Building a World of Difference

Preparing for the Unexpected During Design & Construction

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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

<table>
<thead>
<tr>
<th>SMALL PUMPS</th>
<th>LARGE PUMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pump Types</strong></td>
<td>Vertical Centrifugal, non-clog</td>
</tr>
<tr>
<td><strong>Number of Pumps</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Design Capacity (gpm)</strong></td>
<td>1250</td>
</tr>
<tr>
<td><strong>Head Conditions (ft)</strong></td>
<td>45</td>
</tr>
<tr>
<td><strong>Horsepower (Hp)</strong></td>
<td>25</td>
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</tbody>
</table>
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

Field mount switch enclosure in non-hazardous area. A non-hazardous area and fiber optic transmitter/receiver shall be used on all float switch circuits.

Conduit sized as required to provide or pursue spare capacity.

Splices and terminations shall be in a non-hazardous area, and fiber optic transmitter/receiver shall be used on all float switch circuits.

Contractor to furnish and install 1-1/2" stainless steel eye hook every 5 feet for cable support and shall allow for removal of cable and float assembly without disturbing down wetwell.

Stainless steel chain or cable furnished with instruments.

Contractor to furnish 5 feet of cable slack (per float). Slack shall be deiced and hung from wetwell ceiling beam.

Fiber optic control cable furnished with instrument, coordinated length with installation contractor (typical).

3-1/2" (Typical)

5-1/2" O.D.A. flight switch (typical)

Adjustable fitting furnished with instrument (typical).

Additional float assemblies (as required).

Floats shall be positioned and rotated such that adjacent floats and cables do not interfere with operation.

PVC coated anchor weight, sized as required to stabilize entire assembly for all expected flow ranges.

Weighted float type level switch

Installation detail

No scale

Alignment Selection
Critical Stakeholders

- Ohio EPA
- Ohio Department of Natural Resources
- Ohio Department of Transportation
- Ohio Historic Preservation Office
- United States Army Corps 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
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.
“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
<table>
<thead>
<tr>
<th>Location</th>
<th>Proposed Schedule Duration</th>
<th>Actual Schedule Duration</th>
<th>Schedule Delta</th>
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<tbody>
<tr>
<td>West 1st Street/Railway Crossing</td>
<td>91 cd</td>
<td>250 cd</td>
<td>+ 159 cd</td>
</tr>
<tr>
<td>Major Roadway (RT 41)</td>
<td>146 cd</td>
<td>231 cd</td>
<td>+ 85 cd</td>
</tr>
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