

Recovering from H₂S Attack: Greenwich, CT – Shore Road Area Sewer Rehabilitation Project

January 26, 2016

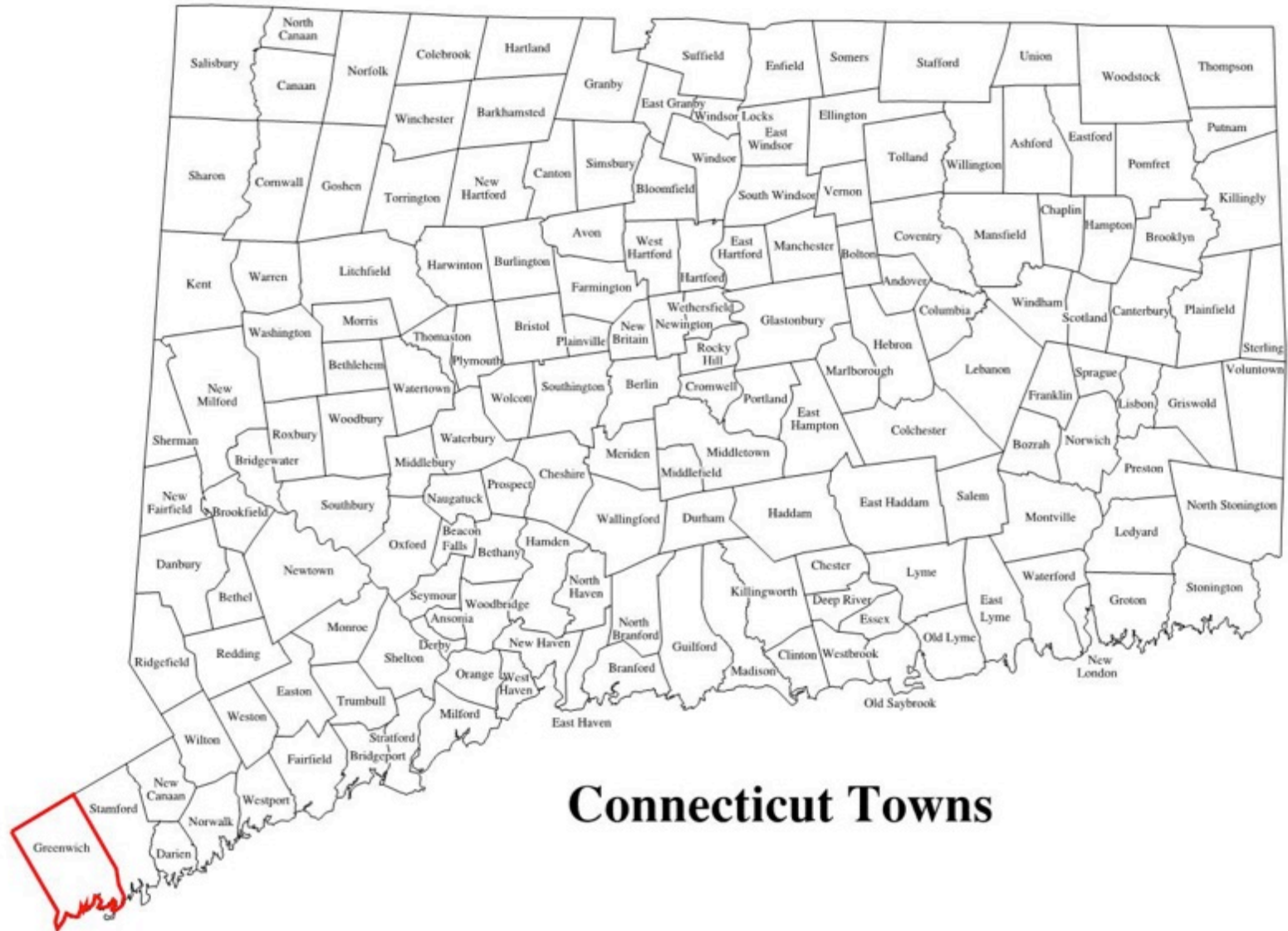


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Greenwich, CT



Connecticut Towns

Hydrogen Sulfide Attack and Rehabilitation

- Aggressive Environment in critical sewers and structures (H_2S)
- Town is taking a proactive approach to sewer rehabilitation
- Few critical, high-profile projects in recent years
- Manholes and structures are in critical condition



Shore Road Area Sewer Rehabilitation Project



Shore Road Area Sewer Rehabilitation Project

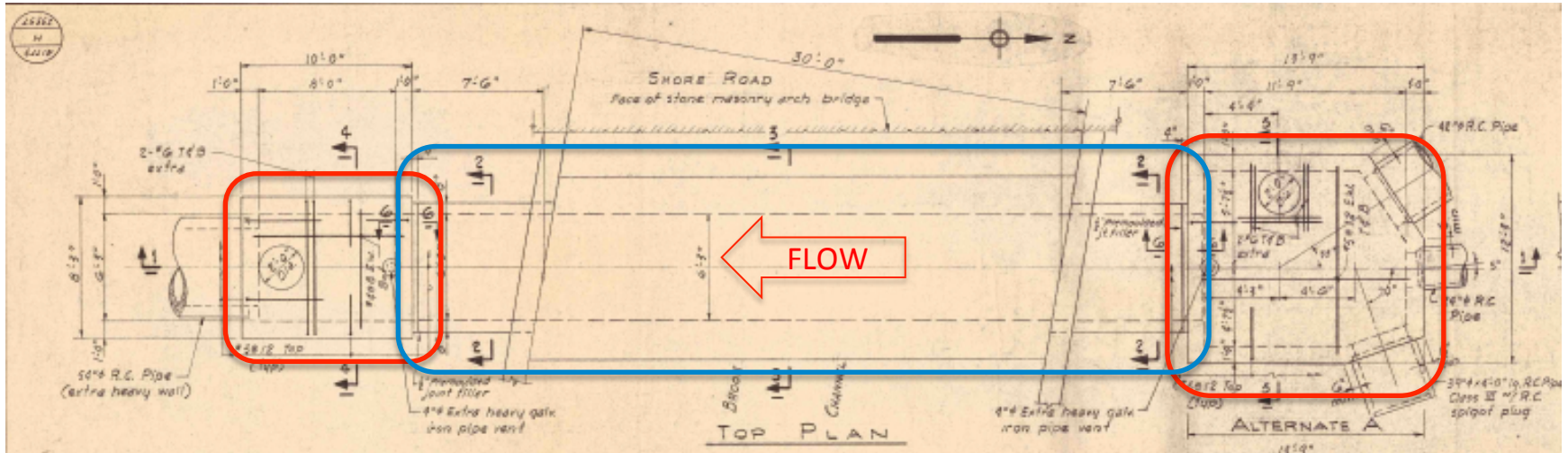
- Critical sewers and structures
- Goal: Rehabilitation to the highest standards feasible due to the project conditions and complexity (“1 shot at this”)
- CIPP Sewer Lining, Long-lasting rehabilitation of structures



Structural Inspection

- Confined space entry during low flow
- 2 days – 2 structures; constructed in 1964
 - Junction Chamber – 13.75' x 12.25' x 9.00'
 - Transition Chamber – 10.00' x 8.25' x 9.00'
- Limited visual inspection of elliptical conduit
- Conducted due to concerns about concrete deterioration inside the chambers
- Concrete surfaces unprotected against attack from H₂S

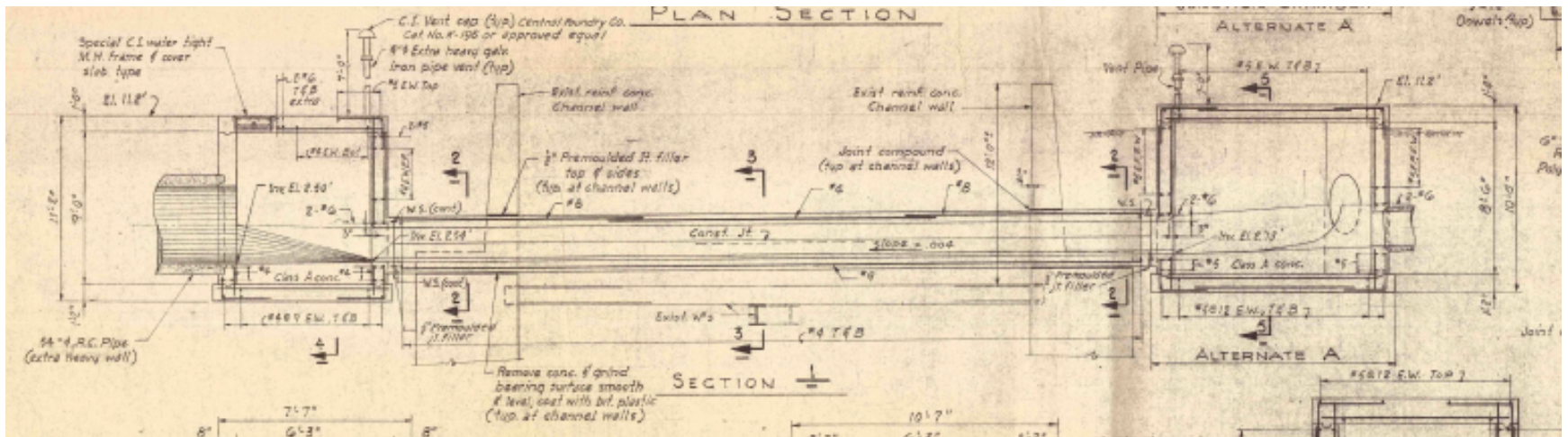


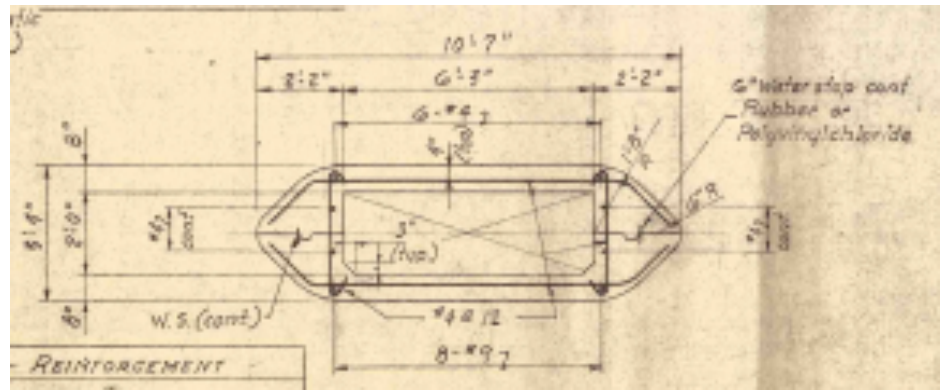
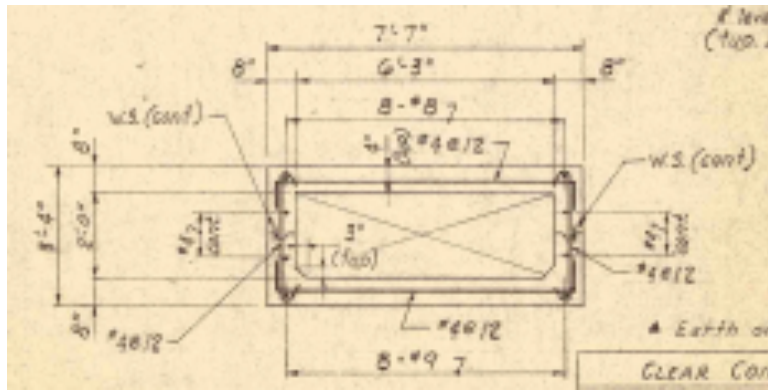


Transition Chamber

Elliptical Conduit

Junction (Home Plate) Chamber





Junction Chamber and Transition Chamber

- Visual observations
- Hammer sounding of accessible concrete surfaces
- Photography of representative conditions
- Three 4- inch diameter concrete core samples at each of the chambers
 - One core was obtained from the top slab
 - Two cores were obtained from the walls

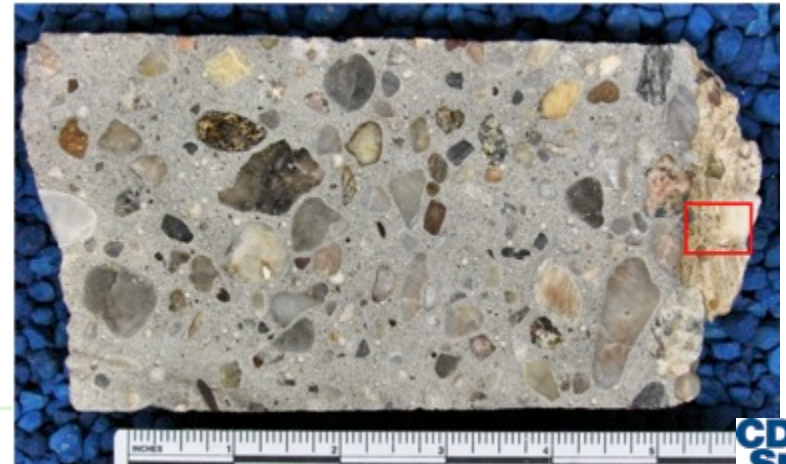


Transition Chamber Wall



Junction (Home Plate) Chamber Walls

Junction Chamber and Transition Chamber



Junction Chamber and Transition Chamber

- Petrographic Analysis
- Sulfate Content & pH:
 - Roof Slab: 0-1", 1-2" & 6"
 - Walls: 0-1" & 1-2"
- Results:
 - Petrographic confirmed chemical attack
 - Reinforcing steel in relatively good condition
 - 0.4 to 0.8 inches of remaining concrete surface integrity compromised
 - High amount of sulfate content in all samples to a maximum depth of 2 inches
 - pH of concrete samples ranged between 8.5 – 11.5

Conduit over Horseneck Brook

- Exposed concrete surfaces on the walls above the water surface and the underside of the top slab had coarse aggregate exposed



Conduit over Horseneck Brook



Conduit over Horseneck Brook



Conduit over Horseneck Brook



Junction Chamber and Transition Chamber



Junction Chamber and Transition Chamber



Junction Chamber and Transition Chamber



Conclusions and Considerations for Future Projects



- In this case, worthwhile to spend the time and funds for full assessment and rebuilding
- Can you afford this level of assessment and rehabilitation? What are the consequences of doing less? Consider criticality and ease of access – evaluate goals for each project.

Outreach and Coordination



- Residents
- Businesses
- Commuters
- Fire Department



Team Partners

- Town of Greenwich
- CDM Smith
- Corrosion Probe Inc
- Godwin Pump (Xylem)
- A. Vitti Excavators
- United Concrete Products
- Insituform
- National Water Main



Thank you for your attention!

Questions?

Similar Project (2015) - Bruce Park Avenue Area

- Also critical/difficult location and complex bypass
- Similar approach – manholes are structures!



Conduit over Horseneck Brook



Connection between Conduit & Chambers

