INTEGRATED REMEDIAL APPROACH AT A FORMER CHEMICAL BLENDING FACILITY: EXCAVATION, DUAL-PHASE EXTRACTION AND SITE-SPECIFIC RISK ASSESSMENT

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SITE DESCRIPTION

• Former chemical blending facility included laboratories, production area, storage tanks, drum storage, truck loading areas
• Facility built in 1975 for the production and testing of scale and corrosion inhibitors, demulsifiers, co-polymers, defoamers, surfactants
• Raw chemicals delivered in drums and final products sold in drums or bulk truck loads
Stratigraphy consists of:

- FILL
- SILT
- SILTY CLAY TILL
- SAND LENSES
- SILTY CLAY TILL
- BEDROCK
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Major contaminants of concern are xylenes, toluene, naphthalene, and acetone.
Over 200 additional compounds identified on and off site including MAHs, PAHs, ketones, alcohols and more.
• K in the range of $10^{-9}$ to $10^{-6}$ m/s
• Estimated range in lateral groundwater flow velocity 0.1 to 10 m/yr SSW
• Level loggers used to measure relative surface water elevation in canal
• Results show groundwater not discharging to canal
REMEDIATION STRATEGY

• Remove three USTs Sept. 2000
• Decommission all ASTs and piping Oct. 2000
• Biopile construction for Tank #3 excavation material
• Soil excavations July to October 2001
• 30 000 tonnes of soil disposed at landfill
• Dual phase system pilot testing March 2001
• Dual phase system initiation January 2002
• Operation Jan 2002 to August 2005

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EXCAVATION

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REMEDIATION SYSTEM

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**EXTRACTION RATE AND TOTAL VOLUME**

*Extraction Rate and Volume Product Extracted*

![Graph showing extraction rate vs. total volume from January 2002 to January 2005. The graph displays a steady increase in both extraction rate and total volume extracted over time.*

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*Data points indicating a rise in extraction rate and total volume extracted from January 2002 to January 2005.*

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*Graph from Aqua Terre, showcasing responsible, practical, innovative, and cost-effective environmental solutions.*
TOTAL BTEX AND NAPHTHALENE CONCENTRATIONS IN SOIL

Max. Xylene concentration
3179 mg/kg

Industrial Criteria
(CCME, 2002)
Naphthalene: 22 mg/kg
(AENV, 2001)
Benzene: 9 mg/kg
Toluene: 450 mg/kg
Ethylbenzene: 890 mg/kg
Total Xylenes: 1500 mg/kg
TOTAL BTEX CONCENTRATIONS IN GROUNDWATER

Max. MW-30 = 348 mg/L toluene

Multi-Phase Extraction System Started in January 2002

Concentration (mg/L)

Jan 00 Jan 01 Jan 02 Jan 03 Jan 04 Jan 05 Jan 06

MW-10 MW-11 MW-30 MW-32 MW-34

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F1 Concentration in Groundwater

Max. MW-11 = 293 mg/L

Tier III Criteria for Generic Building = 65 mg/L

AENV (2001) Fine-Grained Industrial Criteria = 24 mg/L

Multi-Phase Extraction System
Started in January 2002
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F2+F3 CONCENTRATION IN GROUNDWATER

Max. MW-34 = 870 mg/L
Max. MW-11 = 513 mg/L
Tier III = 50 mg/L
AENV = 18 mg/L
Multi-Phase Extraction System Started in January 2002
SUMMARY

• Assessment initiated April 2000
• Decommissioning and tank removal conducted Fall 2000
• North half of property remediated by excavation Fall 2001
• Dual phase system initiated January 2002
• Dual phase system effectively removed free-phase liquid hydrocarbons
• Significant reduction in dissolved phase concentrations noted
• Xylenes and naphthalene concentrations remain elevated in surface soils behind blend room

• Conventional assessment and remediation guidelines could not ensure protection of human health
• Risk Assessment/Tier III criteria development started in 2002