

Challenges During the Pre-Feasibility Stage of Restoration Planning

Pete Kero, PE

John Kubiak

Irvin Mossberger, PG

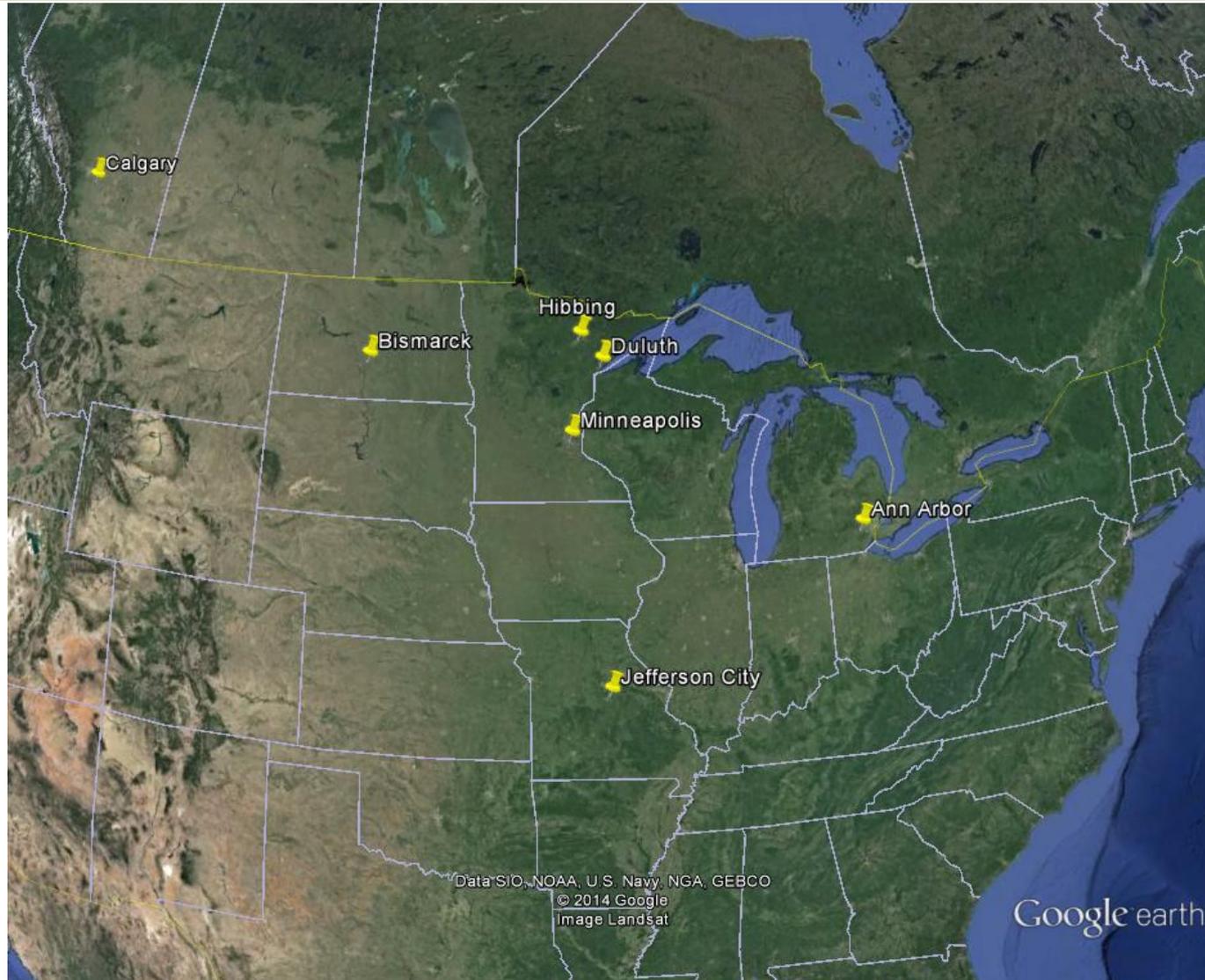


April 11, 2014

Barr Engineering Co.



Barr Offices



presentation outline

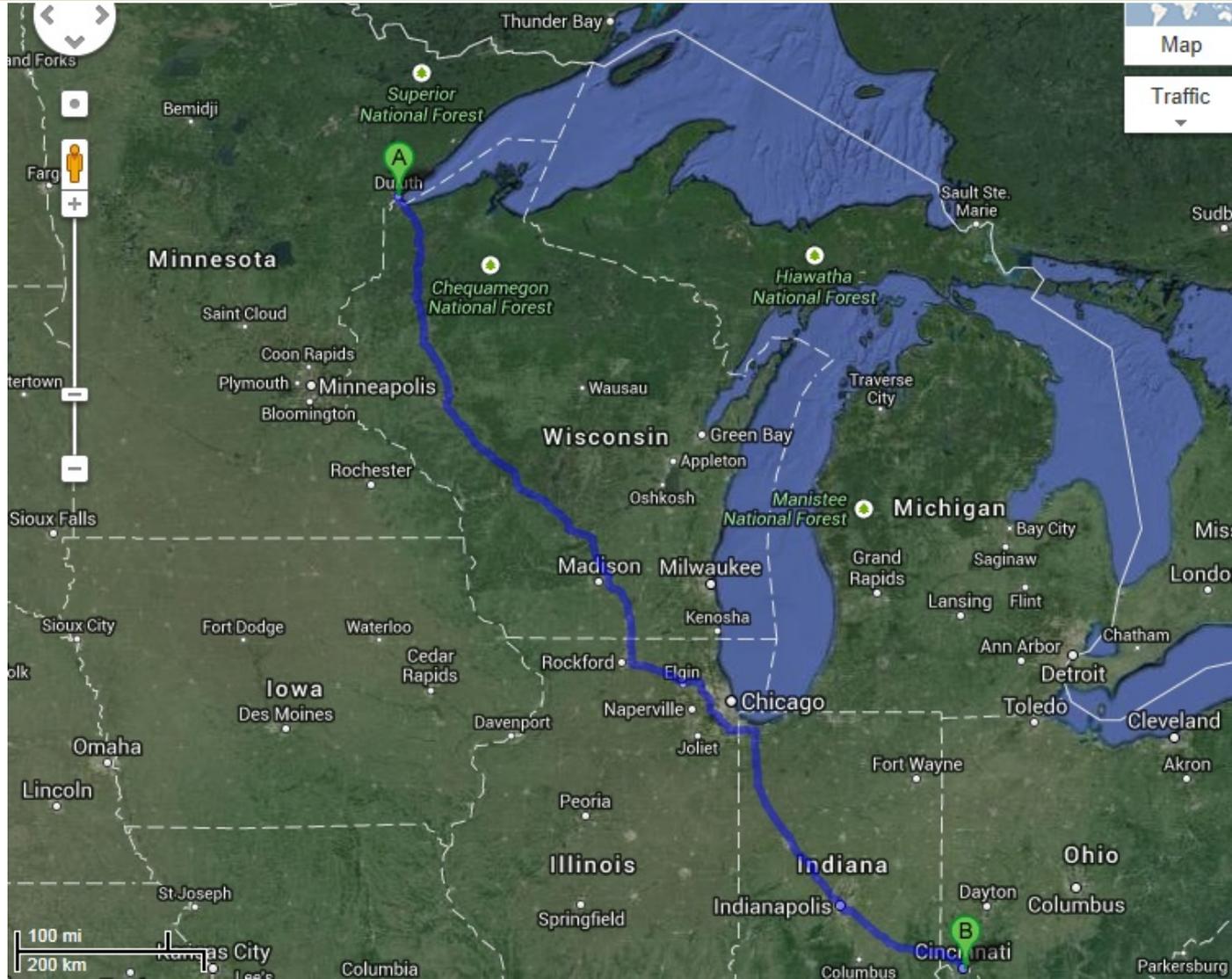
- How sediment projects differ from terrestrial work
- Intro to St. Louis River Area of Concern
- Methods, challenges, and preliminary results from Barr's recent work at ecosystem restoration sites

the muddy world of sediments in ecosystem restoration

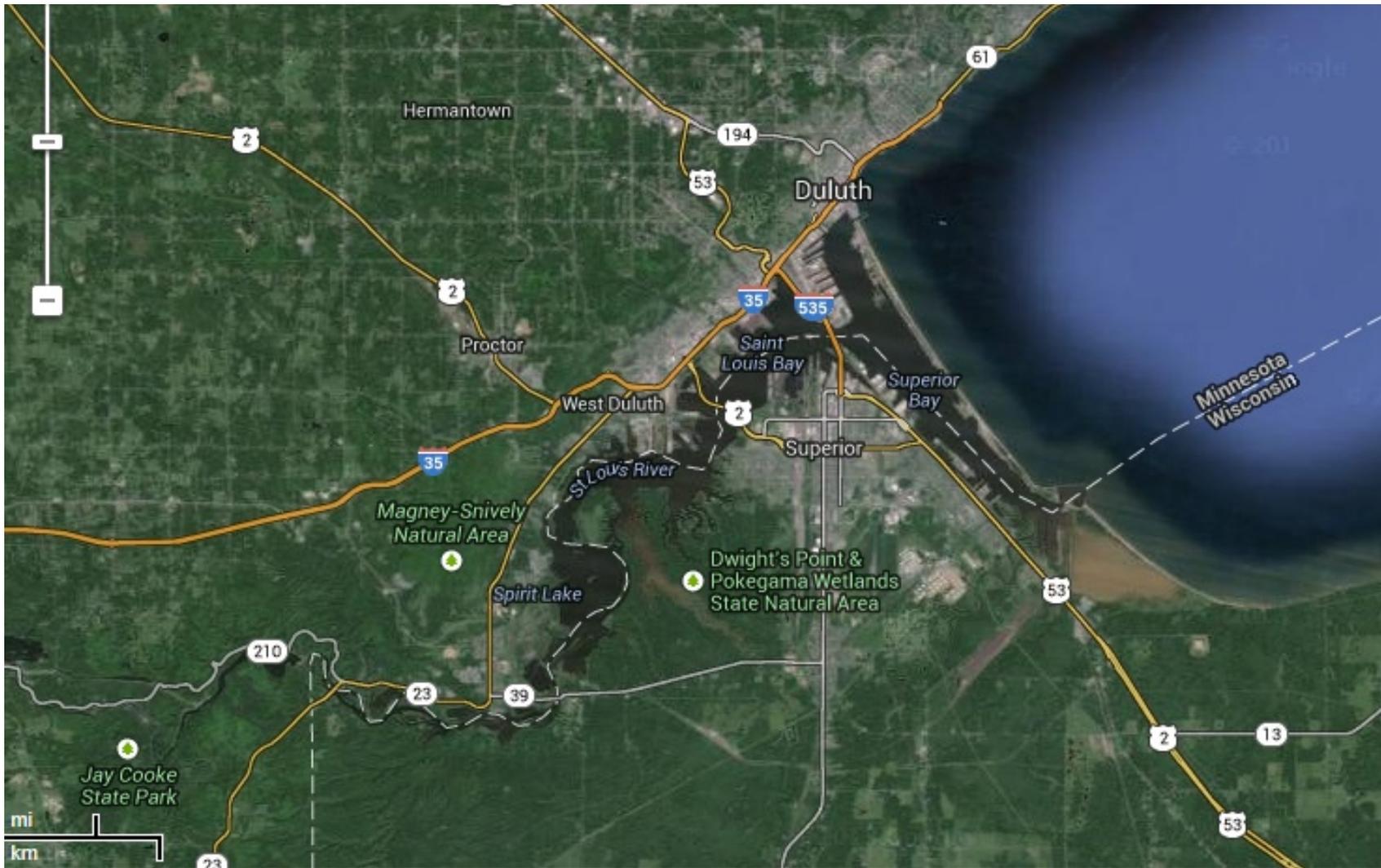


- often, last medium to be addressed
- dynamic environment
- recalcitrant contaminants
- many stakeholders
- more difficult and costly than terrestrial work
- lack of regulatory consensus

St. Louis River Area of Concern (AOC) Duluth, MN and Superior, WI



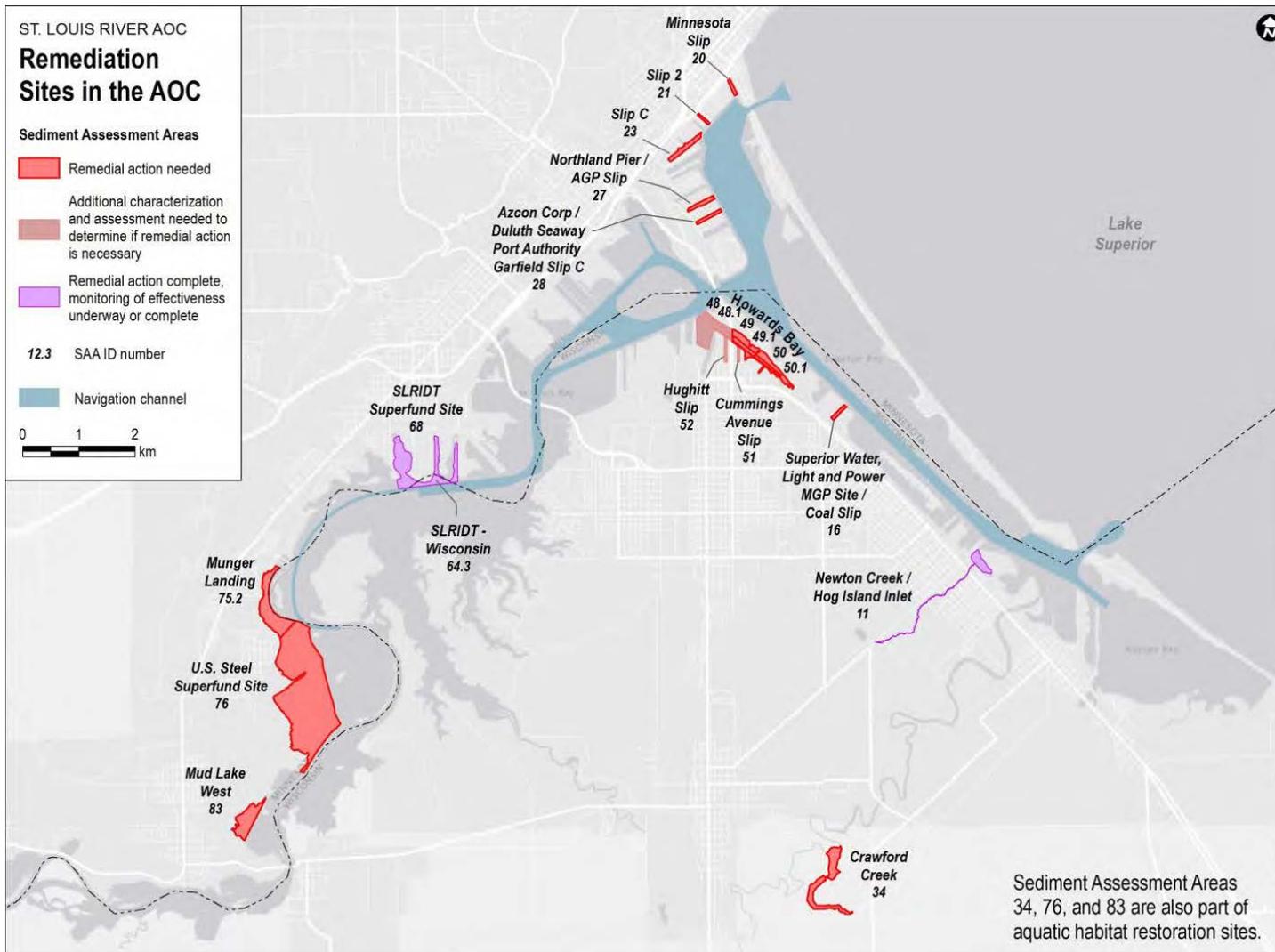
St. Louis River AOC – Duluth, MN and Superior, WI



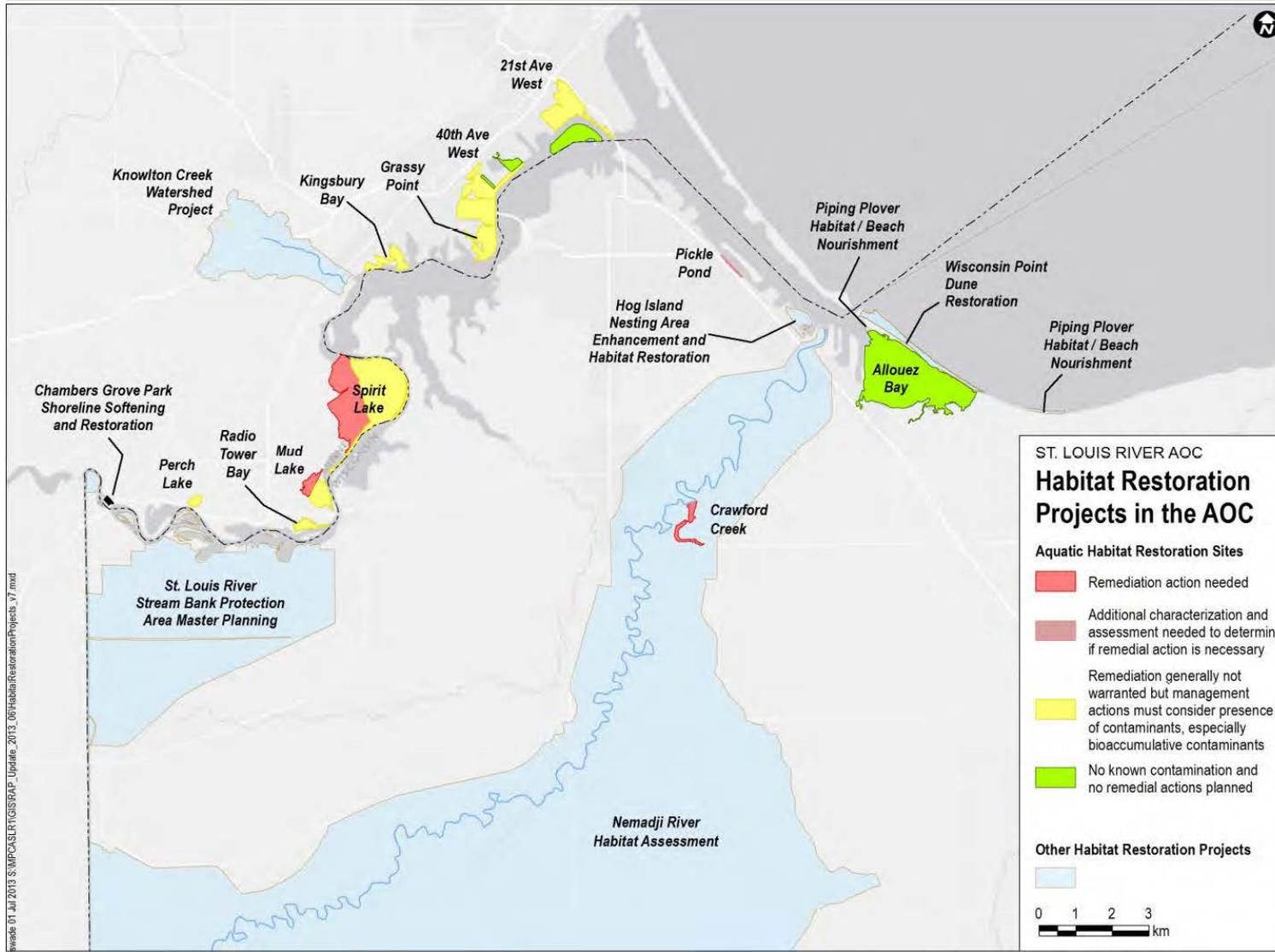
St. Louis River AOC – Duluth, MN and Superior, WI

- **Nine Beneficial Use Impairments (BUIs) in 1987:**
 - 1. Fish Consumption Advisories**
 - 2. Degraded Fish and Wildlife Populations**
 - 3. Fish Tumors and Deformities**
 - 4. Degradation of Benthos**
 - 5. Restriction on Dredging**
 - 6. Excessive Loading of Nutrients and Sediments**
 - 7. Beach Closing and Body Contact**
 - 8. Degradation of Aesthetics**
 - 9. Loss of Fish and Wildlife Habitat**
- **Restoration Goals are to Delist all by 2025 (~10 years)**
- **Estimated \$300-\$400M of work remaining**

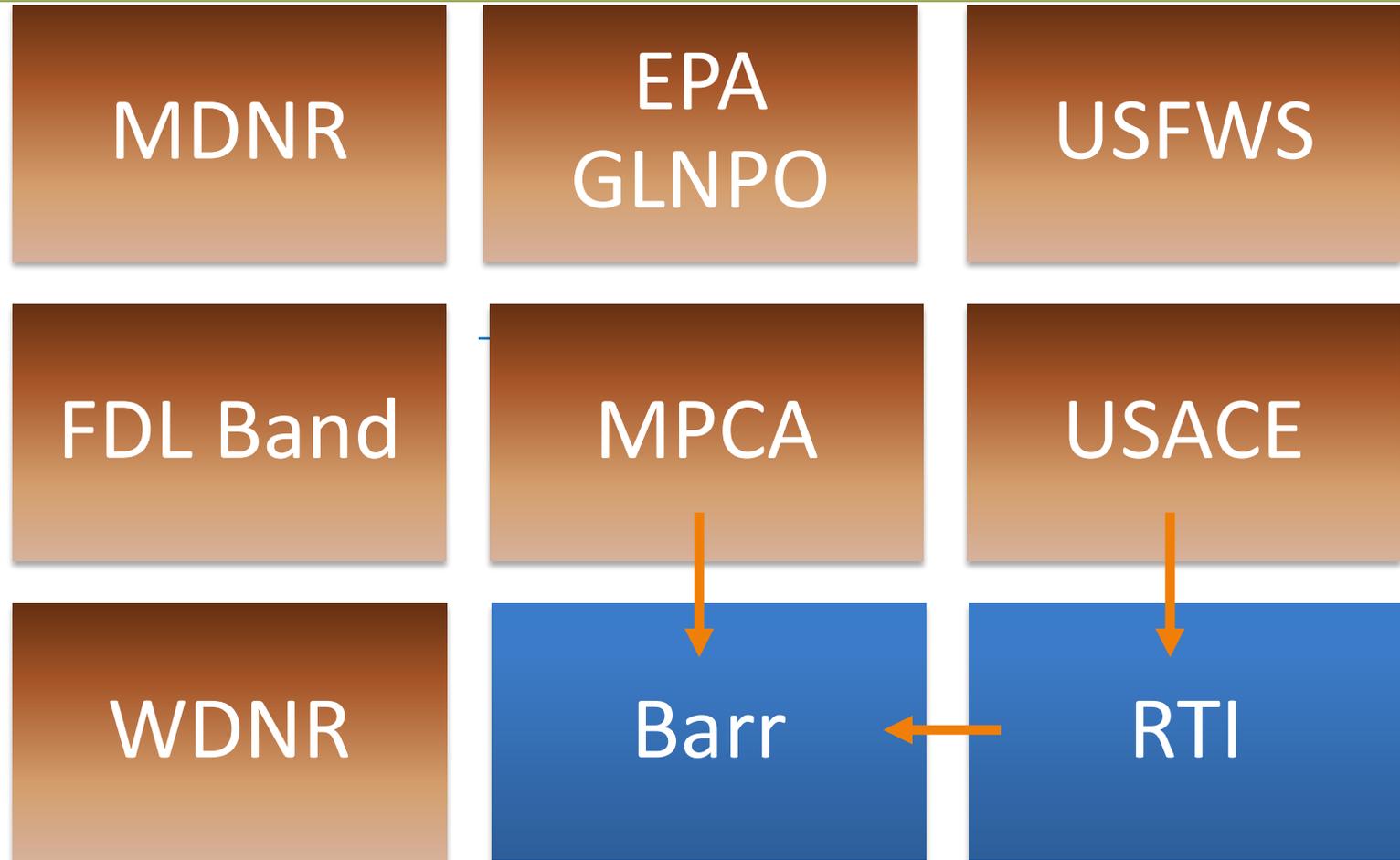
St. Louis River AOC – Duluth, MN and Superior, WI



St. Louis River AOC – Duluth, MN and Superior, WI



Challenge #1: general relationships



Challenge #2

scope of Barr's project for the MPCA

Original scope was to estimate the quantity of dredged material required through the USACE dredging program to use as suitable fill at each project location.

Problem:

Ecological design concepts were preliminary and constantly evolving throughout stakeholder meetings.

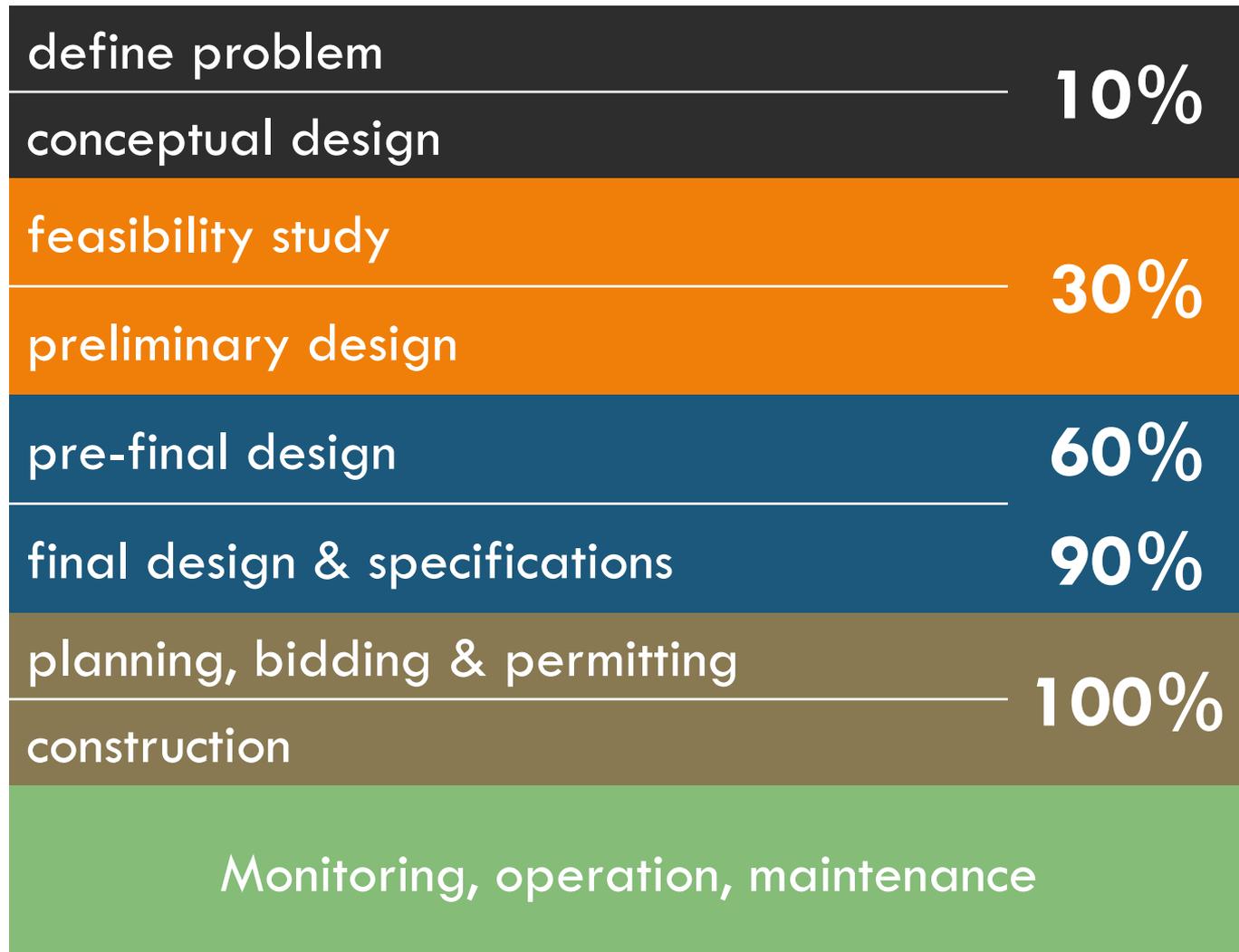
Challenge #3

scope of Barr's project for the MPCA

Ecological design concepts were generated in many different formats by different stakeholders

GIS, pdfs, hand-drawn maps

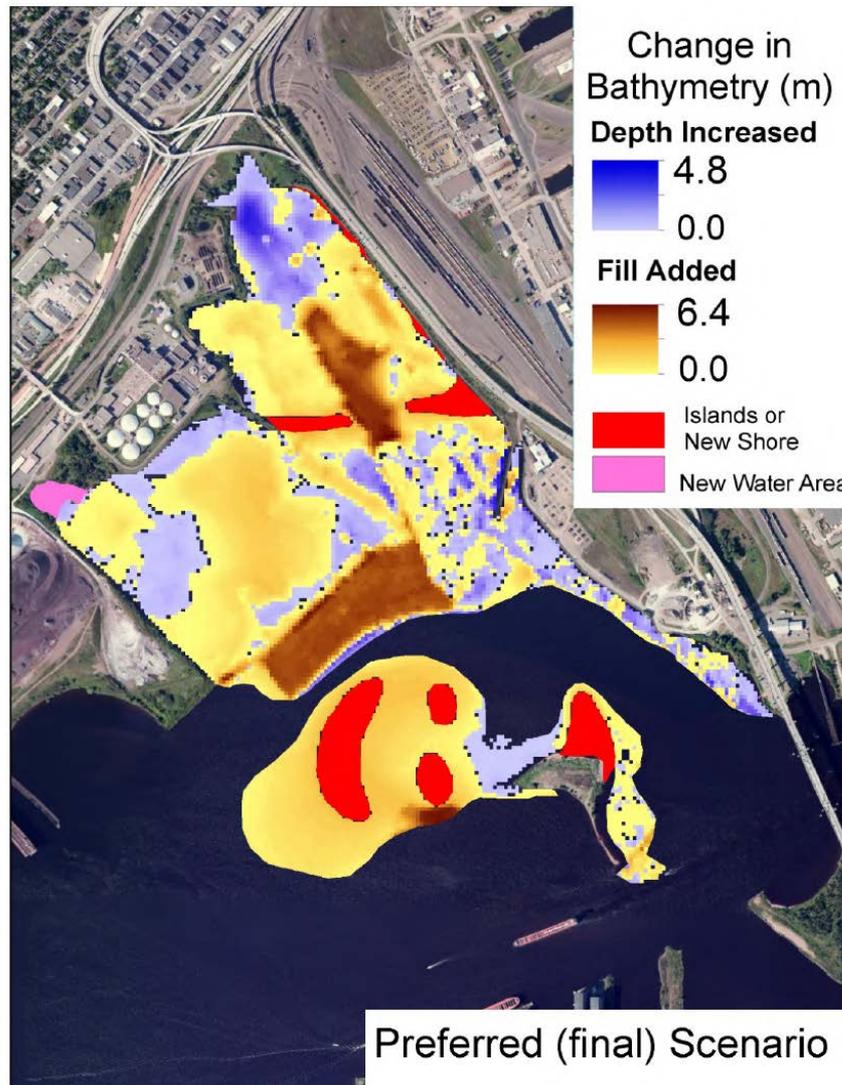
Challenge #4: calculating volumes occurred very early in the project



project locations



21st Ave. W. draft concept

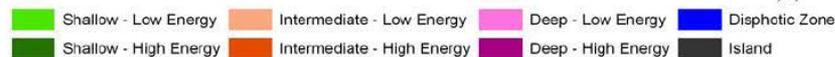


Challenge #5 – mix of bathymetric methods

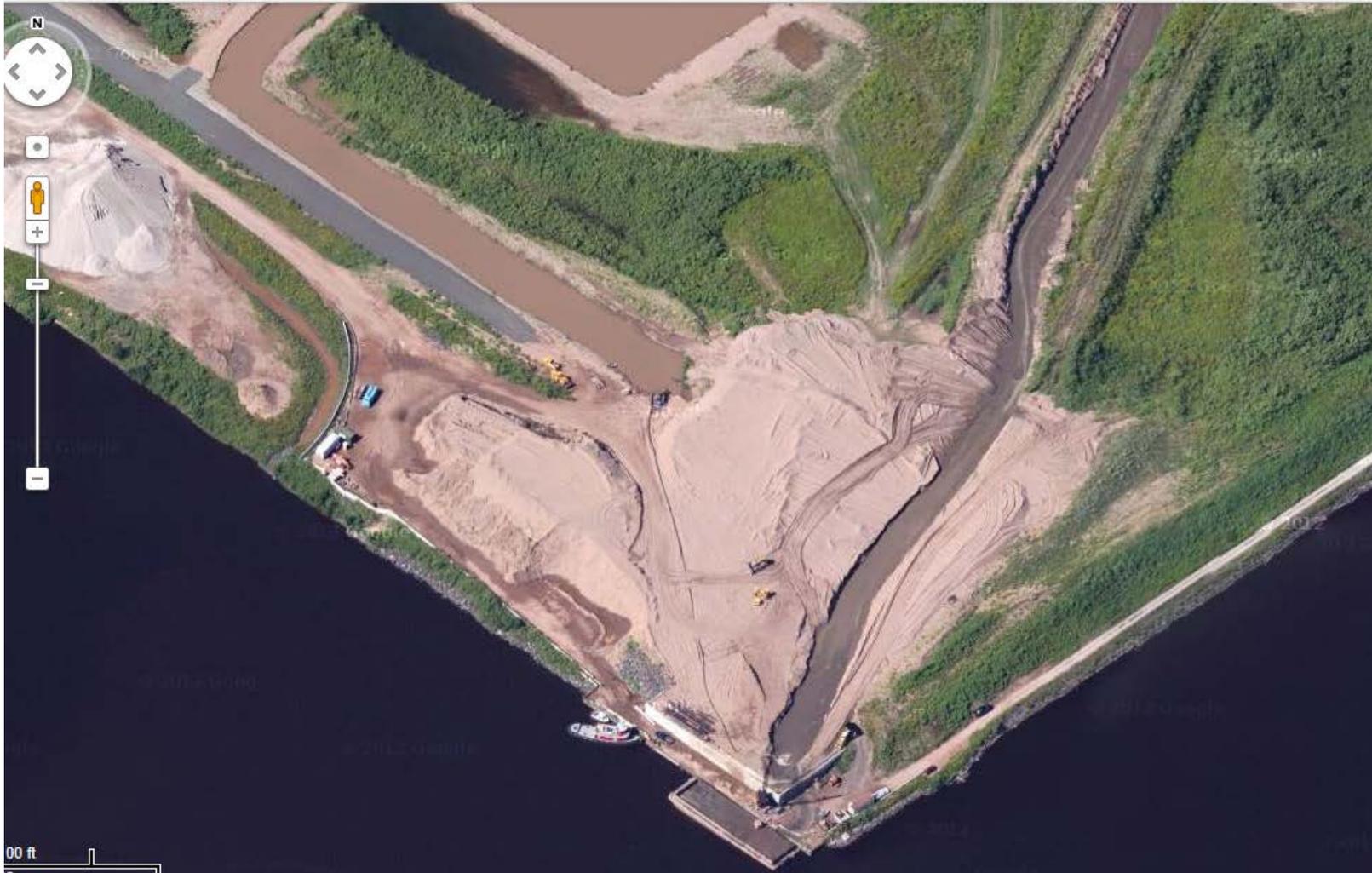


results: 40th Avenue West design concept

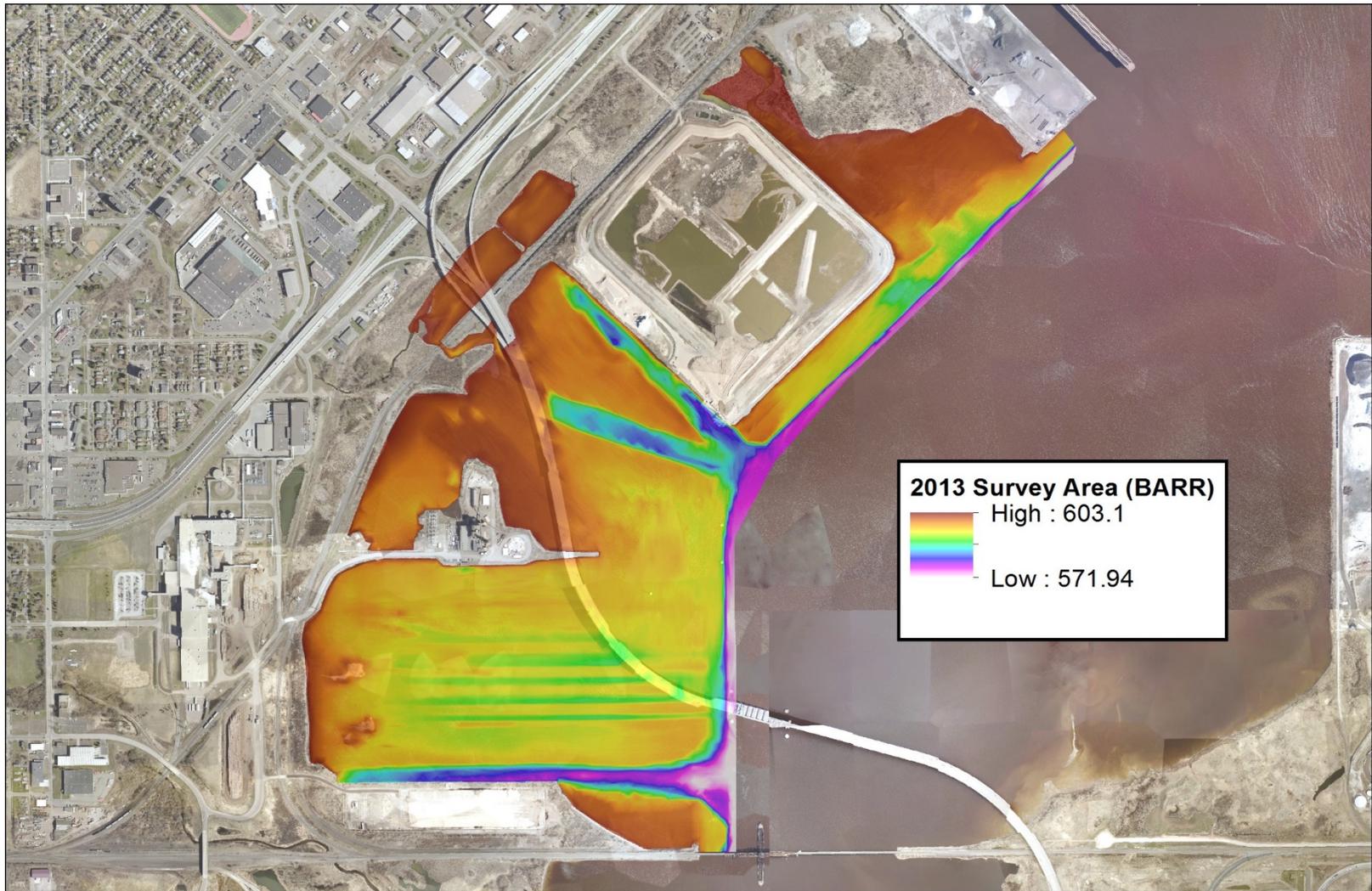
Ecological Design Scenarios Scenario 1



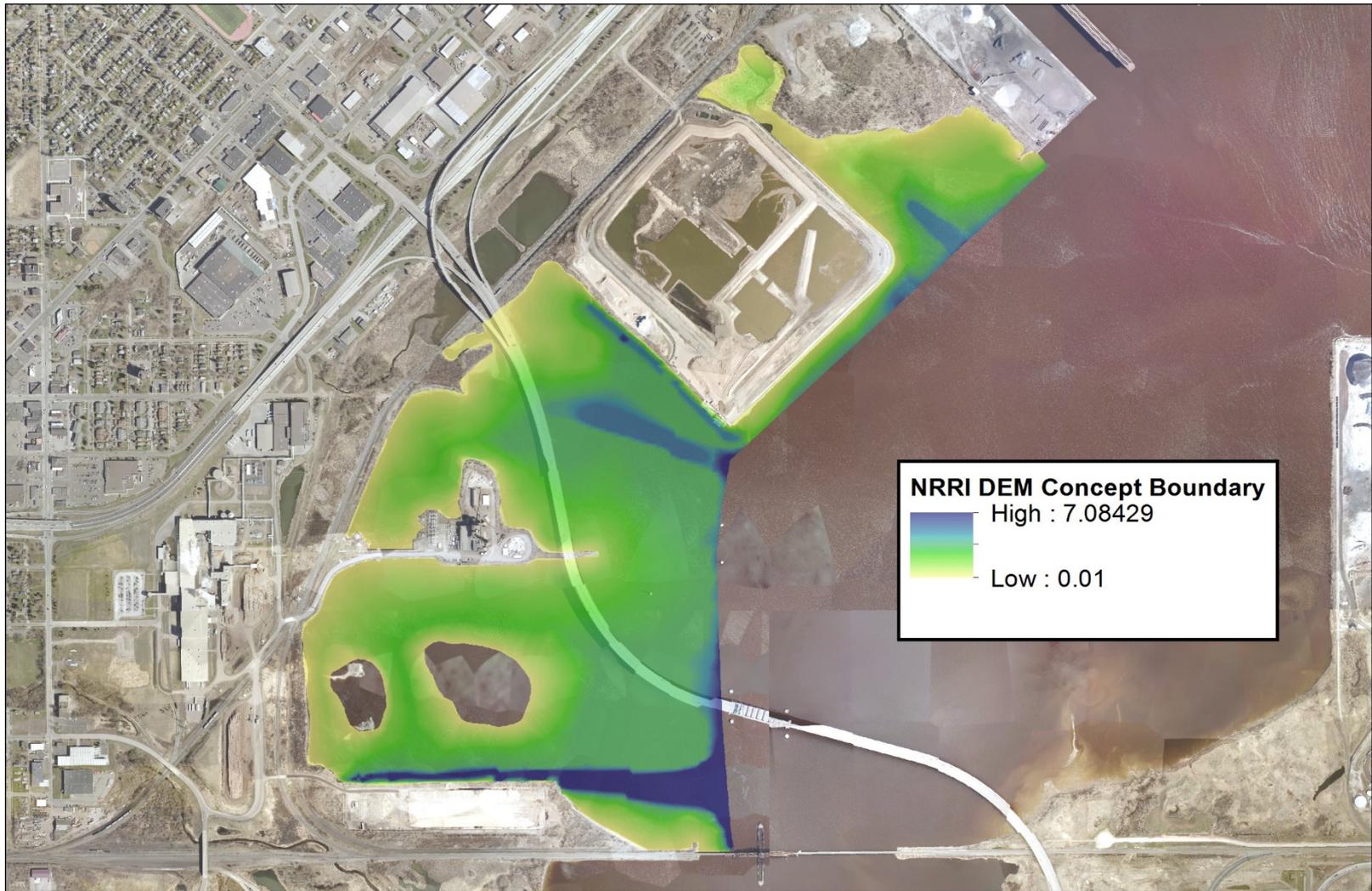
Luckily, this site is right next to the USACE dredge disposal facility at Erie Pier! (low transport costs)



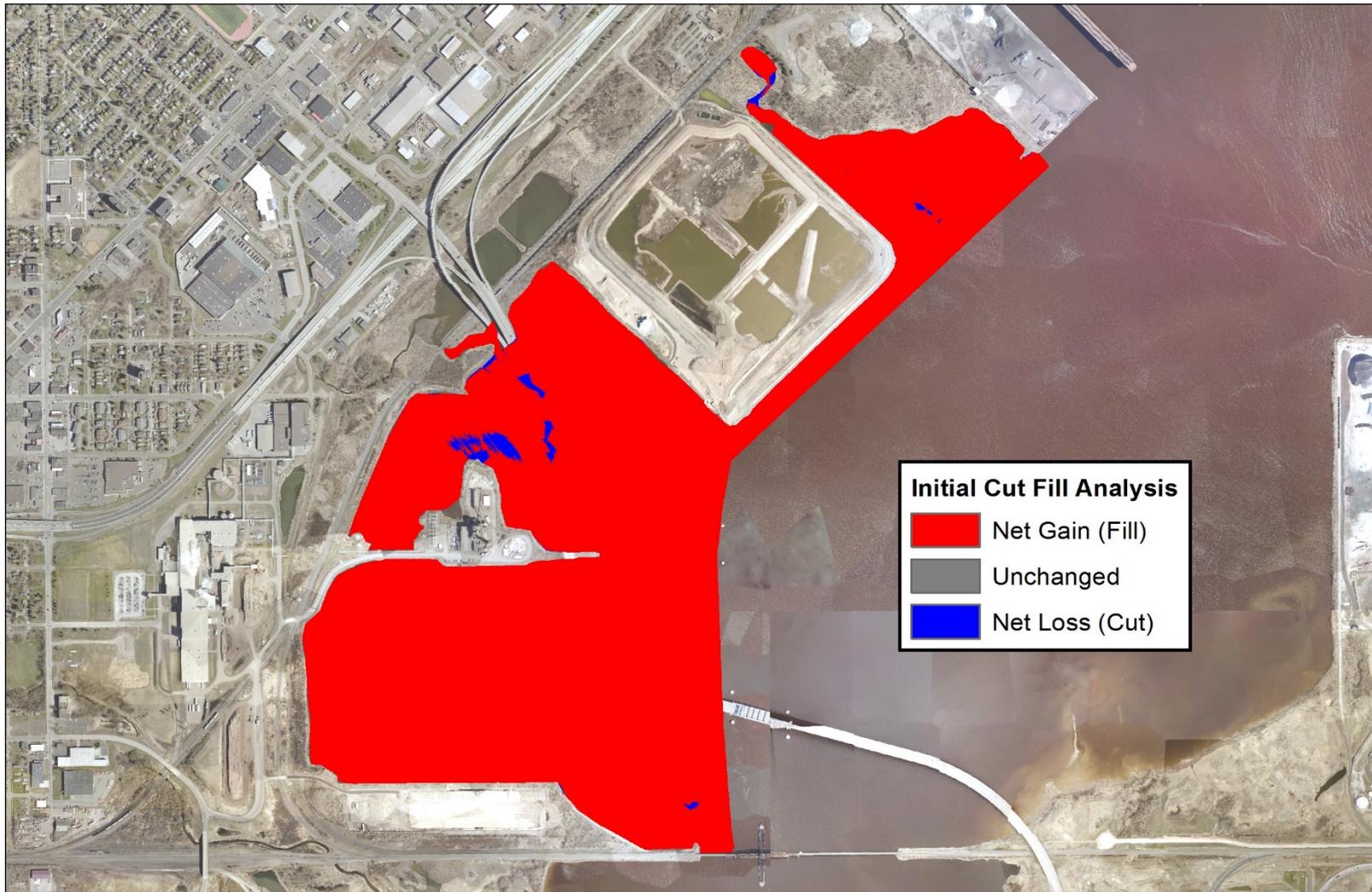
results: 40th Avenue West BARR survey



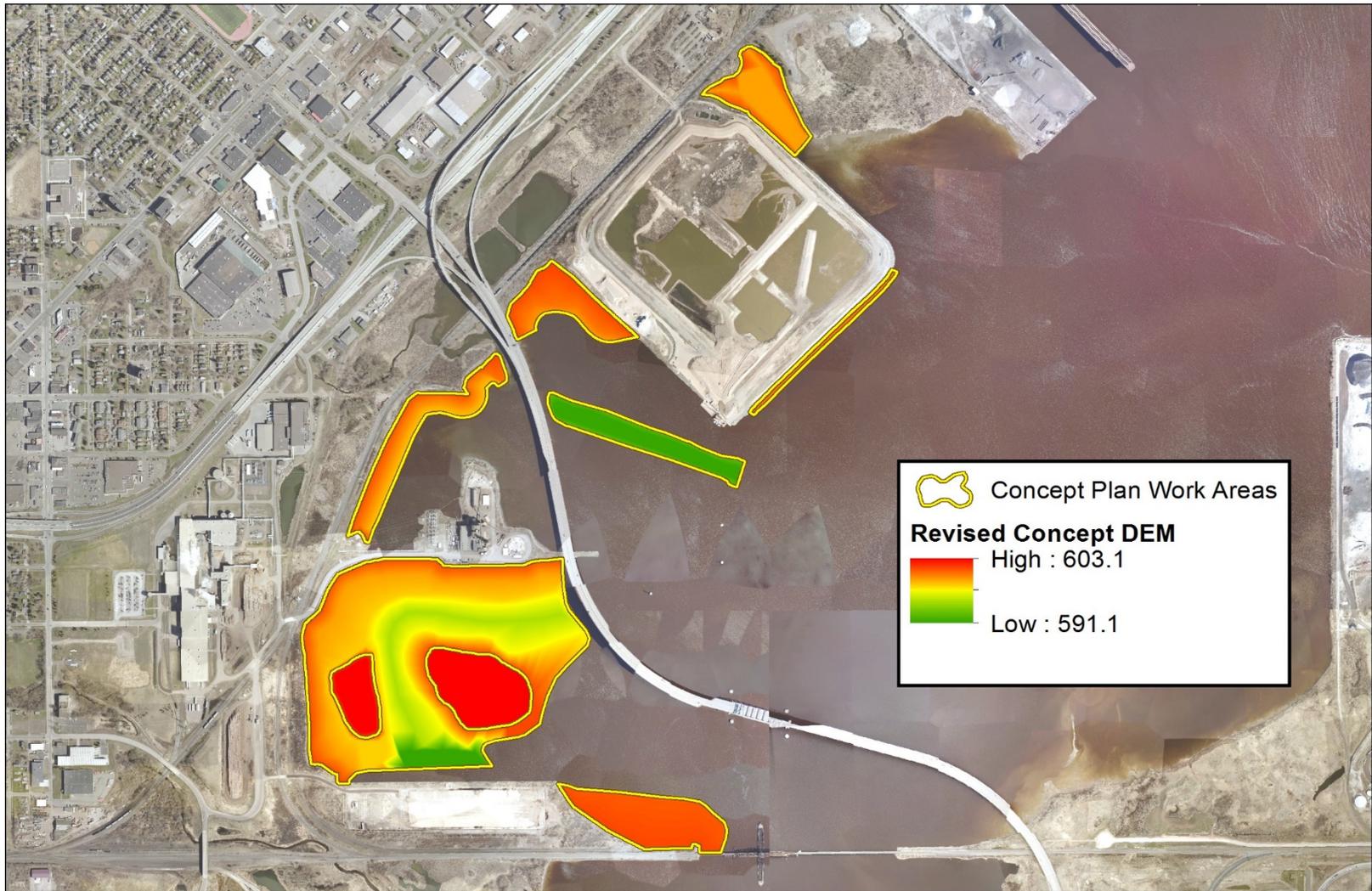
results: 40th Avenue West initial concept DEM



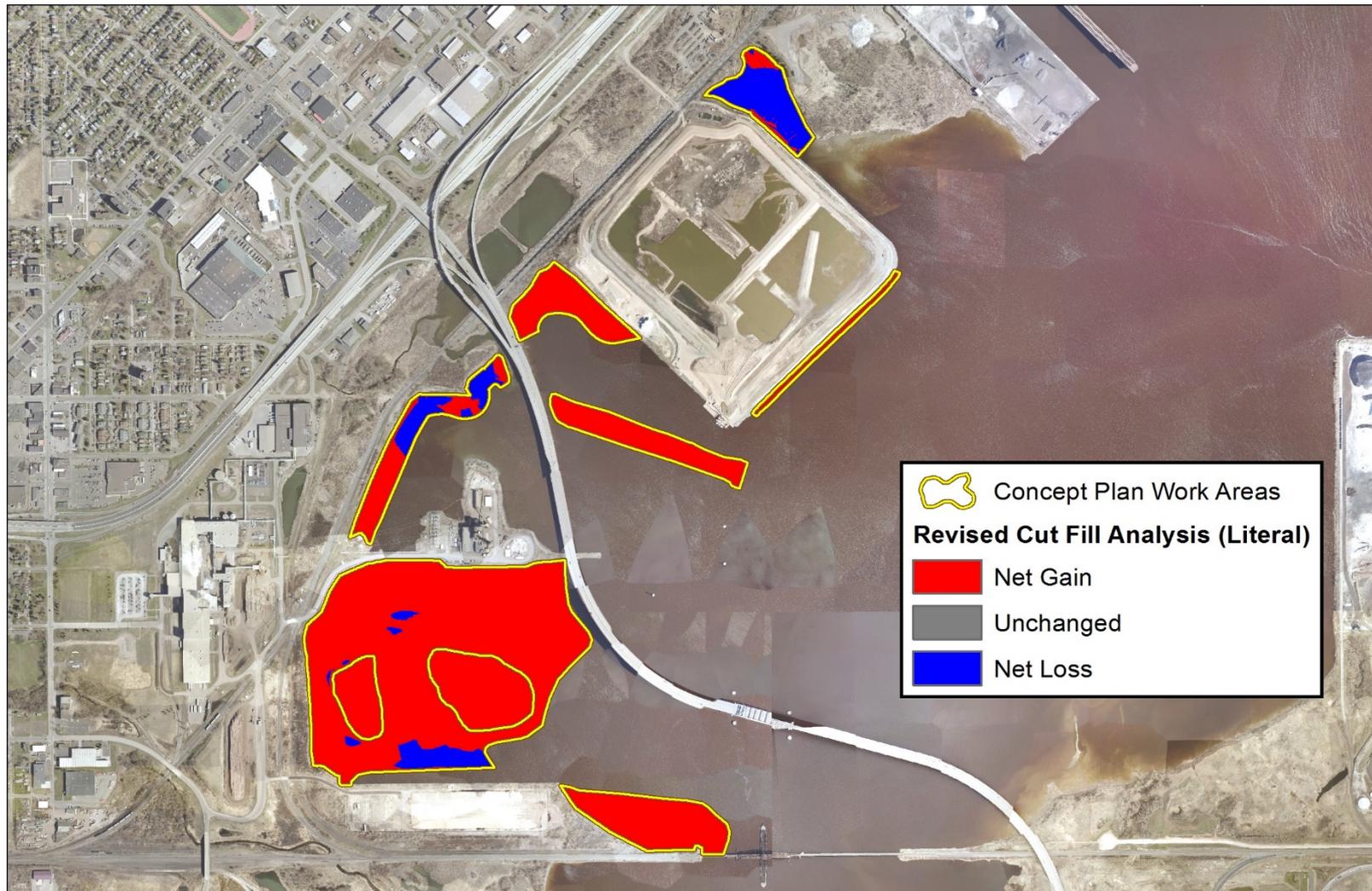
results: 40th Avenue West Initial Analysis



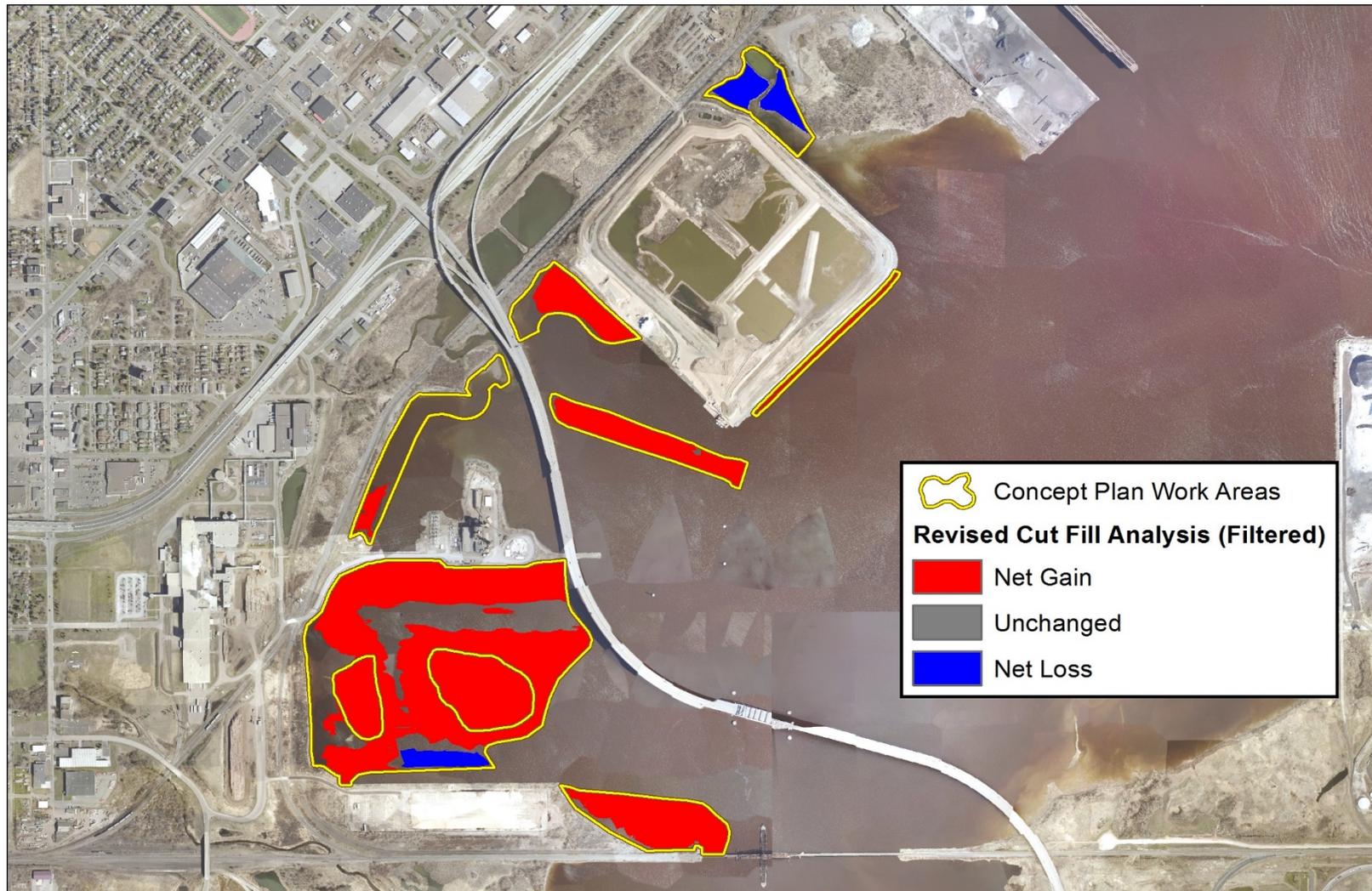
results: 40th Avenue West revised concept



results: 40th Avenue West revised analysis (literal)



results: 40th Avenue West revised analysis (filtered)



results: 40th Avenue West preliminary results

Site: 40th Avenue West Preliminary Results

Analysis Run 01/28/2014

| LITERAL ANALYSIS | | |
|------------------|----------------|-------------|
| Gain (Fill/Red) | 700,850 | Cubic Yards |
| Loss (Cut/Blue) | 40,197 | Cubic Yards |

Analysis Run 01/28/2014

| FILTERED ANALYSIS | | |
|-------------------|----------------|-------------|
| Gain (Fill/Red) | 655,075 | Cubic Yards |
| Loss (Cut/Blue) | 32,673 | Cubic Yards |

| Differences between Cut/Fill Analyses above: | | | |
|--|---------------|-------------|---------------|
| Gain (Fill/Red) | 45,775 | Cubic Yards | 6.53% |
| Loss (Cut/Blue) | 7,524 | Cubic Yards | 18.72% |

preliminary results – all sites

| Project Site | Overlap/Analysis Size (Acres) | Fill Volume (Cubic Yards) | Cut Volume (Cubic Yards) | Site Gain/Loss (Cubic Yards) |
|---|------------------------------------|-------------------------------|---------------------------|---|
| 21st Avenue West (Pilot Project Area Only) | 103 Acres (Full site is 413 acres) | 535,000 to 565,000 | 40,000 to 65,000 | 496,000 to 500,000 (for roughly 25% of total project area) |
| 40th Avenue West | 120 Acres (Full site is 305 Acres) | 655,000 to 701,000 | 33,000 to 40,000 | 622,000 to 661,000 |
| Grassy Point | 77 Acres (Full site is 131 Acres) | 117,000 to 136,000 | 136,000 to 161,000 | -19,000 to -25,000 |
| TOTALS: | | 1,307,000 to 1,402,000 | 209,000 to 266,000 | |

material placement at 21st Ave. W. pilot project by Roen Salvage (from Sturgeon Bay, WI)



mechanically offloaded, hydraulically pumped



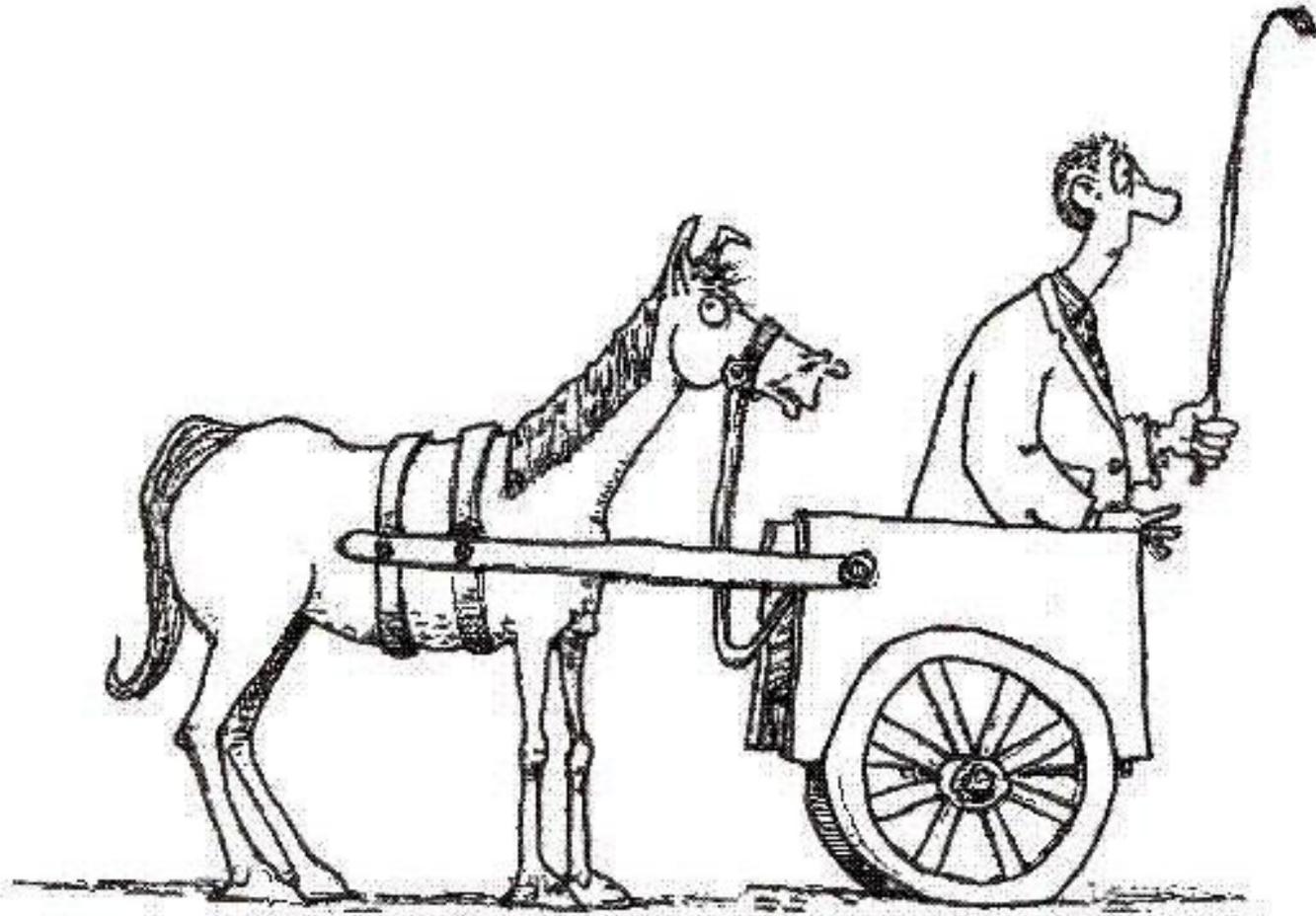
spill plate



turbidity monitoring (sonde & TSS samples)



lesson learned: sometimes you need to put the cart before the horse for awhile!



questions