I Wonder What's Down Under?

Condition Assessment and Rehabilitation of Critical Sewer Siphons

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CDM Smith

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2023 Annual Conference & Exhibit
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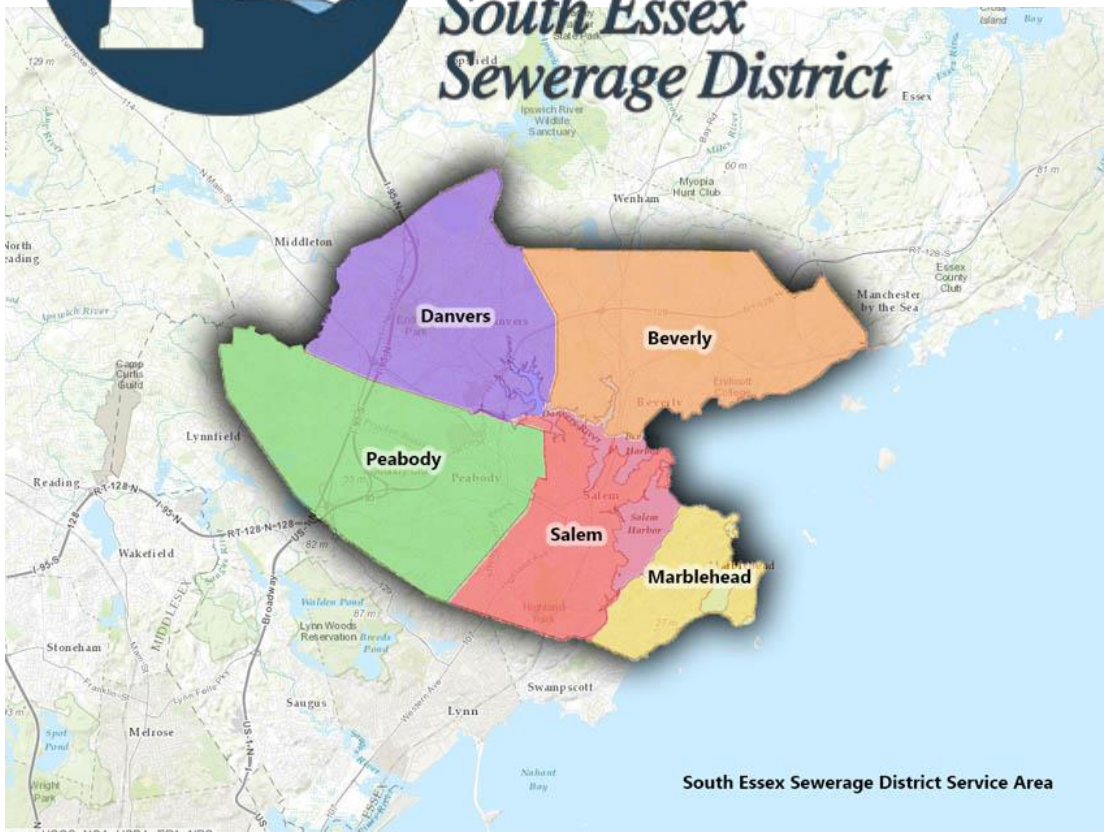
Presentation Overview

- Background
- Need for Action
- Condition Assessment
- Alternatives Evaluation
- Rehabilitation
- Lessons Learned

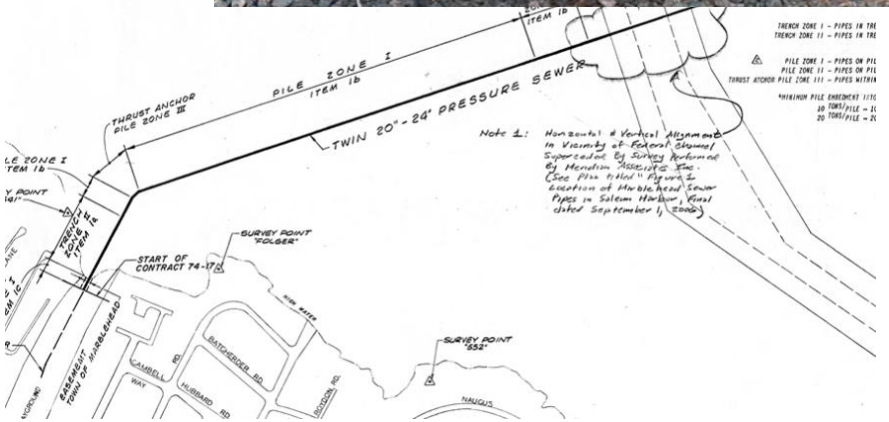
South Essex Sewerage District

- Established in 1925
- Collect, Convey and Treat Wastewater from 5 Member Communities
- Serves 189,000 people and businesses
- 29 Miles of Interceptor and Force Mains, Pump Stations and other facilities



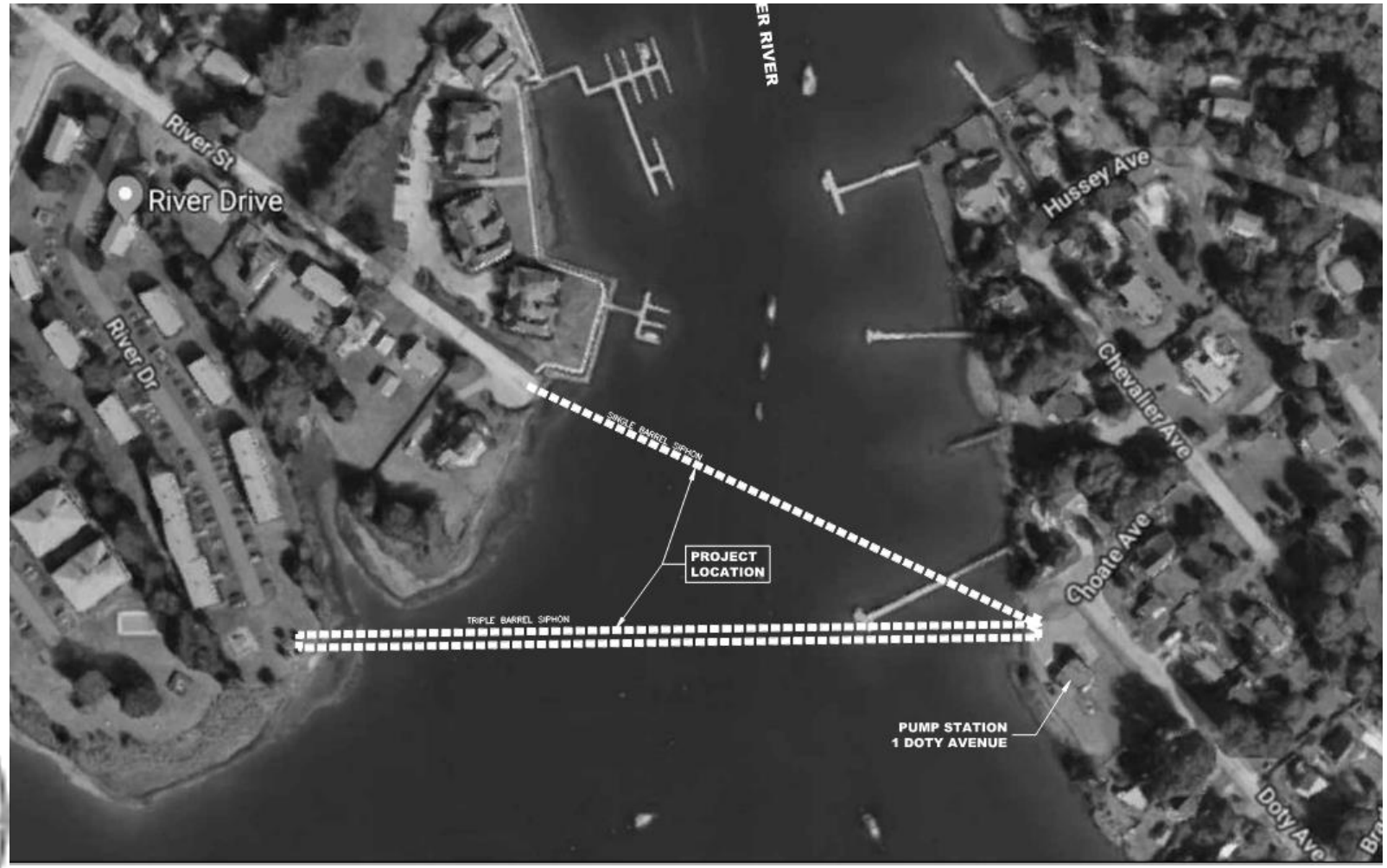
Project Drivers and Background

- District Operates Several Subaqueous Pipelines – Siphons, Force Mains
- 2013 – Failure and Replacement of Marblehead Force Main
- 2017 Collection System Assessment Plan
- Danvers Siphons Identified as a High Priority Assessment Project
- Primarily Concerned about External Corrosion



Danvers Siphons

- Owned and Maintained by the District Serving the Town of Danvers
- Crossing Porter River
- Single Barrel 24-in CI Siphon 1920's – Approx 750lf
- Triple Barrel 24-in DI, 24-in DI, 16-in DI 1970's Approx 950 LF

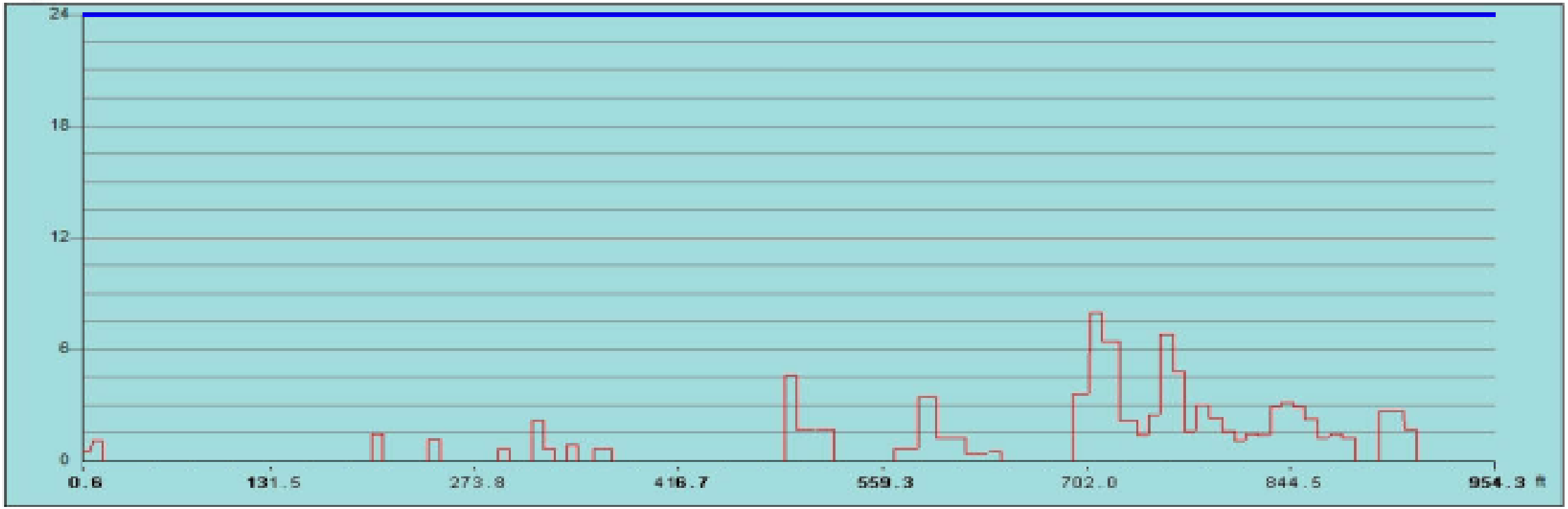


Condition Assessment Approach

- Began in 2018
- Dual Approach
  - Sonar Inspection
  - Wall Thickness Assessment

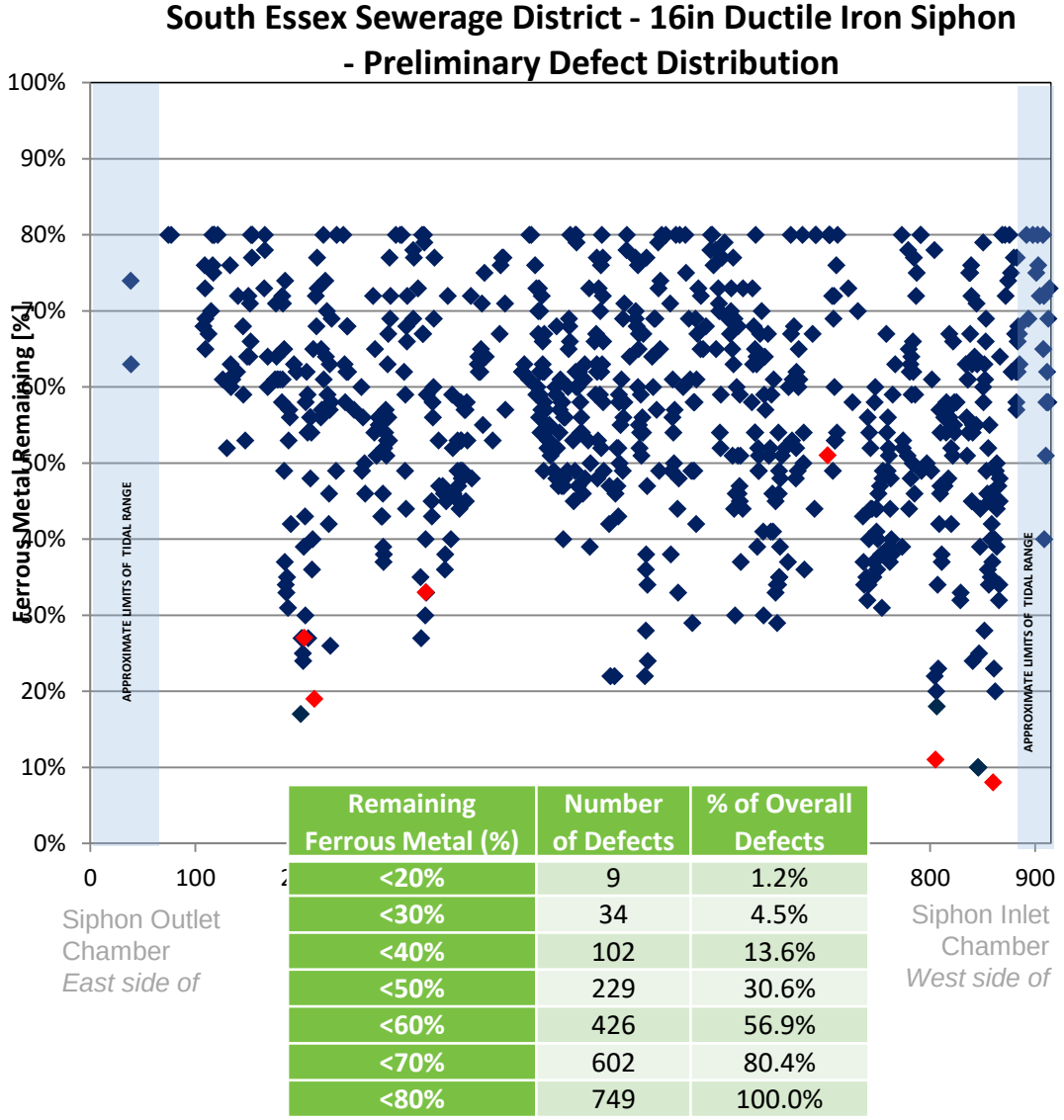
Sonar Inspections

- Purpose – Assess Sediment and Debris Levels
- Redzone Robotics and National Water Main Cleaning Company
- Initial Cleaning and Stringing of Tag Line
- Stand-Alone-Sonar Device
- 24-in Active Siphon up to 1/3 full with Debris, Similar Results with Other Lines



Pipe Wall Condition Assessment

- PICA See Snake Remote Field Testing
- Electromagnetic Evaluation of Pipe
- Detects Wall Loss, Corrosion, Graphitization
- 16-in DI and 24-in CI Siphons were inspected

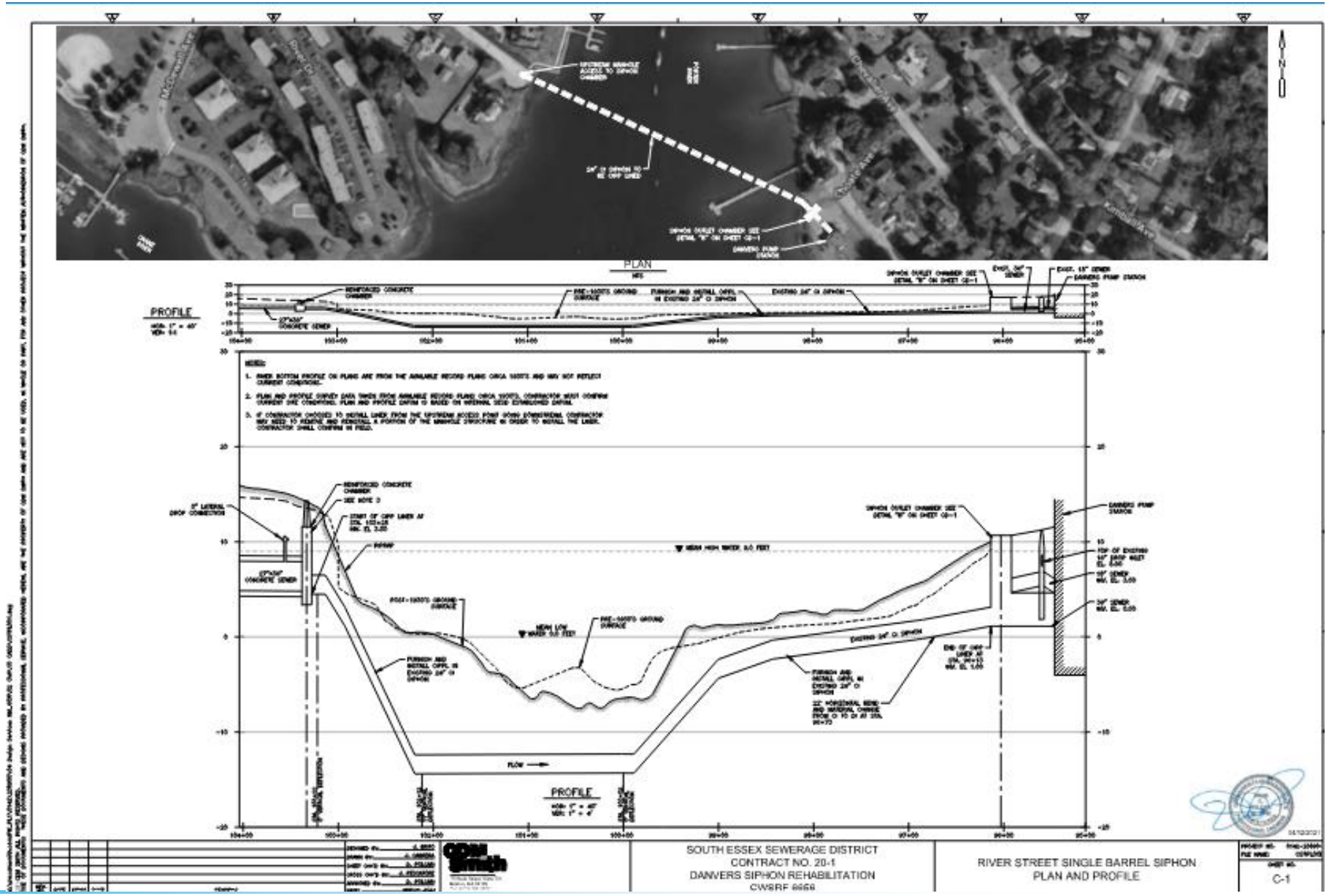


Remaining Ferrous Metal (%)	Number of Defects	% of Overall Defects
<20%	9	1.2%
<30%	34	4.5%
<40%	102	13.6%
<50%	229	30.6%
<60%	426	56.9%
<70%	602	80.4%
<80%	749	100.0%

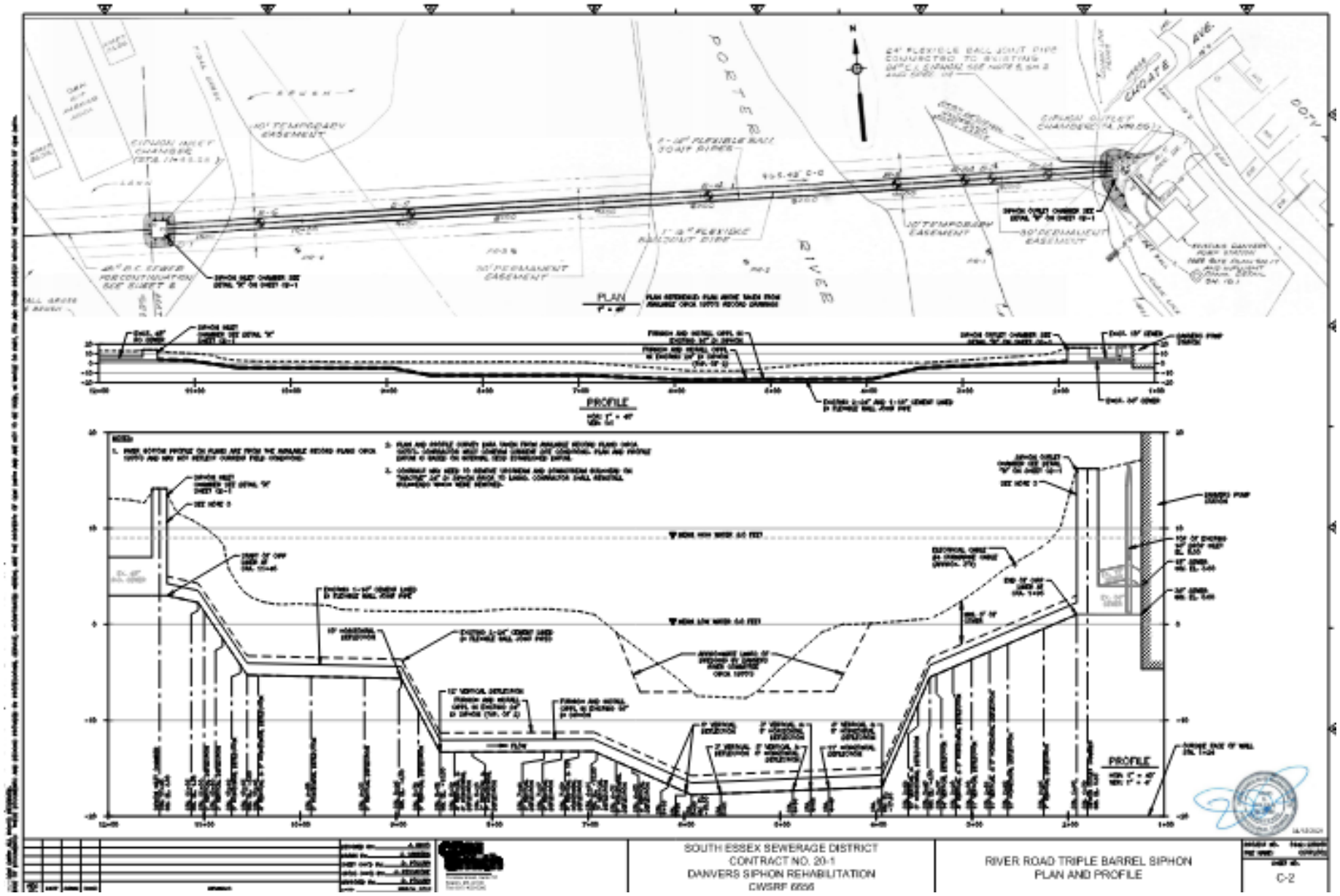
Assessment Results

- Sedimentation and Wall Loss Identified in Siphons
- Structural Rehabilitation Recommended as a Proactive Approach
- Alternatives Evaluated
  - CIPPL
  - Slip Lining
  - Swage Lining
- Primary Evaluation Criteria
- Selected Alternative
- Next Steps

Single Barrel Siphon



Triple Barrel Siphon



Design Phase

- Primary Design Criteria
  - Fully Deteriorated ASTM F 1216
  - External Load – Hydrostatic Head, High Tide Plus Climate Change
- Water Inversion / Cure Only
- Preliner
- Siphon Cleaning and Dewatering

Design Phase

- Order of Lining
- Bypass / Flow Diversion
- Access / Coordination
- Unknown Conditions

Bidding and Construction Phase

- SRF Funding
- Bids Received May 2021
- 2 Bidders, Below Engineers Estimate
- Michels Corporation - $1,295,758

South Essex Sewerage District
Danvers Siphon Rehabilitation
Contract 20-1
CWSRF No. 6656

Bid Taublation May 14, 2021 1:00PM

				Michels Corporation		Insituform Technologies		Engineers Estimate	
Item	Description	Quantity		Unit Price	Total Price	Unit Price	Total Price	Unit Price	Total Price
1a	Clean / CCTV 16 DI Siphon	955	LF	$45	$42,975	$75	$71,625	$100	$95,500
1b	Clean / CCTV 24 DI Siphons	1,910	LF	$45	$85,950	$75	$143,250	$110	$210,100
1c	Clean / CCTV 24 CI Siphon	750	LF	$41	$30,750	$69	$51,750	$120	$90,000
2a	CIPPL 16in DI Siphon	955	LF	$134	$127,970	$205	$195,775	$180	$171,900
2b	CIPPL 24in DI Siphons	1,910	LF	$153	$292,230	$279	$532,890	$210	$401,100
2c	CIPPL 24in CI Siphon	750	LF	$184	$138,000	$300	$225,000	$220	$165,000
3a	Pre Liner 16in DI	955	LF	$6	$5,730	$3	$2,865	$20	$19,100
3b	Pre Liner 24in DI	1,910	LF	$7	$13,370	$4	$7,640	$20	$38,200
3c	Pre Liner 24in CI	750	LF	$7	$5,250	$4	$3,000	$20	$15,000
4	Bypass / Flow Diversion	1	LS	$51,248	$51,248	$127,300	$127,300	$200,000	$200,000
5	Dewatering Siphons	1	LS	$402,175	$402,175	$141,700	$141,700	$250,000	$250,000
6	Miscellaneous Work	1	LS	$47,110	$47,110	$49,000	$49,000	$225,000	$225,000
7	Mobilization	1	LS	$48,000	$48,000	$43,000	$43,000	$100,000	$100,000
8	Fuel Adjustment Allowance	1	LS	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
					Total $1,295,758		Total $1,599,795		Total $1,985,900

Construction Phase

- Preparatory Activities
  - Cleaning
  - Dewatering
  - Inspection
- Bypass / Flow Diversion
- Major Construction Activities

Construction Challenges

- Cleaning
- Dewatering
- “Lift” Area in Installed Liner
  - 12 ft area
  - Recured portion, substantially corrected lift,
  - Extended Warranty
- Acceptance Testing

Conclusions and Lessons Learned

- Effectiveness of Condition Assessment Tools
- Review of Design Documents
  - Effectiveness
  - Lessons Learned
- Construction Phase
  - Challenges
  - Lessons Learned
- Importance of a Proactive Approach

Acknowledgments

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  - David Michelsen – Executive Director
  - Peter Pommersheim – Project Manager
- Town of Danvers
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- CDM Smith
  - John Britto – Project Engineer
  - Steve Callahan – Construction Coordinator

Questions?

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Water Partnership with CDM Smith

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