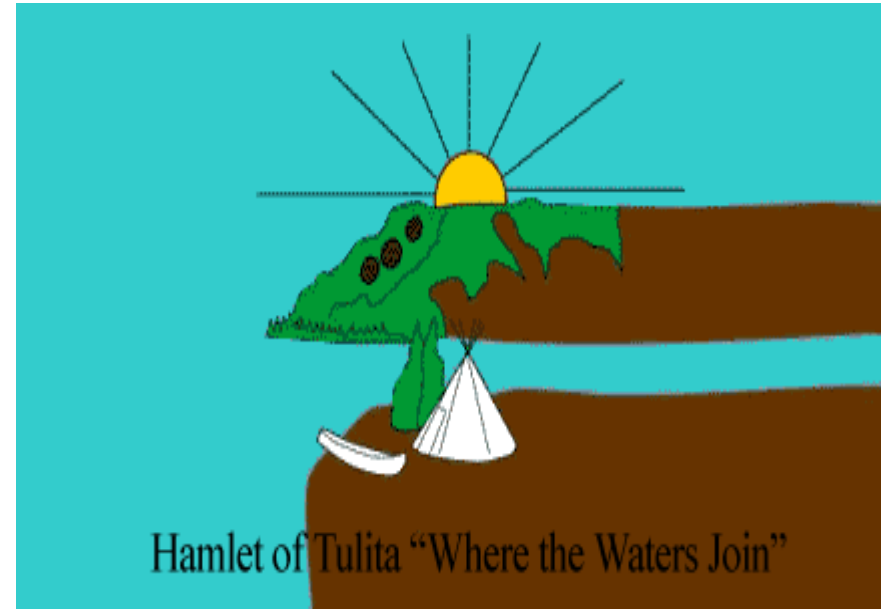


RemTech 2005 – Banff, Canada

Soil Remediation of a Former Power Plant Site in Tulita, Northwest Territories

Guillaume Bédard
Biogénie S.R.D.C. Inc.



Location of Tulita



Soil Remediation of a Former Power Plant Site in Tulita, Northwest Territories



Local Communities

- Population of approximately 400
- Slavey Indians of the Dene Nation
- Fairly important Metis Population
- Located within the Sahtu Settlement Area



Source: <http://museum.learnnet.nt.ca>

The Hamlet of Tulita



Challenges

- Former Power Generating Plant Located in the Center of Village
- Soils impacted with PHC from Operations and Accidental Spills
- Remote Location: Access by Plane and Barge
- Short Work Season



Site Conditions

- Average concentration: 12,500 mg/kg
- Presence of Contaminated Peat Material
- Estimated volume of 6,500 m³
- Average impacted depth was 2.0 m bgs



Cleanup Criteria

- PHC Fractions: F1 to F4
- Site and surroundings are Industrial/Commercial
- Groundwater Protection (not applicable)
- Material was defined as Fine-Grained
- Surface Soil Criteria for full depth

Table 1: Tier 1 Canada Wide Standards Levels for Surface Soil

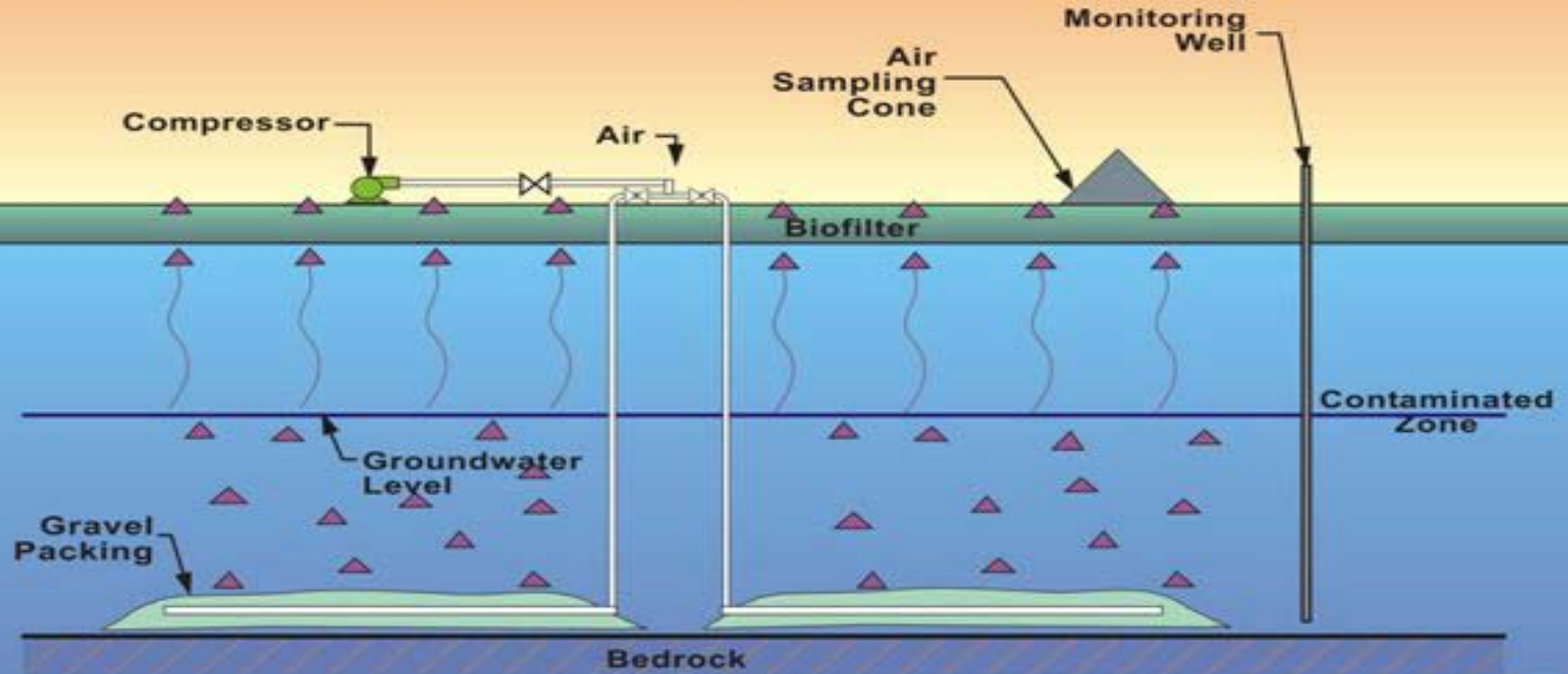
<u>Land Use</u>	<u>Soil Grain Size</u> μm	Fraction 1 $(\underline{C_6 - C_{10}})$ mg/kg	Fraction 2 $(\underline{>C_{10} - C_{16}})$ mg/kg	Fraction 3 $(\underline{>C_{16} - C_{34}})$ mg/kg	Fraction 4 $(\underline{>C_{34}})$ mg/kg
Industrial	< 75*	660	1,500	2,500	6,600

* Fine-grained as defined by the CCME



Proposed Technology

ON-SITE BIOTREATMENT



Selected Treatment Technology

- On-Site Biopile
 - Underground piping system
 - Wells covering entire depth of contamination
 - No Soil Transportation
 - Total Hydrocarbon Removal from 70 to 90%
 - Minimal Soil Handling



Treatment Set-Up

- Land Treatment Area divided in 12 Sub-Areas
- Each Sub-Area was 15m x 15m
- 1 Specific Sub-Area for Peat Layer
- Sub-Areas used as management units during entire process



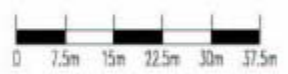
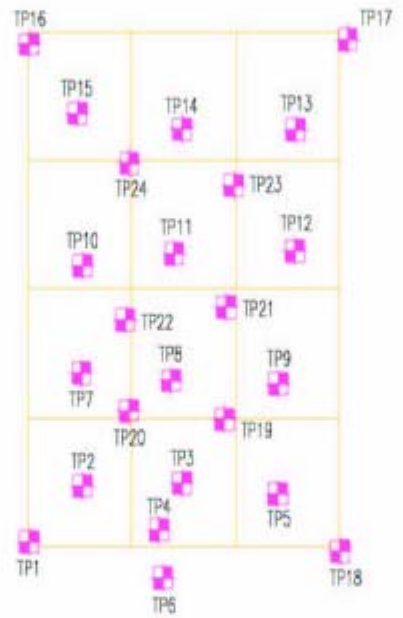
- Test Pit
- Electrical Pole
- Parcel



N/S RANGE ROAD

E/W TOWNSHIP ROAD

1000M
GILMORE SURVEYS (ARTIC) DATUM
1000E



2	FOR APPROVAL	00-07-21	A.S.	F.
NO.	VERSION	DATE	BY	APP.



Biogénie SITE REMEDIATION SERVICES
281 Forest Street, Suite 100, (Corner), Oshawa (17th Ave)
Phone: (416) 663-4422 Fax: (416) 663-3583

DATE	10/01/04	SCALE	1:750	REV	00-07-04
DATE	10/01/04	SCALE	1:750	REV	00-07-04
DATE	10/01/04	SCALE	1:750	REV	00-07-04
DATE	10/01/04	SCALE	1:750	REV	00-07-04

Actual Treatment Efficiency

Table 2: Average Land Treatment Area Concentration of PHC

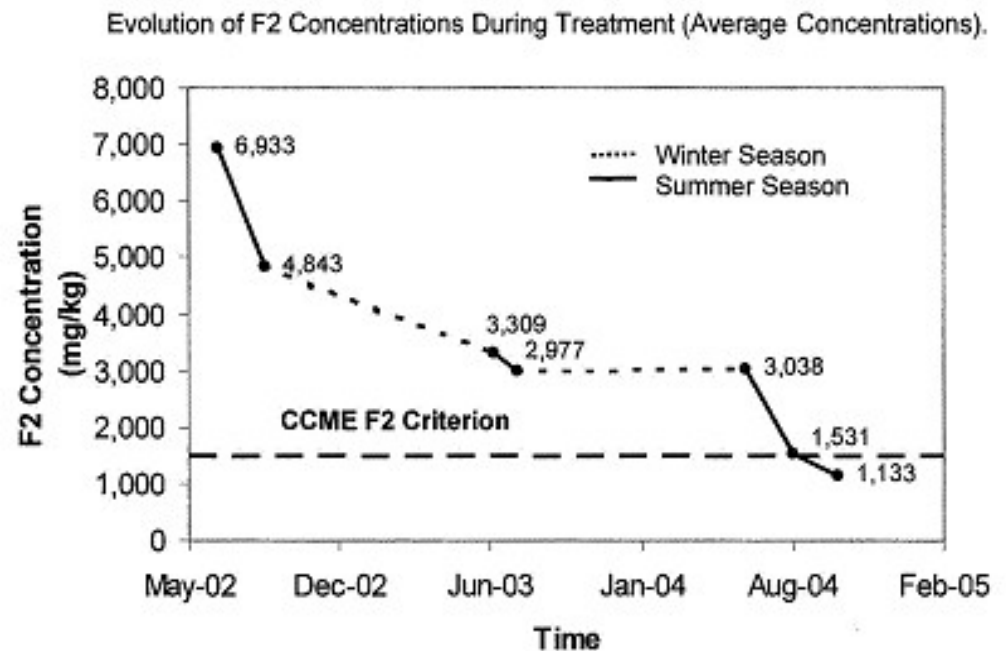
<u>Sampling Date</u> Month/Year	Fraction 1 $(C_6 - C_{10})$ mg/kg	Fraction 2 $(>C_{10} - C_{16})$ mg/kg	Fraction 3 $(>C_{16} - C_{34})$ mg/kg	Fraction 4 $(>C_{34})$ mg/kg
July 2002 (initial)	987	6,933	3,828	749
Sept. 2002 (2 months)	617	4,843	1,946	178
July 2003 (12 months)	234	3,309	2,070	389
Aug. 2003 (13 months)	360	2,977	2,098	418
June 2004 (23 months)	185	3,038	2,023	427
Aug. 2004 (25 months)	119	1,531	1,212	221
Oct. 2004 (27 months)	80	1,133	1,066	217
Removal Rate (%)	92	84	72	71
Remediation Criteria	660	1,500	2,500	6,600

Concentrations above CCME Guideline are bolded



Problems and Solutions

- Concentration Higher than expected
- Biodegradation slower but more effective than anticipated
- Relationship with Soil Temperature
- Addition of Nutrients



Work with Local Communities

- Initial Project meeting with the Hamlet Representatives
- Local Contractor provided all Machinery for the Project
- Employees were hired through the Hamlet Employment Office



Conclusion

- PHC Removal Rate Higher than expected (from 71 to 92%)
- Treatment Duration longer than expected (3 seasons vs 2 seasons)
- Hamlet of Tulita highly involved by providing manpower and machinery



Other Projects in Northern Canada

Churchill (Manitoba)



- Former Bulk Fuel Facility
- Soil Contaminated with BTEX and TVH
- 13,000 m³ Required Remediation
- *In Situ* Biopile Treatment



Other Projects in Northern Canada

NTPC Tuktoyaktuk (Northwest Territories)

- Former Power Generating Plant
- 4,840 m³ (*In Situ*) of Soils impacted with PHC and BTEX
- On-Site Biopile Process Used
- Treatment started in August 2004
- Remediation Continues in the Summer of 2005



Other Projects in Northern Canada

FOX-B: Nadluardjuk lake (Nunavut)

- 20,000 L of Jet A-1 Fuel was Spilled in 1996
- *In Situ* Bioremediation Pilot-Scale Project
- Aerobic and Anaerobic Oxydation Enhancement
- Project Started in 2001



Other Projects in Northern Canada

Fort Albany Mid-Canada Line Clean-Up Project (Ontario)

- Soils impacted with PCBs and PHCs
- Transport and Thermal Treatment of 6,000 m³ of PCB Soils (> 50 ppm)
- Landfilling of 5,000 m³ of PCB Soils (< 50 ppm)



Other Projects in Northern Canada

Saglek (Labrador)

- Former North Warning System Radar Station
- 19,500 m³ of PCB-Contaminated Soil
- Installation and operation of water treatment units



