

5th National Conference on Coastal and Estuarine Habitat Restoration

Beneficial Reuse of Dredge Material to Restore Benthic Habitat in an Urban Harbor on the Great Lakes

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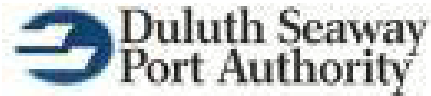
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Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Lower St. Louis River and Duluth-Superior Harbor



**US Army Corps
of Engineers®**



Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

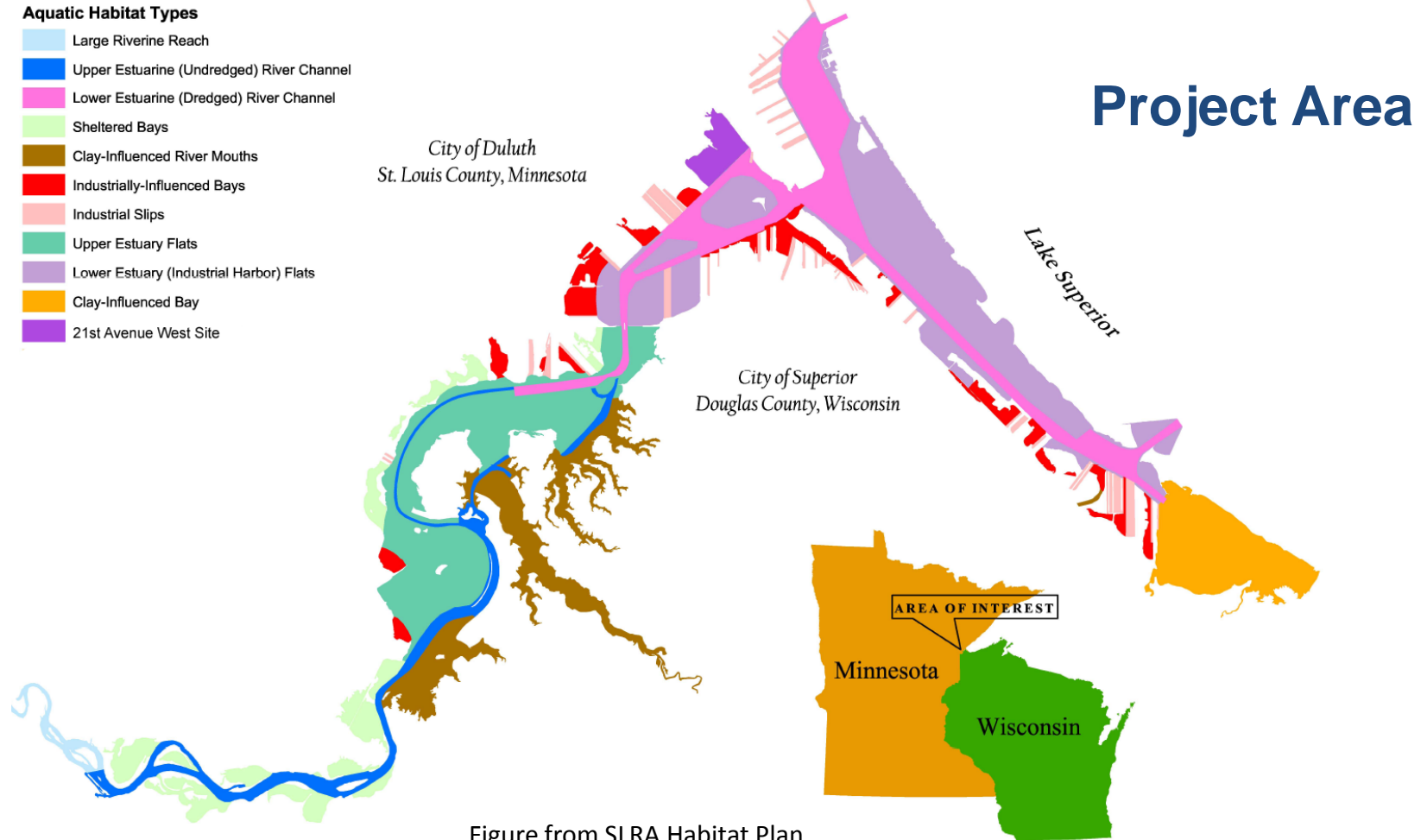


Figure from SLRA Habitat Plan

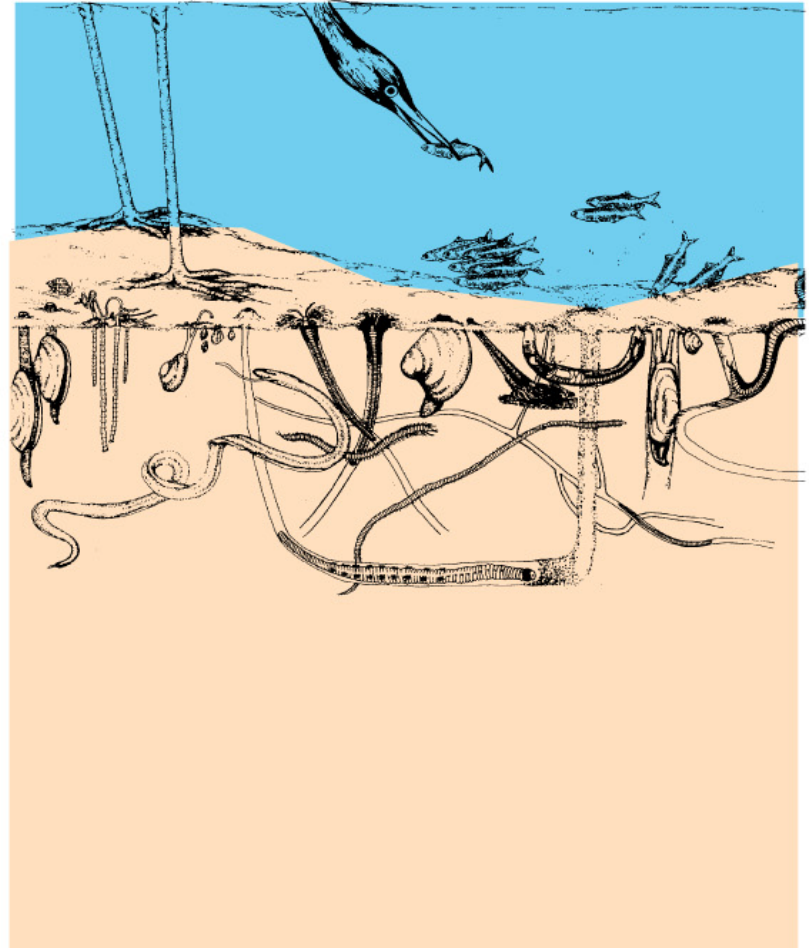
Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Monitored Natural Recovery

Relies on physical, chemical and biological processes to reduce exposure and toxicity of contaminants in sediments

Recovery processes can include:

- biodegradation
- biotransformation
- bioturbation
- diffusion
- dilution
- adsorption
- volatilization
- chemical reaction or destruction
- resuspension
- burial by clean sediment



Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

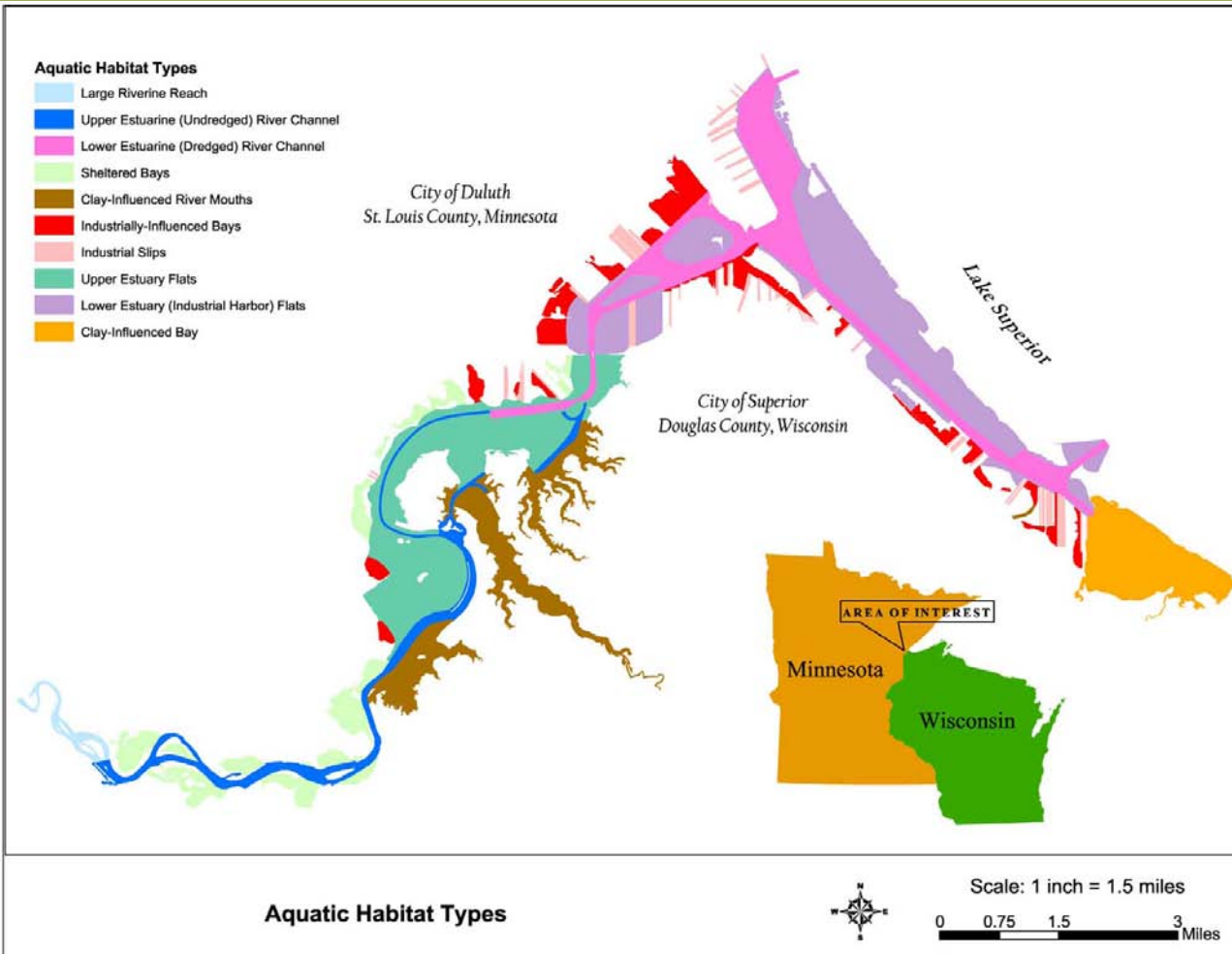
Enhanced Monitored Natural Recovery

- Addition of a thin layer of clean sediment to accelerate the recovery process by engineering means
- Physical Isolation
 - burial
 - dilution
- Achieves risk reduction
 - less direct contaminant exposure to receptors
 - less potential for contaminated sediment scour and resuspension
- Major habitat impact by improving each square foot of large areas by a little bit

Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Industrially Influenced Bays in the St. Louis River

- ~762 Acres
- Capacity for ~615,000 cy of clean sediment if applied in a 6-inch lift
- Identify areas with appropriate hydrologic regime



Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Erie Pier Confined Disposal Facility (CDF)

- Primary receptor of harbor maintenance dredge material
- Material entering CDF goes through hydraulic sorting process
- Sand is typically sold
- Fine-grained material is accumulating



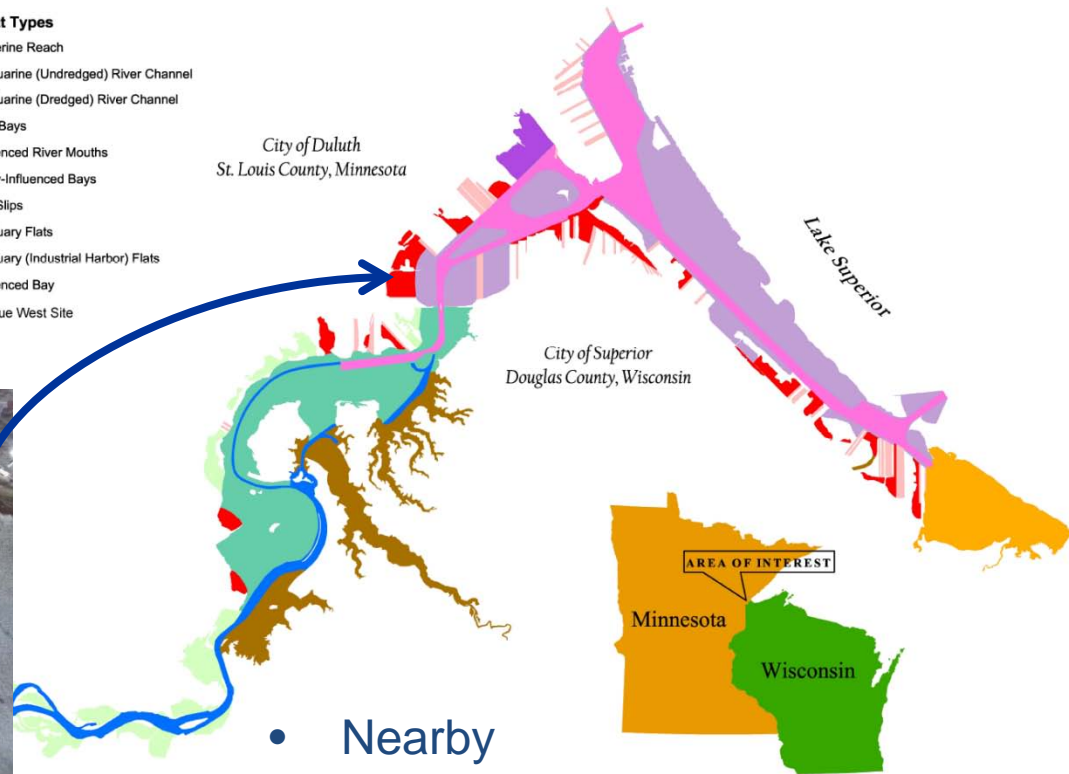
Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Erie Pier CDF Material



Aquatic Habitat Types

- Large Riverine Reach
- Upper Estuarine (Undredged) River Channel
- Lower Estuarine (Dredged) River Channel
- Sheltered Bays
- Clay-Influenced River Mouths
- Industrially-Influenced Bays
- Industrial Slips
- Upper Estuary Flats
- Lower Estuary (Industrial Harbor) Flats
- Clay-Influenced Bay
- 21st Avenue West Site



- Nearby
- Clean
- Same material as in bays
- Beneficial reuse of dredged fines

Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Placing Clean Material in Thin Lifts

- Difficult with traditional methods
- Need to control suspension/migration of new material
- Need to maintain physical properties of slurry



Beneficial Reuse of Dredge Material for Benthic Habitat Restoration



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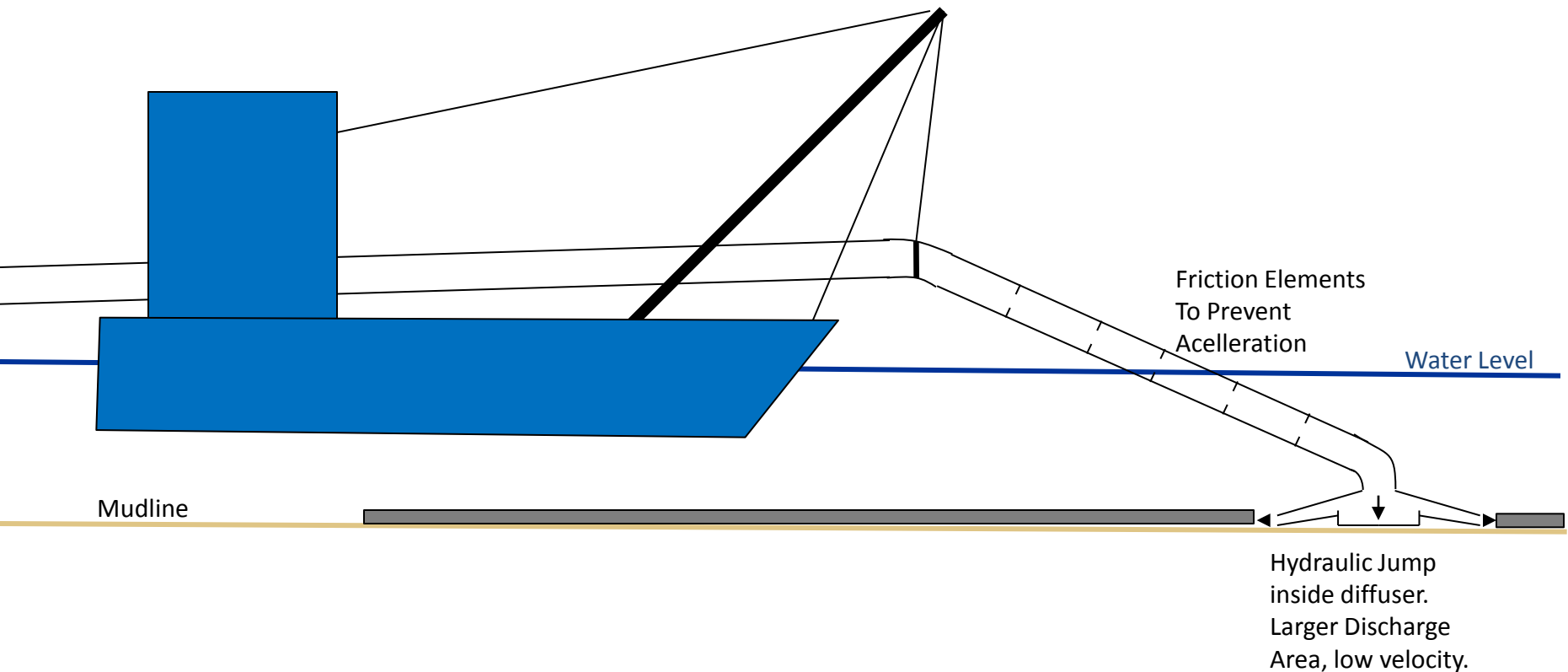
Tremie Diffuser

- Developed in Netherlands by Deltares
- Designed to suit specific material properties
- Delivers material in thin lifts with minimal turbidity

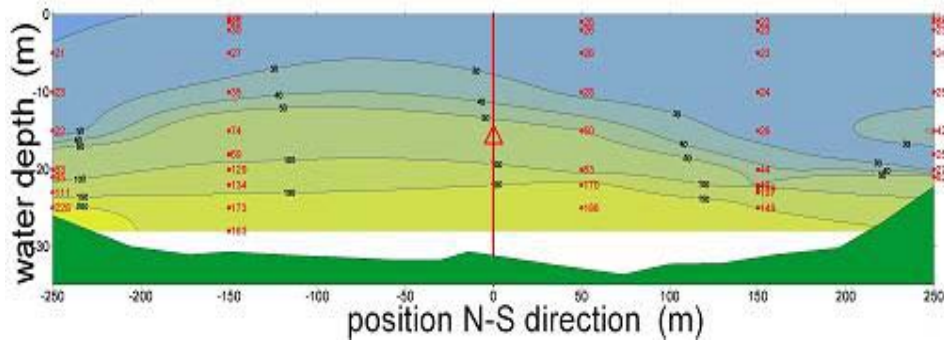


Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

- Shallow Water Delivery (slurry less dense than bed)

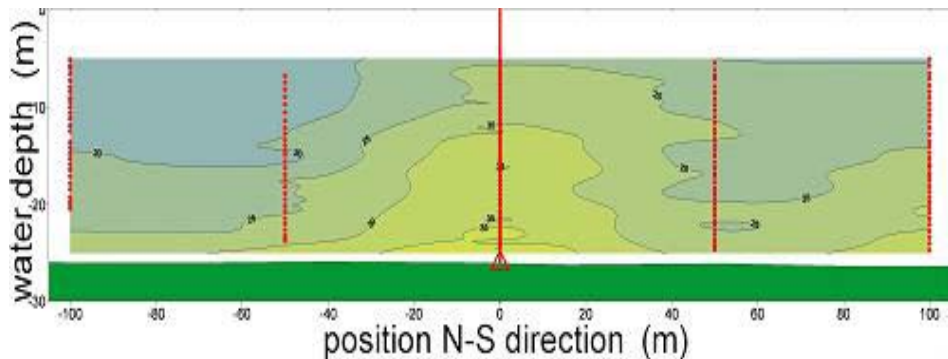


Beneficial Reuse of Dredge Material for Benthic Habitat Restoration



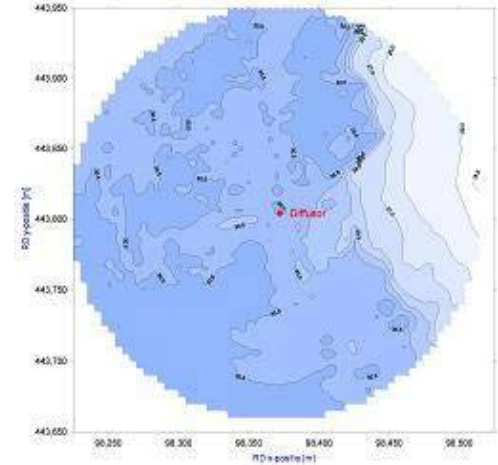
Max = 170 mg/L

Suspended Solids



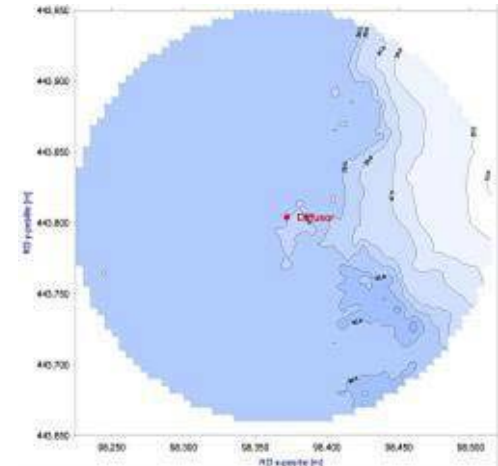
Max = 35 mg/L

Before



Bathymetry

After



Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Additional Advantages of Tremie Diffuser

- Accepts material hydraulically from stockpiles or barges
- Can be scaled to fit project requirements and conditions
- Attractive remediation technique
 - efficient placement with minimal repositioning
 - no need for water quality control structures/fish herding
 - beneficial reuse of organic mud
 - can extend the life of a CDF

Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Summary

- EMNR is a suitable remedy for low to moderately impacted sediments in a depositional environment
- EMNR requires the use of clean fine-grained material
- EMNR is a beneficial reuse of dredge materials
- EMNR can be a cost effective way to have a large impact on benthic health
- EMNR projects can benefit from tremie diffuser technology

Beneficial Reuse of Dredge Material for Benthic Habitat Restoration

Questions?

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