

# Commissioning & Pipelines



IAIN WEIR

CHIEF TECHNICAL OFFICER



# Institute of Water



# Watermain Cleaning, Preparation and Lining





...Many watermains are now reaching the end of their useable lives



6" tuberculated water main. Photo by Envirolitics



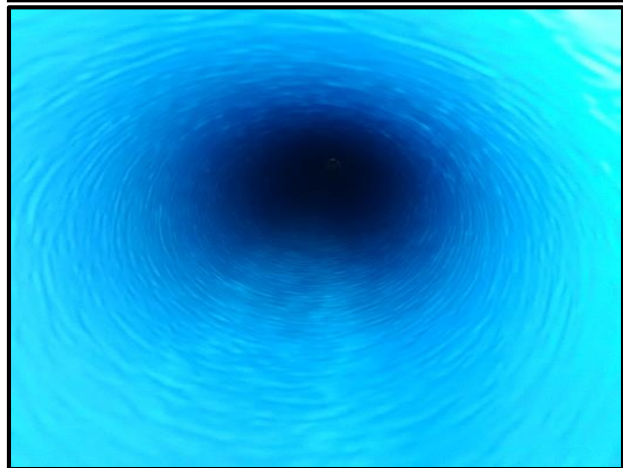
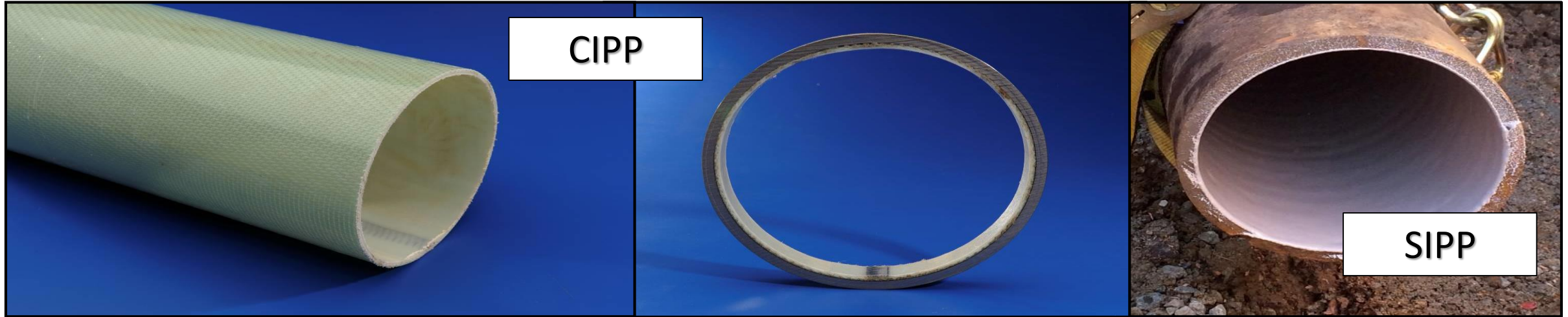
Water main break and repair. Source: Google Maps

These aging, deteriorated pipes are often congested with deposits, leaking and too often...failing!



# Good News!

Trenchless linings offer cost effective renewal solutions that extend the pipe's life



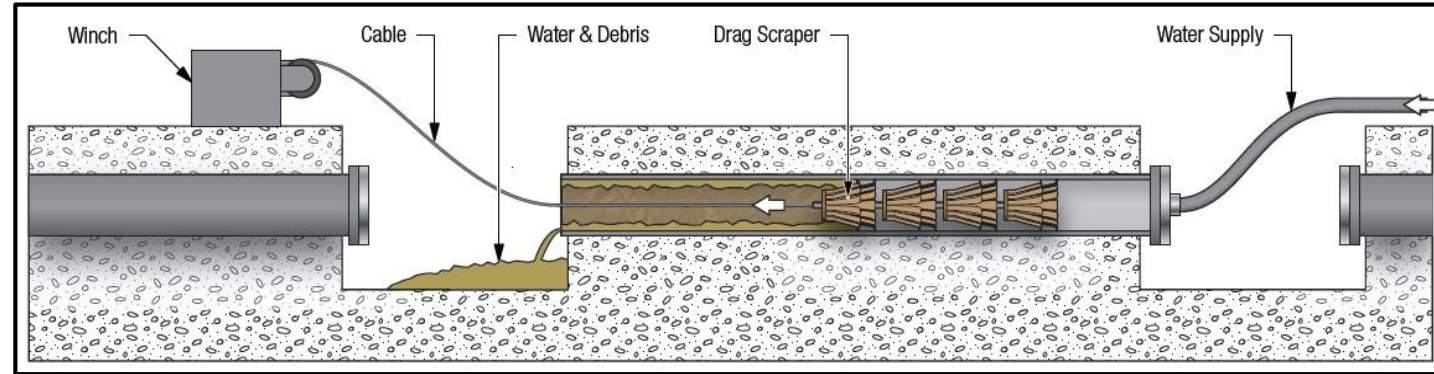
- Applied to the pipe interior after the cleaning process has removed all deposits and corrosion
- They keep the pipe healthy and corrosion free!

# Examples of Current Cleaning Methods

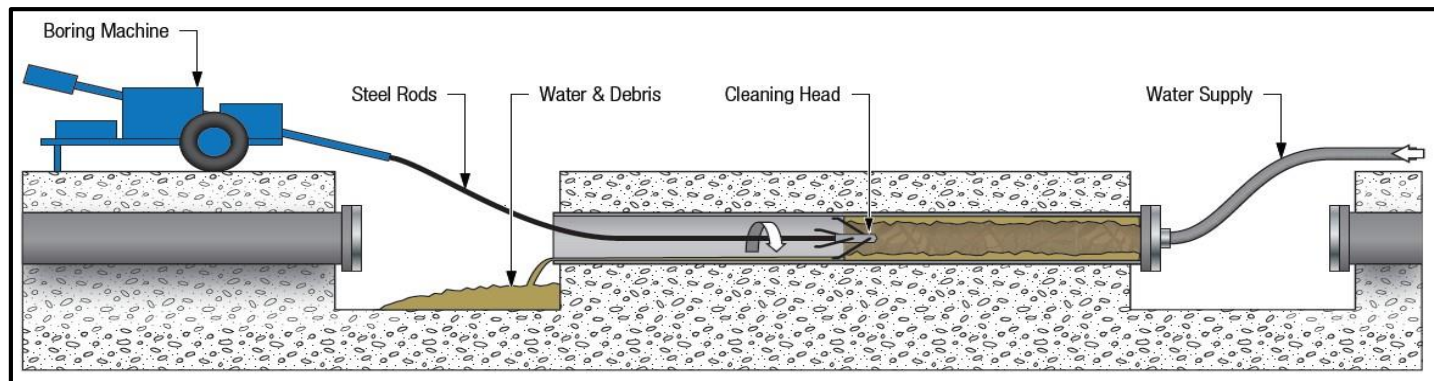
American Water Works Association (AWWA) Manual M28



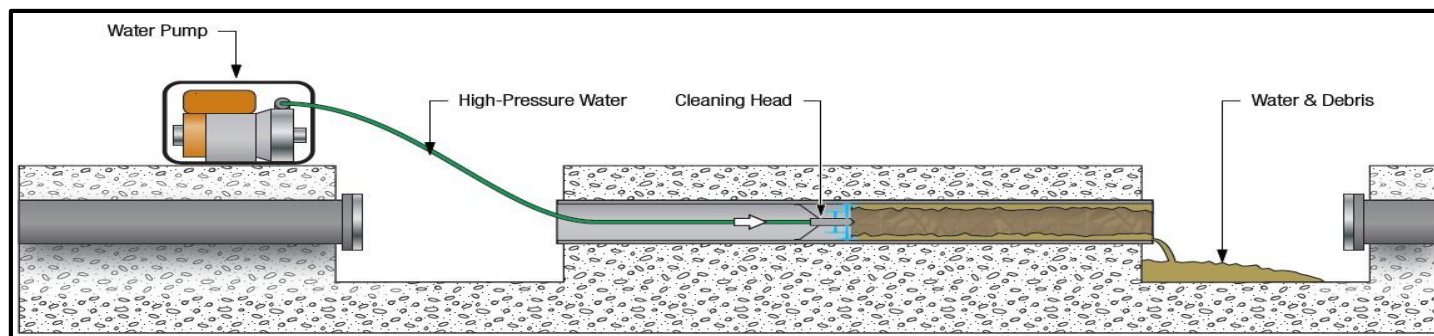
Drag Scrape



Power Bore



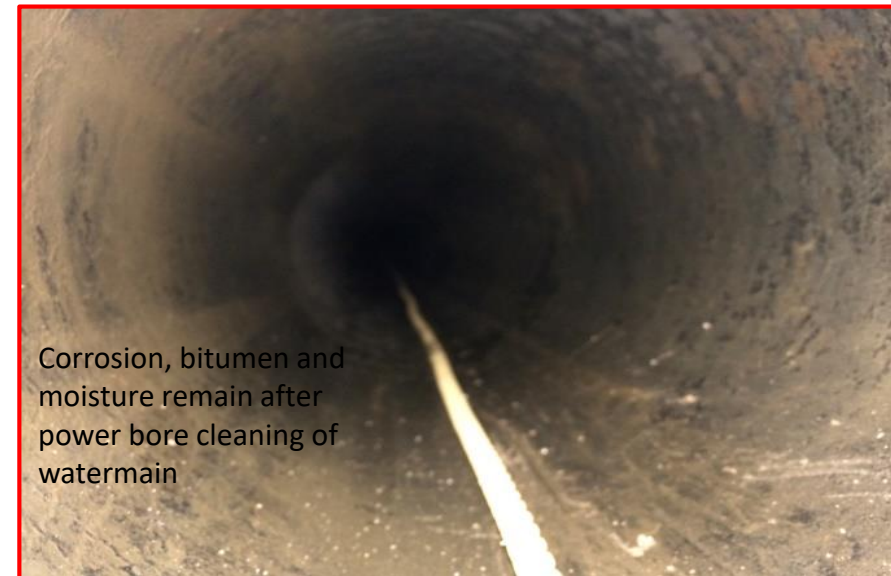
Water Jet





# Current Cleaning Methods

- Can foul thousands of litres of clean water and may require containment and treatment depending on contents
- May not remove all deposits, corrosion and bitumen to fully expose pipe wall
- Leave the pipe wet
- Further surface preparation may be required to meet ASTM F3182



# Tomahawk™ System

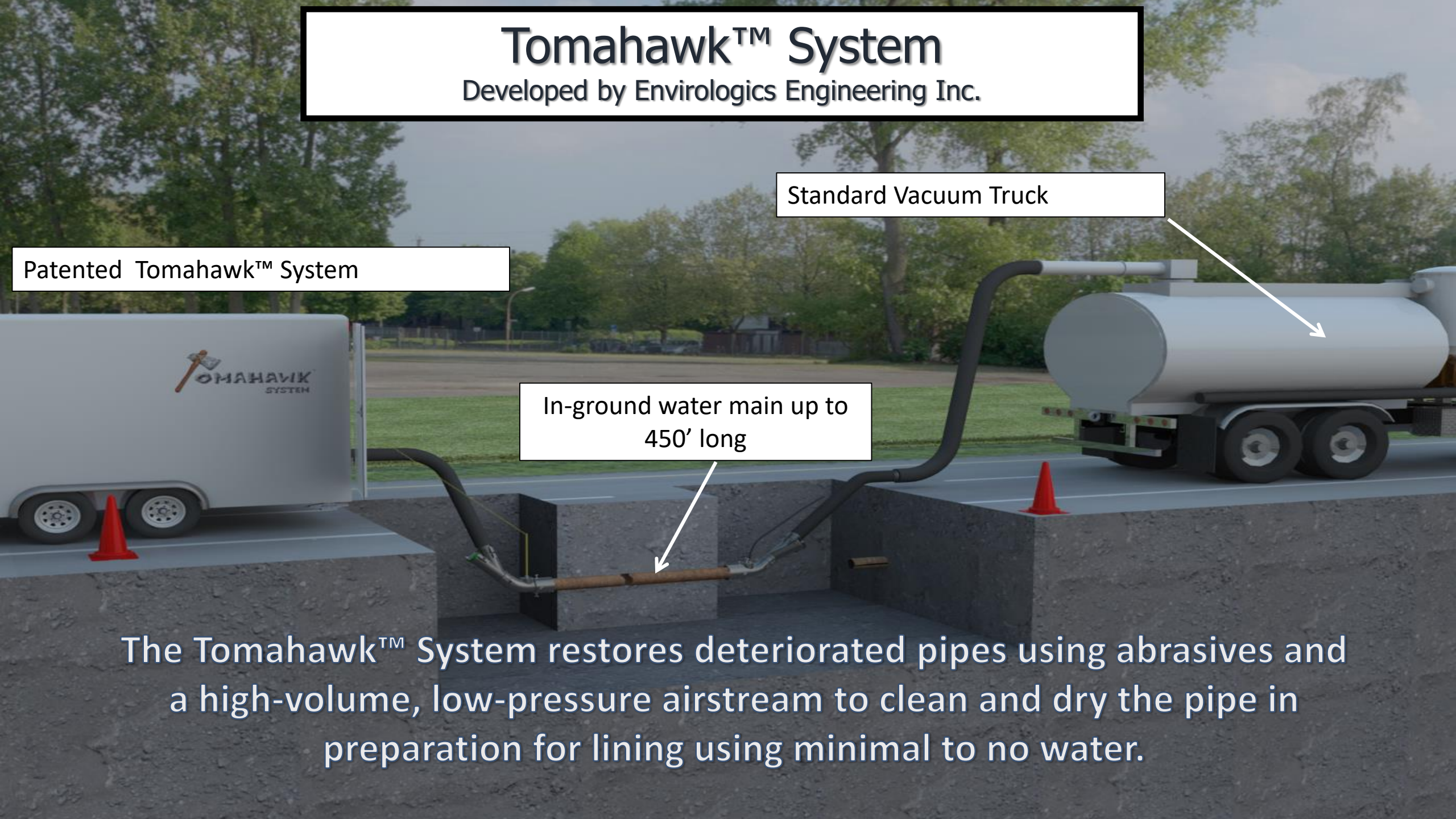
Developed by Envirolomics Engineering Inc.

Patented Tomahawk™ System

Standard Vacuum Truck

In-ground water main up to  
450' long

The Tomahawk™ System restores deteriorated pipes using abrasives and a high-volume, low-pressure airstream to clean and dry the pipe in preparation for lining using minimal to no water.

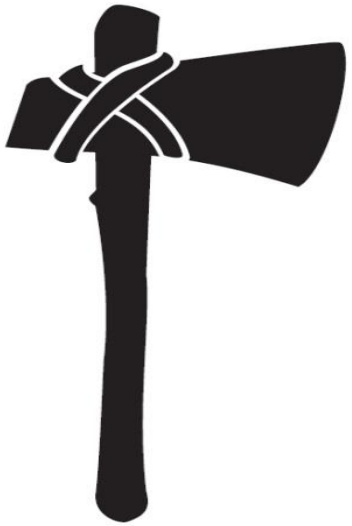




# Tomahawk™ System Process Overview



[Click here to view video](#)



- ✓ Minimal water usage, dust-free, environmentally friendly, trenchless process
- ✓ Up to 98% waste reduction over other wet cleaning methods
- ✓ Fast, 2-4 hours to clean and prepare typical pipe section, service bypass optional
- ✓ Removes tuberculation and old bitumen or coal tar linings to restore water capacity and quality
- ✓ Dry pipe allows for immediate liner application
- ✓ Superior clean and dry surface preparation for excellent liner bond and years of leak-free service
- ✓ Targeted clean – Scout Camera and deflector
- ✓ Capture waste in vacuum tanker





# Cleaning progression.....



Tuberculation



Partial tuberculation removal



Full tuberculation removal, bitumen liner visible



# Preparation progression.....



Bitumen liner being removed



Partial liner and graphitic corrosion  
removal

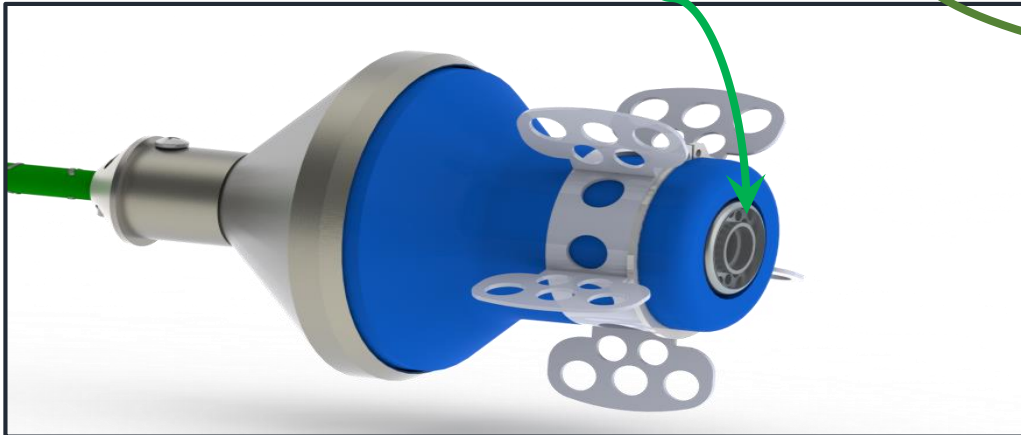
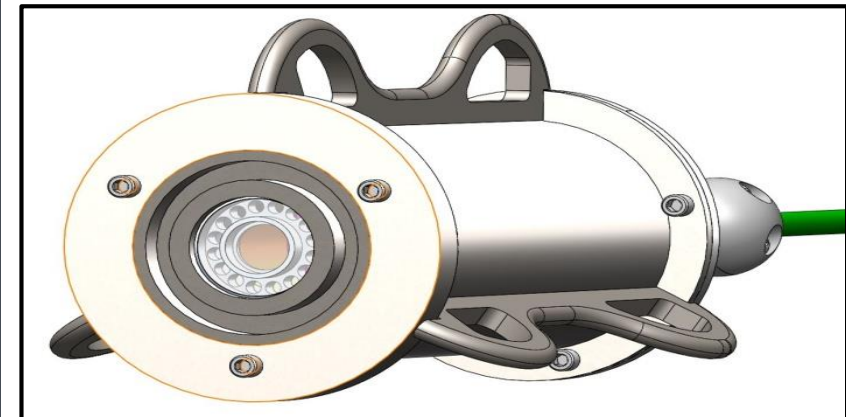
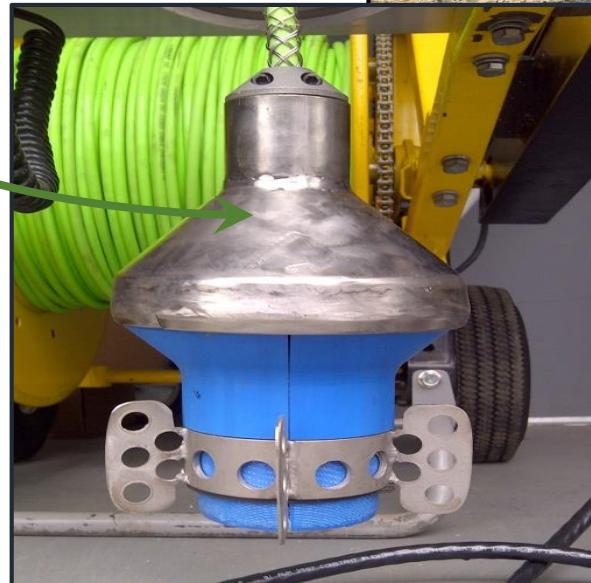


Fully prepared for liner bonding



# Concurrent Cleaning, Drying and Inspection

- After initial cleaning, the patented Tomahawk Scout™ is instantly deployed
- Airstream driven, integrated CCTV camera and abrasive deflector



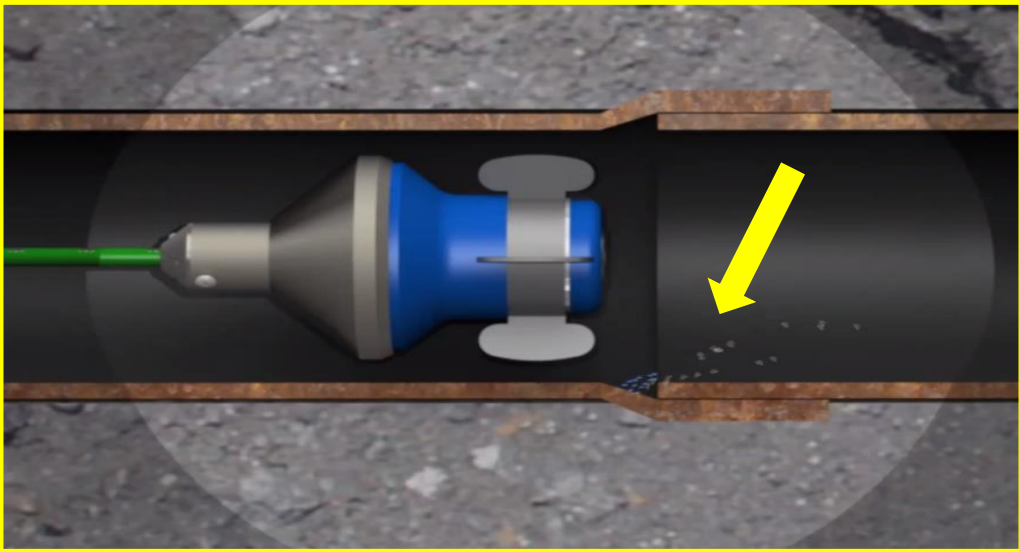


# Concurrent Cleaning, Drying and Inspection



Visually inspect and target clean along pipe, at joints and around service connections

The diagram shows a cross-section of a pipe with a blue and grey cleaning tool inside. A green arrow points to the tool. An inset image shows a red cylindrical component with a blue double-headed arrow and the text 'Target Cleaning Zone'.

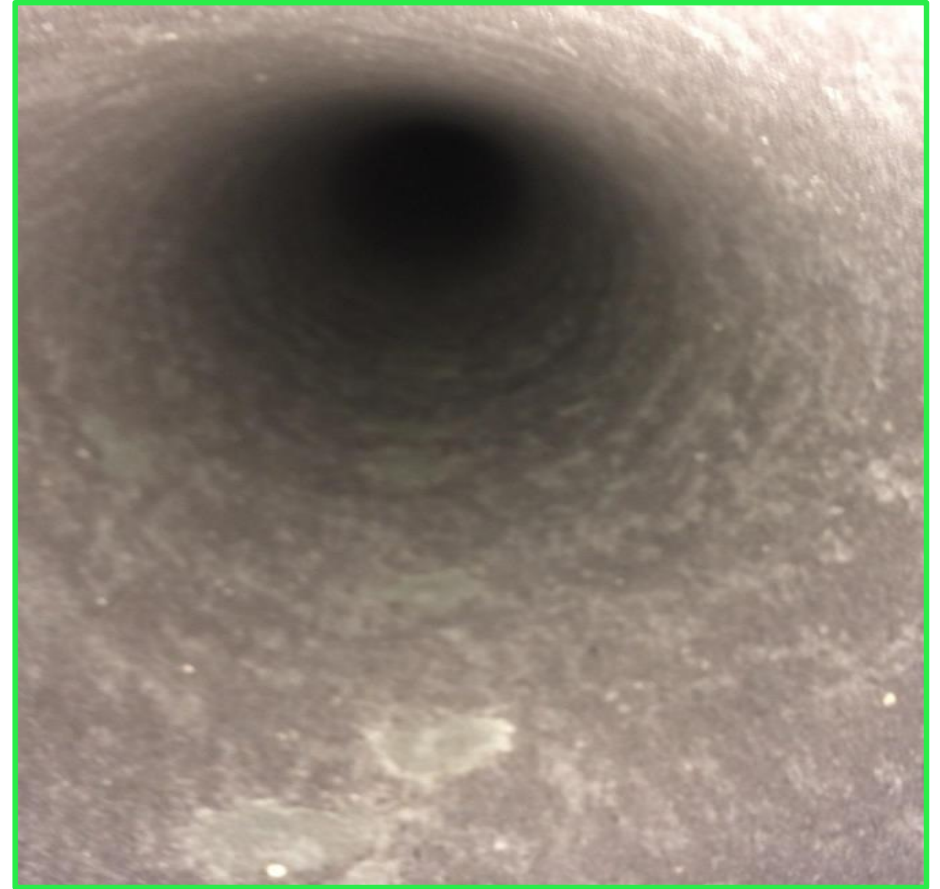


Visually inspect and draw trapped moisture and debris from joints, crevices and service connections

The diagram shows a cross-section of a pipe with a blue and grey cleaning tool inside. A yellow arrow points to a joint or crevice in the pipe.

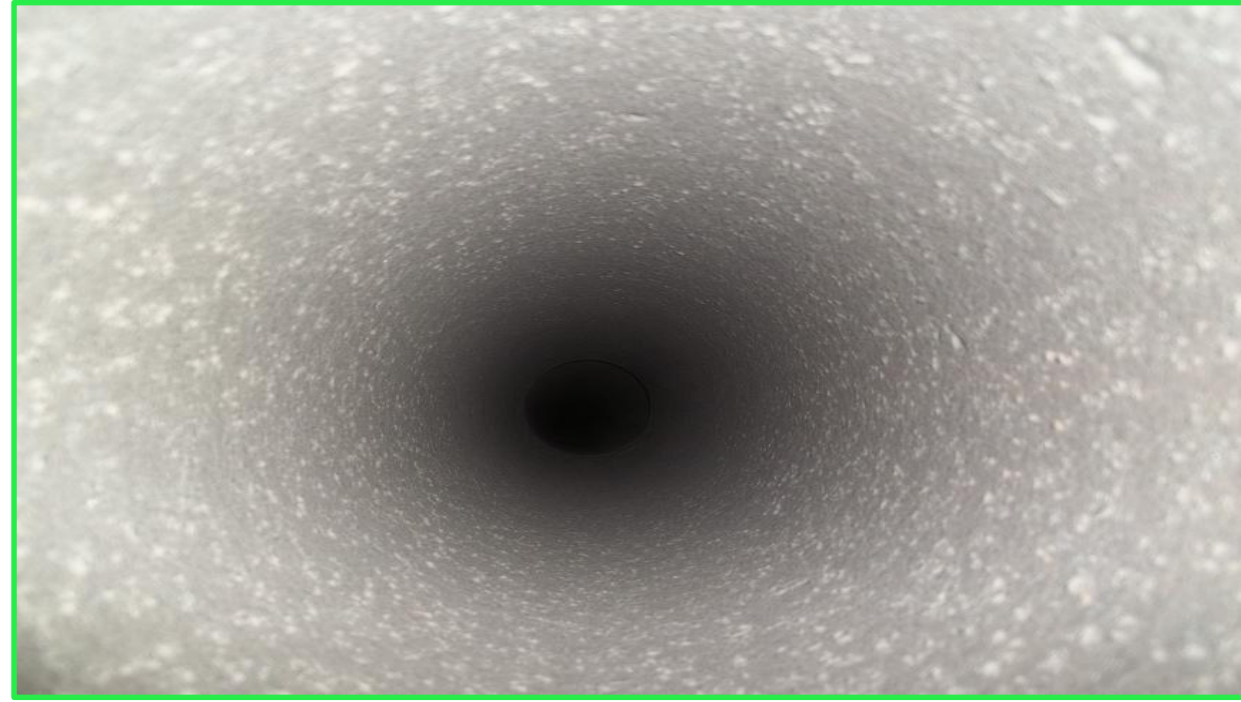
Other inspection and condition assessment technologies can be utilized following cleaning

# Tuberculation Removed From 6" Unlined Cast Iron Pipe



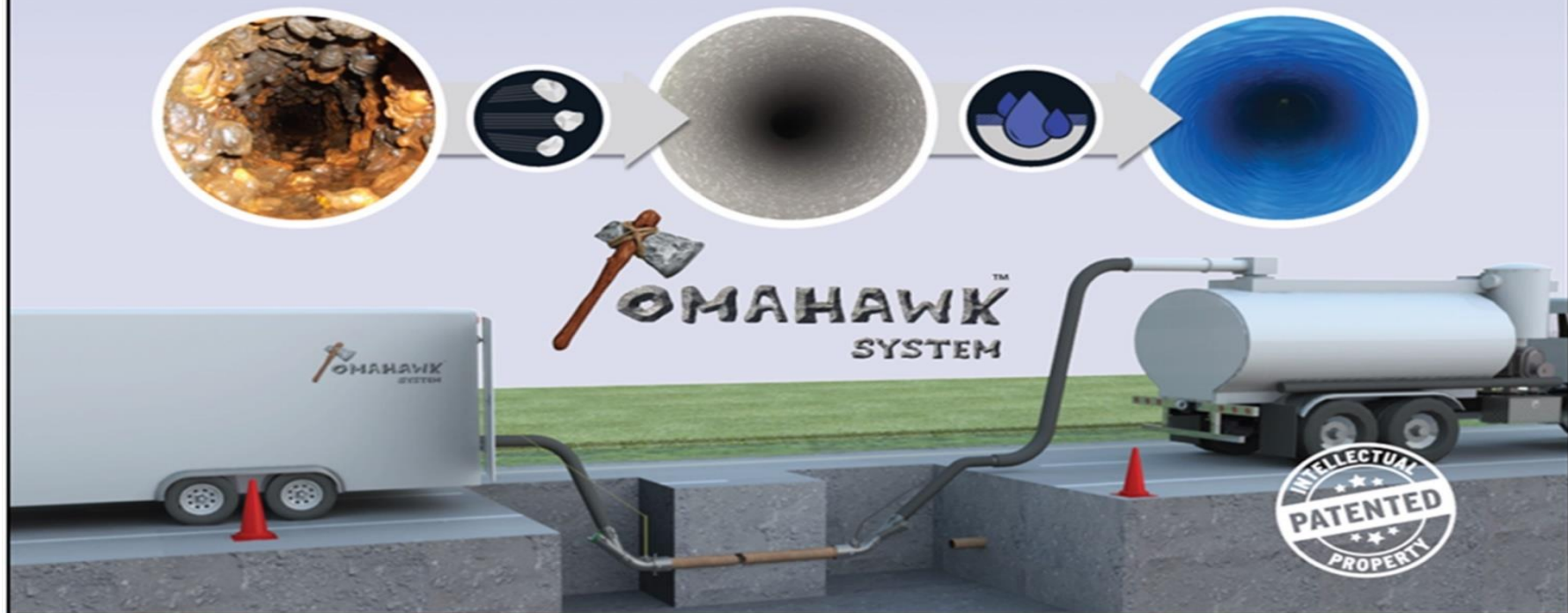


# Corrosion and Coal Tar Liner Removed from 6" Cast Iron Pipe



# DRY WATERMAIN CLEANING & LINING

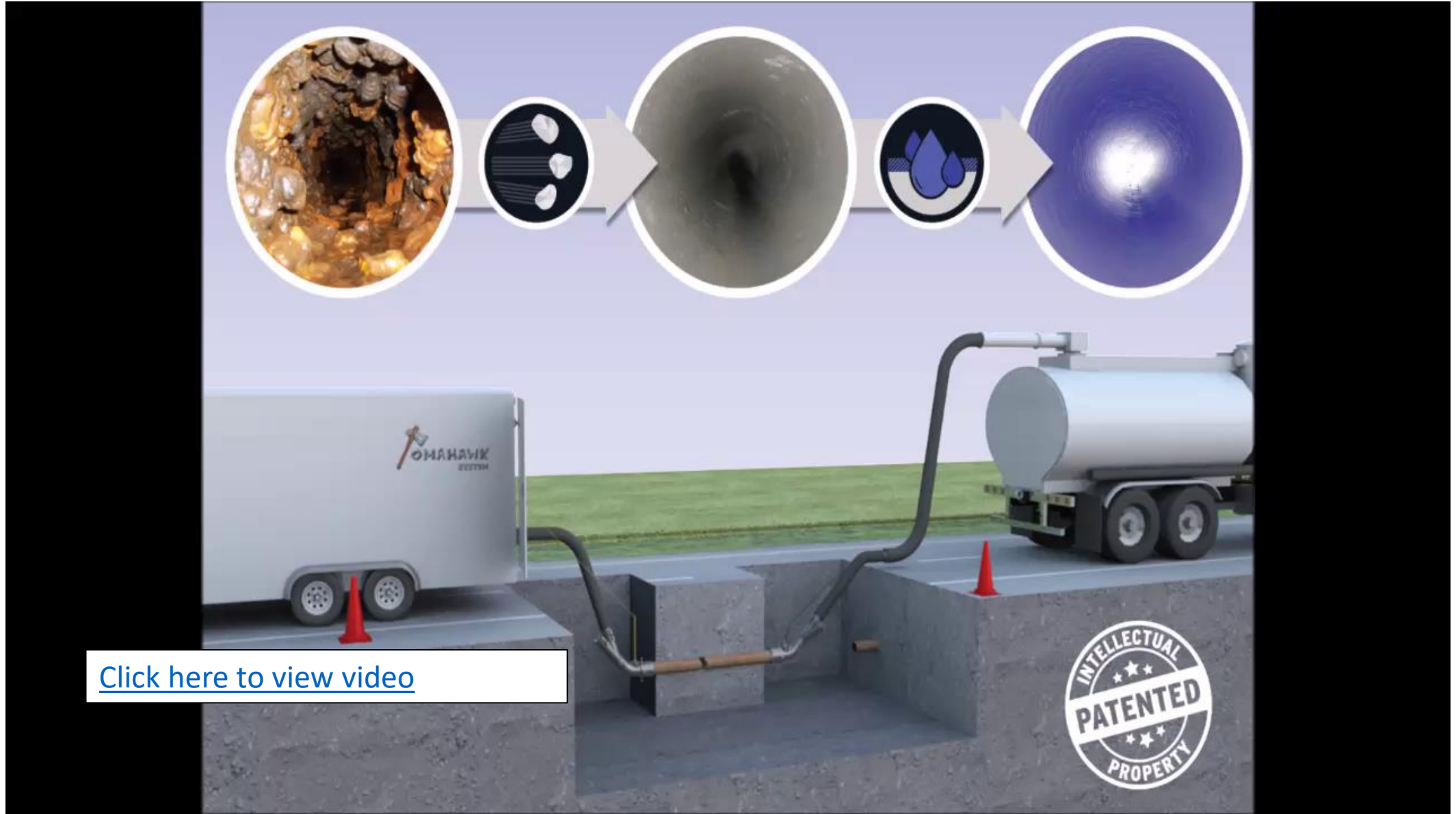
FOR DECADES OF LEAK-FREE PERFORMANCE



Immediately following cleaning, the Tomahawk airborne lining system uses a high-volume, low-pressure airstream and aerodynamically engineered bodies to deliver lining material to the pipe walls for a continuous barrier coating to resolve water quality issues.



# Tomahawk Airborne Lining - Animation



[Click here to view video](#)



# Tomahawk Airborne Lining

Clean then apply barrier coat in minutes



Low cost barrier coat to:

- Extend pipe life
- Restore flow capacity
- Improve water quality
- Encapsulate lead found in pipe and joints



# Saint John, NB: Bitumen and Tuberculation Removal

- Project completed July 2014
- Objective: Water quality/capacity improvement
- 800 meters of CI pipe rehabilitated in 6 days
- 150 mm (6") and 200 mm (8") bitumen lined
- 1955 cast iron pipe; structurally sound
- Same day return to service; no service bypass
- Water quality lining: 3M Scotchkote™ 2400 Liner applied by Trenchless Solutions Inc. of Moncton NB.

# Saint John, NB: Bitumen and Tuberculation Removal



## Achievements:

- Improved water quality
- Hydraulic capacity restored
- Reduced power consumption to pump water
- Decades of additional service



# WATER INDUSTRY SPECIFICATION

WIS 4-02-01

Version 7.3  
October 2014  
(Page 1 of 39)

ISSN 2042-311X

UK Water Industry

## OPERATIONAL REQUIREMENTS: *IN SITU* RESIN LINING OF WATER MAINS

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This document has been prepared on behalf of the Water UK Standards Board. Technical queries should be addressed to the Standards Board c/o the Technical Secretary E-mail: [brian\\_spark@nlworld.com](mailto:brian_spark@nlworld.com). WIS 4-02-01 replaces the DWI publication Operational requirements: *In-situ* resin lining of water mains version 2.4 8 January 2007. The latest version of this document can be downloaded from: <http://www.wis-ign.org>

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# WATER INDUSTRY INFORMATION & GUIDANCE NOTE

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UK Water Industry

## CODE OF PRACTICE: *IN SITU* RESIN LINING OF WATER MAINS

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1. INTRODUCTION
2. PROCESS SUMMARY
3. APPROVALS
4. *IN SITU* SPRAY-APPLIED RESIN LINING PROCESS

#### 1. INTRODUCTION

The purpose of this Code of Practice is to supplement the Operational Requirements for *In Situ* Resin Lining of Water Mains<sup>(1)</sup>. It is essentially a guidance document containing background information and recommendations for resin lining schemes.

Not all Operational Requirements are referenced in this Code but are fully set out in 'Operational Requirements: *In Situ* Resin Lining of Water Mains'<sup>(1)</sup>, hereafter referred to as the 'OR'

The Operational Requirements (including all Appendices referenced from the Operational Requirements) are mandatory.

It is recommended that the Code of Practice forms the basis of the contractual requirements for *in situ* resin lining works, though clauses may be amended to suit individual client circumstances. However, tender documents should clearly indicate if any amendments have been made to the standard specification and what those amendments are.

#### 1.1 Scope

This Code of Practice covers the requirements needed to provide protective coatings for pipelines constructed of plastic, iron, steel, asbestos cement, or concrete using resin materials approved for *in situ* lining of potable water mains. This currently includes two part epoxy resin and two part rapid setting polyurethane materials. Issues considered include:

- resin materials;
- approvals required;
- scheme preparation;
- pipeline cleaning;
- application of coating;
- curing;
- quality control procedures;
- disinfection; and
- rectification of lining defects.

Definitions (highlighted in ***bold italics***) are given in the Operational Requirements (OR 1.3).

#### 2. PROCESS SUMMARY

##### 2.1 Scope

For engineers and contractors who are not familiar with the cleaning and lining processes, this section provides a schematic summary of the methods.

This document has been prepared on behalf of the Water UK Standards Board. Technical queries should be addressed to the Standards Board c/o the Technical Secretary on E-mail: [brian\\_spark@nlworld.com](mailto:brian_spark@nlworld.com). IGN 4-02-02 replaces the DWI publication Code of Practice: *In situ* resin lining of water mains Version 2.2 30<sup>th</sup> October 2006. The latest version of this document can be downloaded from: <http://www.wis-ign.org>

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## IGN 4 - 02

# In situ resin lining of water mains



# Cleaning Capability

- 100mm (4") to 300mm (12") pipe
- Cleaned up to 137m (450 feet) per pipe segment
- Up to 40% tuberculation/encrustation
- One 22.5° elbow per line segment
- Cleaned and dried CML lined pipe
- Meets or exceeds ASTM 3182 for pipe cleaning and preparation





# Research Partnership

## Novel Water Technology for Livable Communities



Thank you & questions



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