REMEDIATION OF A SUBSURFACE HYDROCARBON PLUME AT A MANUFACTURING FACILITY IN ALBERTA USING A VACUUM ENHANCED RECOVERY SYSTEM

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Geological and Hydrogeological Setting
Nature and Extent of Hydrocarbon Impacts

- Soil Plume (5,600 m²)
- Groundwater Plume (5,600 m²)
- Product Plume (2,300 m²)
Remedial Objective

Remedial Goal - AENV 2001 Risk Management Guidelines for Petroleum Storage Tank Sites, commercial land-use and fine-grained soil.

Off-Site impacts - reduce all off-site environmental liability by January 2003.

On-Site impacts - contain the impacts on site and remediate the Site within a 3 to 5 year time frame.
Remedial Action Plan

The selected remedial action plan consisted of:

1. Excavation and disposal of impacts on the municipal road and adjacent commercial property

2. Installation and operation of a vacuum enhanced recovery and treatment system on the site.
Off Site Remedial activities began in October 2002 and excavation work was completed in December 2002.

A total of approximately 2,600 tonnes of impacted soil was excavated and transported off site.
Off Site Remediation

Excavation next to commercial building was conducted in a series of slots that were then backfilled with fillcrete.
Excavation in the road involved reconstruction of sanitary and storm sewers and a water line.
Remedial approach was effective in removing off site liability by 2003.

Post excavation sampling was conducted in May 2003 and all groundwater concentrations were below the applicable guidelines.
On Site Remediation

A VER pilot study was conducted in August 2002.

Results:
- 6 m radius of influence;
- opt. vacuum of 10” Hg;
- airflow rate ~36 scfm;
and
- water pumping rate ~2.0 L/min.
On Site Remediation

- Site preparation included installing 47 new wells;
- Recovery wells were standard 2” diameter monitoring wells completed to depths ranging from 5.8 to 6.8 m.
- Recovery well heads were installed on new wells and 16 existing wells.
On Site Remediation

Winterized Recovery Lines

#1
#2
#3
#4
#5
#6
#7
On Site Remediation

LEGEND
- Liquid
- Vapour
- Liquid and Vapour
- Sample Port
- Flow Direction

AIR COMPRESSOR

ISOLATION TANK

OIL/WATER SEPARATOR

TRANSFER PUMP

AIR STRIPPER

BAG FILTER

CARBON FILTER

SEWER DISCHARGE

CONTROL PANEL

INLET MANIFOLD

AIR/LIQUID SEPARATOR

10 HP LIQUID RING PUMP

CARBON TANK (EMPTY)

OXIDIZER

(COMBUSTION CHAMBER)

DISCHARGE TO ATMOSPHERE
On-Site Remediation
Operation of the VER system began in January 2003.

Results indicate that groundwater recovery flow rates have ranged from 0.1 to 5.0 L/min and a total of approximately 11,400 L of groundwater has been recovered over an operational period of about six months.

The average air flow recovery rate for each network is 500 scfm.
On-Site Results

Correlation Total BTEX (mg/m³) to PID Reading

PID Readings (ppm) vs. Total BTEX (mg/m³)
On-Site Results

Total Volume of Product = 2,600 L
On-Site Results

- Effluent water and ambient air concentrations indicated that the system is effectively treating recovered groundwater and vapours.
- VER system has removed approximately 2,600 L of product over 6 months.
- The system is effectively containing impacts on the Site.
Project Summary

- Off-site remedial approach was effective in removing off-site liability by 2003.
- VER system is effectively containing impacts on the site and recovering hydrocarbons.
- It is anticipated that the Site will be remediated within a 5 year time frame.
QUESTIONS ?