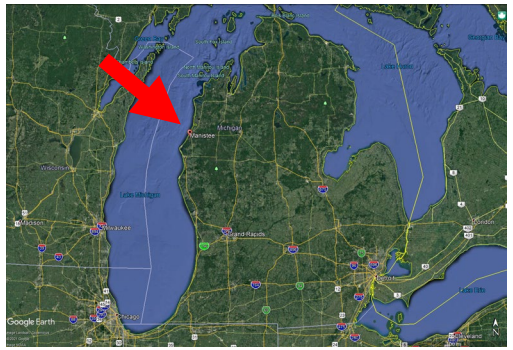
Manistee Sediment Remediation

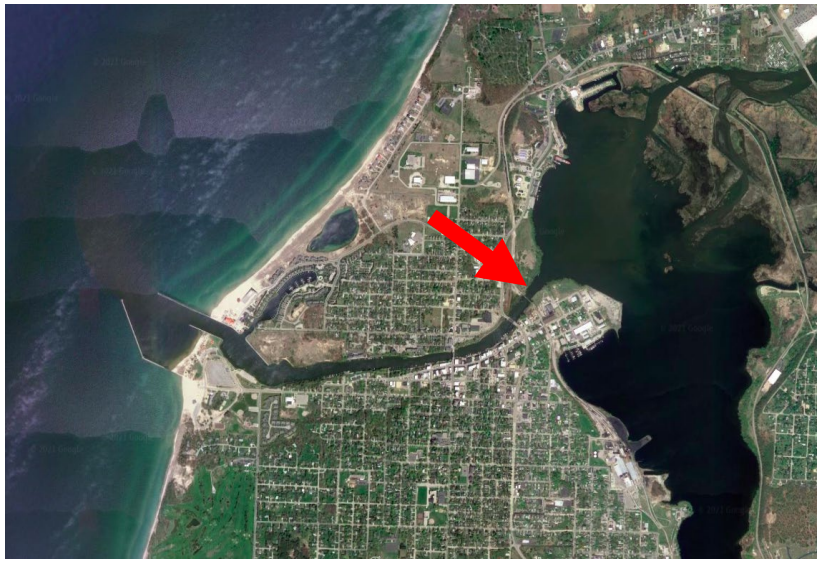
WEDA Dredging Summit and Expo

July 25-28, 2022 | Houston, Texas

Presentation Overview

- Site Background
- Design Approach
- Remedy Implementation
- Lessons Learned





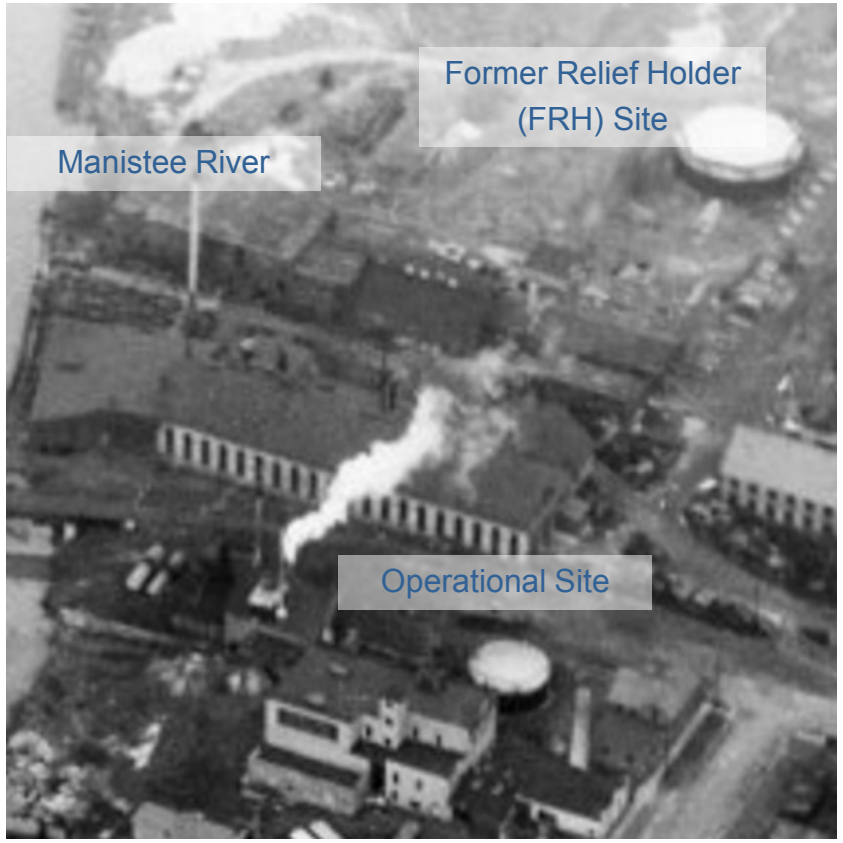
Site Background

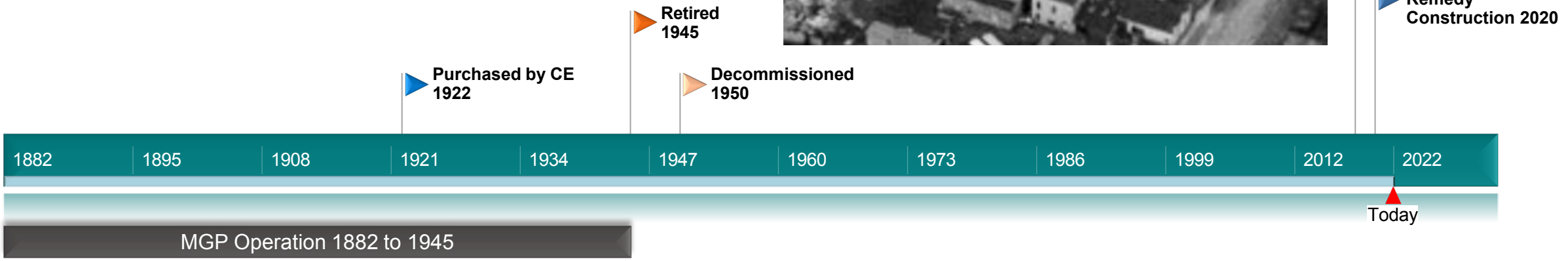
Site uses

- MGP
- Post-MGP

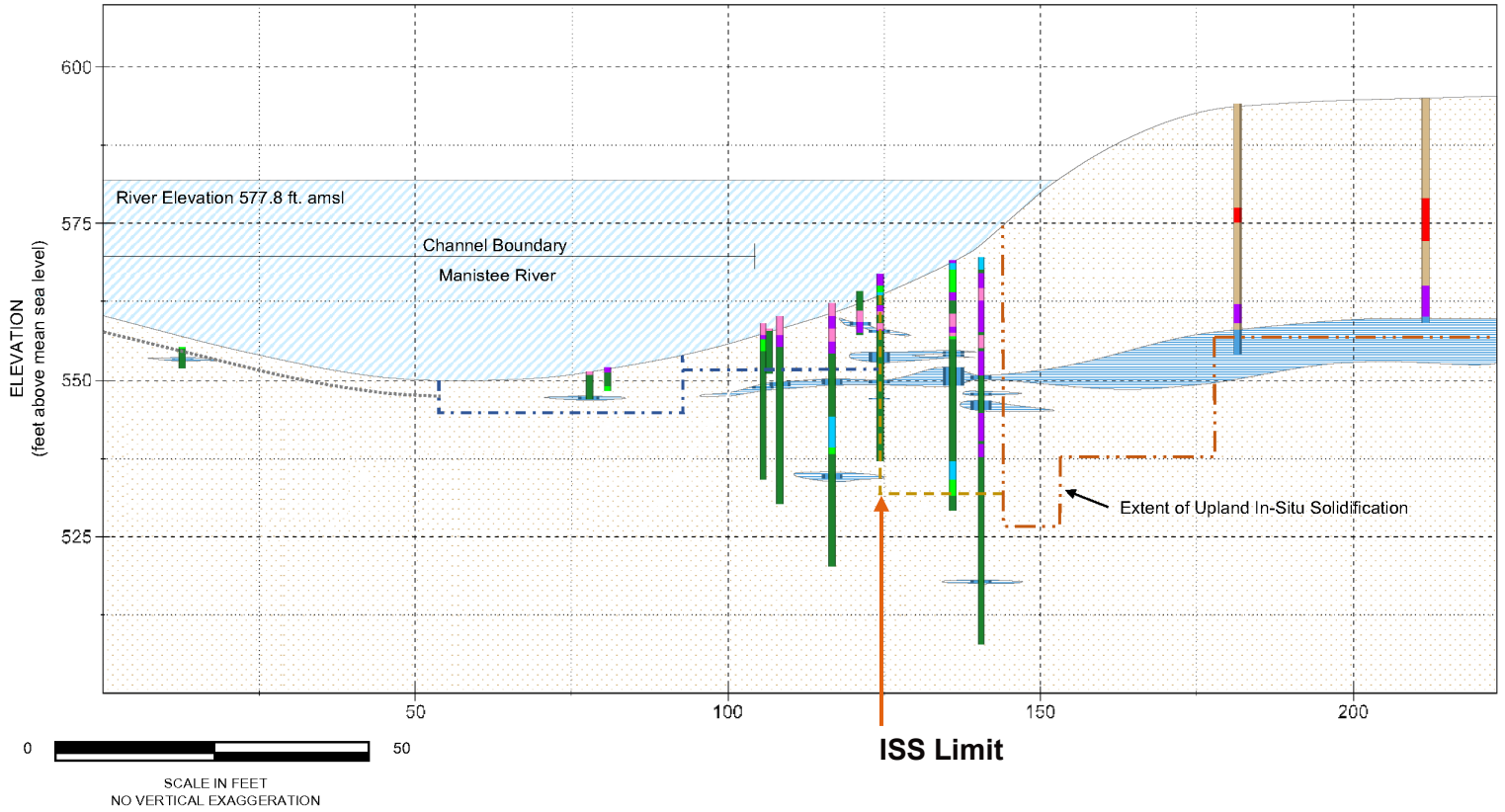
Site remedial history

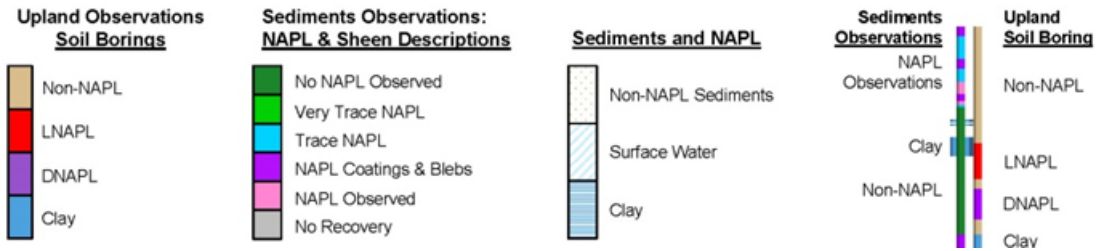
- Investigations
- Upland interim remedies
- Areas of concern





Conceptual Site Model





Geology

- Sand to ~ 38 ft bgs with K ~10^{-2} to 10^{-3} cm/sec
- Clay

Hydrogeology

- Flow to Manistee River
- Depth 16 to 20 ft bgs

Impacts

- Dissolved phase BTEX and PAHs > criteria
- LNAPL and DNAPL present

ISS Design Goals

Mix

- 2.5% Portland cement
- 4.5% blast furnace slag

Permeability

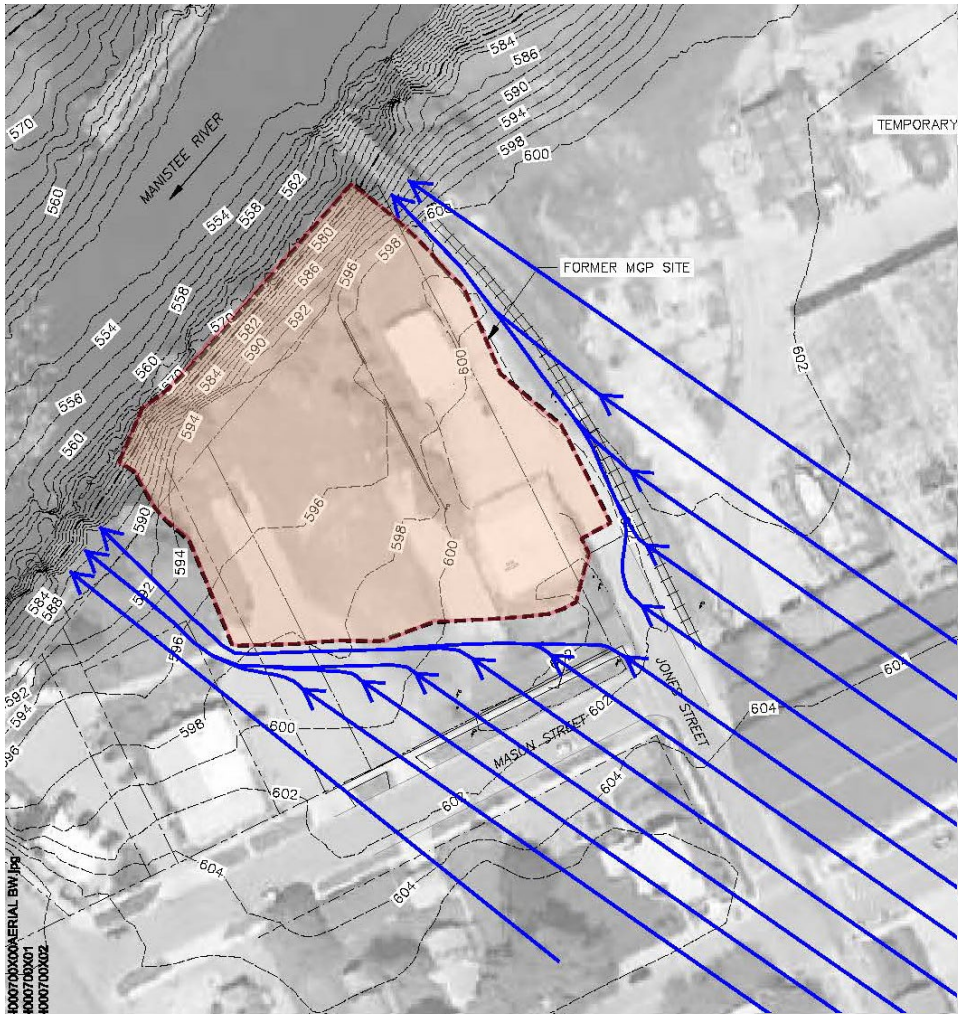
- $<10^{-6}$ cm/sec
- Alternative is two orders of magnitude less permeable than surrounding aquifer

Compressive Strength

- >50 psi minimum unconfined compressive strength @ 28 days

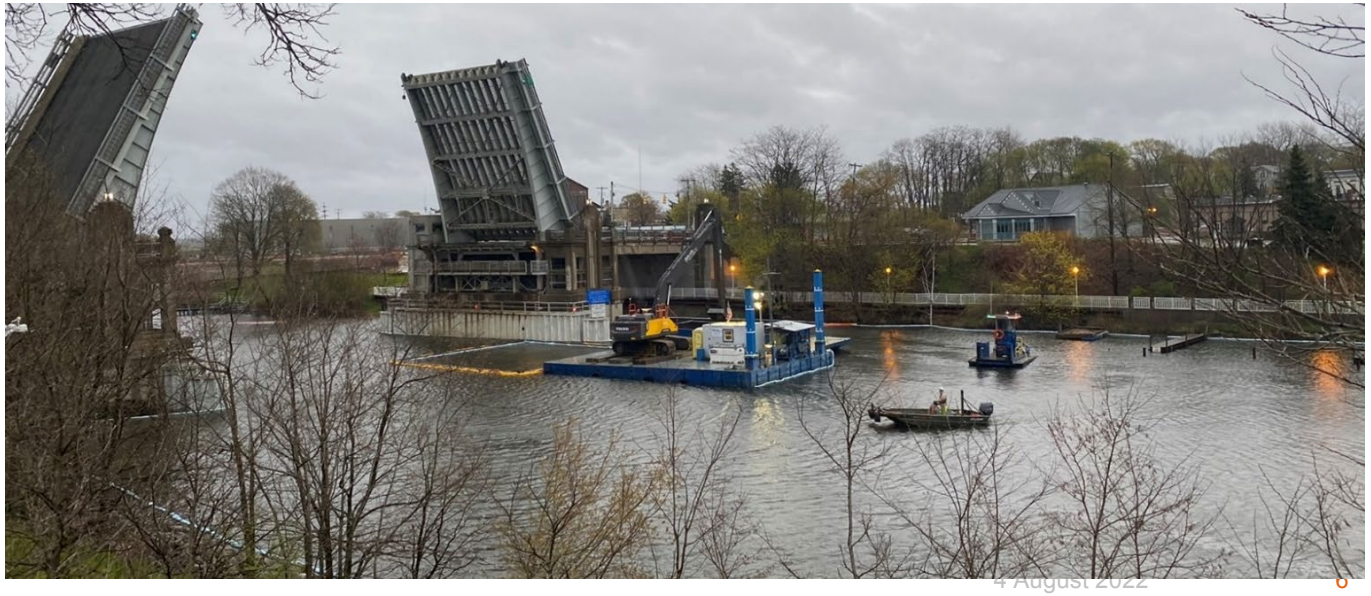
QA/QC

- One sample per 500cy



Design Considerations

- High traffic (commercial and recreational) with limited space outside navigation channel
- Critical infrastructure including highway bridge, rail bridge, and private docks
- Critical utilities including bridge cables and outfalls
- Permit requirements – no backfill in navigation channel
- Protection of in-river ISS/incorporation in bank restoration
- Dredging would potentially produce sheen



Design Approach – General

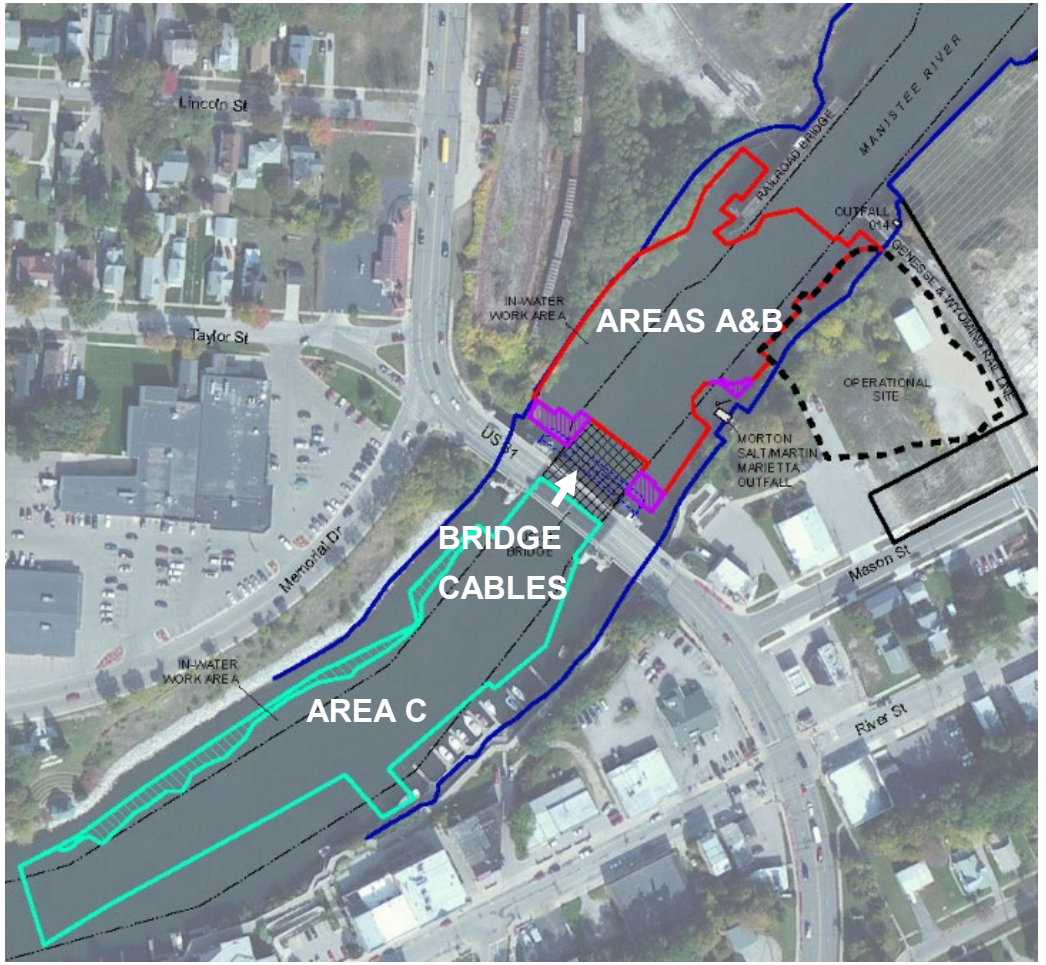
- Offsets from critical infrastructure
- Diver-assisted hydraulic dredge near bridge cables
- Flexible approach to allow ship traffic on short notice
  - Moon pool and excavator for most removal
  - Fixed turbidity controls near shoreline and structures
  - Air bubble curtain for secondary containment
- Sheen patrol crew

Design Approach – Remedial Areas

Area	Max. Removal Depth (ft)
A	12
B	5
Bridge Cables	0.5
C	1

Structural Considerations

- Optical monitoring on railroad bridge
- Dredging offsets from outfall, rail bridge, riprap shoreline, docks, other utilities/structures



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In-River ISS

Approach

- Cofferdam
- Platform construction
- Auger mixing

Challenges

- Depth of mixing
- Utilities: 60” storm, 36” outfall
- Active railroad, navigational channel must remain open
- Native American artifacts
- Obstruction removal
- Schedule and sequencing

Cofferdam and Platform Construction

Sediment and Water Handling

Sediment Handling

- Transfer station on shoreline
- Lined dewatering pad
- Gravity dewatering plus stabilizing agent (as needed)
- Geotube for hydraulic dredging
- Offsite landfill disposal

Water Treatment

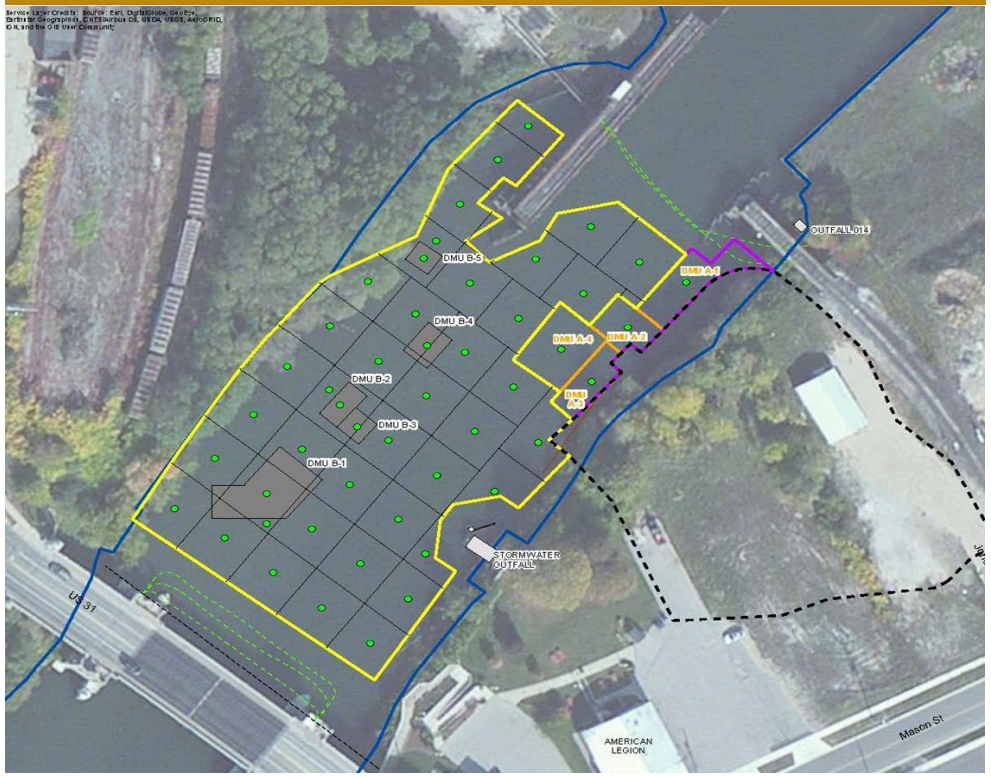
- Onsite treatment
- Initial discharge to groundwater via trench
- NPDES discharge to river

Confirmation Approach

Area	Observation Frequency
A	1/DMU
B	1/2,000 sf + 1/deeper DMU
C	1/2,000 sf

NAPL Presence	Response Action
Observed	Additional dredging
Not Observed	Dredging complete

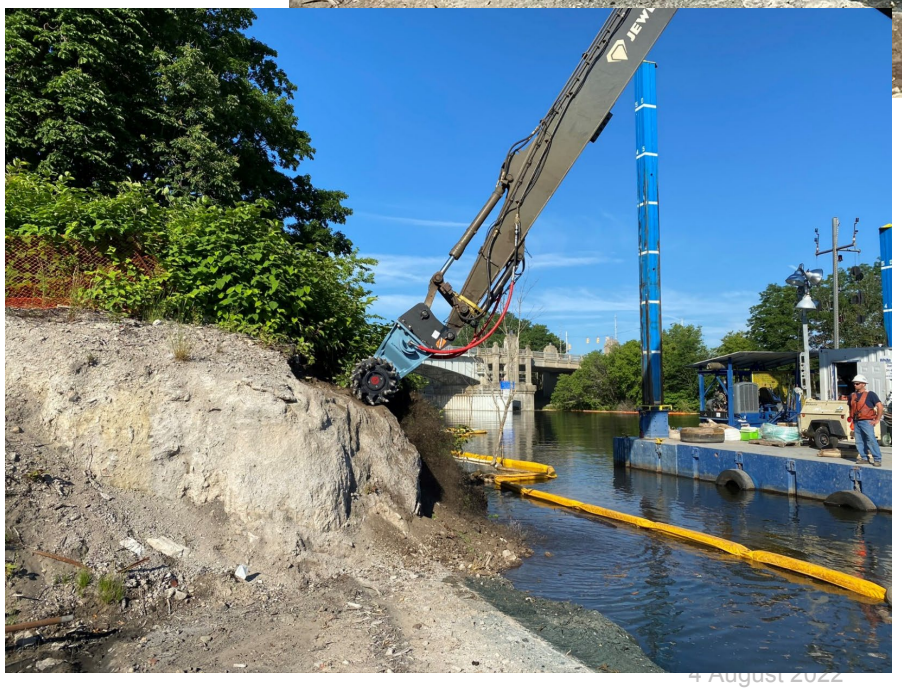
Areas A and B



Area C

Restored Bank Challenges

- No fill requirement in navigation channel
  - Redesign of restored bank to keep toe out of channel
- ISS swell
  - Excavation to extent practicable
  - Rock wheel grinding to final grade
  - Further adjustments to restored bank
  - Flexible approach to allow ship traffic on short notice

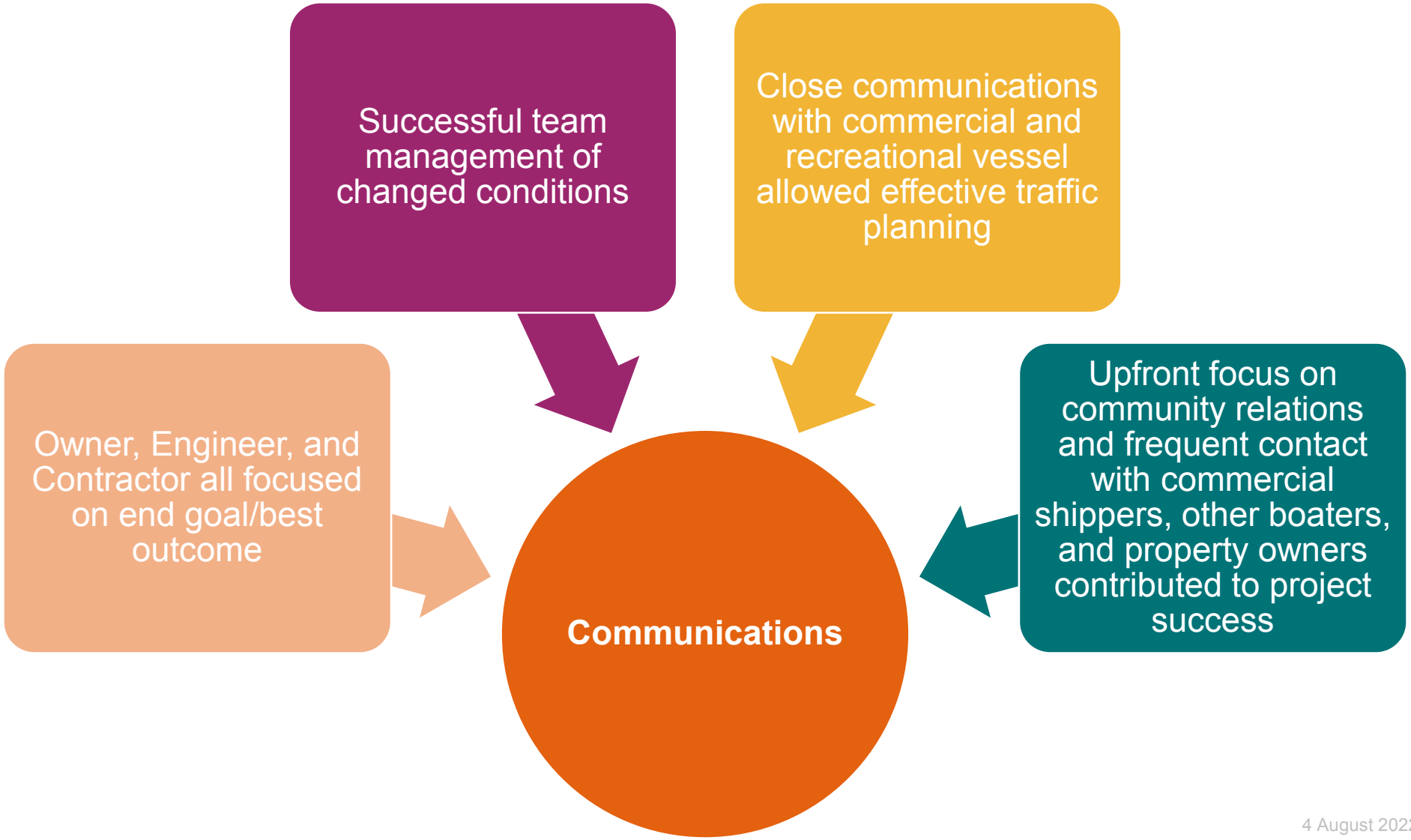


In River ISS Swell Removal

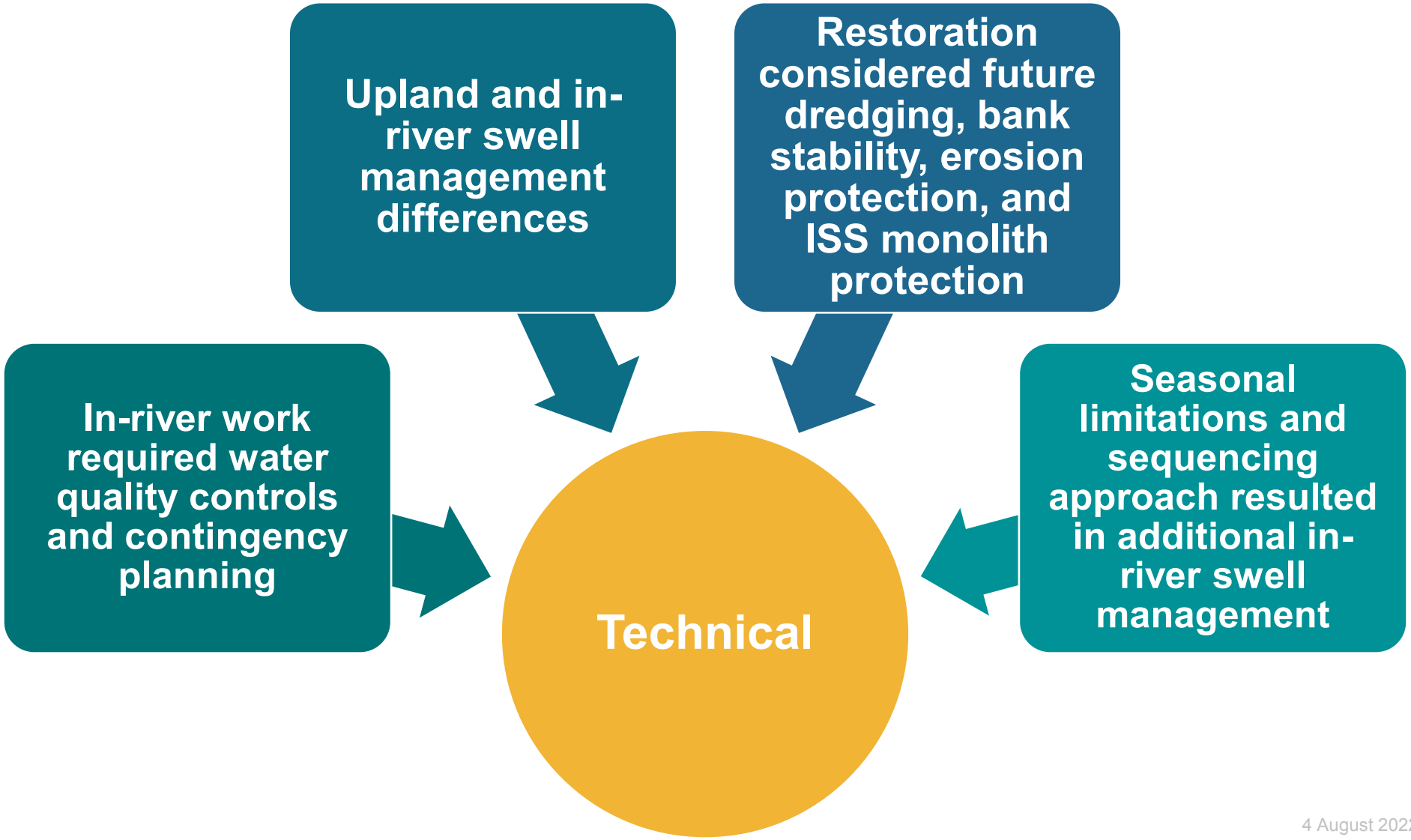
Other Field Challenges

- Traffic coordination
- Debris in diver-assisted dredge area
- Consideration of confining layer in confirmation sample collection
- Community relations

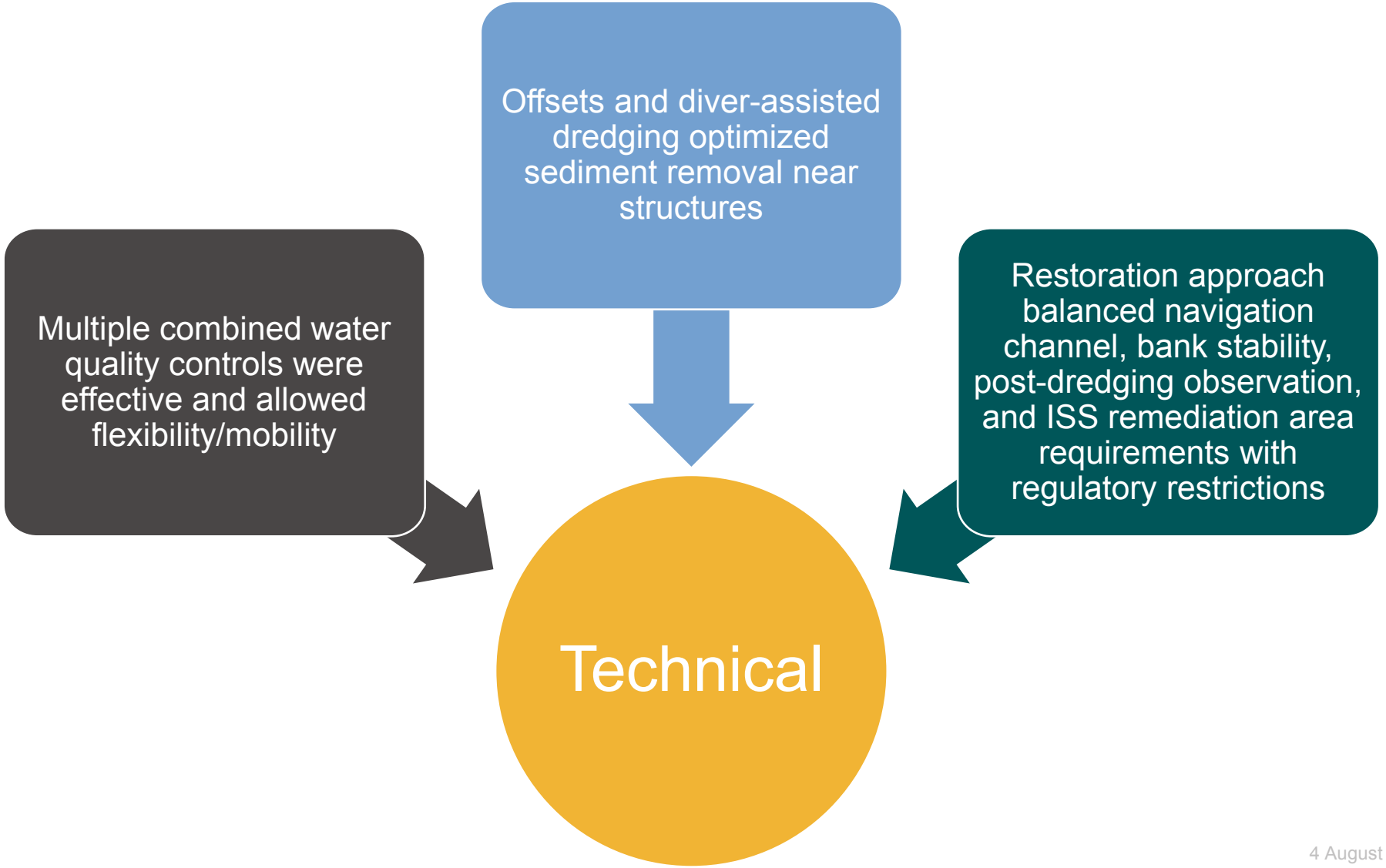
Lessons Learned – Communications



Lessons Learned – ISS



Lessons Learned – Dredging



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