Clean Sediments and Clear Channels for Howards Bay and Fraser Shipyards – Combined Navigation and Remediation Dredging

Howards Bay, Superior, Wisconsin

WEDA Dredging Summit and Expo

July 25-28, 2022 | Houston, Texas

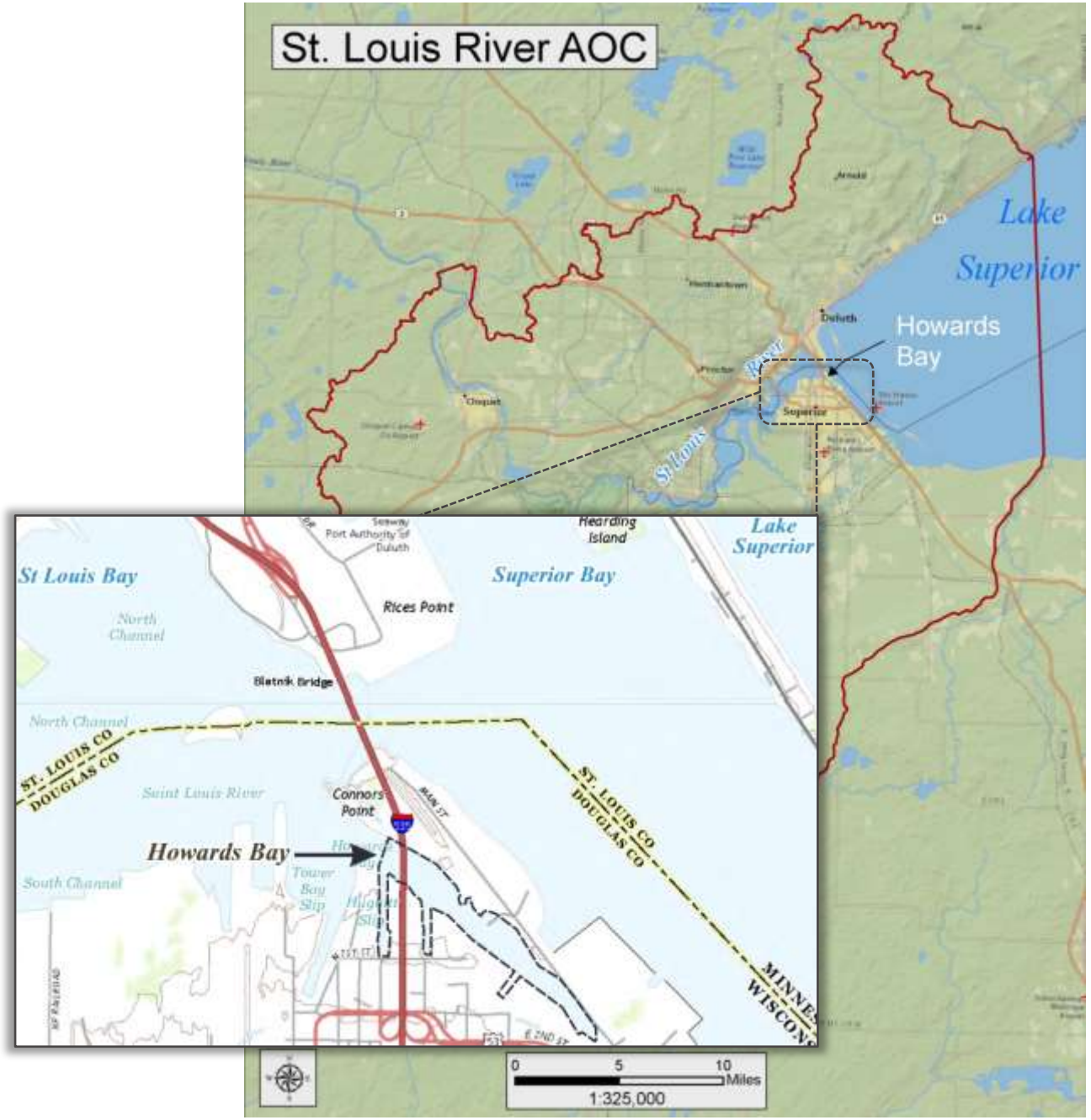
Overview

- Site Introduction
- Project Development
- Design Approach
- Construction
- Conclusions

Site Introduction

Howards Bay

- Located in City of Superior, WI
- In Twin Ports (Duluth/Superior) – furthest inland freshwater seaport
- Part of St. Louis River Area of Concern
- 300 acres
- Shipping in federal channel and private slips
- Fraser Shipyards – dry docks and ship repair services
- Largest capacity grain terminal in North America



Project Partners

Project Initiation

Photo courtesy of WDNR

- USEPA and WDNR assessed sediment under Great Lakes Legacy Act (GLLA) administered by USEPA
- USACE developed initial maintenance dredging program
- Fraser and City invited to collaborate in cleanup planning as non-federal sponsors
- Joint supplemental investigation completed
- The Focused Feasibility Study (FFS) and Remedial Design (RD) was conducted under a GLLA project agreement and co-funded with the sponsors

Site Conditions

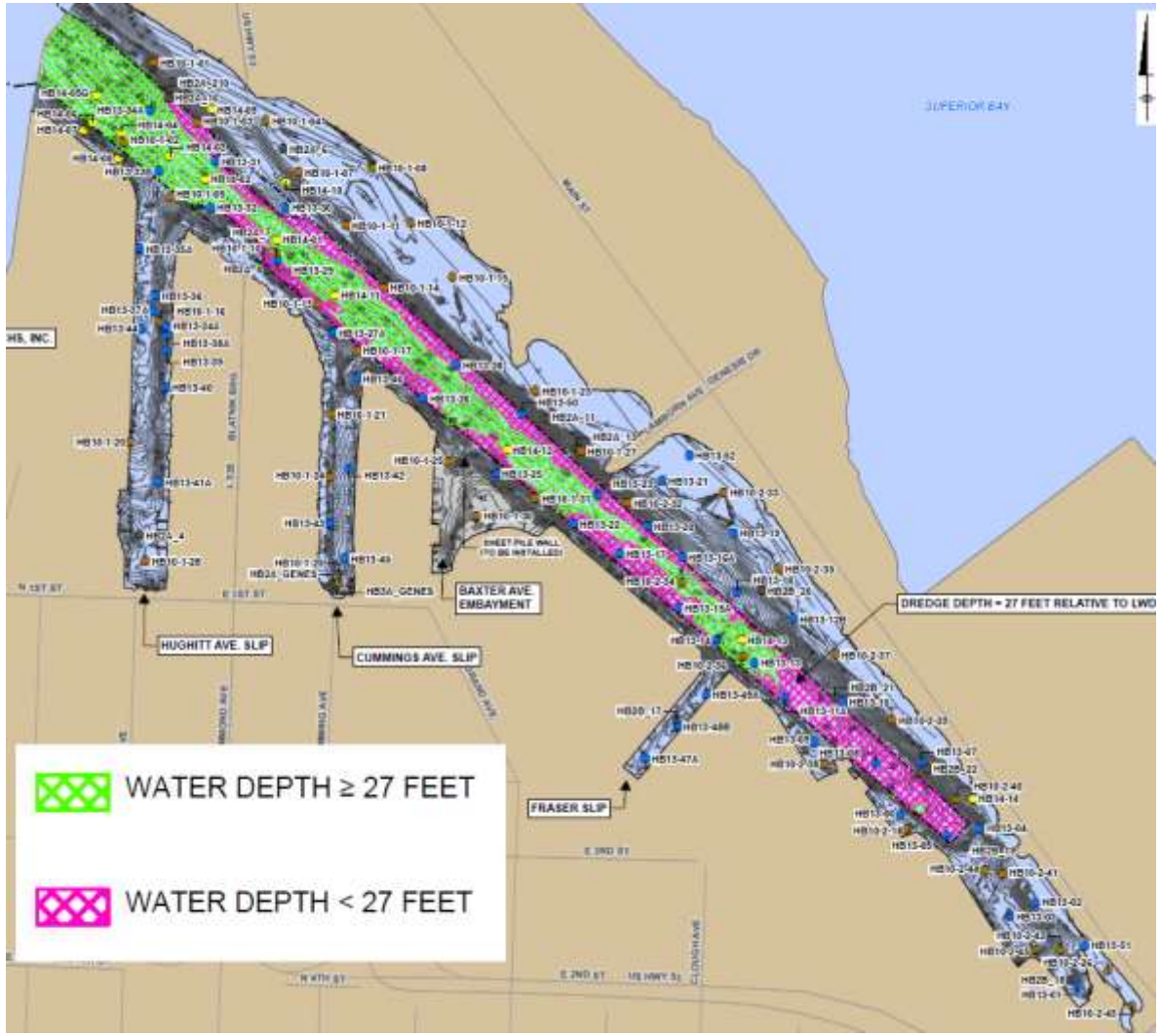
- Legacy sediment impacts from shipyard, industrial, grain terminal, municipal CSO and urban runoff sources
- Sediment impaired in varying degree throughout the bay:
  - Lead*, Mercury, Polycyclic aromatic hydrocarbons (PAHs)*, Tributyl tin (TBT)*

- Significant sedimentation in navigational channels, the ship slips and quiescent areas
- Maintenance dredging was required in addition to addressing contamination

* Components of marine paint. TBT is a biocide and was historically used as antifouling agent for ocean-going ships.

Design

Navigation Channel Maintenance Dredging



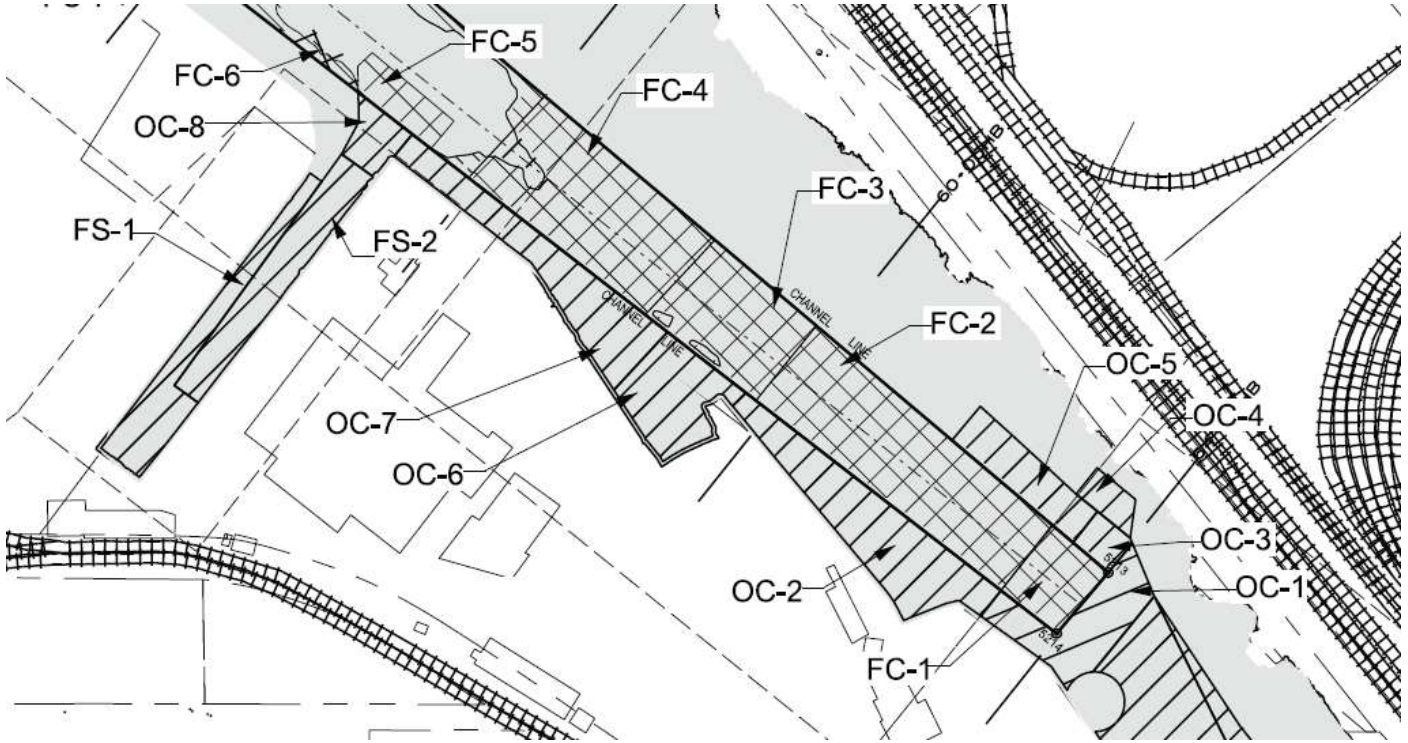
- USACE designed strategic navigation dredging (SND)
- Required project depth = 27 feet
- Periodic maintenance dredging by USACE
- Navigation dredging first
  - Access environmental dredge areas below
  - Protect from redeposition of environmental dredge materials
- Disposal at Erie Pier facility

Environmental Dredging

- Designed by Arcadis
- Tied to post-SND conditions
- Remediation limits developed with WDNR using Wisconsin Mid-Point Effects Concentration (MEC) and Probable Effects Concentration (PEC) values
- Disposal at Wisconsin Point Landfill and offsite commercial facility
- Portland cement required for stabilization per extensive treatability study

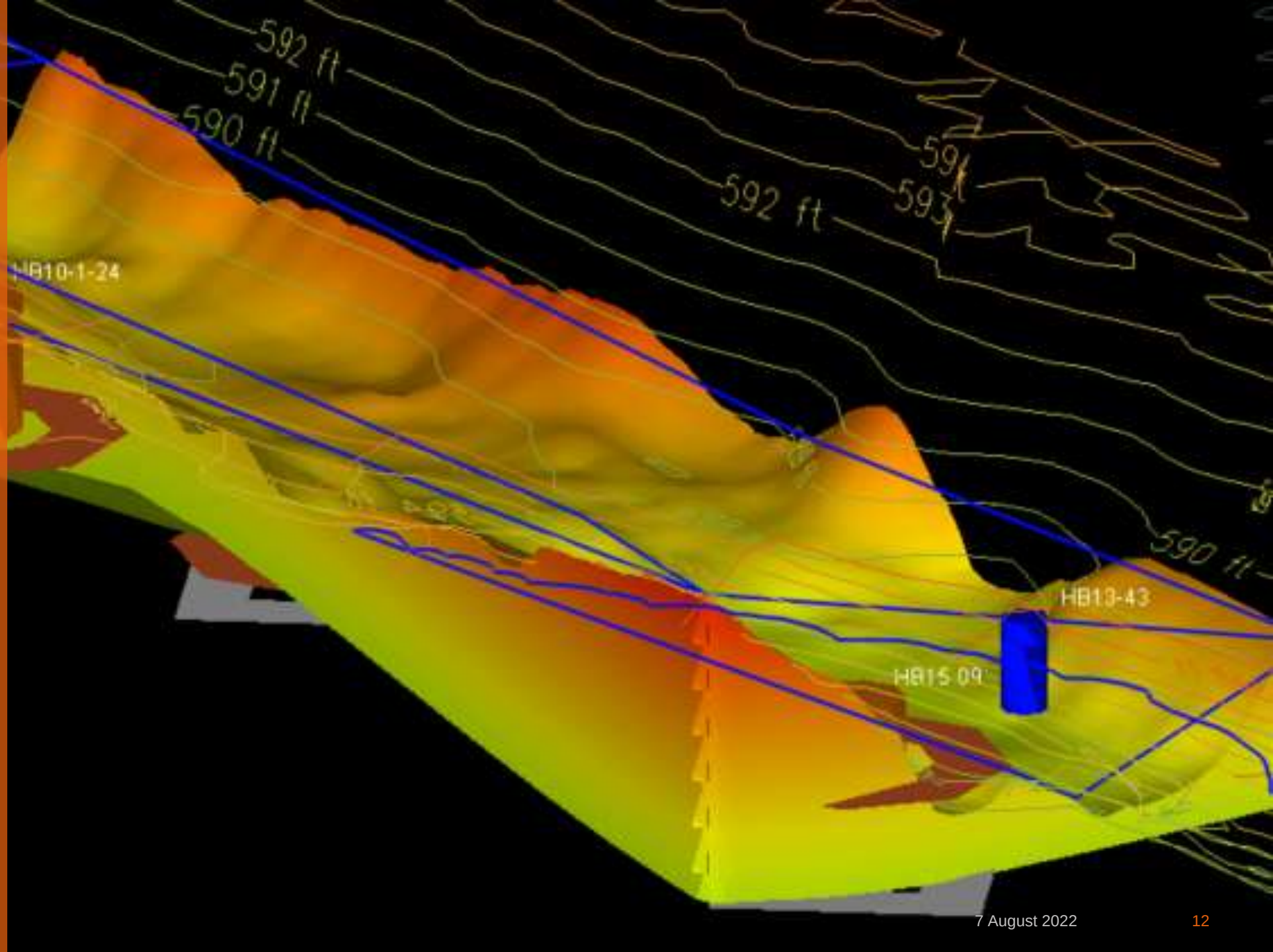
Interaction of SND/ENV

- SND requires cut to El. 574.1 ft
  - Allow 1 ft overdepth to El. 573.1 ft
  - 2:1 slope outside of Federal Channel
- Allow concurrent SND/ENV work
- Adjust ENV design in the field for post-SND survey



3D Model

- Input data and constraints
- Kriging method to interpolate COC and clay data
- Refine dredge limits



Geotechnical Considerations

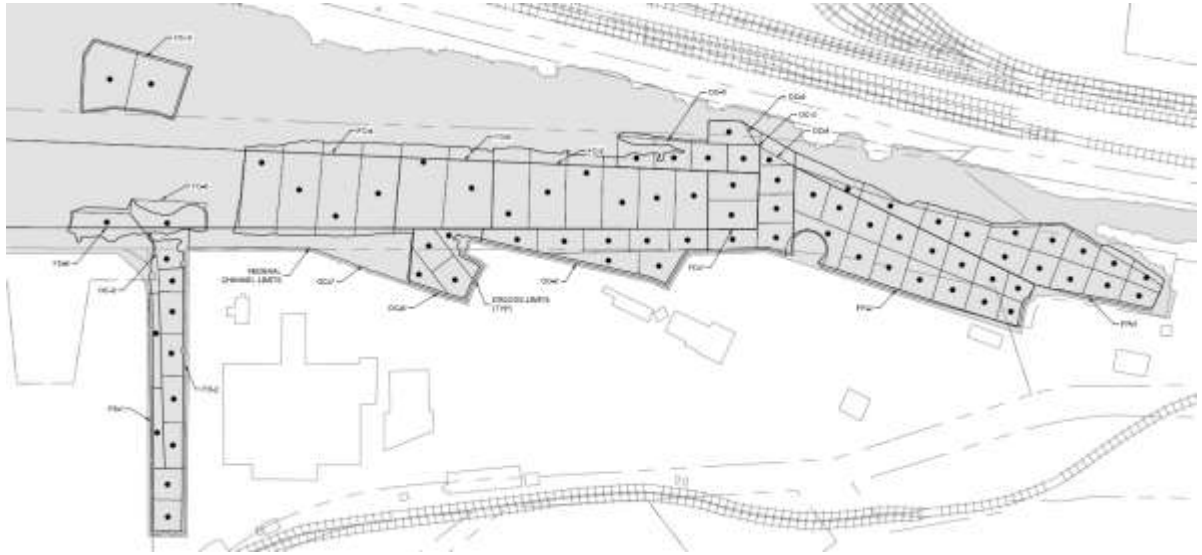
- Offset 10 ft min. from shorelines and structures
- Cut slope no steeper than 2:1
  - 3:1 slope at head of Hughitt Slip

Constructability Considerations

- Adjustment/smoothing of model grades
- Transitions between DMUs

Residuals Management

- Collect confirmation samples
  - Develop sampling subareas
  - Goal of 1 per 3,600 square feet
- Assess next steps with decision tree
  - No further action
  - Residual dredging
  - Residual cover (thickness varied)
- Collaborative, real-time decisions



Enhanced Natural Recovery (ENR)

- 6-inch sand cover
- Place in areas with shallow water and low COCs
  - No need for additional dredging
  - No need for specialized equipment

Wisconsin Point Landfill

- Closed municipal landfill, owned by City of Superior
- Cost-saving alternative to offsite disposal
- WDNR placement criteria allowed beneficial use
- Designated sediment for subgrade vs. cover fill
- Vegetative cover with reused Erie Pier material
- Redevelopment for public use

Photo courtesy of WDNR

Design Finalization and Bidding

- Collaborative team reviews throughout design
- Arcadis and USACE combined SND and environmental designs into one bid package
- USACE managed bidding and contractor selection with Partner input
- J.F. Brennan Company, Inc. awarded contract

Construction

Water Quality Monitoring and Controls

Photo courtesy of USACE

Active Shipyard

Photo courtesy of WDNR

Encountered Sunken Vessel

Conclusions

Final Environmental Dredging Numbers

Total dredge volume[1]	90,200 cy
Residual sand cover[2]	16,100 cy
ENR sand cover[2,3]	800 cy
Beneficial Use Soils[4]	15,000 cy
Person-hours with no lost-time injuries[5]	50,000 hours

Notes:

[1] Final dredge quantities verified by survey and include 13,000 cy of re-dredge material.

[2] Residual cover thickness and ENR cover thickness verified by survey and core collection/observation.

[3] ENR sand cover consisted of placement of a nominal 6 inches of sand over existing bed surface.

[4] Estimated quantity pending completion of work in 2022.

[5] Arcadis and Brennan combined on-site person hours.

Lessons Learned

- The spirit of **collaboration** that emerged provided momentum, creativity, and combined goals, which encouraged agreeable, timely solutions.
- **Cost savings** $ $ $
  - ***In design**, permitting, and planning phases by combining navigation and remedial dredging in one project*
  - ***In construction** via a single contractor, construction management team, staging site, and monitoring program*
  - ***In disposal** in beneficial use of SND material, and the City accommodating dredge material within the Wisconsin Point landfill, which supports a closure beneficial to public use*
- Rapid confirmation sampling data evaluation by the project partners, aided by graphical summaries and results mapping to support project completion within budget
- Monitoring and management controls to protect water quality were important for meeting regulatory expectations, and response actions successfully mitigated concerns

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