BENEFICIAL USE OF FINE MATERIAL: 40TH AVENUE WEST MANUFACTURED BIOMEDIUM

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U.S. ARMY

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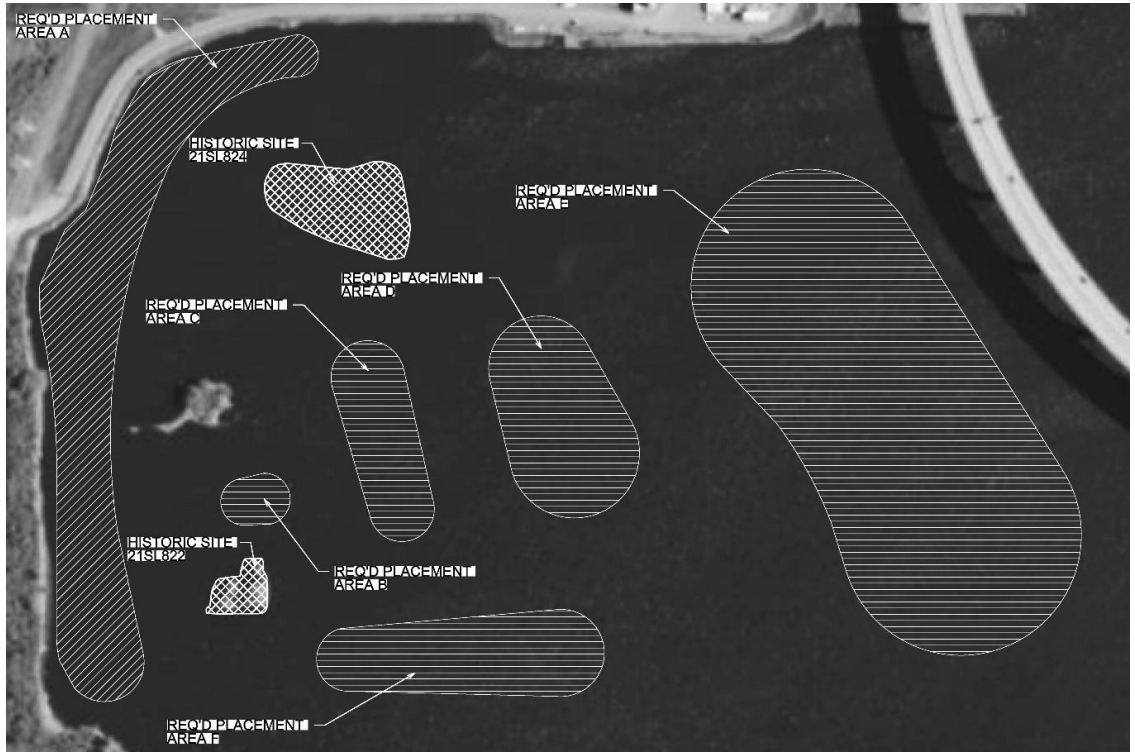
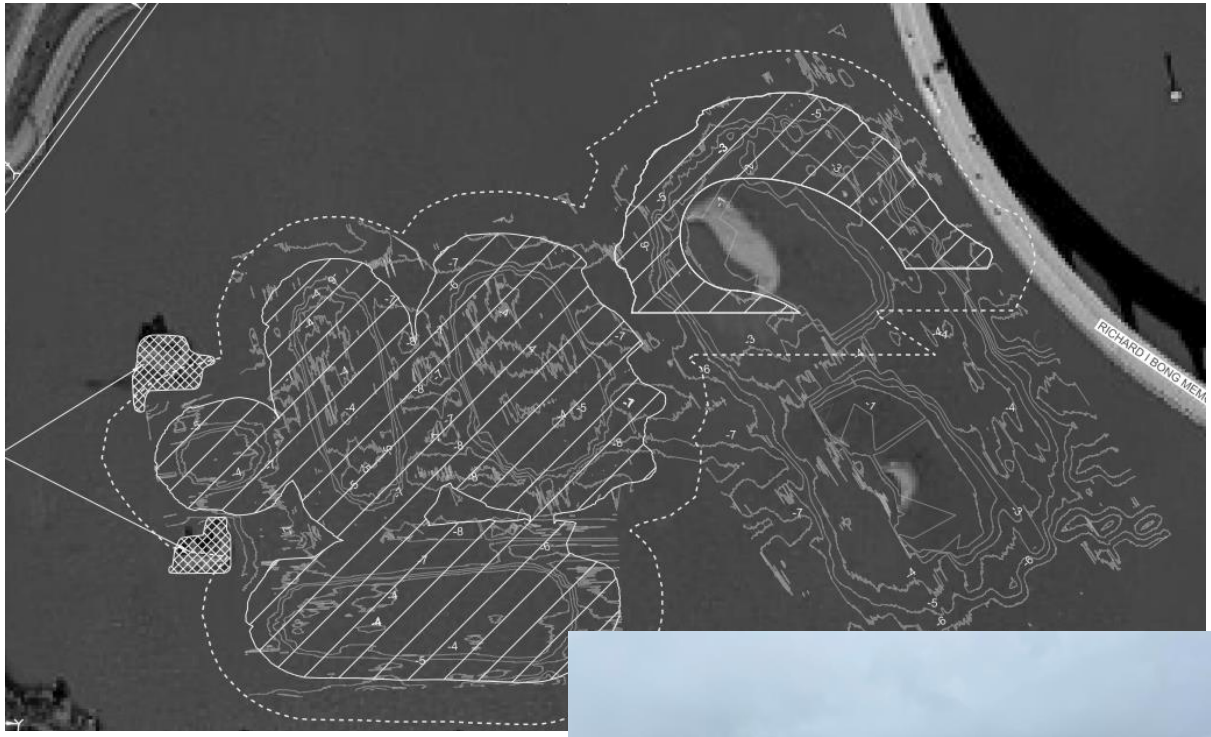
40TH AVE WEST AQUATIC HABITAT RESTORATION PROJECT

- Site located in the Duluth-Superior Harbor within the St. Louis River Area of Concern
- Constructed 6 shallow water habitat features in 2017-2018
- Approximately 267,000 CY of dredged material
- Features constructed to -1 ft and -3.5 ft LWD



40TH AVE WEST MANUFACTURED BIOMEDIUM

- Veit covered a portion of 40th Ave West features with approximately 20,000 CY of material from Grassy Point, which had natural existing seed bank
- Needed to come up with an alternative to complete remining features
- Test plots adjacent to each other, side by side comparison
- Project site approximately 25 acres
- Approximately 51,000 CY of fine grained dredged material from the Federal navigation channel
- Dredged material inoculated with 54 LBS of aquatic macrophyte seed source to create biomedium
- Biomedium uniformly placed in 6” layer over constructed features (-0”/+6” tolerance)
- Contractor conducted pre and post placement elevation surveys



40TH AVE WEST MANUFACTURED BIOMEDIUM

- 10 different aquatic seed species
- Varying quantities, based on availability
- GLRI funding used to purchase seed source, inoculate dredged material, and pre/post placement elevation surveys
- Approximately 1 LB seed to 944 CY of fine grained dredged material
- MPCA is currently monitoring the project site for water bugs and aquatic vegetation to evaluate success of the project
- Results will be later this fall for aquatic vegetation and next spring for macroinvertebrates

Seed Source	
Description	Pounds (LB)
Blue-Joint Grass - Calamagrostis canadensis	4
Reed Manna Grass - Glyceria grandis	4
Giant Burreed - Sparganium eurycarpum	16
Softstem Bulrush - Schoenoplectus tabernaemontani	7
Great Spike Rush - Eleocharis palustris	4
Spike Rush - Eleocharis acicularis	2
Common Arrowhead - Sagittaria latifolia	7
Nodding Bur Marigold - Bidens cernua	4
Sweet Flag - Acorus americanus	4
Northern Blue Flag Iris - Iris versicolor	2

Bioaccumulation Control with Activated Carbon to Enhance Beneficial Use

Sediments Tested in Lab Study

Sediment	PCBs Conc. µg/kg	% Organic Matter			% Clay	% Silt	% Sand	% Solids
		Total	Soft	Refractory				
Ashtabula Harbor	43.7	3.4	0.8	2.6	21	69	10	60.7
Cleveland Harbor	110	4.1	1.6	2.5	20	69	11	58.6
Buffalo River	184	4.3	1.8	2.5	24	63	13	48.1

Paul R. Schroeder, PhD, PE

Environmental Laboratory

PAC Amended Bioaccumulation Results

Sediment	Treatment	% Lipids	Total PCBs Conc. in Tissues (ng/g)	Lipid Normalized PCBs Conc. (µg/g)	Reduction in Lipid Normalized Bioaccumulation
Ashtabula Harbor	3% PAC static	1.3	6.39	0.52	93.8%
	0.3 % PAC rolled	1.5	8.24	0.55	93.4%
	0.06% PAC rolled	1.5	17.8	1.21	85.6%
Cleveland Harbor	0.3 % PAC rolled	1.3	27.2	2.14	63.6%
	0.1% PAC rolled	1.7	32.5	1.97	66.4%
Buffalo River	0.3% PAC rolled	1.4	103	7.54	77.3%
	0.1% PAC rolled	1.6	130	7.91	76.2%

Target Lipid Normalized PCBs Conc. of 2 µg/g.
Reductions of 65 to 85%.

3-Year Bioaccumulation Reductions

Sample	% GAC	% PAC	%AC	Effective % AC	Percent reduction in PCB concentrations in lipids after 3 years
No AC	0	0	0	0	0
Low AC	0.09	0.29	0.38	0.31	61
Medium AC	0.3	0.43	0.73	0.49	67
High AC	0.99	0.68	1.67	0.88	79

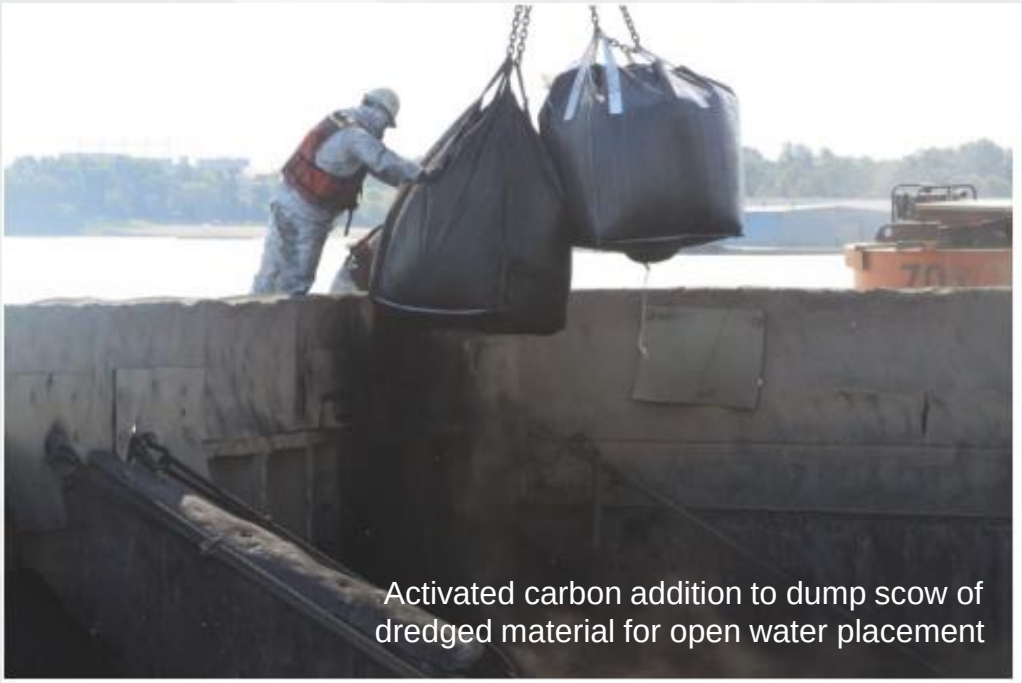
***Assuming GAC is about 10% as effective as PAC in the short-term due to distance between AC particles in the dredged material.**

**** TOC is 1.4% comprised of 0.4% carbon from soft labile organics and 1.0% carbon from hard refractory carbon.**

About 85% of the reduction achieved in the first year at Ashtabula field site.

Understanding Field Performance of Amendments – DOER Research Task 23-09

- **Problem:**
  - Presence of contaminants limits beneficial use capabilities
  - Dredged material from many Great Lakes urban harbors may be considered marginally unsuitable
  - Potential for amendments to render sediments suitable for beneficial use, but further evaluation is needed



Activated carbon addition to dump scow of dredged material for open water placement

- **Objectives:**
  - Develop better understanding of field performance and application techniques and provide guidance on use of amendments for beneficial use applications

Susan Bailey, PE
Environmental Laboratory

Understanding Field Performance of Amendments – DOER Research Task 23-09

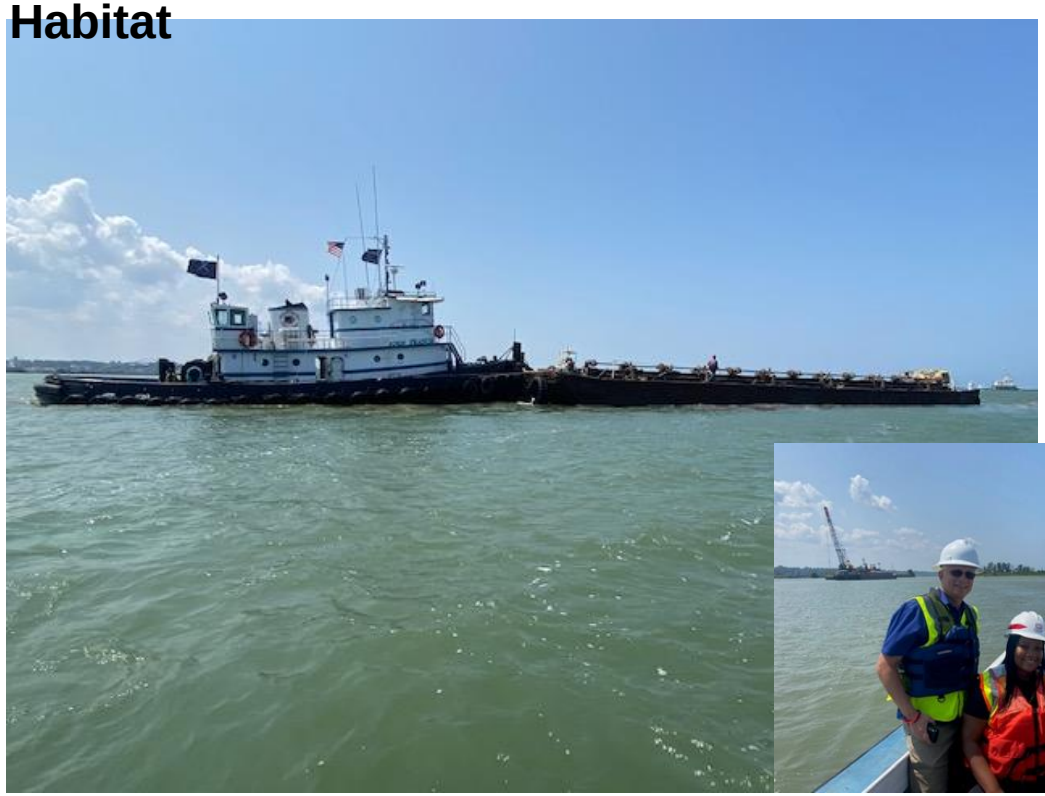
- **Laboratory studies**
  - Time to effectively reduce bioaccumulation based on sorption/desorption kinetics
  - Evaluation of field mixing techniques and effects of sub-optimal mixing on dosage requirements

- **Develop tools to estimate dosage requirements**
- **Generate guidance for field application of amendments**

Panel Discussion:
What cooperative efforts would be needed to demonstrate or develop pilot projects for beneficially using fine grained dredged material?

Sandusky Harbor Cedar Point Causeway Wetland

Ashtabula Harbor Section 204 Submerged Aquatic Habitat



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Toledo Harbor Dredged Sediment Management and Beneficial Use

Facility 3 Dredge Management

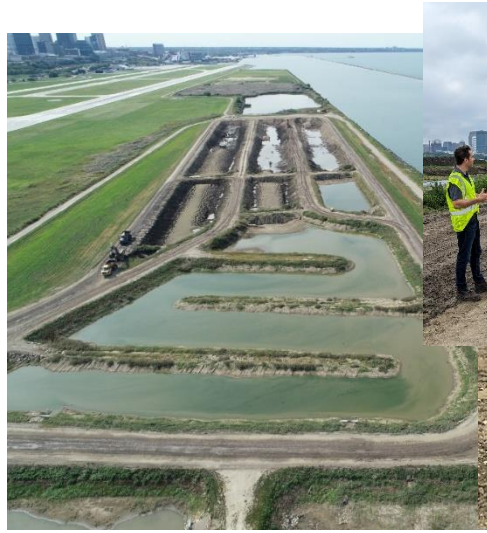
Glass City Metropark Dredge Beneficial Use

Dredged Material Center of Innovation

Farm Field Dredge Demonstration Projects

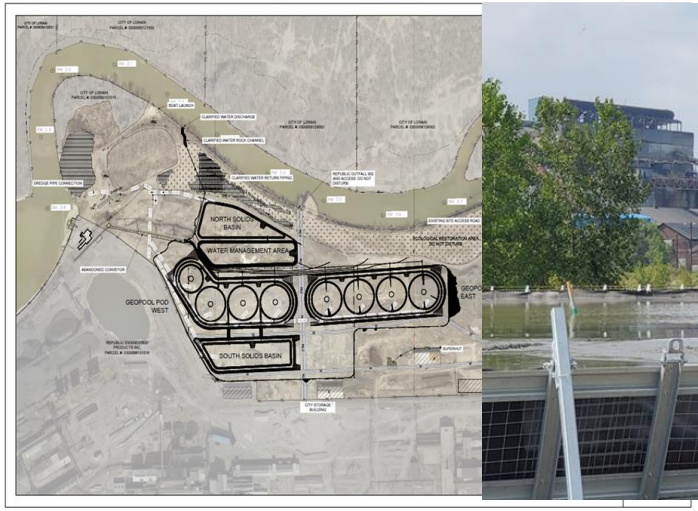
Sediment Processing/Recycling Facilities

Cleveland Harbor



Fairport Harbor

Lorain Harbor



Conneaut Harbor

BU of Fine-Grained Dredge Material: Wisconsin Considerations for Demonstration Project

- **Above OHWM (already do these)**
  - **Structural suitability**
  - **Groundwater and surface water pathway/impacts if dewatering**
  - **Need to 'track' material is based on presence of contaminants**

- **Below OHWM:**
  - **"Low Risk" areas; nearshore with notable impacts and degradation of water quality and habitat.**
  - **Must use evidence-based projections.**
  - **Monitoring: turbidity, nutrients, biological impacts (improvements? Invasives?).**

- **Conduct as part of AOC restoration project; opportunity for cost-sharing , detailed data collection, and monitoring.**