BUILDING A WORLD OF DIFFERENCE

Preparing for the Unexpected During Design & Construction

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BLACK & VEATCH

Overview

Erie Interceptor Express Sewer Project

- Background
- Pump Station
- Alignment Selection
  - Design Contract Amendments
  - Alignments
  - Property Acquisition
  - Mitigating Risk During Bid
- Project Construction
  - Construction Challenges
- Conclusions
- Lessons Learned

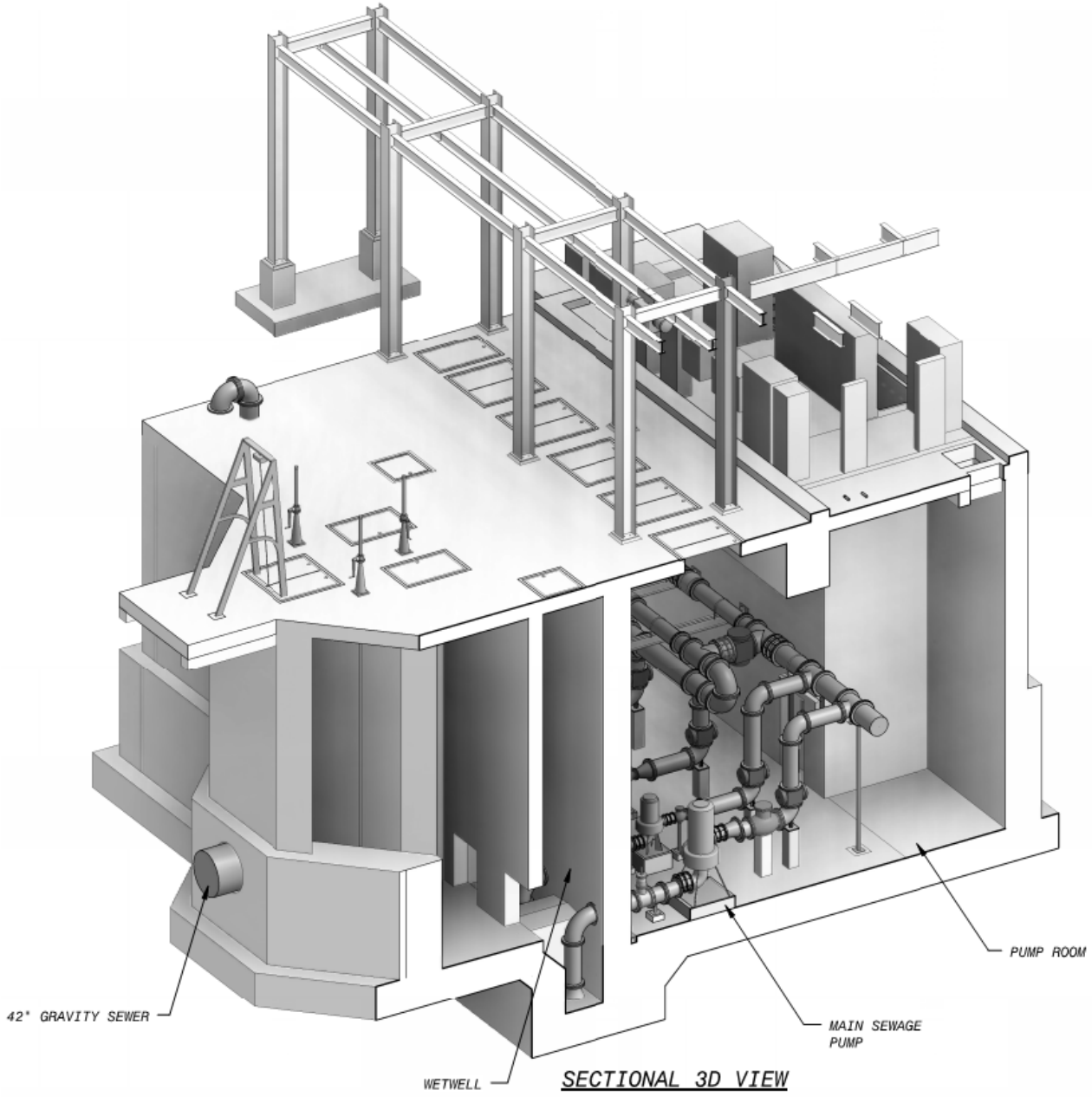
Background

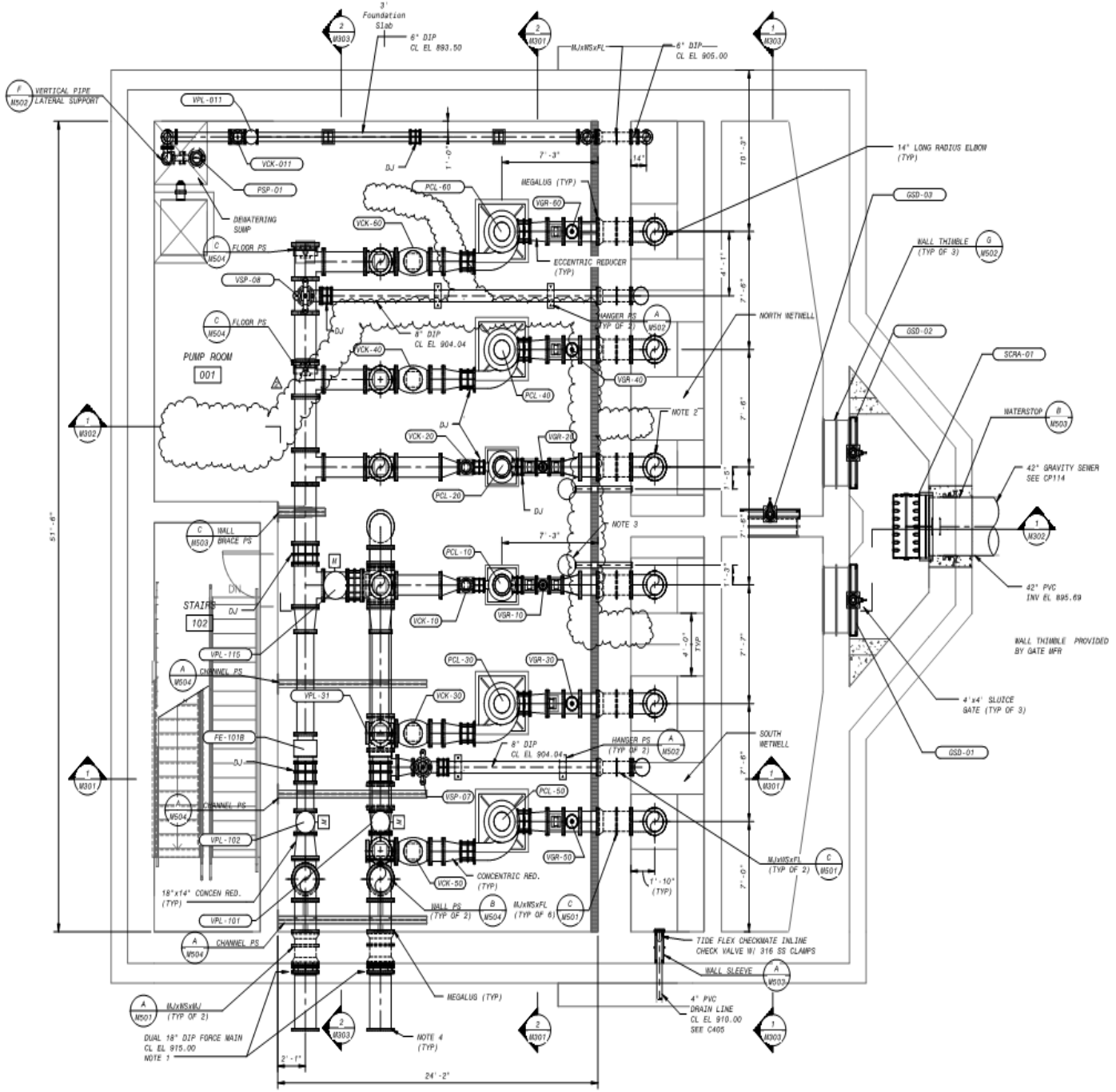
- Approximately $20M investment
- Reduce combined sewer overflows
- Convey separate sanitary flow to be preferentially treated
- Design and Construction
  - 7,000 LF of 42” gravity sewer
  - 6,000 LF of dual 18” force main (total 12,000 LF)
  - New 11 MGD pump station (expandable to 19 MGD)
  - Decommissioning and demolition of four existing wastewater pump stations
  - 3,000 LF of 8” gravity connector sewers from current pump station locations to new express sewer
  - Rehabilitation of approximately 4,100 LF of an existing 36” combined sewer
- Complex pipeline alignments
- Various stakeholders

Pump Station

Pump Station

- 42” Gravity Sewer
- Influent Screening
- Split Wet Well – Hydraulic Institute Standards
- Vertical End Suction Pumps
  - 2 small
  - 4 large
- Dual 18” Force Mains





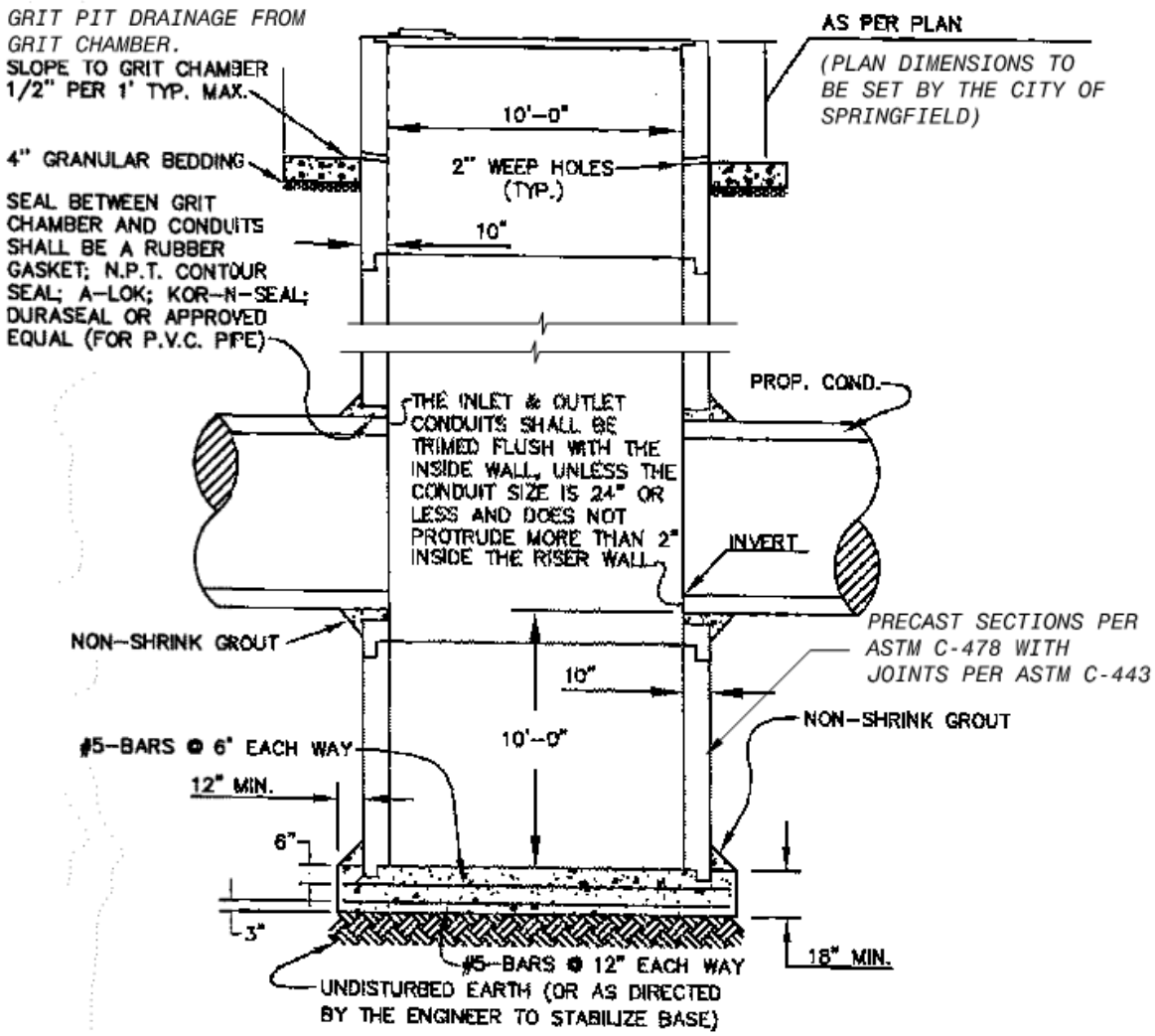
DESIGN CRITERIA	SMALL PUMPS	LARGE PUMPS
Pump Types	Vertical Centrifugal, non-clog	Vertical Centrifugal, non-clog
Number of Pumps	2	4
Design Capacity (gpm)	1250	2600
Head Conditions (ft)	45	120
Horsepower (Hp)	25	125

Control Scheme

- Average daily flow pumped with small pumps
- Wet-weather flow
  - 2 small pumps running
  - Transitions to 1 large pump
  - Additional large pumps come online as needed

Grit Removal

- Grit Manhole
  - 10’ Diameter
  - ~34’ Deep
  - 10’ Deep Grit Pit



Influent Screening

- Retractable Basket Screen
  - 30” x 42”
  - Bar Spacing:
    - Initially 2.5”
    - Modified to 1.25”
- Influent Fall Screen
  - 2.5” Bar Spacing

Influent Screening

Stamped Metal Bars (2.5” Opening)

Welded Bars (1.25” Opening)

Ragging - Preliminary Design Concepts

- Grinder
  - At rag source location
  - Upstream of pump station
  - In the east and west wet well
- Pump Impeller Modifications
  - Chopping impeller
  - Single vane
- Headworks
- Deragger

Influent Screening

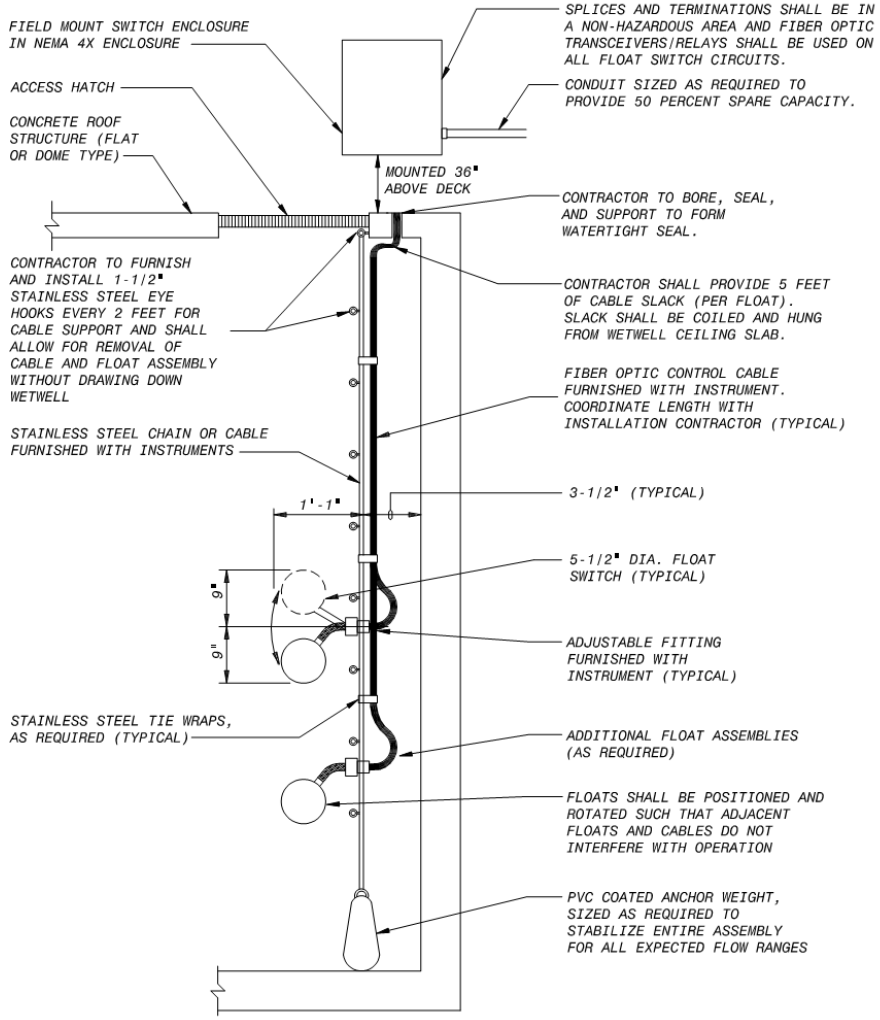
Debris Management

Surge Control

Force Main Surge Relief Valves

Discharge Header Surge Relief Valves

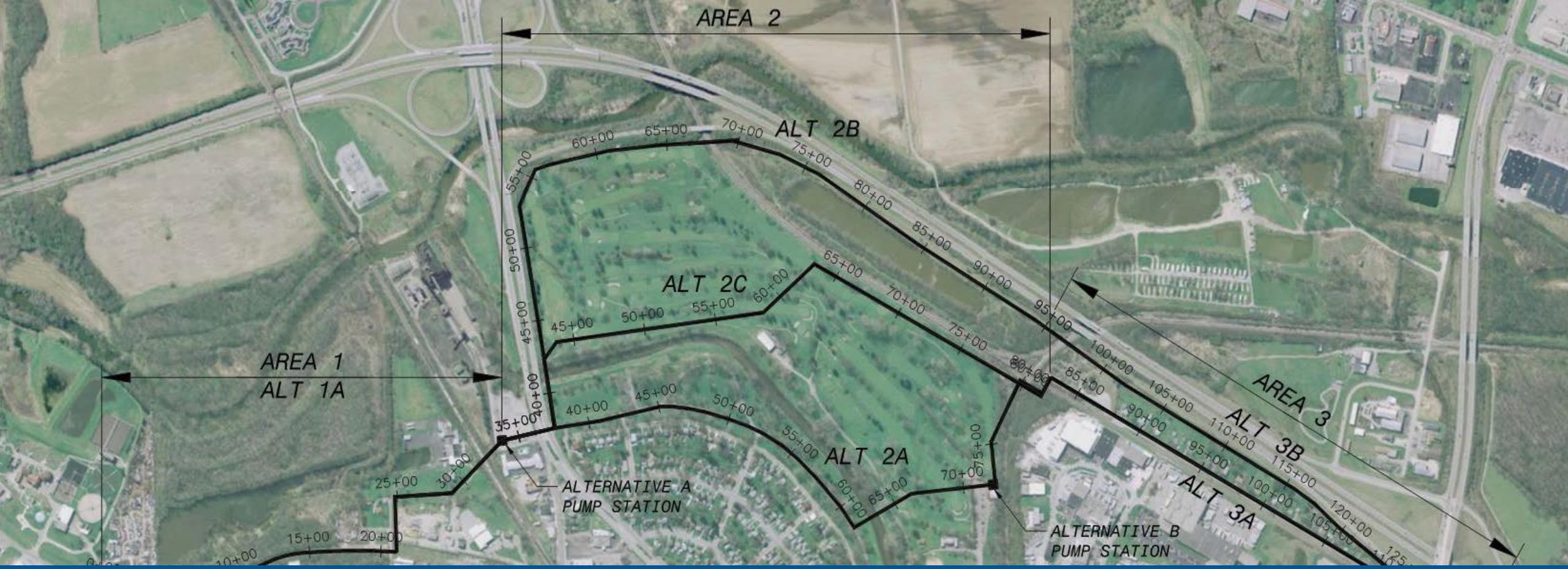
Manual Float Override



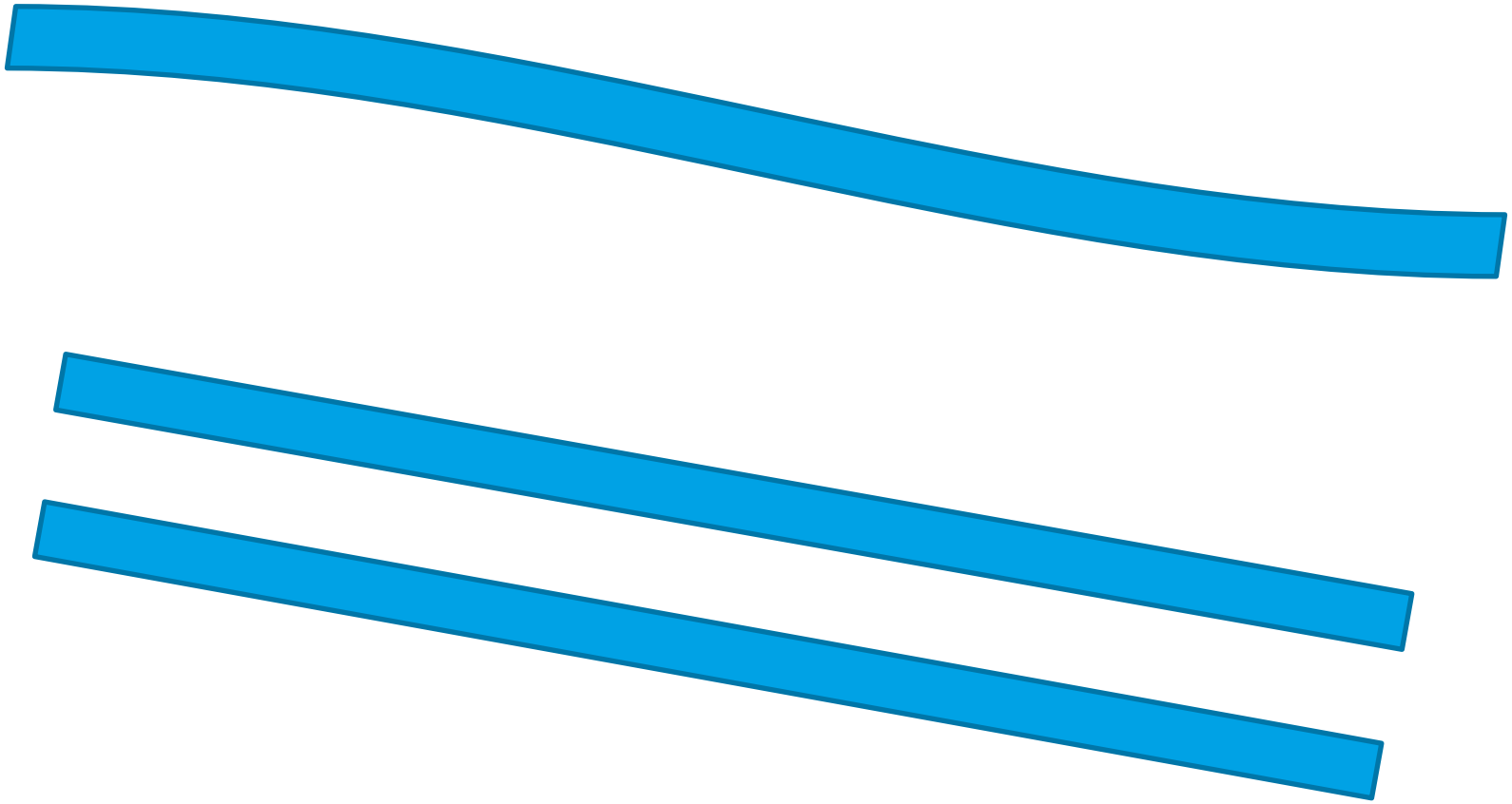
WEIGHTED FLOAT TYPE LEVEL SWITCH INSTALLATION DETAIL

NO SCALE

TYPICAL FOR LSLL-10A, LSL-10A, LSH-10A-1, LSH-10A-2, LSHH-10A, LSLL-10B, LSL-10B, LSH-10B-1, LSH-10B-2, LSHH-10B



Alignment Selection



Critical Stakeholders

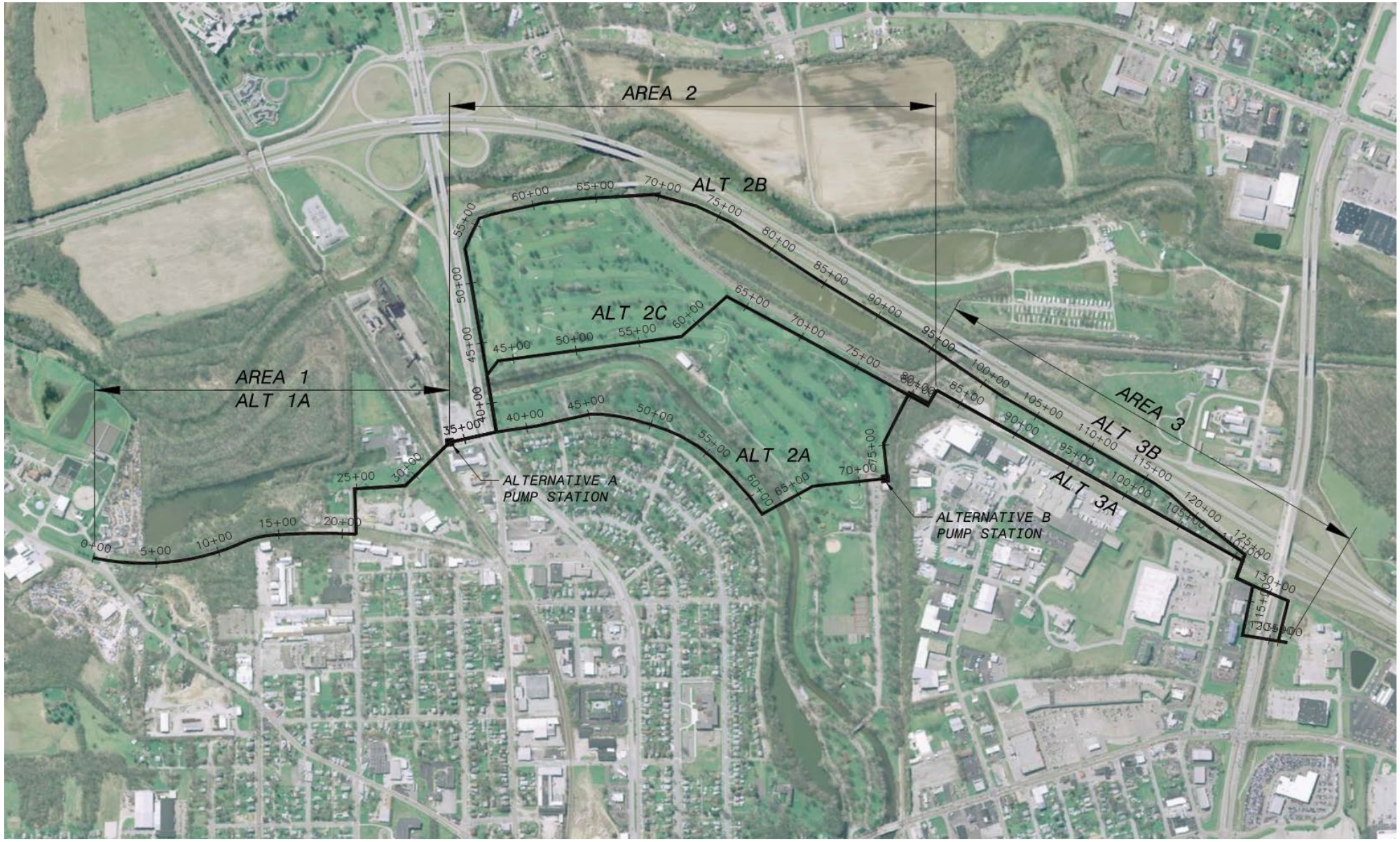
- Ohio EPA
- Ohio Department of Natural Resources
- Ohio Department of Transportation
- Ohio Historic Preservation Office
- United States Army Cops of Engineers
- United States Fish and Wildlife Service
- Clark County Combined Health District
- Springfield Township
- Electric Utility
- 2 Gas Utilities
- Various Telecommunications Companies
- 3 Railroads

Design Contract Amendments

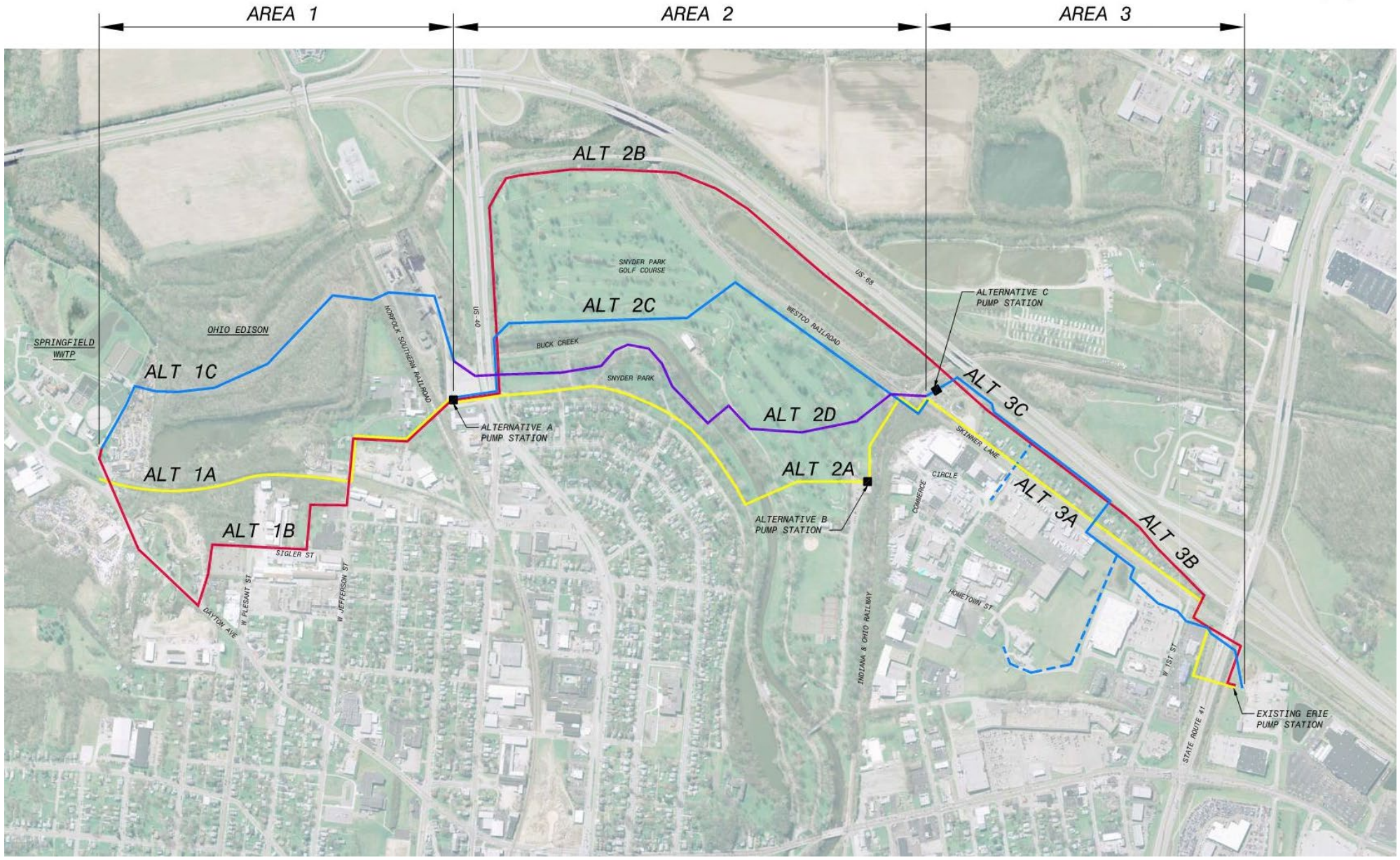
- 5 Amendments
- $700,000 to $2,000,000

"In life you must always have a Plan A… but you better be well prepared to operate on Plan F."

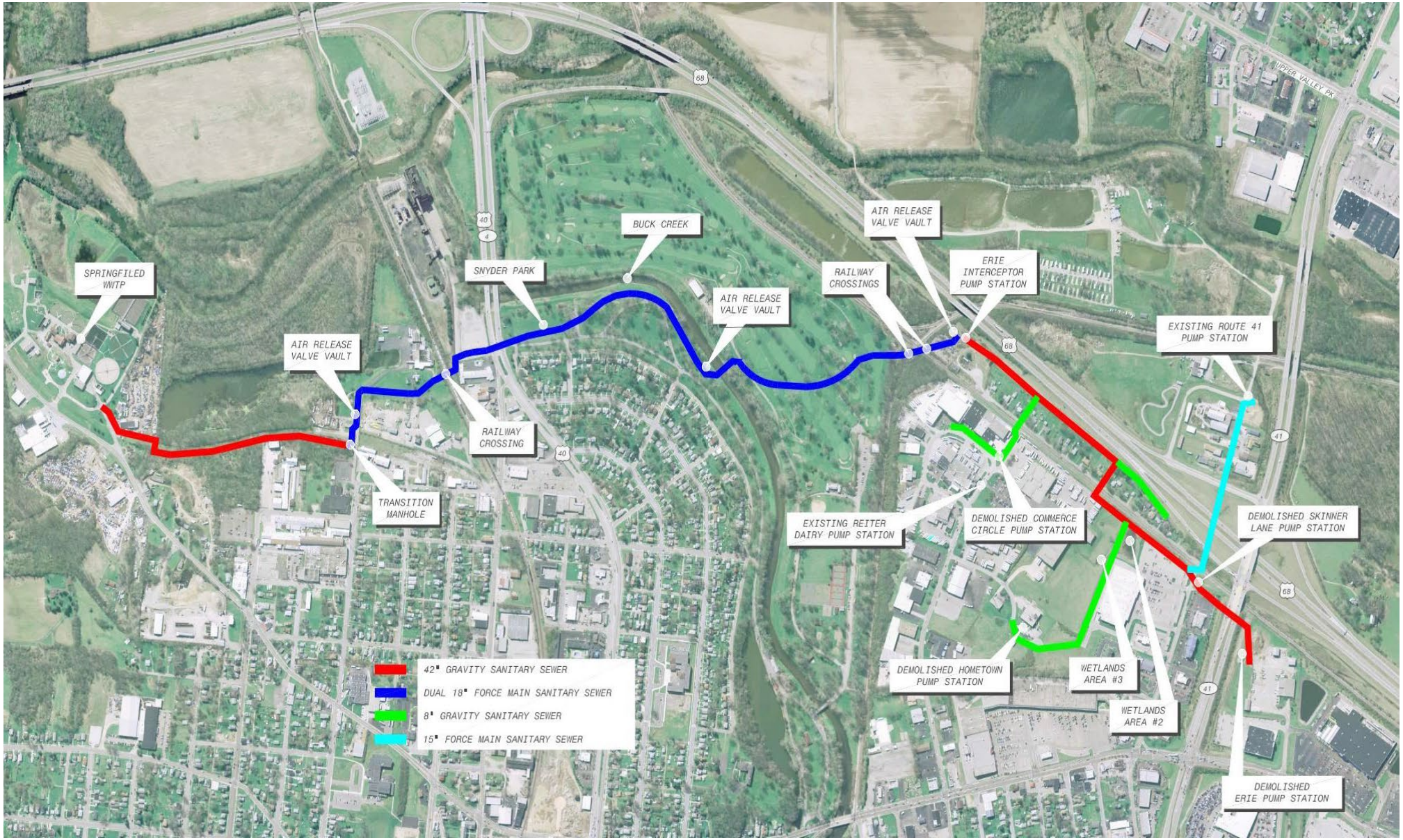
Original Alignment Alternative



Alignment Alternatives



Final Alignment



Amendment A

- Purchase of an additional parcel
- Pump station maximum flow increase
- Discovery of natural gas transmission main
- Surveying activities ruled out proposed alignments
- An additional alignment was created
- Bridge over Buck Creek and adjacent roadway

Amendment B

- Power plant property owner rejected alignment
- Provide service to the residents along Skinner Lane
- HLI sewer revealed deterioration
- Environmental concerns

Amendment C

- Provide assistance for the acquisition of property and/or easements for the construction of the project

Amendment D

- Rehabilitation or replacement of the existing sewer and manholes for the HLI

Amendment E

- Stakeholder coordination and interfacing

Property Acquisition

- Residential and Commercial Property Acquisition
  - 41 parcels, totaling $332,750
- Residential Owners
  - Property damage due to blasting and excavation
  - Construction traffic and noise
- Commercial Owners
  - Access impacts
  - Loss of usable space
  - Potential impacts to their customers
- Industrial Owners
  - Impacts to their operations
  - Potential environmental impacts
  - Liability due to existing contamination

Mitigating Risk During Bid

- Focus on planning and risk identification during design
- Bid form included several cash allowances
  - Petroleum contaminated soils
  - Hazardous material testing and abatement
  - Power service to the pump station
  - A malacologist for mussel survey and relocation
  - Railroad flagging
  - Utility company inspection fees
- Costs during construction were drawn from these allowances without the need for change orders
- Cut necessary trees in advance to minimize schedule impacts
- Baselined rock quantities and trench width

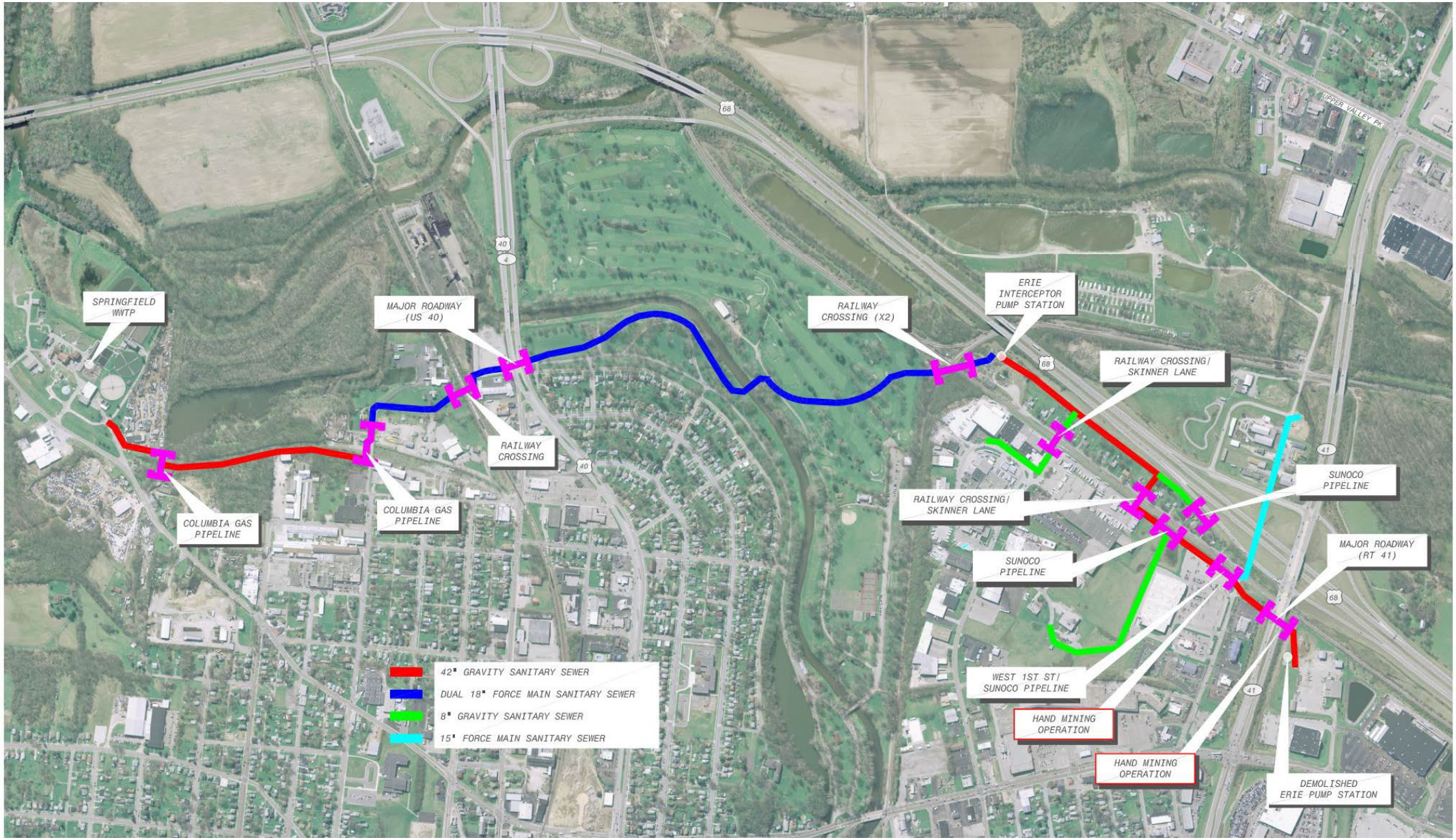
Project Construction

Construction

- Trenchless crossings
  - 11 total: existing utilities and railroad crossing
  - Two installed by hand mining and nine by jacking and boring
- Open cut crossing of Buck Creek
- Rock blasting through industrial, commercial, and private residential properties

- Open cut installations
  - Junk yard
  - Former box factory
  - Former petroleum factory
  - Current food industry
  - Golf course
  - Park

Trenchless Crossings



Construction Challenges

- Sinkholes under a railroad during boring activities
- Discovery of an orphaned underground storage tank
- Unsuitable soils on two commercial properties
- Realignment for tree preservation in the park

Sinkholes under railroad

Rock excavation


Restoration through Snyder Park

Conclusions

- Construction is nearly complete on schedule
- Percent cost growth is at 2.5%
  - Value in taking the time and spending the engineering cost to ensure efficient installation and minimize cost changes during construction

Lessons Learned

Be Flexible

Alignments, scope, and schedule will change.

Ensure Competitive Cost

Be open to changes in design scope as an owner.

Unforeseen Conditions

Nobody can possibly predict them all.

Manage Unknowns

Find a way to deal with unknowns in the bid.

Engage Early

Nothing is final until all stakeholders have bought into the alignment.

Thank You

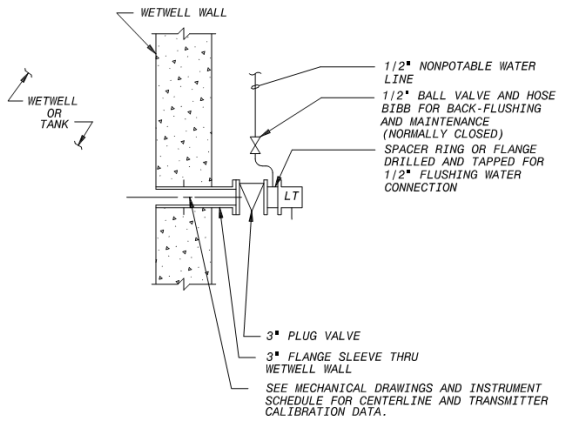
"We are, all of us, water beings on a water planet. Water is life. Without it, all living things die. Our dependence on water is absolute; our psyches know this and signal us in myriad ways of water's elemental importance and significance.

That is why we love the water and remember experiences associated with it. Of the earth's vast resources of water, only a small fraction is fresh and drinkable.

A few people among the globe's billions have been charged with the task of ensuring everyone else has a reliable supply of safe water. Supplying potable water is an essential human activity, a great responsibility, and a vocation of distinction."

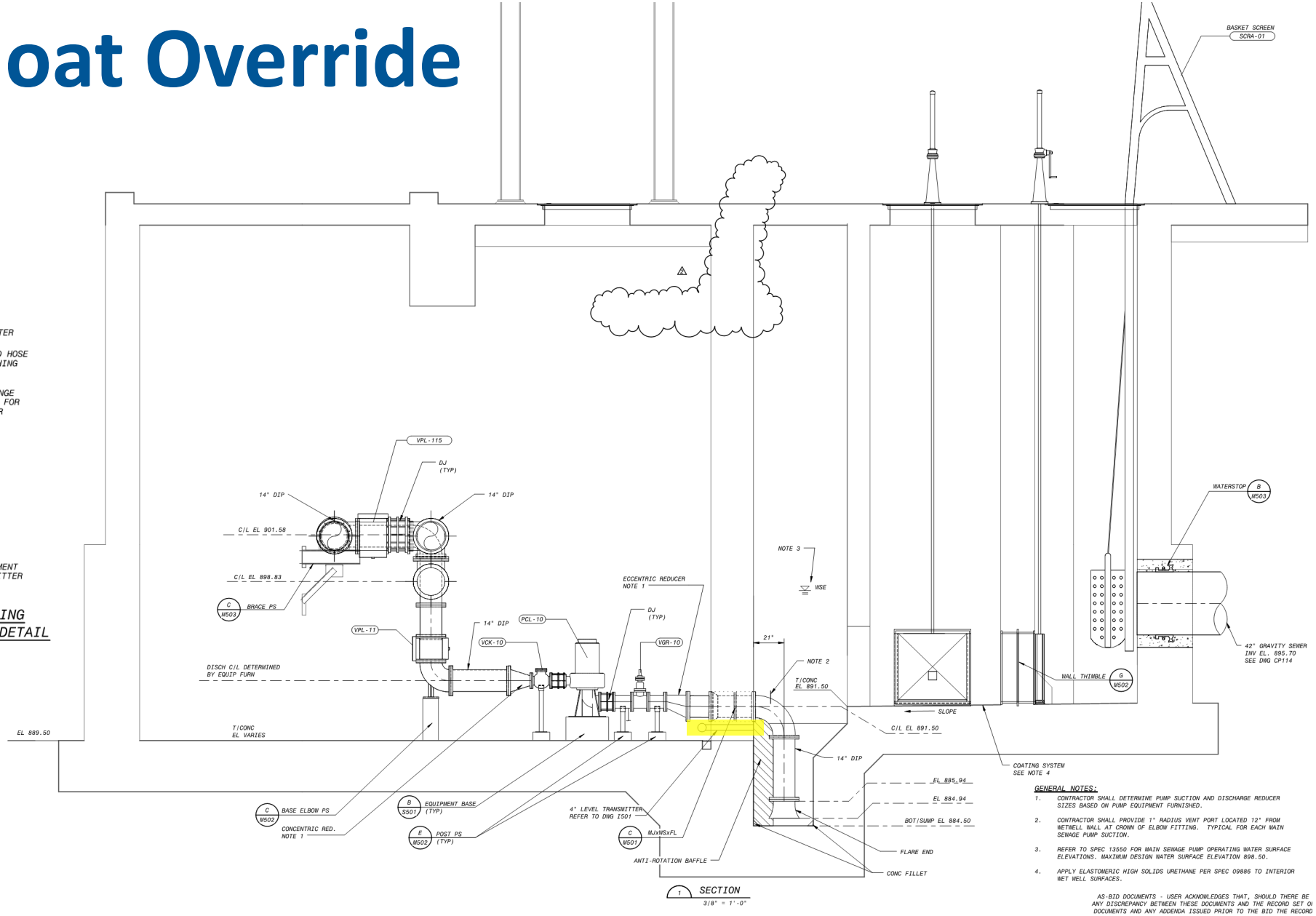
- J.B. Mannion

Manual Float Override



FLANGE MOUNTED PRESSURE SENSING LEVEL TRANSMITTER INSTALLATION DETAIL

NO SCALE
TYPICAL FOR LT-010A, LT-010B



GENERAL NOTES:

1. CONTRACTOR SHALL DETERMINE PUMP SUCTION AND DISCHARGE REDUCER SIZES BASED ON PUMP EQUIPMENT FURNISHED.
2. CONTRACTOR SHALL PROVIDE 1" RADIUS VENT PORT LOCATED 12" FROM WETWELL WALL AT CROWN OF ELBOW FITTING. TYPICAL FOR EACH MAIN SEWAGE PUMP SUCTION.
3. REFER TO SPEC 13550 FOR MAIN SEWAGE PUMP OPERATING WATER SURFACE ELEVATIONS. MAXIMUM DESIGN WATER SURFACE ELEVATION 898.50.
4. APPLY ELASTOMERIC HIGH SOLIDS URETHANE PER SPEC 09886 TO INTERIOR WET WELL SURFACES.

AS-BID DOCUMENTS - USER ACKNOWLEDGES THAT, SHOULD THERE BE ANY DISCREPANCY BETWEEN THESE DOCUMENTS AND THE RECORD SET OF DOCUMENTS AND ANY ADDENDA ISSUED PRIOR TO THE BID THE RECORD

Location	Proposed Schedule Duration	Actual Schedule Duration	Schedule Delta
West 1st Street/Railway Crossing	91 cd	250 cd	+ 159 cd
Major Roadway (RT 41)	146 cd	231 cd	+ 85 cd