CONSTRUCTION CHALLENGES OF THE SEEKONK COMBINED SEWER OVERFLOW (CSO) INTERCEPTOR

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Outline

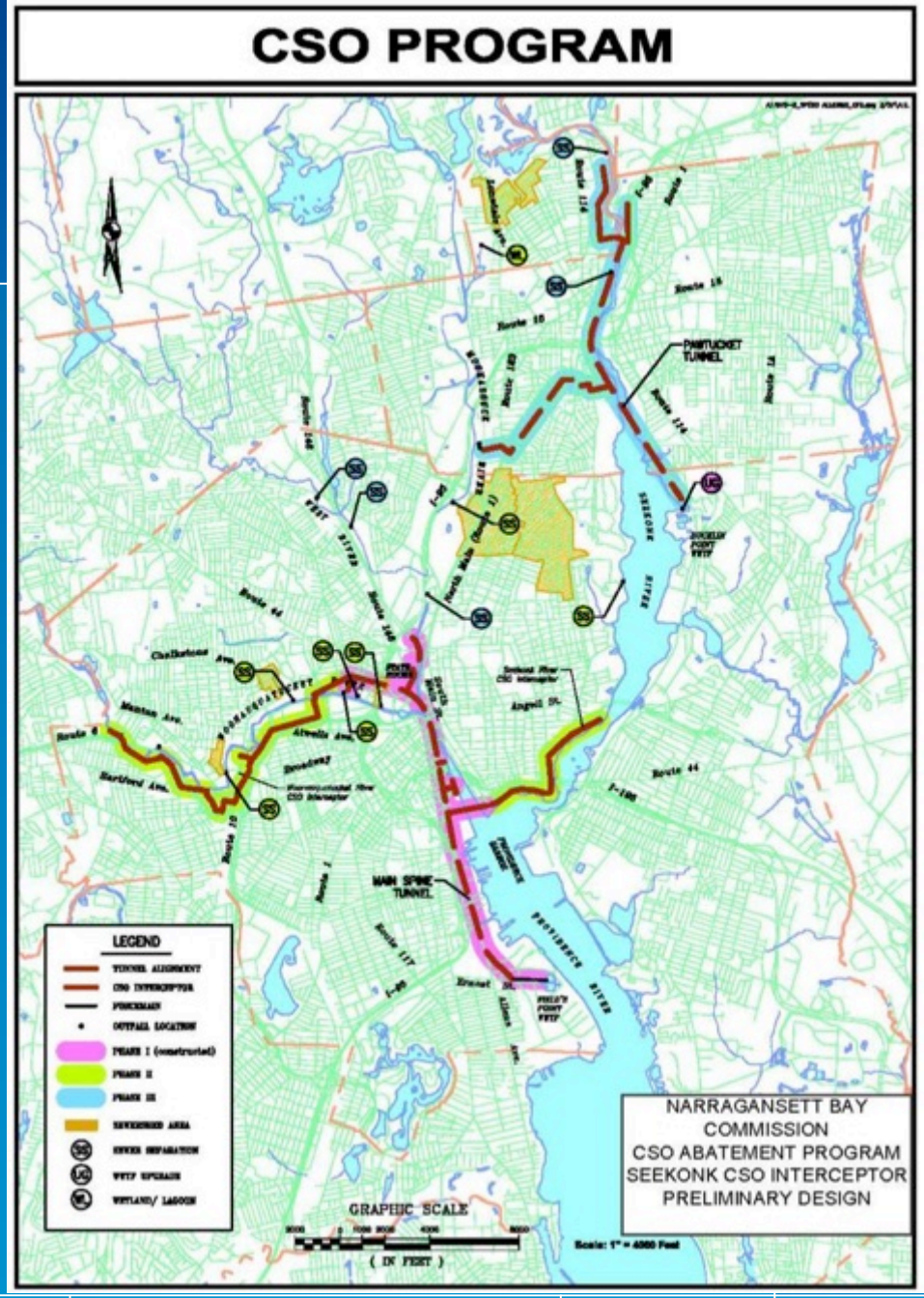
- Project Team
- Background
- Project Elements
- Alternatives and Evolution
- Fundamentals of Mirotunneling
- Geotechnical Exploration and Geological Conditions
- Project Specifics
- Project Features and Restrictions (Challenges)
- Project Update

Project Team

- CDM Smith (Design)
- Louis Berger Group (Program Manager)
- Gilbane (Construction Manager)
- Northeast Remsco Construction (Contractor)

Background

- The Narragansett Bay Commission (NBC) is a regional authority that serves ten communities in Providence, Rhode Island metropolitan area.
- Comprehensive three-phase facilities plan to abate CSO discharge to Narragansett Bay over the next 20 years.



Background
Phase I

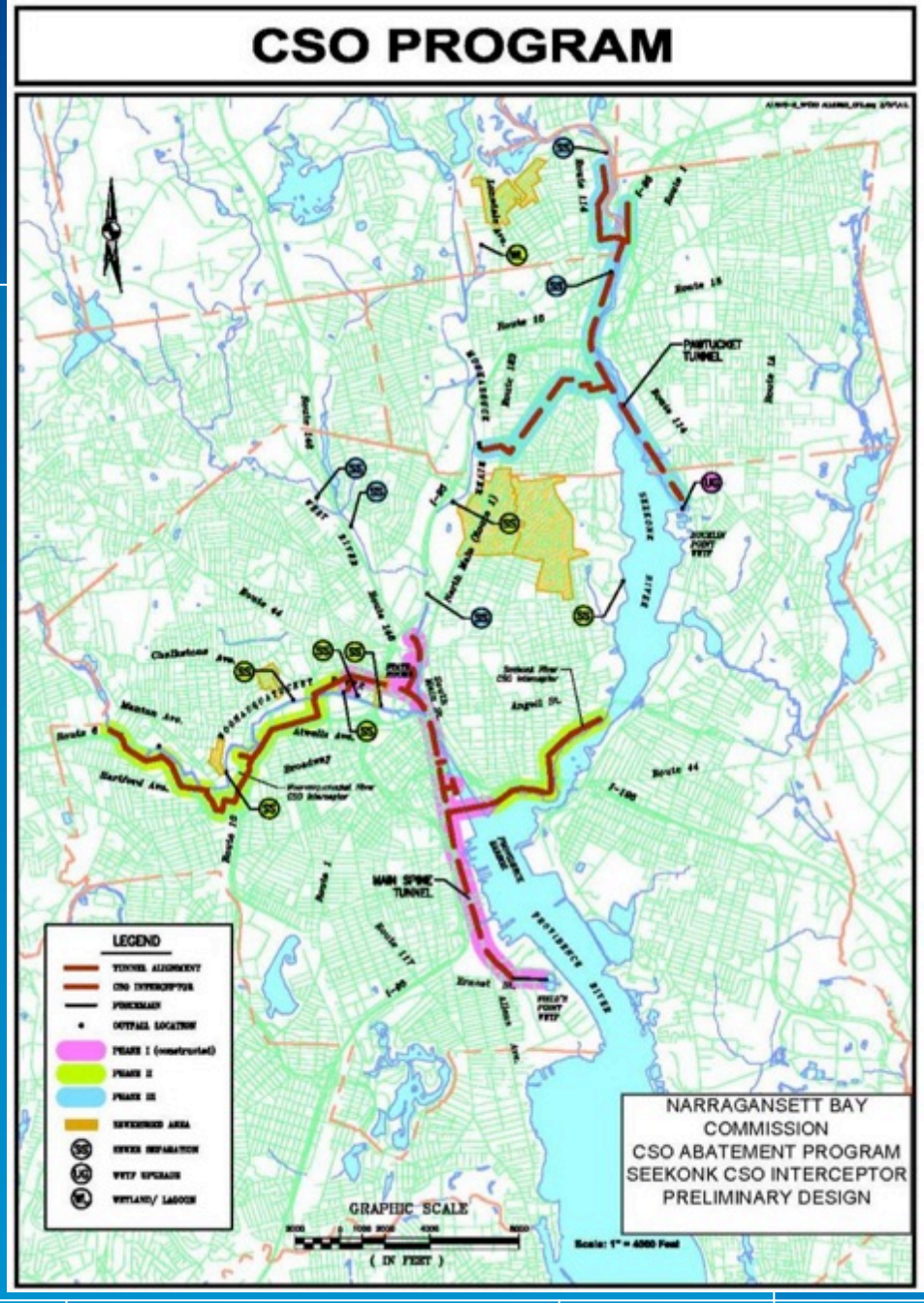
- 16,248 ft long, 26 ft diameter, 230 ft deep storage tunnel
- Seven drop shafts and connecting adits
- Field's Point Pumping Station

Background
Phase II

- Two CSO Surface Interceptors
  - Woonasquatucket River
  - Seekonk
- Two Sewer Separation Projects
- Wetland Treatment Facility

Background
Phase III

- Pawtucket Tunnel
- Bucklin Service Area CSO Interceptors
- Sewer Separation
- Outfall Closure
- Minimum Nine Controls

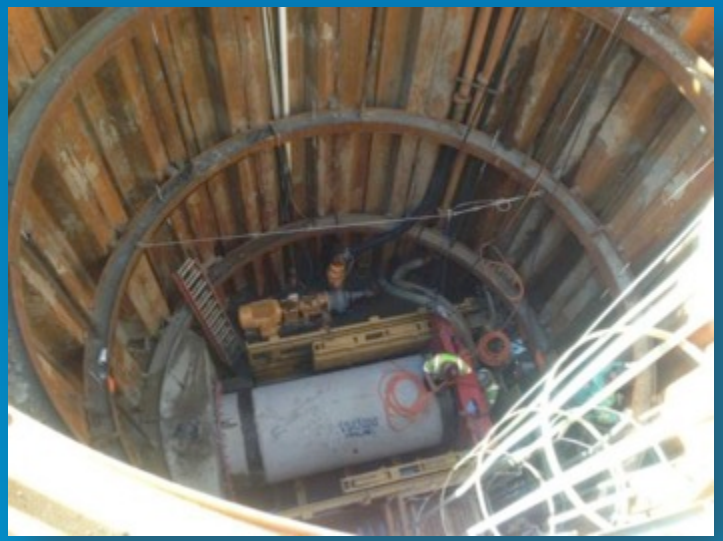


Project Elements Phase II

- Seekonk Combined Sewer Overflow Interceptor (SCSOI):
  - 7,210 ft of 48-in to 60-in pipeline
  - 13 Manholes
  - Two Diversion Structures
  - Interceptor Relief Structure
  - Modifications to Regulator

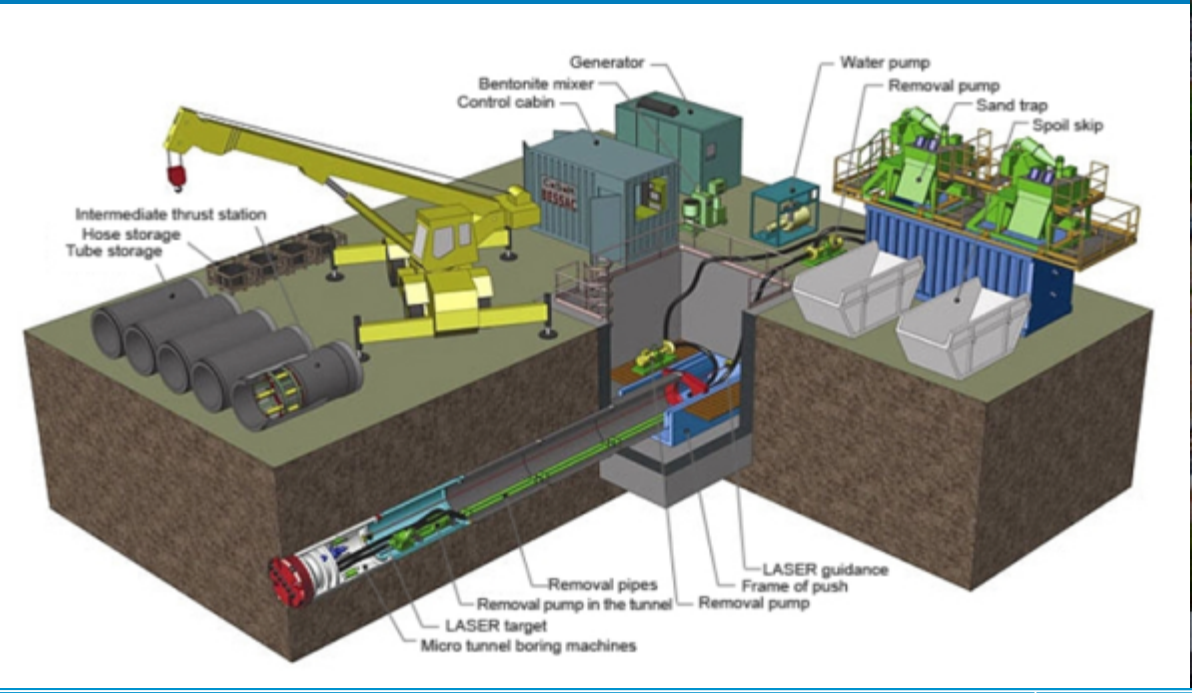
Alternatives and Evolution

- Open Cut
- Two-pass Pipe Jacking
- One-pass Microtunneling



Fundamentals of Microtunneling

- A remotely controlled, guided pipe-jacking process



Fundamentals of Microtunneling

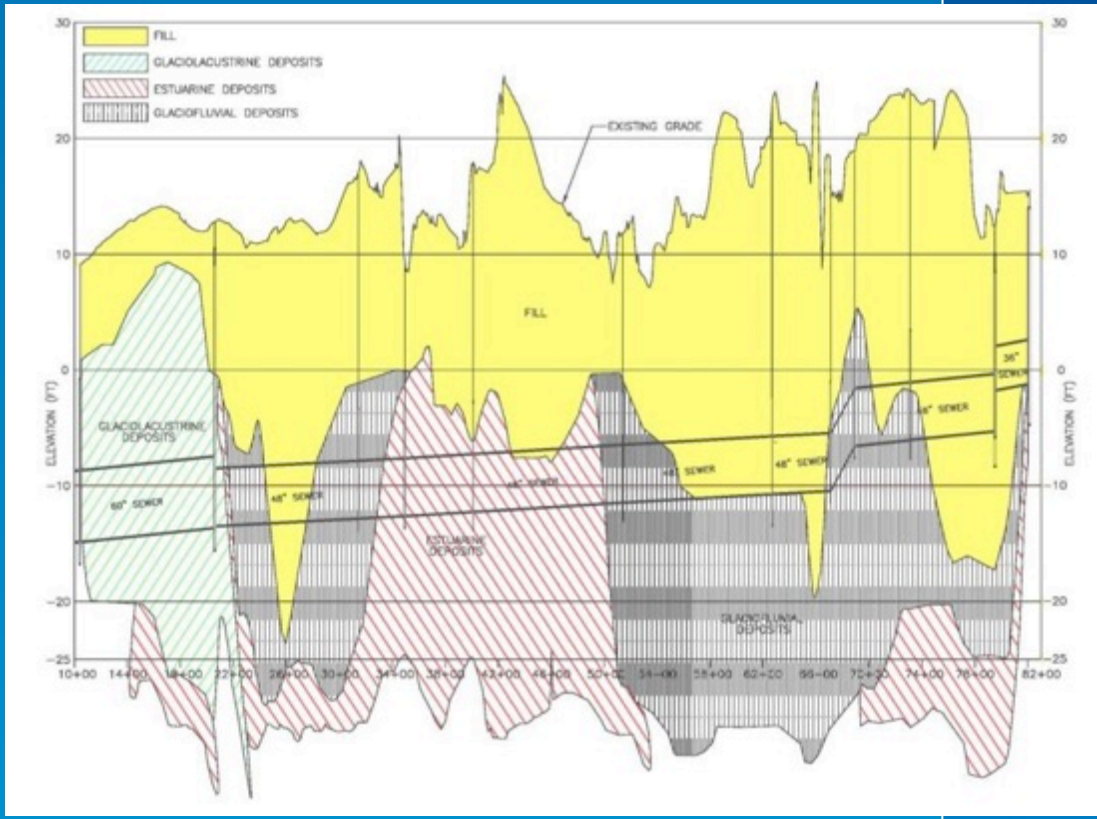
Fundamentals of Microtunneling

Geotechnical Exploration and Geologic Conditions

- 32 borings spaced at 250 to 300 ft
- Two large auger borings (3 ft)
- Borings from previous projects
- No GBR developed
- GDR Provided

Geotechnical Exploration and Geologic Conditions

- Fill
- Glaciolacustrine Deposits
- Glaciofluvial Deposits
- Estuarine/Bottom Bay Deposits



Project Specifics

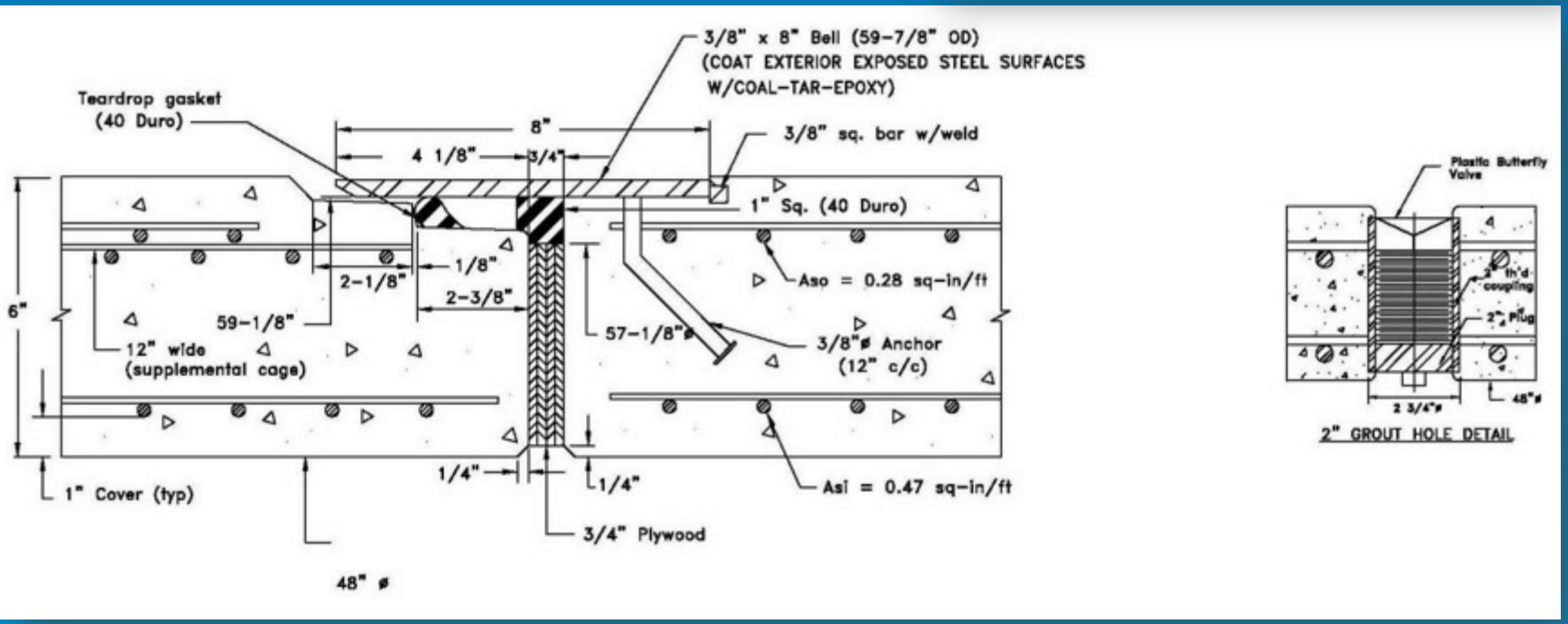
- Closed-face MTBM
- Circular launch/receiving shafts (sheet pile with steel ring beams)

Project Specifics

Reach No. (segment)	Pipe Inside Diameter (inch)	Geometry of the Reach		Method of construction
		Straight Alignment (length, ft)	Curved Alignment (radius/ length, ft)	
1	60	980		MTBM
2	48		2864/1054	MTBM
3	48	1528/306		MTBM
4	48	473		MTBM
5	48	264		MTBM
6	48	806		MTBM
7	48	1,084		MTBM
8	48	393		MTBM
9	48	141		MTBM
10	48	395		MTBM
11	48	563		MTBM
12	36	251		Open Cut

Project Specifics

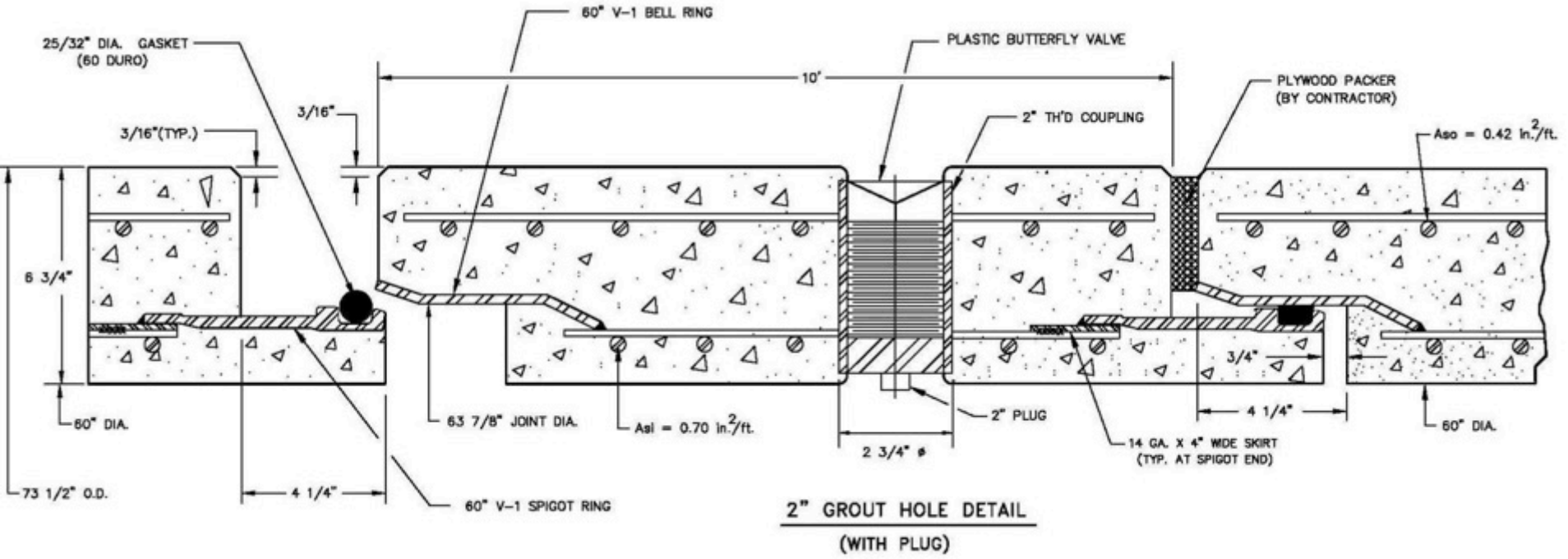
- 48-inch Precast Reinforced Concrete Carrier Pipe



2" GROUT HOLE DETAIL

Project Specifics

- 60-inch Precast Reinforced Concrete Carrier Pipe



2" GROUT HOLE DETAIL
(WITH PLUG)

Project Features and Restrictions (Challenges)

- Difficult Subsurface Conditions
  - Frequent boulders and nested cobbles in Glaciofluvial Deposits

Project Features and Restrictions (Challenges)

- Difficult Subsurface Conditions
  - Timber, metal pieces, railroad spikes in Fill Deposit

Project Features and Restrictions (Challenges)

- Difficult Subsurface Conditions
  - Slurry blow out caused by radical flushing to remove slurry return blockages (microtunneling through buried timbers)

Project Features and Restrictions (Challenges)

- Difficult subsurface conditions resulting in sinkholes
  - Frequent boulders and nested cobbles in Glaciofluvial Deposits
  - Microtunneling in fill deposits

Project Features and Restrictions (Challenges)

- Difficult subsurface conditions resulting in wear and tear of MTBM

Project Features and Restrictions (Challenges)

- Passing Under Sensitive Utilities
  - 42-inch Pre-Stressed Concrete Cylinder

Project Features and Restrictions (Challenges)

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Project Features and Restrictions (Challenges)

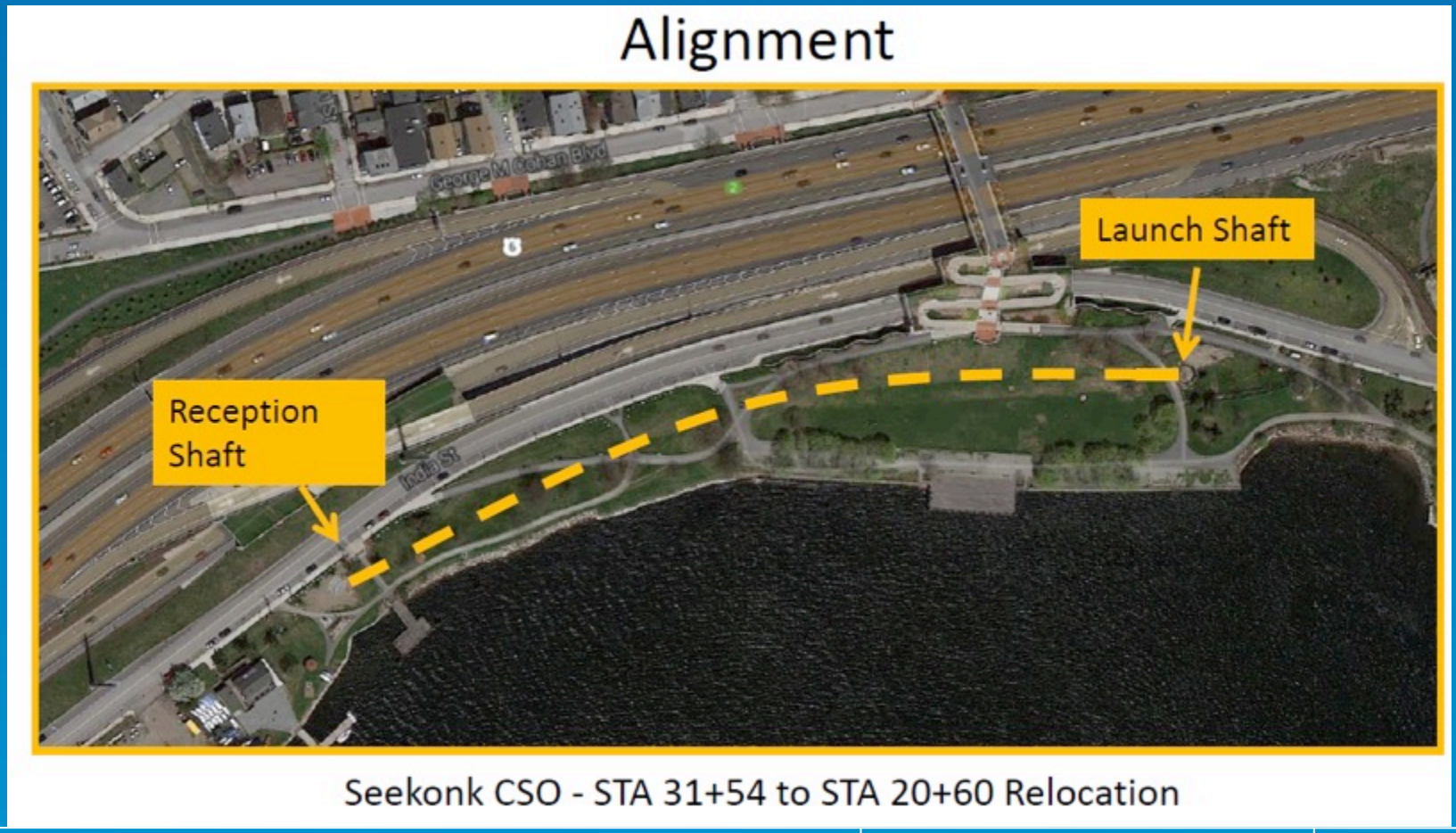
- Crossing through Known Obstruction
  - Timber Piles Supporting Abandoned 42-inch CI SRI

Excavation Support System

Exposed Timber Pile Cap and Pile

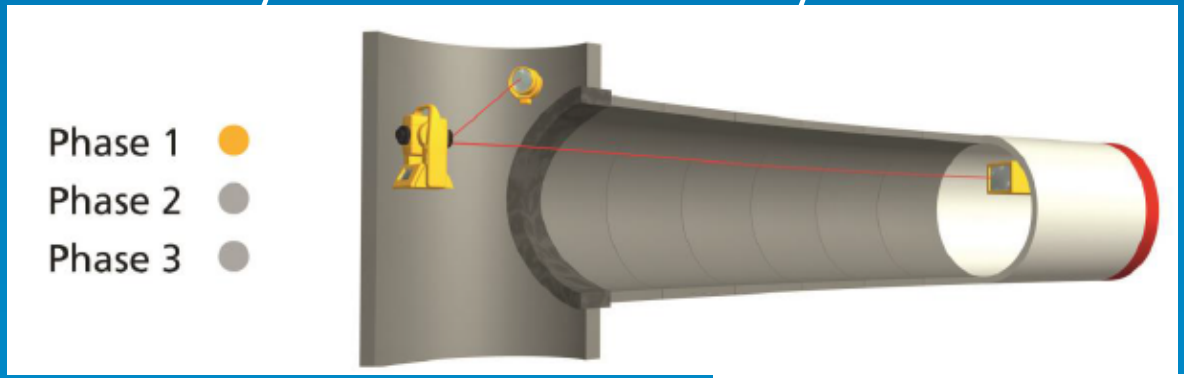
Project Features and Restrictions (Challenges)

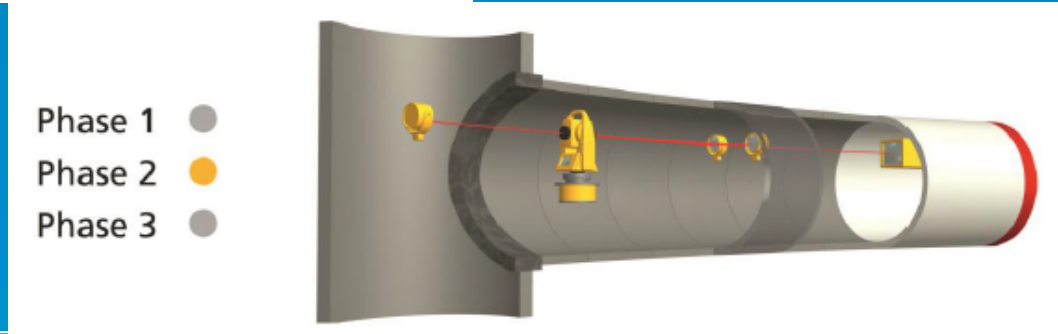
- Curved Alignment



Project Features and Restrictions (Challenges)

- Curved Alignment Guidance System
  - SLS-Microtunneling LT from VMT
  - Laser Theodolite System
  - System Calibration every 100-150 ft





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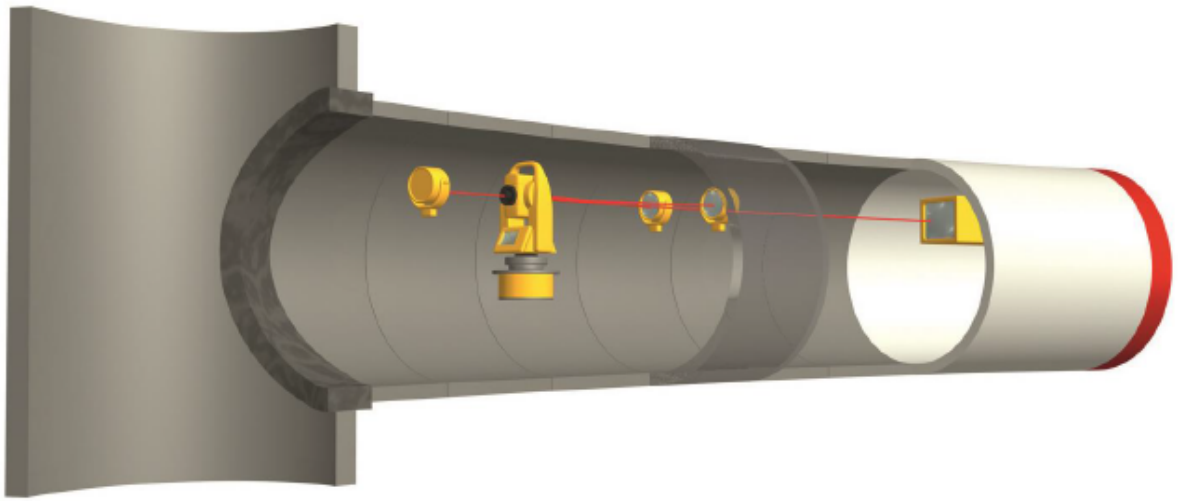
Phase 1
Phase 2
Phase 3



Project Features and Restrictions (Challenges)

- Curved Alignment
  - Encountering Timber Piles

Project Update

- 7,210 ft of microtunneling successfully completed (100% of work)

- $927K in change orders executed or approved
  - CO rate of about 5% total work
  - Access Road, Relocate Overhead Wires, Final Grade Changes, Timber Piles Removal, Additional Debris Removal, etc.

Lessons Learned

- Comprehensive geotechnical investigation
- Design of geotechnical monitoring program
- Review of historic data to identify possible obstruction along the tunnel alignment
- Close collaboration between owner, designer, and contractor
- Capability of MTBM operator

Questions?