

Former Wisconsin Steel Works

South Slip Management
of Impacted Sediment
of a Sorptive Cap

Western Dredging Association/
Texas A&M Dredging Seminar 2103

Mark Gravelding/Alex Francisco
ARCADIS US, Inc.
August 28, 2013

Imagine the result

HANFMAN & FABRY CO
CHICAGO
24-5901-2



Outline

1. Site History
2. Cleanup Objectives
3. Pre-Design Activities
4. Cap Design
 - Chemical Transport
 - Erosion
 - Stability
 - Future Use
5. Cap Installation
6. Institutional Controls/Monitoring

Former Wisconsin Steel Works Team

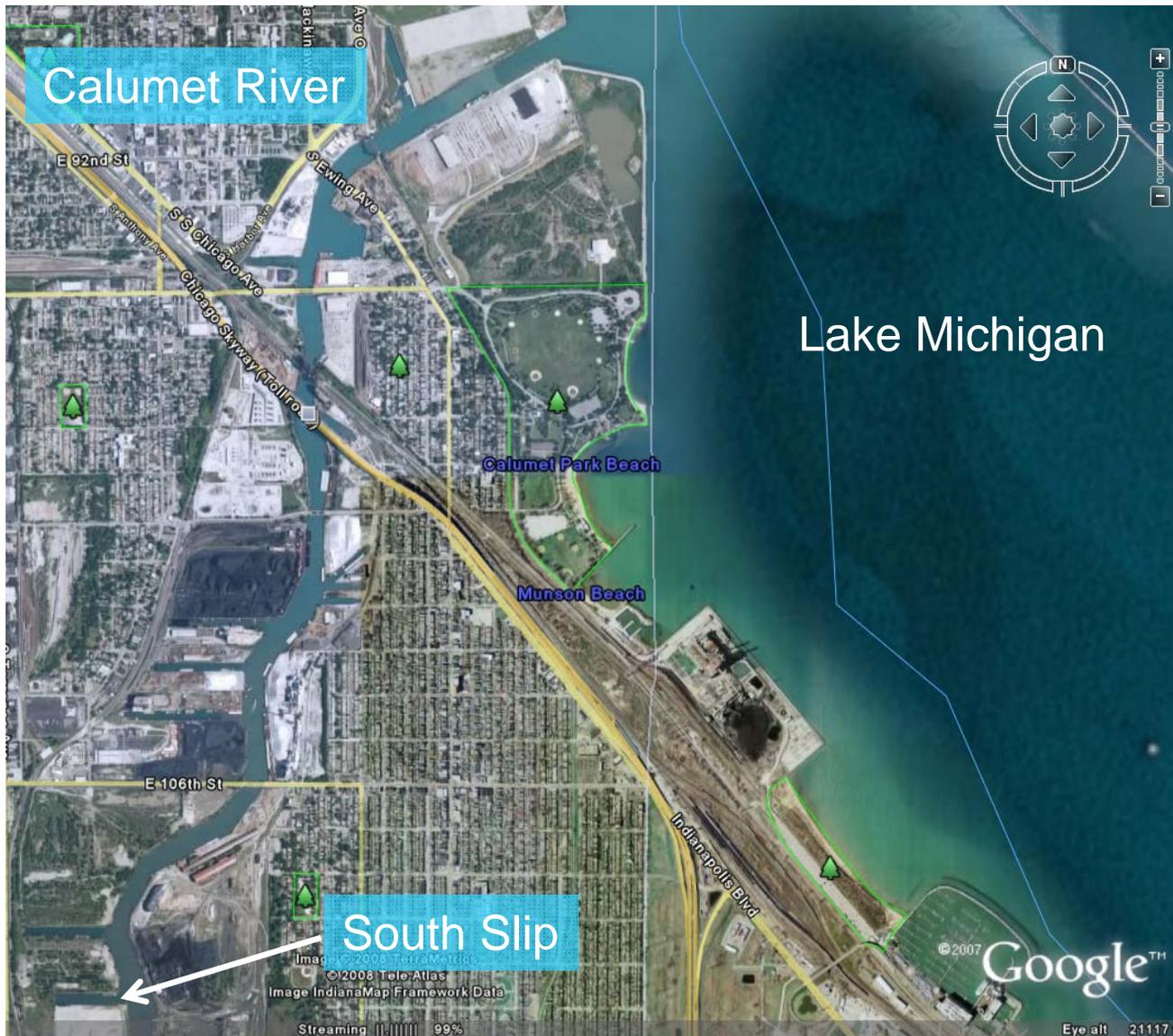
- **Regulatory Agency** – Illinois EPA
- **Former Owner** – Navistar, Inc.
- **Current Owner** – Walsh Group, LLC
- **Environmental Consultant** – ARCADIS U.S., Inc.
- **Remedial Contractor** – Terra Contracting, LLC.

Site History

- Actively produced steel from 1875-1982
- Steel mill was partially demolished: rolling mills remained and nearly 100 foundations above, at, and below grade
- 176 acres: one of the largest sites in the Site Remediation Program (SRP)
- Split into 13 parcels; 12 of which have a No Further Remediation (NFR) letter

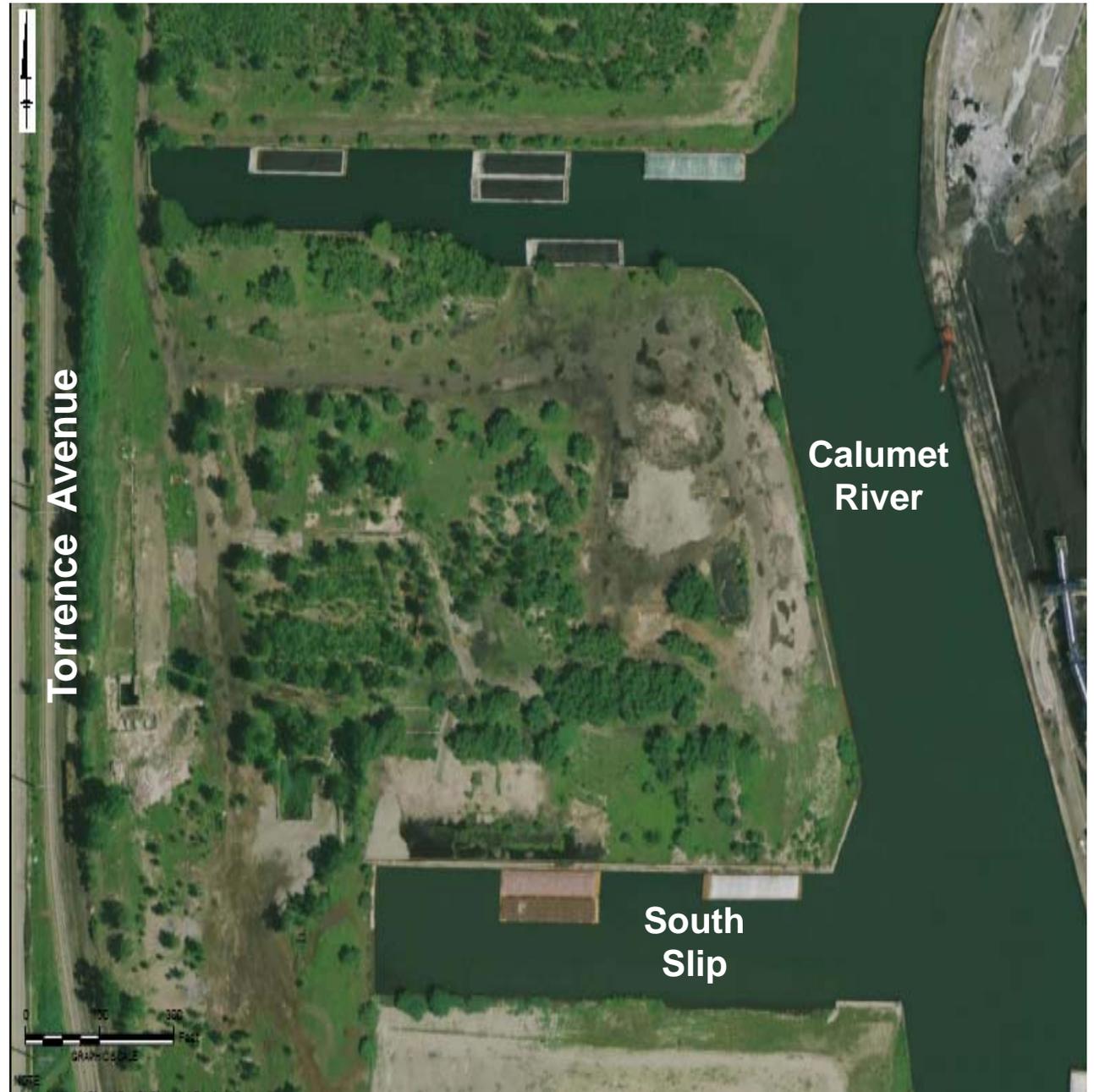


Site Location



Site Layout

- South Slip used for temporary mooring of barges



Phase II Risk Assessment/Remedial Cleanup Objectives

- Samples from South Slip and background locations
 - PAHs primary risk drivers
 - Potential risk to benthic invertebrates, fish, and aquatic wildlife
 - Minimal risk to humans based on fish ingestion

Remedial Cleanup Objectives

Primary objective:

- Eliminate exposure pathways by isolating impacted sediment from surficial ecological receptors, which in turn, addresses human risk

Secondary objective:

- Maintain current slip use

Cleanup Objectives

- No sediment cleanup objectives for Illinois EPA
- Statistical analysis of background data indicated a threshold level of 400 mg/kg total PAHs in sediment
- PAHs greater than background in South Slip drove need for remediation
- Maintain current slip use

Pre-Design Investigation

March 2011

- Surficial and at depth geotechnical samples
- Velocity measurements
- Sediment thickness probing
- Bathymetric survey
- Side scan sonar survey



Key Findings

- **Water depth:** < 5 feet (west end) – approximately 25 feet (east end)
- **Velocity:** 0.01 to 0.13 feet per second
- **Debris observed:** Significant debris targets observed
- **Sediment observations:**
 - Typically at least 10 feet thick
 - Soft, elastic silt
 - Soft sediments underlain by very stiff to hard silt and clay
 - Relatively steep slope observed on south shore



Design Parameters Considered for Capping

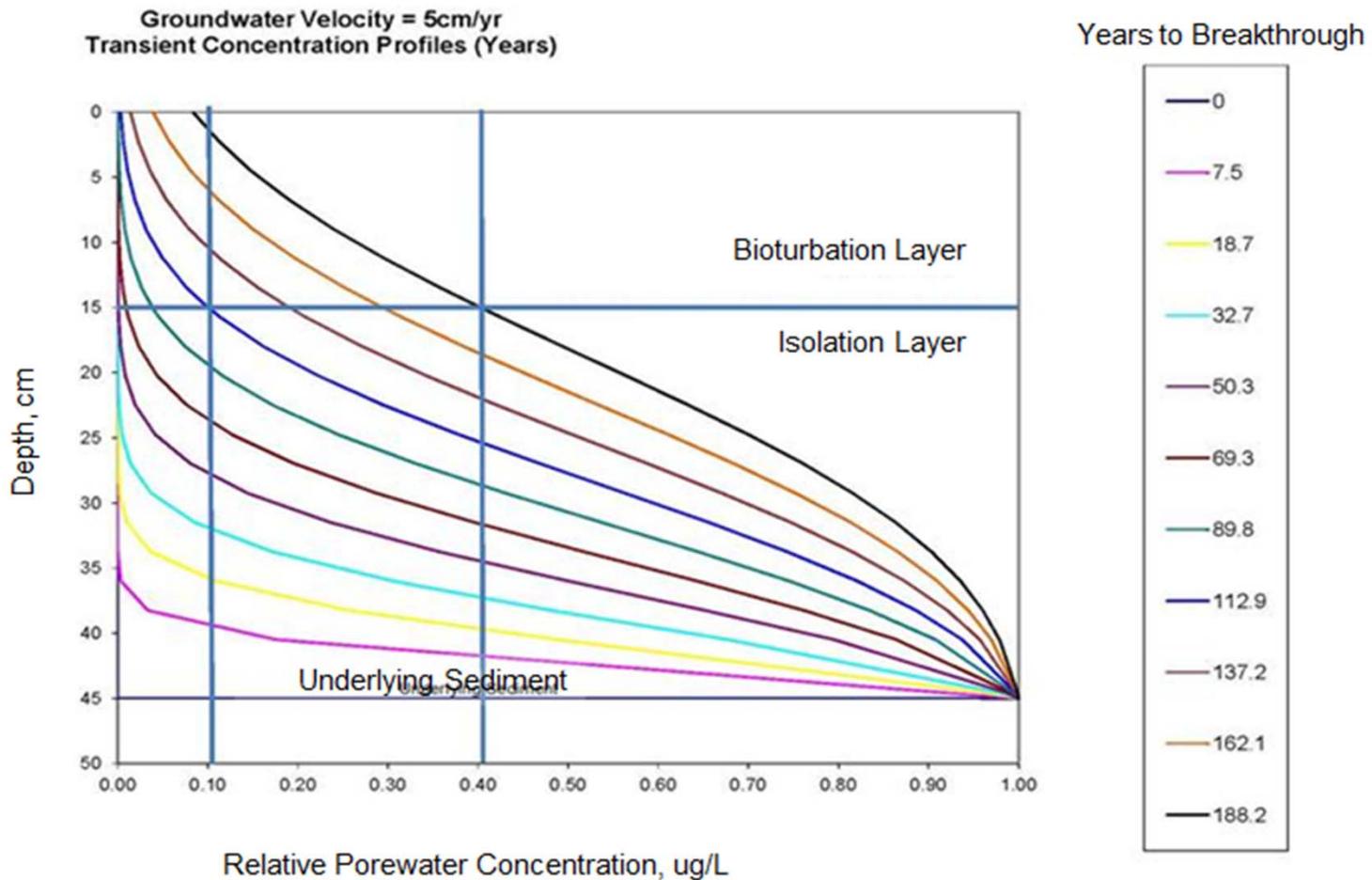
- **Chemical Transport**
 - Diffusive and advective transport
 - Presence of debris
 - Bioturbation
- **Erosive Forces**
 - Channel flow velocities
 - Waves and vessel wakes
 - Prop wash
- **Stability**
 - Bearing capacity
 - Consolidation
 - Side slopes
- **Future Use**
 - Navigational water depth

Transport Modeling

- Lampert and Reible 2009, v. 3.16
- Breakthrough Time: Number of years until PAH concentrations at the top of the isolation layer approach background
- Minimum Desired Breakthrough Time: 100 years
- Equilibrium partitioning theory used

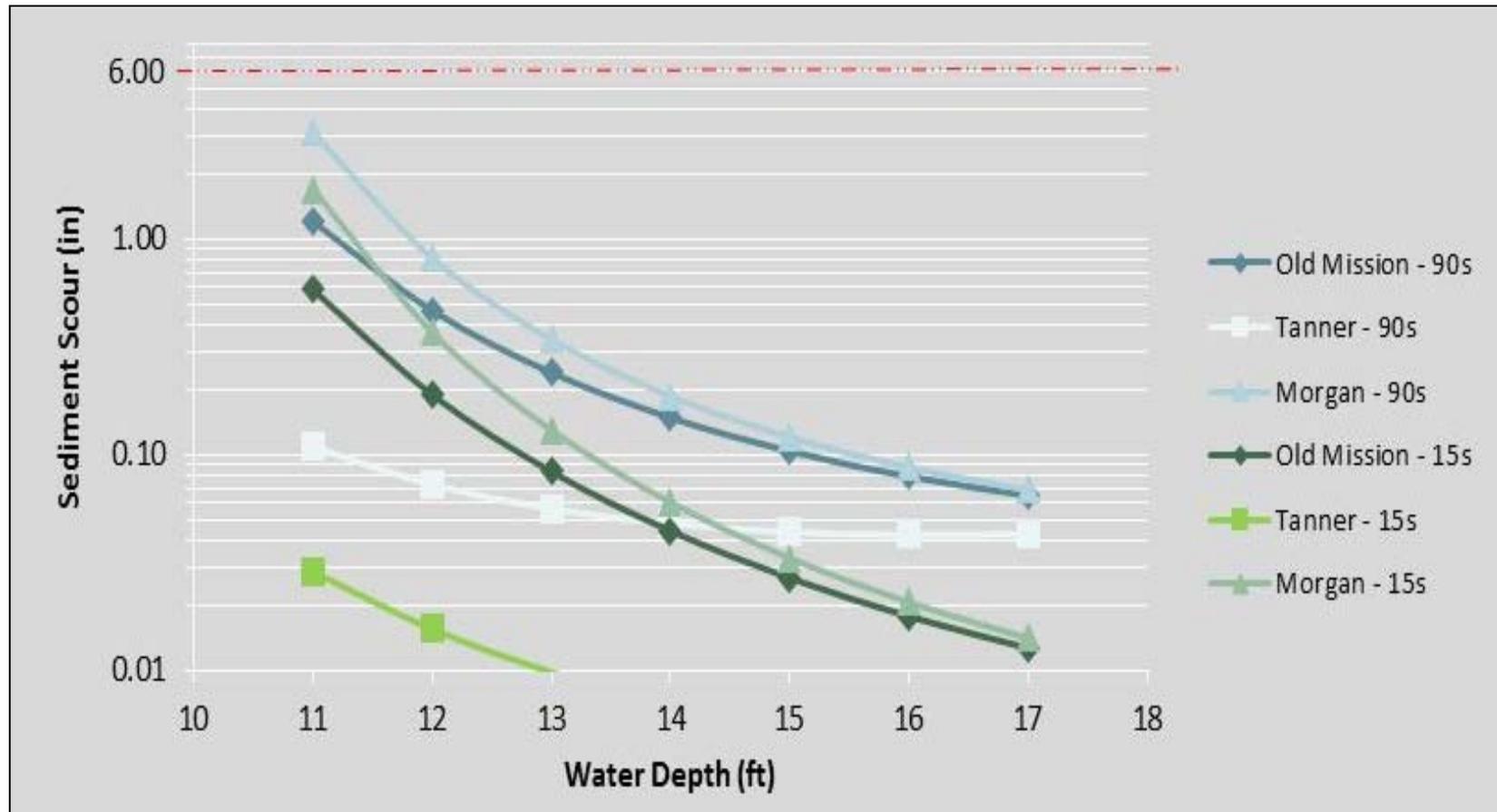
$$C_{pwtotal} = \left(\frac{C_{sed}}{f_{oc} * K_{oc}} \right) * \left(1 + (C_{doc} * K_{doc}) \right)$$

Transport Modeling with 2% TOC



- Modeling conservatively based on naphthalene characteristics
- 113 years to breakthrough based on C_{max}
- 188 years to breakthrough based on C_{avg}

Prop Wash Analysis



- Modeling based on post-construction water depth of 11 feet
- 2 inches stone: Max Scour = 3 inches
- Erosion Protection Layer = 6 inches

Stability Analysis

Bearing Capacity

- Drained (long-term) and undrained (short-term) porewater conditions
- Sediments have adequate strength to support cap

Consolidation

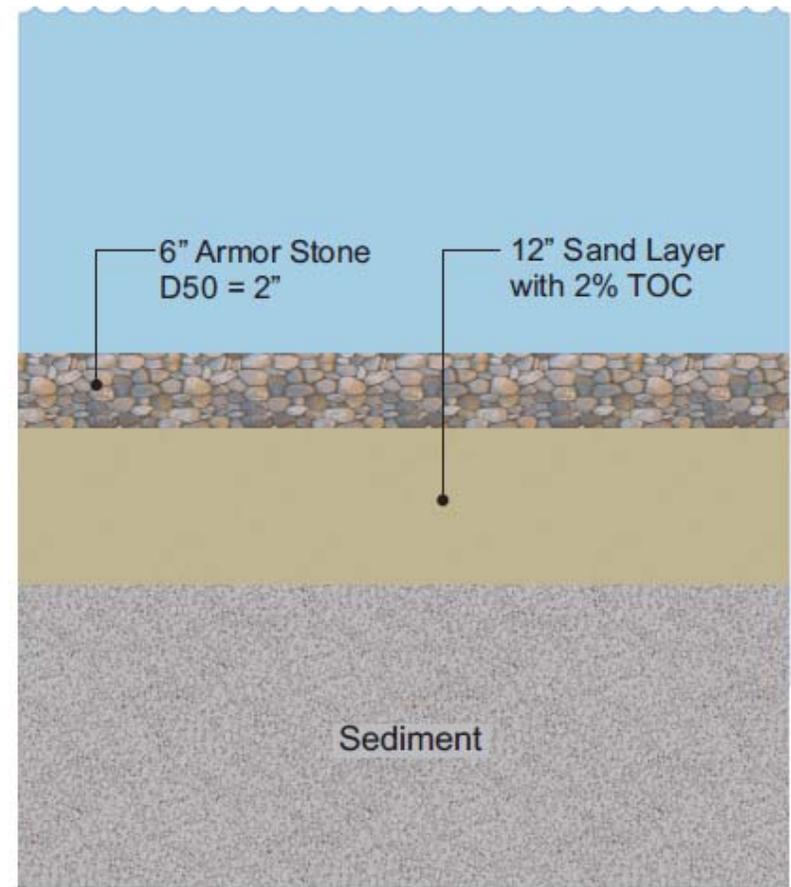
- 1 to 2 inches of consolidation
- Maximum lift of 6 inches

Slope Stability

- South slope filled to 2H:1V prior to cap placement

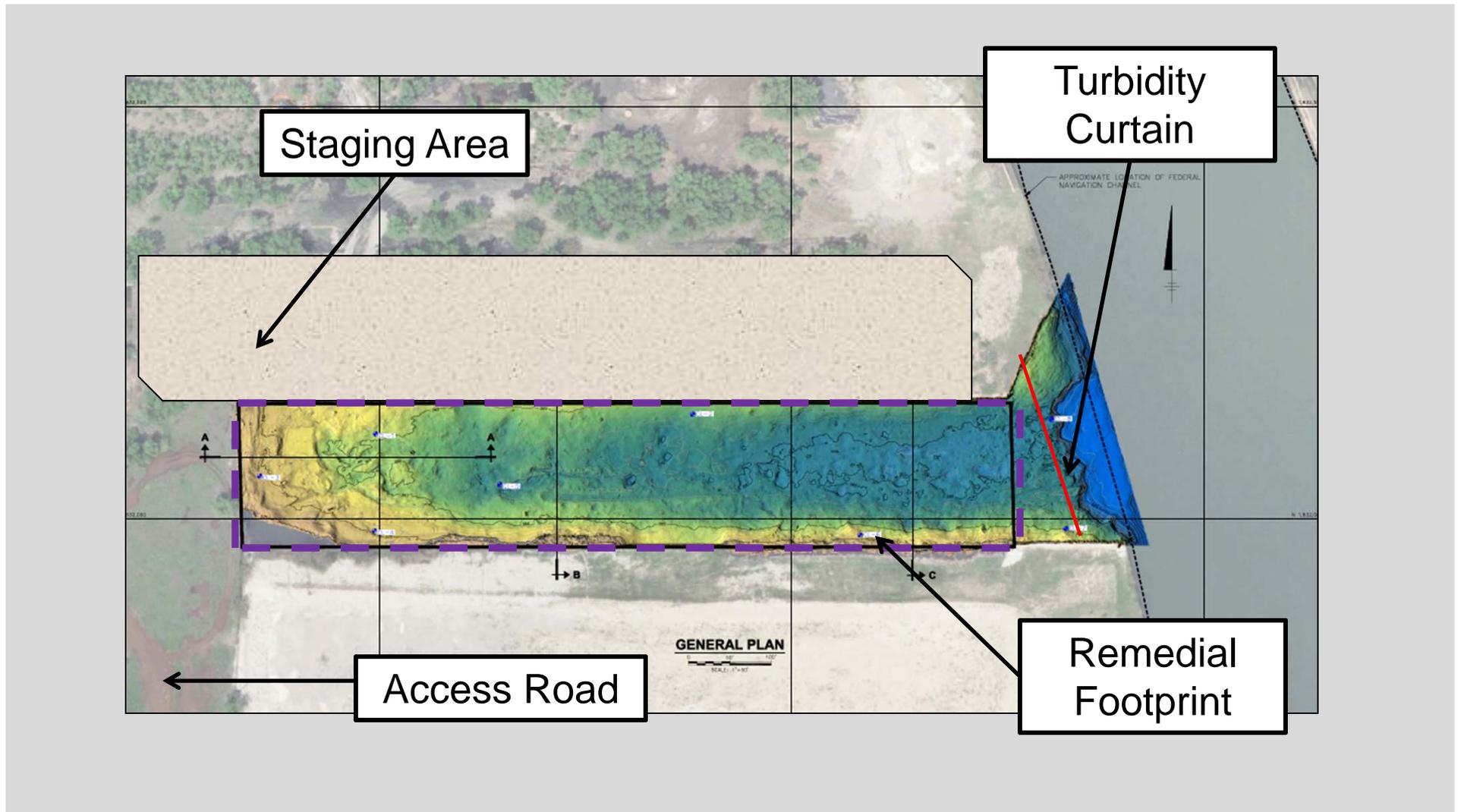
Cap Illustration

- TOC acts as receptor sites for dissolved phase constituents
- Reduces porewater concentrations and extends breakthrough time
- Sand used at site has a natural TOC of 0.5%
- CETCO Organoclay PM-199 used as an organic carbon analog
- Partitioning to Organoclay is believed to be 2.6 times as great as the partitioning to organic carbon



POST-CAPPING

Site Layout



Mobilization



Debris Removal



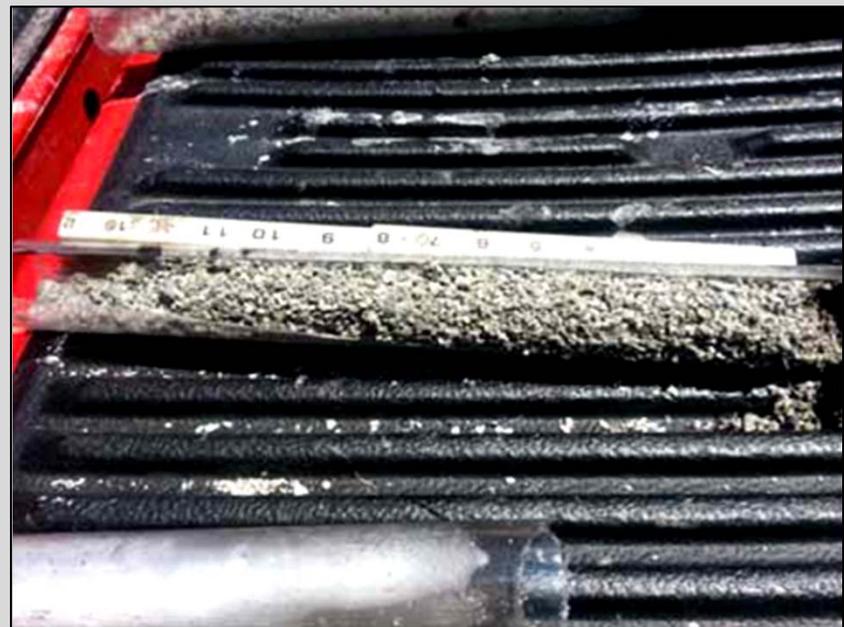
South Slope Fill Placement



Sand Placement



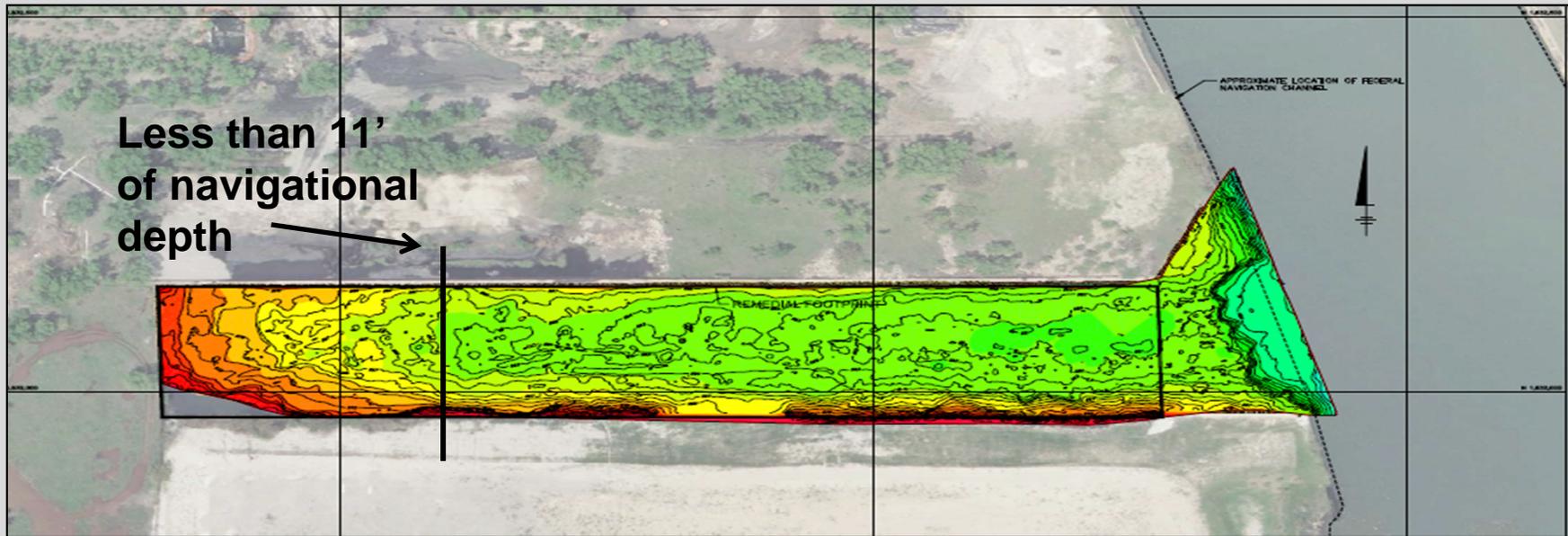
Sand Placement



Stone Placement



Institutional/Engineering Controls and Monitoring



- Navigation restrictions
- Seawall/dock repair provisions
- IEPA 5-Year Review

Imagine the result

