

**CASE STUDY****BTEX AND PHC  
REMEDIATION IN  
SILTY SAND USING  
LIQUID ACTIVATED  
CARBON (LAC)****Background****CLIENT:** Commercial**DURATION:** 1 Week**LOCATION:** Whitby, Ontario

In the town of Whitby, on Lake Ontario, the site of a former retail gas station, located in a residential area, required remediation to prepare the property for sale and redevelopment. The site's heterogeneous geology, with high hydraulic conductivity zones within lower hydraulic conductivity zones, created a challenging remedial situation. The client desired an expedient solution to enable them to sell the property.

**Approach**

The landowner hired an environmental consultant who characterized the site and determined that the soil and groundwater was impacted with petroleum hydrocarbons, including benzene, toluene, ethylbenzene, and xylenes, along with the F1 and F2 PHC fractions. The landowner retained an environmental contractor to remove the source of the impacts, along with the residual impacts in the soil and groundwater. The contractor removed the majority of impacts, but was not able to remediate the site to the applicable regulatory standards. The landowner tendered the remaining clean-up to multiple contractors; IRSL earned the contract based on their approach and cost.

**DIRECT PUSH TECHNOLOGY (DPT)  
WITH ADSORPTION AND AEROBIC  
BIOREMEDIATION**

To treat the remaining dissolved phase impacts, IRSL designed a Direct Push Technology (DPT) program that used adsorption and aerobic bioremediation to address the impacts.

## ANALYSIS

To develop an optimal injection design, IRSL used their proprietary analytical model, which incorporated observed contaminant concentrations, groundwater flow rates, reaction rates, temperature and inorganic parameters, within the subsurface. Through this process, they discovered the required mass and injection pattern that led to the successful remediation of the remaining impacts.

## CONSTRUCTION

Based on their analysis, IRSL created and implemented a design that covered the groundwater plume while minimizing the possibility of rebound and back flow from other potential sources.

**Direct Push Technology:** To remediate the contamination in the silty sand, they used Direct Push Technology at various depths and intervals to create a reactive zone.

## TREATMENT

IRSL injected a mixture of **PlumeStop®** liquid activated carbon and **Oxygen-Releasing Material (ORM)** in the silty sand aquifer to remediate the residual BTEX and PHC F1 and F2 groundwater impacts. The ORM stimulated the native aerobic bacteria, whereas the PlumeStop™ allowed for the adsorption of the PHCs from the groundwater. This combination effectively reduced the PHCs within the groundwater to below the regulatory limits. It also created a geochemical environment that enhanced biological degradation reactions that resulted in the re-generation of the activated carbon itself.



**GEOLOGY:** Silty Sand

**PLUME SIZE:** Approx. 200 m<sup>2</sup>

## Monitoring

An independent consultant monitored the process and conducted a rigorous Quality Assurance–Quality Control program throughout the project. Subsequent monitoring of the groundwater quality by the independent consultant confirmed that the remedial goals had been reached within the target time frame and budget.

## Challenges

- The very short desired remedial time frame required a quick design and implementation.
- The heterogeneous geology, with high hydraulic conductivity zones within lower hydraulic conductivity zones, created a very complicated remedial situation with geological and hydrogeological unknowns that required a robust remedial design.

## Results

- The BTEX and PHC plumes were treated to below the applicable regulatory standards and have remained below.
- The remedial program was executed with one injection in two days with the first clean samples being obtained within three weeks of the injection.



InSitu Remediation Services Ltd. (IRSL) is one of Canada's most experienced remediation companies. Our team has designed, implemented, and optimized, soil and groundwater remediation programs in diverse geological environments in North, Central, and South America, Asia, Europe, and the Middle East.

We confidently implement innovative solutions, based on sound knowledge, using seasoned field staff. Our pragmatic, flexible approach reduces effort, cost to our clients, and environmental risk.

**For more information,  
contact:**

**InSitu Remediation Services Limited**  
St. George, Ontario, Canada

T: 289.208.8832  
E: [info@irsl.ca](mailto:info@irsl.ca)

**IRSL.CA**