

BOAT HARBOUR

Sludge Thickness Determination



The STORY

The image features a solid blue background on the left side, which transitions into a low-poly, geometric pattern of various shades of blue on the right side. The pattern consists of numerous triangles and quadrilaterals, creating a textured, crystalline effect. The text 'The STORY' is centered horizontally and vertically, with 'The' in a smaller font size than 'STORY'. The text is white and stands out against the blue background.



PAST

In the early 1990s, the remediation industry in Canada took off mostly with US-imported technologies.



PRESENT

As a result, SCG Remediation was founded in 1992 seeing an opportunity to provide Canadian remediation services, led by Canadian-made technologies and local expertise, and has remained competitive, bringing the most innovative solutions to the industry through the years.



FUTURE

Today, SCG has consolidated as a preferred remediation and water treatment equipment and systems manufacturer through its strength in design and ability to leverage practical and technical understanding of technology applications. This experience enabled SCG to help its clients by customizing systems designed to meet the most demanding project requirements.

In 2018, SCG became part of the NELSON Environmental Group.

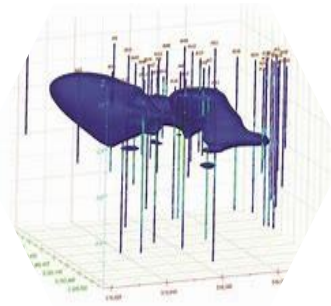
The SERVICES

30 Years of Technology Manufacturing and Design

By acting as both the manufacturer and the operator, SCG Remediation has a unique perspective on site characterization, remedial action planning, system design, operation, and application. The technologies used and manufactured by SCG are user-friendly and remediation programs are tailored to the site-specific goals of our clients.



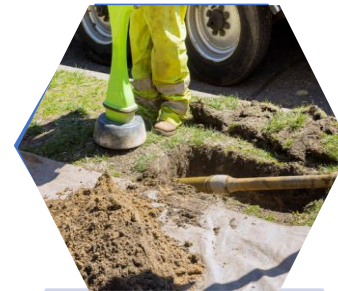
Remedial Options Assessment and Evaluation Services



High-Resolution Site Characterization Services



In-Situ Water Treatment Systems Design and Manufacturing Services



In-Situ Soil Remediation Services



In-Situ Injection Services





NELSON Environmental Group Inc.



NELSON Environmental Group combines decades of expertise in contaminated soil and groundwater. Our team delivers complete ex-situ and in-situ remediation solutions to Canadian and international projects.



NELSON Environmental Remediation Ltd.

Direct-Fired Thermal

Indirect-Fired Thermal

NELSON Earthworks

Osprey Scientific

SCG Remediation Services

MALAHAT NELSON

30541-100 Ave.
Acheson,
Edmonton, AB
T7X 6L8
Canada

Phone: (780) 960-3660
Fax: (780) 962-6885
Toll Free: (888) 960-8222
Email:
info@NERglobal.com

www.NERglobal.com



DTD

Direct-fired Thermal Desorption:

Is an ex-situ process for remediation of soils with organic contamination via evaporative extraction and oxidation destruction.

DTD recycles high-quality soil for beneficial re-use while eliminating risks of off-site transportation, imported backfill quality, and long-term landfill liability.

ITD

Indirect-fired Thermal Desorption:

Is an ex-situ process for evaporative extraction and condensation recovery of organic compounds from waste streams.

ITD is a non-destructive thermal process delivering value of product recovery from waste with high-level organic concentration, such as sludge and oil-based muds.

General Contracting

Excavation and Site Restoration.

Soil Treatment/Disposal.

Tank Removal.

Barrier Wall and Slurry Excavations.

Water Treatment.

Shoring.

Site Decommissioning and Demolition.

Pipeline Decommissioning and Abandonment.

Concrete Crushing and Recycling.

Environmental Assessment

Remediation Test Kits and Samplers.

Water Quality Meters, Kits, and Samplers.

Waste Characterization Test Kits and Samplers.

Gas Monitors for Safety & Site Evaluation.

Consumables.

Laboratory Equipment and Supplies.

Service and Technical Support Training.

Rentals.

In-situ Environmental Services Pioneer

Provides innovative solutions for the assessment, management, and remediation of impacted sites.

High-Resolution Site Characterization Services.

In-situ Remediation Services.

Water Treatment Systems Design and Manufacturing Services.

Remedial Option Assessment and Evaluation Services.

Indigenous Partnership on Vancouver Island

Thermal Treatment of Hydrocarbon Soils.

Impacted Soils.

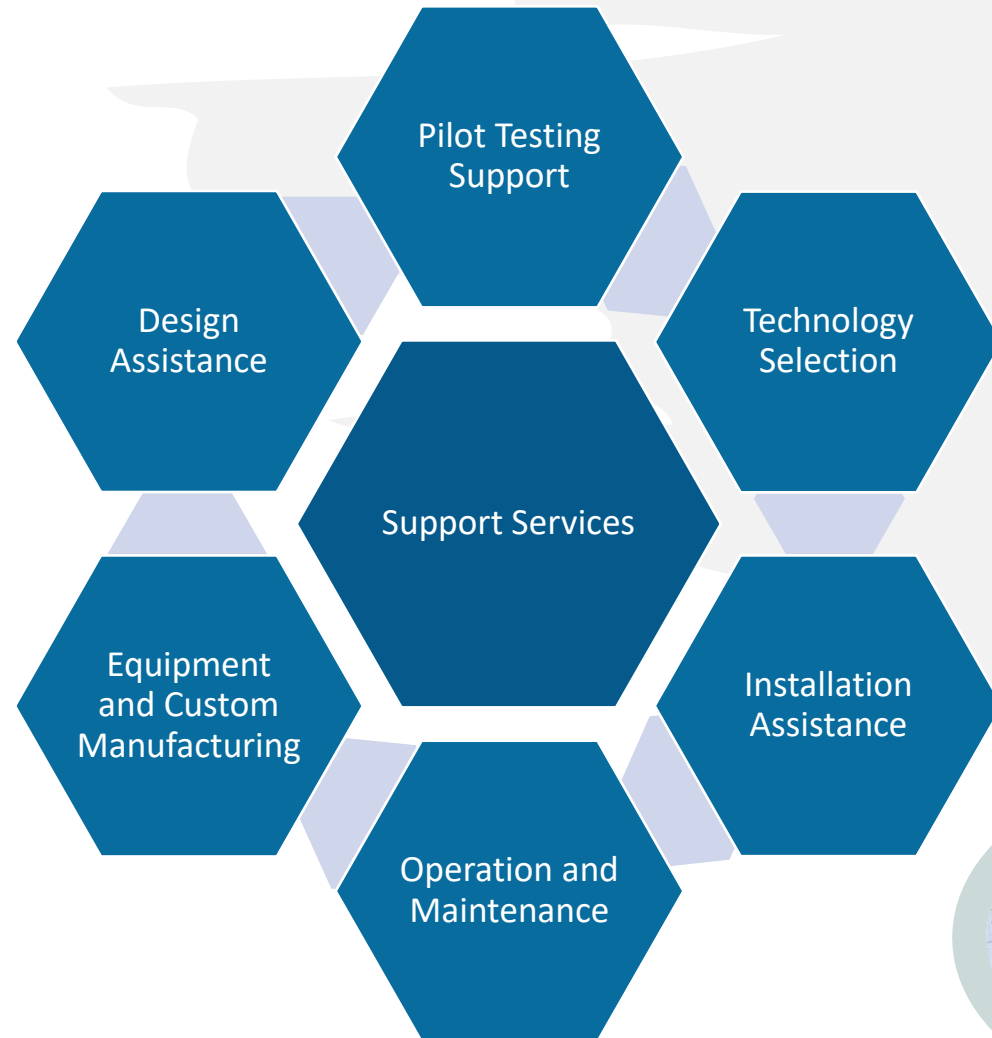
Landfill of Saline Impacted Soils.

Creosote and Clean Wood Disposal.

Water Treatment Services.

Soil Wash and Earthworks Services.

Support Services



Projects

SCG Remediation provides services in Canada, the US, and the Caribbean, and has completed over 1,200 successful projects.

This spirit will help the company and its team to continue to provide exceptional technologies and services to our clients over the years to come.



The PROJECT

Background

For over 50 years, wastewater coming from a pulp and paper mill contaminated Boat Harbour (A'Se'k), within the Pictou Landing First Nation's land, Nova Scotia.

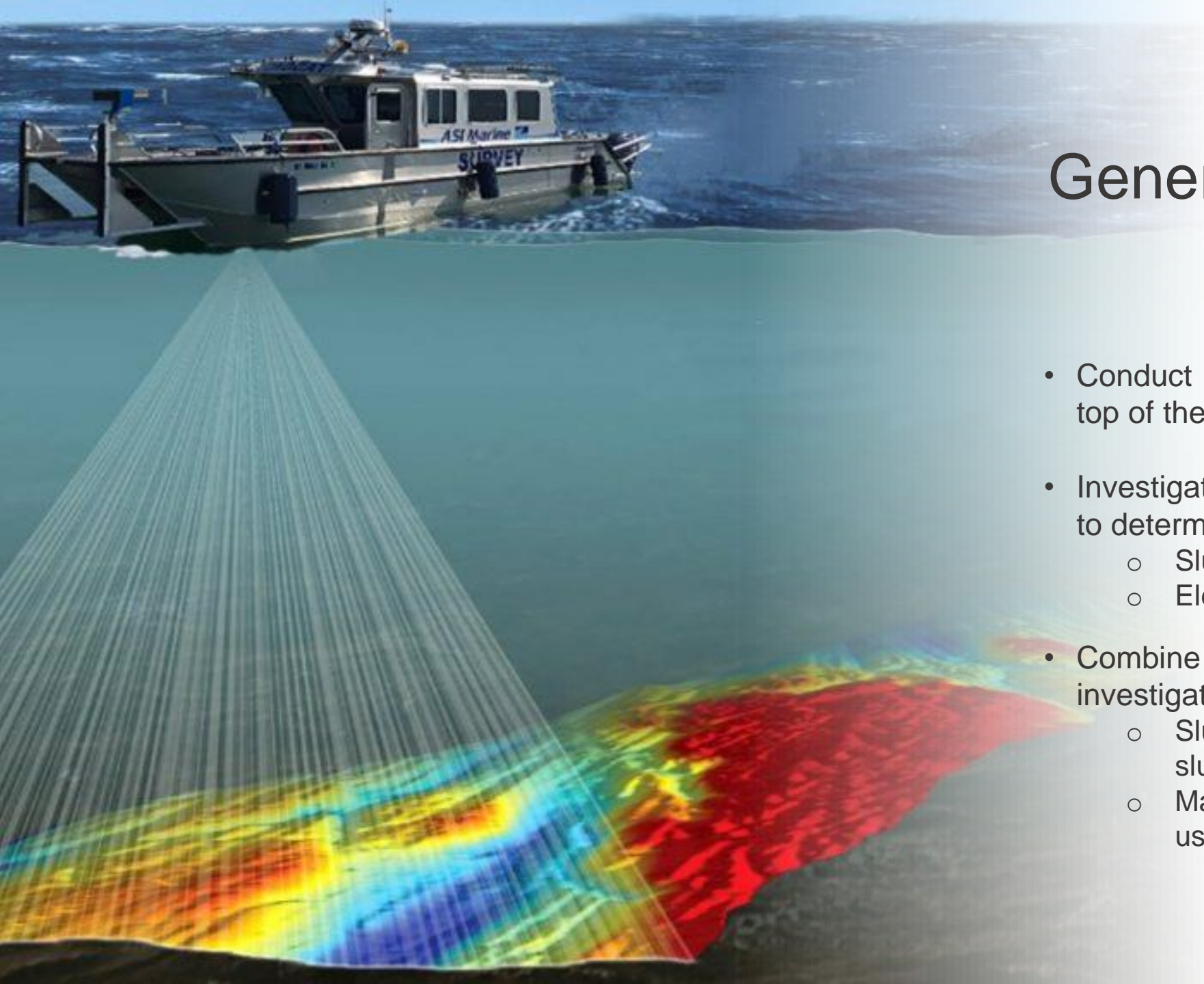


Remediation Planning

Information required to refine the Boat Harbour remedial design and planning phase:

- How much sludge will be removed from Boat Harbour?
- How thick is the sludge and where is it present?
- Where is the bottom of the sludge or contaminated sediment?





General Scope of Work

- Conduct a bathymetric survey to map the top of the sludge across Boat Harbour.
- Investigate sludge profiles at 500 + locations to determine:
 - Sludge thickness profiles.
 - Elevation of the bottom of sludge.
- Combine the top of the sludge map with the investigation points:
 - Sludge volume estimate to inform sludge containment design.
 - Map of the bottom of the sludge to be used for remedial design.

Project Team



GHD - Client's Consultant
• Technical advisory

WSP - Prime consultant
• Project management
• Bathymetry
• Data management and reporting



Build Nova Scotia - Client
(Formerly Nova Scotia Lands Inc.)
Project support
• Confirmation of process



Pictou Landing First Nation
• Project logistics support



SCG - Subconsultant
• Sludge measurements
• Barge construction and operation

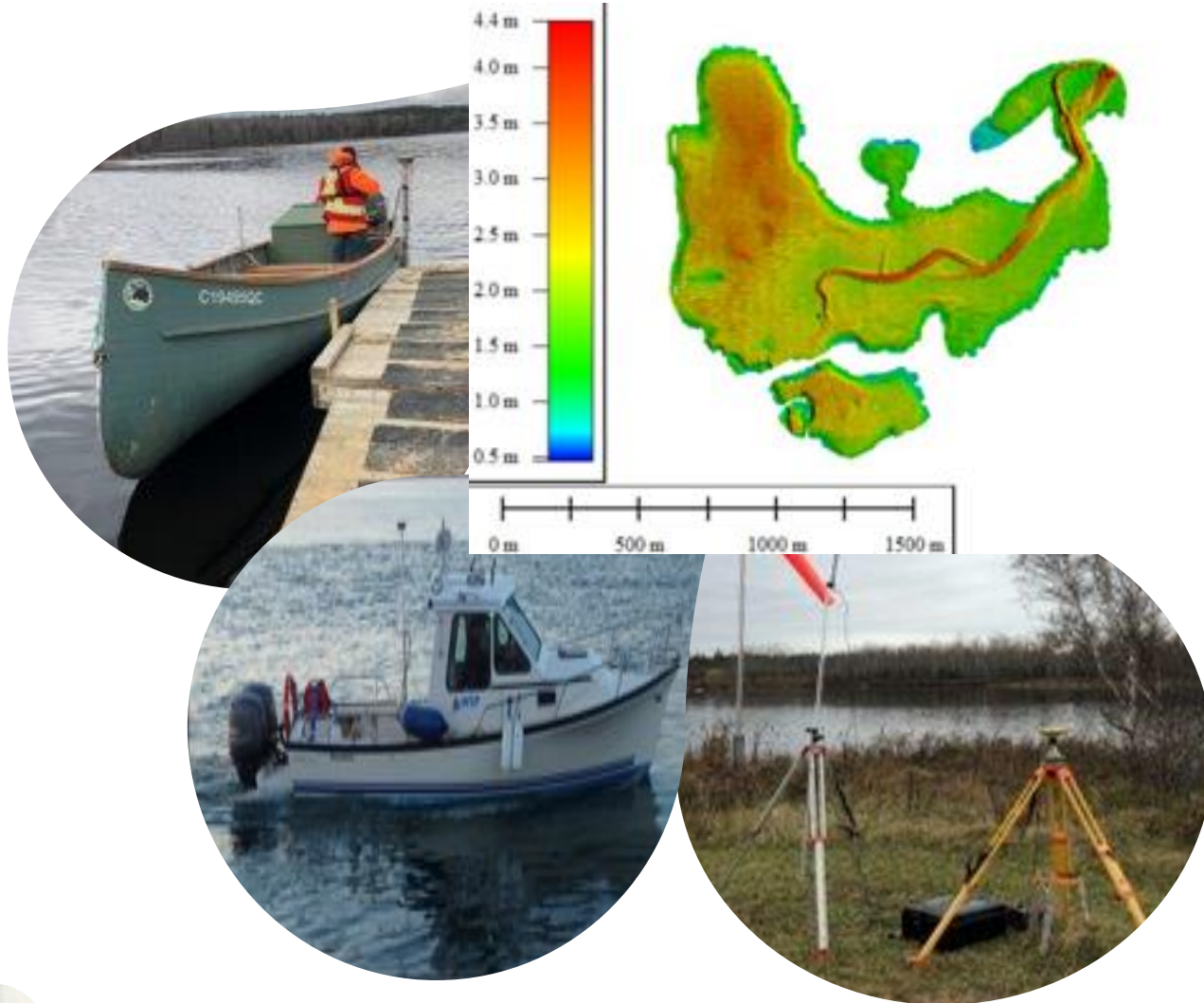


Barges & Project Health and Safety

- Dedicated boat operators.
- Cold weather suits.
- Dock installation.
- Site security.
- Weather monitoring.
- Equipment upgrades.
- Communications.
- Planning and teamwork.
- Improved design.

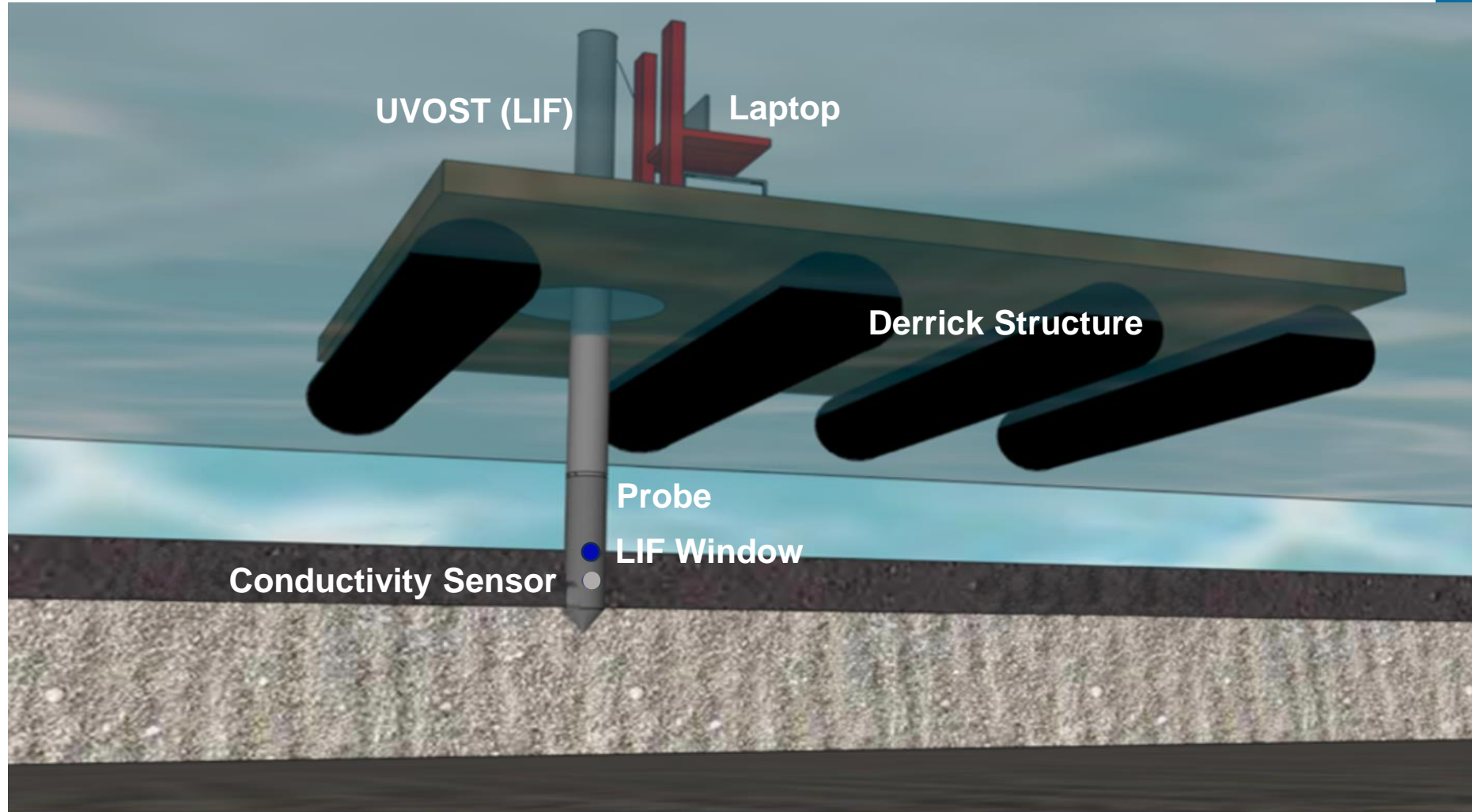


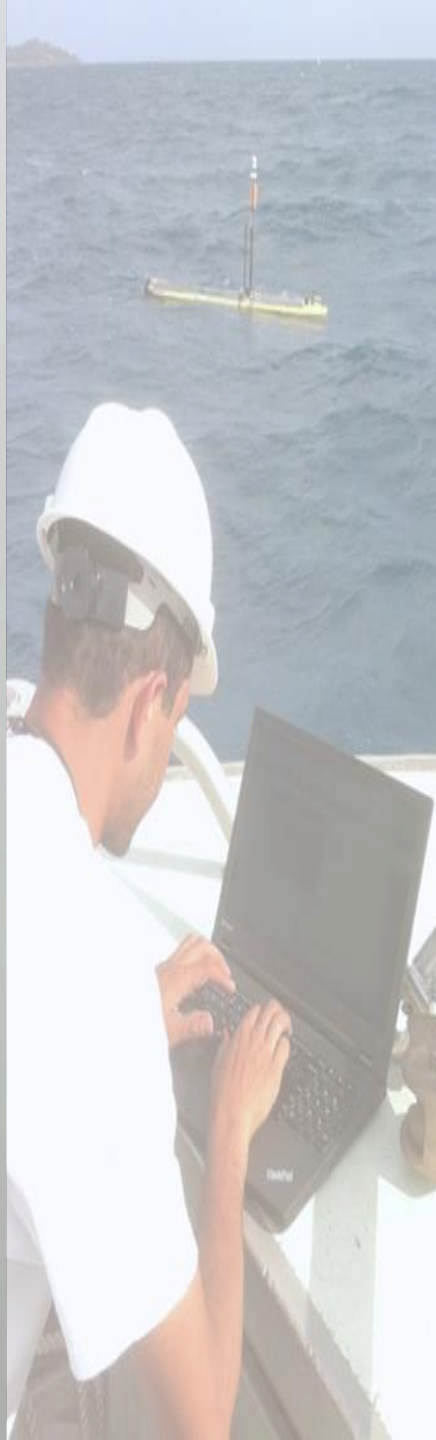
Bathymetric Survey



- Surveys to determine the depth of water.
- Single beam and multi-beam sonar.
- Connected to RTK survey equipment to provide elevations.
- Sonar depth measurements corrected to elevation.
- Used to produce a map of the bottom of the Harbour.

Sludge Thickness Measurements: LIF/EC

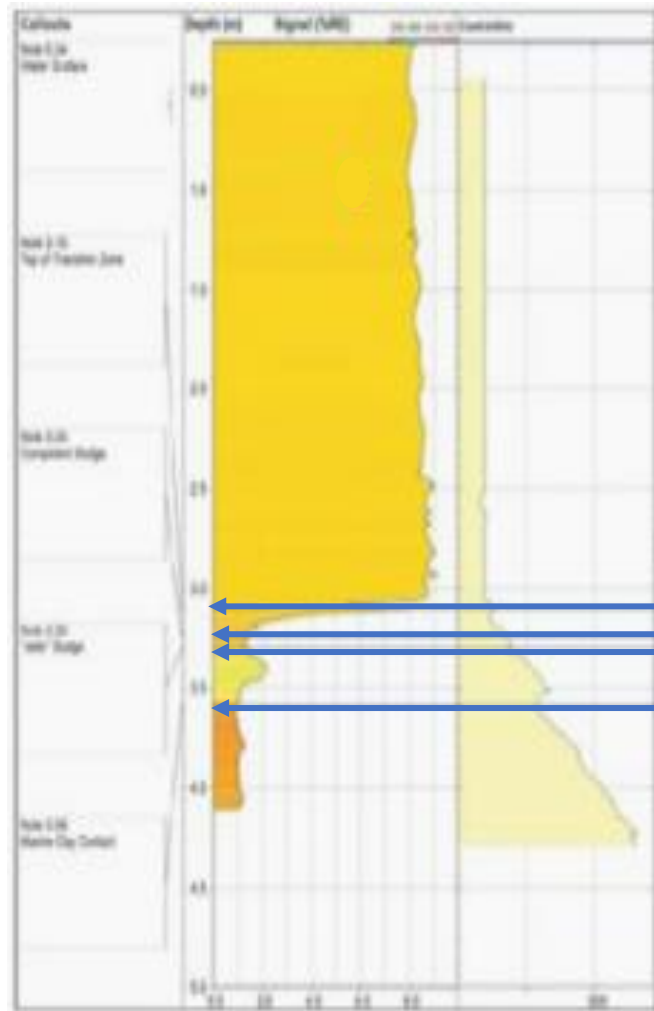




Data Collection

- Navigate to location.
- Secure the barge using pole anchors.
- Deploy LIF/EC.
- Survey benchmark on the barge.
- Verify data quality.
- Enter data into the database.
- Sync database to online tool.
- Digital and cloud-based data management.

Example of LIF/EC Log



Bathymetric Surface (SBES and MBES)
LIF/EC Top of Transition Zone
LIF/EC Top of Competent Sludge
LIF/EC Top of Compact Sludge
LIF/EC Top of Marine Clay

Water Surface

Top of Transition Zone

Top of Competent Sludge

Top of Compact Sludge

Top of Marine Clay



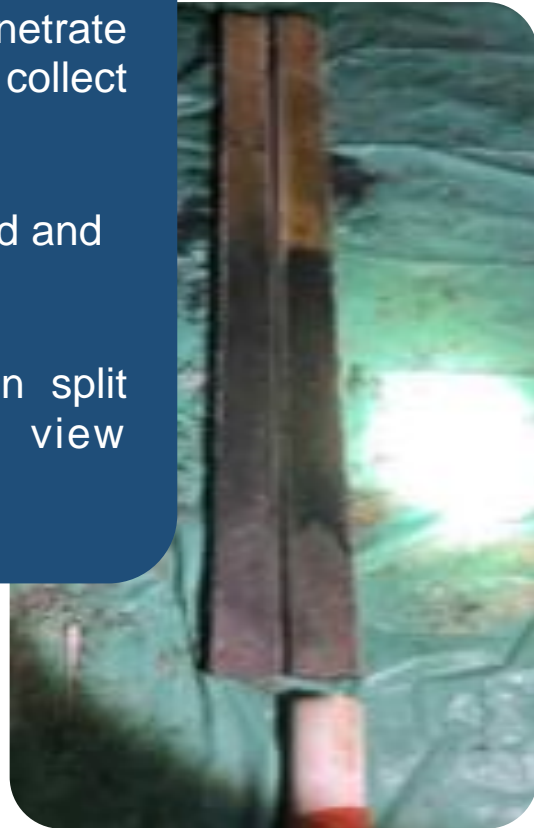
Sludge Thickness Measurements: Gravity & Percussion Coring

Percussion Cores:

Use of a slide hammer and core catcher to penetrate the sediment and collect samples.

Samples then drained and frozen.

Frozen samples then split lengthwise to view sediment interfaces.



Gravity Cores:

Use of a weighted core barrel and a suction trap to penetrate the sediment and collect samples.

Core samples extruded to visually examine structure and distribution of sediments.



Sludge Observations



Transitions Zone

- Increasing solids content with depth.
- Low degree of cohesiveness.
- Dynamic.
- Thickness: Non-detect – 1 m.



Competent Sludge

- Approximately ½ of the competent sludge layer.
- Cohesive gel or jelly-like material.
- Increase in thickness observed with increase in location depth.
- Thickness: Non-detect – >1 m.



Compact Sludge

- Uncertain if the properties of this layer are a result of historic differences in effluent or in-situ changes to sludge properties (natural organic material).



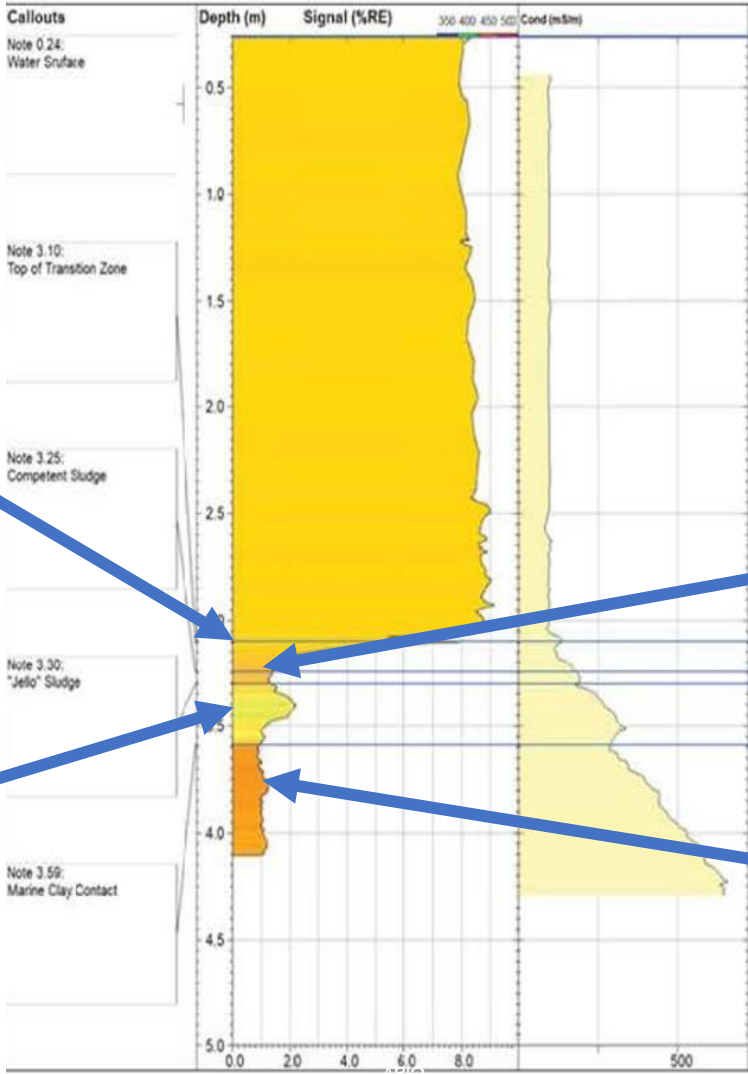
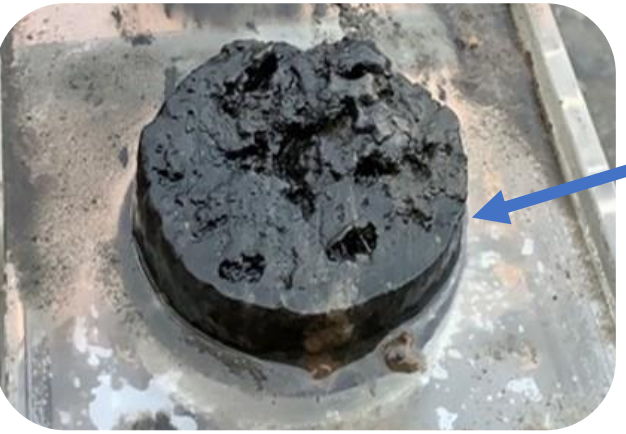
Marine Clay

- Native sediments of the Boat Harbour marine estuary.
- Holocene (post-last glaciation) marine deposits.

Sludge Observations



Transitions
n



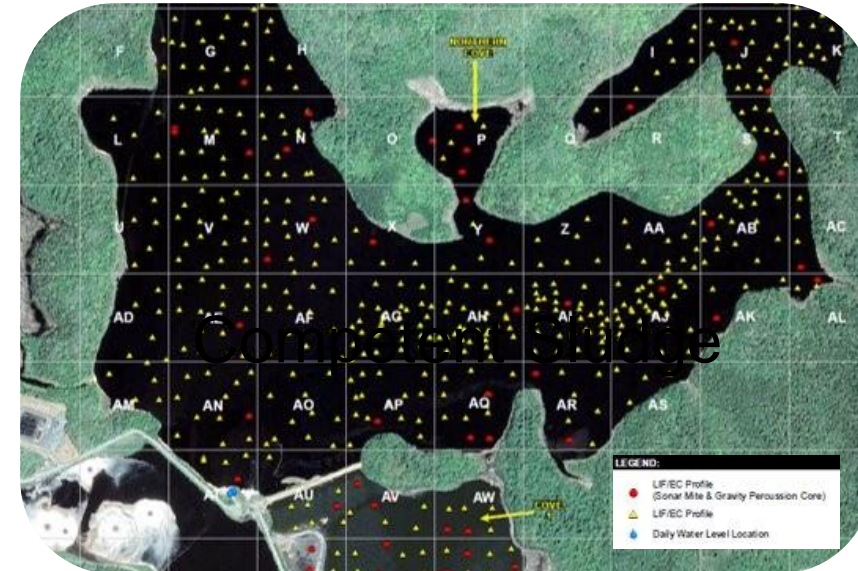
Data MANAGEMENT

The image features a solid dark blue background on the left. On the right, there is a vertical strip with a low-poly, faceted geometric pattern in various shades of blue, creating a 3D effect. The text 'Data MANAGEMENT' is centered horizontally across the middle of the image, with 'Data' in a lowercase sans-serif font and 'MANAGEMENT' in an uppercase sans-serif font, both in white.

Data Collection



The project area was subdivided into 200 x 200 m grids (A – AZ).



410 points placed initially.

90 points were added during the program to refine data understanding.



Data Entry & Quality Control Measures

LIF/EC Data Control

- Calibration checks
- Real-time profile monitoring
- Duplicate profiles
- Post Collection Processing
- Core sampling

Core Data Control

- Repeat cores collected
- Modified pulley system to reduce human error
- Extrusion completed in short intervals

Bathymetric Survey Data Control

- Calibration checks
- Testing of systemic errors
- Post field processing



RESULTS

Data Processing

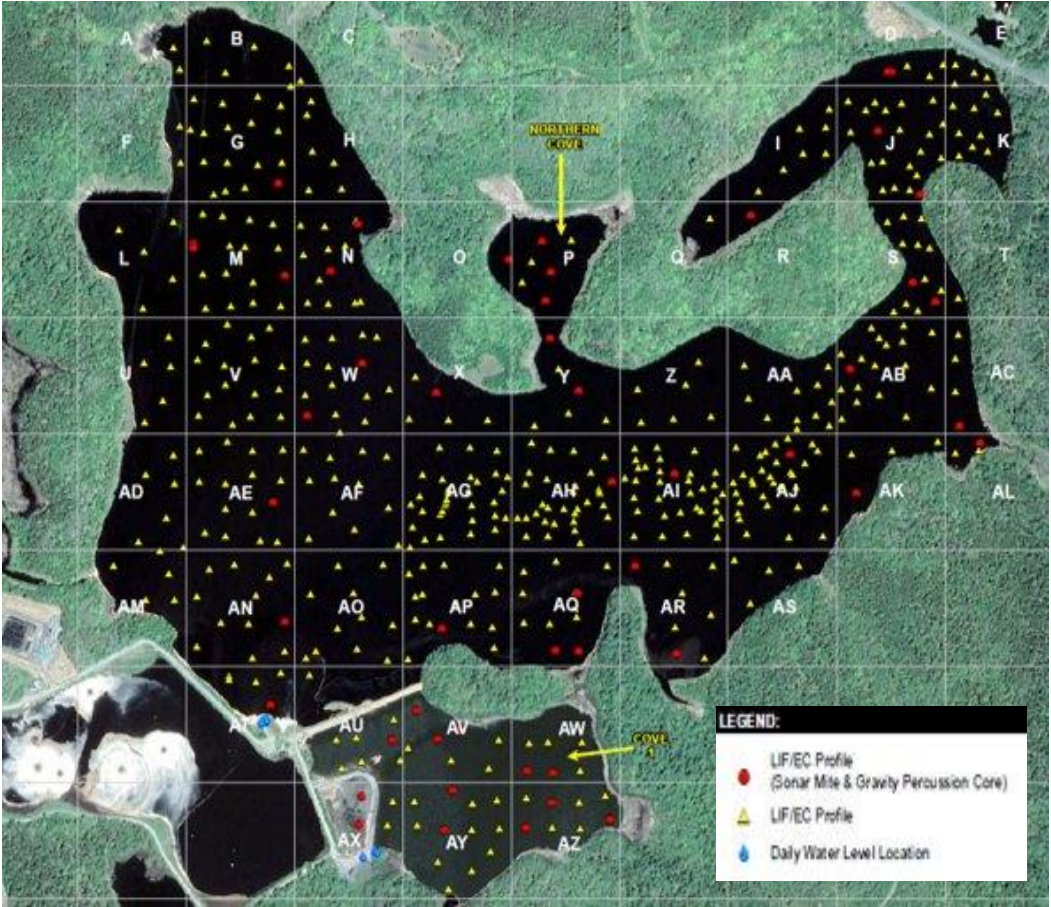
Bathymetric

- SBES & MBES data points combined.
- Data set subsampled for ease of processing.
- 1% of data points used for surface generation.

LIF/EC Data

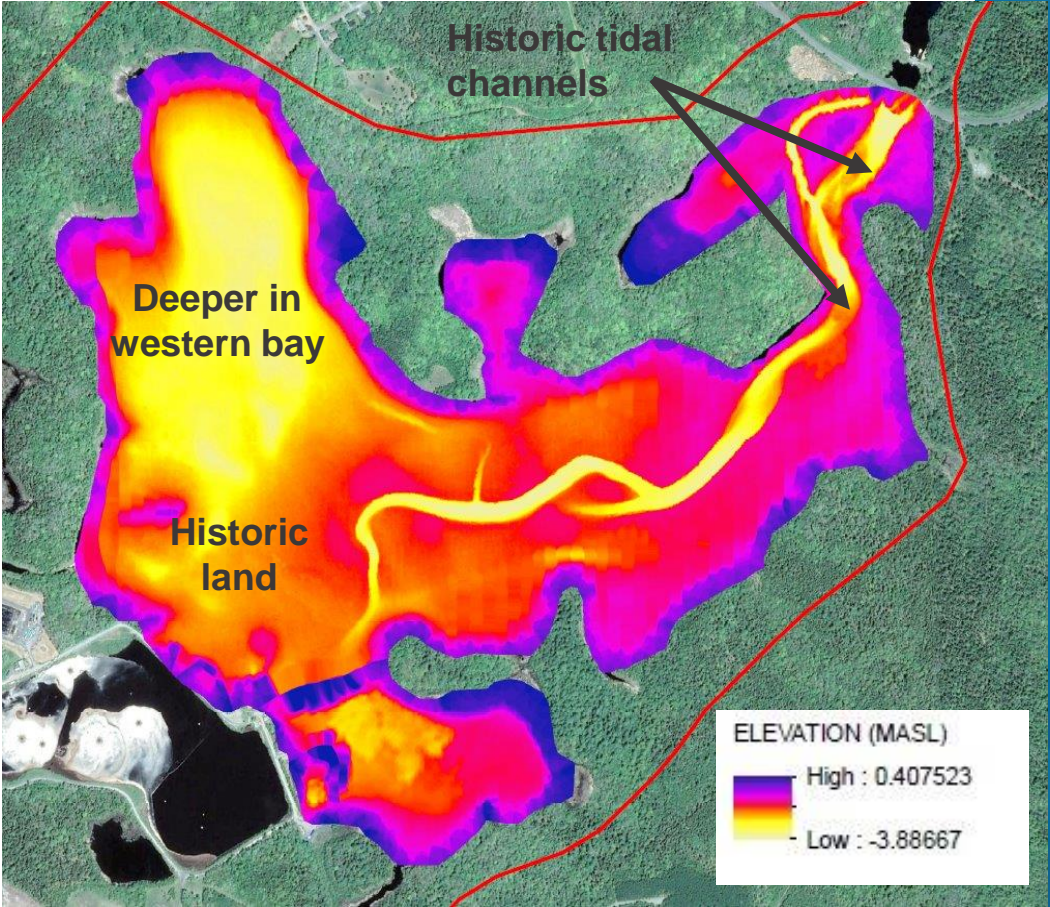
- Field interpretation of logs.
- Post-field interpretation of logs.
- Interface depths converted to elevations.
- Validation during the iterative surface generation.

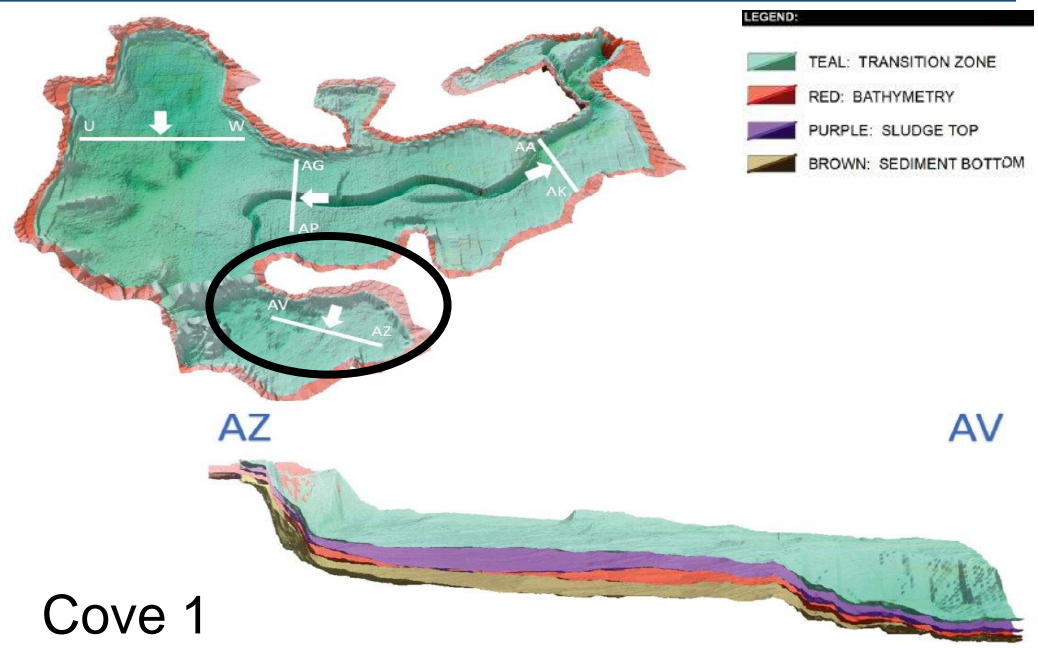
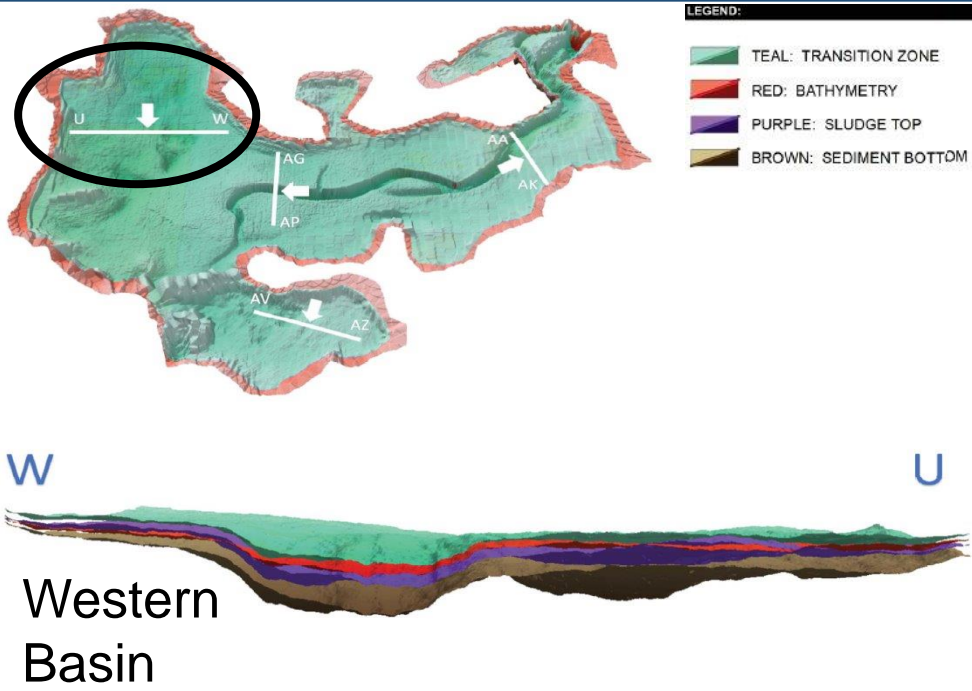
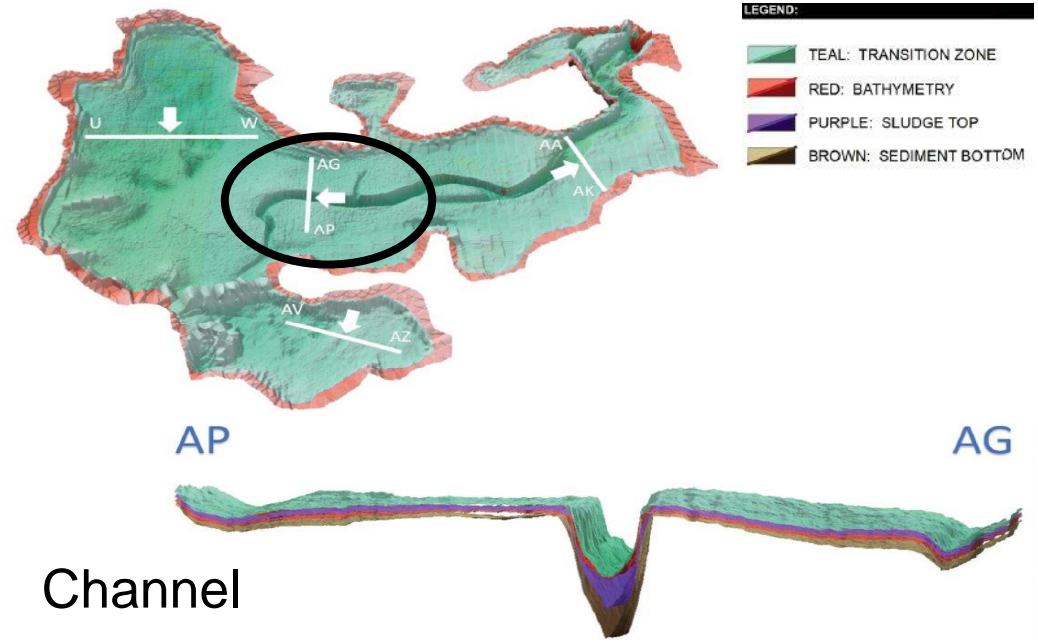
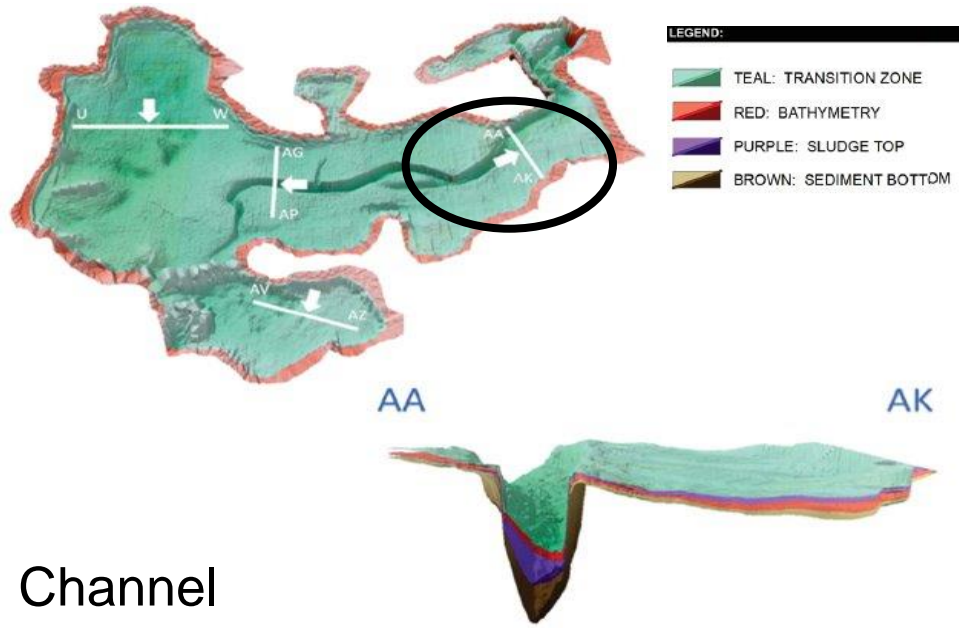
Sludge Thickness Data



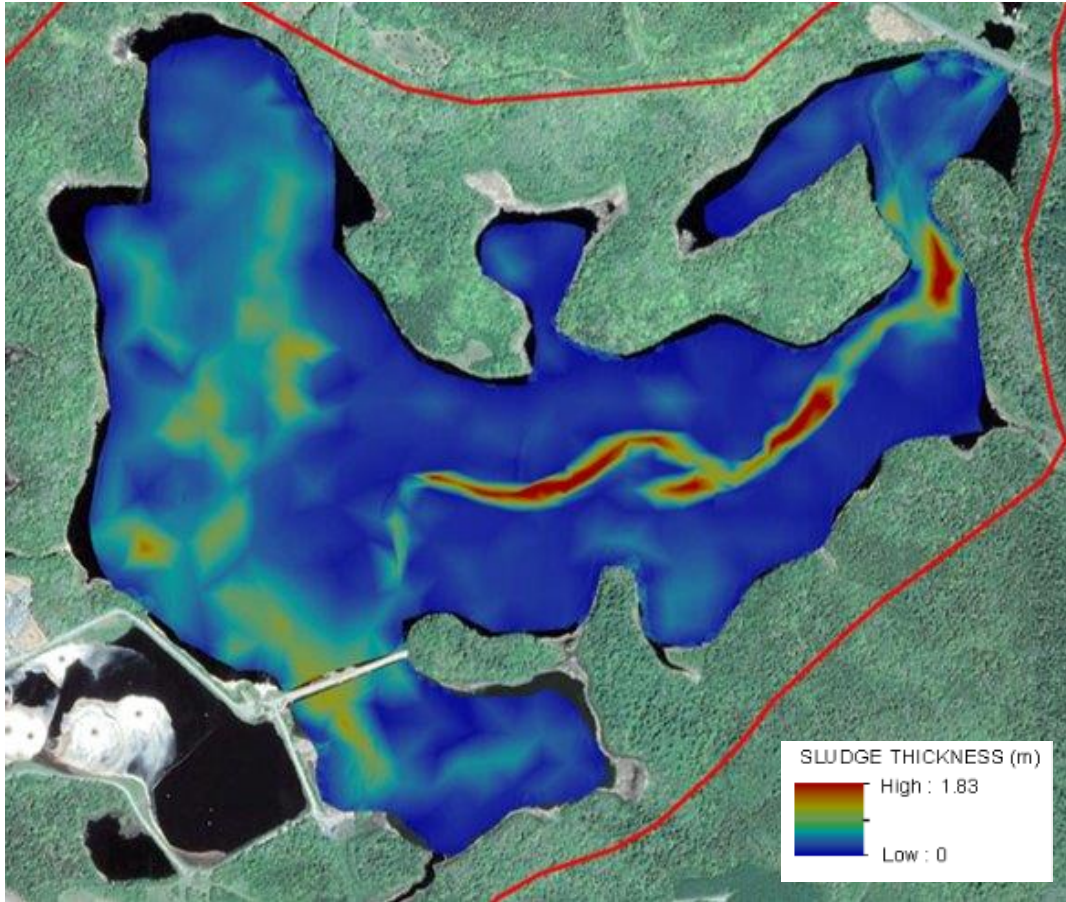
Convert sludge thickness profiles into surfaces and sludge volume estimates.

Bathymetric Surface



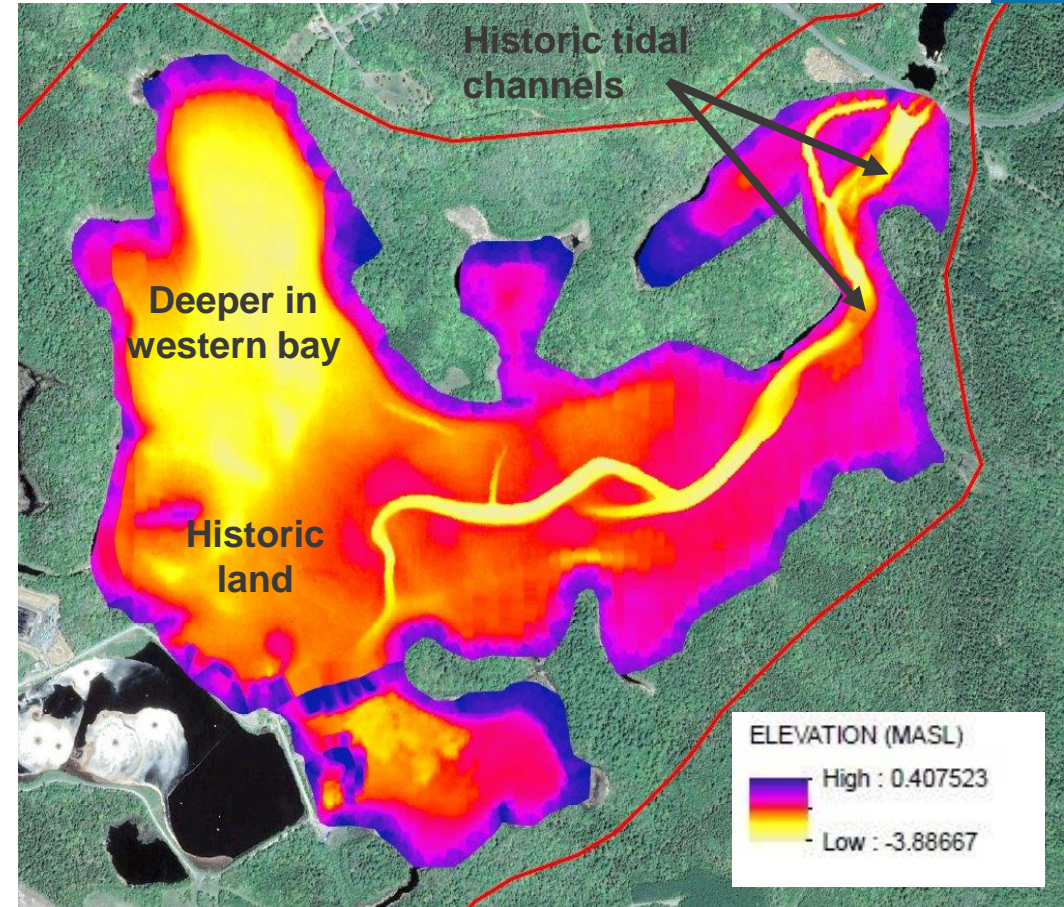


Sludge Thickness



Sludge is thickest in the channel and western basin.

Bathymetric Surface



Sludge volume estimates:

- Competent sludge: 271,000 m³
- Competent sludge plus transition zone: 400,500 m³

CONCLUSIONS

Summary



- Field program during early winter with up to 15 staff on-site daily.
- Collaborative team effort.
- LIF/EC is an effective tool for identifying sludge.
- Data collection:
 - 504 LIF/EC investigation points; 51 core samples.
 - Single beam and multibeam surveys.
 - All measurements surveyed to convert to elevations.
 - All collected data resulted in a greater understanding of contaminant dynamics.
- Data management.
 - Real-time upload of data.
 - Data validation and interpretation.
- Bottom of sludge surface defined for remedial design.
- Sludge volume estimates calculated on-site real-time.



Future Applications

Boat Harbour remediation:

- LIF/EC profiling after dredging to identify areas of sludge/sediment mixing and identifying 'hot spots' where sludge remains.
- Couple LIF/EC with chemical analyses to provide semi-quantitative interpretation.
- LIF/EC profiling following dredging to quantify the settling of suspended sediment.

Applications beyond Boat Harbour:

- Novel approach to sludge characterization and quantifying contaminated organic-rich sediments.
- Wastewater treatment systems (tailing pond applications).
- Ports and marine facilities.



Thank You



250 King William Road
Saint John, NB
E2M 5Y5, Canada
Ph: (506) 674-1081
Toll Free: (888) REMEDI8 (736-3348)
Cell: (506) 608-5165
Fax: (506) 674-1082

www.scgindustries.com

