Going Off the Deep End: Characterizing Deep Sediment in the Owen Sound Harbour Applying COA Framework and Risk Assessment Principles

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Overview

- Historical uses and location of the harbour
- Dillon’s approach to characterizing harbour sediments
- Challenges to assessing deeper sediments
- Characterization results
- Risk assessment and management outcomes
Owen Sound Harbour

- Long history of commercial and industrial use since mid-1800s
- Adjacent lands historically subject to a variety of activities:
  - rail yards
  - boat mooring and maintenance areas
  - bulk petroleum storage
  - grain and cement storage terminals
  - other industrial/commercial uses
Historical APEC

Current APEC

Commercial/Industrial Land Use

Primarily Residential Land Use
Owen Sound Harbour Today

- Mixed harbour uses (commercial, recreational)
- Winter berthing for *M.S. Chi-Cheemaun*
- Low water levels within inner harbour
- Potential for Harbour divestiture from Transport Canada
Dillon’s Involvement

- Dillon has completed numerous environmental site assessments of land immediately surrounding the harbour and sediment investigations
- Risk assessments completed on land lots and water lot
- Deep sediment sampling work expanded on existing data set
Deep Sediment Sampling Approach

• Near surface sediments chemically characterized previously by Dillon and others (2002 onwards)
• Deeper sediments were characterized to assist with identification of potential disposal options should future dredging be proposed in the context of site divestiture
• Assessment of deep sediment chemistry will help inform any future site management decisions
Focused on characterizing deeper sediment should it be uncovered in the future.

Deep sediment samples considered in terms of Step 7, Decision 6 of the COA Framework.

**Decision and process followed during this project**

Deep Sediment Sampling COA
Area B – Deep Sediment Sampling Locations

Area A – Deep Sediment Sampling Locations

Locations for sampling chosen based on historical surficial sediment chemistry data and sounding survey depths

<table>
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<tr>
<th>Sampling Depth</th>
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<td>0-1 m</td>
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<td>1-2 m</td>
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<td>2-3 m</td>
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Vibracore Sediment Sampling

- Vibracore system– view showing Power Head, Plastic Core-tube and Stabilizer (stabilizer not used in this study)
- Device deployed using winch and tripod from a pontoon boat equipped with a trap door

Image Source: VC-3.5.2 Vibracore System Operating & Maintenance Manual, Version 1.2
Vibracore Sediment Sampling
Deep Sediment Sample Processing

3 cores collected per sampling location

Cores cut to access sediment from targeted depth intervals

Sediment extruded from tubing

Sediment across same depth interval homogenized, samples collected
Vibracoring Technology Benefits

• Sediment samples collected from multiple discrete depth intervals at one sampling location
• Use of vibrational energy to rearrange sediment particles to achieve penetration can result in less sample disturbance (compared to sediment coring techniques that employ impact forces)
• Can be deployed from a small vessel relatively quickly
• Deployment from frozen water features in the winter
Owen Sound Sampling Program

- High sample volume required for project – collection of 3 sample cores/location (less sample volume = faster)
- Able to collect and process sediment samples from 35 locations (1-3 different depth intervals) in 7 days (minor poor weather delays)
- Achieved desired depth in 29/35 locations (max. depth 3 m)
Vibracoring Technology Constraints

• Important to understand sediment properties at your site before choosing vibracoring technology
• Difficulty penetrating dense, overconsolidated, and/or coarse grained sediment
• Differences between depth of penetration and length of core sample due to densification of sediments as they are collected in core-tube – important to measure both in field
Characterization Results

- Chemistry and toxicity samples submitted from deeper sediment that could be uncovered in the future – impact to benthic community
- Sediment quality in sampled locations impacted by metals and PAHs
- Results indicated exceedances of regulatory and/or criteria for a wide range of parameters for screened disposal options
Characterization Results

• One sample had chemical concentrations in excess of the PSQG SEL for PAHs (heavily contaminated)
• Area A revealed more sporadically impacted sediment than Area B
Identified potential for sediment within Area A to be re-used/disposed of on municipal land.

Sediment chemistry data screened against different criteria to evaluate the following theoretical disposal options:

- Municipal land
- Federal land
- Local quarry pit
- Re-use or recycling
- Soil washing treatment
- Confined disposal facility
- Licensed waste facility

Options requiring additional scientific and technical assessment

Chemistry Screening
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Acknowledgements

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For more information regarding use of vibracoring sediment sampling equipment please contact Tim Moran (Pollutech)