



Inspections for Eliminating Cross Bores

The Canadian Institute Pipeline Safety Conference

Calgary, AB- May 29, 2013

**By: Mark Bruce, President,
Cross Bore Safety Association**

www.crossboresafety.org



Cross Bores - Recognized in 1976

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

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/



Gas Utility Integrity Requirements

- Distribution Integrity Management Program (DIMP) requirements
 - Does significant risk exist?
- State regulatory requirements
- Funding & budgeting
 - Pilot program funding
 - Full scale program funding
- Making the case for regulator approved rate adjustments

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**

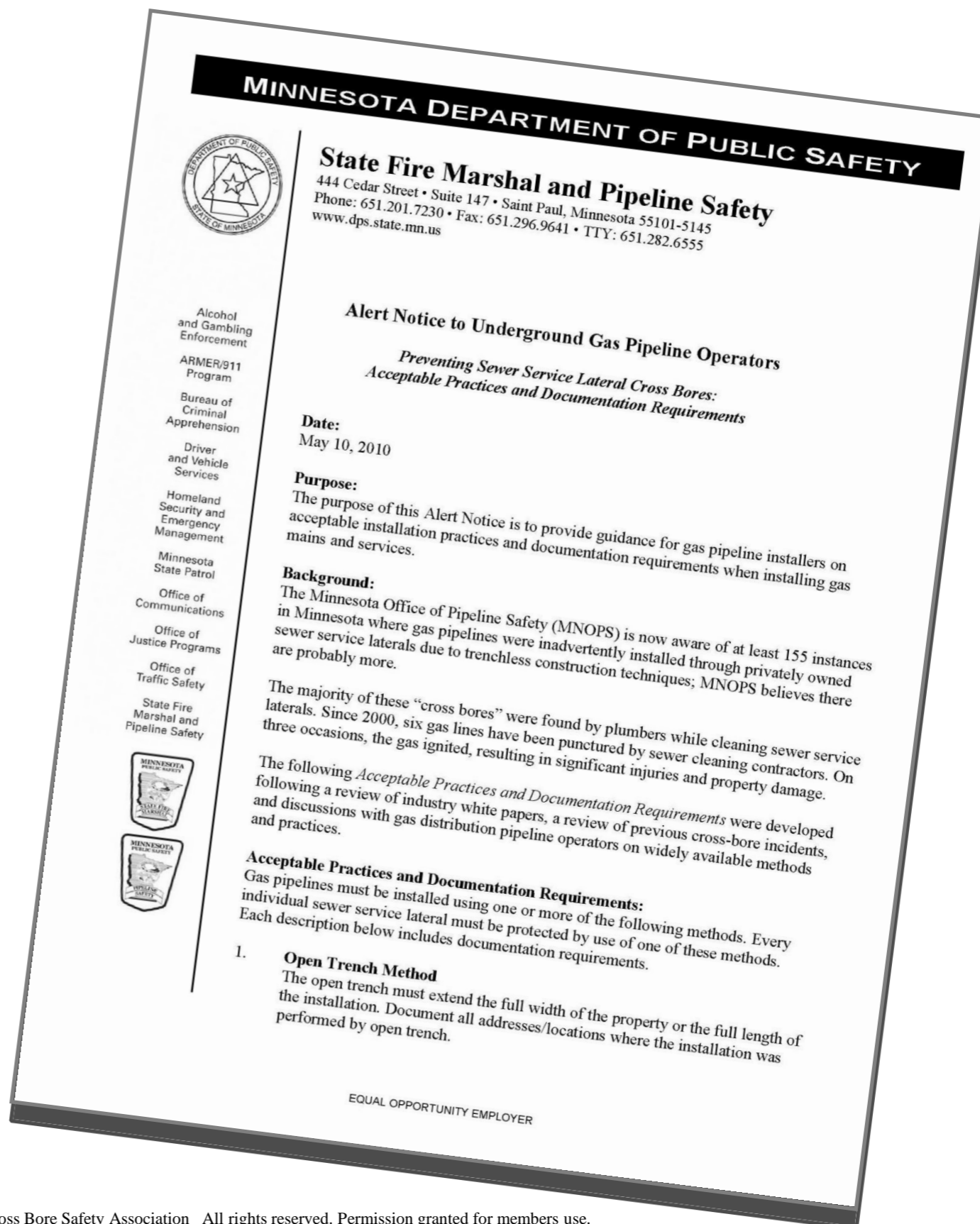
AGENCY: Pipeline and Hazardous
Materials Safety Administration
(PHMSA), U.S. Department of
Transportation (DOT).

ACTION: Advance notice of proposed
rulemaking.



Minnesota Office of Pipeline Safety Acts in 2010

- Required new construction practices to prevent cross bores.
- Specified acceptable methods





Definition

“Cross bores are defined as 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.” *

Quantifying the Cross Bore Problem

- Large projects up to 3 per mile
- Found at a hospital and at schools
- Small project 12 cross bores of 147 inspections
- Expected average estimate = ± 0.4 / mile
- Most expensive cross bore explosion = \$30 million, 2 girls burned



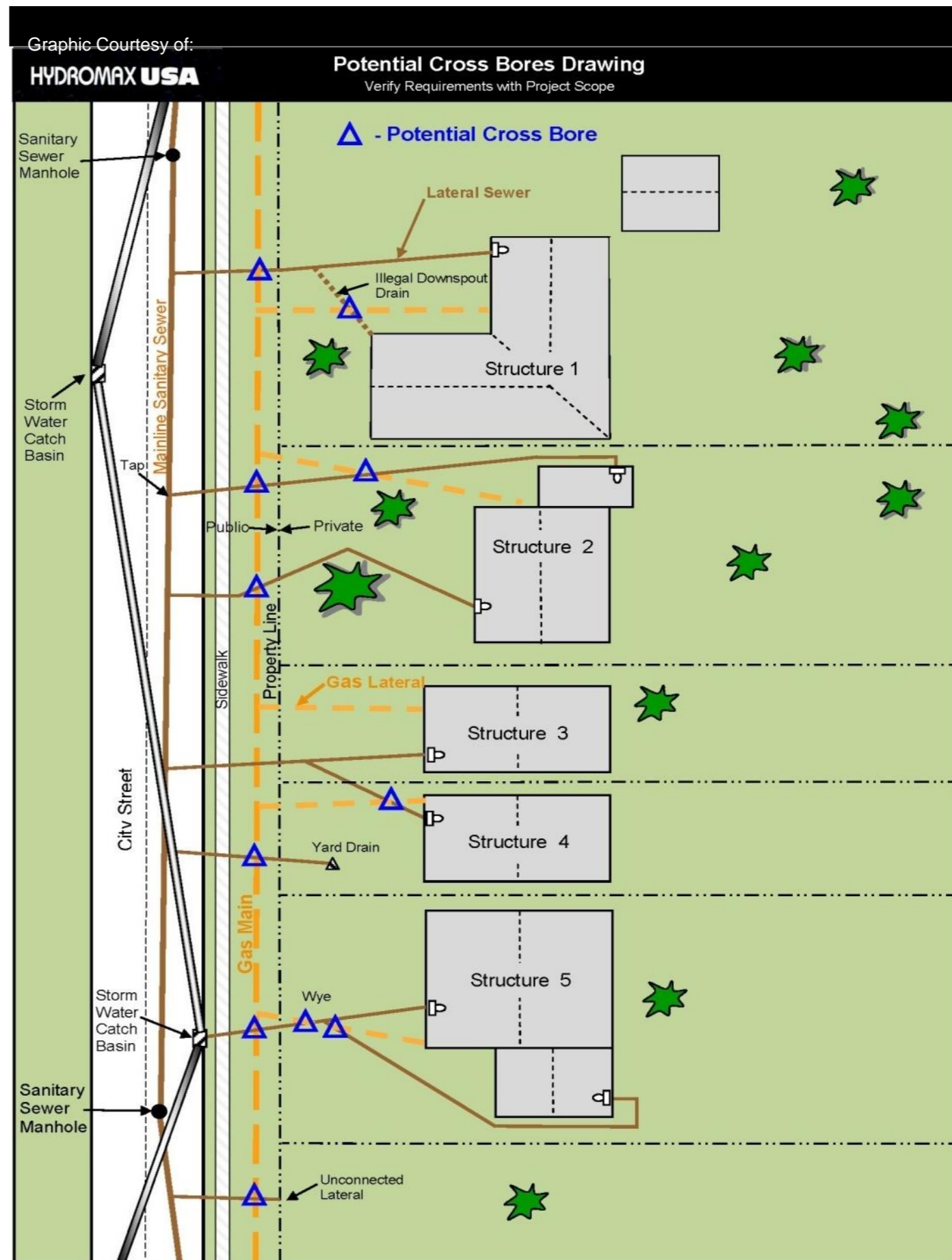
Cross Bore Risks Factors

- Trenchless construction methods used?
 - slip lining / insertion of gas laterals – may reduce cross bore risks
- Some utilities are unknown or unmarked?
- Depths of utilities are unknown?
- No post construction video inspections of sewers adjacent to construction?



Potential Cross Bores

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



Class 1 Cross Bores

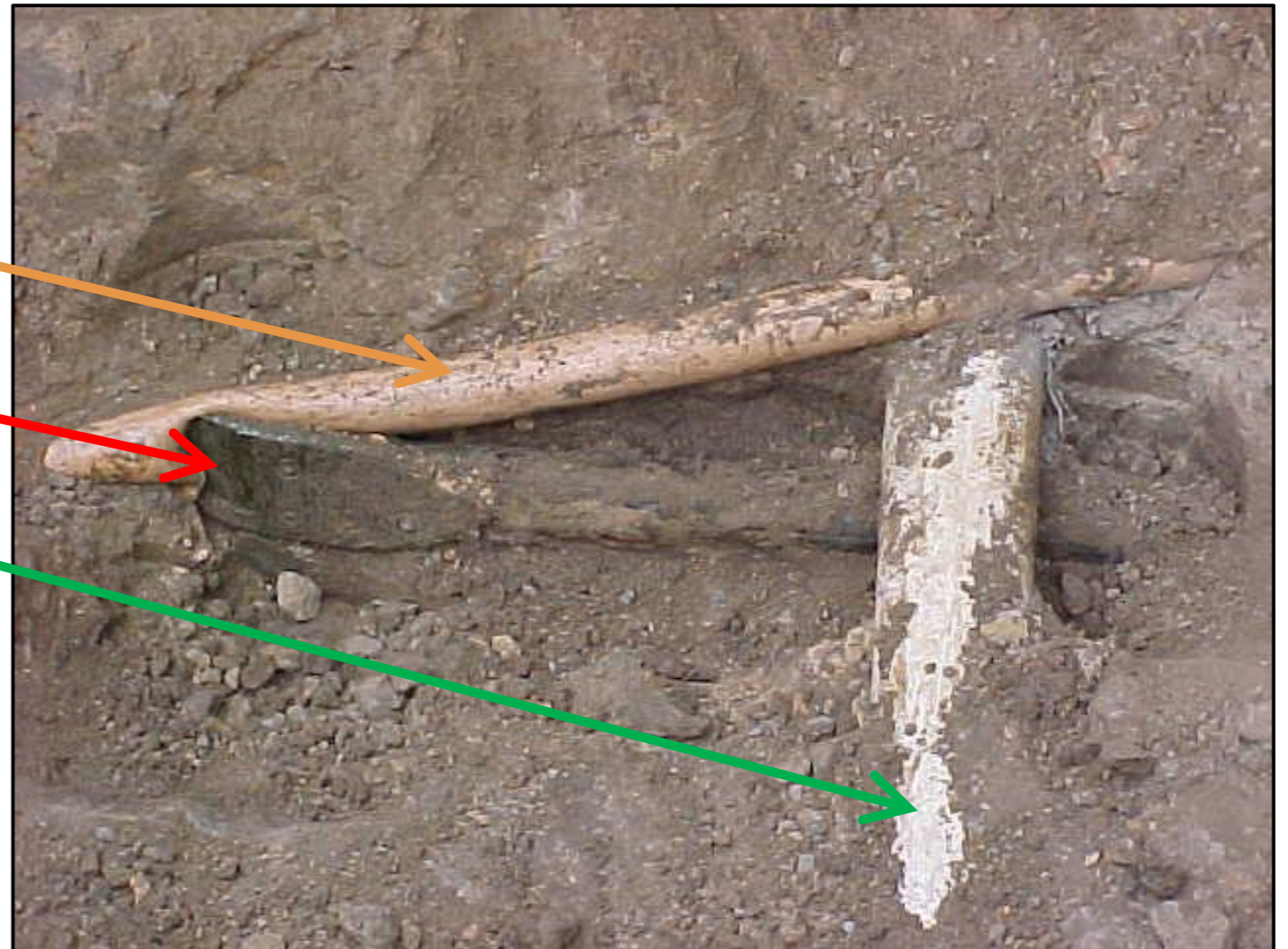


Class 1 Crossbore Explosions



Class 2 Cross Bore

Gas line
HDD tool
Sewer to house



Class 2 Cross Bore Explosion



Cross Bore Required Repairs

- Gas cross bore repairs to sewers shown on this slide cost >\$150,000.
- EPA illegal pollution, fines
- Disruptive to community



Proven Rules

- Records are only as good as your ability to access them
- If visual evidence is not conclusive, additional measures must be taken rule out existence of crossbores
- There is no accurate way to predict the path of sewer lines on private property
- Lateral launching systems will provide indications of all taps/laterals serving a parcel
- One gas cross bore is too many

Cross Bore Project Steps

- Develop detailed processes, budgets and managers
- Determine budget, get approval
- Evaluate and identify areas of high risk
 - FIRST => High occupancy – schools, hospitals, etc.
 - High incidence reported of cross bore
- Select high confidence & verifiable field inspection tools
- Collect field data
- Insure full limits of area are inspected - via GPS mapping
- QA/QC data in separate processes - 100% video, etc.
- Store data for quick access, permanence and use by others.

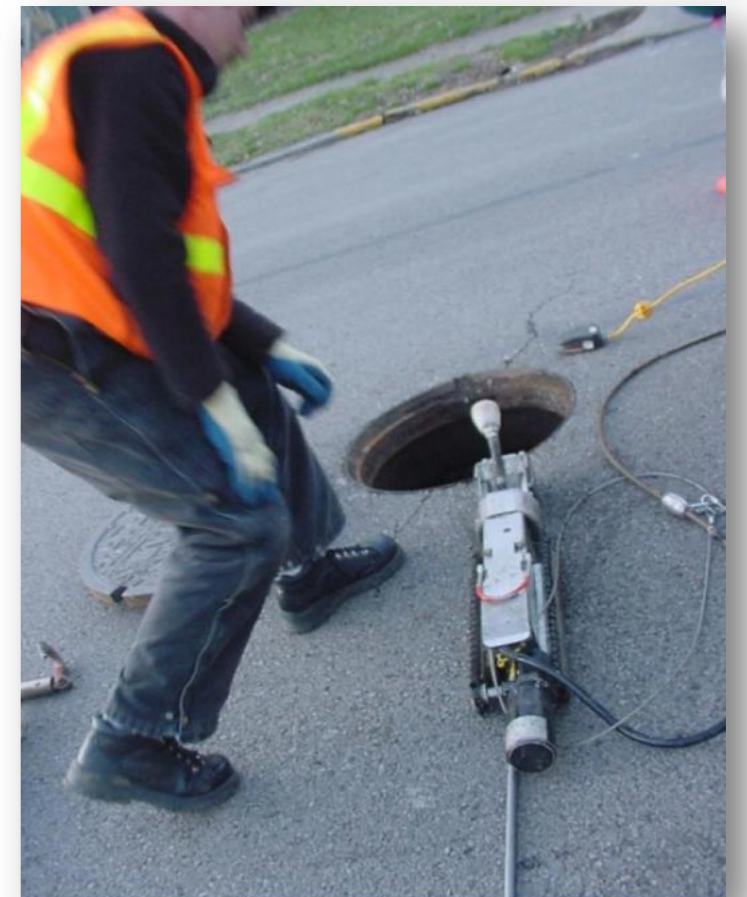


Steps for Field Inspections

- Determine inspection area
 - Records review – trenchless vs. open cut installation
- Visual Inspect
 - Mainline robotic CCTV cameras, with sonde & GPS locations
 - Push rod CCTV cameras
 - Pot holing using vacuum excavation
 - Other tools & gas line locate for proximity determination
- Depth with sonde – pre construction
- GPS locate were inspections performed

Mainline Cameras w/ Lateral Launch Camera

- Inspect mainline sewers for cross bores through manholes
 - 550 feet from manhole
 - Determines # of laterals, structures may have multiple
- Inspect lateral sewer up to 120 ft from sewer tap



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



Push Cameras

- Manual push camera on stiff cable
- Distance to 200 ft or more of cable
- Used when mainline robotic cameras do not reach required limits of inspection
- Video, depth and GPS loaded into GIS mapping



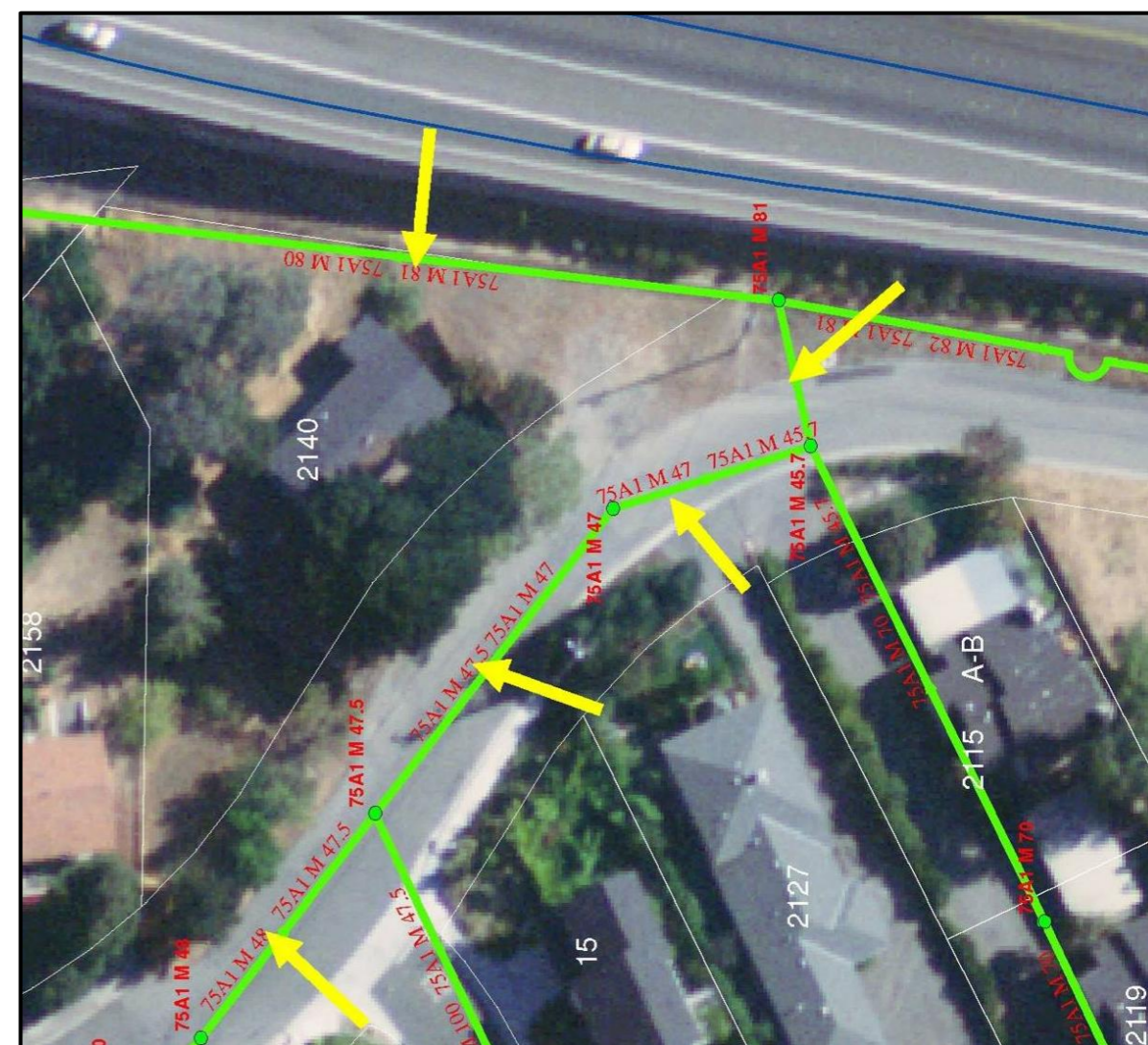
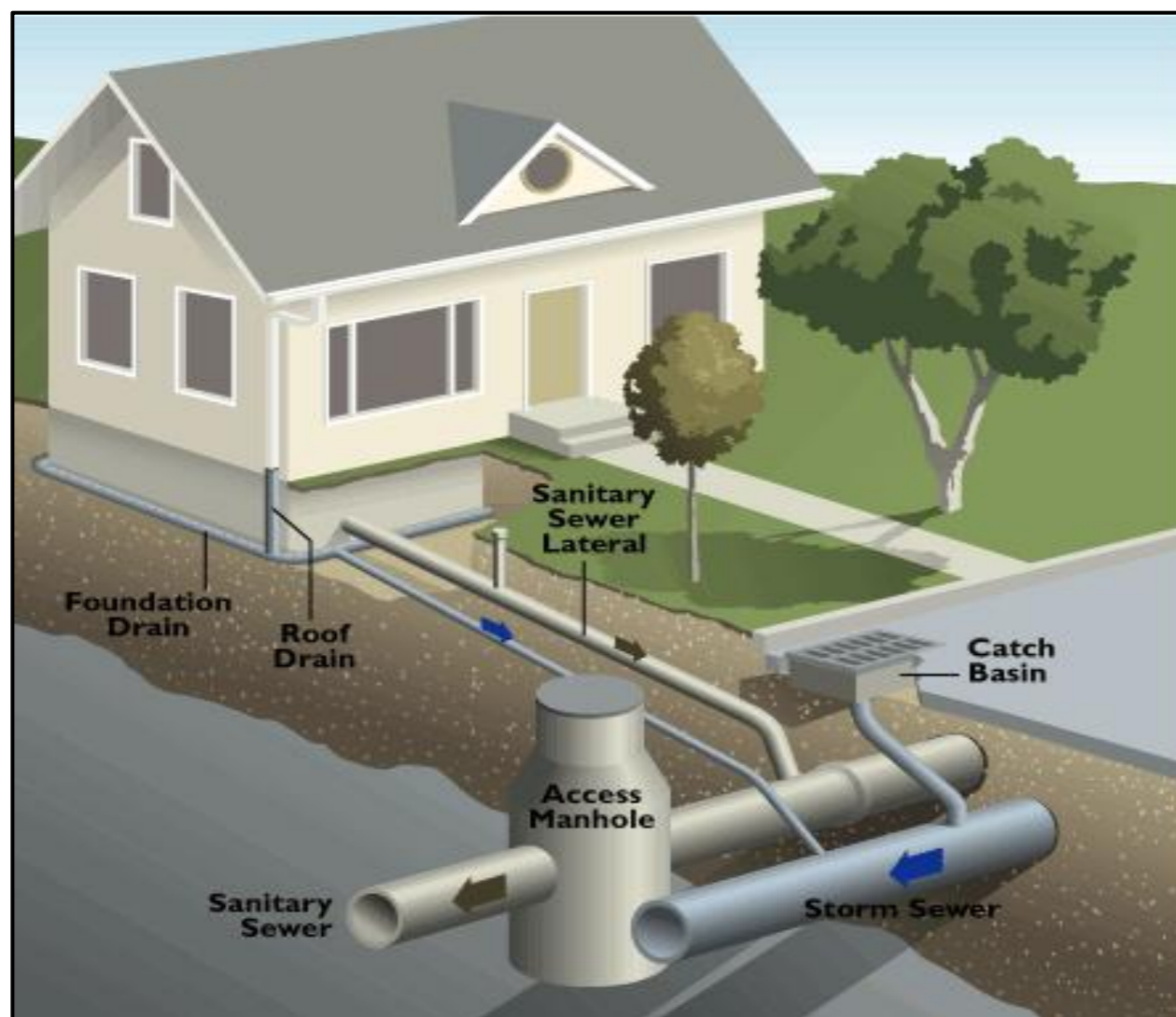
Sonde - Radio Frequency Transmitter & Camera

GPS & Sondes

- Locate
 - XYZ
- Depth of Camera
- Receives signal from sonde
- Recorded into GIS mapping

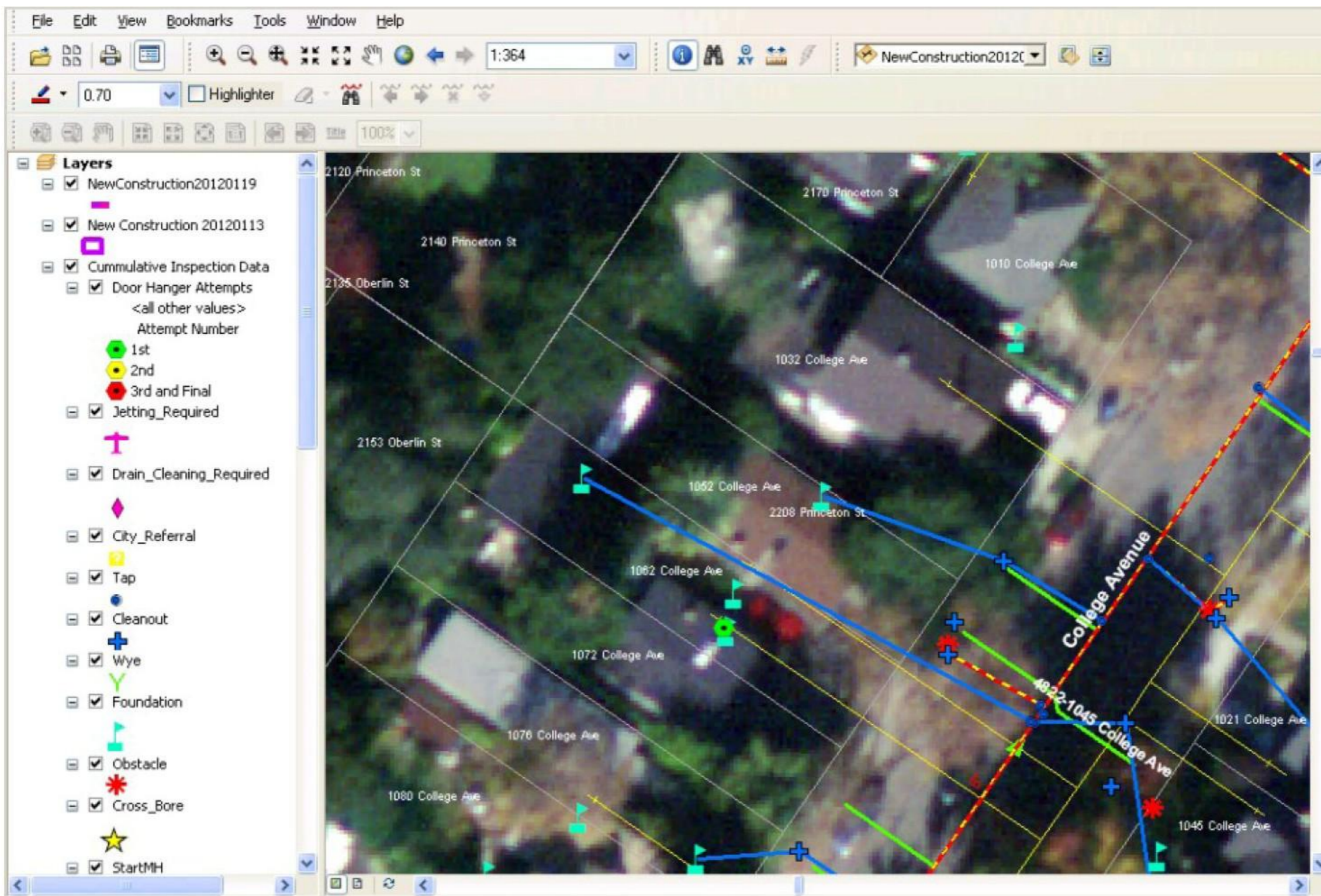


Residential Plumbing Connection to City Sewers



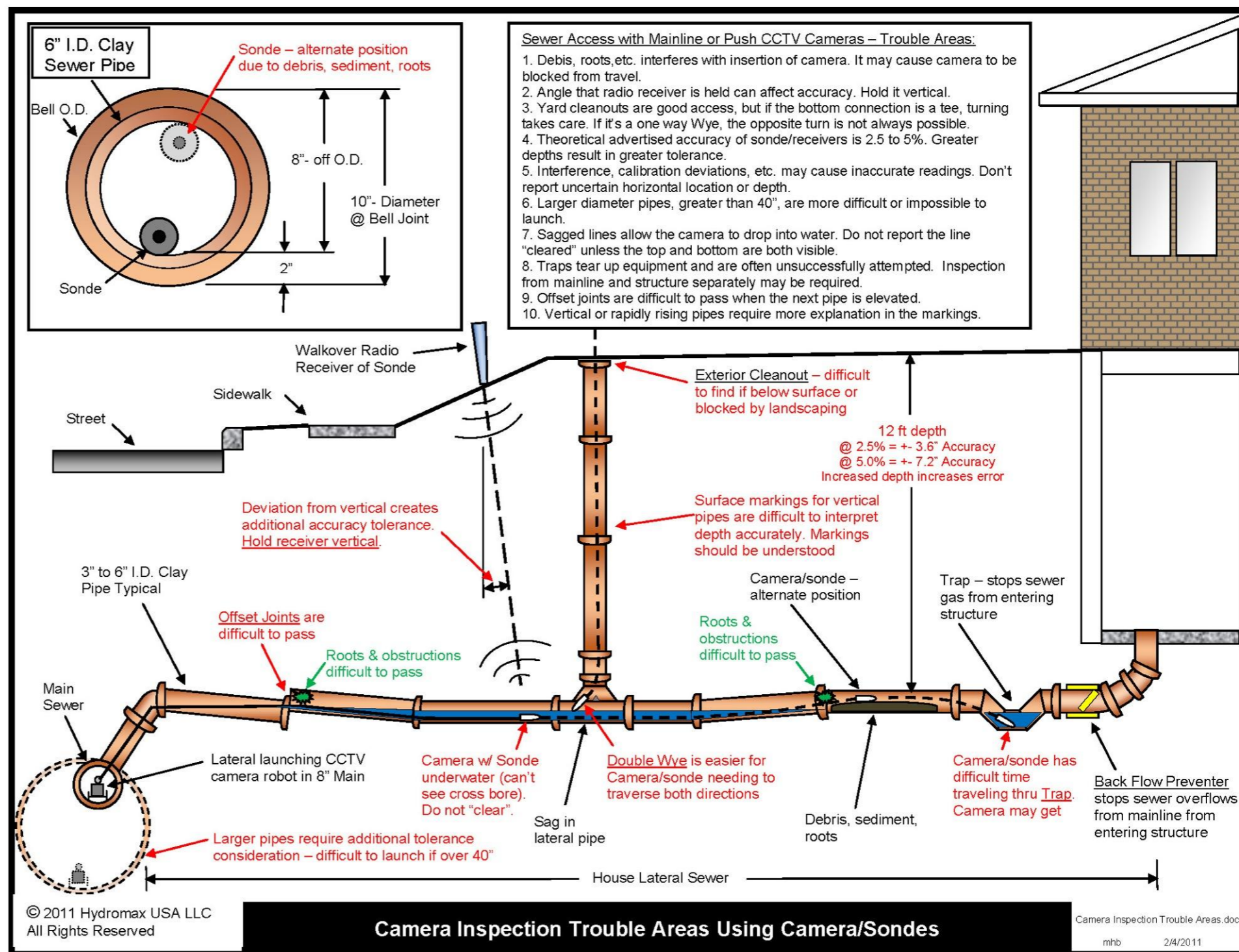
House with 5 mainline sewers on perimeter

GIS Mapping – Visual Data Results



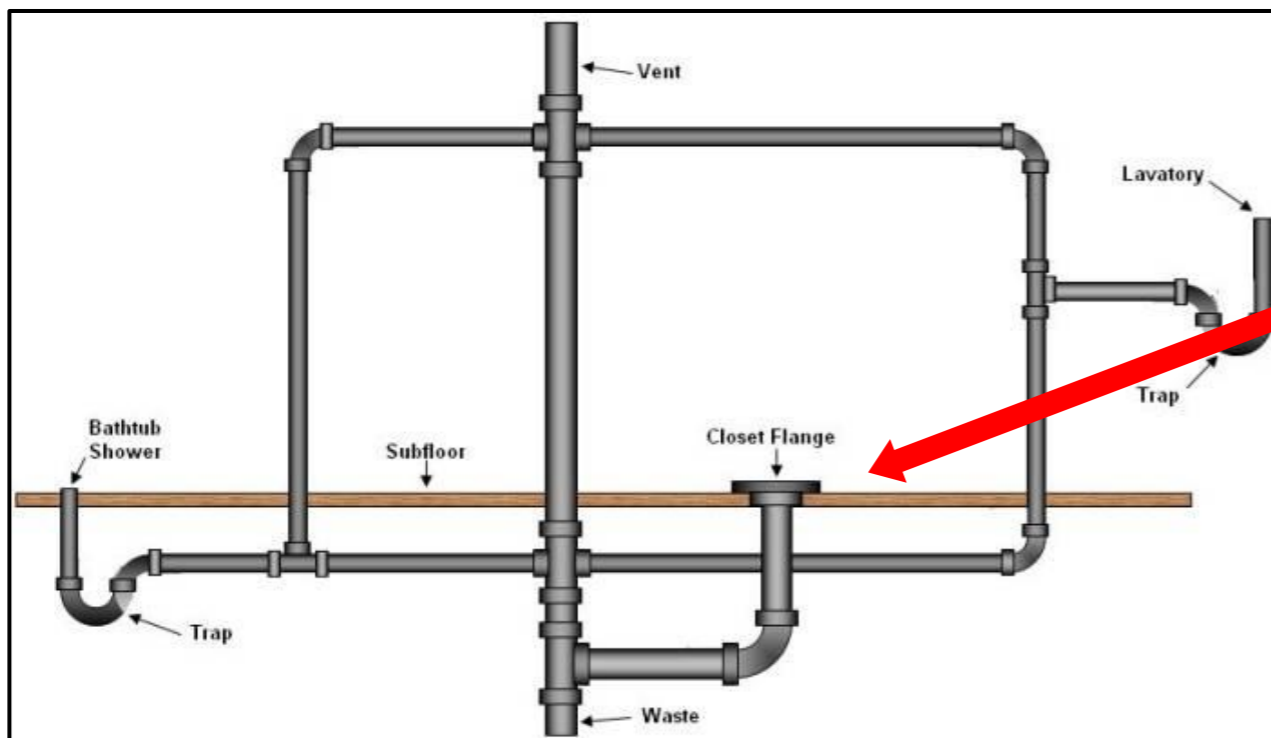
Camera Inspection Trouble Areas

- Water in sags
- Roots
- Sonde Angle
- Sonde Position
- Traps
- Back flow preventers



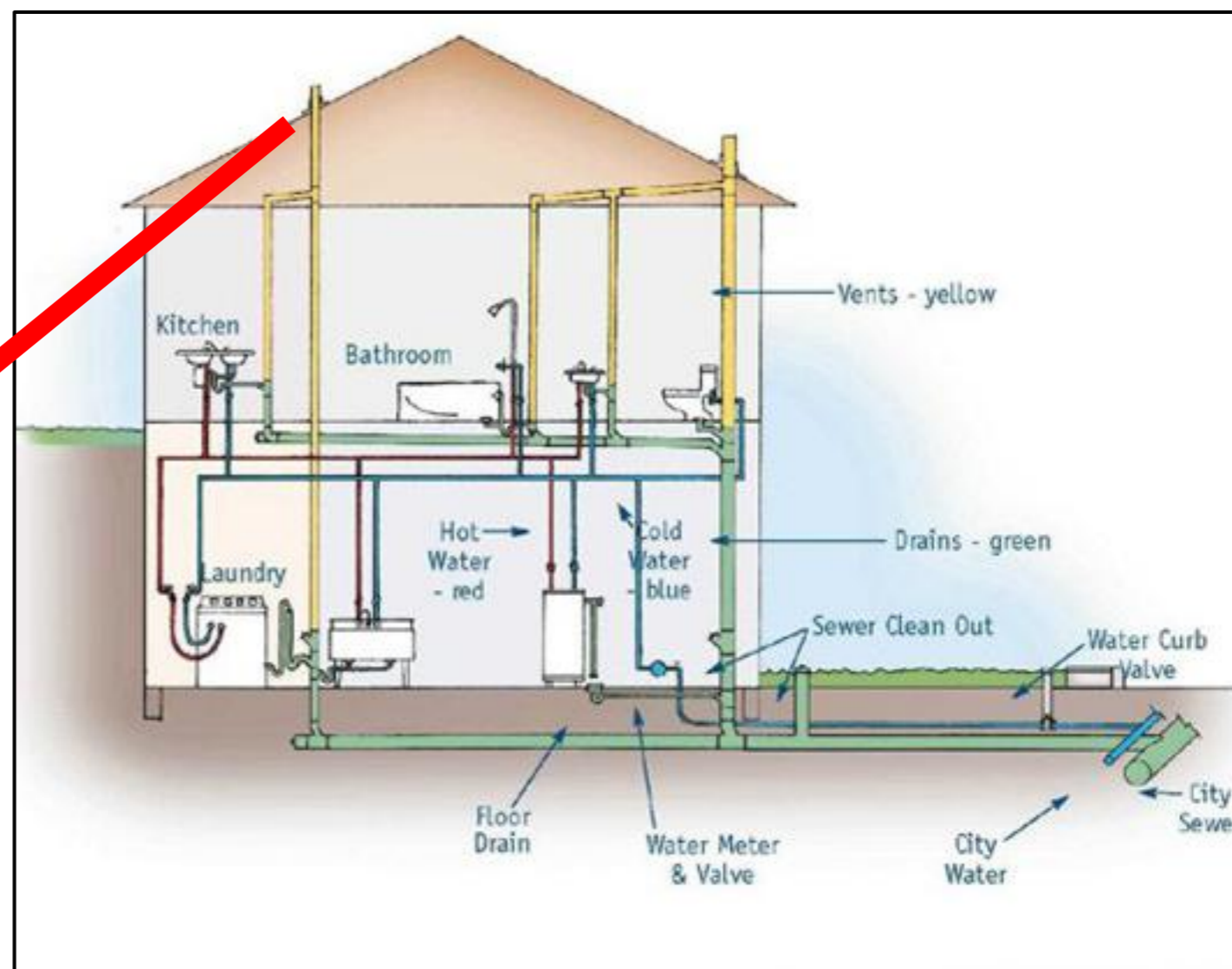
When Exterior Access is Limited or Pipes Impassable

- Interior access through pipe, roof vents or interior cleanouts
- Permission from owner



Roof Vent Access

- Usually only 1 story houses
- Permission from owner
- Protect from falls



Roof Vent Access



Cross Bore

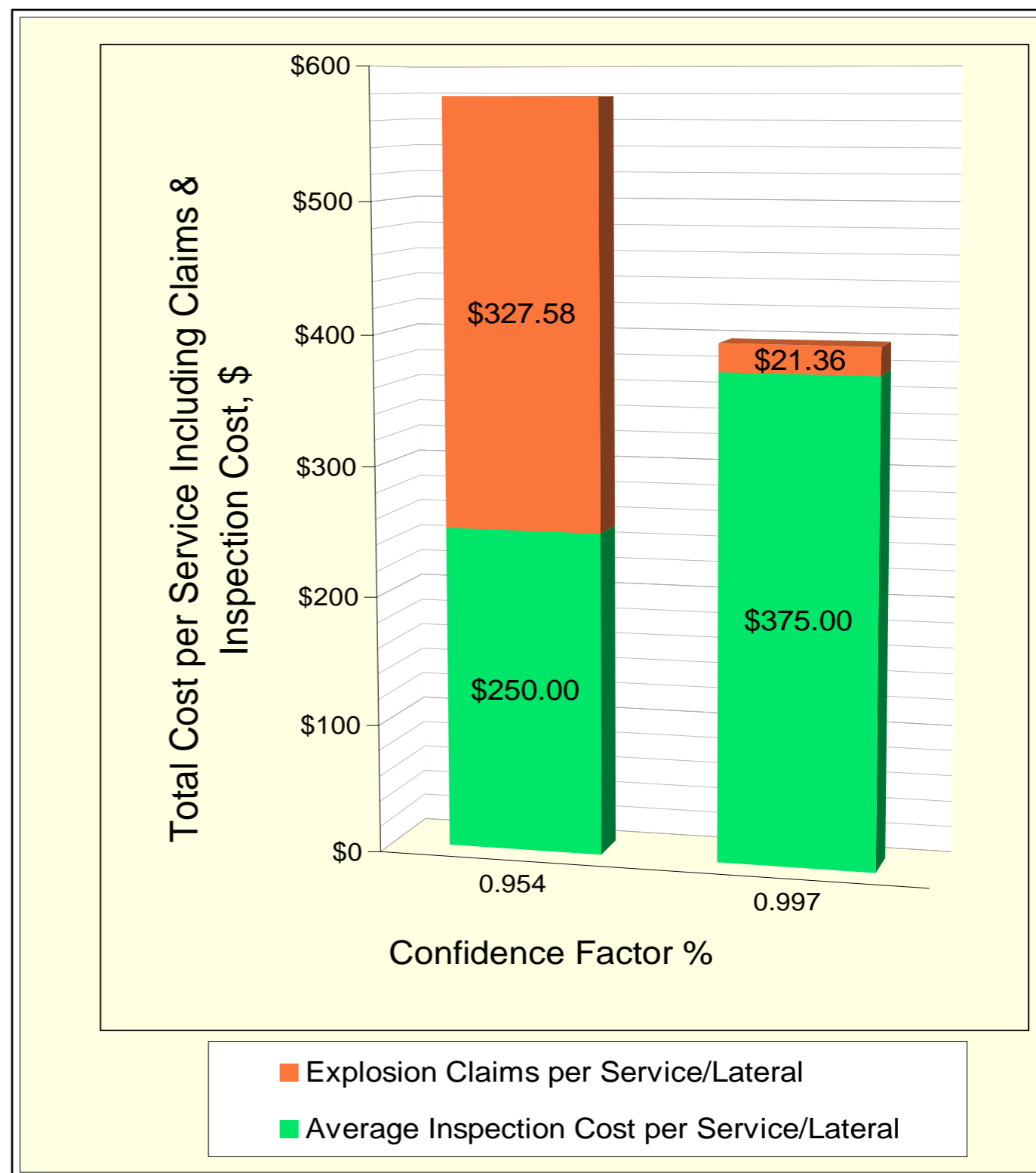


Cross Bore Example - U.S. and Canada

Based Upon Total Gas Services in U.S. and Canada = +/- 75,000,000		
Confidence Factor of Locate / Inspection Processes	95.4% (2 σ)	99.7% (3 σ)
Total Cross Bores Expected to be in Project Area	267,000	267,000
Cross Bores Expected to be NOT Found	12,288	796
Cross Bores Not Found & Expected to Result In Explosion Claims, expect 20% <u>will</u> result in explosion.	2458	159
Expected \$ Cost of Cross Bore Explosion Claims	\$24,580,000,000	\$1,590,000,000
Explosion Claims per Total Services in Project Area	\$328	\$21
Average Inspection Cost per Lateral, includes in-house and contractor costs	\$250	\$375
Total Apparent Cost per Service/Lateral	\$578	\$396
Net Cost Savings, 2 σ vs. 3 σ	\$13.6 Billion <u>Savings</u> & <u>Many Lives</u>	

High Confidence Processes Saves \$

- Net cost of high confidence work is less expensive¹.
- Higher percentage of explosions from lower confidence processes.
- Net savings US\$13.8 Billion



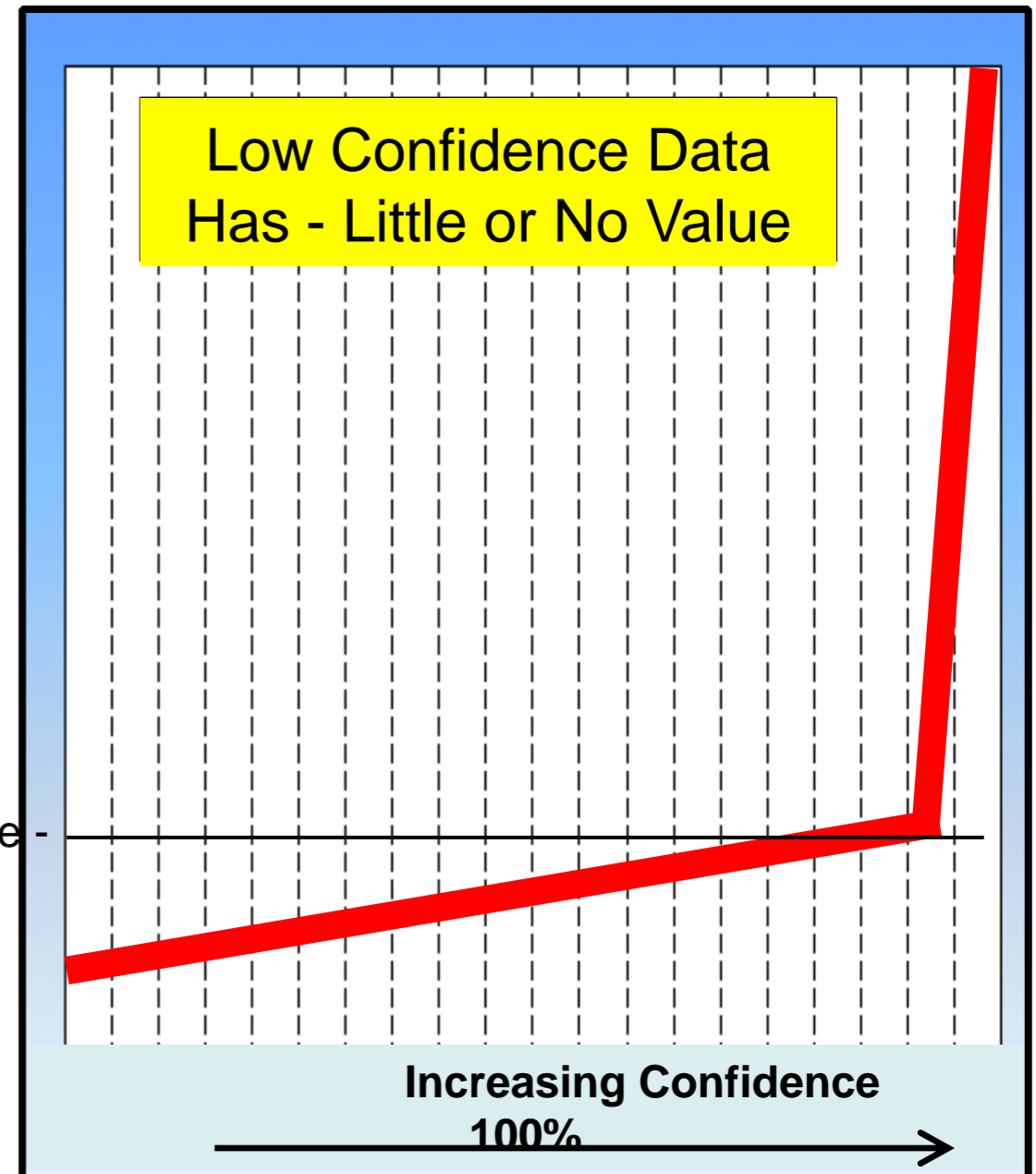
¹ Creating High Confidence Results for Cross Bore Elimination Projects, NoDig 2012 Conference, M. Bruce & J. Graham, revised

Value Increases with Higher Confidence Processes

- Low confidence results create false security
- Low confidence results may have negative value
- Low quality work may have to be completely reworked.

100% Value -

0 Value -





Survey

1. Were you aware of cross bore risks before today?
2. Does your company have plans for cross bore reduction and elimination?
 1. Time line: 5, 10, 20 years duration?
3. Does the magnitude of costs / benefits appear appropriate?
 1. Too high of cost?
 2. Too low of cost?
 3. Roughly agree?
4. New ideas to reduce new & eliminate legacy cross bores?



Questions?

For more information on cross bores:
www.crossboresafety.org