



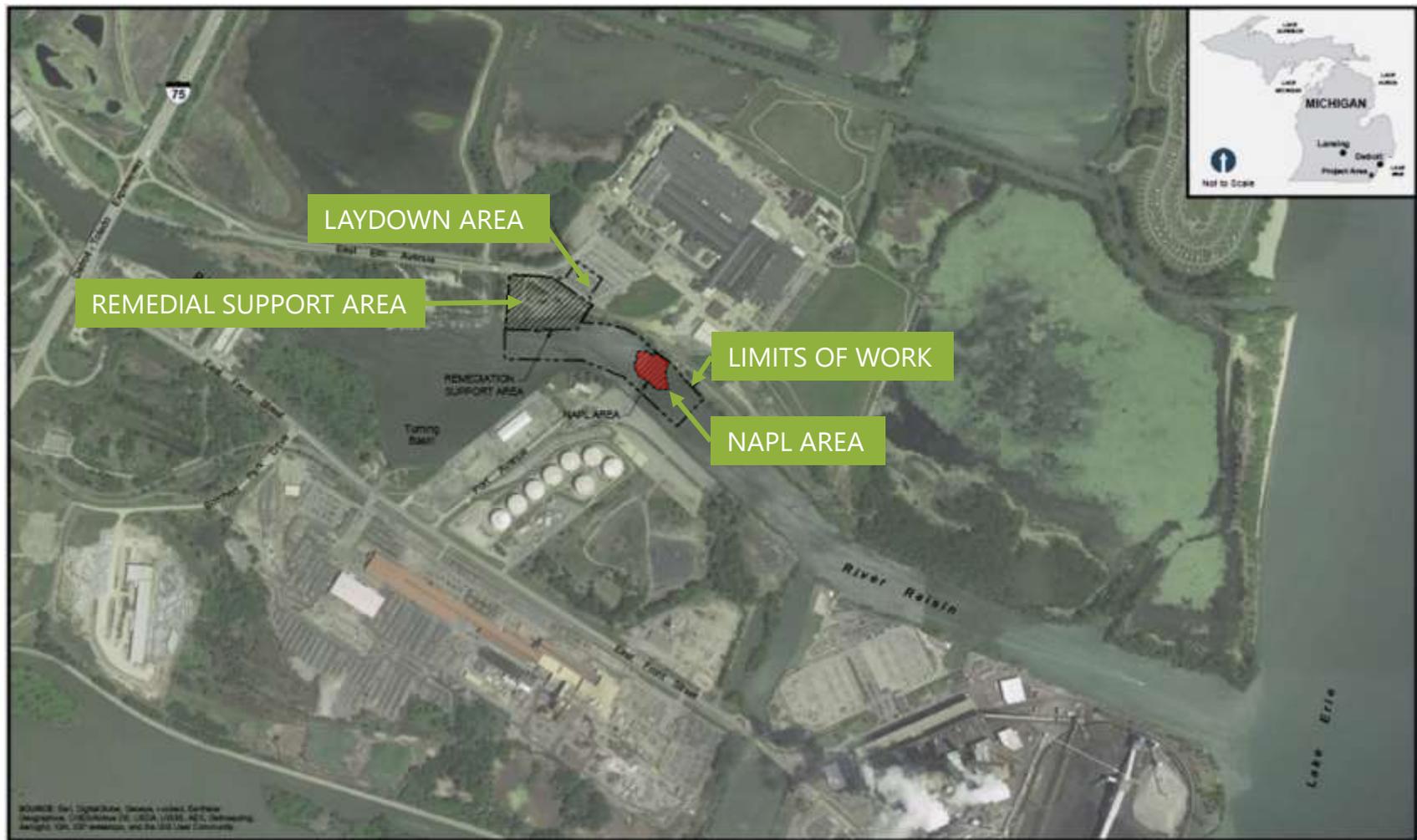
River Raisin Area of Concern – NAPL Area – Sediment Remediation



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Site Description and History



Site Description and History

- **1997 to 2012:** 120,000 cubic yards (cy) of sediments with PCBs were removed from the area of concern
- **2012:** Nonaqueous phase liquid (NAPL) observed during 2012 dredging and verification sampling
- **2013 to 2014:** Define the extent and mobility of the identified NAPL
 - NAPL and Toxic Substances Control Act (TSCA) PCBs (>50mg/kg) found as deep as 28 feet below the existing sediment surface
 - Additional sampling successfully delineated lateral extents of NAPL area
 - Presented remedial alternatives to regulators
- **2015:** Regulators approve final remedy

Project Participants

- Ford Motor Company
 - Mannik & Smith
 - Anchor QEA
 - Severson Environmental Services
 - Geo. Gradel Company
- EPA
 - GLNPO
 - Environmental Restoration, LLC and J.F. Brennan Co.
 - U.S. Army Corps of Engineers
- MDEQ
 - Surface Water Quality Division

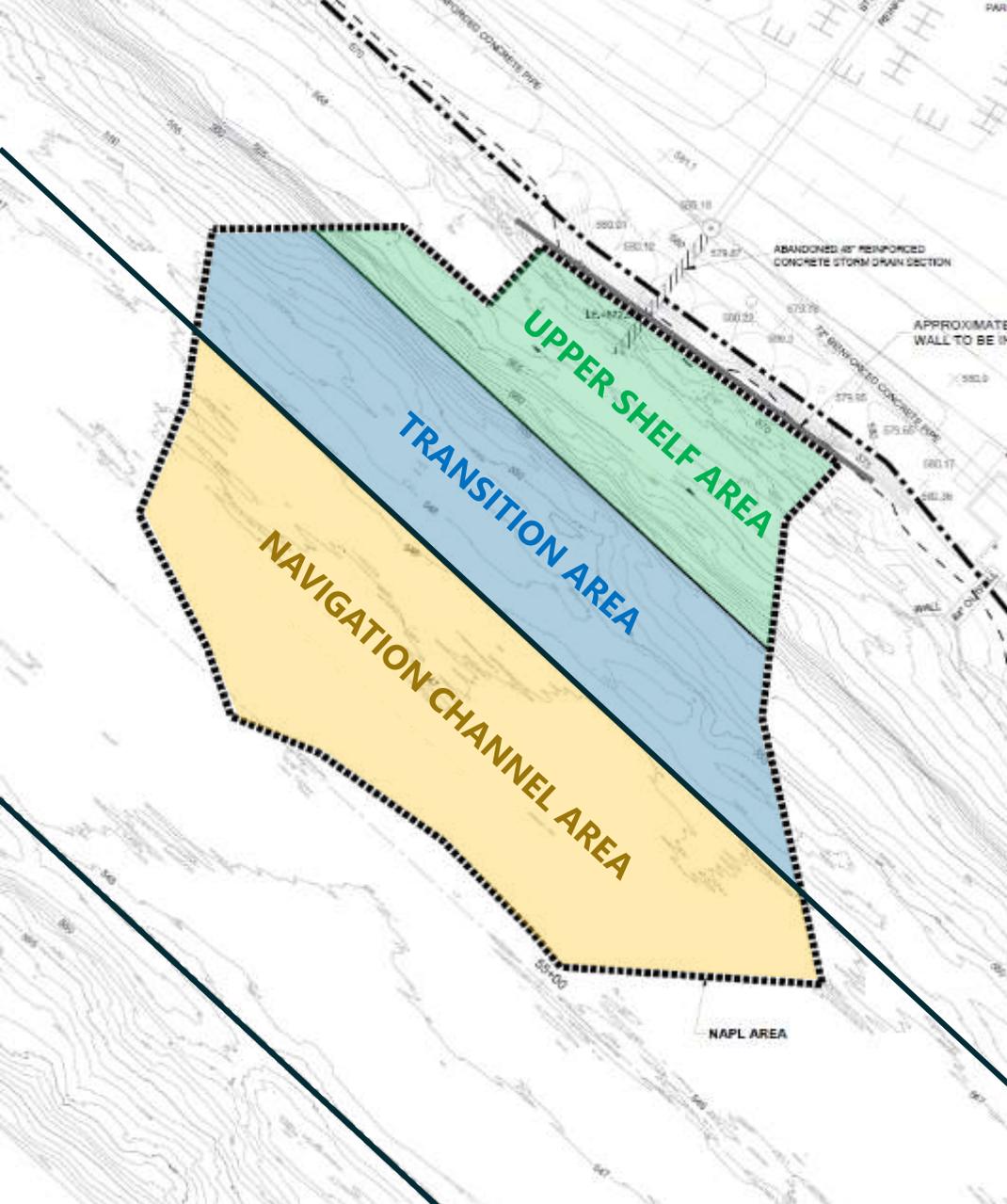
The remedy was a joint effort between Ford Motor Company and EPA (GLNPO).

Remedial Design Elements

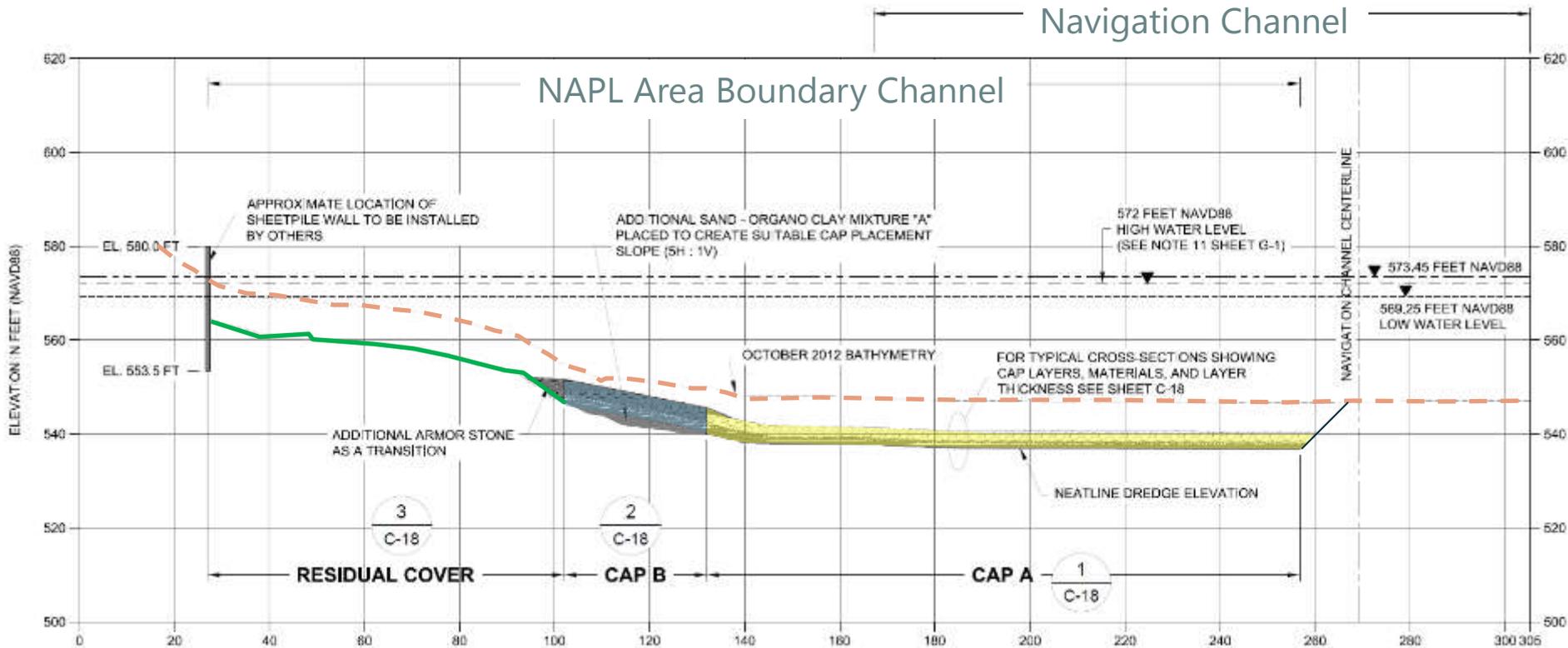
- Permanent sheet pile wall along shoreline to facilitate nearshore sediment removal
- Planned dredging of 28,100 cy of sediment
- Upper shelf area includes:
 - Target removal depth of 8.2 feet of material
 - 6-inch residual cover (graded gravel)
- Transition area and navigation channel includes:
 - Target removal depth of 10.0 feet
 - 5-foot cap in transition area
 - 3.75-foot cap in navigation channel

Remedial Design

1. PCBs above 50 parts per million (ppm) and NAPL observed up to 25+ feet below mudline
2. Dredging 8 feet in upper shelf area to remove PCBs above 1 ppm
3. Dredging 10 feet in transition and navigation channel for practicability
4. Engineered cap installed in transition and navigation channel after dredging



Remedial Design



Construction – Sheet Pile Installation



2016 Sheet Pile Installation

Construction – Sheet Pile Extensions



Construction – Dredging



2016 Sediment Remediation at River Raisin¹

¹ Source: <https://www.youtube.com/watch?v=N28Arvufgxl#action=share>

Construction – Environmental Controls

- Dual-curtain system
 - Moon pool
 - Permeable outer curtain
 - Impermeable inner curtain
- Real-time turbidity monitoring
 - Upstream and downstream sensors take readings every 10 minutes, averaged every hour
 - 1 hour average not to exceed 50 Nephelometric Turbidity Units above upstream, or 1.5 times greater than upstream, whichever is greater
 - No project exceedances attributable to dredging or capping



Construction – Dredging

- Actual removal was 29,465 cy
- On average, 330 cy dredged per day
- Water depths greater than 35 feet in navigation channel (post dredging)



Construction – Sediment Processing

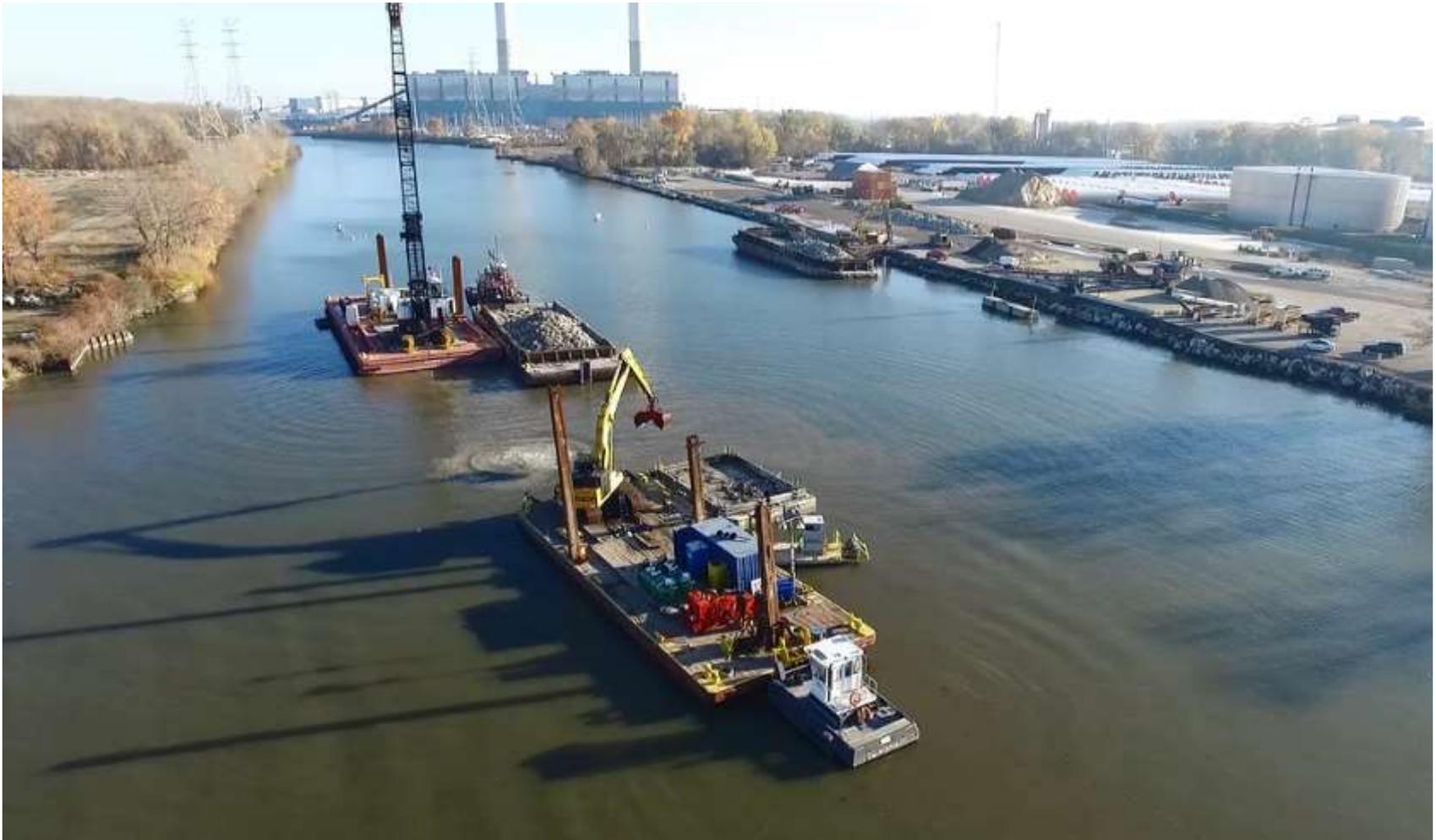


Construction – Stabilization and Disposal

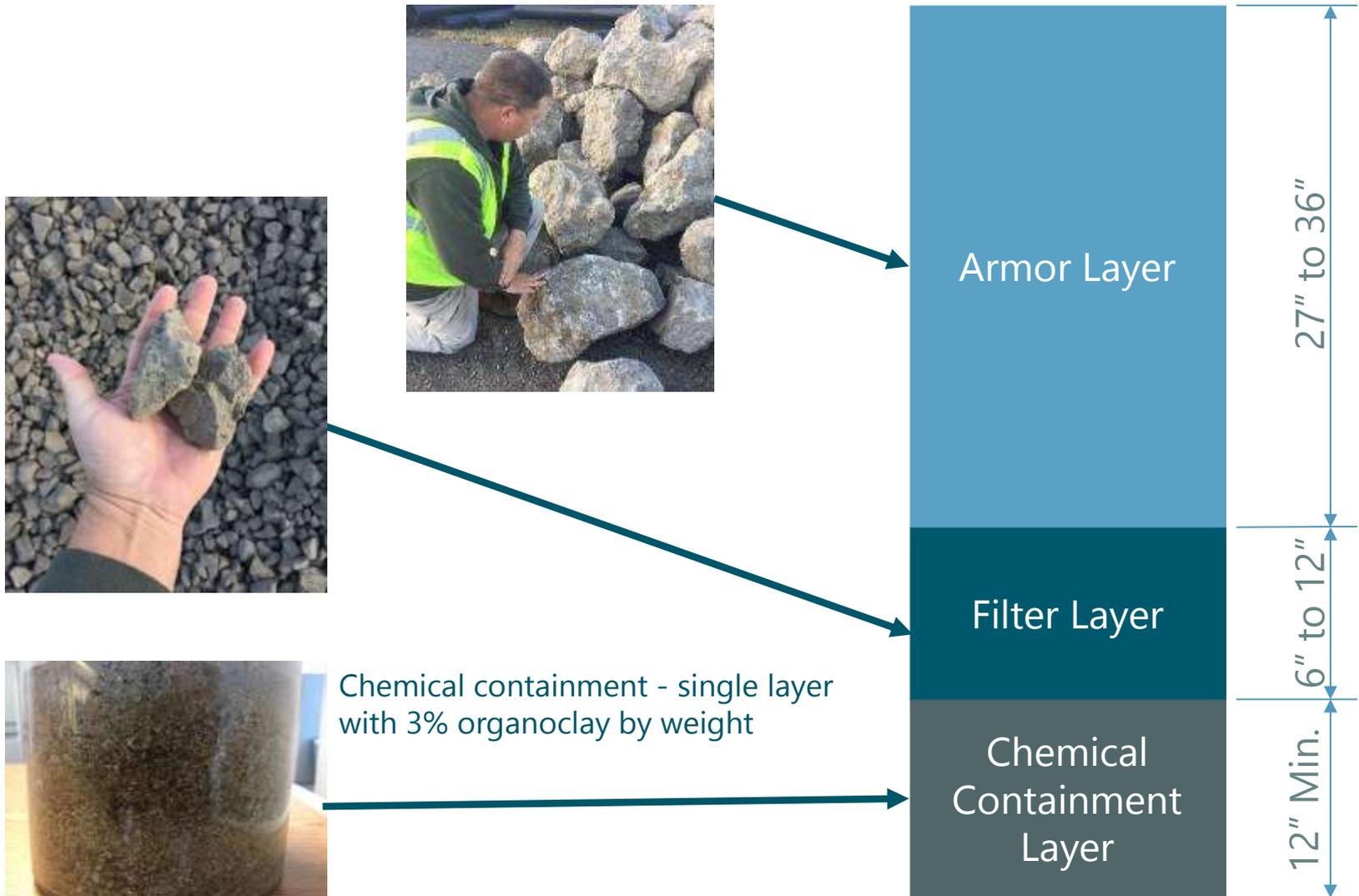
- 62,293 tons of stabilized sediment hauled off site as TSCA waste (1,353 truckloads)
- Calciment® and Type II Portland cement used for stabilization
- Average dosage rate of 6%
- Processed an average 776 tons of sediment each day on a 28,900-square-foot pad



Construction – Capping



Construction – Engineered Cap



Construction – Capping

- Sand and organoclay blended onshore using series of hoppers, conveyors, and mixing augers
- Sand and organoclay placed using moonpool
- No turbidity controls utilized during placement of filter and armor stone



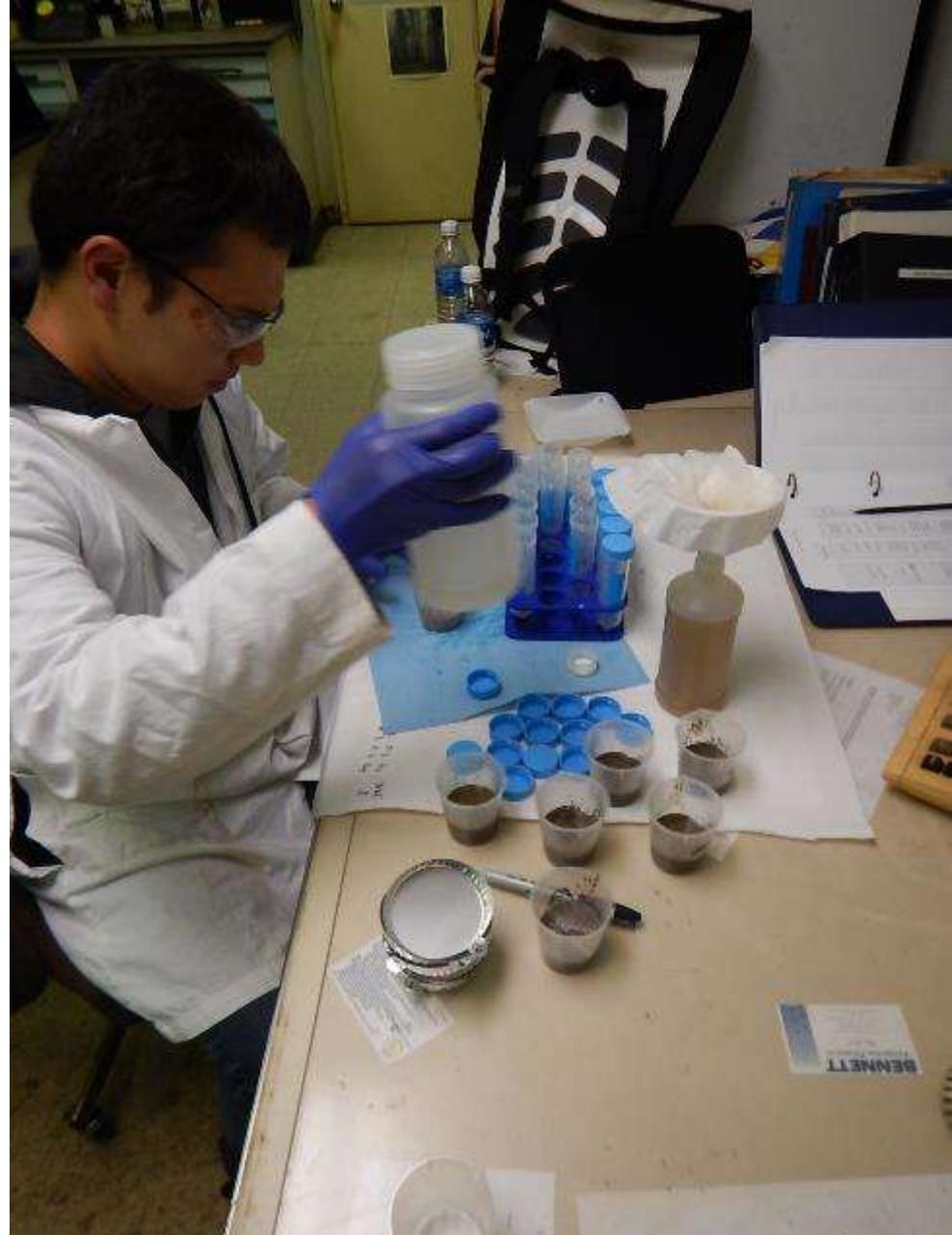
Quality Assurance

- Daily coordination
- Full-time oversight
- GPS control
 - Dredgepack®
 - ClamVision®
- Capping
 - Sand leveling
 - Depth of placement
 - Organoclay content
- Bathymetric survey



Quality Assurance

- Separated organoclay from sand in the chemical containment layer to determine organoclay percentage by weight



Quality Assurance



Project Challenges

- Water depth/Geology
- Extent of impacts
- Embedment depth of sheet pile wall
- Vessel traffic scheduling and coordination
- Procurement and contracting
- Variable work schedule – up to 24 hours per day



Key Takeaways

- Communication and flexibility needed to manage schedule challenges
- Developing and maintaining good working relationships with regulators and project partners was key to success

Questions?

