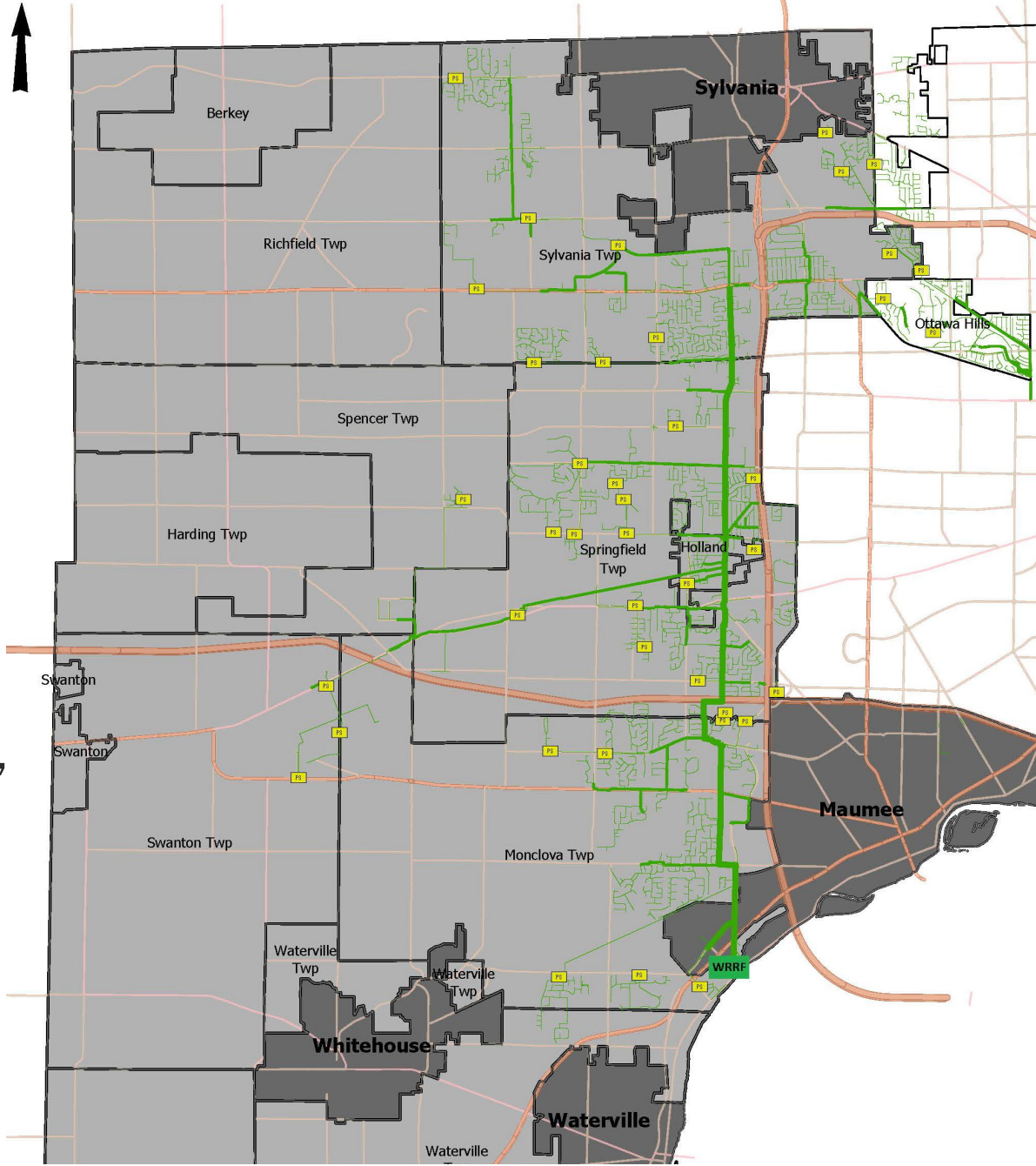


# Let's Get This Program Started

Hidden Challenges of Large Diameter Sewer Rehabilitation Projects



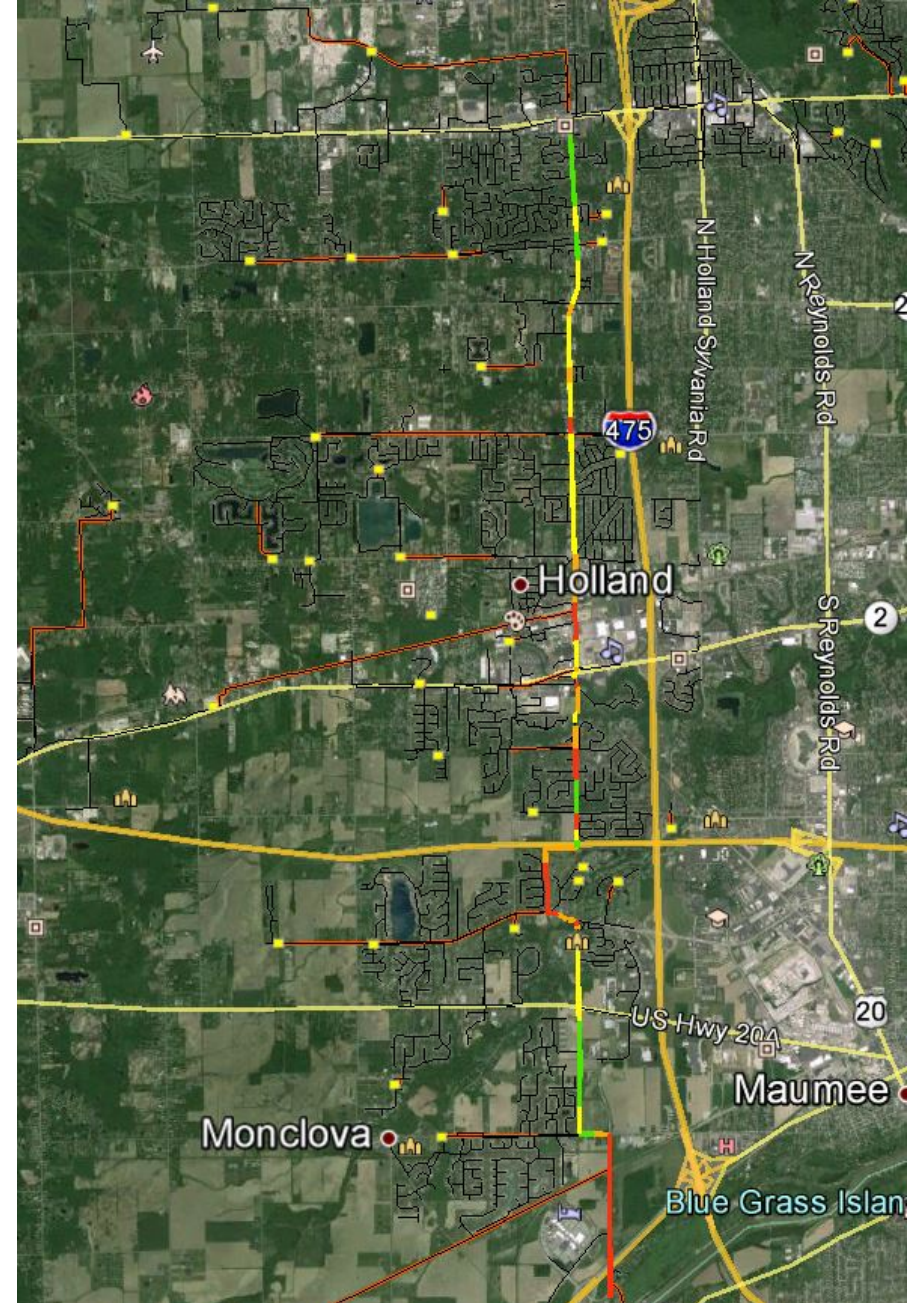


- Population Served (2018) ~115,000
- LCSE operates the Lucas County Water Resource Recovery Facility (WRRF)
- ~18,000 customers
- Partnership of the following communities:  
Maumee, Sylvania, Waterville, Whitehouse
- Serves Townships – Monclova, Springfield, Sylvania, Waterville, Whiteford, Perrysburg

# Sewer No. S-500

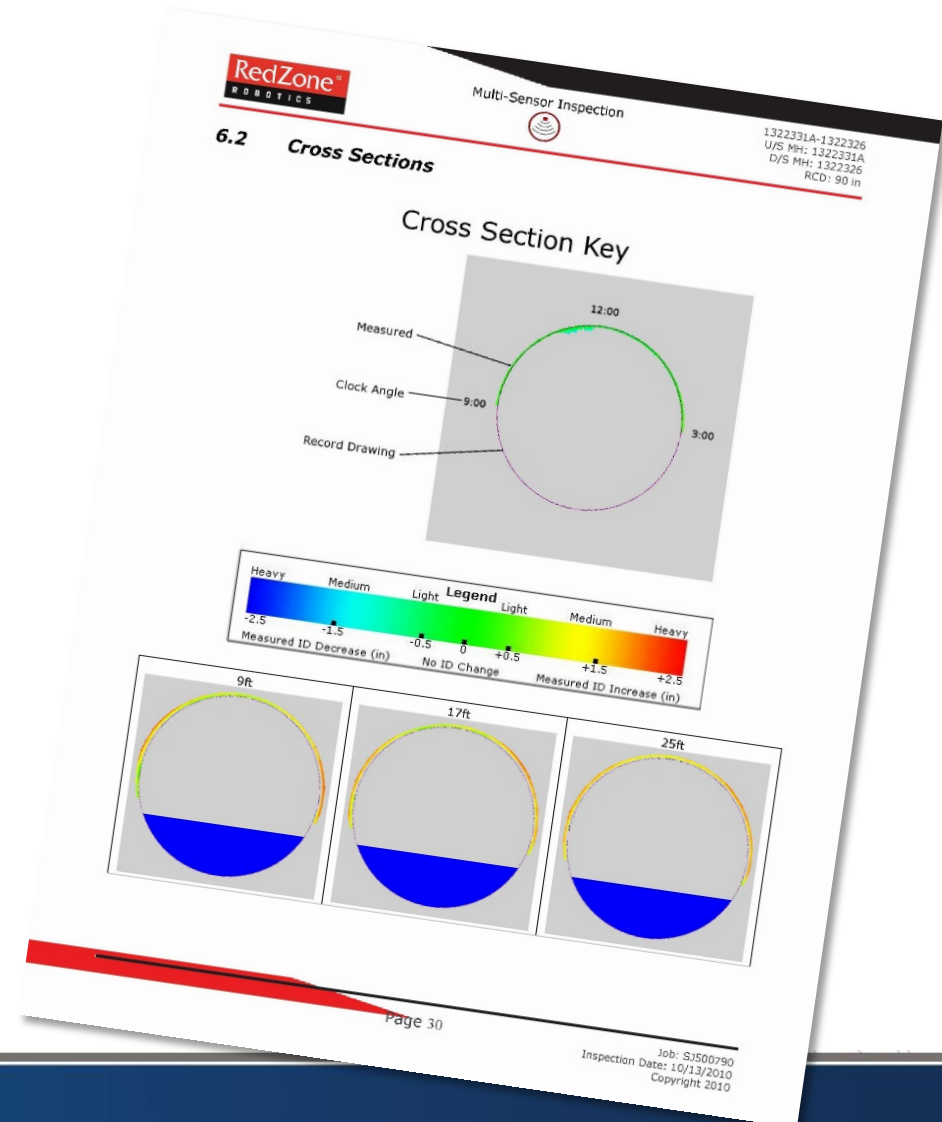
## McCord Road Interceptor

- Approx. 53,000 ft (10 miles) of sewer N-S through the area
- Pipe diameters 60 to 90 inches
- Reinforced concrete pipe installed in 1972-1980
- Three double-barreled inverted siphons: Swan Creek, Cairl Ditch and Wolf Creek
- Design flow of 66 MGD



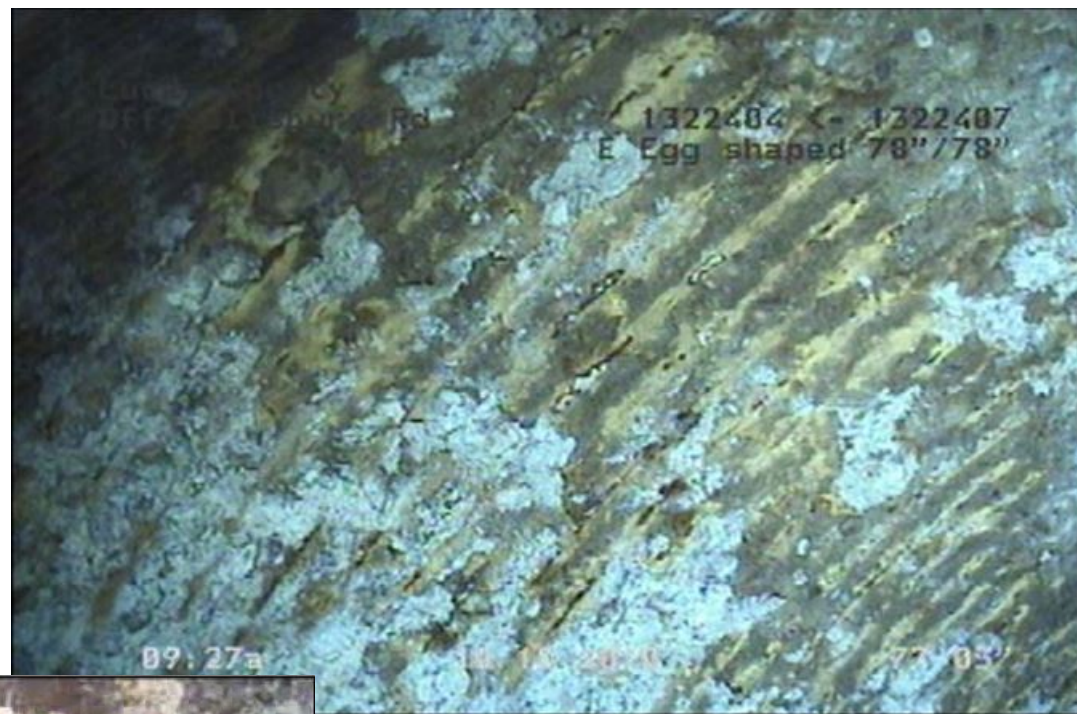
# Inspected entire interceptor in 2010 by Redzone using Multi-Sensor Unit

- Video and PACP inspection
- Ovality and Deflection
- Sediment
- Gas
- Corrosion and Buildup



# Initial Results

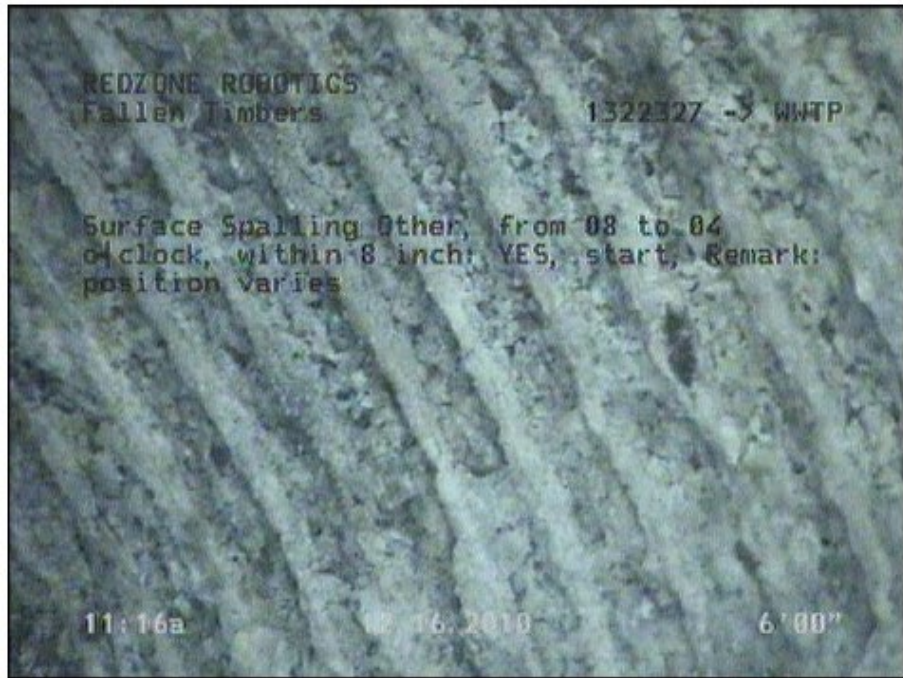
- 109 sewer reaches inspected
- 27 with grade **5** structural defects



Corroded Reinforcement

# Initial Results

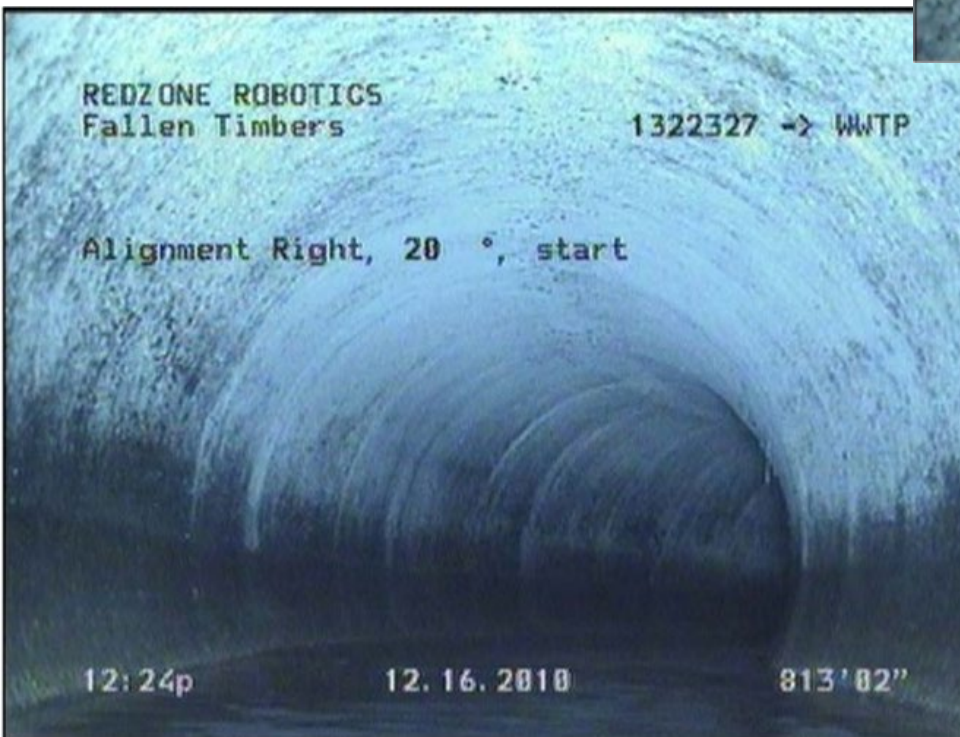
- 20 with grade 4 structural defects



Visible, Exposed Reinforcement

# Initial Results

- 36 with grade 3 structural defects



Increased roughness and  
Spalling Concrete

# Defect Trends

- Near WRRF Influent Chamber
- Force Main Discharges
- Abrupt bends
- Up and Downstream of Inverted Siphons
- (Siphons not inspected)



**Whitehouse and Waterville  
Force Main Discharge**



# Recommendations – 2015 LCSE Master Plan Update

- Identified 5 Priority Areas
- CIP to Repair all Pipes with Grade 5 defects within 10 years

Project Description	Estimated Cost	Est. Construction Date
S-500 Interceptor Rehab Priority 1 - WWTP to Monclova Rd	\$11,000,000	2016-2017
S-500 Interceptor Rehab Priority 2 - Salisbury Rd to Ohio Turnpike	\$4,900,000	2019-2020
S-500 Interceptor Rehab Priority 3 - Pilliod to Morningdew	\$3,400,000	2021-2022
S-500 Interceptor Rehab Priority 4 - South of Airport Rd	\$2,200,000	2023-2024
S-500 Interceptor Rehab Priority 5 - Misc. North of Airport Rd	\$2,400,000	2025-2026
<b>Total ALL CIP <u>\$23,900,000</u></b>		

Included several lower rated pipe segments between grade 5 pipe segments

# 2018 Program Initiation

## LCSE Plan

- **Construct CIP - Break Into Smaller Projects (\$2-3 Million Average)**
  - Priority Area 1 divided into multiple phases

- **Utilize Grants and Other Funding Mechanisms**

- WPCLF
- OWDA
- OPWC



- **Contracted with Tetra Tech for design services**
- **Phase I Construction to be completed by end of year to meet funding deadlines**

# 2018 Program - Revised CIP

- **Developments**

- Solicited quotes for inverted siphon cleaning and inspection  
Estimated cost of \$250,000
- Preliminary investigation revealed siphon chambers severely deteriorated
- 3 total inverted siphon rehabilitation projects add to highest priority

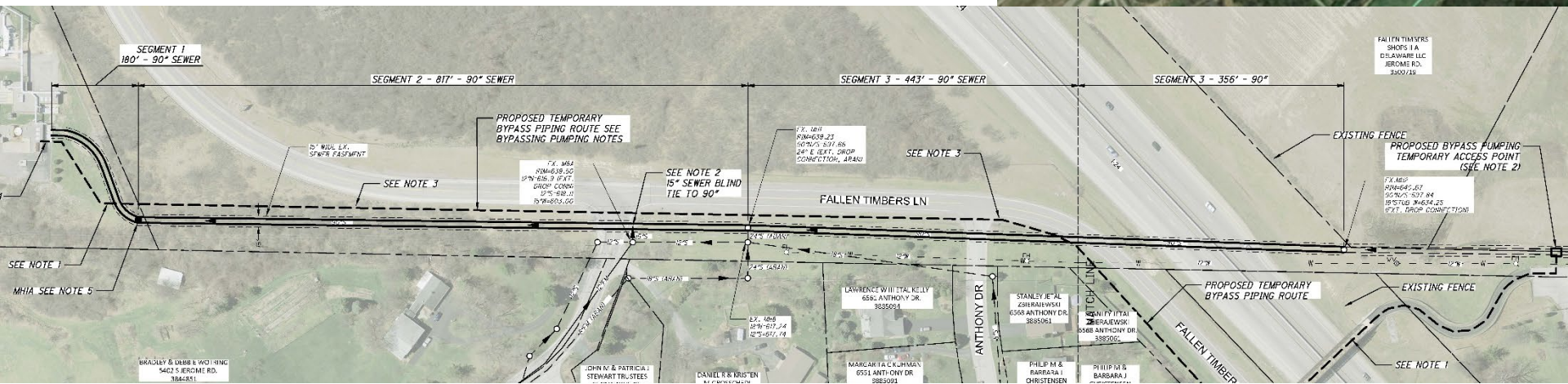
## Revised Near-Term CIP

Project Description	Estimated Cost	Est. Construction Date
S-500 Interceptor Rehab Phase I - WRRF to MH 2 (1,900 feet - 90")	\$2,600,000	2018
S-500 Cairl Ditch Rehab - (140 feet - Double Barrel Siphon 54")	\$1,100,000	2019
S-500 Wolf Creek Rehab - (160 feet - Double Barrel Siphon 54")	\$1,400,000	2019-2020
S-500 Interceptor Rehab Phase I - MH 2 to MH 4 (1,950 feet - 90")	\$3,000,000	2019-2020
S-500 Swan Creek Rehab - (160 feet - Double Barrel Siphon 60")	\$1,500,000	2020
<b>Total ALL CIP</b>		<b>\$9,600,000</b>

# S-500 Rehabilitation Phase I

## Project Information:

- 1,900 feet of 90 inch sewer influent to WRRF
- Downstream 190 feet laid in an “S” curve on WRRF grounds
- 40 feet of cover at upstream end
- Crosses the Anthony Wayne Trail (US24)



**Bid Different Technologies against each other - Treat as pilot project**

# Sliplining

- **Pros**

- Experience with Sliplining from 2017 project for McCord Road Underpass
- Doesn't require full bypass
- Majority of interceptor straight

- **Cons**

- Significant diameter change - 90 inch to 78 inch ID Hobas pipe
- Not ideal due to curved pipe segment



# Cured-in-Place

- **Pros**

- Familiarity with technology
- Minimal loss of diameter
- Can line curved pipe

- **Cons**

- Requires full bypass
- Pipe accessibility
- Water intensive



# Sprayed-in-Place

- **Pros**

- Flexible pipe access
- Minimal loss of diameter
- Can line curved pipe

- **Cons**

- Requires full bypass
- Pipe preparation
- Newer material/technology



# Design Feature – New Manhole

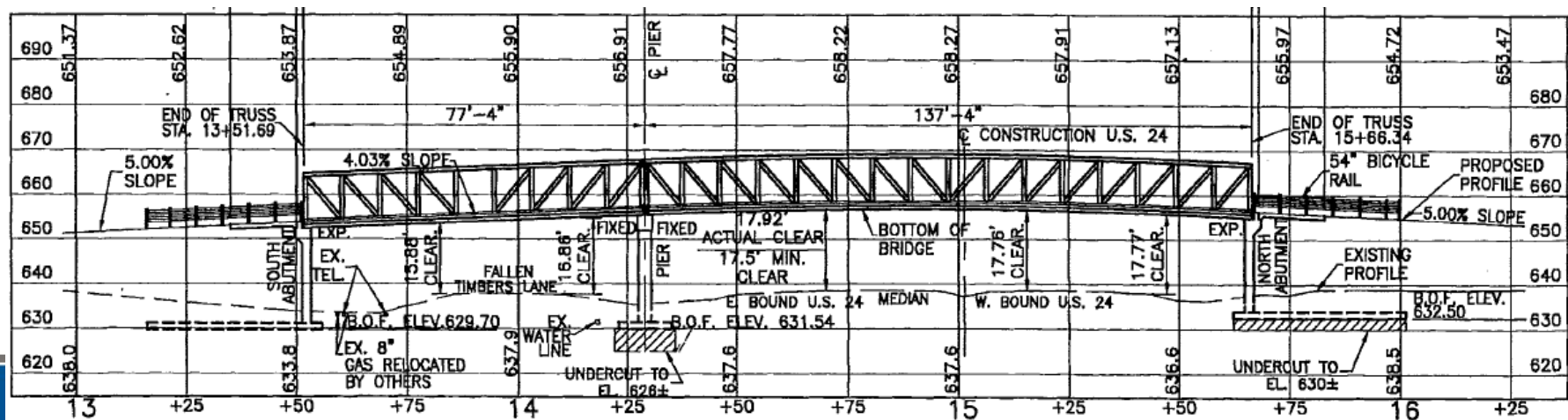
- Where S-bend begins on WRRF site
- “Level the playing field” for different technologies
- At low point - very shallow excavation
- Large laydown area for construction equipment on WRRF property





# Design Feature – Bypass Pumping Route

- Need to access pipe upstream of rehab limits – deep excavation
- Flows to WRRF extremely variable
- Discharge piping route – freeway crossing, side streets
- Design for shaft and bypass footprint
- Provide 2 years of average flow data at WRRF in construction documents
- Worked with Toledo Metroparks & ODOT to utilize pedestrian bridge for bypass piping
- Buried bypass piping across side streets to minimize impacts



# Bidding Results

- **Low Bid – Michels Corp**
- **Proposed Using Spray-in-Place Geopolymer Liner Geospray by Milliken**

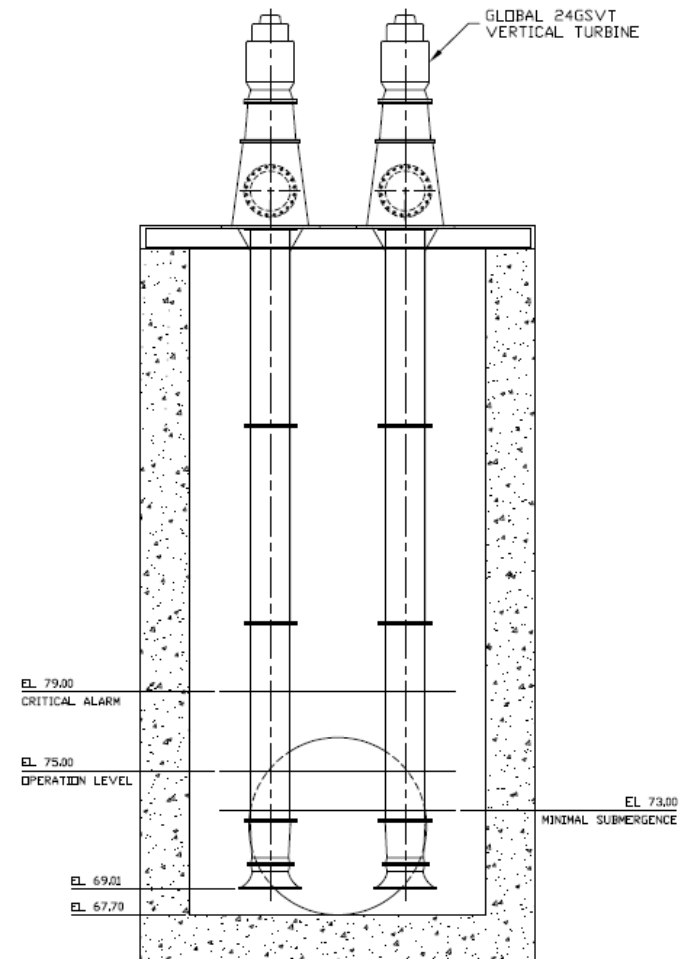


Bidder	Technology	Bid Price
Michels Corp	SIPP Geopolymer Liner	\$2,535,137
IPR	SIPP Geopolymer Liner	\$2,596,300
Insituform	CIPP Liner	\$2,632,339
Spinello	Slip Liner	\$2,633,000
Quadex	SIPP Geopolymer Liner	\$3,275,512
Turn-Key Tunneling	Slip Liner	\$3,873,800

# Project Challenges

## • Bypass Pumping – Vertical Turbine Pumps

- Mersino Dewatering – 15 MGD Capacity
- More reliable and efficient
- Few parts for failures
- Electric motor on top of shaft, impeller at bottom



# Project Challenges

- **Bypass Pumping - Suction**

- 45 feet + deep to pipe invert
- Minimal pipe access requirements
- Michels Proposed 8 foot diameter steel caisson shaft to access pipe in lieu of braced excavation.
- Shaft would be converted to manhole to facilitate future phases



# Project Challenges

- **Bypass Pumping - Discharge**
  - Concerned about piping across pedestrian bridge
  - Temporary bypass piping buried across side streets left in place and converted to permanent road culverts



# Bypass Pumping - Discharge

- Bypass Pumping - Discharge

- Air relief locations
- Controlled discharge velocities by upsizing and adding bends
- Bulkhead to hold back water from re-entering pipe



# Project Challenges

Lucas County CCTV Segment 2 Post Cleaning



- **Sewer Cleaning**

- Difficult due to pipe depth and manhole spacing
- Process took multiple weeks to fully clean and prepare the pipe for lining
- Removed several loads of debris



# Project Challenges

- **Pipe Lining**

- Site laydown – WRRF had multiple construction projects underway – competing for space.





# Project Challenges

- **Pipe Lining**

- Typical SIPP range is approximately 500 feet
- Michels developed system to line entire reach from on access point at WRRF
- Electric buggies would carry material from hopper to spraying tool through the pipeline



# Project Challenges

- **Weather**

- Tropical Storm Gordon in September dropped extreme rainfall and resulted in a failure of the sewer plug
- Another minor incident with tributary sewer flooding handled entirely by the Contractor

## 4-6" of rain



# Project Successes

- Minimal change orders
- Bypass Pump Access MH to facilitate future construction projects
- On schedule for funding requirements

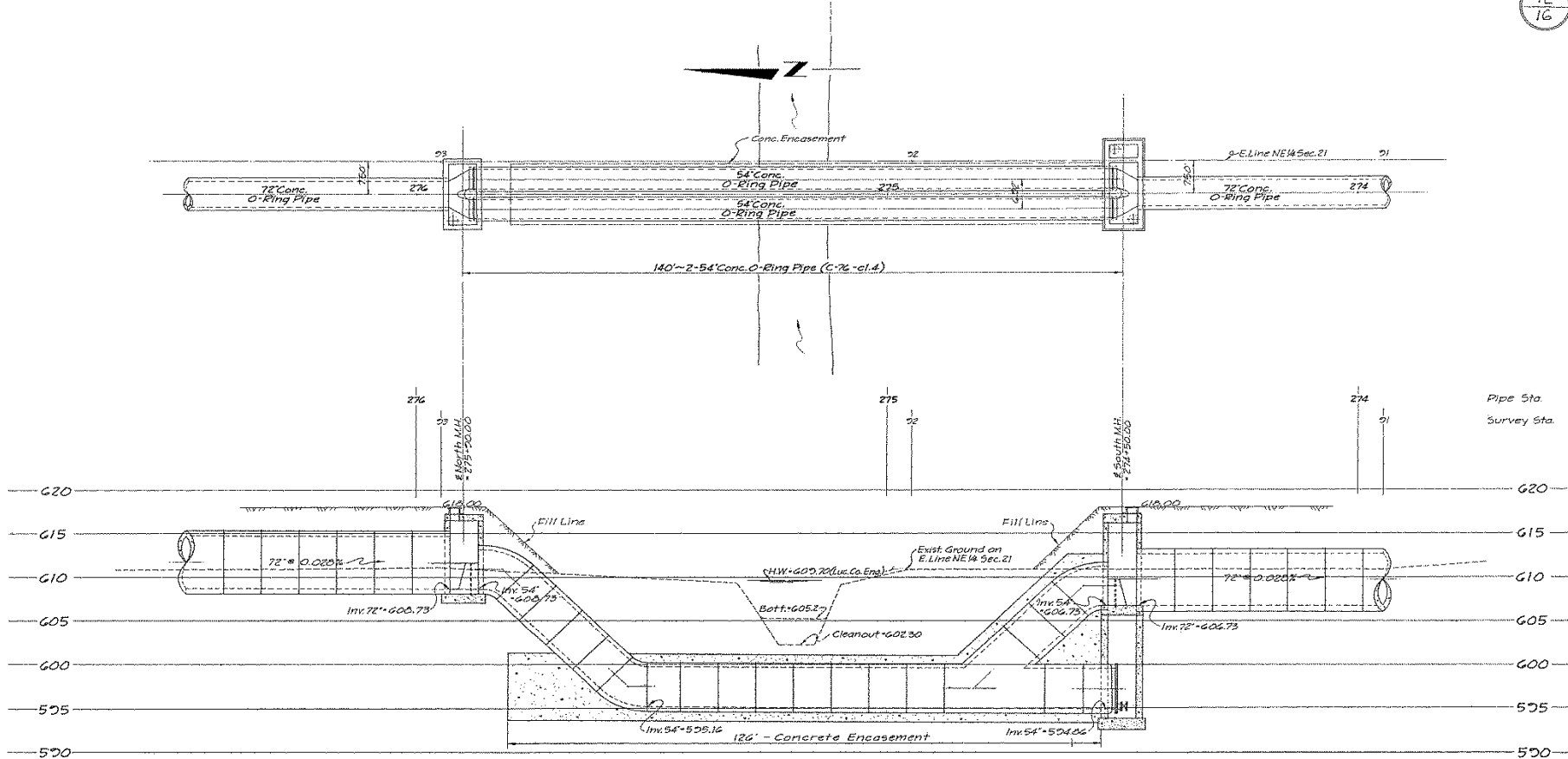


# Upcoming Projects

- Cairl Ditch Inverted Siphon
  - Dual-Barrel 54" Inverted Siphon
  - Bid April 2019 – Low Bid IPR - \$939,500

**SANITARY SEWER N<sup>o</sup> 500**  
METROPOLITAN T&O OPENINGS SEWER DISTRICT

12  
16



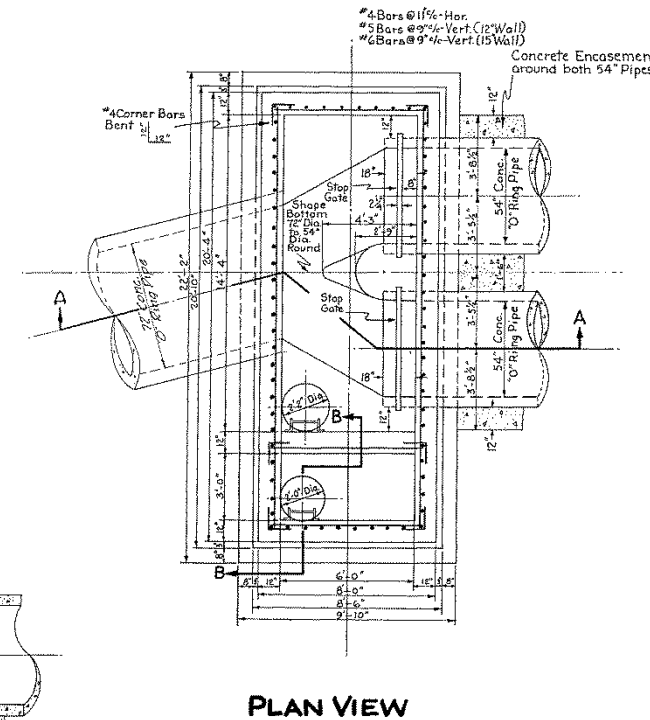
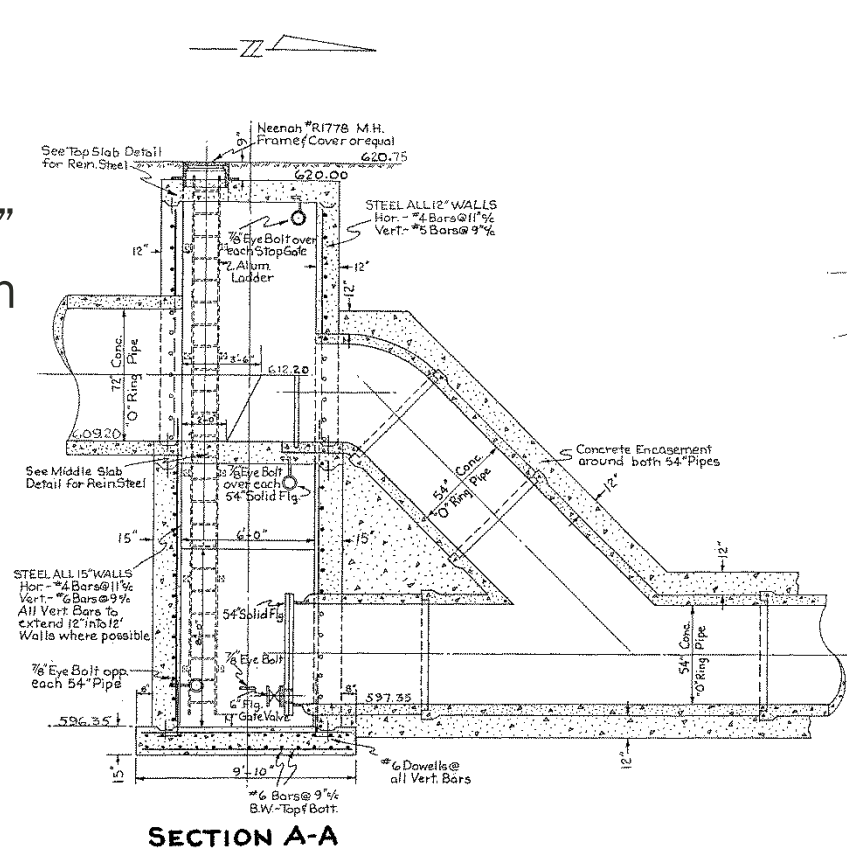
**TWIN 54' SYPHON UNDER CAIRL DITCH**

SCALE  
Horizontal 1"=10'  
Vertical 1"=5'

# Upcoming Projects

## • Wolf Creek Inverted Siphon

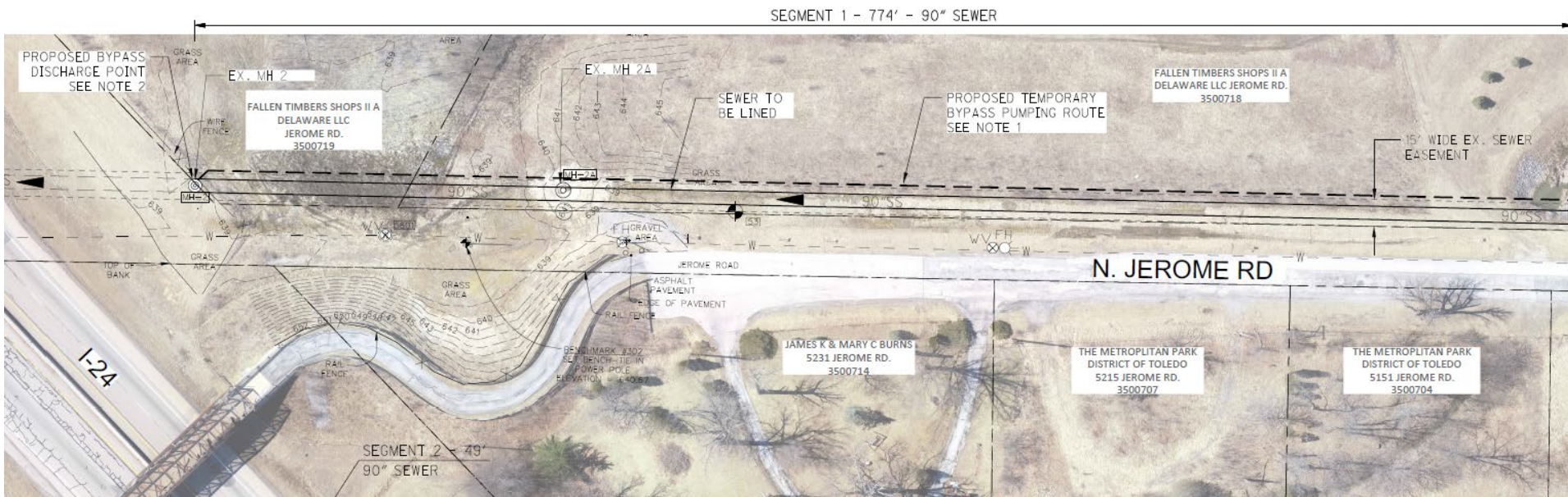
- Dual-Barrel 54" Inverted Siphon
- Bidding Early Winter 2020
- To be completed by December 2020



**SOUTH M.H. OF TWIN 54" SYPHON UNDER WOLF CREEK**  
Scale 3/8" = 1'-0"

# Upcoming Projects

- **S-500 Rehabilitation Phase II**
  - 1950' – 90" Interceptor
  - Early winter 2020
  - To be completed by December 2020



# Lessons Learned

- Consider impacts and footprint of different lining technologies and design for disturbance.
- Some areas of the pipeline were in better condition than others – may allow for flexibility in selecting liner design thicknesses in future projects.
- Bidding multiple technologies was successful, but be sure specifications are written to get what you need and equivalent products.
- Design bypass pumping plan – understand size and needs for large pumping operations – prepare for peaks!



# Questions?



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