Lessons Learned During Ex Situ Bioremediation at a Large Hydrocarbon Contaminated Site

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Introduction

Project was undertaken to support a sale of industrial property along the St. Lawrence River. The property was noted to have three (3) large areas totaling over 2.7 acres of contaminated silty clay soil at depths of up to 16' below ground surface (bgs).

Contaminants of concern included petroleum hydrocarbons (PHCs) fractions 1-4, benzene, toluene, ethylbenzene, and xylene (BTEX), and polycyclic aromatic hydrocarbons (PAHs). Non-Aqueous Phase Liquid (NAPL) was present in some areas, typically within higher permeability seams within the native silty clay soil.

The objective was to support a sale of property agreement which stipulated the vendor clean the site to the applicable criteria.

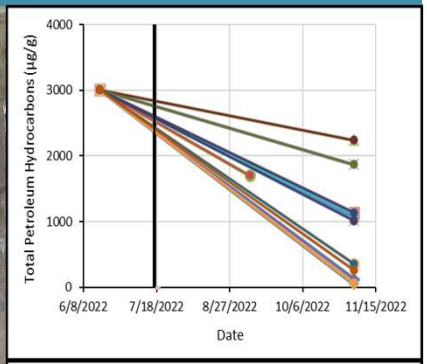
Excavation

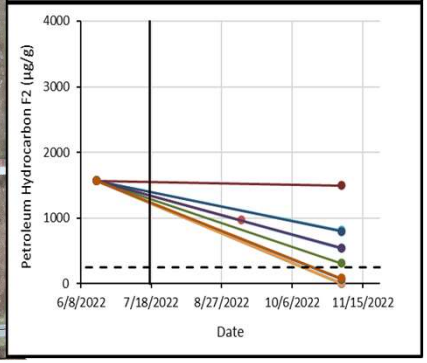
- 111,854 US tons of contaminated soil excavated
- Depth of excavation ranged from 1.5-5 m, on average 2.5 m deep
- Soil placed into 63 biopiles, totalling 5,271 m in length
- Excavations backfill seeded with calcium peroxide and injection galleries installed

Biopile Treatment

- Application of Biomix (surfactant, nutrients, bacteria)
- Biopiles sprayed in phases as built
- Many biopiles installed over backfilled excavation areas

Results to Date





Conclusions

- Excavation & Sampling Ongoing
- ~80% Reduction of TPH in 4 Months
- Low PHC F2 Criteria Drives Remedial Closure
- High Clay Content + Tall Piles = Slower Biodegradation Rate
- Logistical Planning is Key