



A presentation for 2025 ESAA Remtech Conference

Estimating Brownfield Remediation Costs: How Much Data is Enough, and How Many Expert Opinions are Needed?

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File:



Outline

1. Introduction
2. Brownfield Defined and Discussion
3. Case Study Details
4. Approaches for Remediation Cost Estimating
5. Key Takeaways
6. Questions



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- Graduate of University of Waterloo – Civil/Environmental Engineering
- P.Eng. (Ontario, Alberta) and Consulting Engineer (Ontario)
- QP in Ontario
- Over 31 years experience in consulting
 - Site Assessment, Remediation, and Auditing
 - Excess Soil Management
- Industry Associations – ONEIA, QPCO, formerly CBN

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What is a Brownfield?

What is a Brownfield?

The Canadian Brownfields Network defines brownfields as "*abandoned, vacant, derelict or underutilized commercial or industrial property where past actions have resulted in actual or perceived contamination and where there is an active potential for redevelopment.*"

This definition was derived from the 2003 NRTEE.





Contamination

- The environmental quality of the brownfield site and the liabilities associated with remediation to ensure human health and the environment are safe in the redevelopment scenario are often challenges for the developer
- In some cases, the financial liabilities associated with managing the environmental quality can be greater than the value of the property. “upside down”
- Are there longer-term liabilities associated with managing the contamination with risk-based solutions?
- So how do you estimate the environmental liabilities? Accuracy can make-or-break the redevelopment deal. **How much data is needed and how many expert opinions are necessary?**



Case Study



Case Study Details



The Site

- Located in a prominent Western Canadian city
- ~3.5 hectares in downtown setting
- Long history of industrial uses, current parking
 - Rail lands and ancillary services
 - Trucking, warehousing
 - Some fueling, maintenance
- Soil depths to ~5.5 metres over bedrock
- Groundwater at ~ 3.5 metres

What is planned

- Redevelopment
 - Up to 6 levels of below grade parking
 - Retail/commercial on main floor
 - Up to 19 stories of residential



Case Study Details



The Situation

- Legal suit from client – very complex
 - Delays due to defendant activities
 - Environmental only a small portion of the lawsuit
- Defendant argued that the site was so contaminated, would never be redeveloped
- Defendant also argued that the remediation ahead of redevelopment would be many years
- Experts retained for both sides to comment on environmental conditions

Two Approaches

Data Review, Investigations

- Phase I ESA
- Review past investigation reports, remediation (1996 to 2003)
- First Detailed Investigation
 - 18 Boreholes, 79 soil samples
 - 10 groundwater samples
- Initial Remediation Cost Estimate
- Second Detailed Investigation
 - Added 14 Boreholes, 45 soil samples
 - 14 groundwater samples
- Second Remediation Cost Estimate

- Costs (\$250,000 est.) 18 months

Data Review, Predictive Model

- Phase I ESA
- Review past investigation reports, remediation (1996 to 2003) - doubts
- Predictive Model
 - Wide Range of Cost
- Provided Detailed Investigation Reports for review – critiqued
- Provided Remediation Cost Estimates for review – critiqued
- No adjustments based on real data

- Costs (\$25,000 est.) 3 months



Approach 1 – Actual Data

Soil and Groundwater Quality

- Investigate Areas of Potential Environmental Concern
 - Metals, PHCs, PAHs, VOCs
- Compare Analytical Results to Guidelines/Standards
- Delineate the Identified Impacts
 - Site contamination versus area wide impacts
- Quantify the Impacts, Soil = dimensions and depths, Groundwater = volume, depth, porosity, hyd. cond.

Determine the Costs Associated

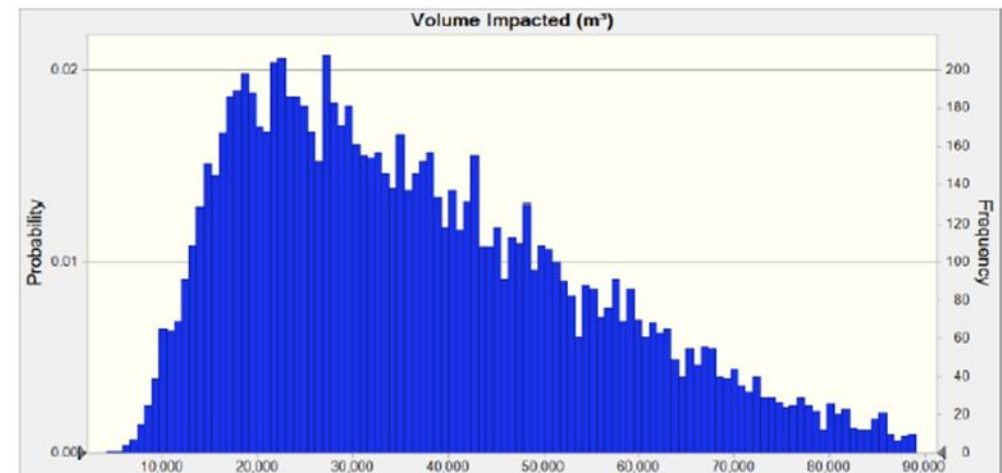
- Use Current Unit Rates (i.e., excavation, pumping)
- Quotations (treatment, transport, disposal)
- Savings and Apportioning for activities would be completed anyway – remediation only incremental
 - excavation/removal for soil, dewatering for groundwater



Approach 2 – Predictive Model

Monte Carlo Simulation

- Reportedly used due to variability in unknowns
- Probabilistic Computer Simulation
- Bound by the model inputs – no access to actual data but relies on other sites/projects
- Does not account for past remediation activities
- Uses typical statistical percentiles from population distribution (bell curve)



Results from Two Approaches

Data Review, Investigations

- Cost Estimate using actual data and volume calculations
- First Remediation Estimate
 - Soil = \$1.75M
 - Groundwater = \$1M
 - Total Estimate = \$2.75M
- Second Remediation Estimate
 - Soil = \$5.5M
 - Groundwater = \$350,000
 - Total Estimate = \$5.85M

excavation and dewatering are construction costs for development

Data Review, Predictive Model

- Range of Costs
- Low – 5th Percentile = \$4.5M
- High – 95th Percentile = \$36M
- Does not account for past remediation activities
- Does not account for construction costs for development



Key Takeaways

- Different Approaches can be used
 - Real data and unit rates, or
 - Predictive analysis
- Selected Approach can be tailored to serve the needs
 - Real Data and unit rates are costly – need property access
 - Predictive Analysis – lower cost to determine but no access is needed
- In this case, the Real Data is providing an accurate remedial cost estimate, where the predictive analysis is providing a wide range estimate
- The developer now has reliable cost estimate
- Predictive Analysis did not account for construction activities that result in savings
- Unfortunate when experts from sides of lawsuit are not using the same method - trying to discredit



QUESTIONS?

We're Here to Help.

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