UTILITY SERVICE

Ice Pigging

Daryl Bowling

Utility Service: Overview

- Leading US provider of water tank asset management
- Manage over 6,000 water towers in full asset programs
- Completed over 1,300 renovations in 2013
- More than 3,000 clients in over 42 states
- Perform over 6,000 condition assessments per year
- 300 employees - 44 field representatives geographically organized
- 10 Production & Logistic Centers

Utility Service: Services

- Tank Cleaning and Painting
- Chemical Cleaning
- TRS
- In Tank Mixing
- Ice Pigging water and waste water
- Valve and Hydrant Services
- Water Metering (AMI)
- Water Well Service

ICE PIGGING

A Sustainable Best Practice for Cleaning Water Mains and Force Mains

suez environnement

Utility Service

What you will learn …

- What is Ice Pigging
- How is it used
- Case studies

What is Ice Pigging?

A patented innovative *sustainable* pipe cleaning technology to improve water quality and asset management

Designed in Europe several years ago

Designed for cleaning Water Lines

How does it work?

Ice Pigging harnesses the characteristics of a semi-solid material

- **An ice pig is a semi-solid material that *can be pumped like a liquid***
- **But *behaves like a solid* once the pig is formed in the pipe**

Controlling the semi-solid state

To maintain the correct consistency of the Ice Pig during an operation a **freezing point depressant is used**

- **NSF approved additives (NaCl) as freezing point depressants**
- **Additional chlorine maybe added**

What Ice Pigging Can and Cannot Do:

Can:

- Remove sediment, bio-film, debris, and FOG
- Be pumped in and out of hydrants
- Clean between 1-2 miles/day
- Clean up to 18 inch diameter pipes (larger possible)
- Clean Water Mains, Raw Water lines and Force Mains

What Ice Pigging Can and Cannot Do:

Cannot:

- Remove heavy tuberculation
- Remove hard water deposits
- It is not a pipe rehabilitation method

Why Clean pipes?

Cleaning pipes improves customer service & reduces costs:

- Reduce discolored water complaints
- Improve water quality compliance
- Reduce biofilm deposits
- Reduce THM production
- Remove iron and manganese build up

Why clean Force Mains?

- **Maintain and restore flow rates**
- **Odor issues**
- **Pumping costs**
  Sediment build up reduces the pipe capacity in turn increasing the pumping costs

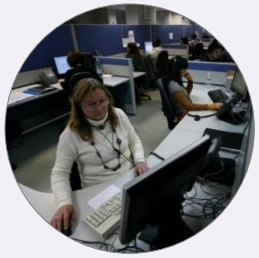
Sediments

Associated problems:

Turbidity

Taste & Odor Issues

Customer complaints



Traditional Cleaning Techniques

Cleaning devices:

Flushing, air scour and jet washing

Operational problems

- **Inefficient**
- **High Water Usage**
- **Customer service affected**

  Long interruption to supply

Traditional Cleaning Techniques

Cleaning devices:

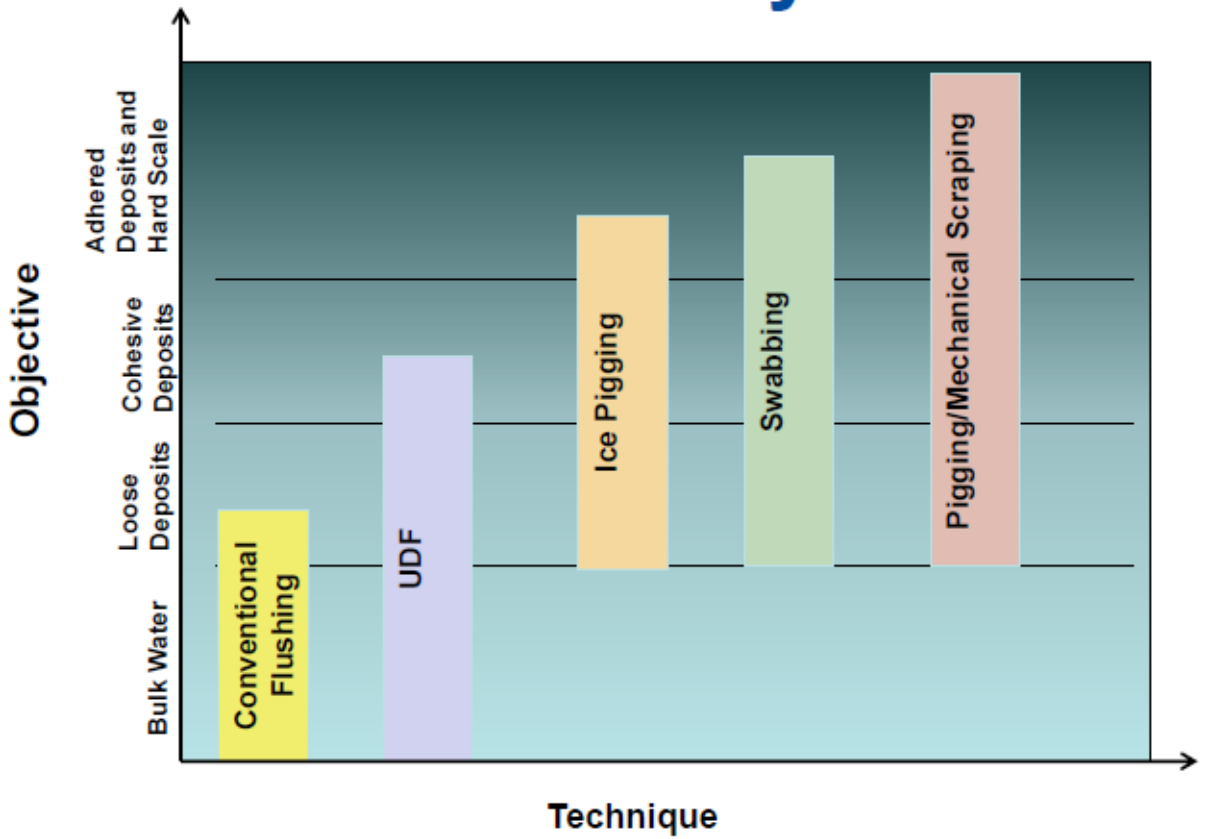
Pigs

Swabs

Operational problems:

- **Incompatible with**
  pipe bends and changes in diameter
- **Requires Excavation**
  Excavate to launch and receive pigs
- **Customer service affected**
  Long interruption to supply

Main Cleaning Comparative Summary



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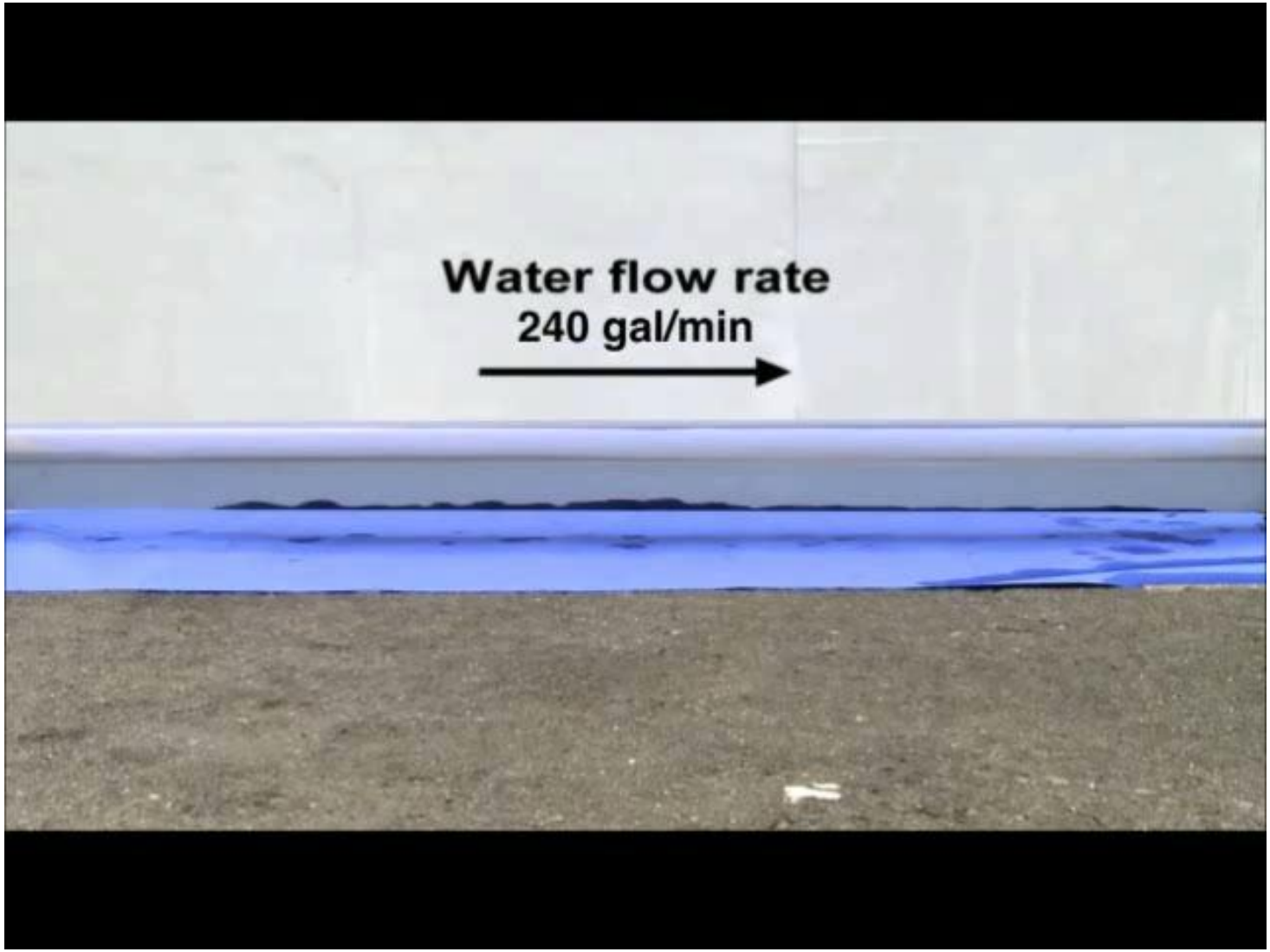
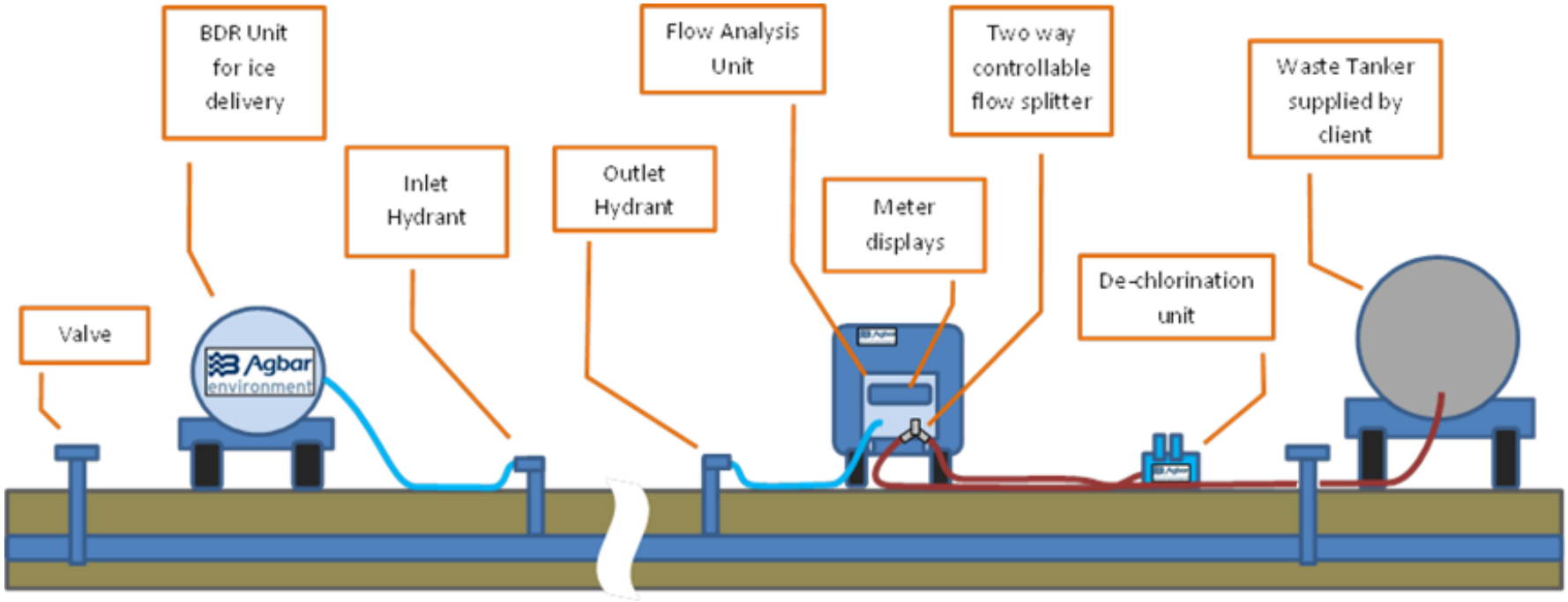

Water flow rate
240 gal/min

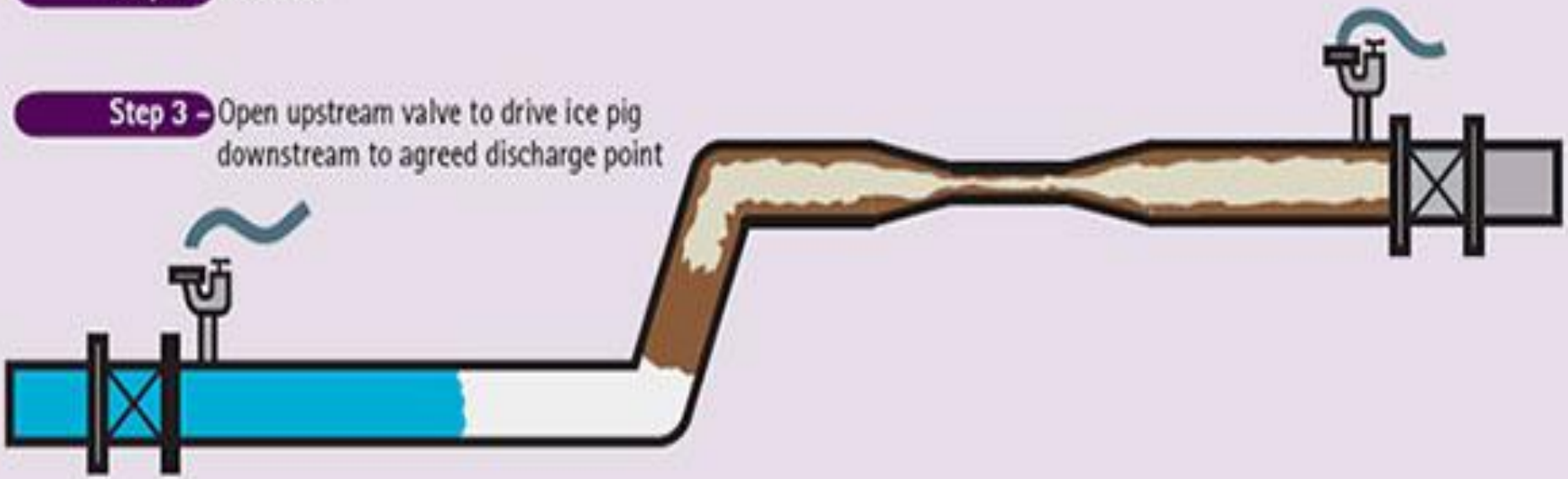
Ice Pigging in Practice:



Step 1 – Isolate main

Step 2 – Insert ice

Step 3 – Open upstream valve to drive ice pig downstream to agreed discharge point

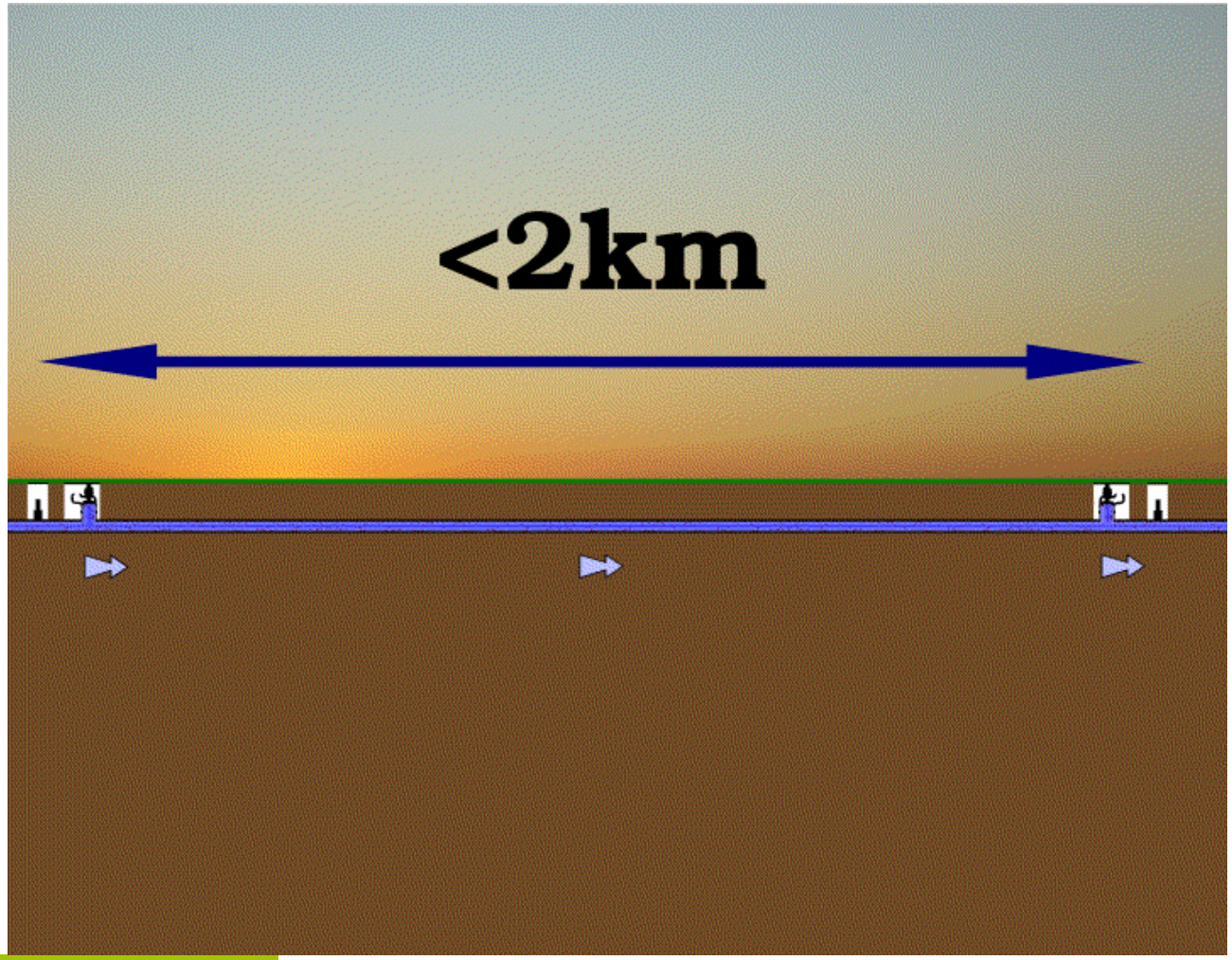


Step 4 – Collect ice pig

Step 5 – Flush and return to service

Ice Pigging in Practice:

Less than 1.25 miles



Ice Pigging in Practice:

Custom built equipment

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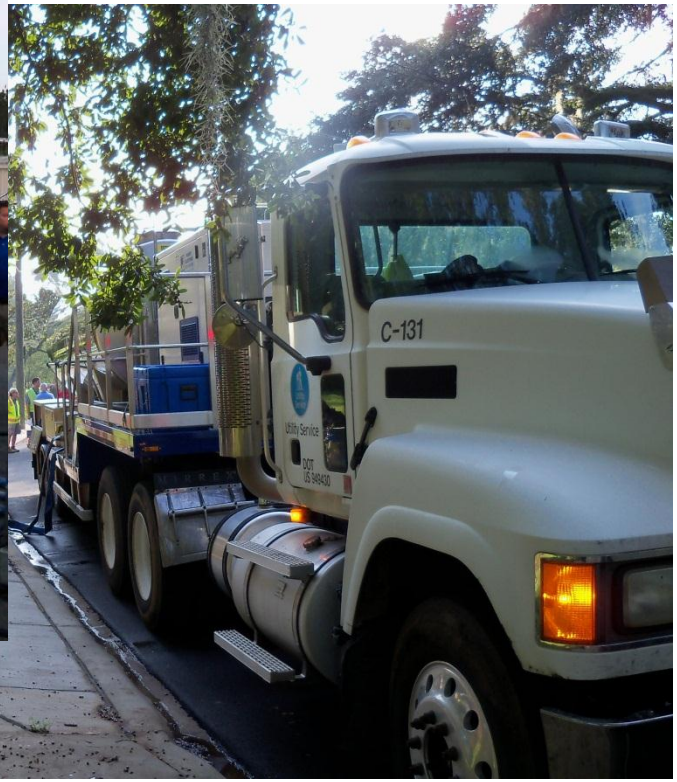
Custom built equipment



Custom built equipment

Ice Pigging in Practice:

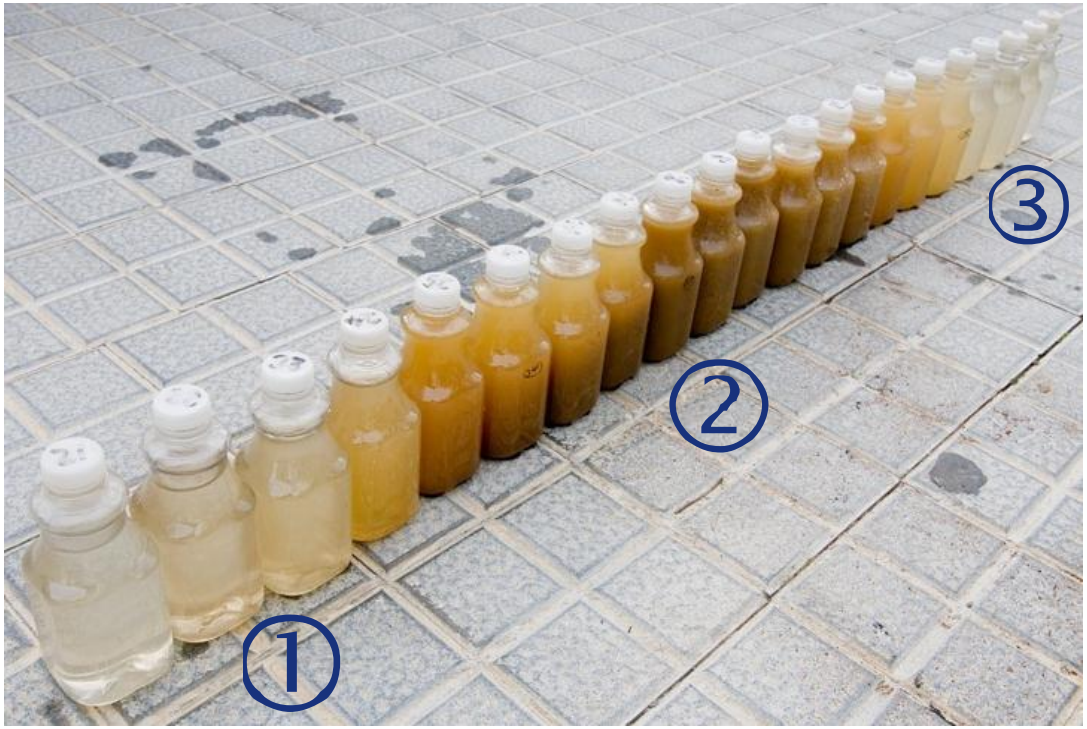
Custom built equipment

Last week in Western Ohio

Ice Pigging in Action:

What comes out:

Actual Samples

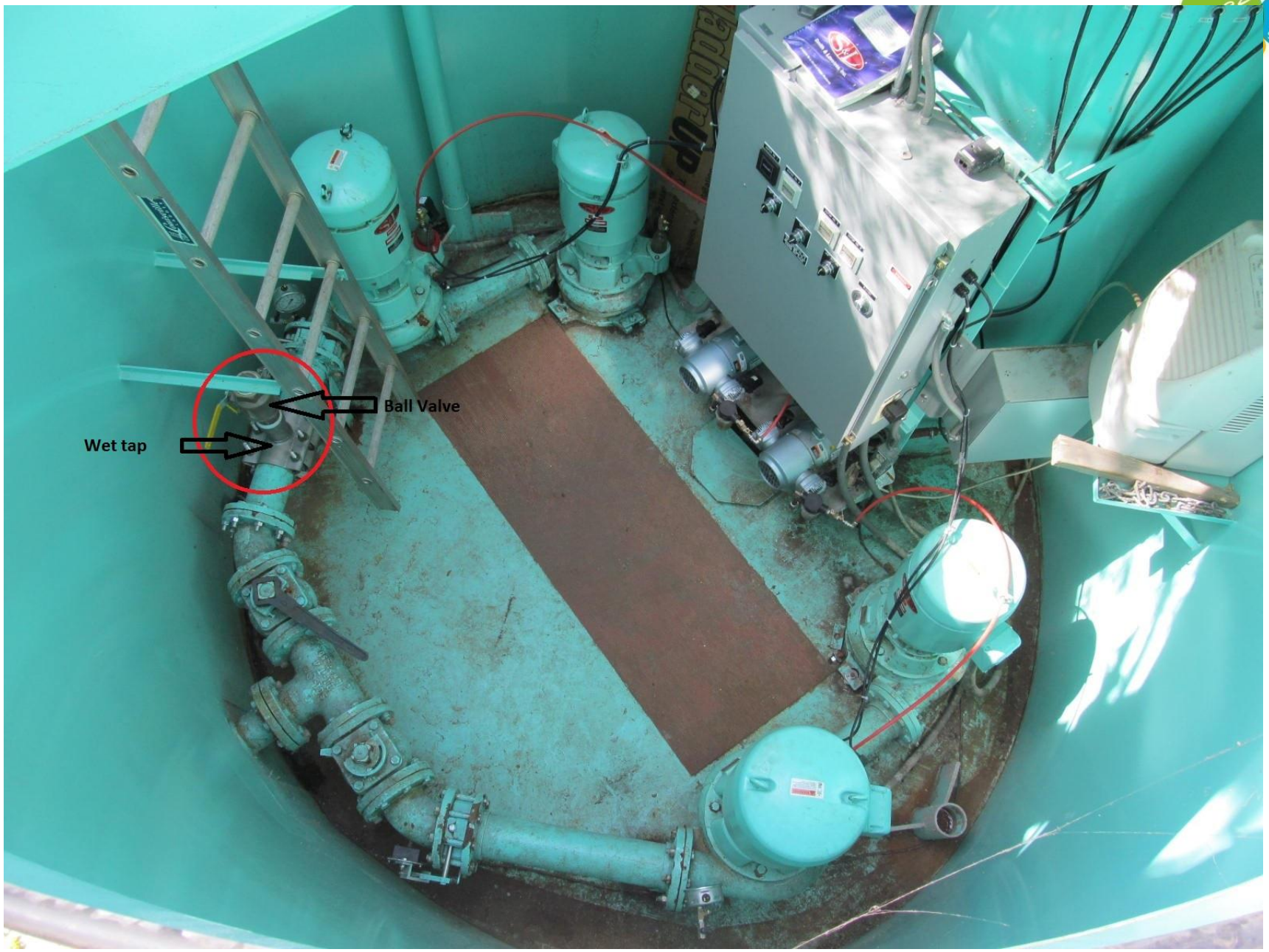


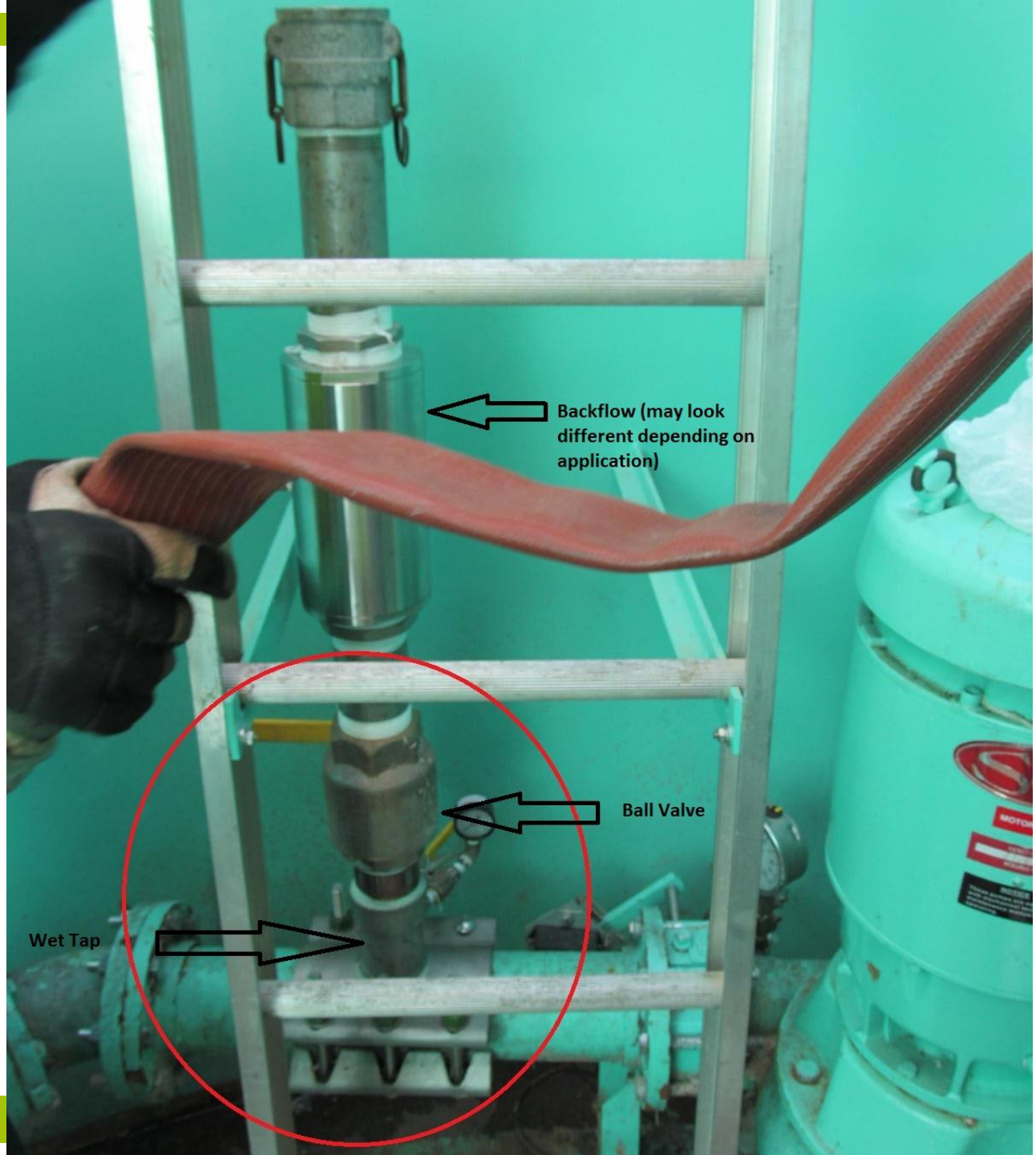
① **Sample from front of pig**

② **Sample from middle of pig as it carries through sediment**

③ **Sample at end of pig where water is clean again**

75 Lbs per mile on average -- 1 raw water line we got 800 lbs in 1 mile


Ball Valve
Wet tap


Backflow (may look different depending on application)
Ball Valve
Wet Tap


WERNER

Things to consider when Ice Pigging a Force Main

- Diameter of the pipe
- Length of Main
- Material of pipe
- Capacity of Wet Well
- How do we keep the pumps running
  - Fire Hydrant
  - Tanker truck
- Where will we inject the ice
- How will we discharge
- Temperature of water in the wet well


Nearest Fire Hydrant
Air Release Valve
West Street Pump Station
East Side Pump Station

Ice Pigging WW Force Main Improves Pumping Efficiency

- Pre cleaning pump tests conducted on 10/1/2012.
- 2 Ice Pigging runs on 1,200’ of 4’ diameter cast iron force main on 12/3/13.
- Post cleaning testing conducted on 1/14/2013.

Pre and post pump test results:

Date	Pump 1	Pump 2
10/1/2012	257 gpm	256 gpm
1/14/2013	334 gpm	325 gpm
	29.9% increase	25.9% increase

By cleaning the force main and **improving flows over 25%**, the Borough can postpone the capital improvement project, allowing that money to be used more effectively.

Dallastown Borough, PA

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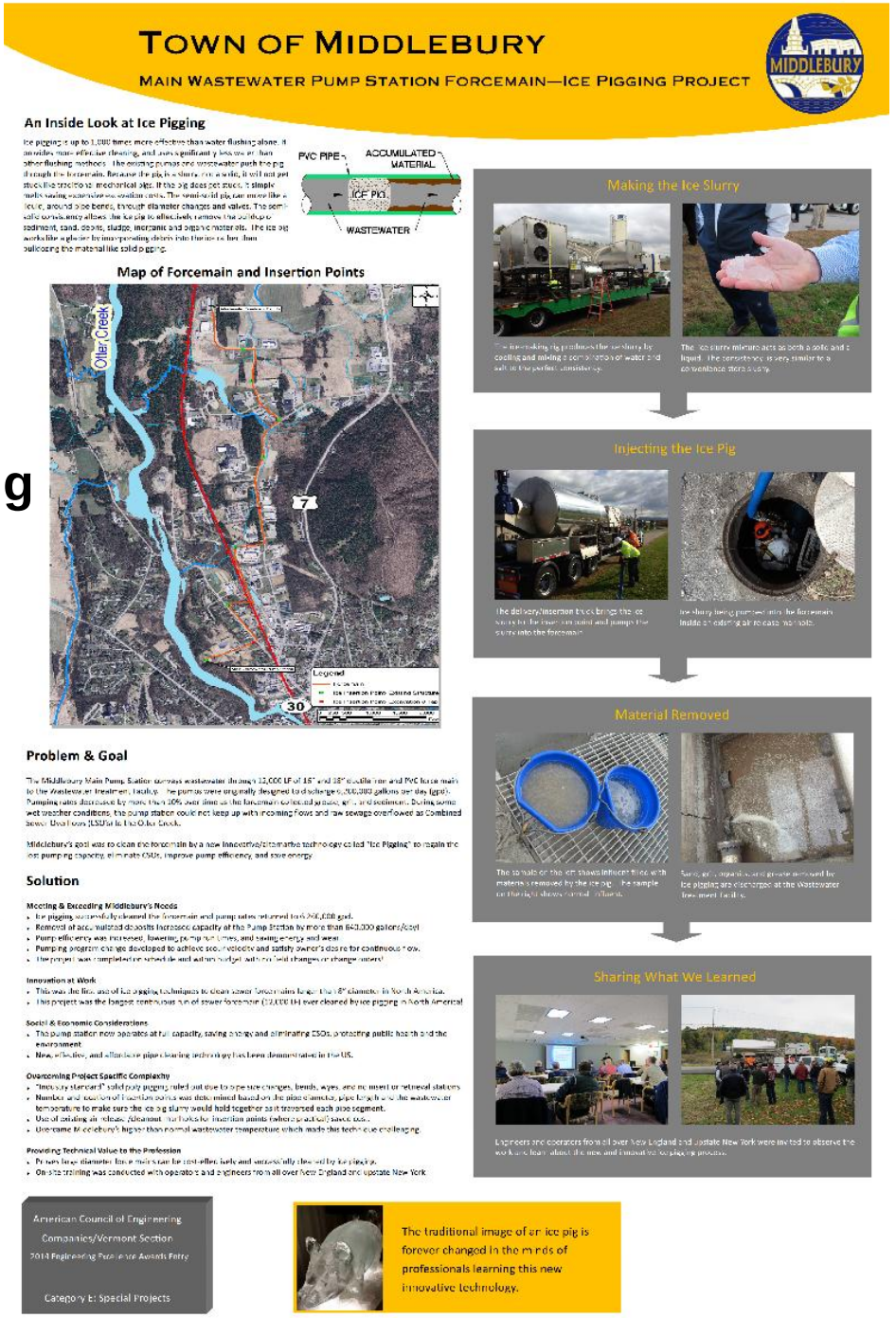
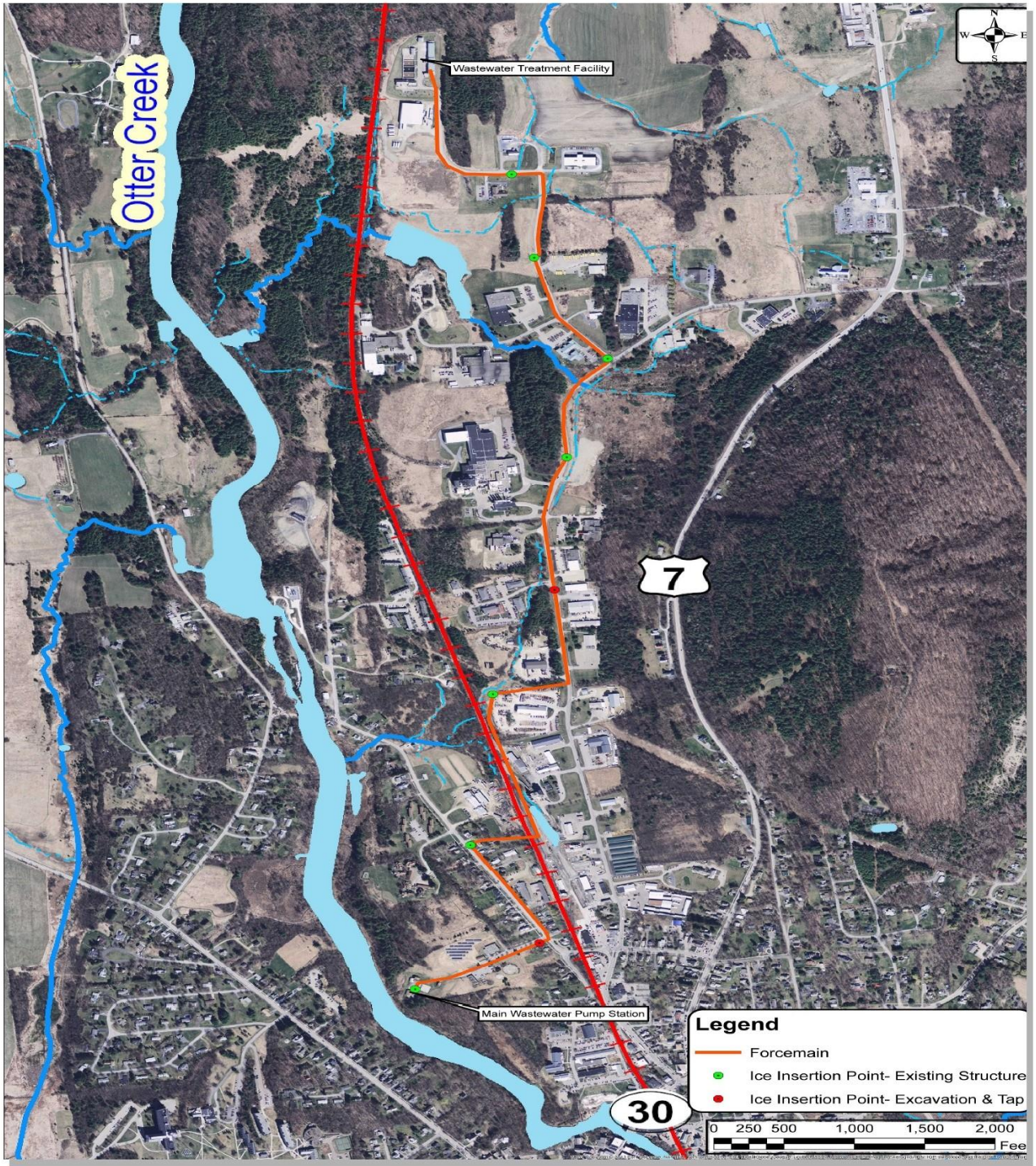
Case Study

American Council of Engineering Companies/Vermont

No other company would bid on this job with traditional methods




Otter Creek
Wastewater Treatment Facility
Main Wastewater Pump Station
7
30
Legend
Forcemain
Ice Insertion Point- Existing Structure
Ice Insertion Point- Excavation & Tap
0 250 500 1,000 1,500 2,000
Fee

Problem & Goal

- The Middlebury Main Pump Station conveys wastewater through 12,000 LF of 16" and 18" ductile iron and PVC force main to the Wastewater Treatment Facility. The pumps were originally designed to discharge 6,200,000 gallons per day (gpd). Pumping rates decreased by more than 10% over time as the force main collected grease, grit, and sediment. During some wet weather conditions, the pump station could not keep up with incoming flows and raw sewage overflowed as Combined Sewer Overflows (CSO's) to the Otter Creek.
-
- Middlebury's goal was to clean the force main by a new innovative/alternative technology called "Ice Pigging" to regain the lost pumping capacity, eliminate CSOs, improve pump efficiency, and save energy.

Solution

Meeting & Exceeding Middlebury's Needs

- Ice pigging successfully cleaned the forcemain and pump rates returned to 6,260,000 gpd.
- Removal of accumulated deposits increased capacity of the Pump Station by more than 640,000 gallons/day!
- Pump efficiency was increased, lowering pump run times, and saving energy and wear.
- The project was completed on schedule and within budget with no field changes or change orders!

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Material Removed

The sample on the left shows influent filled with materials removed by the ice pig. The sample on the right shows normal influent.

Sand, grit, organics, and grease removed by ice pigging are discharged at the Wastewater Treatment Facility.

Ice Pigging WW Force Main Improves Pumping Efficiency

- Original design flow rate was 6.2 mgd.
- Decrease in flow rates – Industrial discharge included Cabot Cheese and several breweries.
- 10/4/13 flow rate was 5.62 mgd (3,904 gpm).
- 10/28/13 conducted 9 IP runs on 12’ of 16” & 18” force main.

Pre and post pump test results:

Date	Two Pumps Flow Rates
10/4/2013	5.62 mgd (3,904 gpm)
10/28/2013	6.26 mgd (4,347 gpm)
	11% increase (640,000 gpd or 444 gpm))

By cleaning the force main flow rates increased to 6.26 mgd (4,347 gpm) for an approximate 11% increase in flow.

Middlebury Wastewater, VT

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January 2013 Underground Construction

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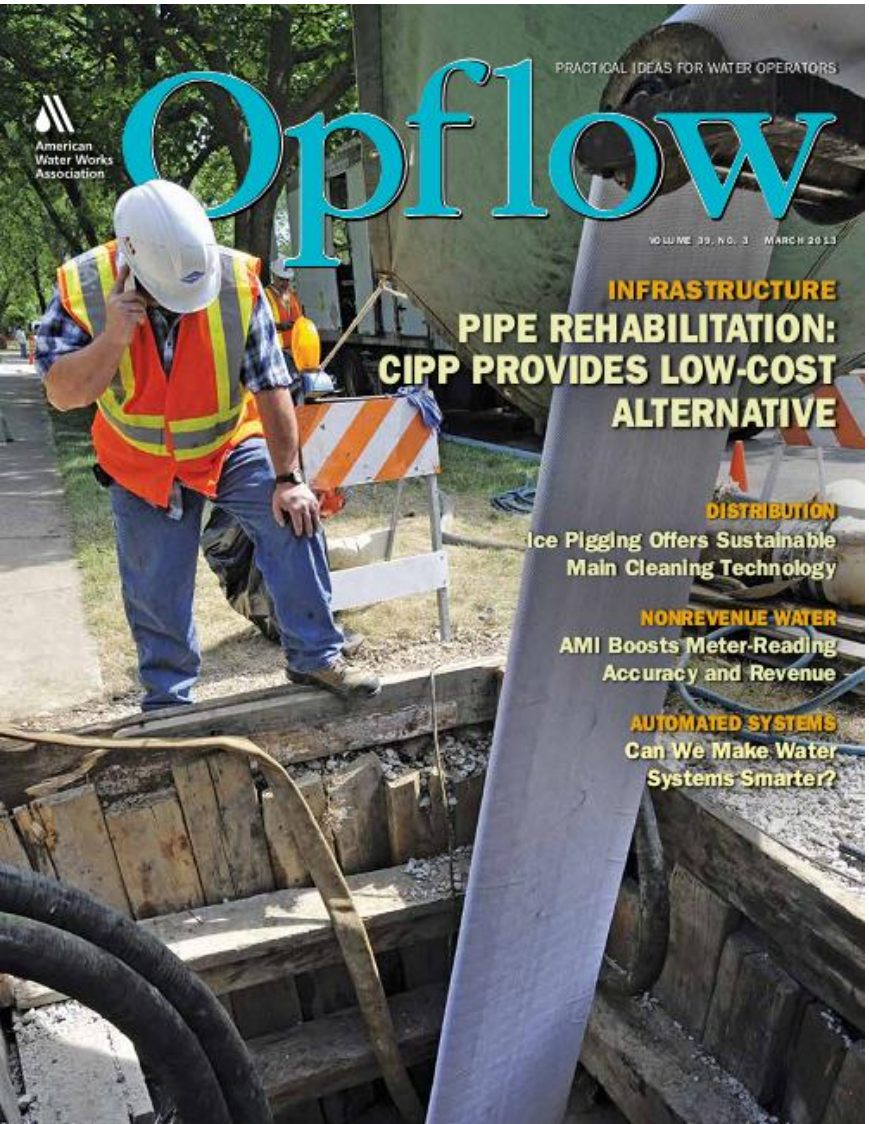
August 2012 & March 2013 Opflow



Questions?

ICE PIGGING

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