

CASE STUDY

BTEX, PHC F1 & F2 SOURCE ZONE REMEDIATION WITH SOIL VAPOUR EXTRACTION



Background

CLIENT: National Retailer

DURATION: Ongoing, 3 Years

LOCATION: Barrie Ontario

PROJECT VALUE: \$255,000 CDN

At an active gas bar on a high-profile, busy commercial site in a populated urban area, petroleum hydrocarbon impacts, in the form of BTEX (Benzene, Toluene, Ethylbenzene, and Xylenes) and PHC (Petroleum Hydrocarbons) F1 & F2 compounds were discovered in the unsaturated zone beneath and near underground storage tanks. The busy location, combined with the thick vadose zone, created a challenging remediation environment.

Approach

The operator, a large national retailer, contracted IRSL directly to complete initial pilot testing and recommend a remedial solution. IRSL then earned the project based on their superior design, which incorporated numerical modeling, and a detailed analysis of the distribution of the compounds of concern within the vadose zone of the source area.

SOIL VAPOUR EXTRACTION

To control and reduce the mass of BTEX and PHC F1 & F2 impacts within the vadose zone, IRSL designed, implemented, maintained, and continuously optimized, a soil vapour extraction system. The extracted vapours were then destroyed using an electric Catalytic Oxidizer, which was monitored on a continual basis to ensure no fugitive emissions were released.

GEOLOGY: Sand

PLUME SIZE: Approx. 12,000 m³

INITIAL TESTING

IRSL developed a site-specific numerical model to aid in evaluating the distribution of the compounds of concern within the vadose zone. Through the process, they explored various design parameters, such as screen placement, screen lengths, screen diameters, and extraction rates, to determine the best system as well as estimate the remedial timeframe, and set project milestones.

APPLIED TECHNOLOGIES

To target the volatile components within the 20 m thick vadose zone, IRSL installed, operated, and optimized a network of 44 Soil Vapour Extraction (SVE) wells at various depths and connected the extraction wells to an automated specialized vacuum system. The above-ground system covered a footprint of less 10 m² and consisted entirely of explosion-proof components. The system was also enhanced with sound proofing to reduce the noise signature.

TREATMENT PROCESS

The petroleum hydrocarbon vapour was then treated using an electric Catalytic Oxidizer, which reduced the concentration of petroleum hydrocarbons by greater than 99.99% prior to discharge into the environment.

MONITORING & OPTIMIZATION

The installed system enabled remote monitoring and adjustments. Based on monitoring results provided by an independent consultant, IRSL customized vacuum and flow rates to individual SVE wells on a bi-weekly basis.

Various fail-safe monitoring networks and devices ensured that the vapours did not migrate into the atmosphere and/or basements of nearby buildings.

Challenges

- Operation at the high-profile commercial site required continuous collaboration with the facility's staff to minimize disruption.
- Preventing migration of vapours into the atmosphere and/or basements of nearby buildings required incorporating various fail-safe monitoring networks and devices.
- Heterogeneity within the vadose zone required using a suite of short-screened extraction wells placed at target intervals.

Results

- Within two months of operation, the LNAPL was eliminated.
- Within one year of operation, petroleum hydrocarbon concentrations had decreased 69% on average and mass balance calculations indicated that over 2,800 kg of PHCs had been recovered by the system.
- Operational run time exceeded 96%.



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.

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