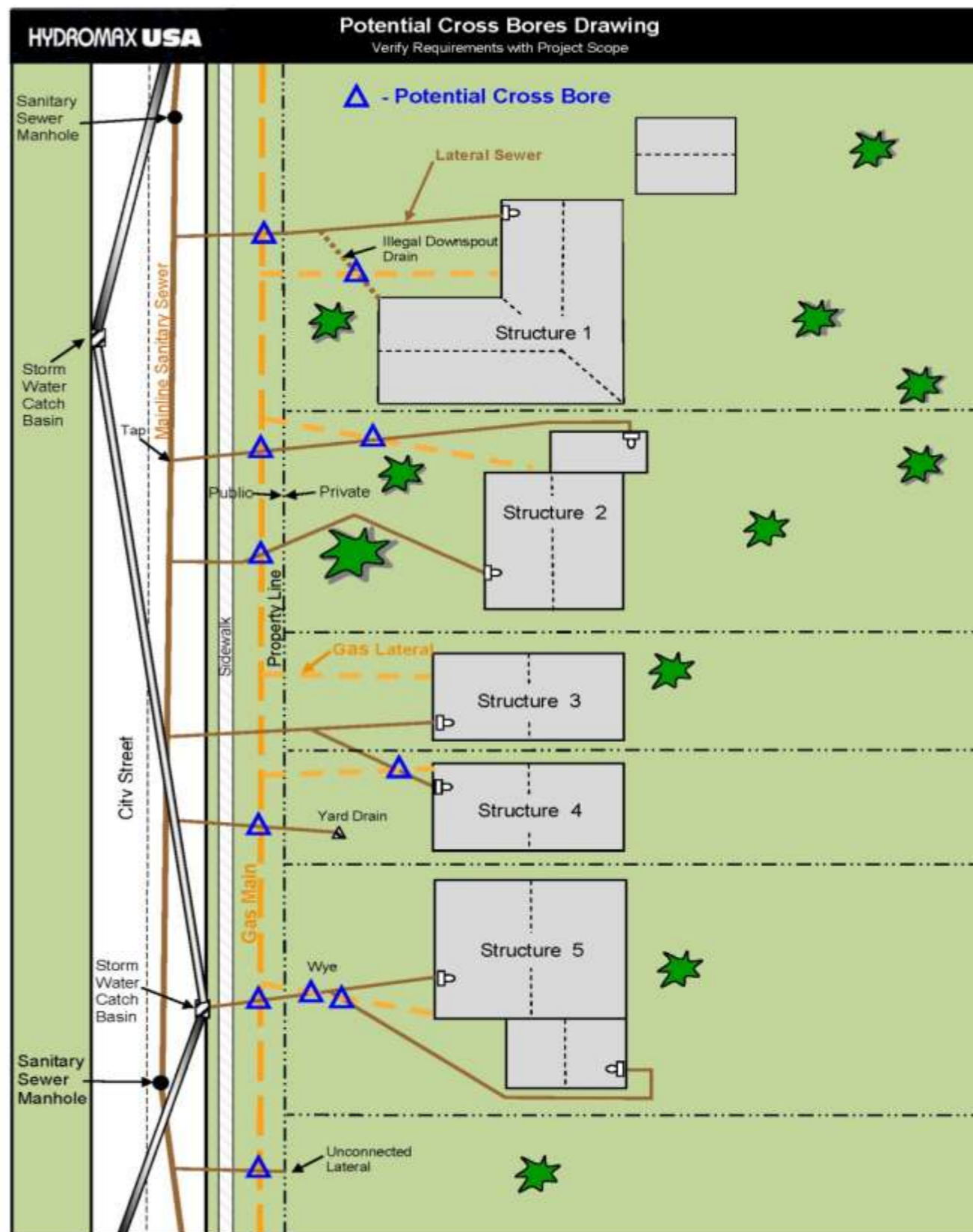
Who is Responsible ???

- Sewer operator?
- Gas installation contractor?
- Gas distribution utility?
- Drain cleaner?
- Home owner?
- All of the Above?

Note: Court cases and settlements have shown that gas contractors and or gas utility have been liable for damages. Maximum reported settlement is \$30 million for one house & two injured children.

Potential Cross Bores of Gas in Sewers

- Mainline sanitary sewer
- Lateral sanitary sewer connected to:
 - Sanitary sewer main
 - Storm sewer main
 - Another lateral sewer
- Storm main sewer
- Gutter drains
- Yard drains
- Septic systems



Advantages of Trenchless Installation Techniques

- Less disruption to surface, yards, driveways, shrubs & trees
- Less disruption to traffic
- High acceptance by the public
- Often very cost effective
- Eliminates damage from an excavator bucket

Trenchless Methods

- Horizontal Directional Drilling
- Moles
- Plowing (yes, it is considered trenchless)





DOT - DIMP

Distribution Integrity

Local gas distribution companies required to submit by August 2, 2011 Distribution Integrity Management Program (DIMP).

DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials
Safety Administration

49 CFR Parts 190, 192, 195, and 198

[Docket No. PHMSA-2009-0192]

RIN 2137-AE43

**Pipeline Safety: Pipeline Damage
Prevention Programs**

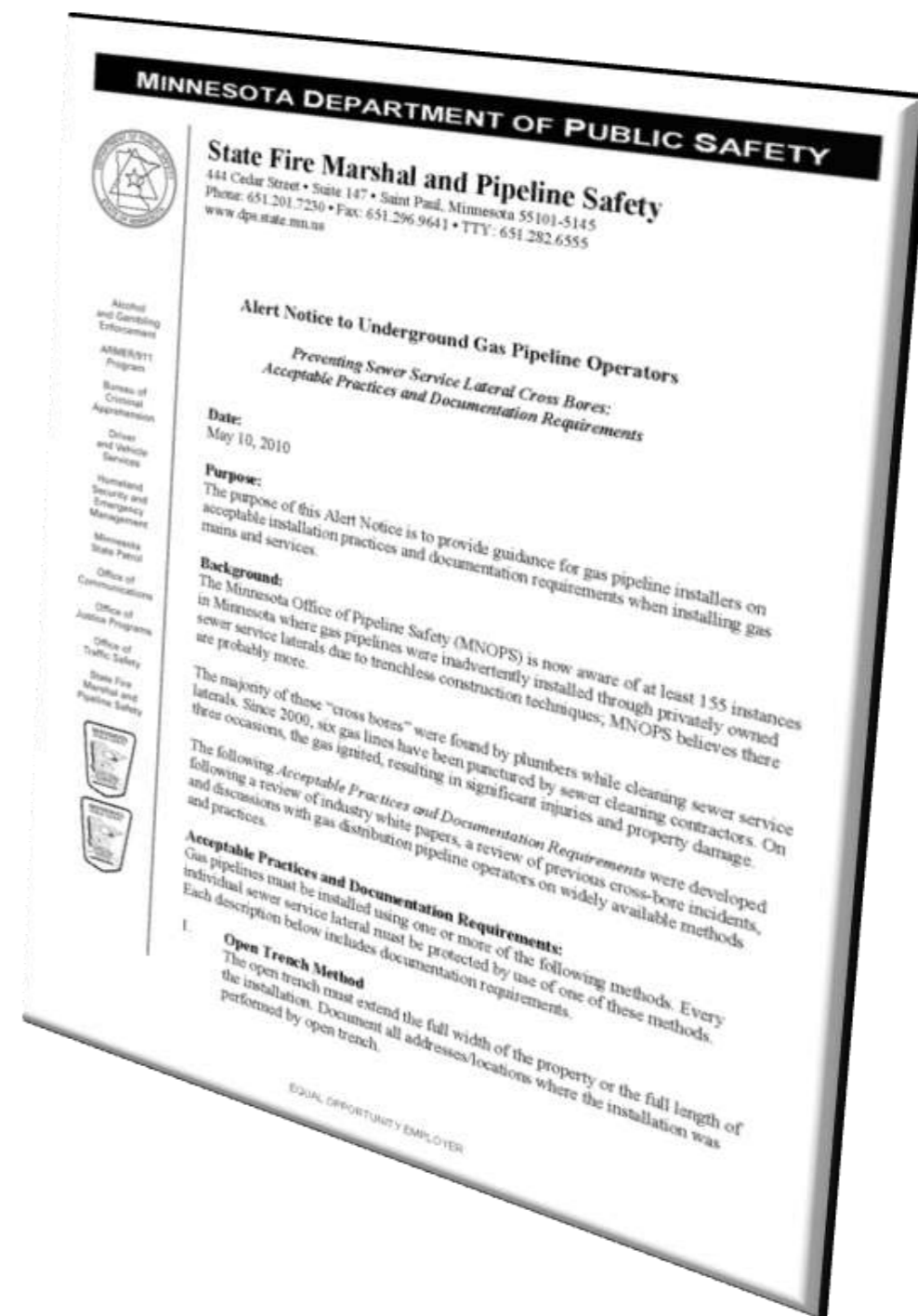
AGENCY: Pipeline and Hazardous
Materials Safety Administration
(PHMSA), U.S. Department of
Transportation (DOT).

ACTION: Advance notice of proposed
rulemaking.

Minnesota Alert Notice

Acceptable Methods

1. Open trench
2. Maps and records method
3. Exposed sewer method
4. Sonde method
5. Relative elevation method
6. Television
7. Other methods that may be approved





Utility Locating Legislation

- Most states' legislation requires some level of locating to be provided by sewer operator.
- A few states exempt sewers/laterals if they are gravity sewer lines.
- All states need to require sewer locations including depth.

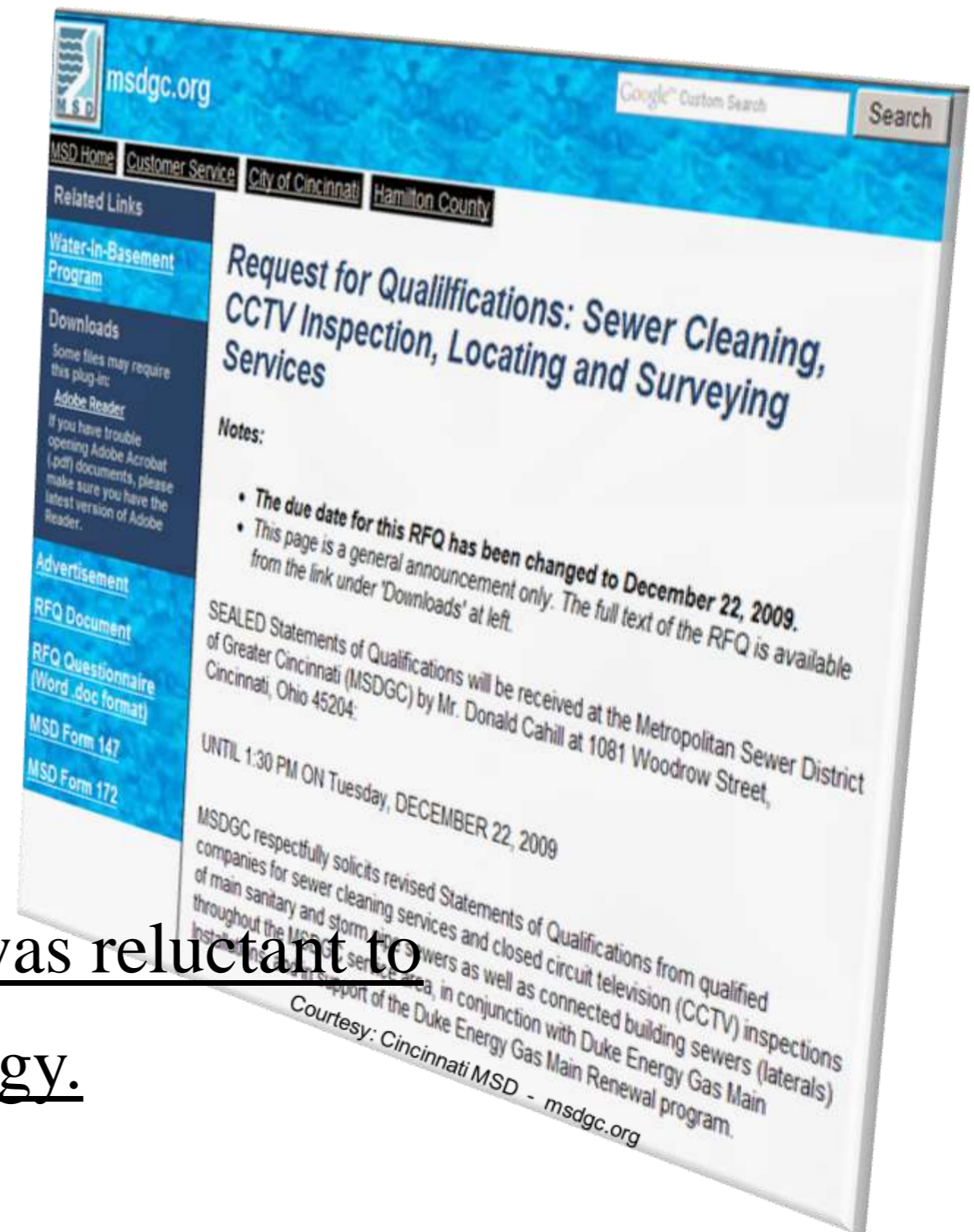


Cross Bore Elimination Solutions

- Locate before construction existing utility's
 - Alignment
 - Depth
- Verify that a new or legacy install has not created cross bore
- Post construction inspection of sewers
- QA/QC all data in a separate process
- Store & Share data on “cleared” and “uncleared” areas with operations personnel, drain cleaners and public

Cooperation of Sewer and Gas Utilities

- Cincinnati Sewer Department (MSDGC) joins with Duke Energy to inspect sewers for deterioration and for gas cross bores.
- First known joint cooperation.
- Several years before, MSDGC was reluctant to provide sewer maps to Duke Energy.





Cross Bore Elimination Project Steps

- Evaluate and identify areas of high risk
- Develop detailed process
- Use high confidence verifiable methods
- Rigorous use of QAQC
- Securely save data in a easy distribute format
- Share information



Legacy - Risk Evaluation & Prioritization

- Review all LEGACY installations for a combination of trenchless installation and presence of sewers in the proximity
- Prioritize trenchless installed areas
- Prioritize multiple occupancy structures
- Prioritize areas with sewers and gas in proximity
- Prioritize buildings without basements, shallow sewer



Methods Used for Cross Bore Elimination and Prevention

1. Records review
2. Inspection mains and lateral sewers from sewer main with robotic CCTV cameras
3. Inspection of lateral with push rod CCTV cameras
4. Pot holing using vacuum excavation
5. Combining 1, 2, 3 or 4 with GPS/GIS sub foot accuracy mapping saved into permanent data base – accessible to multiple users with aerial photo overlay.
6. Open trench construction



Verify New Construction Installations

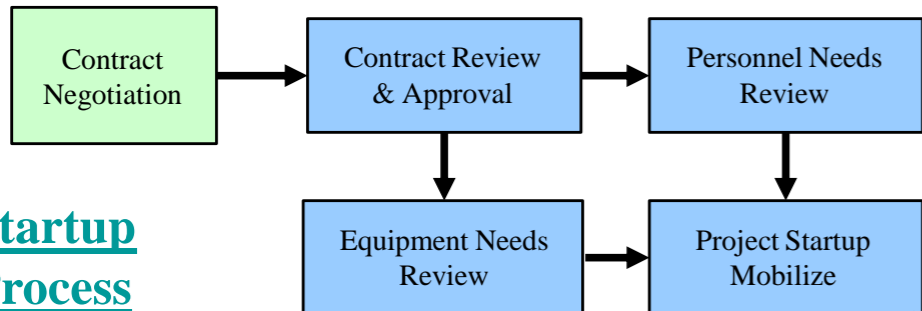
- Inspect before and especially after construction
- Even when locations are accurately known, cross bores do occur
 - Equipment calibration errors
 - Anomalies in soil and on surface can distort locates
- Verification needs to be a separate process
- Order re-inspection when it can not be conclusively determined that a line is cross bore free, i.e. debris, water filled sags, etc. per QAQC review
- Understand the accuracy of the tools and processes

Cross Bore Inspection Process Chart

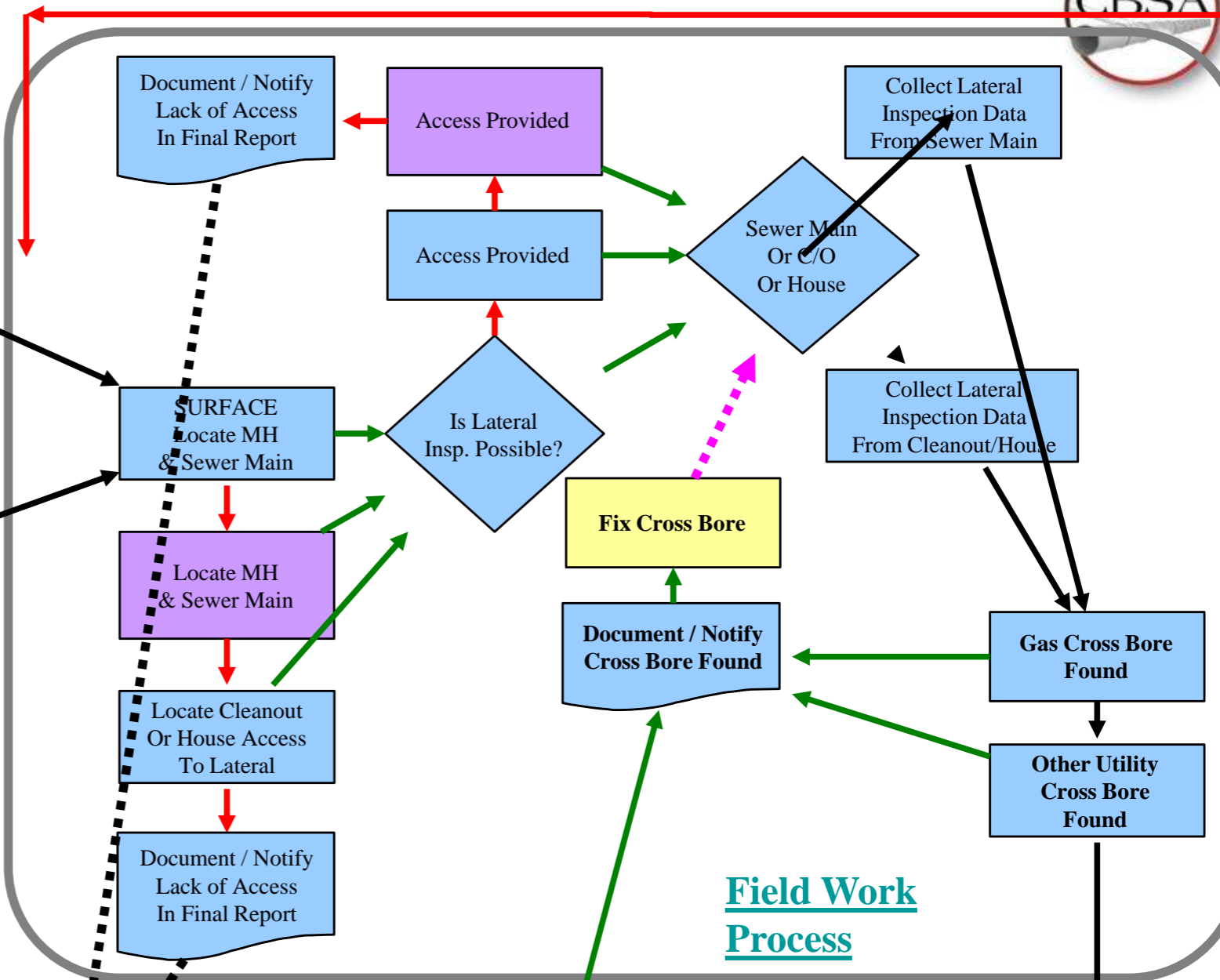
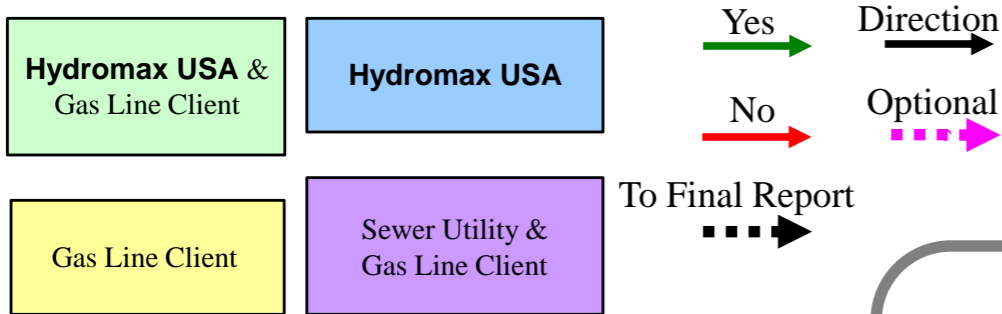
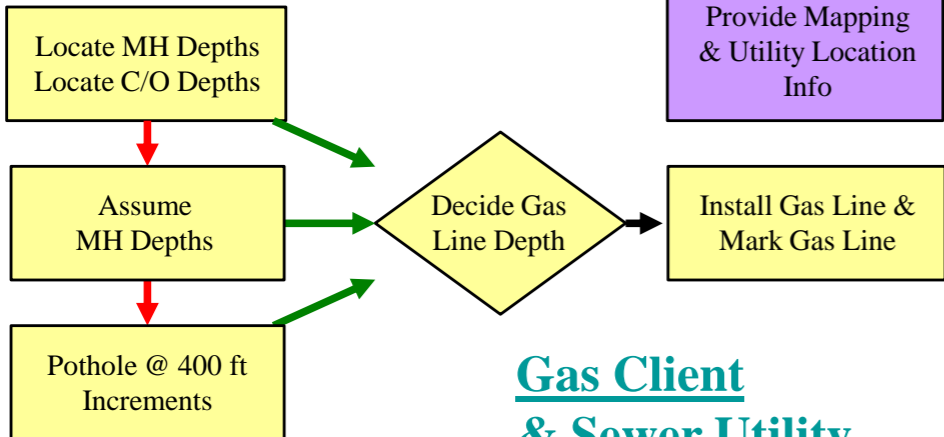


[\(Go to overview\)](#)

Startup Process

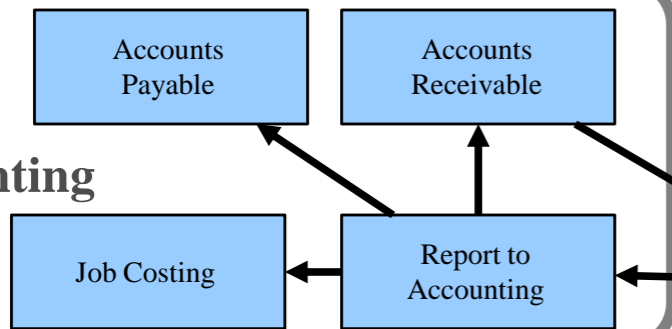


Gas Client & Sewer Utility

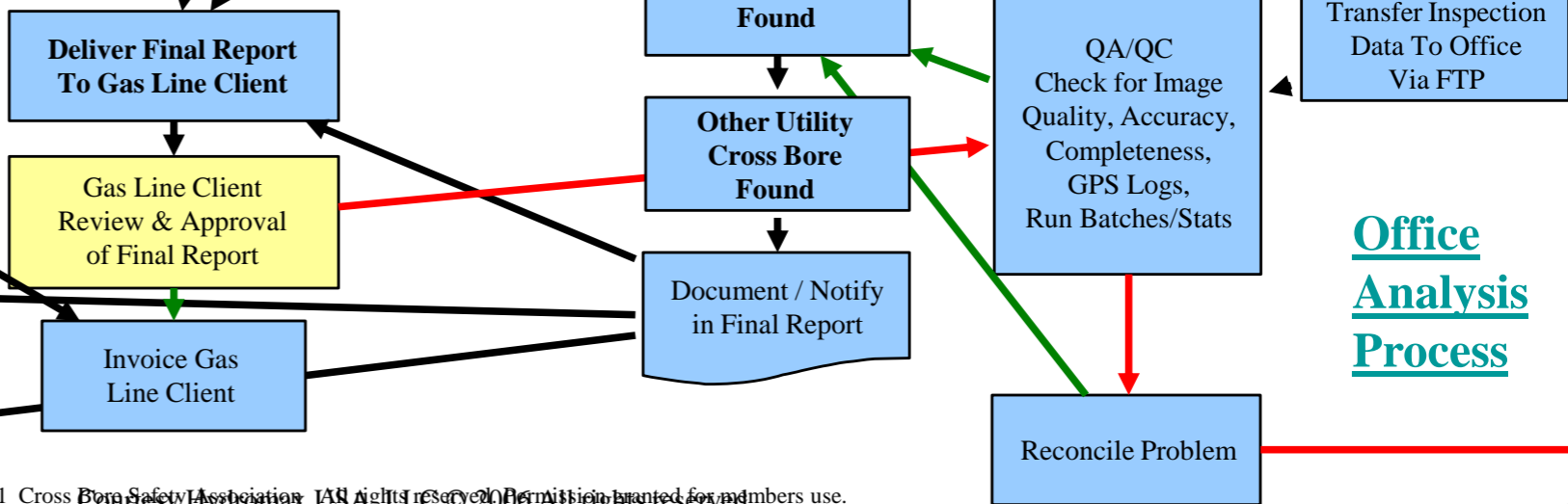
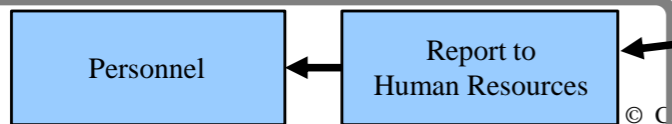


Field Work Process

Accounting



HR



Office Analysis Process



Example of Integration of CCTV, Sonde & GPS

Tools:

- Robotic camera transporter with sonde
- Piggyback lateral camera with sonde
- GPS, optional wireless link to camera software
- Electromagnetic sonde/receiver for depth
- GIS Software on CCTV Camera Truck

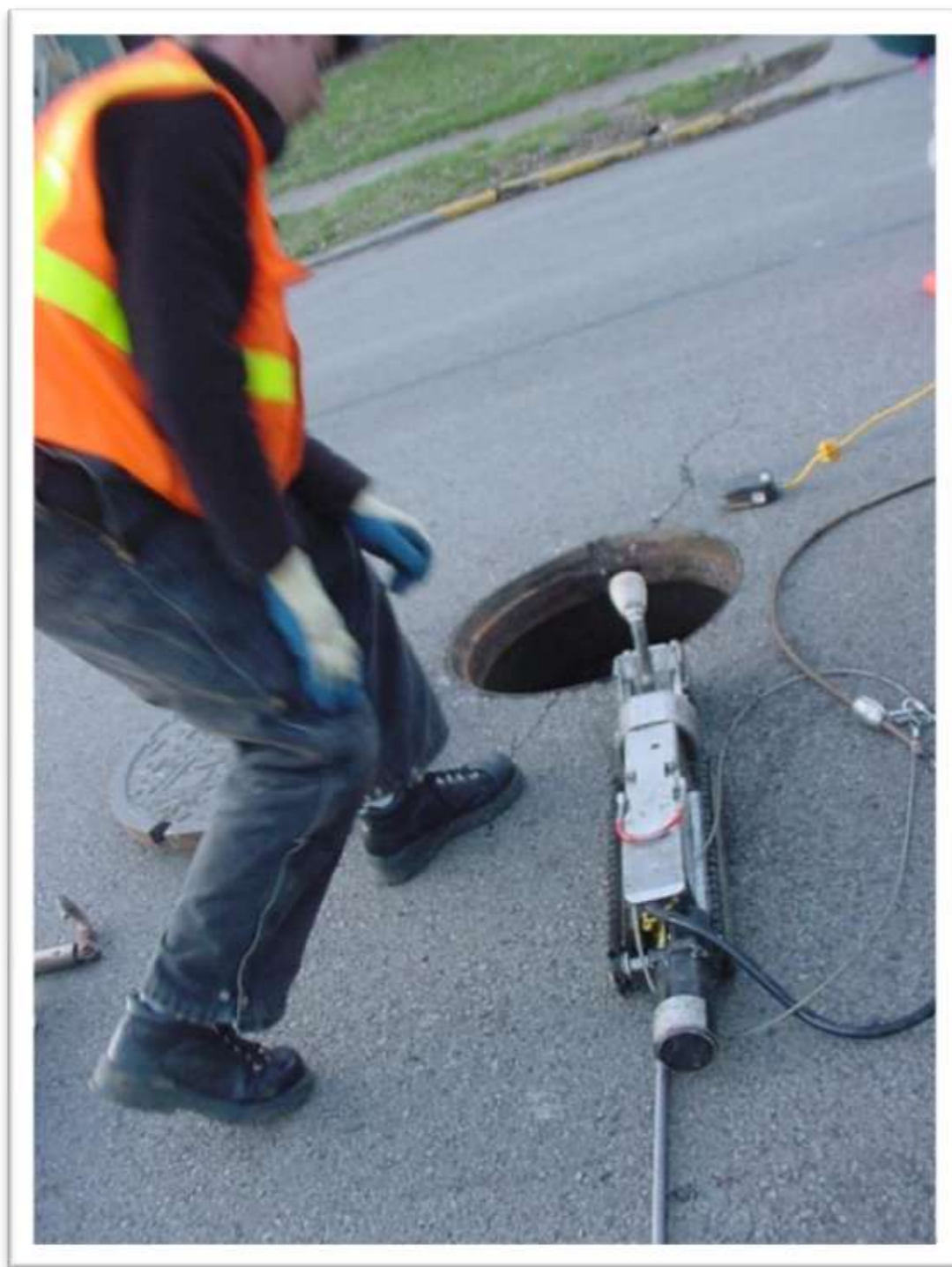
Results:

- Accurate Verifiable Locates
- Time, Visual and XYZ Locations Documented

Example of Combined Robotic Mainline + Lateral CCTV + GPS Inspection



Example of Mainline CCTV with Lateral Piggyback Camera Placed in the Sewer Pipe Manhole + Sonde + GPS



Example of Combined CCTV, Sonde & GPS Use

Note: Lateral Line Traces could remain flagged / spray painted until Gas Line installation crews arrive...



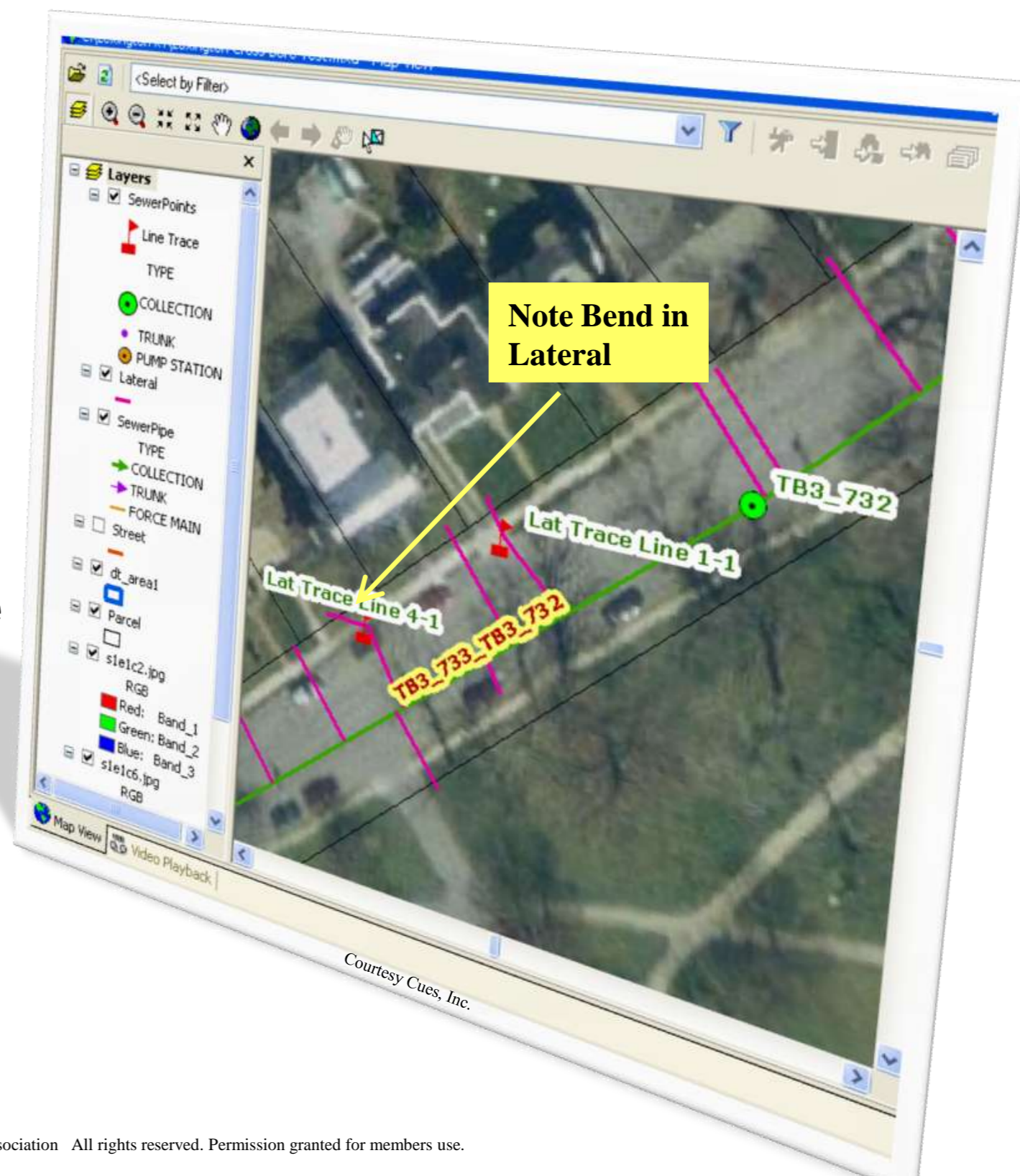
This trace line has bends in the line...which are now reflected in GIS

Results: Sewers Identified for Depth and Location to Prevent Cross Bores - In GIS Database

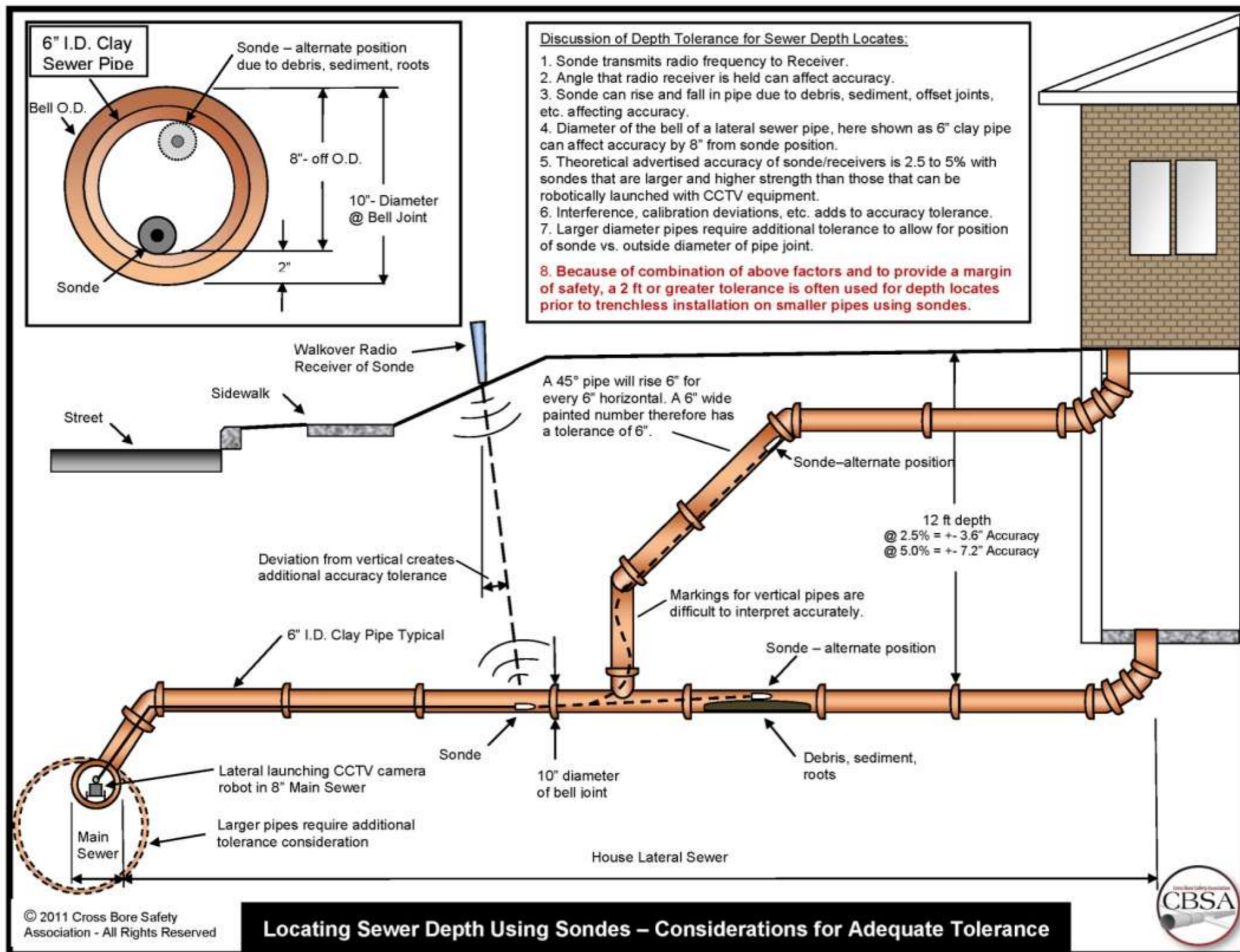
As seen in the truck, each buried wastewater asset is made available in GIS 'Layers':

Laterals are added as "*Lat Trace Line*" and given a unique ID#...

Web accessible GIS data provides info to utility, contractors and drain cleaners



Understand Accuracy of Locates

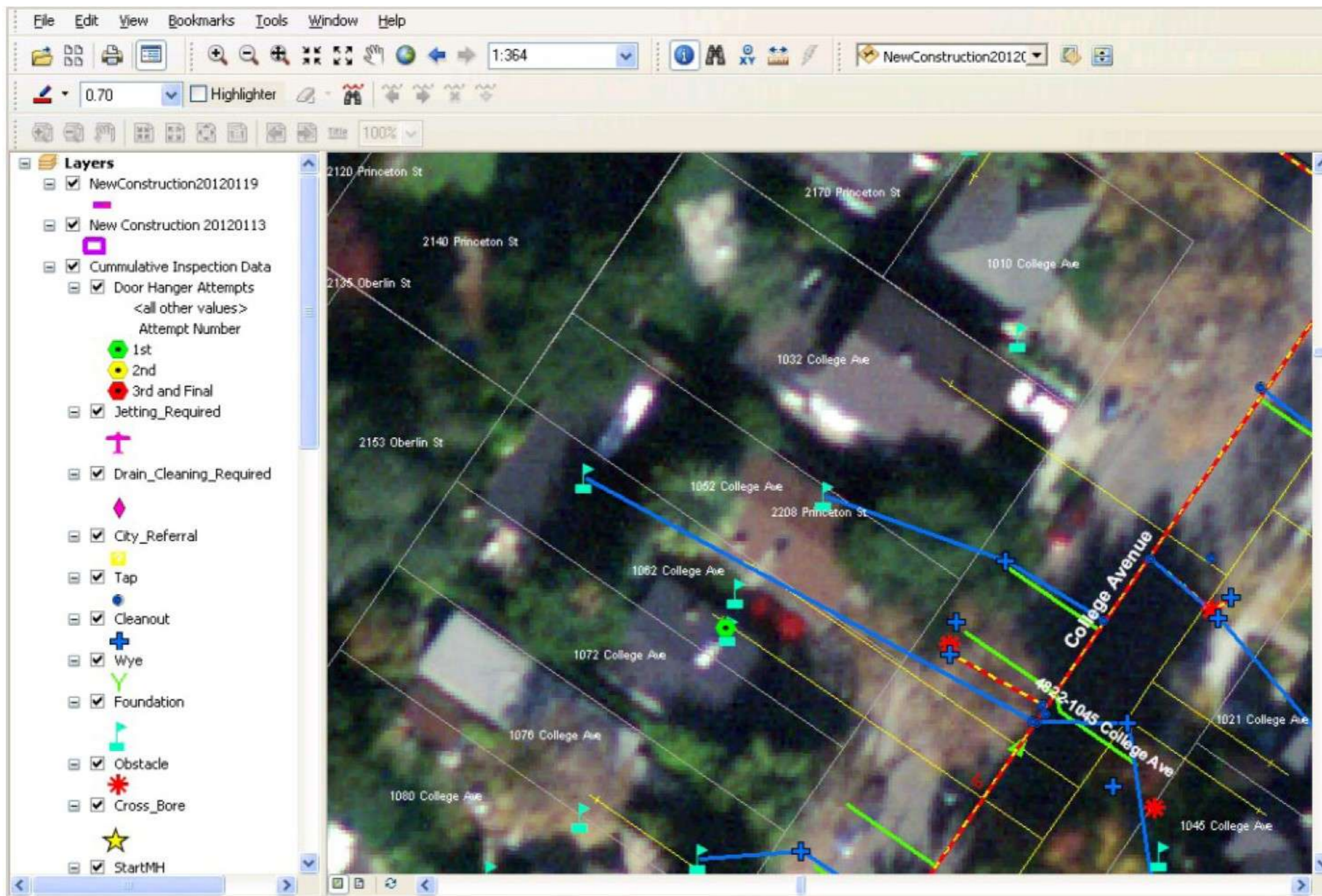




Demand Quality

- **Train** managers to understand sewer and utility conflicts
- **Design** high confidence processes
- **Qualify** & train personnel that can demonstrate capability and understanding
- **Verify** data collection is complete with an independent process
- **QAQC** in separate processes
- **Store** data for easy accessibility and review

GIS Mapping – Visual Data Results

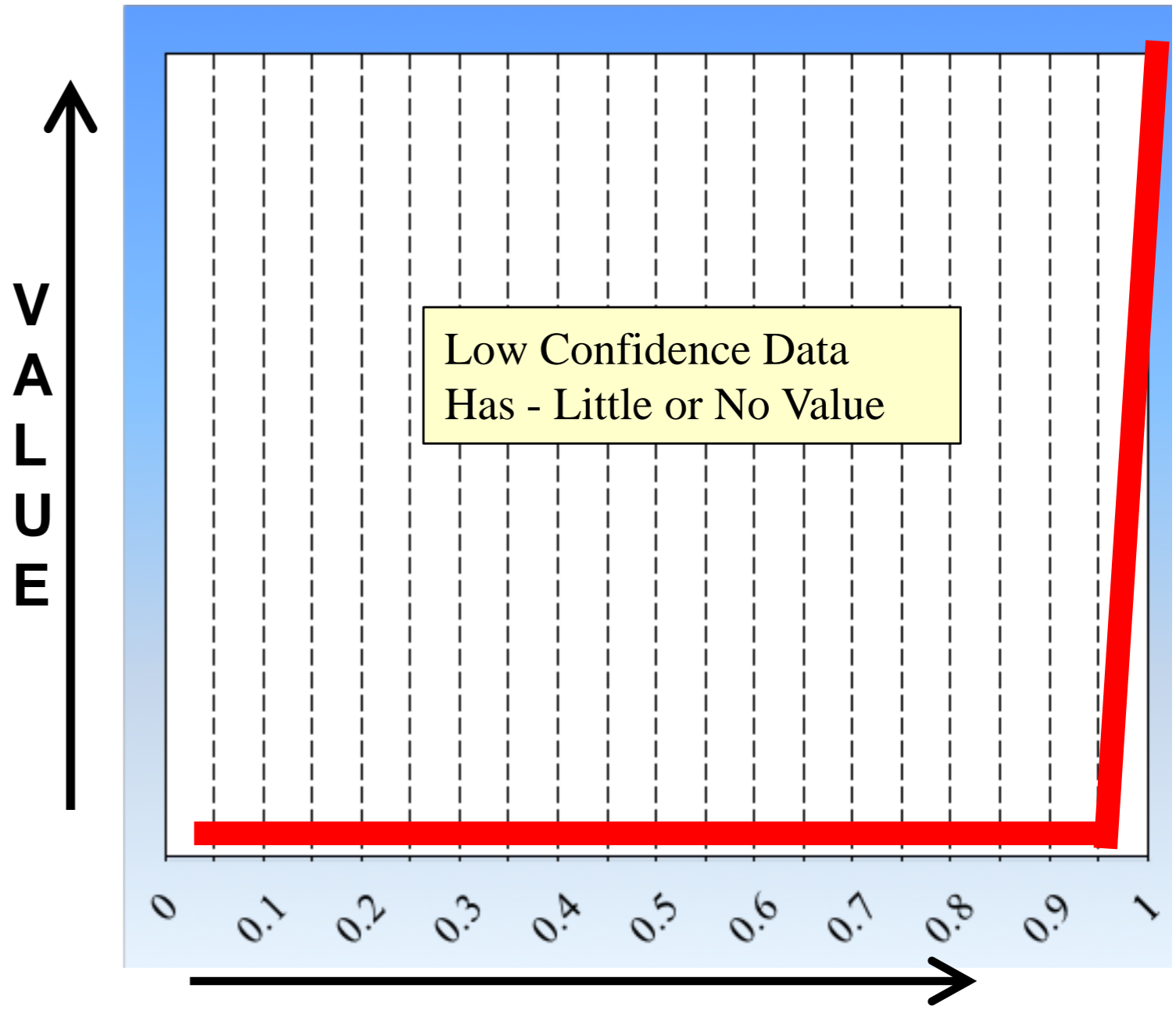


Data

- Provide a system for readily accessible information
- Allow for access by management and operation personnel for greater efficiencies
- Share “cleared” and “uncleared” areas with installers and service technicians, including drain cleaners
- Plan and manage projects for cross bore elimination with the data
- Measure results

Value Increases with High Confidence Processes

- Value Depends upon Confidence of Data
- Low Confidence Data Has Little or No Value
- Low confidence results will likely require rework of entire project





Discussion

- Do DIMP integrity requirements include cross bore verification?
- State Requirements for Cross Bore Verification – What's States are Leading?
- What New Technologies are expected?
- How does GPS/GIS Offer Solutions?
- How Cost Effective are High Confidence Processes?
- What is Cost Effective vs. Acceptable?
- Can Gas & Sewer Utilities Cooperate?



Thank you!

“..... to minimize the risk of injury, loss of life and property damage from utility cross bores in an effective and efficient manner.”

www.crossboresafety.org