Remediation of a Former Sour Gas Plant in Central Alberta

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Remediation of a Former Sour Gas Plant in Central Alberta

Candice Berezan¹, Steve Taylor¹ ¹Biogenie S.R.D.C. Inc., Sherwood Park Office, Alberta



Site Remediation Solutions

History of the Site

- The site was a former sour gas plant owned by Acclaim Energy Trust Inc.
- It was operational from 1952 to 1988 processing sour gas from the Chevron D3-A pool and other area facilities.
- Plant was dismantled in 1988 in preparation for decommissioning.



History of the Site

- Several phase II site assessments were completed from 1996-2003 to delineate the contamination.
- BTEX and PHCs (F1-F4) were found to be present.
- Biogenie was commissioned in 2003 to complete the remediation of any remaining hydrocarbons in two areas: HC1 and HC2.



Supplementary Phase II Results

<u>HC1</u>

Soil with hydrocarbon contamination located between 1.8 and 6.6 m below ground surface and covering 3,150 m².

<u>HC2</u>

Impacted soil located between 4.8 and 8.4 m below ground surface covering 3,300 m².

Result: 27,000 m³ of contaminated soil.



Remedial Criteria Selection

Soil concentrations of BTEX and PHCs (F1-F4) were compared to the Alberta Tier 1 Hydrocarbon Guidelines (Alberta Soil and Water Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities).

Took into account the following five considerations:

- 1) Land use
- 2) Grain size
- Potential discharge of contaminated groundwater into an adjacent surface water body
- 4) Protection of potable groundwater
- 5) Protection of buildings with slab-on-grade construction



Summary of Selected Criteria

Parameter	Guideline ⁽¹⁾ mg/kg	Soil Classification	Exposure Pathway
Benzene	0.073	Fine	Ingestion of Potable Groundwater
Toluene	0.86	Fine	Ingestion of Potable Groundwater
Ethylbenzene	0.19	Fine	Ingestion of Potable Groundwater
Xylenes	25	Fine	Ingestion of Potable Groundwater
PHC F1 (C ₆ -C ₁₀)	660	Fine	Soil Contact (Plants and Invertebrates)
PHC F2 (C _{>10} -C ₁₆)	1,500	Fine	Soil Contact (Plants and Invertebrates)
PHC F3 (C _{>16} -C ₃₄)	2,500	Fine	Soil Contact (Plants and Invertebrates)
PHC F4 (C _{>34} –C ₅₀₊)	6,600	Fine	Soil Contact (Plants and Invertebrates)

⁽¹⁾ Alberta Soil and Water Quality Guidelines for Hydrocarbons at Upstream Oil and Gas Facilities (AENV, 2001). Industrial Criteria with Fine-Grained Soil.



Supplementary Phase II Results

Location	Sampling Date	Sampling Depth	Benzene	Toluene	Ethyl- benzene	Xylenes	PHC F1	PHC F2	PHC F3	PHC F4
HC1 07/29/03	2.4-3.0	4.0	1.9	3.4	11	170	3,900	14,000	3,500	
	2.4-3.0	9.5	2.6	8.8	27	250	4,800	16,000	4,400	
	3.6-4.2	5.7	11	7.4	22	410	6,600	21,000	4,700	
		7.2-7.8	<0.01	0.50	<0.01	0.04	<5	<5	<5	<5
		7.2-7.8	0.02	0.05	0.04	0.18	<5	<5	11	<5
	Criteria		0.073	0.86	0.19	25	660	1,500	2,500	6,600

* Results for one borehole within HC1 location.



Landfill

 Does not remediate soil, only transfers to long-term storage (liability remains). Large amounts of backfill required. 	Advantages
• Traffic concerns due to trucking involved (nearby residences with children, dust from transport, noise, etc.).	ediation.



<u>Windrow</u>

Disadvantages	Advantages
 Large amount of space required for soil treatment. Abundant soil handling. Excavation is open for long periods of time. Timeframe for remediation is 1 to 2 years, performance influenced by weather. Liner required for treatment area. Traffic concerns, trucking involved. 	Does not require disposal at a landfill.



Allu Bucket

Disadvantages	Advantages
 Abundant soil handling. Transfers contamination from one medium to another (soil to air). Danger of benzene inhalants to neighbours. Increasing concerns from Alberta regulators with regards to this application. Not effective for F3 and F4 hydrocarbon fractions. 	Short timeframe for site remediation.



In Situ Biopile

Disadvantages	Advantages
Timeframe for remediation longer than landfill option.	 Minimizes soil handling and traffic. No open excavations during remediation. Small work area required with minimal odours (benzene). Minimizes transfer of contaminants from one medium to another.













Final Sampling Locations

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Final Construction Layout

Final Construction Layout

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Soil Turning and Treatment Monitoring

Soil Temperature Profile

Treatment Monitoring

Treatment Monitoring

Treatment Monitoring

Soil Concentration of PHC (F3)

Soil Chemical Results - F3 Soil Treatment October 2003 - June 2005

Discussion and Conclusion

This project presented unique challenges:

- PHC (F3) concentrations over 8.5 times the regulatory guidelines. Depth of contamination ranged from 1.8 to 14 m below ground surface.
- Work area confined within an active plant site boundary.

Discussion and Conclusion

Understanding the site characteristics and limitations made the *in situ* Biopile the right solution for this project.

- Cost effective rate.
- Limited soil handling.
- Minimized site disruptions.
- Remediated contamination below applicable guidelines.

Discussion and Conclusion

A proven technology that Biogenie has extensive experience with, the *in situ* Biopile, successfully achieved the remedial objectives for the 27,000 m³ of hydrocarbon-impacted soil formerly present on this site.

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