BUILDING A WORLD OF DIFFERENCE

Implementing Condition Assessment Inspections: "Where to Begin"

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THE STATE OF CONDITION ASSESSMENT

- WHY IT'S IMPORTANT
- WHAT IS IT?
- TECHNOLOGY & TOOLS
- WHAT ARE OUR UTILITIES DOING?
- BEST PRACTICES

CONDITION ASSESSMENT

WHY IT'S SO IMPORTANT

THE PROBLEM: FAILURES

CRUMBLING SYSTEMS

- Over 240,000 water main breaks each year
- Aging, leaking pipes lose 7 billion gallons of water per day

ASCE 2009 GRADE CARD

DRINKING WATER D-

WASTE WATER D-

SERIOUS CONSEQUENCES

- Impacts to level of service
- Damage to local transportation systems
- Safety
- Environmental damage
- High unbudgeted repair cost
- Lost Water = Lost $$$$
- Damage to Utility public image

THE PROBLEM: LOCAL GOVERNMENTS AND UTILITIES FACED WITH DOING MORE WITH LESS

ASCE ESTIMATED ANNUAL WATER AND WASTEWATER FUNDING SHORTFALL

$55 BILLION

SOLUTION

CONDITION ASSESSMENT

According to the EPA condition assessment is…

The collection of data and information through direct and/or indirect methods, followed by analysis of the data and information, to make a determination of the current and/or future structural, water quality, and hydraulic status of the pipeline.

How much data needs to be collected?

CONDITION ASSESSMENT TECHNOLOGY & TOOLS

CONDITION ASSESSMENT TECHNOLOGY

- **Visual Inspection**
  Manned Entry
- **Closed Circuit TV**
  Remote Operated Vehicle (ROV)
  Remote Camera
- **Electromagnetics**
  Broadband and Remote Field
- **Ultrasonic**
  Guided Wave, B-Scan, Impact Echo
- **Magnetic Flux Leakage**
- **Leak Detection**
  Acoustic Monitoring
  In the Pipe

VISUAL INSPECTION
MANNED ENTRY

ADVANTAGES

- Ability to use multiple tools - including some that require human operation
- Detailed visual inspection

LIMITATIONS

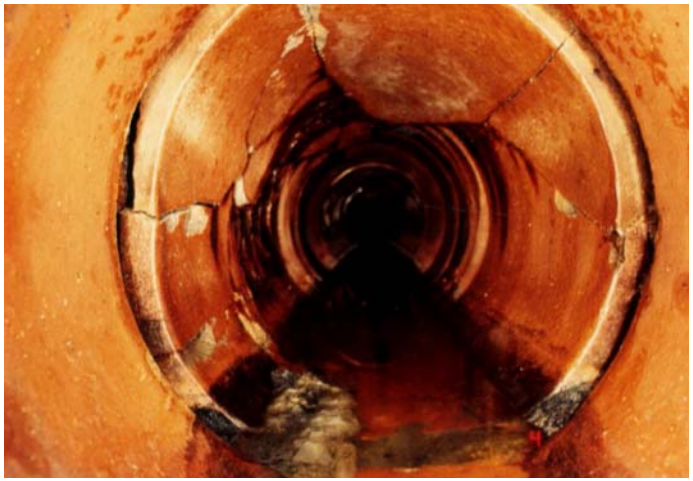
- System must be shut down and drained
- Health & Safety Risks
- Only for large diameter pipes (36 inch?)

CLOSED CIRCUIT TV
REMOTE OPERATED VEHICLE

ADVANTAGES

- Inspection may take place while pipe in service
- Video recording
- No man entry required

Image Courtesy of Hibbard Inshore



LIMITATIONS

- Low flow velocity required < 1 ft/s
- Range < 6,000 ft

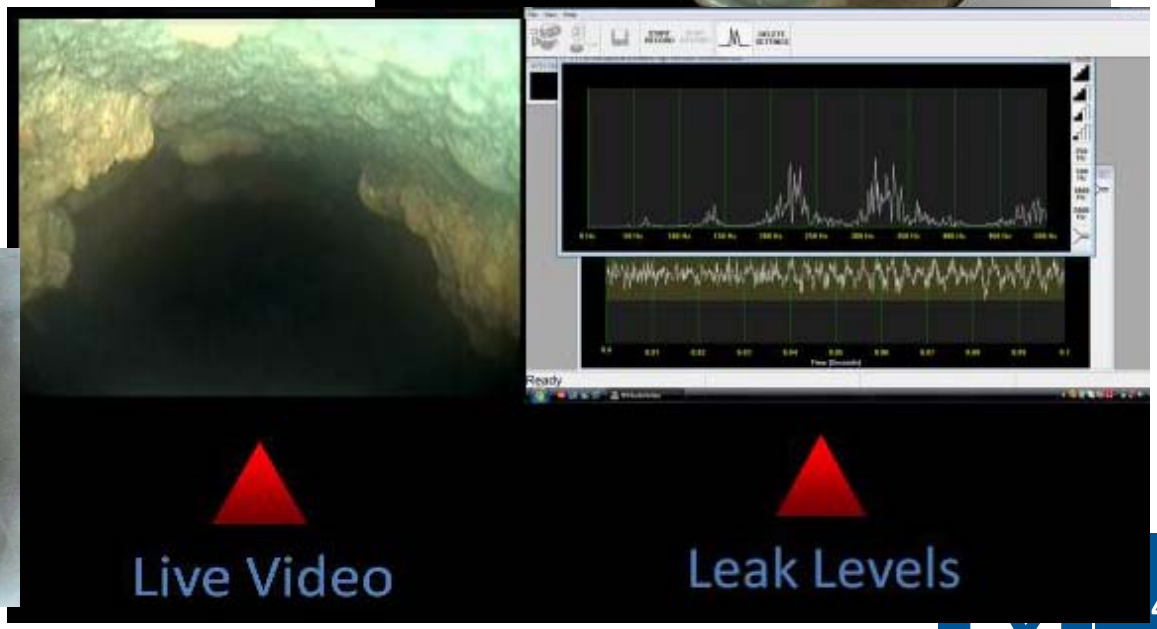
In Line Video

- Inline Video Inspection of up to 3,000 feet while the line remains in service
- Possible Uses:
  - Liner Inspection
  - Location of lost valve
  - Zebra Mussel Investigation
  - Corrosion / Tuberculation
  - Repair Planning

pure TECHNOLOGIES

LDS - 1000 Video and Leak Detection

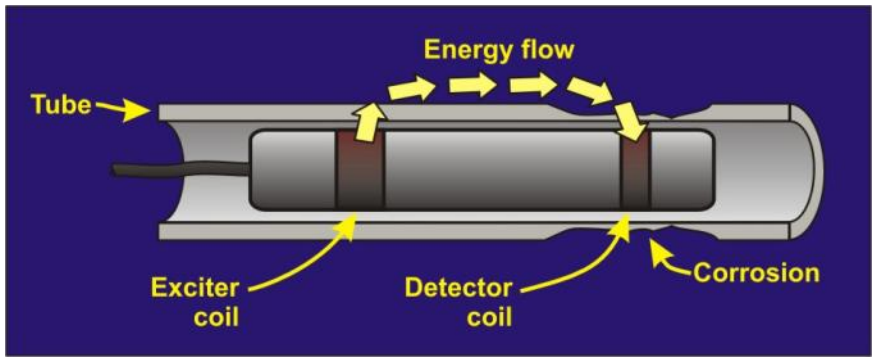
- Insertion Through Fire Hydrant or 2” ARV
- Pipe Dia. <12”
- Inspects 3,000 feet
- Repeatable, Real time data
- Pipe remains in service



ELECTROMAGNETICS
BROADBAND & REMOTE FIELD

ADVANTAGES

- Able to detect internal and external pipe defects
- Measures wall thickness and location of pits
- Doesn't require direct contact with pipe wall



LIMITATIONS

- Only works on metallic pipe
- Insertion and retrieval can be problematic

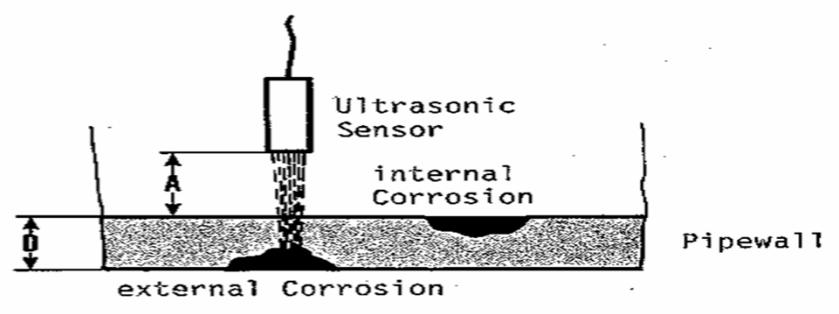
ULTRASONIC – Metallic Pipe
Guided Wave, B-SCAN

ADVANTAGES

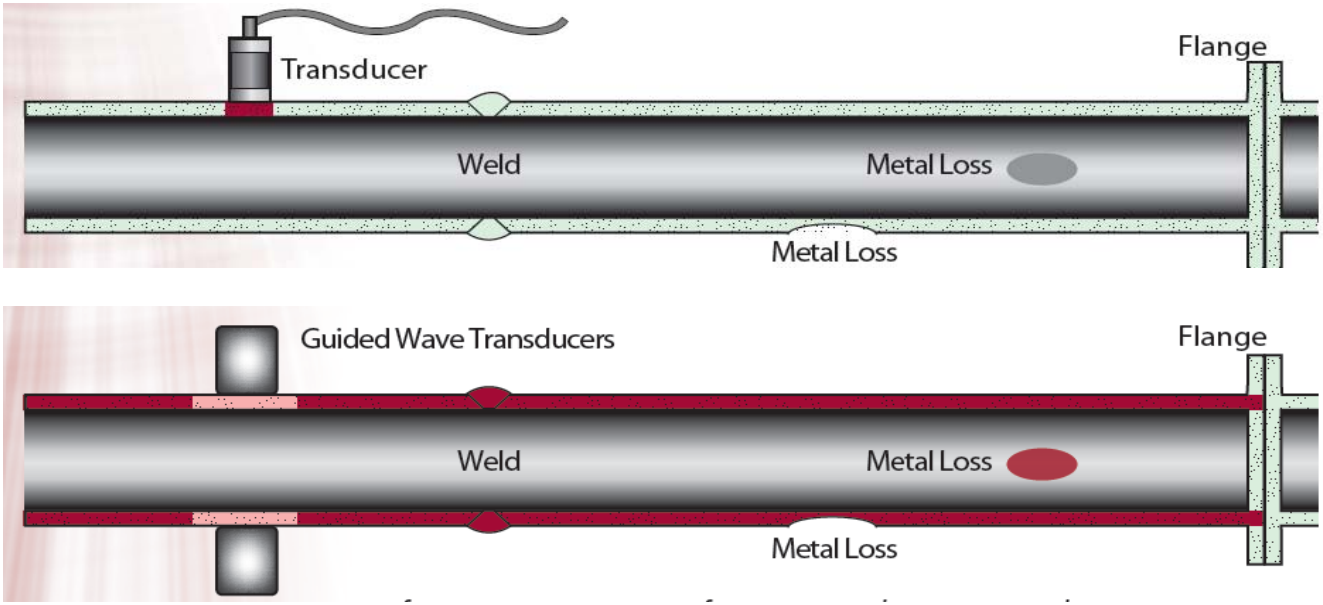
- Accurate to .003 inch
- Displays the cross sectional thickness of the material
- Portable can go about anywhere

LIMITATIONS

- Short Lengths or area can be inspected
- Requires access to the pipe
- Cannot scan pipes with heavily corroded exterior surfaces or coatings



GUIDED WAVE TESTING (GWT)



- Consisting of a collar mounted on the pipe being inspected.
- Low-frequency ultrasonic (>20kHz) waves are generated in the pipe wall.
- The wave travels in the pipe wall and is scattered/reflected by changes in the pipe cross section (i.e. by corrosion, welds, or other wall thickness changes).

BENEFITS OF GUIDED WAVE TESTING

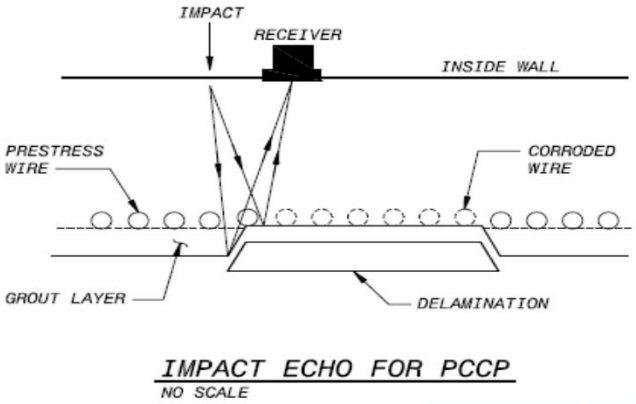
- 100% volumetric coverage
- Inspection over long distances from a single sensor position.
- Ability to inspect hidden structures and structures under water, coatings, insulations, and concrete.
- Defect classification and approximate circumferential and axial sizing.
- Avoidance of removal/reinstatement of insulation or coating, except at location

Magnetic Flux Leakage – Metallic Pipe

- Used Primarily in the Oil Industry
- Provides information on wall thickness
- Free swimming tool so pipe can remain in service
- Limited applications requires contact with pipe wall

Ultrasonic – Concrete Pipe

- Able to detect delamination from rebar corrosion
- Identify cracks in mortar
- More accurate than manual sounding
- Doesn't require removal of coating



IMPACT ECHO FOR PCCP
NO SCALE

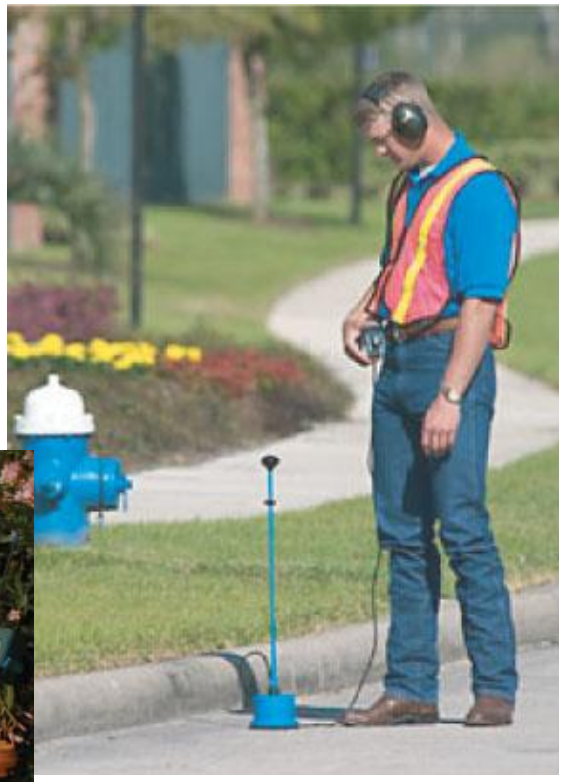
LEAK DETECTION - Correlators

ADVANTAGES

- Pipe remains in service
- No entry required
- Wide range of tools available
- Provides information immediately on pipes condition

LIMITATIONS

- Dependent on method selected
- For small diameter pipe



In the Pipe – LDS 1000, Sahara, Smart Ball

- Free Swimming or Tethered
- Data collected real time or analyzed later
- Range varies with system

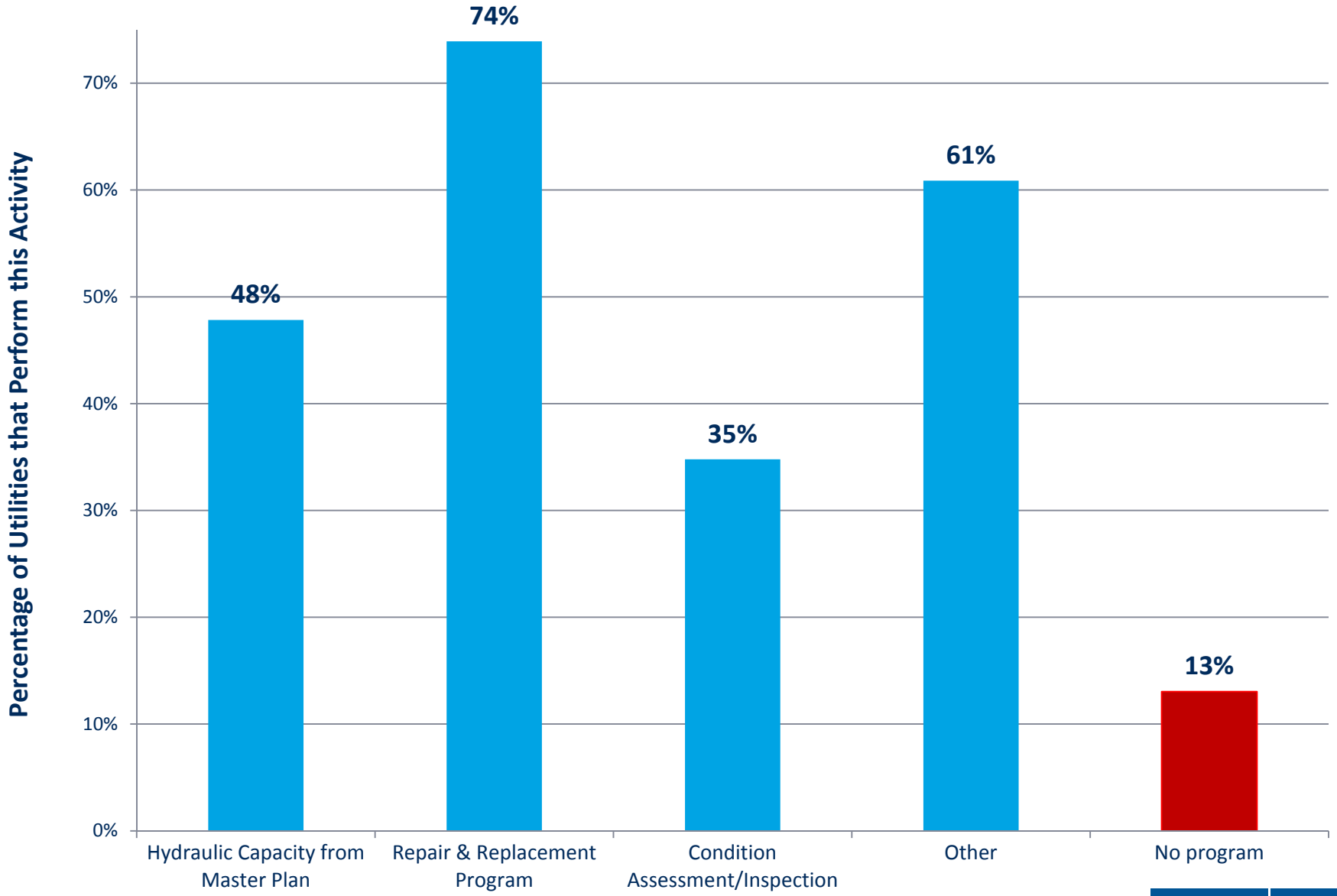
CONDITION ASSESSMENT

WHAT ARE UTILITIES DOING?

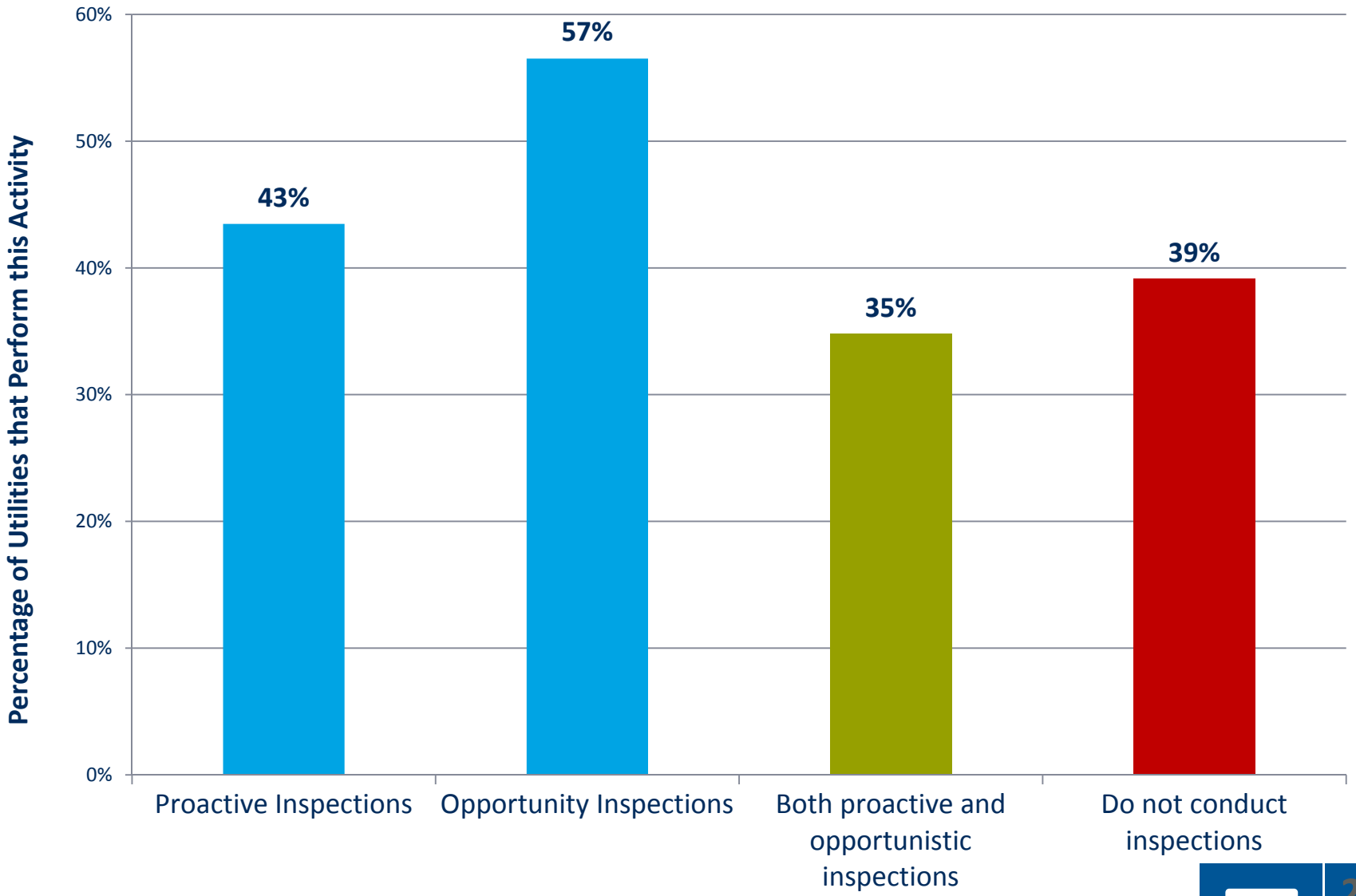
THE CONDITION OF CONDITION ASSESSMENT
ACCORDING TO THE EPA

- **Condition assessment is either not used or not used routinely by a most utilities**
- **Utilities often have little data in system besides the type of pipe, type of service and installation date**
  - If inspections have been conducted usually only have qualitative (Good/Poor) information – **not useful**
- **Utilities are leery of new inspection techniques and need to be educated on how to use effectively**
- **Repair or replacement typically only occurs after major failure event and associated negative attention**

What methods are used to identify pipes for replacement?



Does the utility conduct inspections on pipelines?



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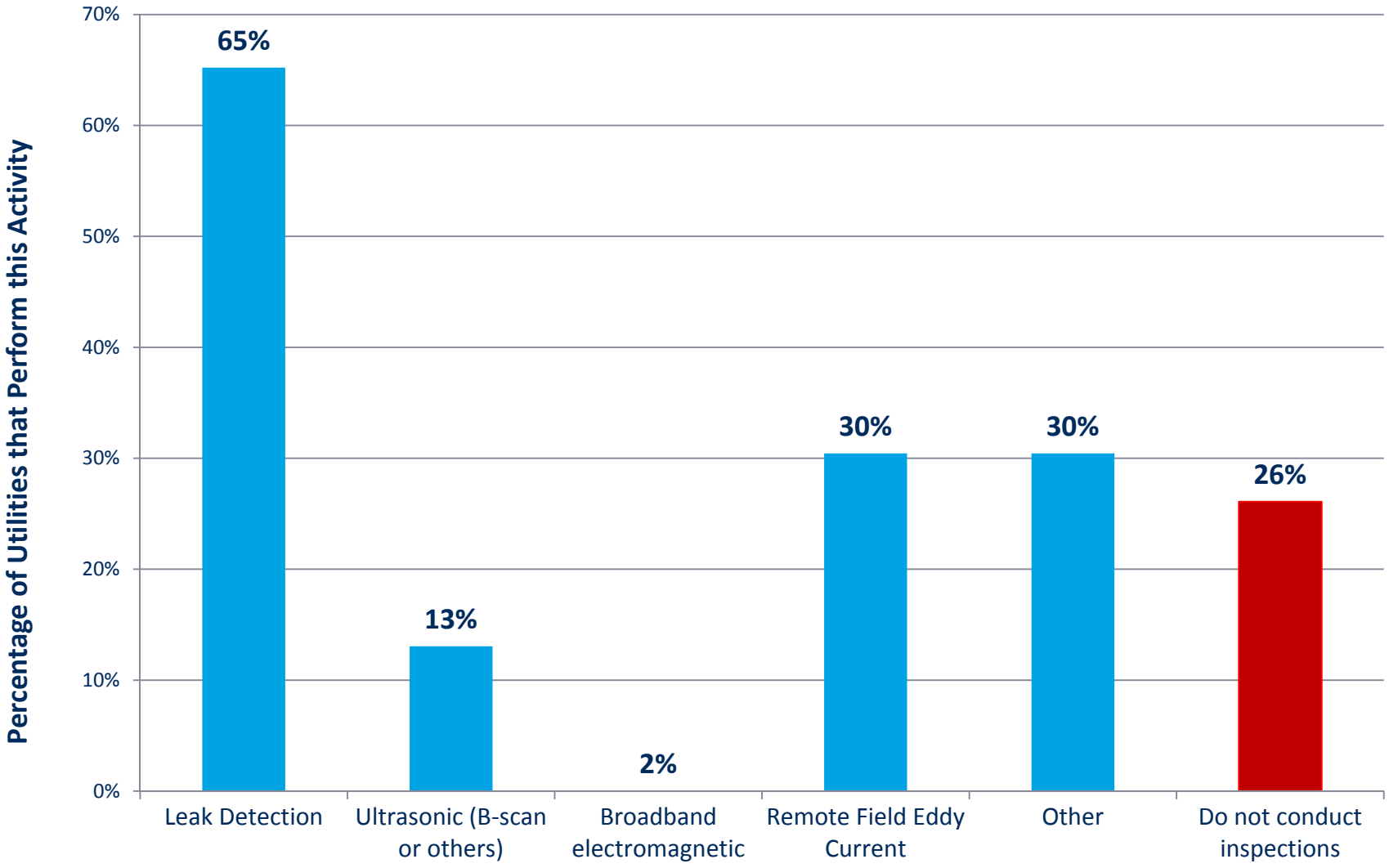
What inspection technologies are used for condition assessment?



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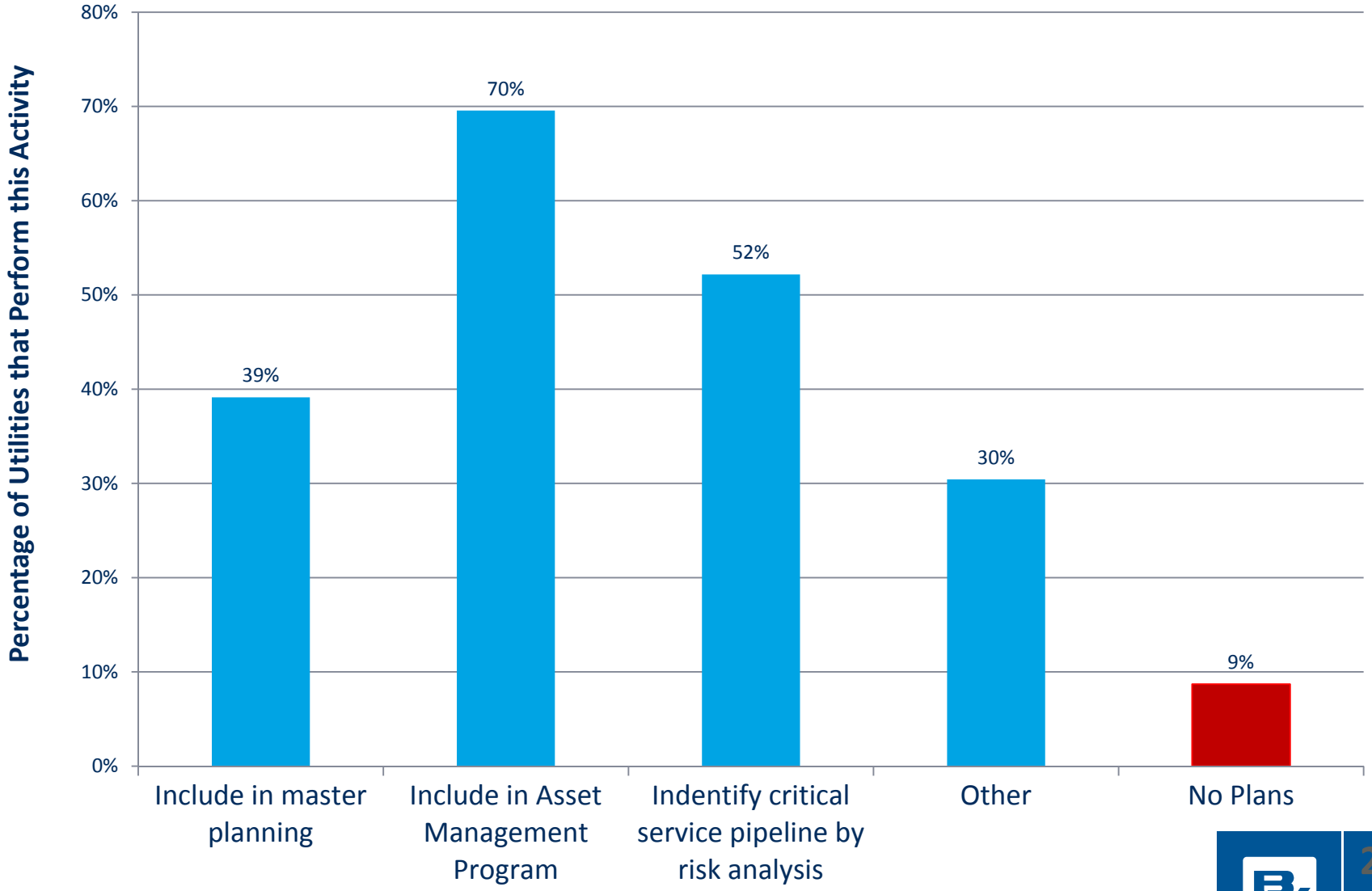
What are the future plans for addressing pipeline condition assessment?



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CONDITION ASSESSMENT

BEST PRACTICES

BEST PRACTICES

INTEGRATED PIPELINE MANAGEMENT SOLUTION

- **Empowers utility to act as steward of community water infrastructure**
- **Encourages proactive investment**
- **Facilitates continuous improvement**
- **Requires detailed inventory of system and condition**
  - Significant emphasis on condition assessment and the type and quality of collected data

RIGHT PIPE

MAINTAIN LEVEL OF SERVICE

RIGHT TIME

CONDITION ASSESSMENTS

RIGHT METHOD

IMPLEMENTATION

R3 RIGHT PIPE ▸ RIGHT TIME ▸ RIGHT METHOD

AN INTEGRATED PIPELINE MANAGEMENT SOLUTION

RIGHT PIPE
MAINTAIN LEVEL OF SERVICE

Stage #1

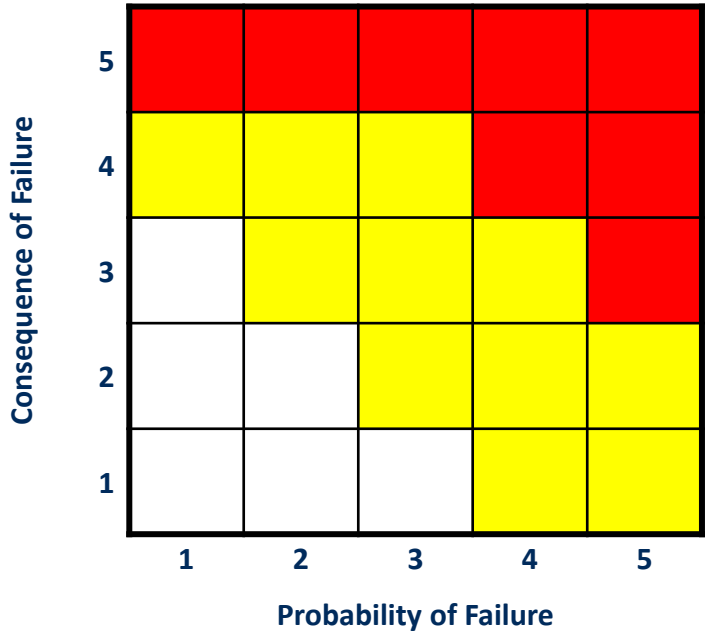
- **Desktop analysis of existing information on pipe**
  - Date placed in service
  - Pipe Material
  - Operating Parameters – pressure, flow and type
  - Service recipients
- **Identify what data needs to be obtained by physical inspection based on the type of pipe**

RIGHT PIPE
MAINTAIN LEVEL OF SERVICE

Stage #1 continued

- **Risk Analysis**

Probability	AKA
5	Probable
4	Likely
3	Possible
2	Unlikely
1	Improbable



Allows investment to be focused on most critical pipes to earn maximum return on investment

RIGHT TIME
CONDITION ASSESSMENTS

Stage #2

- **Evaluate possible inspection technologies**
  - Factors affecting technology selection
    - Pipe Diameter
    - Pipe Material
    - Access Limitations
    - Type of data trying to collect
    - **Budget**
- **Carry out inspection with assistance from qualified firm**

RIGHT METHOD
IMPLEMENTATION

Stage #3

- **Desktop analysis to determine pipe condition**
  - Data itself does not provide answers – analysis is critical
  - Analyzed data should be combined with general pipe parameters identified in Stage 1 to better estimate service life
- **Revisit risk analysis based on new condition information**
- **Perform Repair/Replace analysis on highest risk lines**
  - Allows estimation of timing and cost of risk mitigation strategy

R3 RIGHT PIPE ▸ RIGHT TIME ▸ RIGHT METHOD
AN INTEGRATED PIPELINE MANAGEMENT SOLUTION

RIGHT METHOD
IMPLEMENTATION

- **Stage #3 continued**
- **Determine & Implement the best mitigation strategy based on**
  - Client Needs
  - Cost
  - Capacity
  - Operation
  - Timeline
  - Service Life

PARALLEL PIPE

REPLACEMENT

REHABILITATION

QUESTIONS?

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