

# Overcoming remedy design constraints for the remediation of Young's Creek -Deloro Site

**Trevor Staniec**

Kristin Searcy Bell

Victor S Magar

SMWG Sponsor Forum

October 2025

**RAMBOLL**

Bright ideas.  
Sustainable change.



# Site Location



Deloro, Ontario



The Deloro site  
cleanup project

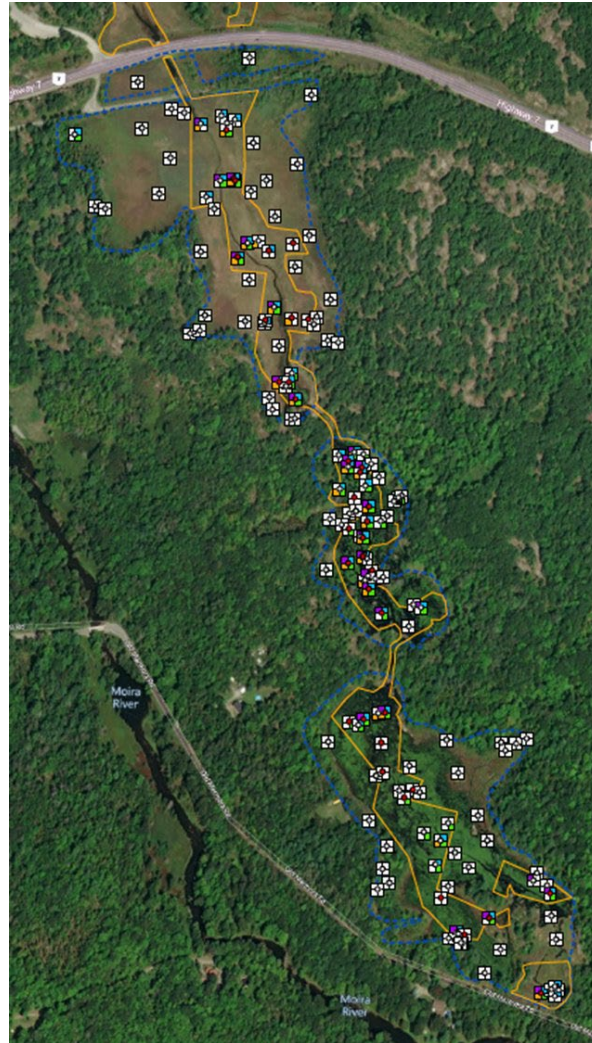


# Remedial Objectives

On-Site Area



Off-Site Area



- » Remove impacted sediments above:
  - › Human health risk
  - › Ecological risk
- » Contain on-site

● Arsenic <810 mg/kg

● Arsenic >810 mg/kg

Benthic Invertebrate PRGs

■ Arsenic normalized to 1% TOC >132 mg/kg

■ Arsenic normalized to 1% TOC >92 mg/kg

■ Copper normalized to 1% TOC >216 mg/kg

■ Nickel normalized to 1% TOC >44 mg/kg

■ Metals less than TOC normalized remedial goal

■ Radiation  $\geq 0.23 \mu\text{Sv/hr}$

■ Radiation survey not available

■ Proposed remediation boundary

# Young's Creek Area Pilot Dredging – 2014 to 2015

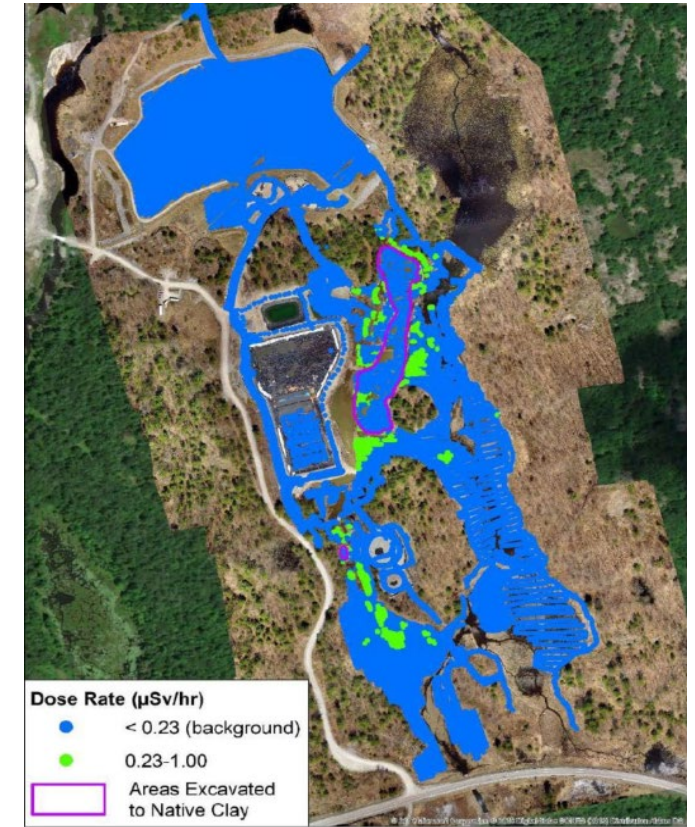
## Containment Cell



## Dredging and Dewatering



## Rad Removal



# Young's Creek Area Pilot Dredging Lessons Learned

## Site Work Completed

### Created On-Site Containment Cell

- 22,000 square meters
- Lower liner with leachate collection

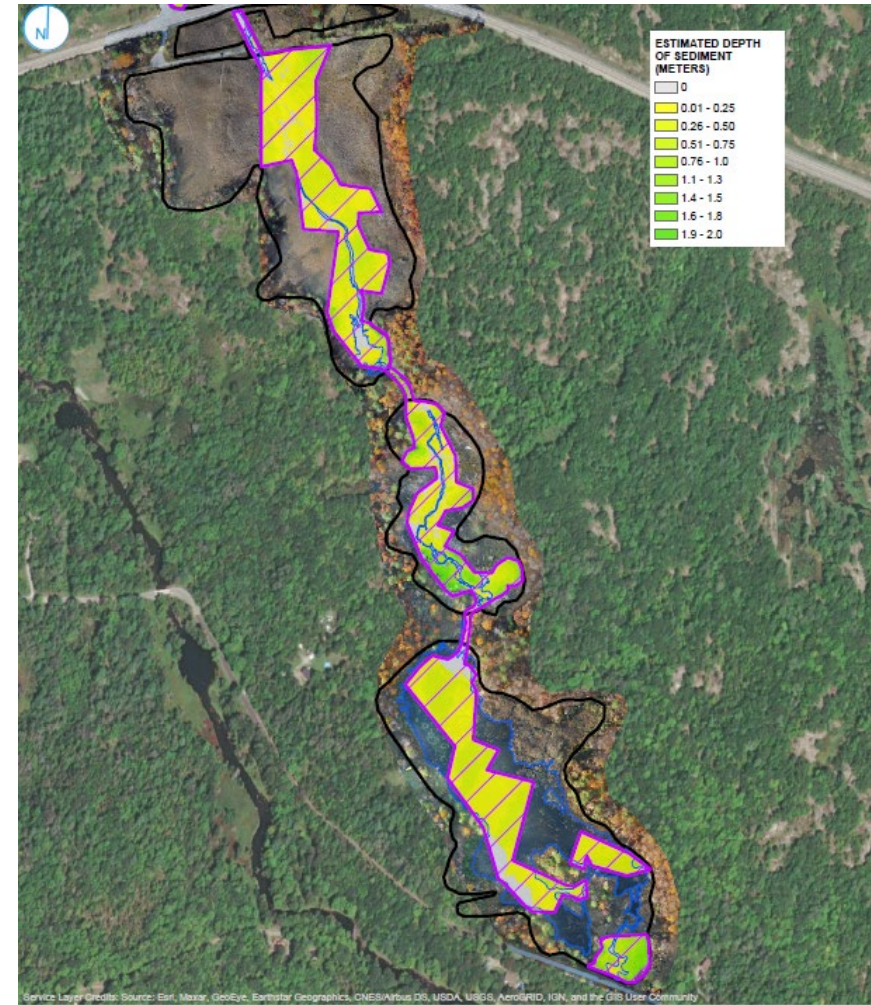
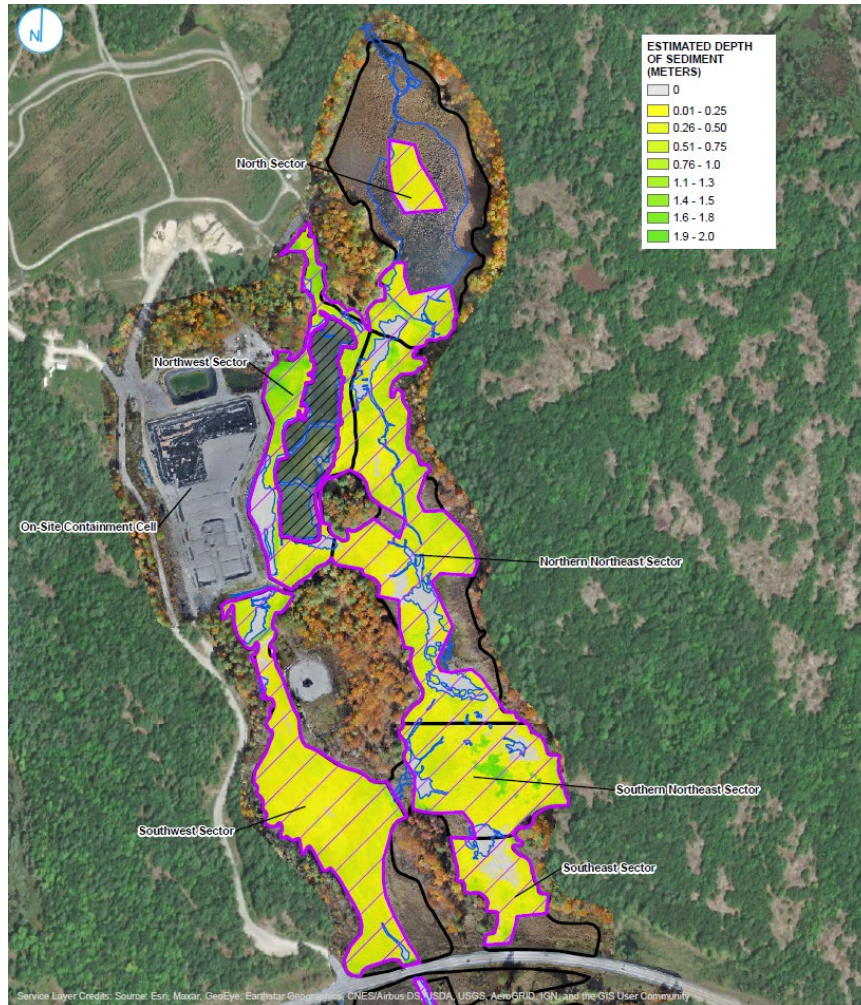
### Dredged and Placed

- 12,600 cubic meters (*approximate*)
- 18% of target volume
- Removed radioactive sediments above 1.0  $\mu\text{Sv/hr}$

## Lessons Learned

- Temporary dams damaged by wildlife and ice events necessitated numerous repairs
- Periods of high water conditions from creek complicated operation of temporary dams
- Geofabric containers (Geobags) did not achieve target dewatering

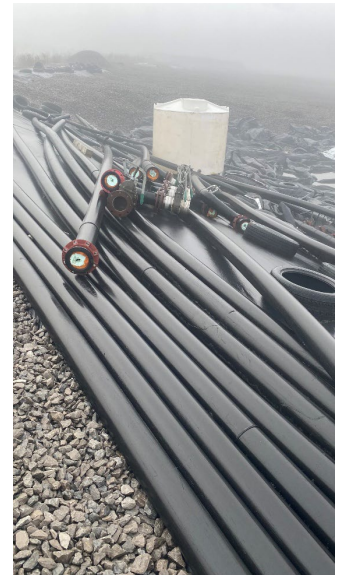
# Young's Creek Full Scale Existing Conditions



# Young's Creek Full Scale Debris

## Prior Construction Materials Present:

- Temporary cofferdam materials
- Geotextiles – silt fence, turbidity boom, etc.
- Rad impacted HDPE piping
- Miscellaneous covers and fabric
- Tires and miscellaneous C&D



## Full Scale Approach – Remedy Constraints

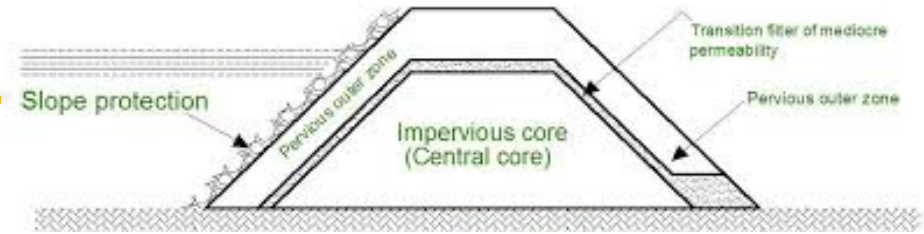
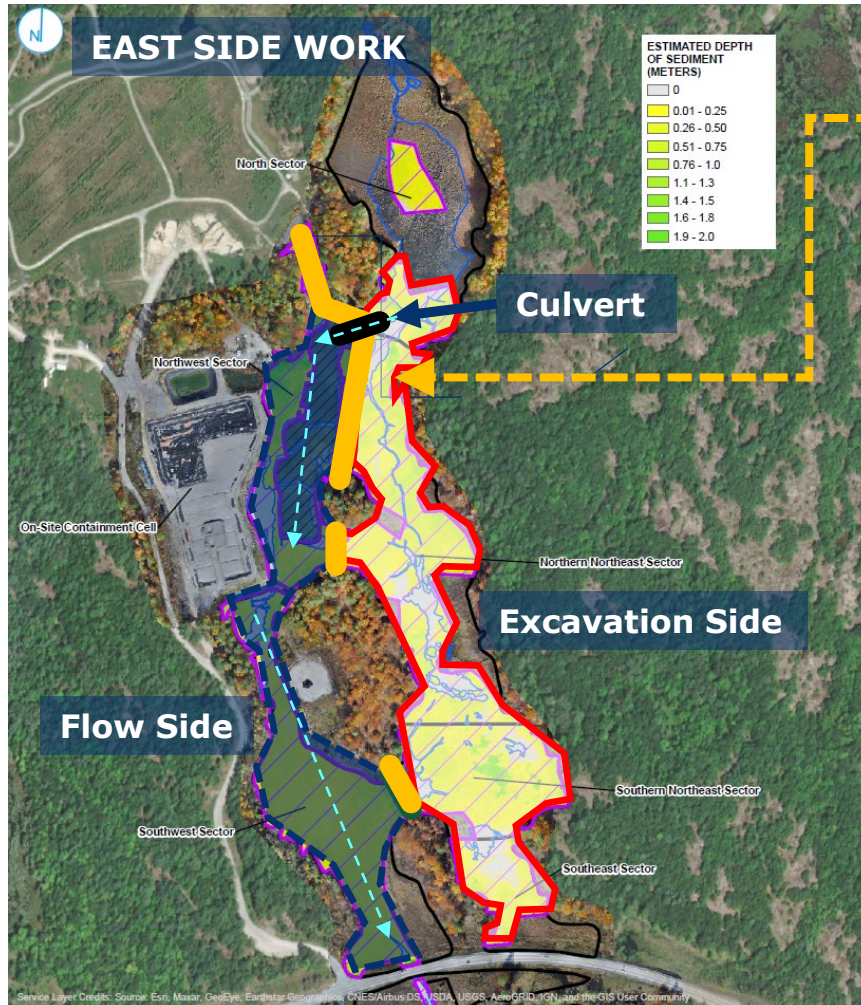
Water  
Management

Access  
Conditions

Dewatering and  
Stability

Containment Cell  
Volume

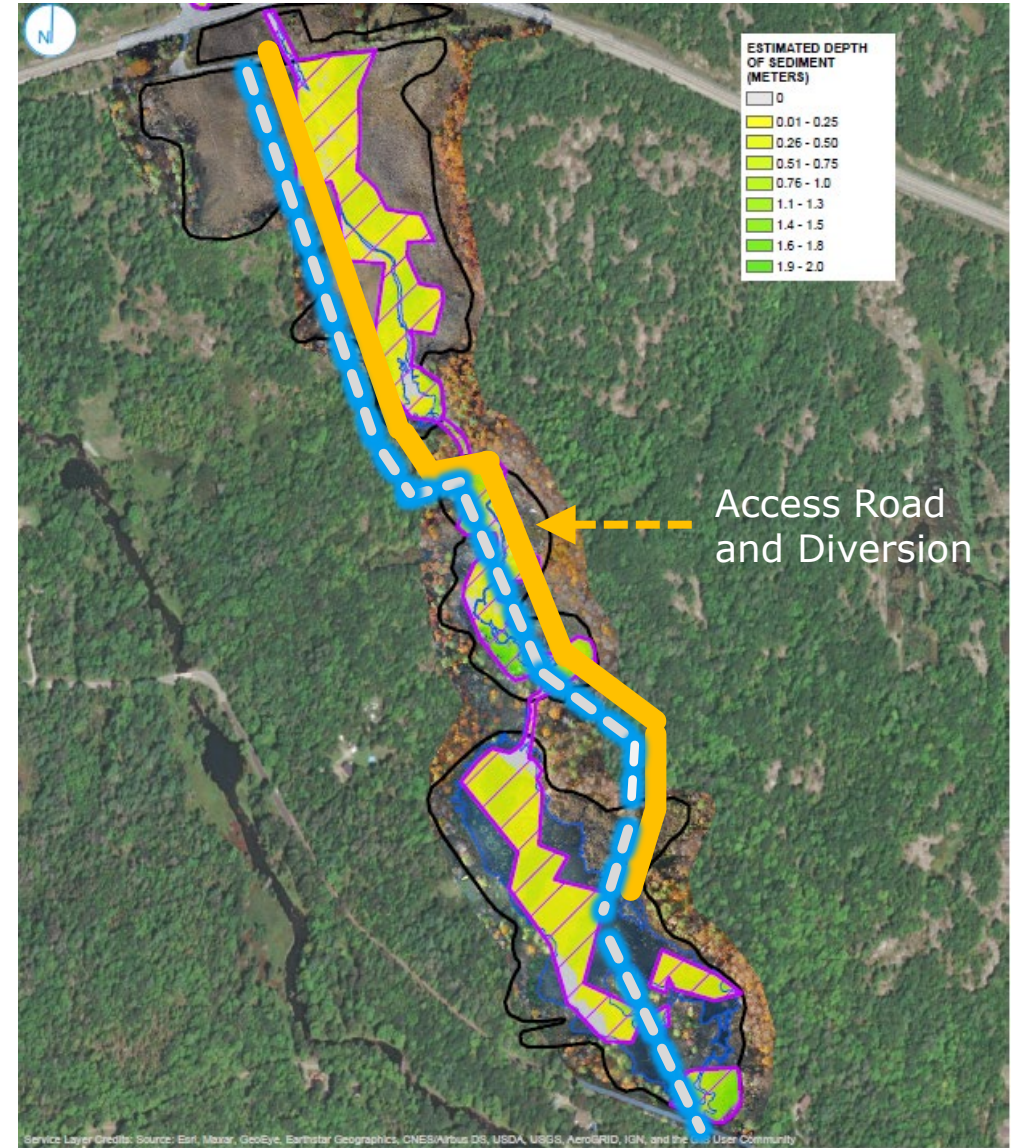
# Young's Creek Full Scale Onsite Diversion and Access



- Excavate in the dry
- Divert creek flow with granular berm
- Granular berm also provide equipment access
- Flow side and excavation side flip-flops

# Young's Creek Full Scale Offsite Diversion and Access

- Excavate in the dry
- Divert creek flow with diversion ditch/piping
- Temporary access roadway complicated by elevation change and rock exposed bedrock



# Young's Creek Full Scale Diversion and Access



Mechanical excavator, dozer, off-road dump

Tracked or off-road equipment with crane mats

Amphibious, low-ground pressure equipment

# Young's Creek Full Scale Solidification and Placement

## SOLIDIFICATION

- Establish treatment area(s)
- 10-15% Portland Cement
- PC additional rates may vary depending on material type and moisture content



## CURE MATERIAL

- Rest 24 hours before handling



## PLACE AND COMPACT

- Rehandle to Containment Cell
- Place and Compact
- Target 30 cm lifts
- 23 kPa final strength target

No rework once placed



# Young's Creek Full Scale Volume Balance

	Neat-line Volume cubic meter (m <sup>3</sup> )	Volume with Overdredge (m <sup>3</sup> )	Volume As Placed <i>Estimated</i> (m <sup>3</sup> )
On-Site	48,500	63,000	66,700
Off-Site	28,900	36,900	39,000
Debris	1,000		1,000
<b>Total Target</b>	<b>77,400</b>	<b>114,900</b>	<b>106,700</b>
<b>Available</b>			<b>108,000</b>

## Design Volumes includes:

- Average over-dredge of 15 cm
- As placed volume includes bulking due to solidification and compaction during placement
- Debris volume estimated and incorporated with placed sediments

# Thank you!

Trevor Staniec (Presenter)  
Syracuse, NY  
[trevor.staniec@ramboll.com](mailto:trevor.staniec@ramboll.com)

Victor Magar, P.E.  
Chicago, IL  
[vmagar@ramboll.com](mailto:vmagar@ramboll.com)

Kristin Searcy Bell  
Chicago, IL  
[ksbell@ramboll.com](mailto:ksbell@ramboll.com)

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