

Great Hill Tunnel and Pipeline Restoration Project



NASTT Northeast Chapter Technical Forum

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The History

- Constructed in 1927; 2,700' long, 6' x 6' horseshoe shaped concrete lined tunnel prior to a transition to a 48" cast iron pipe
- Only source of supply for RWA's largest WTP
 - 60% of customers served via transmission system
- Tunnel system passes under 150' high ridge, through active quarry
- Known defect in the tunnel since 1970's determined by diver's inspection

The History (cont'd)

- Leak associated with this defect was stable and monitored routinely by weir and ROV
- Complex planning for tunnel repair began in early 2017
- Tunnel leak needed repair, but was not an emergency
- October 2017 flow doubled
- Inspection/Tracer study verified 2nd leak present

New Boil Area



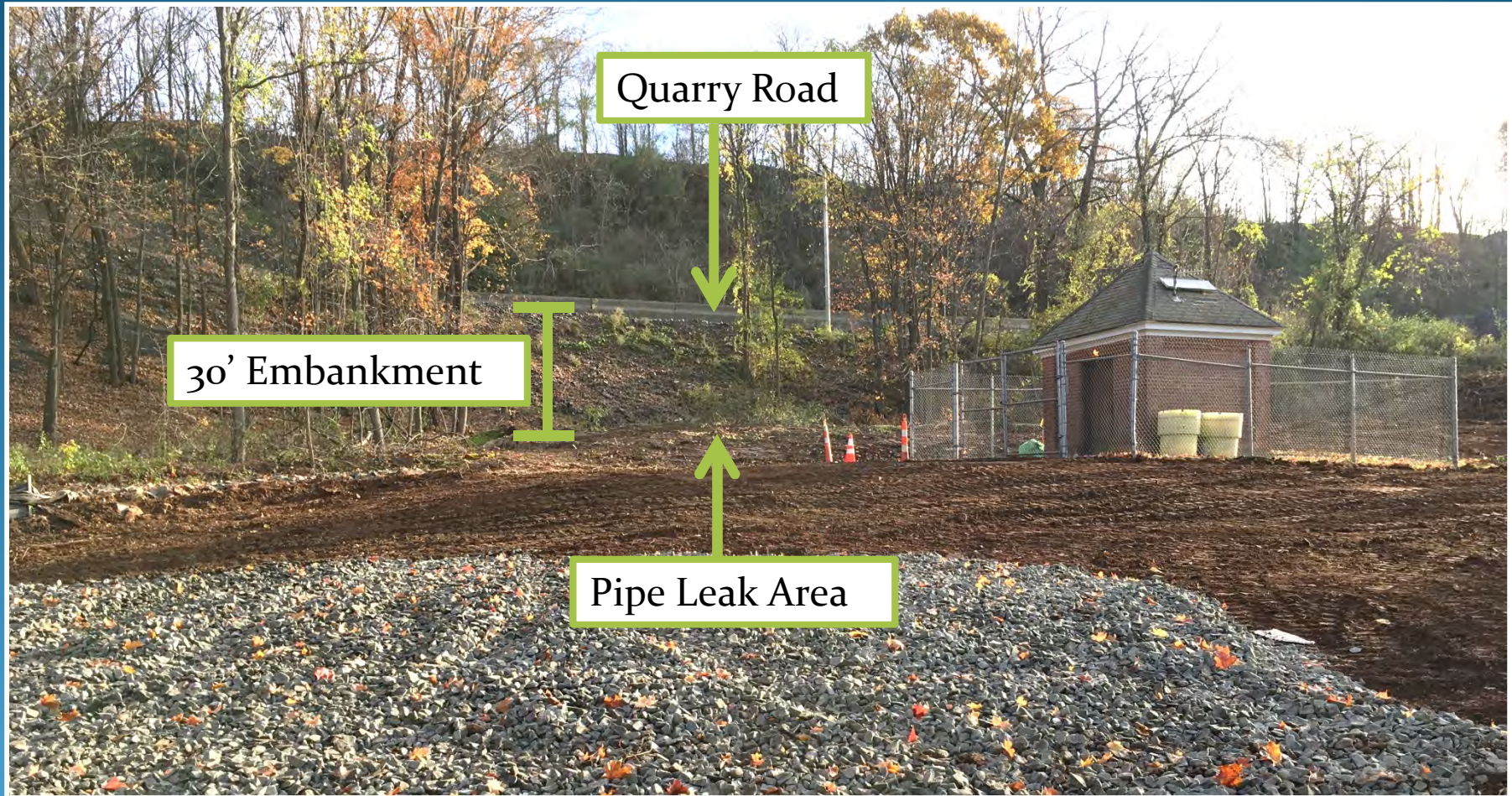
Pipe Bedding Material



Challenges

- Repairs needed on both tunnel and 48-inch transmission main
- Exact location of pipe break unknown
- Site conditions are extremely challenging
 - Steep and deep excavation
 - Quarry road and rail
- Weather conditions over the winter
- No Redundancy - Tunnel shutdown requires treatment plant shutdown

Area of Pipe Leak



Project Components

- ROV Inspections
- By-pass System Installation
- Locate Pipe Leak
- Tunnel Rehabilitation
- Pipe Repair

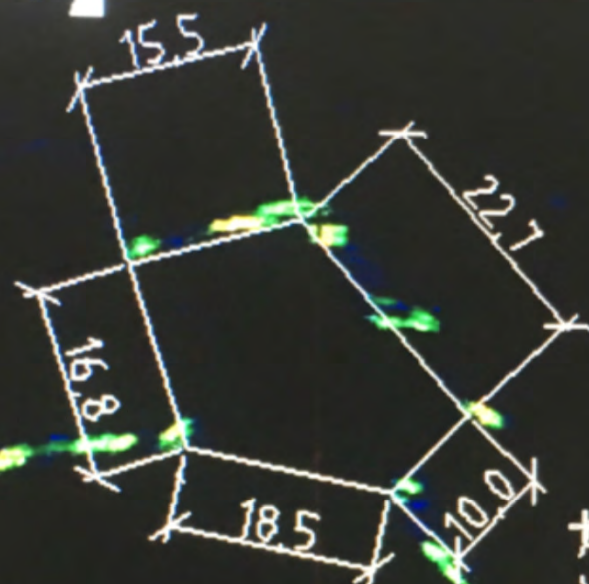
ROV Inspections

March 2017 - Tunnel Defect

Oct./Nov. 2017 - Pipe Leak



Profiling Sonar Image recorded
at Station 28+66



Area: 3.1 ft^2
Volume: Assuming
breach is 3ft deep
volume = approx 9.1 ft^3

Great Hill Tunnel Defect





By-pass System

Design flow 40-MGD

9 pump systems

9,000 ft. through active quarry











Pipe Leak

Locate

Repair

Determine Cause

Diver's Belt



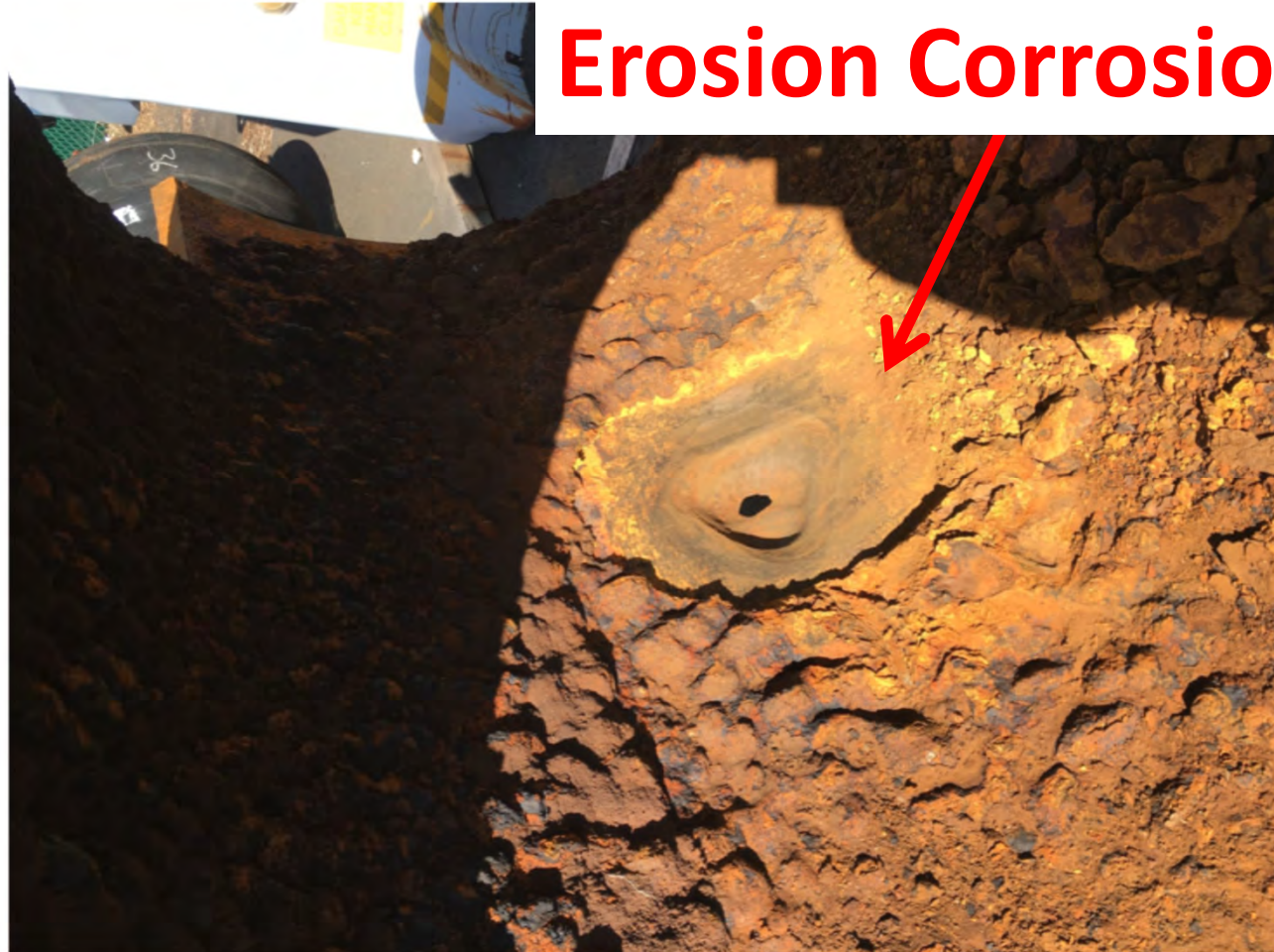


Pipe Leak



Belt Buckle

Erosion Corrosion

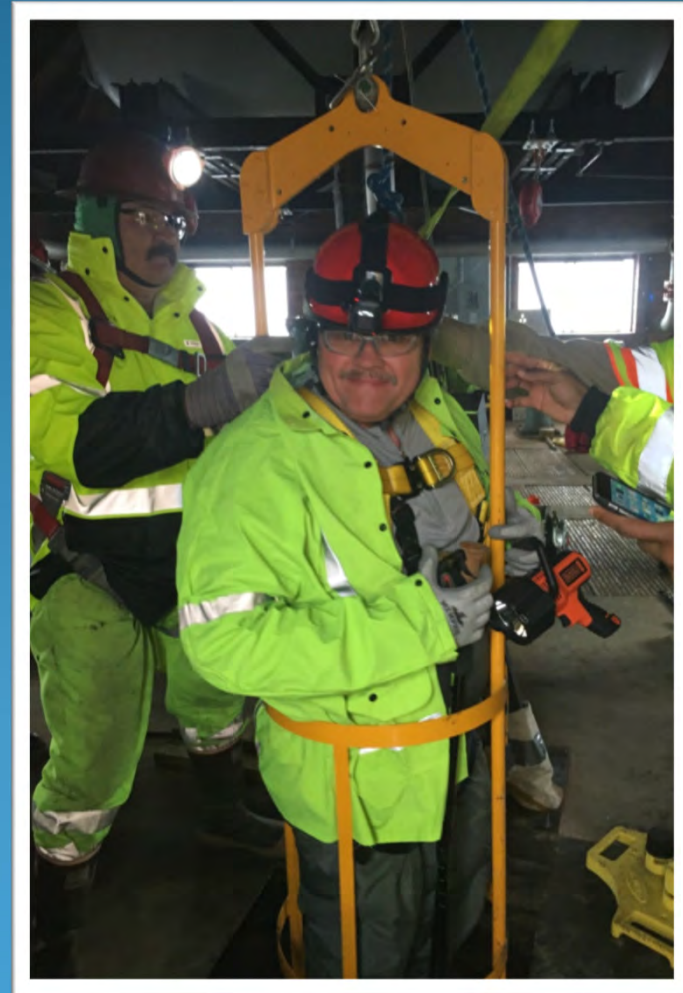


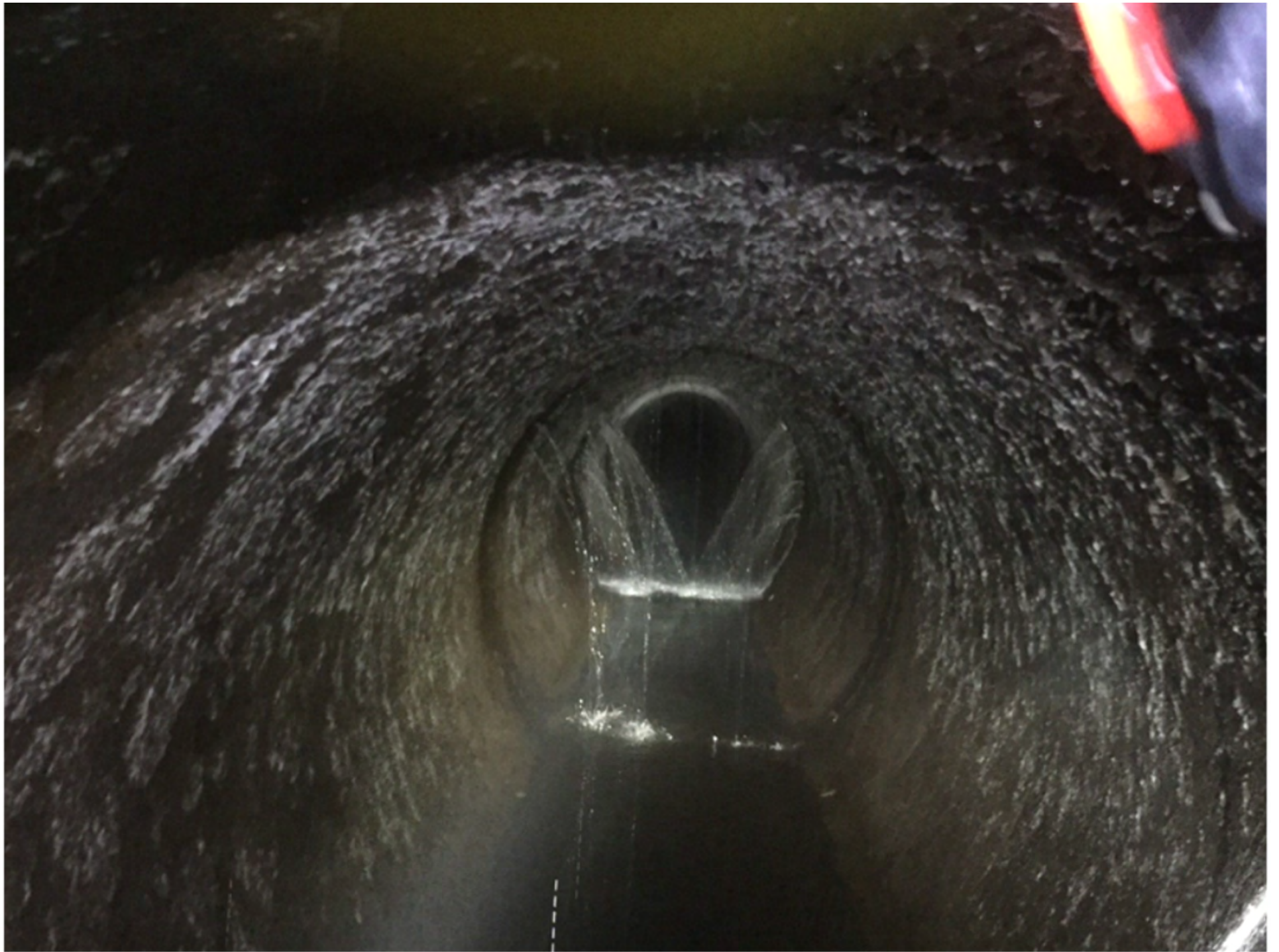
Tunnel Rehabilitation

Inspect
Repair

Initial Tunnel Inspection

- Initial entry through reservoir intake
- Team of RWA, contractor and rescue team walked entire length of tunnel
- Sandstone/Trap rock
- Condition of tunnel generally good



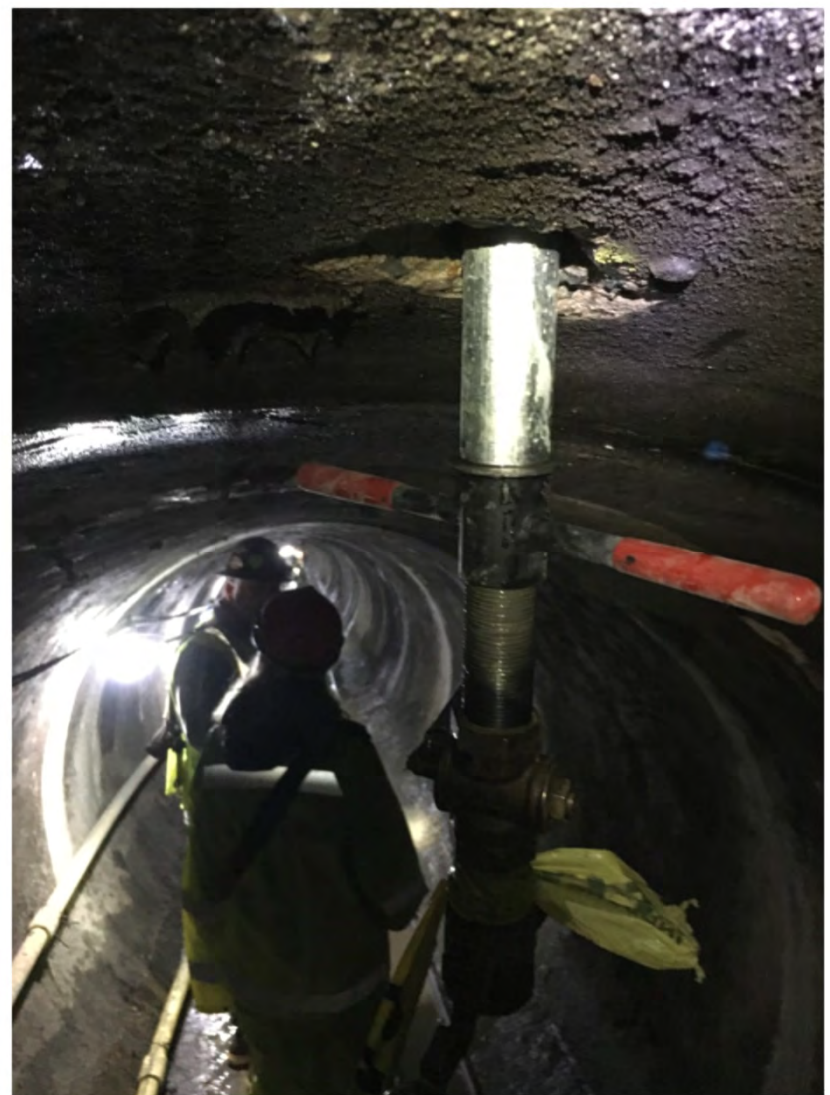




Summary of Repairs

- Surface Repairs
 - 39 concrete repair mortar
 - 8 CY of dry shotcrete and WWF
 - 2 Rock anchor repairs
- Probe Holes – total of 129
 - 100' intervals; 10, 12 and 2 o'clock spacing
 - Additional holes at 50' intervals; 11 and 1 o'clock
- Primary and Secondary Grouting
 - 346,000 lbs. of cement for primary grouting
 - 5,000 lbs. of cement for secondary grouting

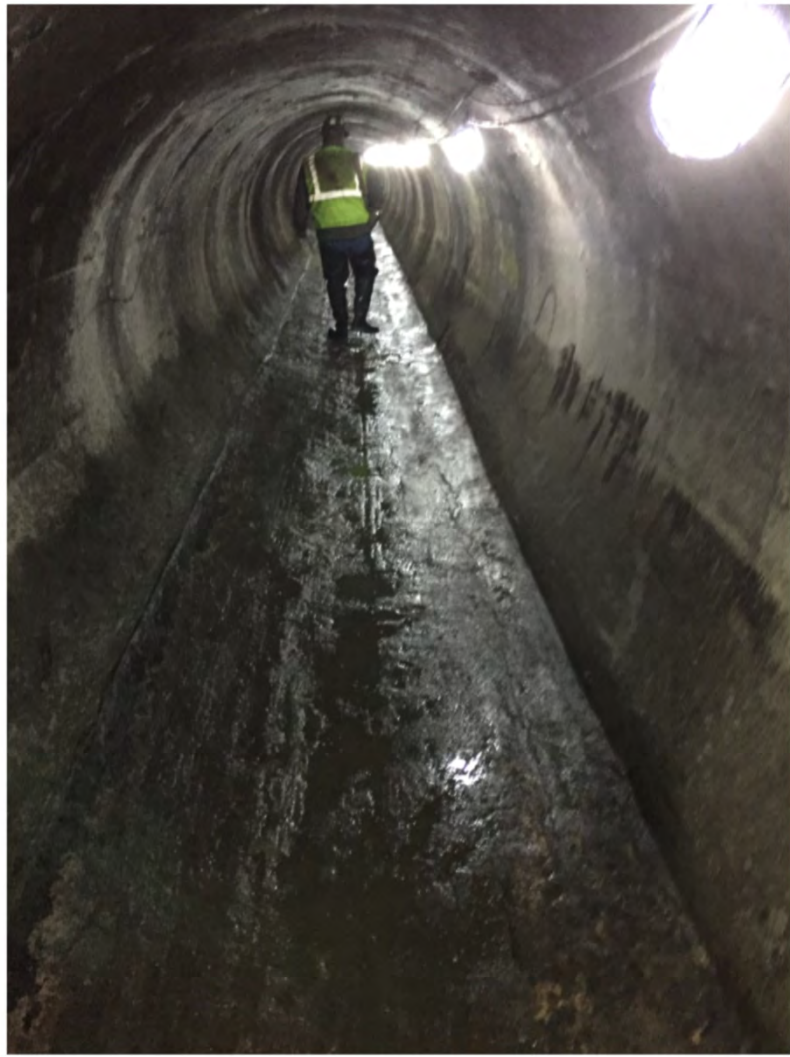
Repair











Pipe Repair

Sliplining
48" DIP replacement



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Questions?

