Remedial and Treatment Techniques

Shibogama First Nations Council – Technical Services

Remediation: Common Approaches

Two general categories of remediation:

* **In-Situ** - remediation/management of contaminant in place.
* **Ex-Situ** – removal of contaminant and remediation/management at a different location.

Treatment Options

* In-Situ vs. Ex-situ depends on a number of technical and social and economic considerations including the following:
  * Type of soils (e.g. sand/clay/silt).
  * Depth of contamination.
  * Structures on or near the site.
  * Community Concerns.
  * Presence/absence of liquid phase hydrocarbons.

Common In-Situ Treatments

Common In-Situ Remediation Approaches

* **Bioremediation** – promote degradation of contaminant by stimulating naturally occurring micro-organisims.
* **Oxidation**- Using a chemical oxidant to breakdown contaminants.

In-Situ Treatment

* **Natural Attenuation** - relying on naturally occurring physical, chemical, and biological processes to reduce contaminate.
* **“Pump and Treat”** - Removal and treatment of contaminated groundwater (e.g. use of Granulated Activated Carbon filtration system)

In-Situ Remediation

Photo courtesy of True Grit Consulting Ltd.

Injection of Oxygen-Releasing Compound

Photo courtesy of True Grit Consulting Ltd.

In-Situ Treatment

* **Advantages**
  * Less-disruptive
  * Can be used around/ beneath structures and utilities
  * Can reach deep impact.

* **Disadvantages**
  * More difficult/takes longer to achieve remedial objectives
  * Less useful in low permeability soils (clays/silts).

Ex-Situ Remediation

* **Off-site disposal** – removal of contamination from site, and relocation to a licensed facility (e.g. landfill) for treatment.
* **Bioremediation** – relocation of contaminated material to a local treatment facility (Biocell), constructed for the purpose of treating impacted soil. Involves the promotion the growth of naturally occurring micro-organisms to promote degradation of contaminants.

Ex-Situ Remediation: Biocell

Ex-Situ Treatment Regime

* May include regular:
  * Addition of ORC's (Oxygen releasing compounds).
  * Addition of nutrients to encourage biological activity.
  * Manual "tilling" of soil with an excavator.
  * Regular soil and water testing to monitor progress.
  * Water treatment/removal.

Resource Requirement for Ex-Situ Remediation

* Heavy equipment
  * Bulldozer
  * Loader
  * Excavator
  * Haulage Trucks
* Local labourers/ equipment operators.
* Backfill (to replace excavated soil)

Ex-Situ Treatment

Advantages

* Immediate and confirmable achievement of remedial objectives at site.
* Risks of exposure to individuals is reduced.

Disadvantages

* Disruptive.
* Depth limited.
* May not complete groundwater remediation.
* Movement of contaminated soil to another location.

Ex-Situ Remediation

Photo courtesy of True Grit Consulting

Ex-Situ Remediation

Photo courtesy of True Grit Consulting

Site Restoration

Photo courtesy of True Grit Consulting Ltd.

Remediation

* It is common for a combined approach to be used (ex-situ and in-situ)
* For accessible soils, remedial excavation and ex-situ treatment is used for accessible soils.
* For inaccessible soils, In-Situ treatment is used.

Remediation Timelines

Ex-Situ (Biocell)

* 2-3 years.
* Treated soil used for landfill cover.

In-Situ

* 3-5 years.
* Treated soil left in place.

Thank You

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for assisting STS with information and images for this presentation.

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