UCT The Underground Utilities Event

Underground Construction Technology | January 28-30, 2020 | Fort Worth, TX

Leading Practices for Cross Bore Risk Reduction

Presented by:

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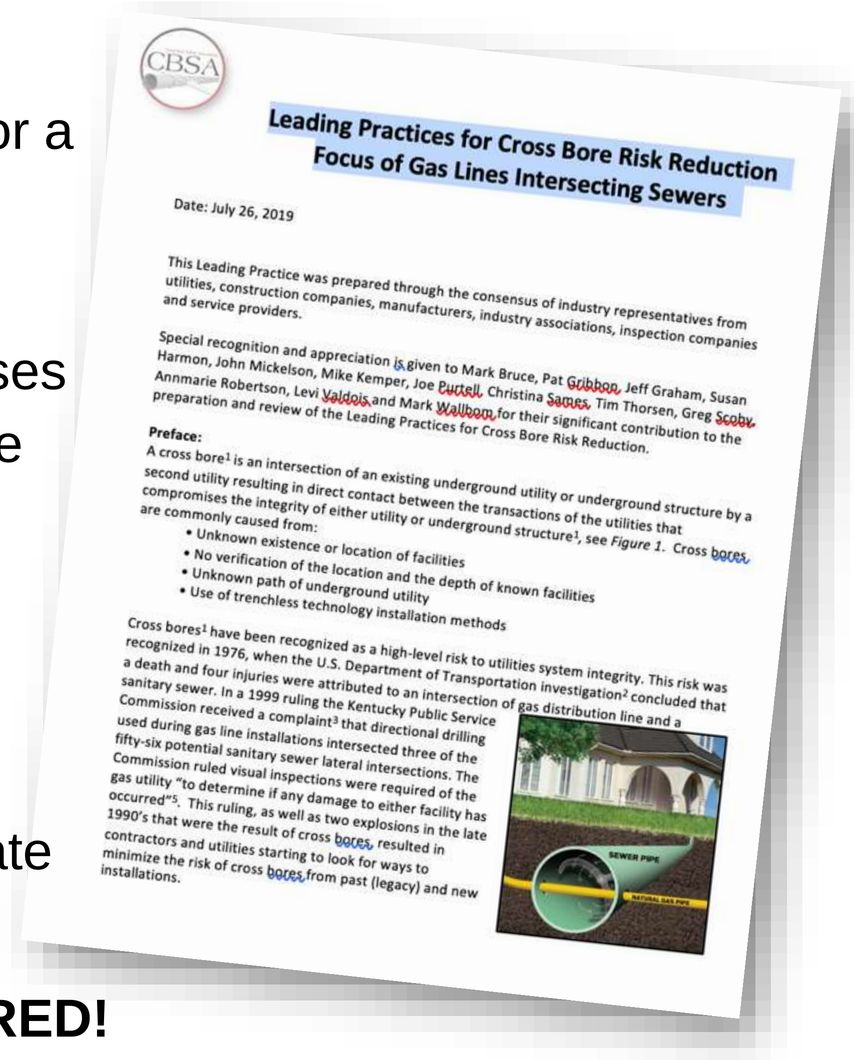
Leading Practices for Cross Bore Risk Reduction

- Requested from industry & regulator because of concerns showing need for a detailed guidance document
- Existing cross bore inspections and construction efforts have, in some cases reported an area cleared of cross bore risks, but cross bores were found subsequently.
- Requires high confidence cross bore reduction efforts.
- Verifiable QAQC'd processes, accurate GPS and GIS are recommended
- **Accurate Verifiable Data is REQUIRED!**



CBSA

Leading Practices for Cross Bore Risk Reduction
Focus of Gas Lines Intersecting Sewers

Date: July 26, 2019

This Leading Practice was prepared through the consensus of industry representatives from utilities, construction companies, manufacturers, industry associations, inspection companies and service providers.

Special recognition and appreciation is given to Mark Bruce, Pat Gribbon, Jeff Graham, Susan Harmon, John Mickelson, Mike Kemper, Joe Purtell, Christina Sames, Tim Thorsen, Greg Scoby, Annmarie Robertson, Levi Valdois and Mark Wallbom for their significant contribution to the preparation and review of the Leading Practices for Cross Bore Risk Reduction.

Preface:
A cross bore[1] is an intersection of an existing underground utility or underground structure by a second utility resulting in direct contact between the transactions of the utilities that compromises the integrity of either utility or underground structure[1], see *Figure 1*. Cross bores are commonly caused from:

- Unknown existence or location of facilities
- No verification of the location and the depth of known facilities
- Unknown path of underground utility
- Use of trenchless technology installation methods

Cross bores[1] have been recognized as a high-level risk to utilities system integrity. This risk was recognized in 1976, when the U.S. Department of Transportation investigation[2] concluded that a death and four injuries were attributed to an intersection of gas distribution line and a sanitary sewer. In a 1999 ruling the Kentucky Public Service Commission received a complaint[3] that directional drilling used during gas line installations intersected three of the fifty-six potential sanitary sewer lateral intersections. The Commission ruled visual inspections were required of the gas utility "to determine if any damage to either facility has occurred"[5]. This ruling, as well as two explosions in the late 1990's that were the result of cross bores, resulted in contractors and utilities starting to look for ways to minimize the risk of cross bores from past (legacy) and new installations.

Contents: 32 Chapters, 88 pages, 23 Figures, 33 References, 12 Example Notices

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CBSA

Executive Summary

The natural gas industry has requested a guidance document to help minimize the creation of unplanned intersections of one utility with another (cross bore[1]) and eliminate legacy cross bores that have been installed in past construction activities.

One of the most serious cross bore risks is the presence of natural gas distribution lines installed through sewer pipes. Several natural gas utilities system integrity evaluations have identified cross bores as their highest risk.

Awareness of the risk has gradually spread through most of the gas distribution industry, but effective ways to mitigate the risk are not standardized. New projects are being implemented without historical perspective and good sources of information. This document is intended to share the leading practices for cross bore risk reduction.

Cross bore risk reduction began in the mid-late 1990's using improved process focus and then technologies based upon visual verification in the 2000's. Updated camera systems are still the primary tool of preference for most cross bore inspection projects. Thorough, deliberate construction practices also reduce the creation of new cross bores. As experience has been gained, better practices using more capable tools and processes have been developed. Many tools, techniques and processes are needed to successfully complete an effective risk mitigation program. More recently, sophisticated risk models coupled with prioritization modeling are proving effective for decreasing risk faster and with more efficiency.

Proven practices are providing utilities efficient high confidence results. Low confidence practices can leave a false sense of security and result in incorrect cross bore determinations. Industry leaders now recognized low confidence risk mitigation practices are no bargain, impede their reputation and allow risk to remain for the gas distribution industry. Inadequate confidence of the processes may require costly re-work.

A well-founded cross bore risk mitigation effort benefits from using all the resources that are available to achieve the best results and highest confidence. To achieve high confidence, collection of data should be designed to allow robust quality control processes including GPS

CBSA

Major Elements

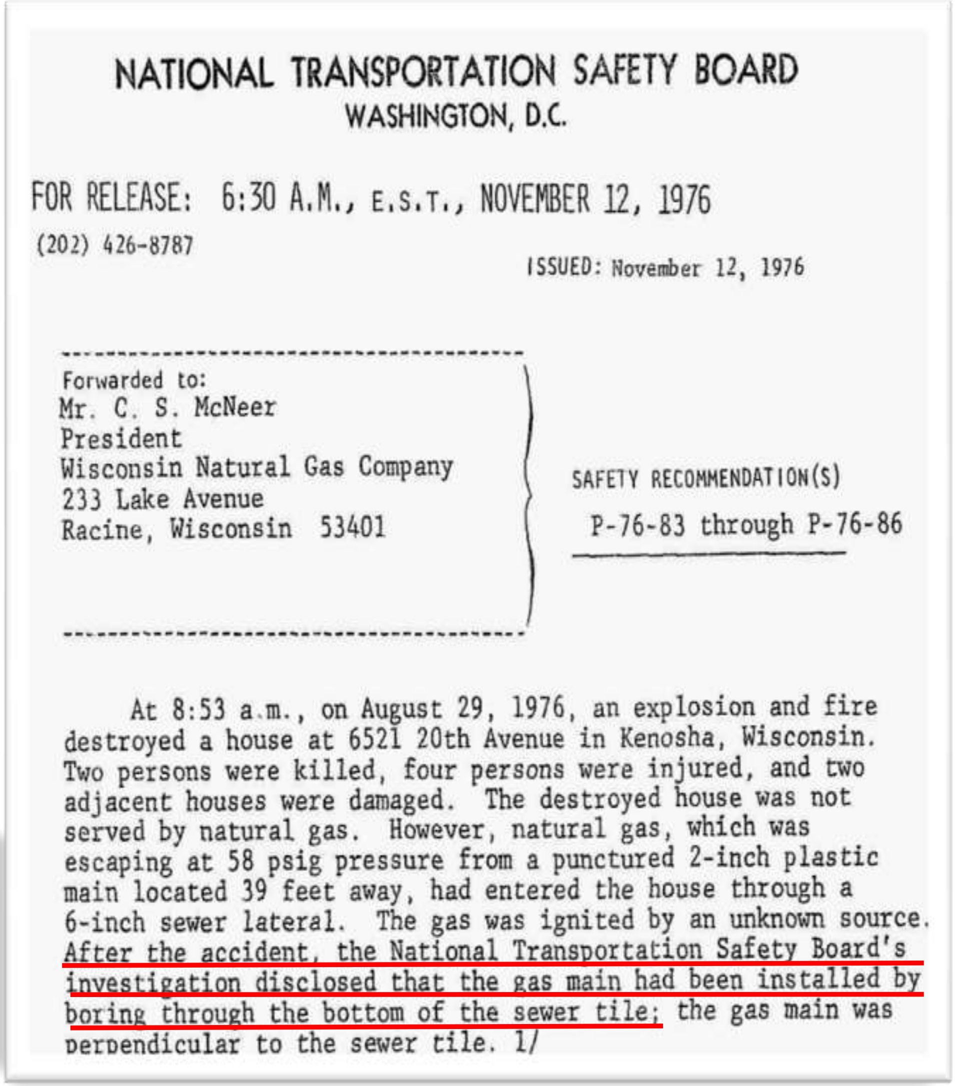
- Historical perspective
- Development process by CBSA
- Organizations and persons participating
- Discusses installations resulting in cross bores
- Illustrates the risks & consequences
- Defines construction & inspection project processes
- Verifiable data requirements
- QAQC processes defined
- Detailed operations recommendations
- Recommended and not recommended inspections tools
- Provides additional resources

What's the Cross Bore Problem?

- Trenchless installations do not "see" existing lines creating potential intersections
- Sewer utilities are often unmarked, and excluded from most 811 requirements, leading to substantial installer risk.
- All types of buried utilities are at risk from cross bores.
- Gas - sewer cross bores have been the focus of most cross bore risk reduction programs.

Cross Bores - Recognized Since 1976 by NTSB

- 2 persons killed
- 4 persons injured
- Punctured 2-inch plastic main.
- Entered house through 6” sewer lateral.
- Bored through bottom of the sewer tile.



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/

Cross Bores – Class 1, Typically Lays Dormant

One Utility Intersects One Other Utility

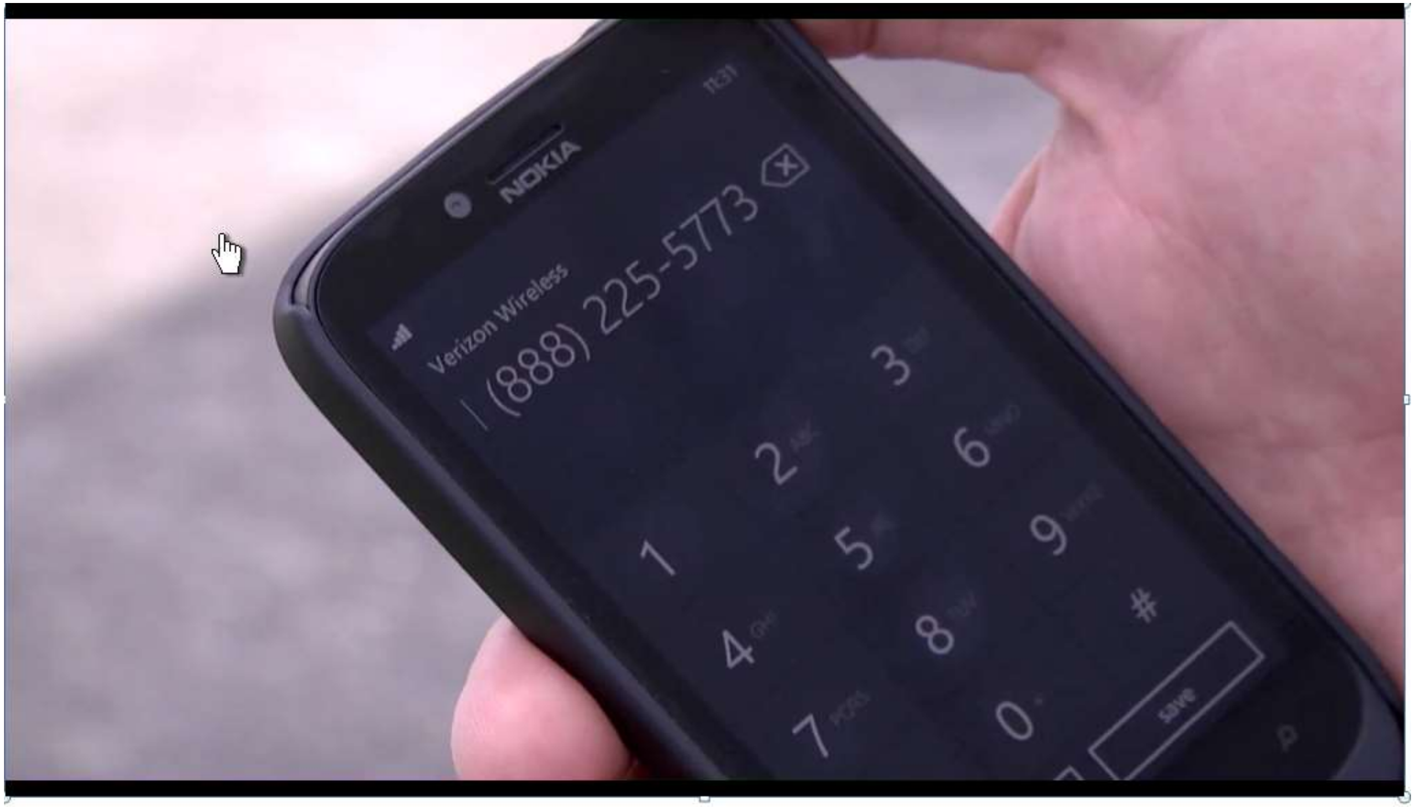
Cross Bores Are At Risk From Drain Cleaning Actions

- Rotating cutting devices used to clear blocked residential and mainline sewers can cut cross bored utilities.
- Explosion, injury and death have resulted from ignited gas released from cross bores
- $30 million per explosion have been reported

Community Outreach - Web, Radio Spots, Letters, Videos, Sandwich Boards, Theatre Spots

Online Links to Video:

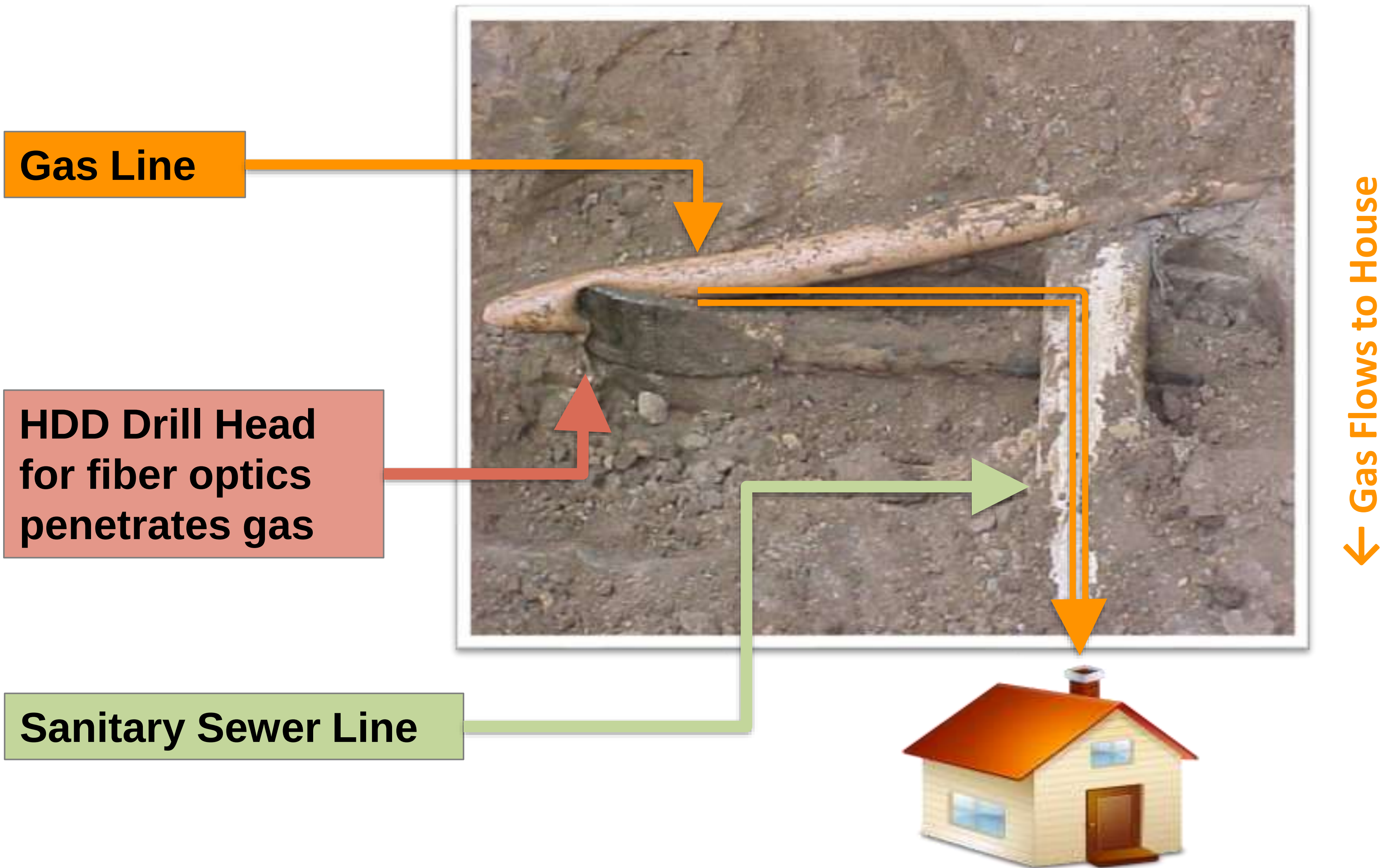
- https://www.pse.com/safety/NaturalGasSafety/Pages/Blocked-Sewer.aspx
- http://www.youtube.com/watch?v=jPAR-3YiSEM&feature=youtu.be



Click on Image to Play

Class 2 Cross Bore – Immediate Explosion Risk

Two Existing Utilities Intersected by Third Utility



Cross Bore Explosion - Class 2 Cross Bore

(see prior slide of this Class 2 cross bore)

Before

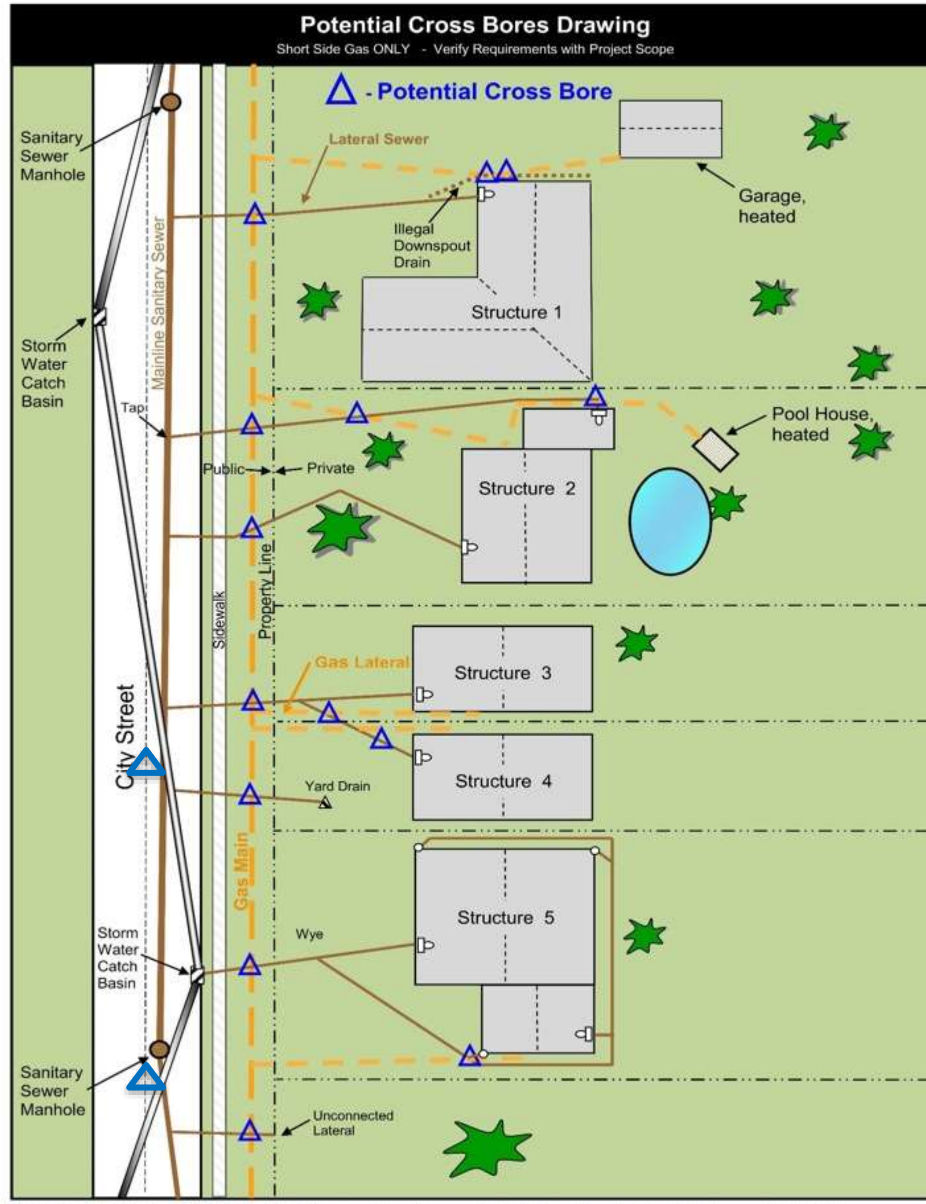
After

Potential Cross Bore Crossings - Gas In Sewer

Intersections Shown (16):

- Sanitary sewers
- Storm sewers
- Yard drains
- Gutter drains
- Cleanouts
- Offset cleanouts
- Branched laterals

- Potential Intersection of Sanitary Sewer and Gas



Estimated Quantity of Cross Bores

- **Gas Cross Bores in Sewers ≅ 0.4 per mainline mile**
- **Total Estimated ≅ 300,000, U.S. & CA, open trench reduces risk**
- Cross bore risk occurs <u>only</u> with trenchless installations
- Approximately >70% of identified gas cross bores are of sewer laterals based on many projects, but percentage can be highly variable
- Gas pipelines, U.S. (2019) 2,558,000 miles *
  - Transmission, U.S. 301,000 miles *
  - **Distribution, U.S. 1,307,000 miles** *
  - **Gas Services, U.S. 922,500 miles** *

* U.S. Department of Transportation (U.S. only)

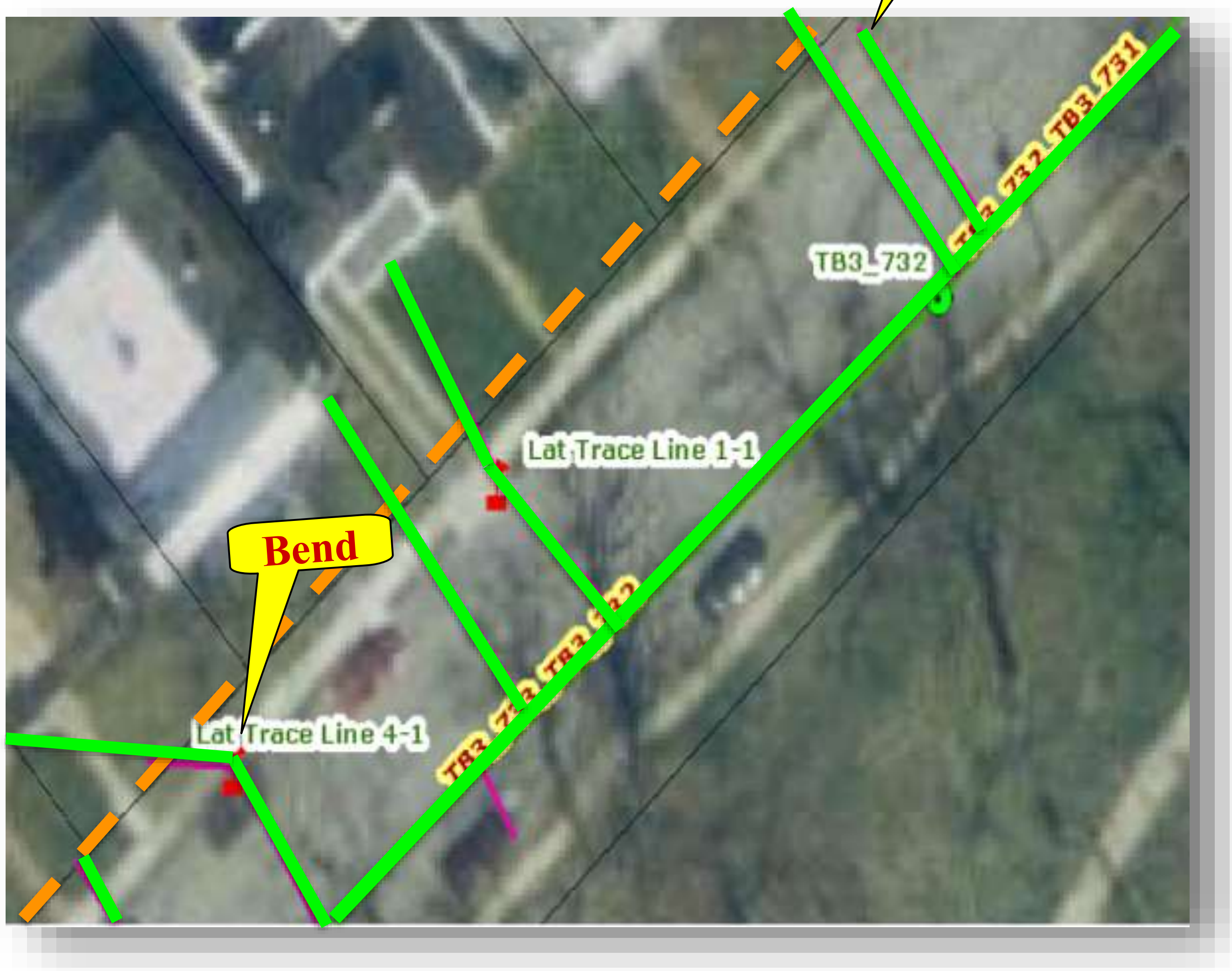
Benefits of Cross Bore Risk Reduction Efforts

- Prevents injuries and damages
- Meets regulatory requirements, DIMP
- Higher confidence the gas utility is safe, encouraging continued demand from customers
- Cost Effective, verification vs. damages and related costs
- Protects the utility enterprise value from unplanned incidents and costs not in the rate base

New Risk Reduction Inspection Projects – Consider Inspection of High Consequence Cross Bore Potentials First

- Schools
- Hospitals
- Assisted Living Facilities
- Large concentration of occupants
- Difficult to evacuate structures

GPS and GIS Mapping – Allows QA/QC from GIS Data



Leading Practices Committee Members

- **Leading Practices Committee Members**
  - Greg Scoby – Cross Bore Consultants, LLC
  - Annmarie Robertson – PHMSA
  - Mark Wallbom, formerly Miller Pipeline / Hydromax USA
- **Sub-Committees**
  - Construction – Mike Kemper, Mears Group - Quanta
  - Data Management – Joe Purtell, Cues, Inc.
  - Risk Analysis – Mark Wallbom, Hydromax USA
  - Stakeholder - Tyler Boyles, Enbridge
  - Legacy Installations – Brian Mattson, Digital Control, Inc.
  - Legal – Mark Bruce, Hydromax USA

Partial List of Reviewing Organizations Asked to Participate In Cooperation with CBSA

- American Gas Association, AGA
- Association of Equipment Manufacturers, AEM
- Distribution Contractors Association, DCA
- Gas Technology Institute, GTI
- National Underground Contractors Assoc., NUCA
- Midwest Energy Association, MEA
- Northeast Gas Association
- Southern Gas Association, SGA
- Western Energy Institute, WEI

Leading Practices – Background Chapters

1. History of Cross Bores
2. Financial and Social Costs
3. Current Practice Gaps
4. Installation Equipment at Risk of Creating Cross Bores
5. Results of Cross Bores and the Timeline
6. Responsible Party's Opportunity to Minimize Cross Bore Risk and Impacts
7. Regulatory Opportunities
8. Regulatory Rate Support
9. Sources of Cross Bore Information

Leading Practices – Technical Recommendation Chapters

10. Cross Bore Risk Reduction Goals
11. Outline of Risk Reduction Project Tasks
12. Legacy Risk Determination
13. New Construction Risk Reduction
14. Data Preservation, Accessibility and Security
15. Data Use Across the Enterprise
16. Quality Control
17. Project Metrics
18. Public Outreach

- Continued -

Leading Practices – Technical Recommendation Chapters, (cont.)

19. Access to Sewer Systems, Public Right of Way and Private Property
20. Scoping for Cross Bore Risk Reduction Inspections
21. New Construction Inspections
22. Robotic Mainline and Launched Lateral CCTV Inspections
23. Manual Push CCTV Inspections
24. Vacuum Excavation Used for Cross Bore Risk Reduction
25. Pull Back Camera Use
26. Ground Penetrating Radar Use
27. Other Emerging Tools for Future Consideration

- Continued -

Leading Practices – Technical Recommendation Chapters, (cont.)

28. Locating Field Work
29. Proximity Determinations
30. Clean Out Installation Use
31. Occupant Notifications

Summary

References

Definitions

Appendix A: Publications

Appendix B: Examples for Notices, Door Hangers and Letters

Risk Modeling & Prioritization / Project Flow Chart

xxi. Prioritization models are an extension of a risk model. Projects benefit from using the risk model together with prioritization factors. Prioritization factors include budget limitations and timing of the program budget. Adding factors for the material life of the existing utility, known obsolescence, for the planned capital improvement (replacement) budget or other types upgrades that affect the life of the existing utility will drive the prioritization results. Shorter life would typically lower the risk.

Figure 6: Risk modeling visualization based on parcel Boundaries and using color coding

xxii. Combining both legacy and new/replacement construction inspections is frequently more cost effective and results in greater risk reduction for a given amount of physical and financial resources. This is frequently found to be effective in sewer inspections for cross bores where a main sewer line is traversed for a single structure that has a new utility installed and the area has been modeled for legacy risk reductions.

xxiii. *Commentary: A cross bore program typically will take several months to get organized. Initial steps may be to begin by inspecting schools, hospitals and nursing homes.*

d. Once cross bore mitigation for new installations, replacement installations or legacy risk) is determined to require risk reduction, the following elements should be considered:

xviii. Who will be responsible and organize the repair activity.

1) Track repair status
2) Permit and inspection requirements

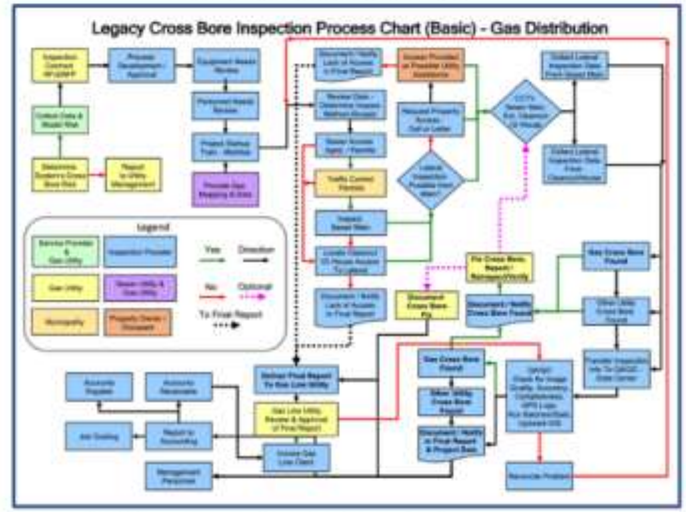


Figure 7: Basic Legacy Cross Bore Inspection Process Chart

13. New and Replacement Construction Risk Reduction

New construction and replacement projects should include verifiable, high confidence construction and inspection processes which eliminate the risk of creating new cross bores. Since replacement installations have a higher risk of creating a cross bore, this paper primarily addresses replacement installations. For new installations the same steps should be considered and then tailored to each specific new construction project since there are often situations when certain steps are applicable for replacement installations but not for new installations; for example, when it has been confirmed that there are no existing utilities in the area. Again, new construction and replacement installations are best addressed as two separate yet related processes in order to achieve maximum thoroughness and efficiency. Utility and installation contractors' liability will be reduced when the work includes high confidence inspection programs. Cross bore risk reduction methods should be integrated in the utility project requirements for construction.

Sewer Inspection Challenges

iii. Mainline CCTV robots in large diameter pipes may not be designed to allow the centering of the sonde in the mainline. This should be recognized and corrected or at least have adequate tolerance allowed in the use of the data.

1) Both the CCTV camera and sondes will follow the contours of the pipe bottom as shown in *Figure 11* depicting factors affecting depth.
2) The project management team should be aware and allow tolerances in the use of data. Small diameter pipe, 8" or less, will not normally have significant vertical tolerance from position in the pipe.
3) Large diameter pipes may have significant tolerance if the camera is not centered. See *Figure 11* (Upper and lower left sections of the illustration).

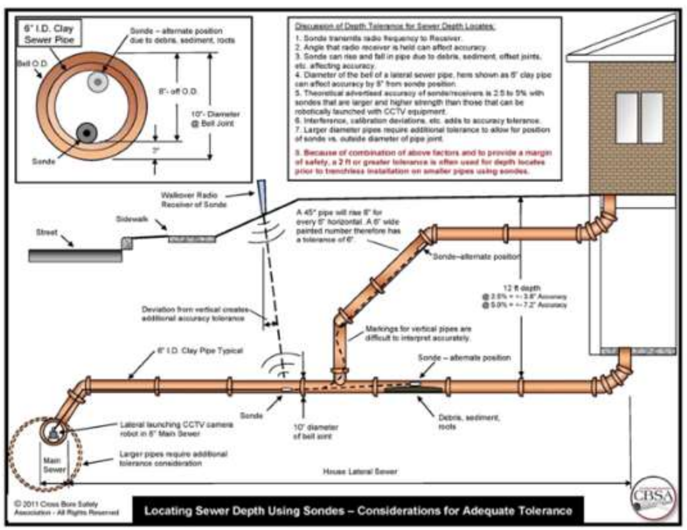


Figure 11: Illustration of Sonde Positions Affecting Sonde Apparent Accuracy

p. Recommended collected data review includes:

i. For CCTV sewer inspections: NASSCO PACP[7] and NASSCO LACP[8] fields. This data structure is equipment independent and allows integration

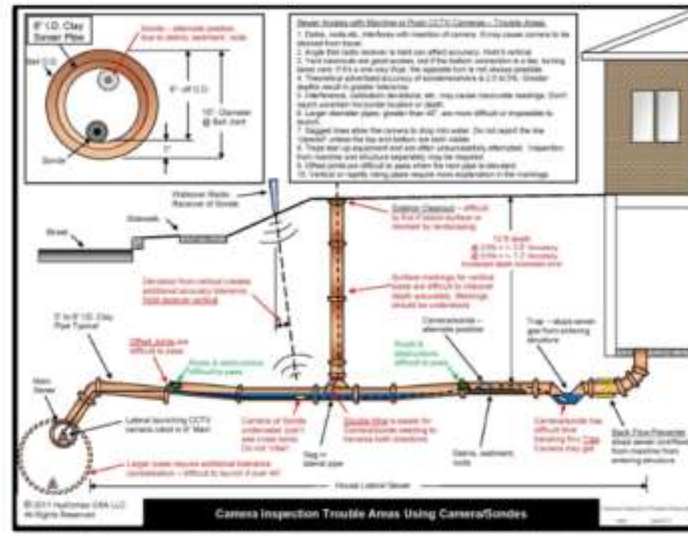


Figure 16: Camera Inspection Trouble Areas and Locating Accuracy Considerations

h. Other impediments which can limit inspection success include: high water flow covering the camera lens, high water flow with high velocity which impedes traverse, grease on lens, grease limiting robot traction, multiple bends of sewer, roughness of the pipe, water sags, large diameters and access to manhole launch points.

i. High water levels of effluent in sewers are typically periodic or related to storm water runoff. Storm water may be planned as part of a combined sewer system (sanitary and storm) or result from leaking pipes or external storm connections such as roof gutter drainage.

i. When storm water flows are high inspections with CCTV cameras may need to be delayed until flows subside.

ii. Periods of high sanitary flows are normally between 6:00 AM and late evening when facilities are in greater use. Scheduling of sewer inspections starting in the late evening until approximately 6:00 am may allow lower

Accessing Sewers from Structures

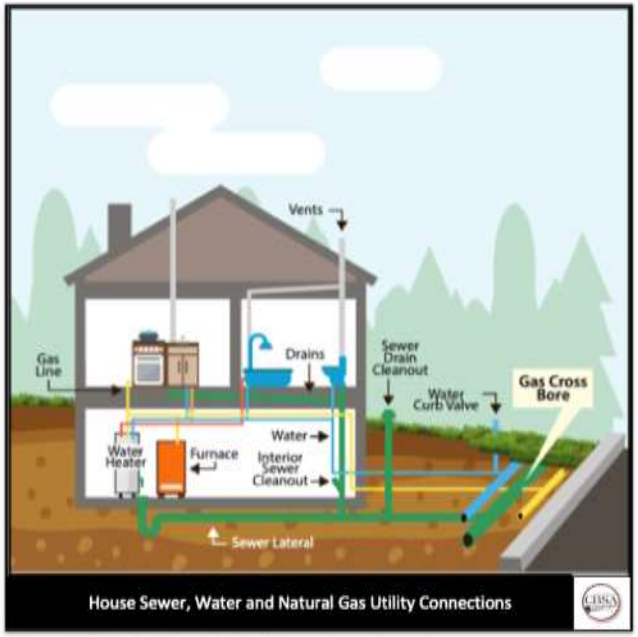


Figure 18: Typical residential plumbing and sewer lateral.

i. Interior cleanouts including in crawl spaces and basements.
ii. Toilet removal and resetting after the inspection is complete, using new seals and typically new hose for the water supply.
iii. Roof vents. See *Figure 18* for an illustration of vents and interior plumbing and sewer connections to the mainline.
iv. Access to roof vents shall be according to OSHA requirements, *see Figure 19* for an example of a push camera inspection from a house vent. See Chapter 23.

d. Structure access has the added inconvenience of requiring permission for the inspection, thus the need for the project scope to include an appointment process to include:
   i. Convenience to the occupant.

iii. Roof vents. See *Figure 19* for an illustration of vents and interior plumbing and sewer connections to the mainline.
iv. Access to roof vents shall be according to OSHA requirements, *see Figure 20* for an example of a push camera inspection from a house vent. See Chapter 23.

d. Structure access has the added inconvenience of requiring permission for the inspection, thus the need for the project scope to include an appointment process to include:
   i. Convenience to the occupant.
   ii. Adequate convenient time slots to determine defined arrival times to gain occupant agreement for access.
   iii. Depending upon work density and traffic congestion, drive times should be allowed. Two-hour windows for appointments may be considered as a starting point.
   iv. Workday appointments can be inconvenient for customers. Saturday work should be considered on a limited basis.
   v. Since defined appointment windows are non-productive for field crews as compared to exterior cleanouts, the costs of customer convenience to achieve higher satisfaction and the increased costs must be recognized.

e. Push CCTV technicians should have good personal interaction skills for success with structure entry activities to achieve high satisfaction goals. Training and use of standard scripts reviewed by the project management team are advised for consistency and higher customer satisfaction. See Chapter 18.

Figure 20: Roof vent inspection with manual push camera. Fall protection must be used according to safety regulations.

Cross Bore Intersections – Sanitary and Gas

e. Access to construction drawings, mapping systems and any other required data sets are required for scoping activities. Prior inspections in the area should be accessible.

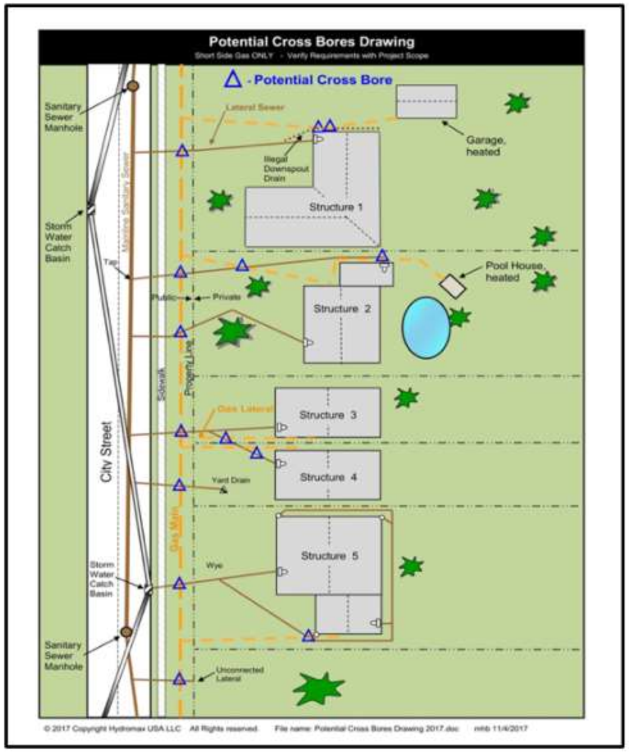


Figure 14: Potential cross bore intersections of gas and sanitary sewers. Storm sewer intersections NOT shown. Short side gas ONLY, laterals on same side of mainline.

lateral launch cameras first as opposed to using manual push cameras, since this method more easily identifies lateral taps. Extra care must be taken by manual push camera technicians to verify that all laterals are traversed beyond the risk of cross bore with the existing utilities, *see Figure 10 and Figure 12.*

Figure 12: Parcel illustrating 5 mainline sewer segments that could have lateral connections to single structure

xiii. Field technicians and QAQC data analysts need to be aware of installed service extensions beyond the gas meter, i.e. to garages, pools or outbuildings.

1) Extensions beyond the meter may not be within the scope of the inspection program. If the risk is only to confirm the gas system operator's lines and not any public or customer owned lines, then any notifications to the occupant/owner stating a property has been inspected needs to have a limiting statement that does not lead to conclusions that there is no remaining risk of that utility from possible user installed lines.
2) In some cases, past practices have resulted in utility installed service extensions. Though current practice may not be to install these extensions, responsibility could exist via past installation practices of the utility.

xiv. If the view or traverse is inadequate and the CCTV camera cannot determine the sewer as cross bore free, additional inspection activities need to be performed. These efforts could include:

GIS Based Data Recommended

above), that particular sewer segment can be determined risk-free with no cross bores observed.

2) If the inspection cannot be determined cross bore free without additional effort, a recommendation for the next process to be used should be made.
3) It is recommended that each parcel's gas line tracer wires be energized, located and mapped during the field inspection as required for mapping. This information is used in the field and in quality assurance.

i. If the inspection is incomplete, the data analyst is assisted by knowing where the gas line is in comparison to the traverse of the sewer inspection, *see Figure 9*, which illustrates an inspection which was not beyond the gas line and risk of a cross bore remains.

j. Confirm that the distance between gas line to inspection limits of adequate visibility meets the defined requirement. Note: A good horizontal distance is typically

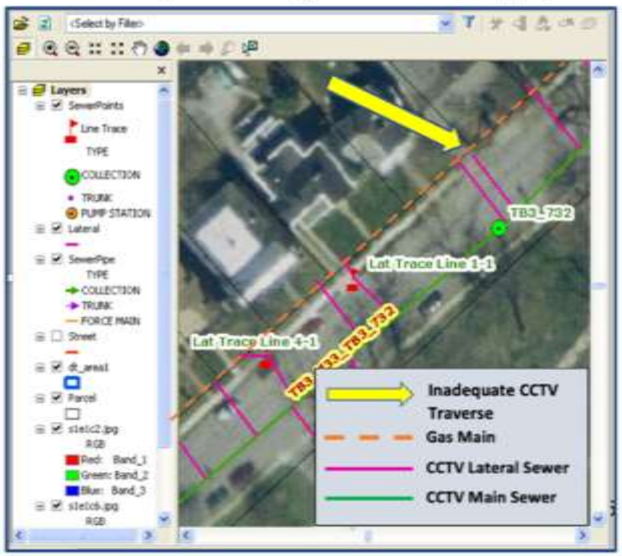


Figure 9: GIS mapping illustrates sewer inspection has not traversed beyond the risk. Note the YELLOW arrow.

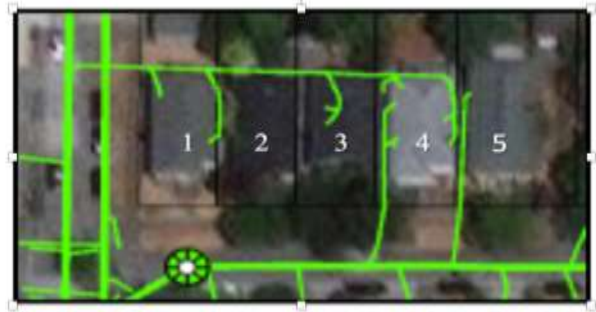


Figure 10: Note structure 4 is connected to 2 mainlines and has 3 other structures on one lateral. Additionally, the need for good accuracy of field locations is illustrated by the closeness of two laterals at the property line between 4 and 5.

m. Review, with extra focus, each horizontal crossing of sewers and gas lines using GIS mapping.
   i. These recognized crossings identified in the field should have a GPS location taken at that point to help with determinations if cross bore risk remains.
   ii. Measured results, with comparison to metric goals, should be provided to the management team. Deviations from goals should be evaluated for corrective actions.

n. Quality control processes similar to the above should be required for vacuum excavation.
   i. Horizontal GPS positions, depth, photos, videos and other data as appropriate to validate a location and depth.
   ii. Information collected should be adequate to validate the location and depth (elevation).
   iii. If a crossing is to be observed, a photo or video should also provide enough information to show that the new and existing utilities did not intersect.

o. Quality control should have processes which recognize and allow for the tolerances of the collection equipment.
   i. The signal of the sondes can be tracked from the surface with locators and recorded with GPS receivers. The rated accuracy of the device should be included in the sum of the tolerances.
   ii. Sonde accuracy can be affected by the angle of the sonde and the receiver. Proper procedure in the field should minimize the effects of angles from horizontal. Field technicians should be trained for this possibility and steps taken to obtain accurate locations.

Proximity Determinations

Figure 22: Example of property with determination made using surface elevation on the site

technicians to utilize existing information previously collected, observable specific circumstances of the site together, and additional use of utility locating at the time of the determination, as needed.

a) Proximity determinations are typically a lower cost option to other actions that could be required, i.e. lower than additional camera inspections from the structure, vacuum excavation for observance of a crossing or installation of a clean out.

b) A specially trained technician uses the site's visual information to augment other information.

   i) All collected information from the prior inspections is accessed, the site is viewed, elevations and separation distances may be utilized.

   ii) Elevations of the terrain are evaluated.

   iii) Elevations of the utilities are evaluated.

   iv) Determination is made for further inspections, vacuum excavation or clean out installation.

      (1) Additional information is collected that will help direct next actions.

      (2) All proximity determinations shall be reviewed in separate QA/QC processes for final risk determination. The result will be determined if the property is not at-risk or if additional inspection work is required.

   v) An illustrative proximity determination example follows, see *Figure 22.*

      (1) The sewer exits on the left side of the house and the sewer tap was previously navigated on the left side of the structure, but the CCTV vision was impaired or a portion of the sewer line was not able to be traversed, and;

      (2) The gas line is located on the right side of the house perpendicular to the main and;

      (3) The concern remains if the known sewer connects to an additional branched sewer from a tee or wye and travels towards the gas line. In this example, a basement garage driveway divides one side of the front yard from the right side. Elevation of driveway is below the elevation of the gravity sewer and there is no risk of a known branched sewer cross and there can be and the no gas line crossing as a result.

      (4) The review would then logically conclude that there is no risk of cross bore for the gas and sewer servicing this structure from the gas and sewer services.

      (5) If a no remaining risk determination can be made, a recommendation for the next action required should be recorded.

Figure 22: Example of property with determination made using surface elevation on the site

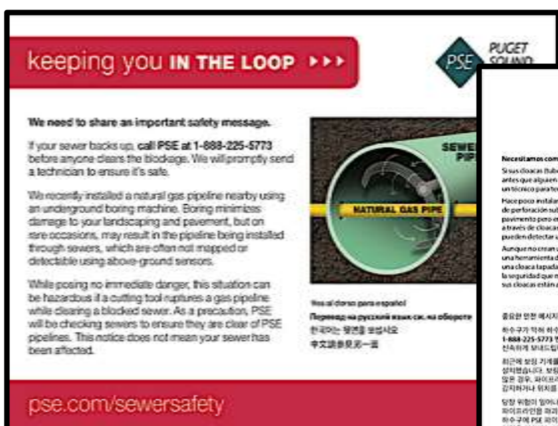
c) Proximity determinations need to be used only with very precise processes from both very well-trained technicians in the field and review from experienced analysts in the quality control.

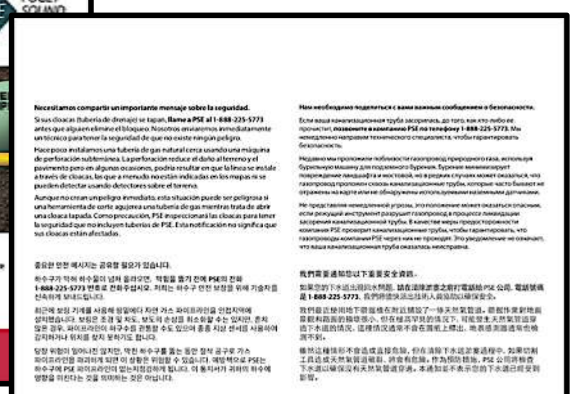
d) A detailed decision matrix should be followed.

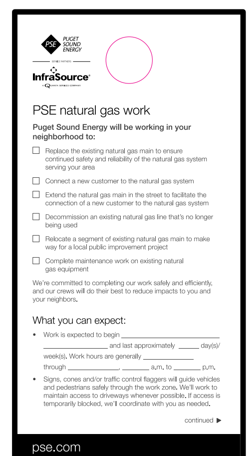
GPS / GIS Mapping

- Recommended GPS Accuracy - better than 12” equipment
- Requires differential correction capability
- Differential correction is free in some states using mobile internet connections
- Frequently achieve 4” (10 cm) accuracy
- Use offsets to accommodate multipath from reflected GPS signals
- Urban canyons are difficult to achieve 12” accuracy

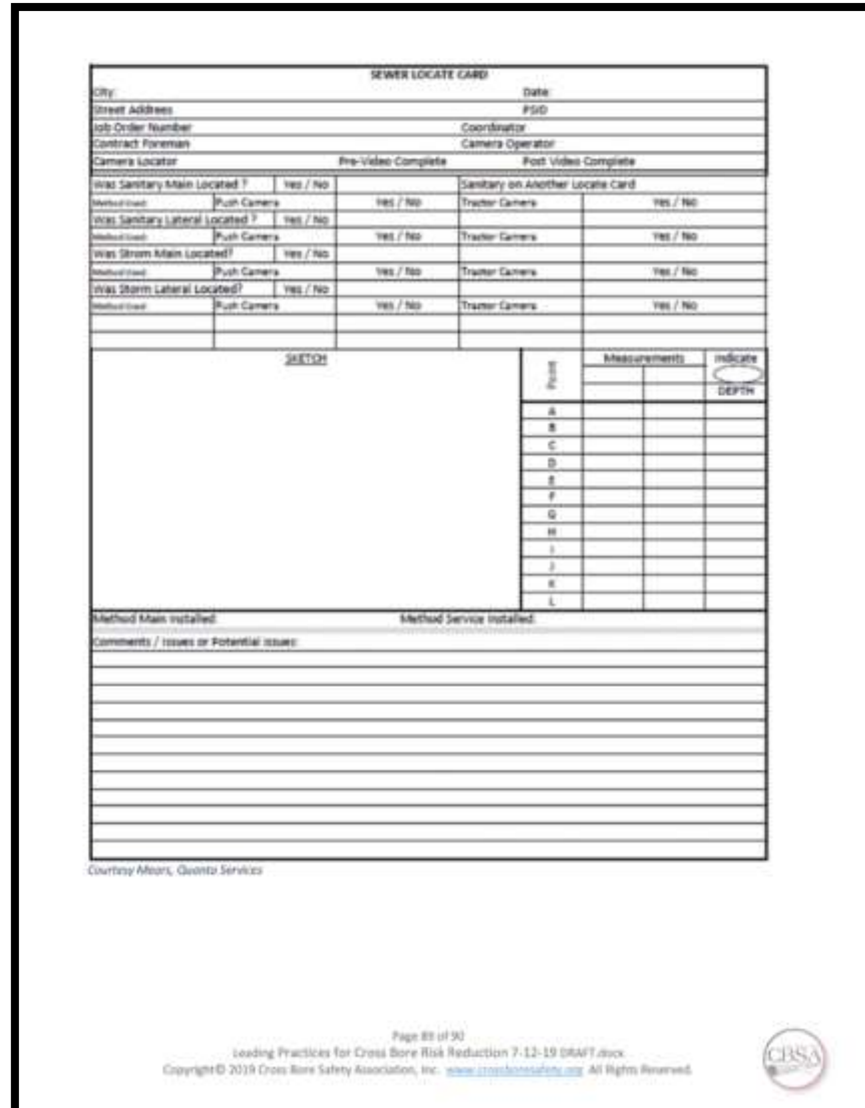
Public Awareness & Form Samples
(consider multi-language when appropriate)







Digital vs. Manual Reporting



SEWER LOCATE CARD

City			Date	
Street Address			PSID	
Job Order Number			Coordinator	
Contract Foreman			Camera Operator	
Camera Locator		Pre-Video Complete	Post Video Complete	
Was Sanitary Main Located ?	Yes / No		Sanitary on Another Locate Card	
Method Used	Push Camera	Yes / No	Tractor Camera	Yes / No
Was Sanitary Lateral Located ?	Yes / No			
Method Used	Push Camera	Yes / No	Tractor Camera	Yes / No
Was Strom Main Located?	Yes / No			
Method Used	Push Camera	Yes / No	Tractor Camera	Yes / No
Was Storm Lateral Located?	Yes / No			
Method Used	Push Camera	Yes / No	Tractor Camera	Yes / No

SKETCH

Point	Measurements		Indicate DEPTH
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
K			
L			

Method Main Installed: Method Service Installed:

Comments / Issues or Potential Issues:

Courtesy Mears, Quanta Services

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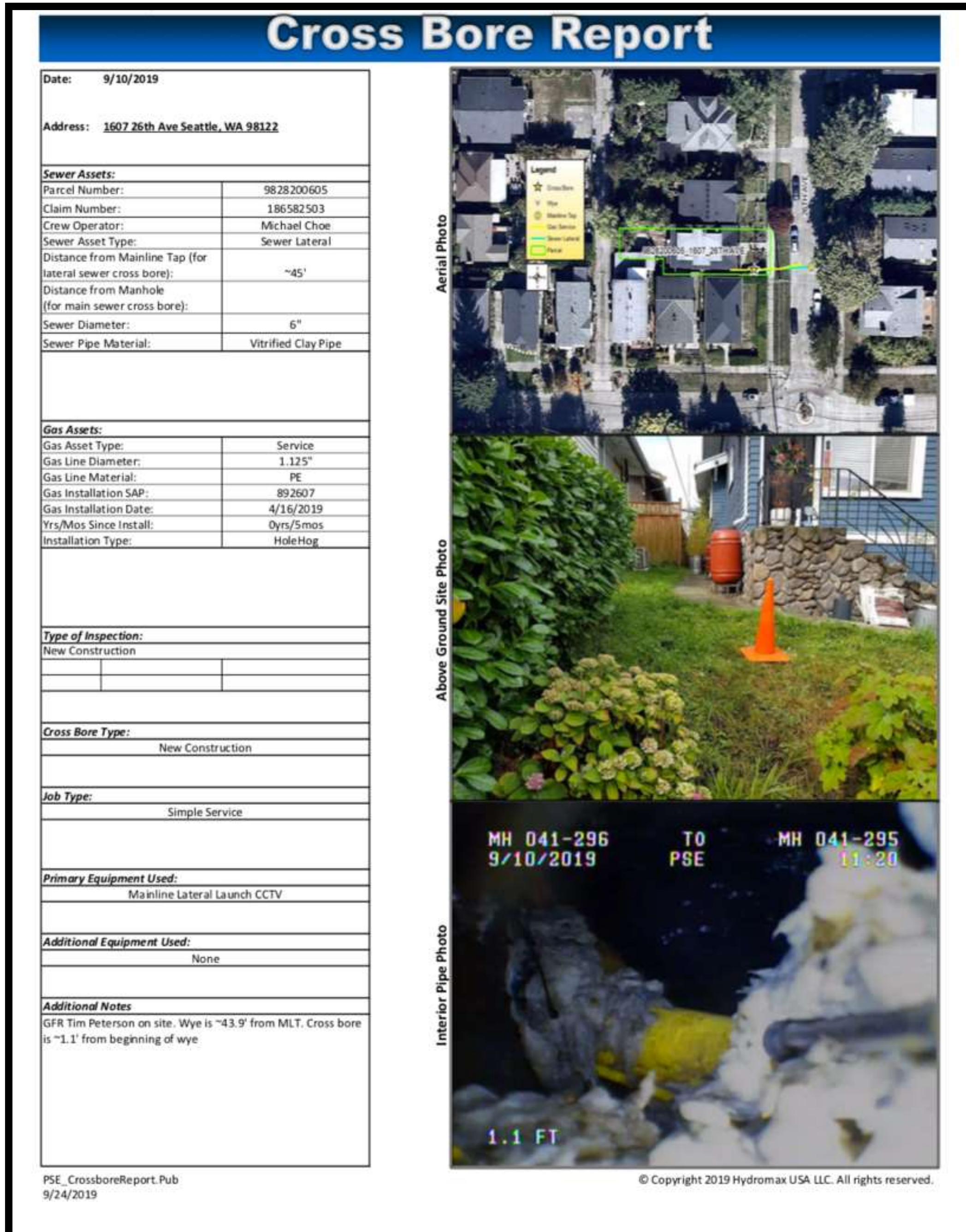
Cross Bore Report - GIS Based

- GIS location map
- Site photo
- In sewer cross bore image
- Address
- Measurements
- Installation age
- Method of installation
- Method of inspection



Cross Bore Report

Date: 9/10/2019

Address: 1607 26th Ave Seattle, WA 98122

Sewer Assets:	
Parcel Number:	9828200605
Claim Number:	186582503
Crew Operator:	Michael Choe
Sewer Asset Type:	Sewer Lateral
Distance from Mainline Tap (for lateral sewer cross bore):	~45'
Distance from Manhole (for main sewer cross bore):	
Sewer Diameter:	6"
Sewer Pipe Material:	Vitrified Clay Pipe

Gas Assets:	
Gas Asset Type:	Service
Gas Line Diameter:	1.125"
Gas Line Material:	PE
Gas Installation SAP:	892607
Gas Installation Date:	4/16/2019
Yrs/Mos Since Install:	0yrs/5mos
Installation Type:	HoleHog

Type of Inspection:
New Construction

Cross Bore Type:
New Construction

Job Type:
Simple Service

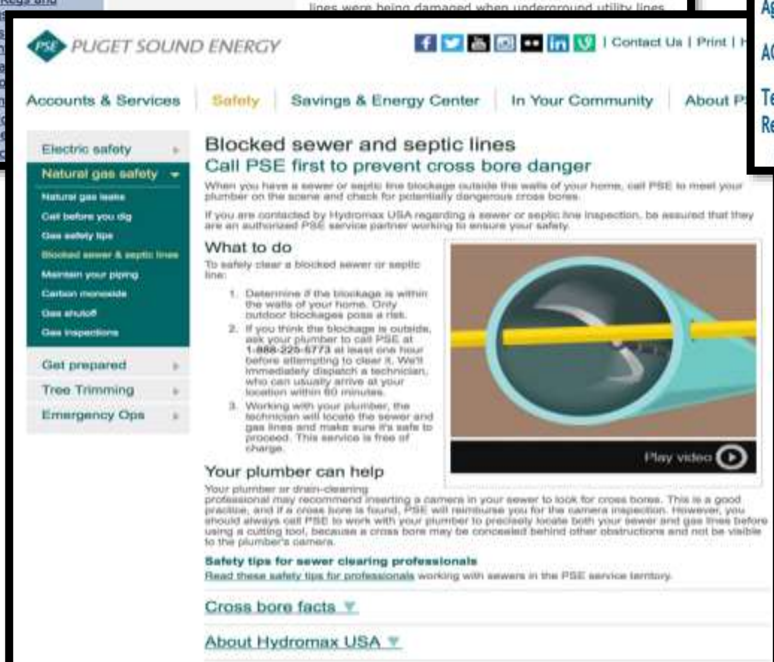
Primary Equipment Used:
Mainline Lateral Launch CCTV

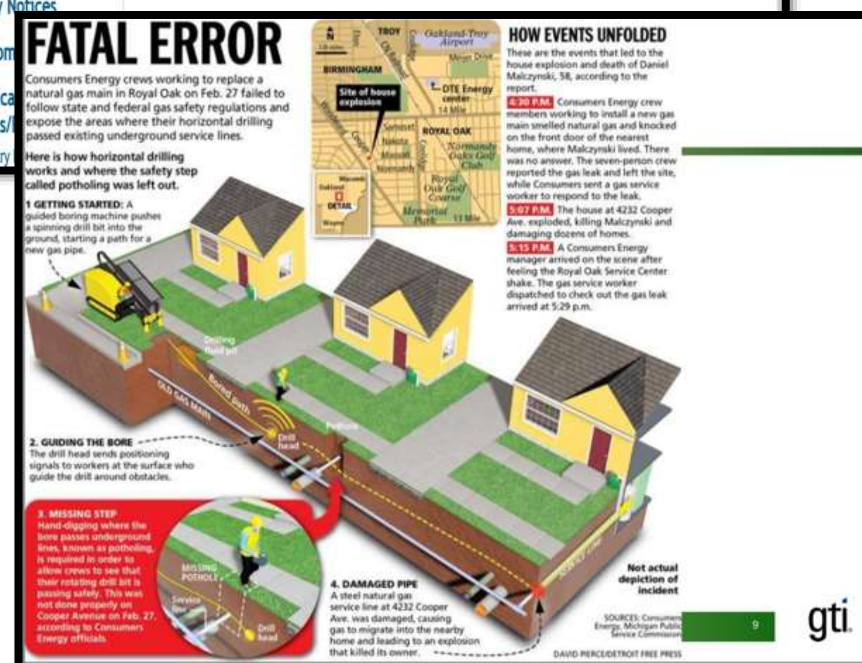
Additional Equipment Used:
None

Additional Notes
GFR Tim Peterson on site. Wye is ~43.9' from MLT. Cross bore is ~1.1' from beginning of wye

PSE_CrossboreReport.Pub
9/24/2019

Cross Bore Info Online





gti

CBSA's *Leading Practices for Cross Bore Risk Reduction*

Questions

Get the *Leading Practices* through your Participating Organization or through the Cross Bore Safety Association

www.crossboresafety.org

mark.bruce@crossboresafety.org

Cross Bore Safety Association
CBSA