

Lessons Learned During Capping an Urban Canal and Installation of a Base for a Planned Urban Wetland

WEDA Dredging Summit & Expo 2023

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Historical Overview



Miller Compressing's Burnham Canal History

Historical operations

Copper wire reclamation furnace operated until mid-1980s

Investigated and evaluated clean-up options

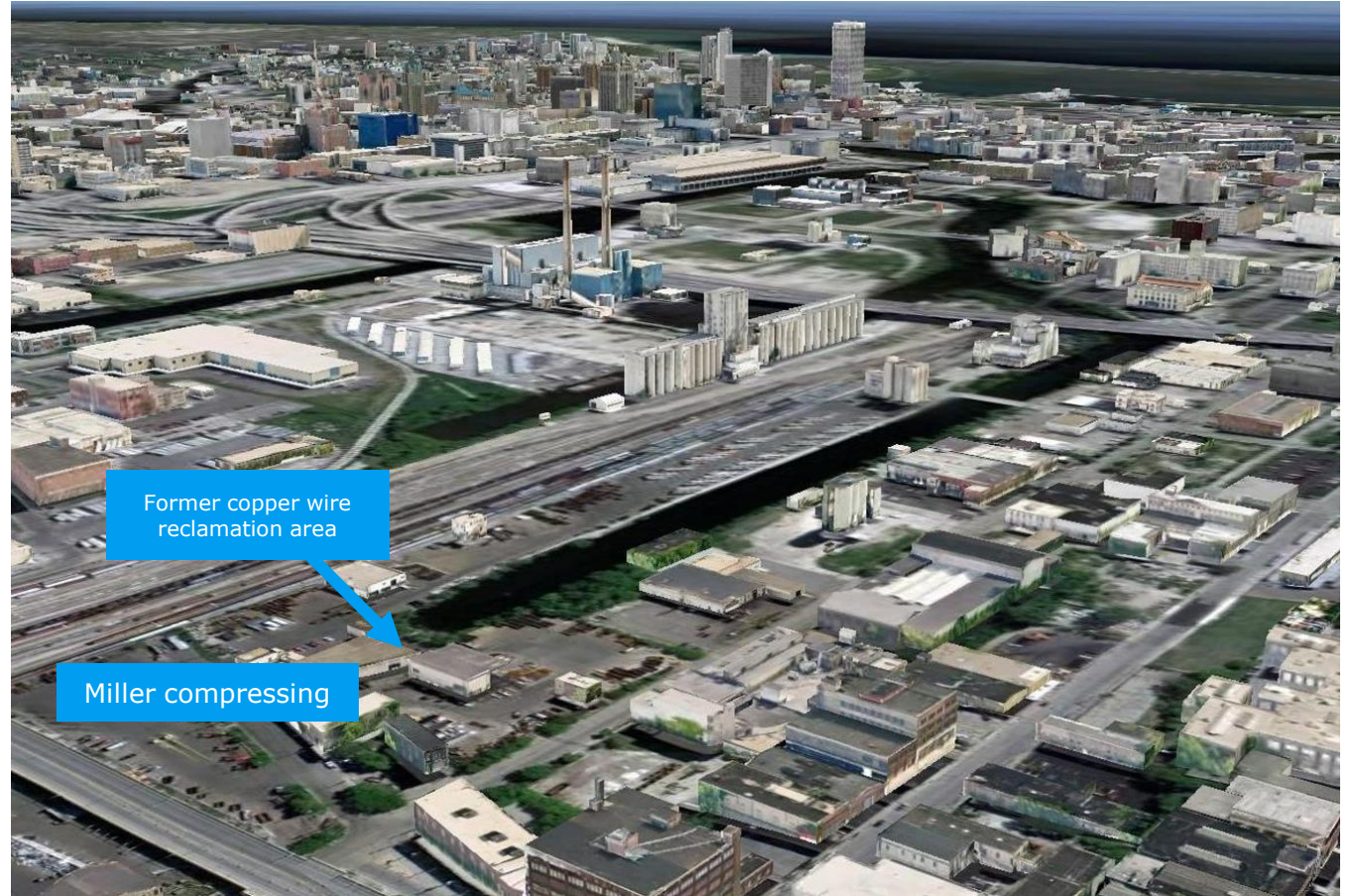
2007 – 2012

Superfund Alternative Site

2010

USEPA approved remedy

2017



USEPA-Approved Remedy

Description of contamination:

- West end bank soil and sediments west of 11th Street bridge contain copper, other metals, and PAHs

USEPA-approved remediation plans:

- Soil removal from west bank ~ 180 cubic yards
- Sediment removal from canal west end ~ 900 cubic yards
- Place base material to stabilize sediment and support cap
- Place 12-inch cap ~ 4 acres (1,500' x 120') on canal bottom



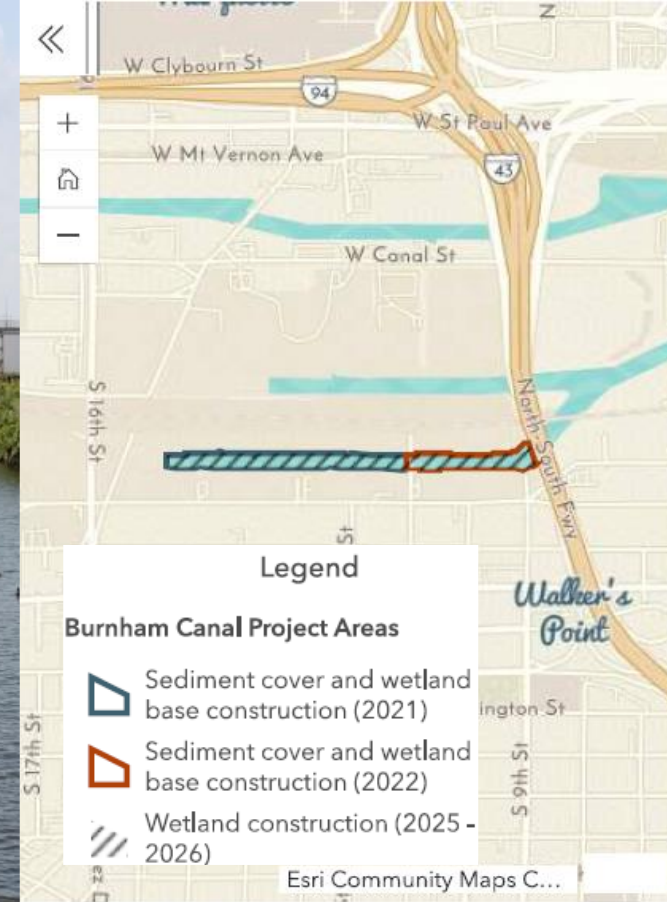
Voluntary Betterment

Betterment:

- Enhancement of canal west of 11th Street bridge to support long-range plans of City of Milwaukee and Milwaukee Estuary Area of Concern Waterway Restoration Partnership
- Exchange to limit monitoring and maintenance responsibility

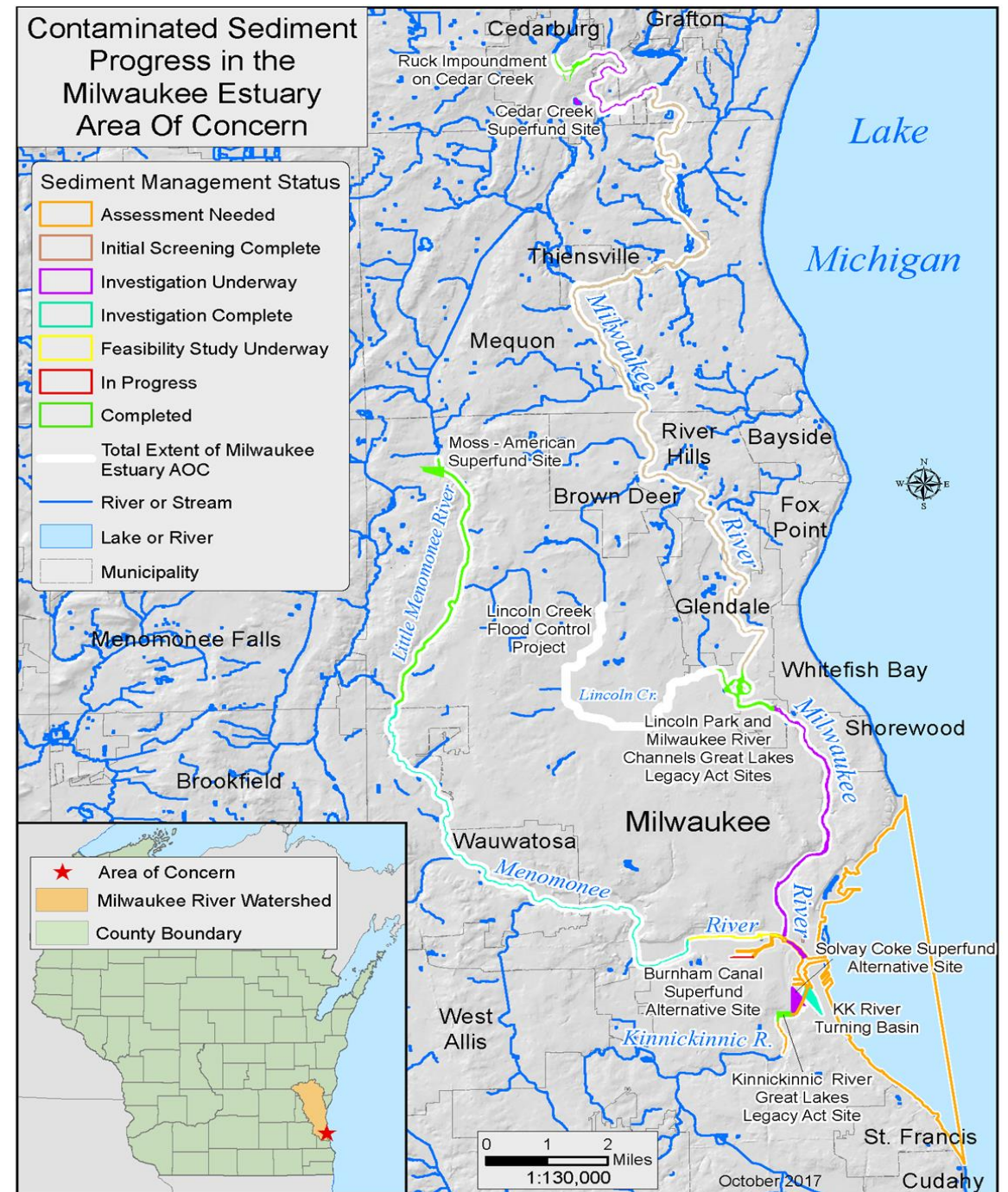
Plans for Betterment:

- Place up to five feet of additional fill material on top of 12-inch cap
- Betterment material same or similar as 12-inch cap material
- Betterment is foundation for potential future wetland construction by MMSD



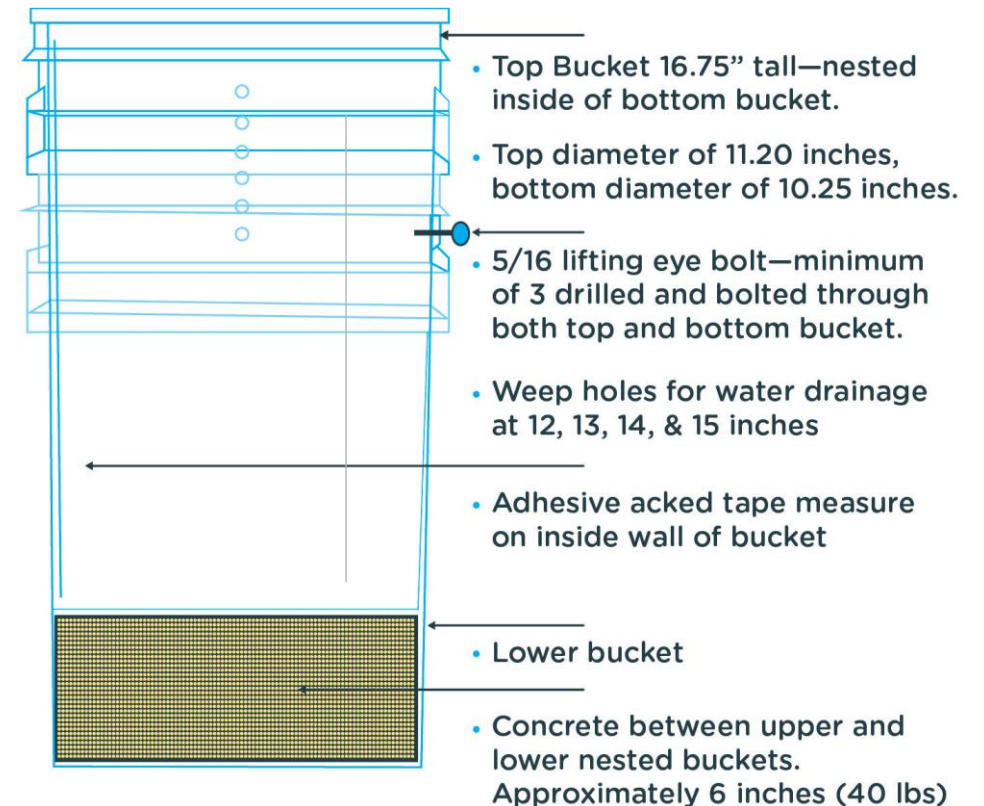
Importance of Lead Agency's Early Involvement and Continued Engagement

- Superfund Alternative Site regulatory oversight deferred from USEPA to WDNR
- Weekly meetings with regulators began during initial drafting of permit applications
- Resolved permit application comments during weekly meetings to expedite review/revision
- Weekly regulator meetings continued through construction completion
- Memos further detailing planned means and methods and/or documenting completion of major tasks submitted to WDNR for their concurrence during construction
- Clearly established requirements and managed expectations



Importance of Marine Contractor's (J.F. Brennan Company) Early Involvement

- Early input on means, methods, and constructability allowed engineering team to better understand potential execution options and challenges
- Able to provide more detailed permit applications and Work Plan with fewer unknowns, contributing to efficient agency review and approval
- Early input on QA/QC procedures allowed for better contractor team understanding of project goals and requirements, increasing efficiency and minimizing deviations from plans and specifications
- Able to demonstrate experience constructing similar projects to increase regulators' confidence in project



Site Prep

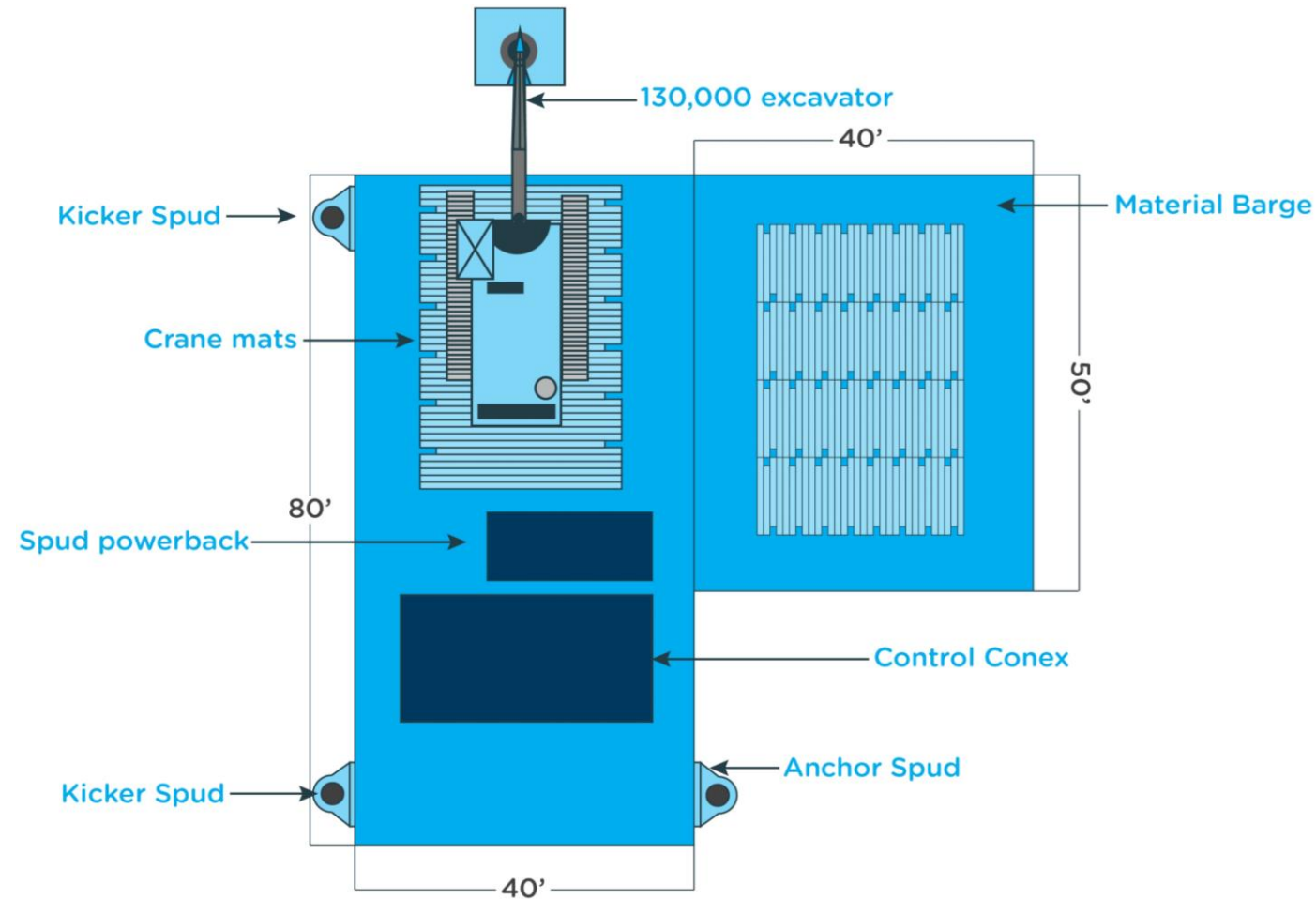


Considerations for Variable Water Level Elevations

- Designed steel sheet pile boundary wall with adjustable weir/gate to control head differential and differential ice formation
 - Allowed water passage during times of elevated water levels on project side
 - Opened weir/gate during winter shutdown to prevent differential freezing
 - Boundary wall also used for turbidity control during construction
- Area established as upland during design was submerged during construction
 - Adjusted dredge and sampling program
 - Cover material changed from seeded topsoil to aggregate
 - Flexibility established for post-construction monitoring/maintenance depending on water level



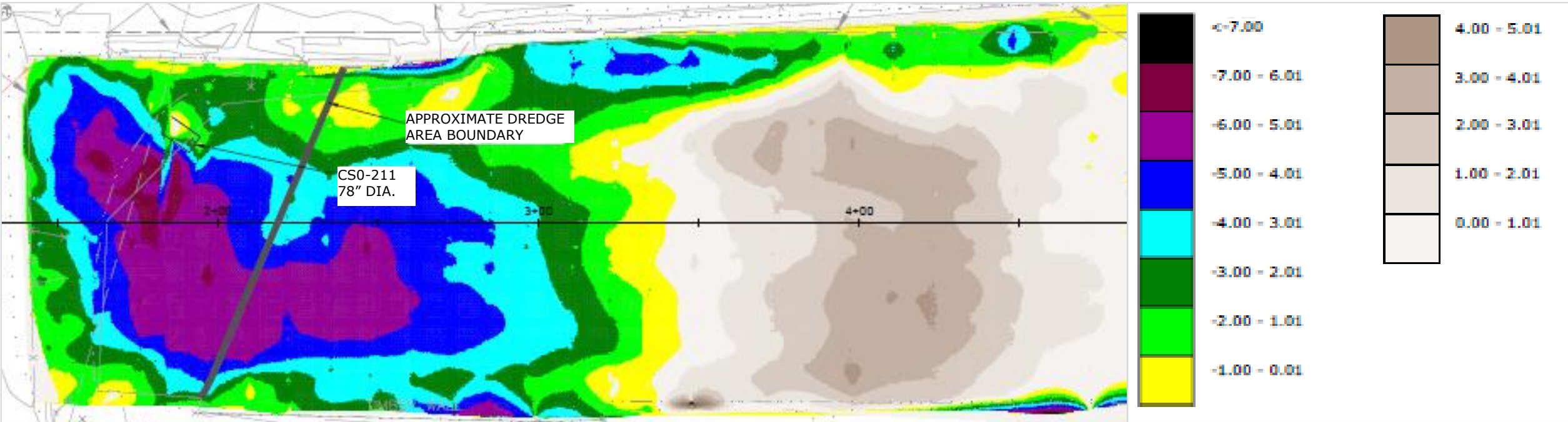
Environmental Dredging



Courtesy of: J.F. Brennan Company, Inc.



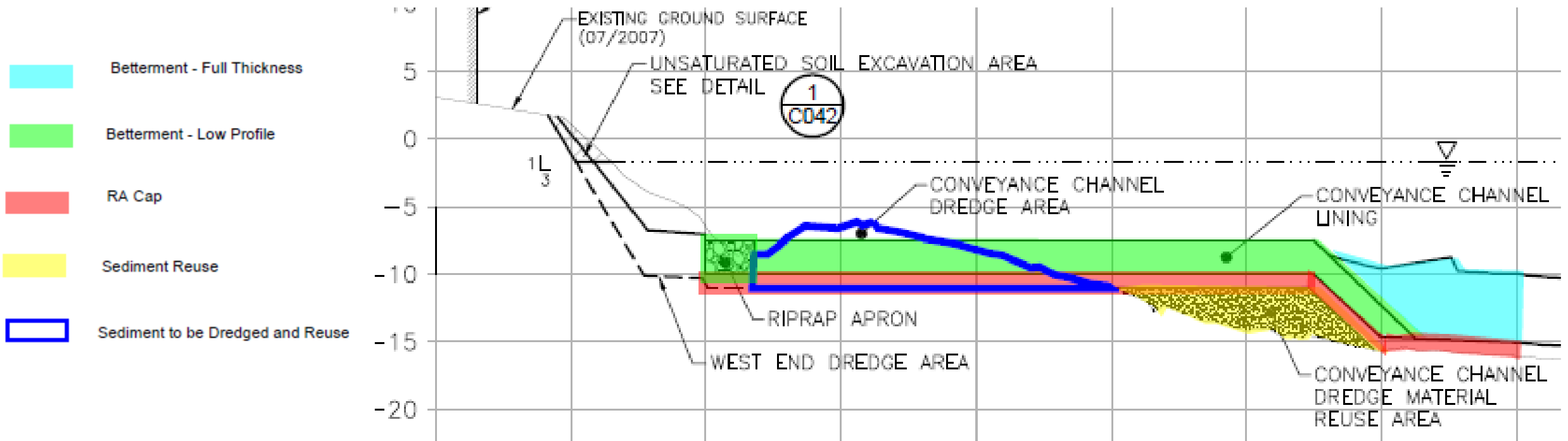
Environmental Dredging and Sediment Relocation



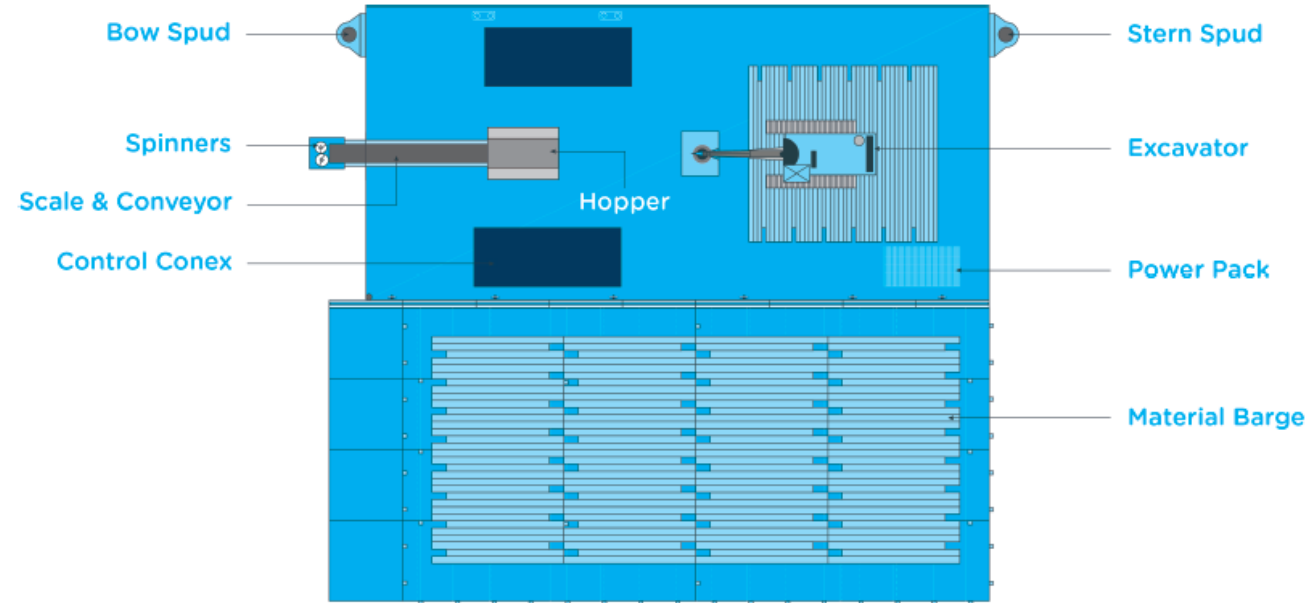
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DIFFERENCE IN POST-SEDIMENT
RELOCATION SURFACE ELEVATION FROM
PRE-CONSTRUCTION SURFACE
ELEVATION (FT)

Environmental Dredging and Sediment Relocation



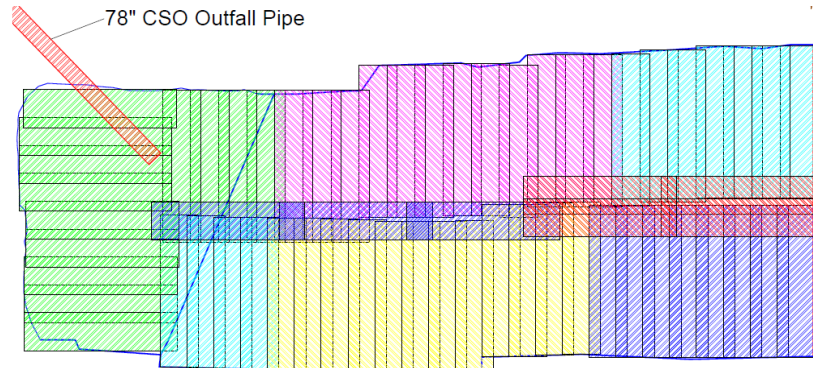
Sediment Stabilization, Capping, and Full-Thickness Betterment Placement



Courtesy of: J.F. Brennan Company, Inc.



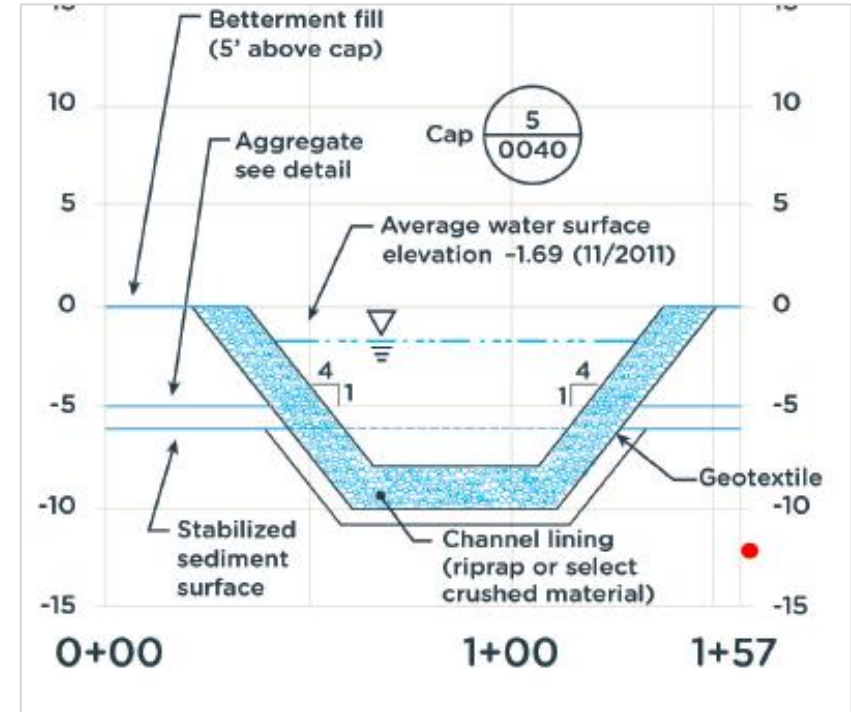
Underwater Geotextile Placement



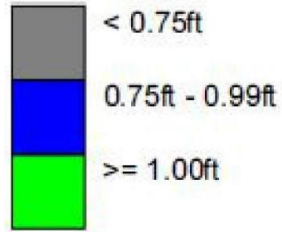
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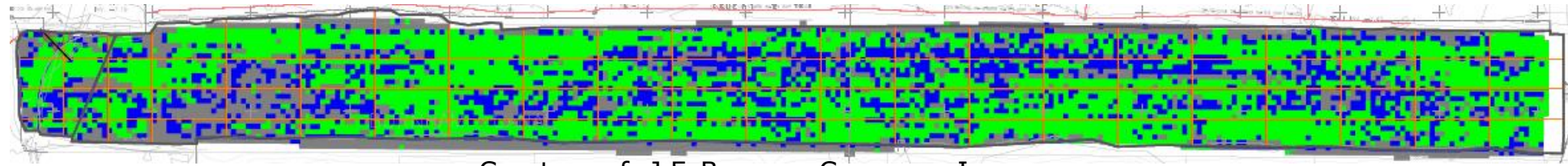
Low-Profile Betterment Placement



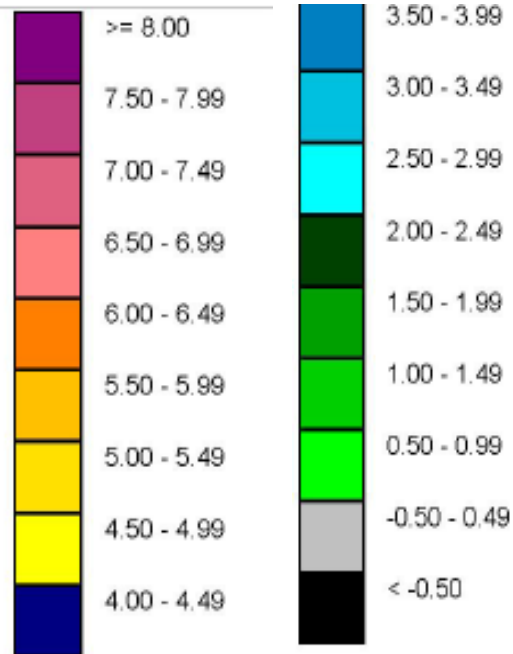
Post-Placement Layer Surface Comparisons and As-Built Cross-Sections



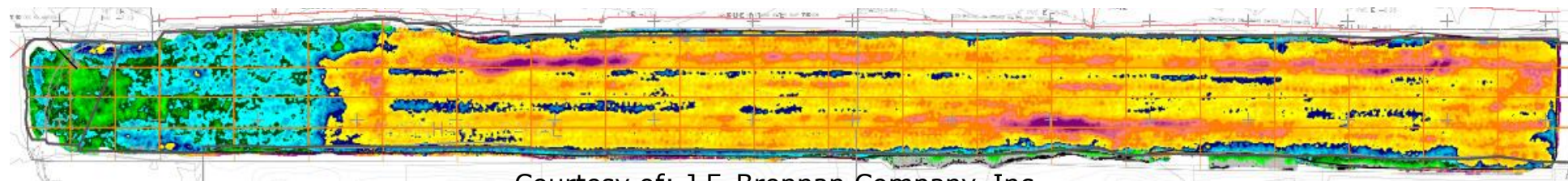
Post-placement cap surface vs. post-placement stabilization surface



Courtesy of: J.F. Brennan Company, Inc.

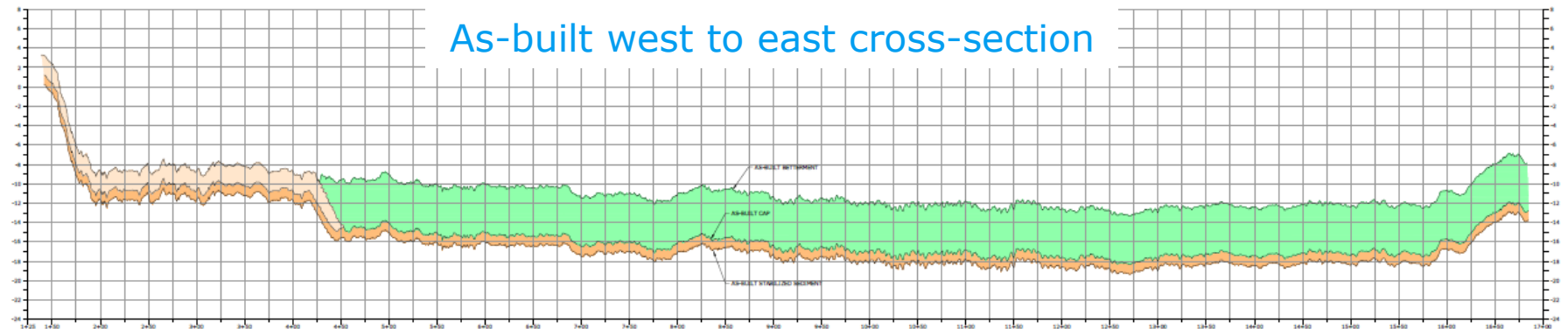


Post-Placement betterment surface vs. Post placement cap surface

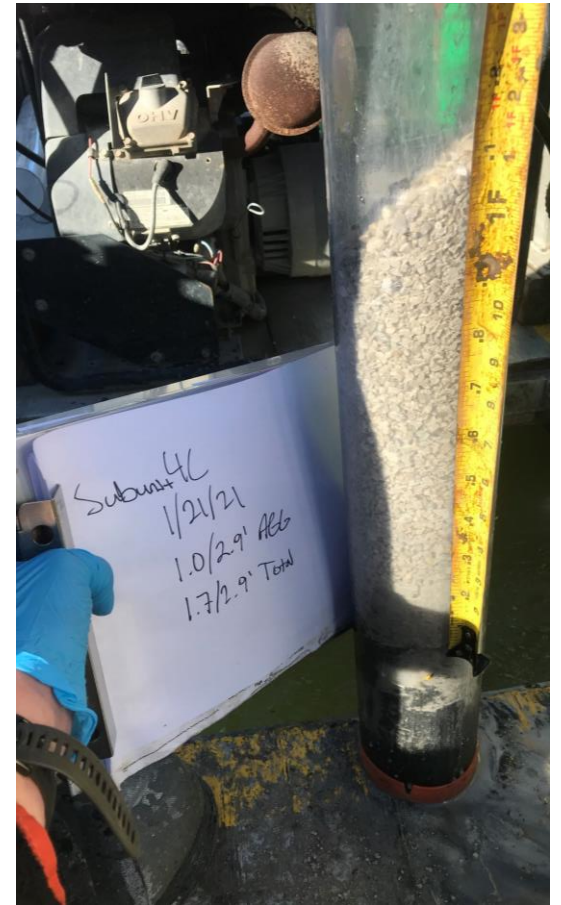
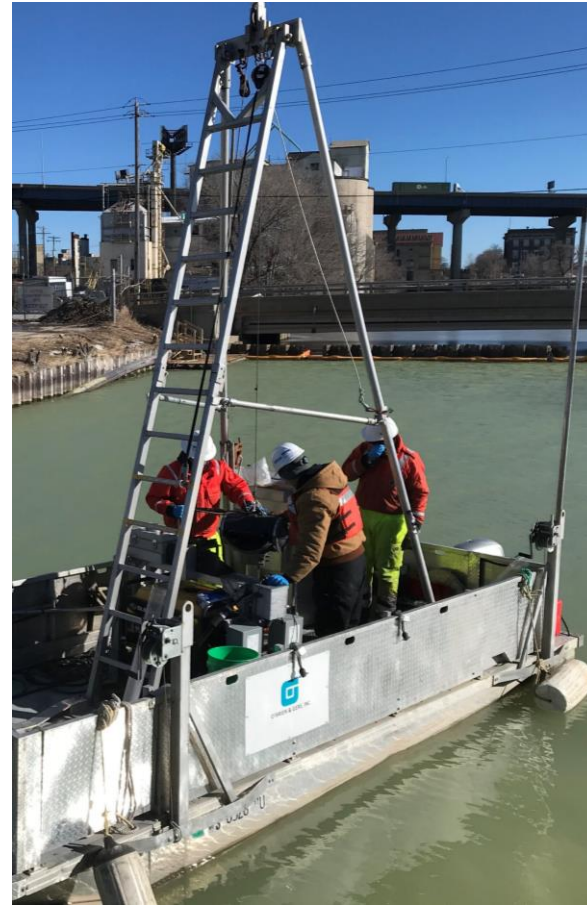


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As-built west to east cross-section



QA/QC Methods (Multiple Lines of Evidence)

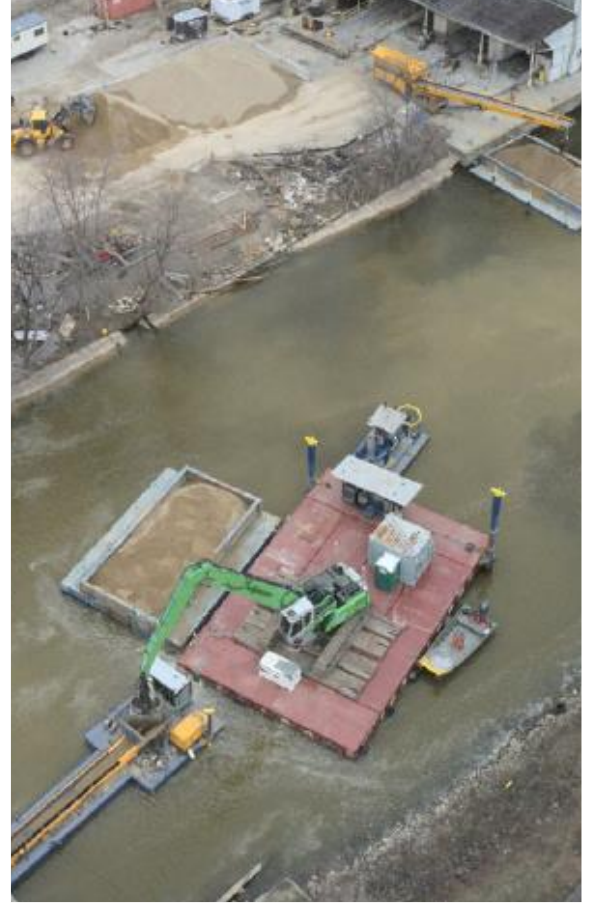


QA/QC Methods (Multiple Lines of Evidence) Considering Settlement of Underlying Soft Sediment

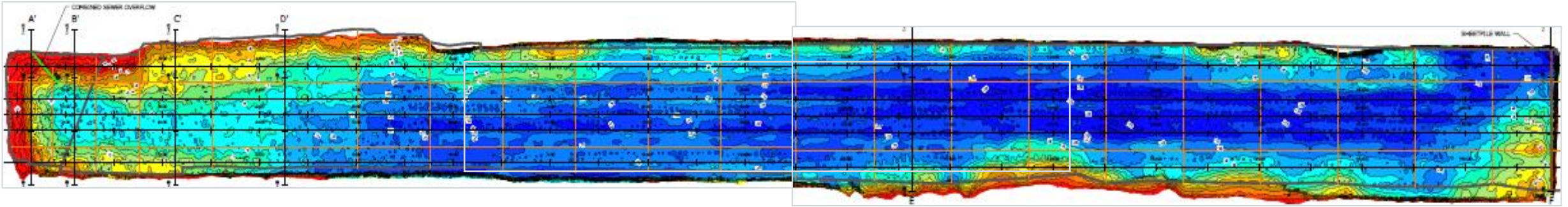
- Pre-qualified multiple material types from multiple quarries
- Complied with agency-approved chemical and gradation analyses at specified frequencies
- Placed surplus local quarry materials containing approximately 18% fines, reduces project's carbon footprint, results in more sustainable construction

Layer	Basis of Measurement	Tons	CY	CF	Density (T/CY) ¹	Area (SF)	Average Thickness (ft)	Average Thickness (in)
Stabilization	Belt Scale	6,794	4,355	117,588	1.6	N/A		
	Quarry Tickets	6,009	3,852	104,002				
Cap	QC Catch Cylinders	N/A					1.11	13.35
	Cores	N/A					1.17	14
	Belt Scale	12,491	8,803	237,672	1.4	185,800	1.28	15.35
	Quarry Tickets	12,569	8,858	239,156			1.29	15.45
Full-Thickness Betterment (Exclude Topping)	QC Catch Cylinders	N/A					4.68	56.13
	Belt Scale	43,706	29,041	784,094	1.5	150,000	5.23	62.73
	Quarry Tickets	42,384	28,162	760,381			5.07	60.83
Full-Thickness Betterment Topping	QC Catch Pans	N/A					0.73	8.74
	Belt Scale	5,718	4,398	118,758	1.3	150,000	0.79	9.50
	Quarry Tickets	5,511	4,240	114,469			0.76	9.16
Total Full-Thickness Betterment	QC Catch Cylinders/Pans	N/A					5.41	64.87
	Belt Scale	49,424	33,439	902,853	N/A	150,000	6.02	72.23
	Quarry Tickets	47,896	32,402	874,850			5.83	69.99
Low-Profile Betterment (Select Crushed)	Barge Surveys	3,306	2,543	68,666	1.3	27,500	2.50	29.96
	Quarry Tickets	3,543	2,725	73,585			2.68	32.11
Low-Profile Betterment (Medium Riprap)	Barge Surveys	941	622	16,789	1.5	8,300	2.02	24.27
	Quarry Tickets	999	660	17,821			2.15	25.77
Total Aggregate Placed From Quarry Tickets (T)	Aggregates Passing 1.5-inch Sieve		Select Crushed (3" Stone)		Medium Riprap		Total	
	60,962		9,054		999		71,016	

MMSD Wetland Base Construction East of 11th St. Bridge

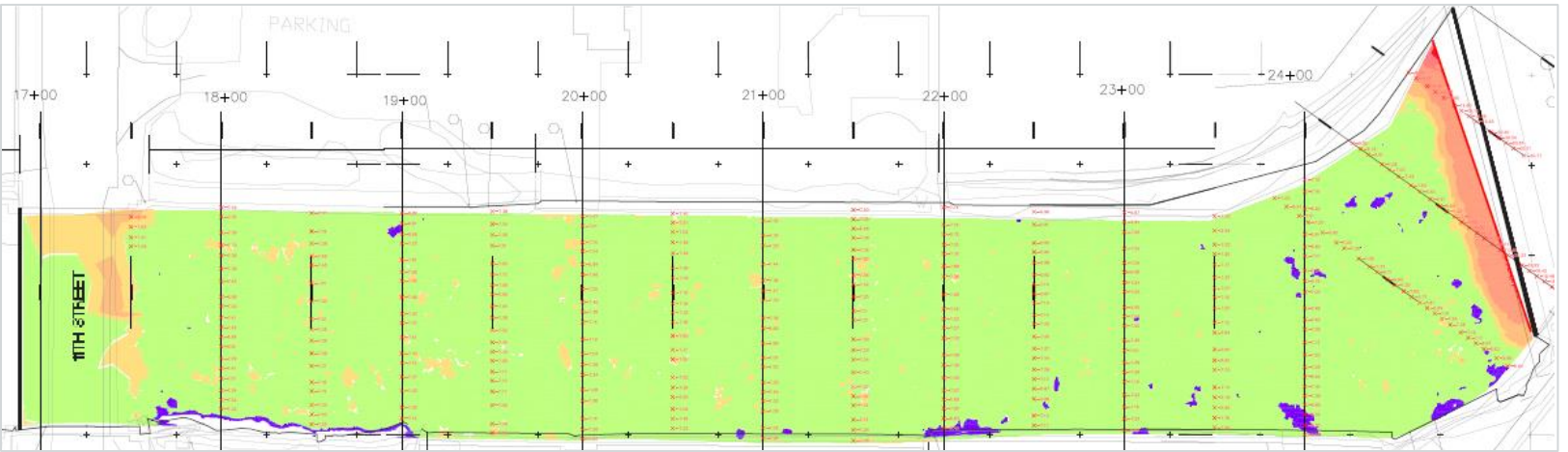
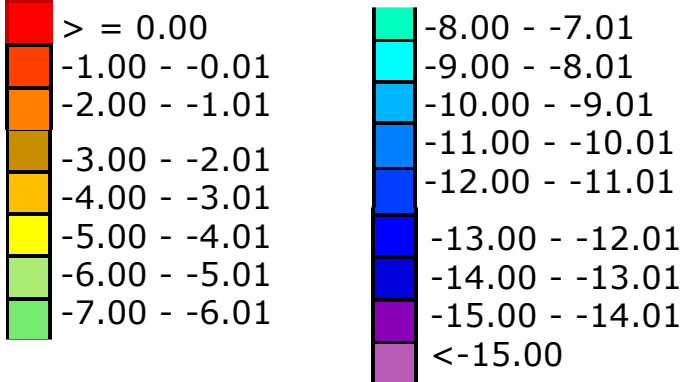


As-Built Surface Elevations



Courtesy of: J.F. Brennan Company, Inc.

AS-BUILT BETTERMENT
SURFACE ELEVATION (CMD)



Courtesy of: White Lake Dock & Dredge, Inc.

Questions?



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