

# First Remediation of an Arctic Drilling Sump

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# Background

Site is located within the ISR, approx 115km NW of Inuvik

Dry well was drilled in 1972, abandoned in 1996

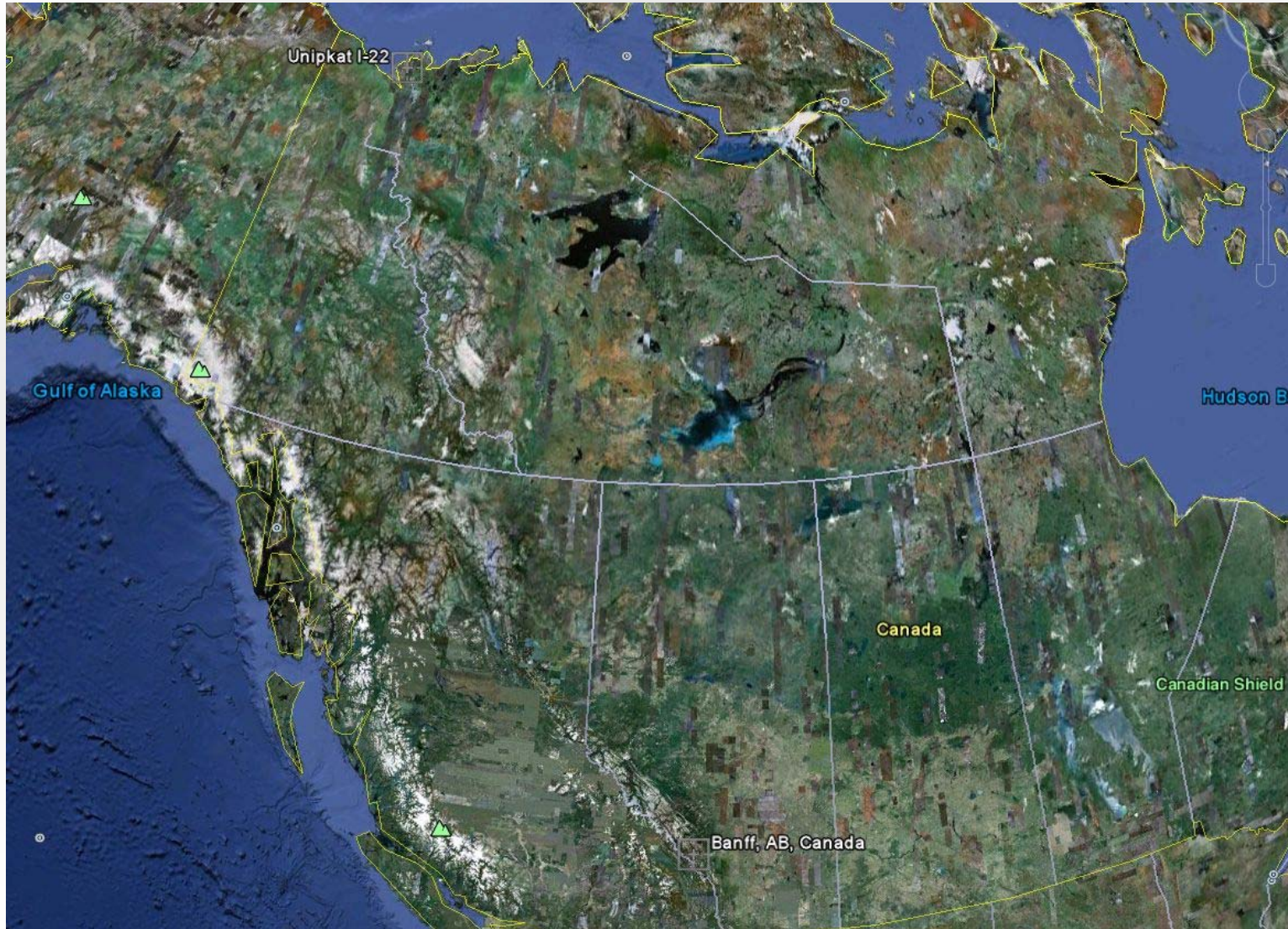
Sump was constructed in July 1972, capped April 1973

INAC letter in 1973 reported overflowing sump

Site is located on the cut-bank of the Arvoknar Channel

Approximately half of site has been eroded

# Location-Location-Location



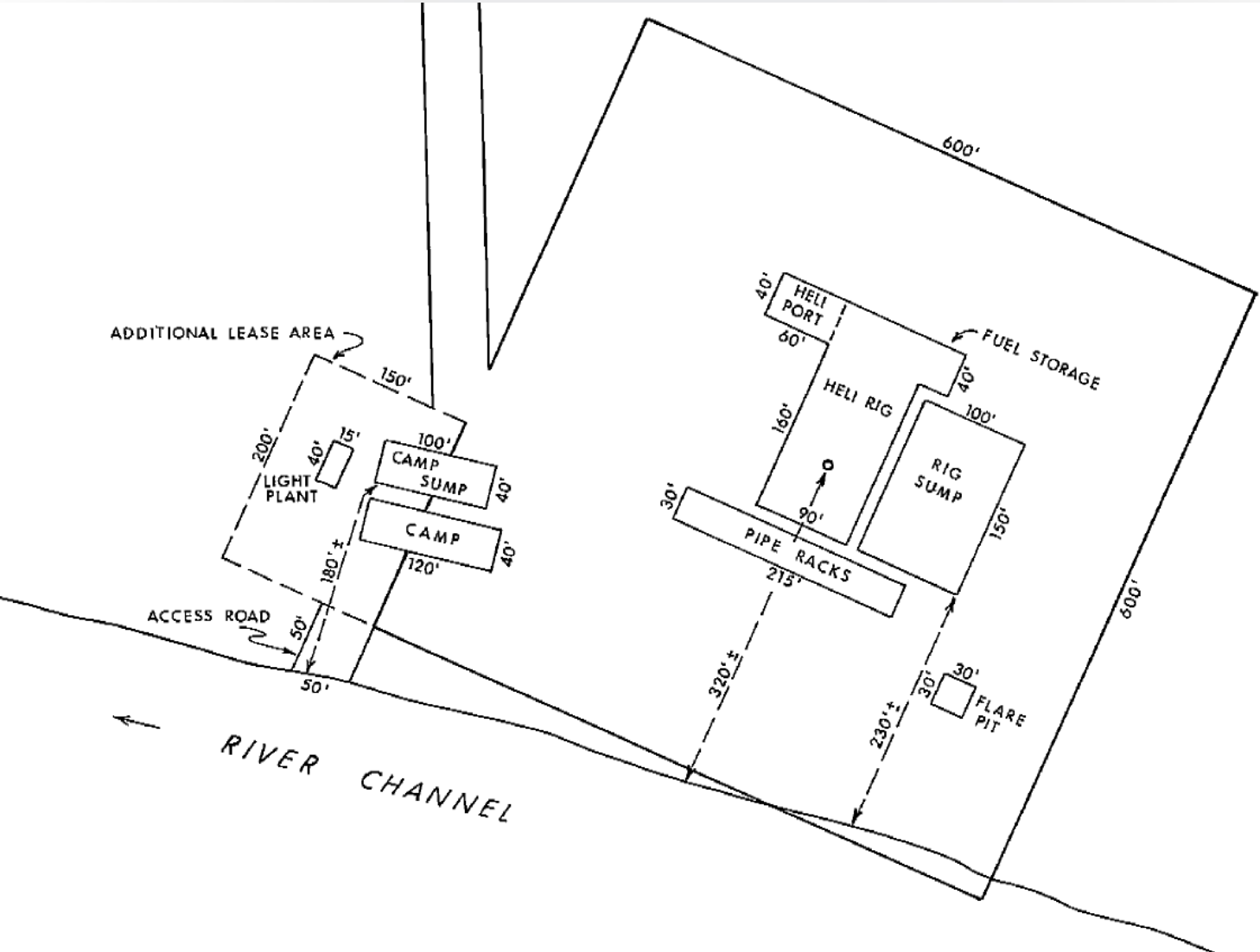
# Background



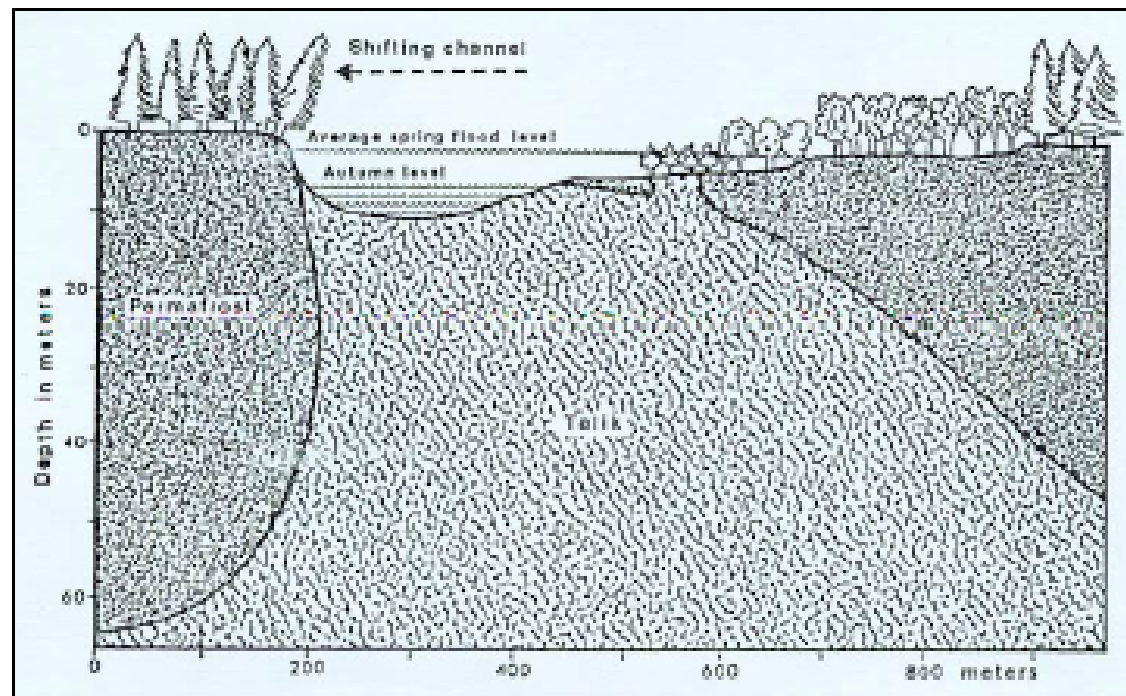
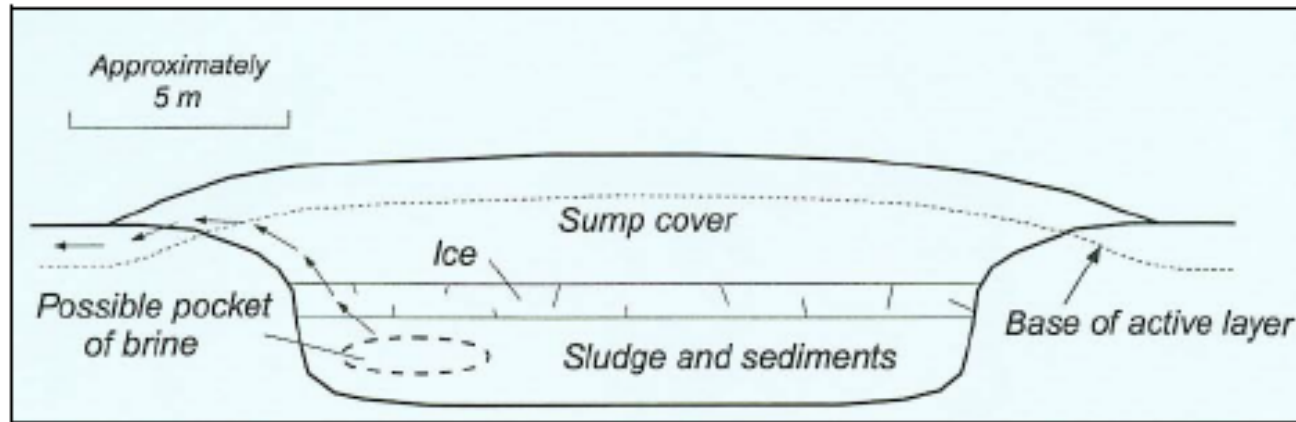
## Previous Work at site

- 6 previous reports in 1976, 2002, 2004, 2007 and 2010
  - Storm surge in 1972 flooded sump
  - Enlargement of sump identified in 1975
  - Final INAC clearance in 1975
- 2002 EM surveys
- 2004 ESA shallow sampling
- 2007 and 2010 ESA – assessments and delineation

# Background



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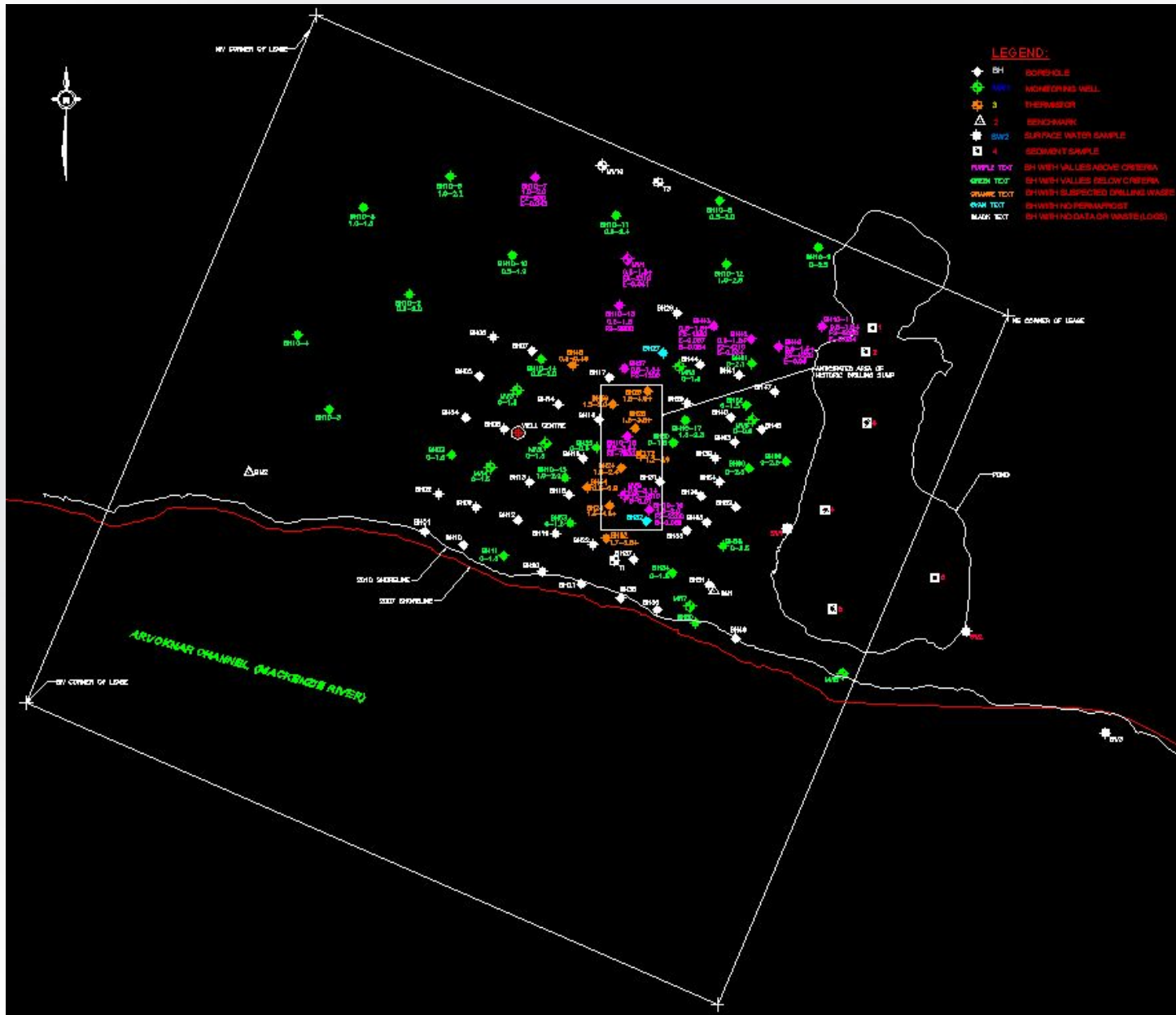


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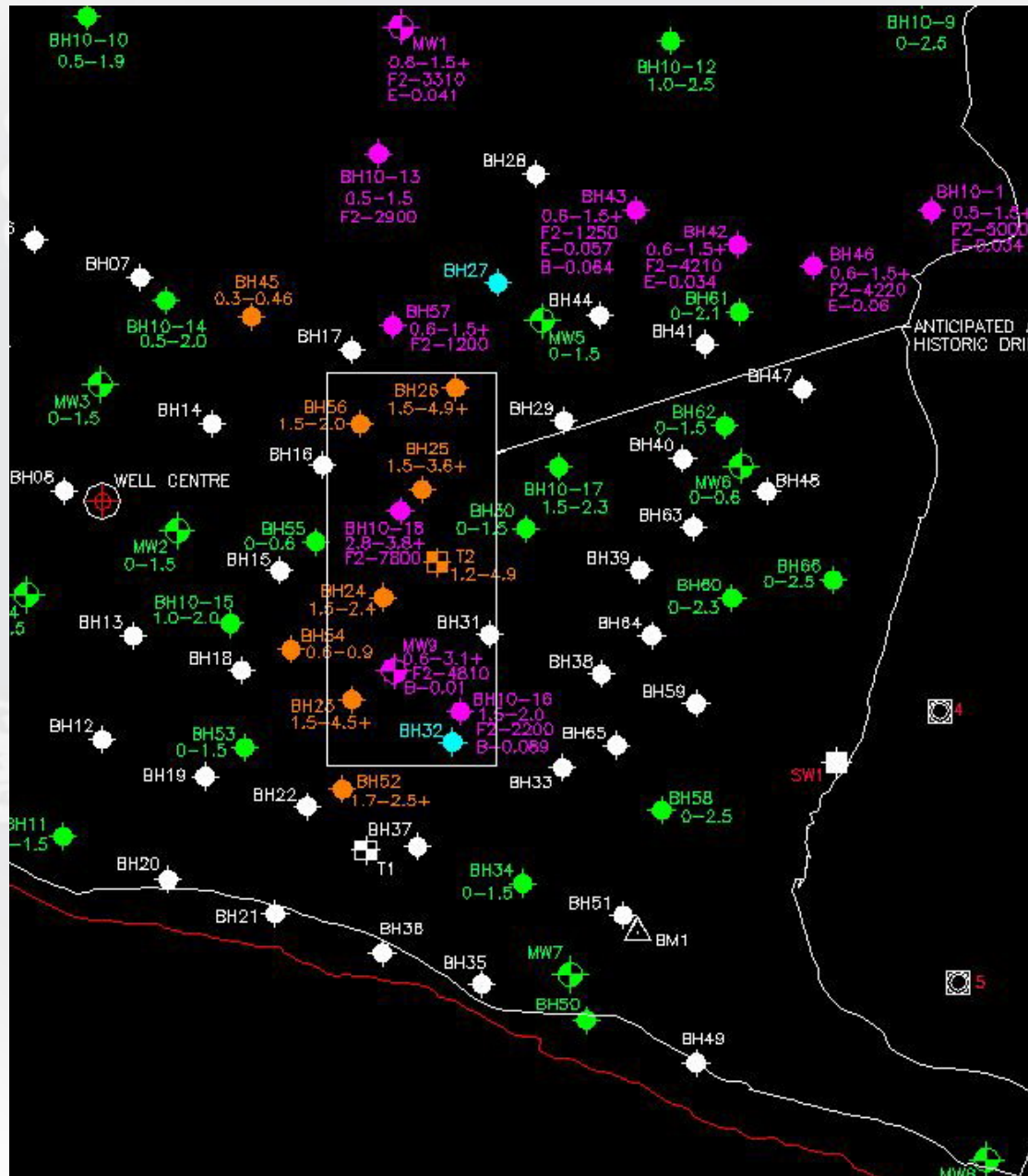




# Background



# Soil Results - Assessments

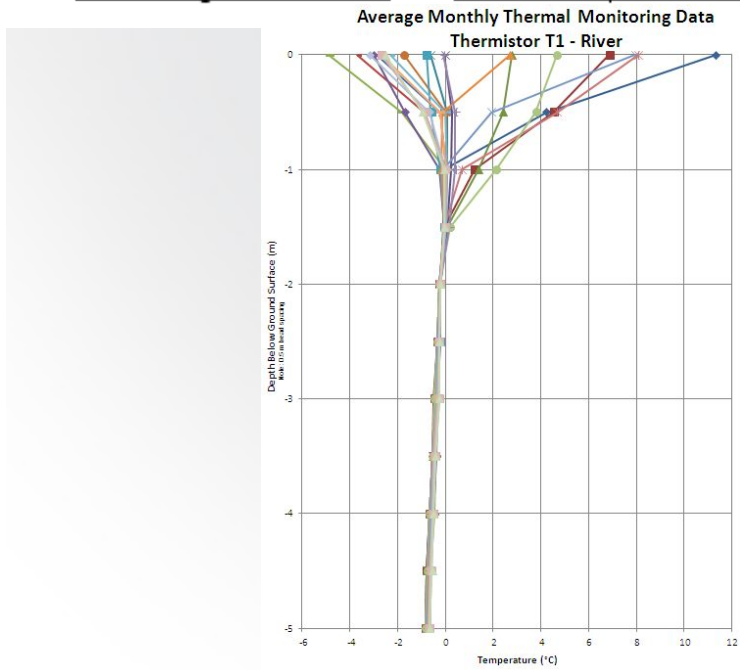
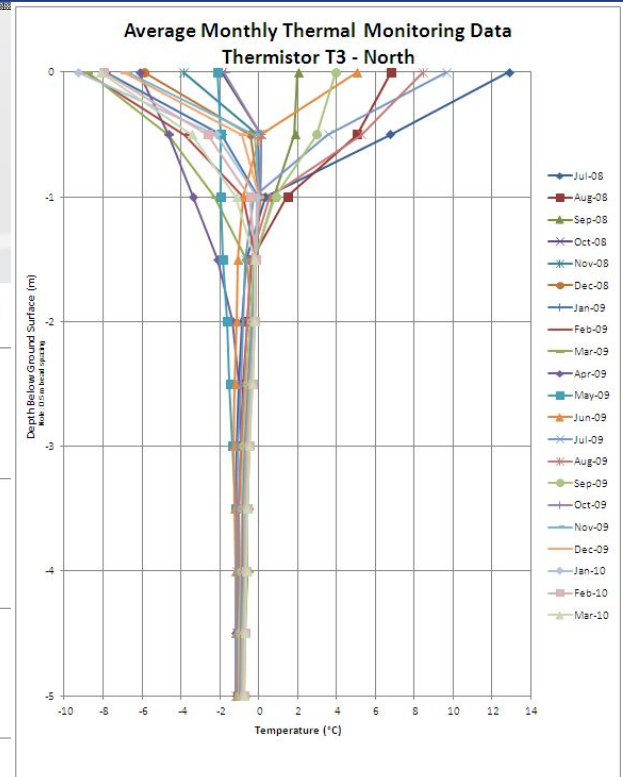
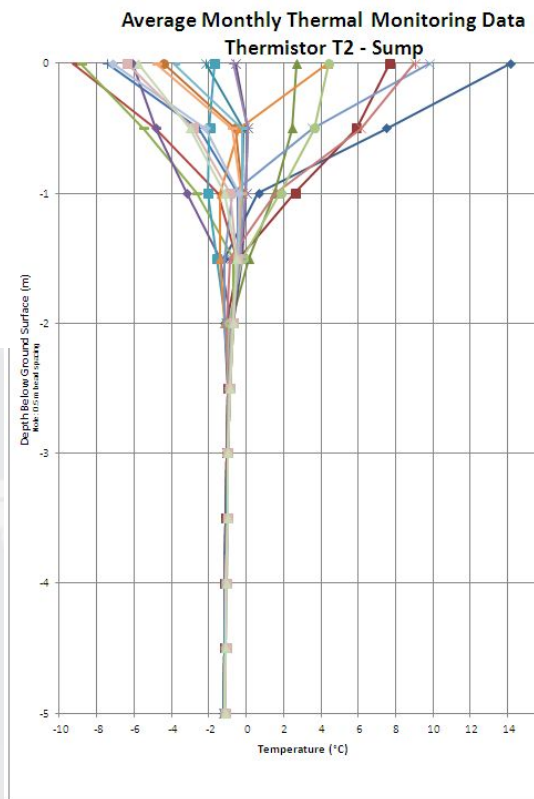
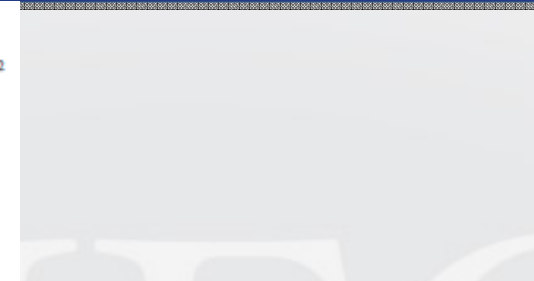
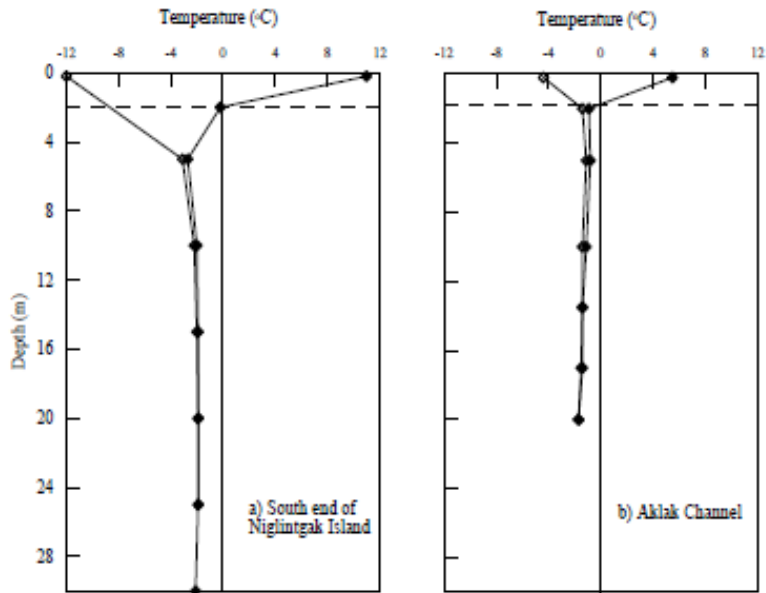


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# Assessment Conclusions

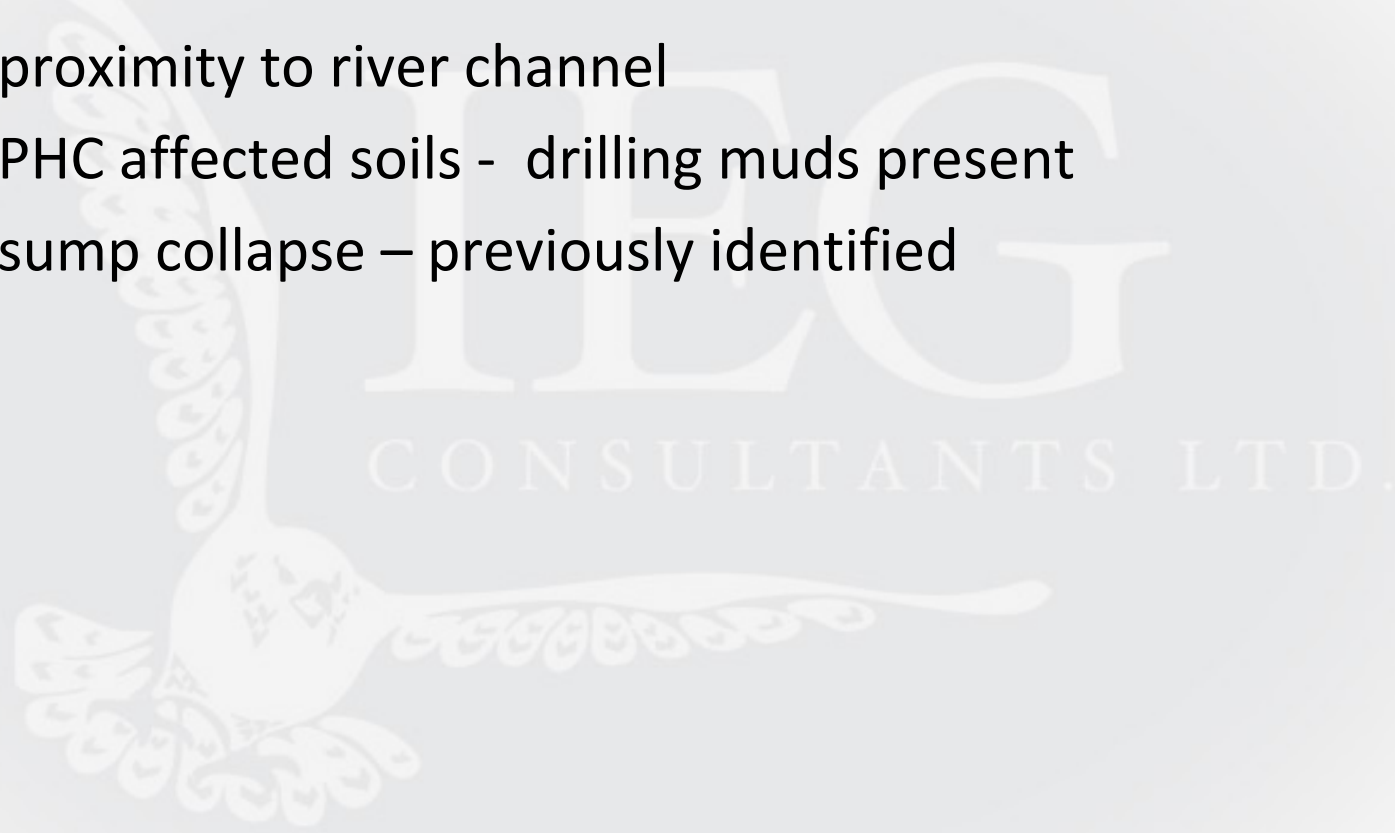
- 100 boreholes/8 monitoring wells
- 3 thermistors – temperature profiles
- 2 river channel benchmarks
  - Identified ~6500 m<sup>3</sup> of PHC affected soil
  - Sump volume ~1600 m<sup>3</sup>
  - Frozen soils at all locations
  - River's thermal influence is limited

# Thermal Conclusions



Site was selected based on several assessed risks

- proximity to river channel
- PHC affected soils - drilling muds present
- sump collapse – previously identified



# Project Methodology

## Project permitting was initiated in Fall 2010

- Project Description was submitted in November 2010.
- Proposed methodology included – Ice road construction, site and camp setup, frozen soil excavation, temporary soil storage on site and in town, dewatering of soil, treatment of soil.
- Permits required: Land Use Permit, Water Use Licence, Ice Road access, and IFA project screening.
- Numerous agencies responded to environmental screening (some with no basis).
- EISC approval on January 31, 2011

Local consultation – 3 local hunters and trappers committees

Change in methodology – backfill of excavation, transport all soil to landfill.

Backfill source? - local arsenic issues

Permits acquired – LUP, Water Use Licence, Ice Road Access, INAC Quarrying permit, DFO authorization, EISC approval.

- Innovative backfill source with DFO approval.

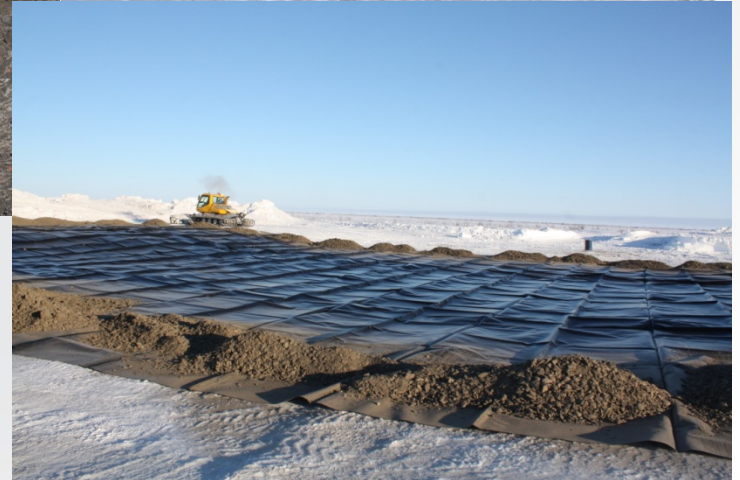




# Site Work - Sump

## Sump work:

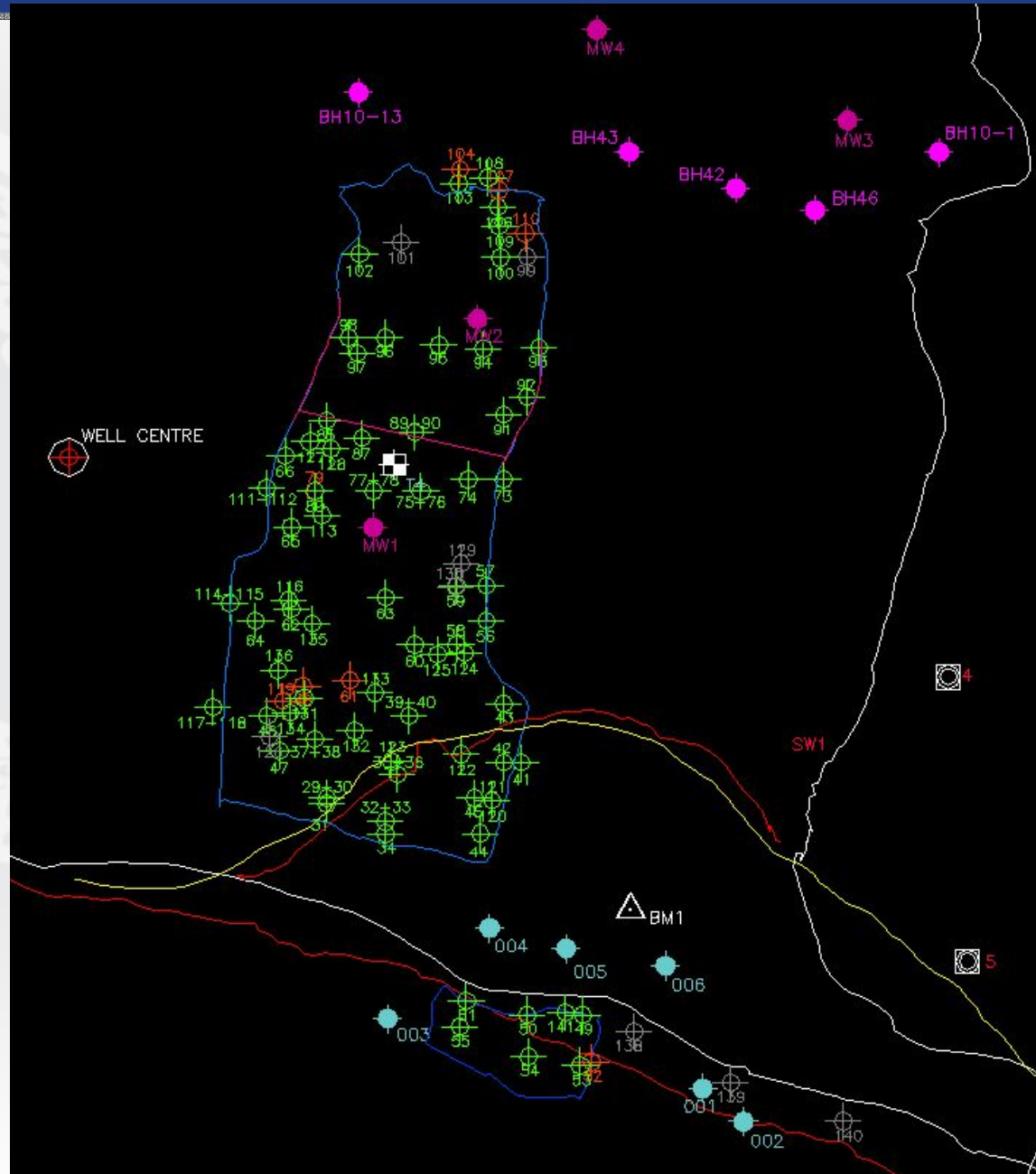
- Site clearing
- Testpit
- Site stripping
- Excavation
- Stockpile
- Hauling
- Sampling
- Backfill
- Drilling
- Storage
- More hauling



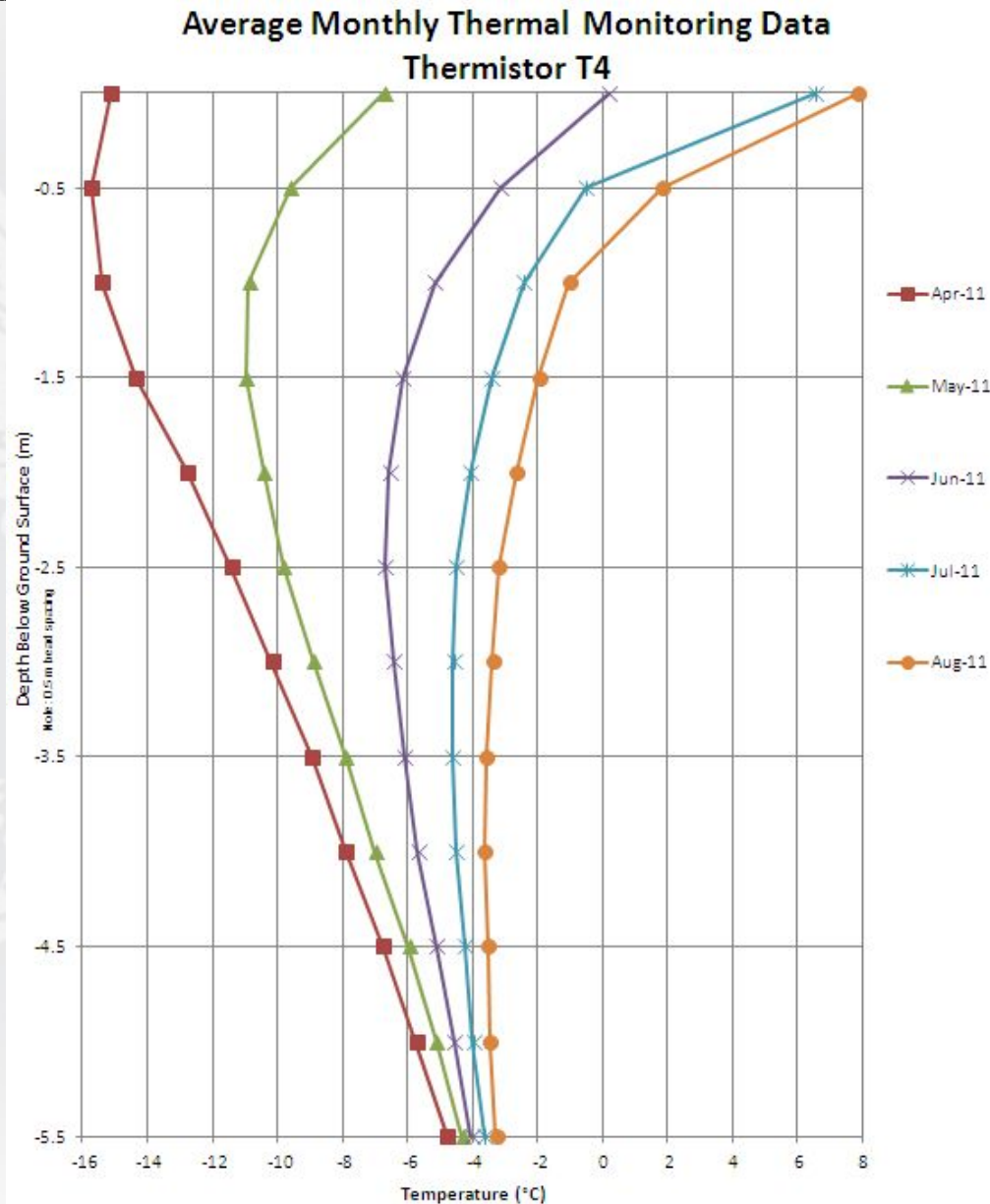
# Site Work - Sump



# Soil Results Discussion - Sump



# Soil Results Discussion



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# Soil Transport – Impressive?

Storage cell in Inuvik to Fort Nelson BC

Total distance = 4330 km

Number of loads 269

Total distance travelled = 1,164,770 km

The average *distance* from Earth to *Moon* is 384,403 km  
(3x)

The circumference of the Earth is 40,075km - 29X

Number of reported driving incidents – 0

Local contractors used exclusively for transport at a cost  
of approx 16,000\$ per haul.

# Next Step - Risk Assessment

- Problem Formulation consists of developing information to gain knowledge the site to be able to discern the complete exposure pathways for both human and ecological receptors that may use the site.
- Data Analysis, involves the collection of information to characterize exposures and toxicological effects to receptors at the site.
- Risk Characterization step involves integrating the exposure parameters of receptors together with the toxicological information to estimate risk from chemicals on site.

# Monitoring and Sampling Plan

## NWTWB Water Licence monitoring plan

- Location of samples
- Monitoring groundwater conditions
- Monitoring thermal regime at site – limit mobility
- Erosion monitoring measures

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# Conclusions

- No soil above criteria left on channel side of blanket.
- No drilling waste left behind
- Unexpected methods used
- Innovative use of channel pointbar
- Successful remediation of PHC affected sump.
- Good timing due to channel erosion
- Risk assessment possible cost savings



# Recommendations

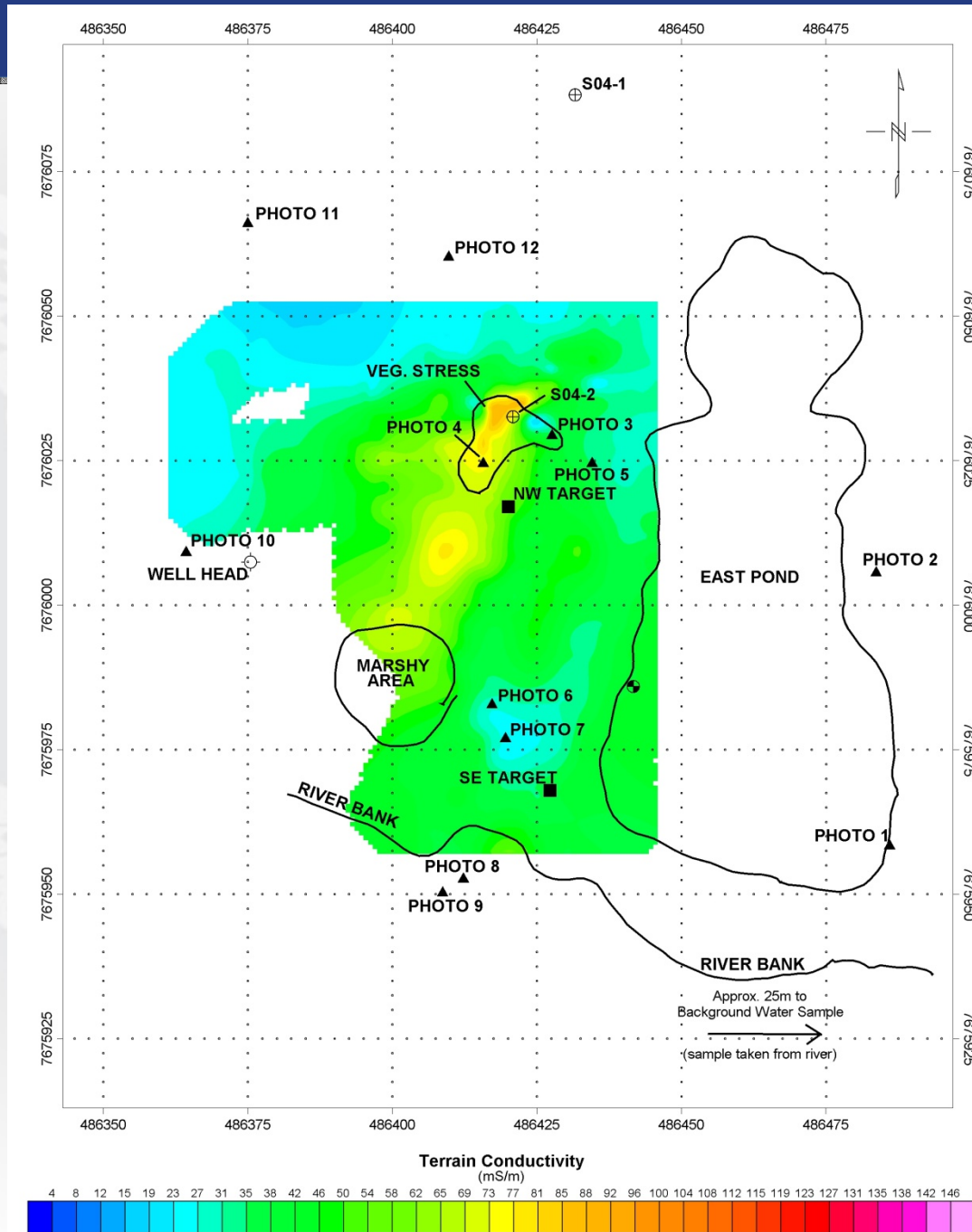
- Project timing (min 1 yr in advance)
- Permitting well in advance
- Thermal regime needs to be defined
- Stockpile on site – control and segregation
- Onsite sample testing – reduction of wait times

# Questions?

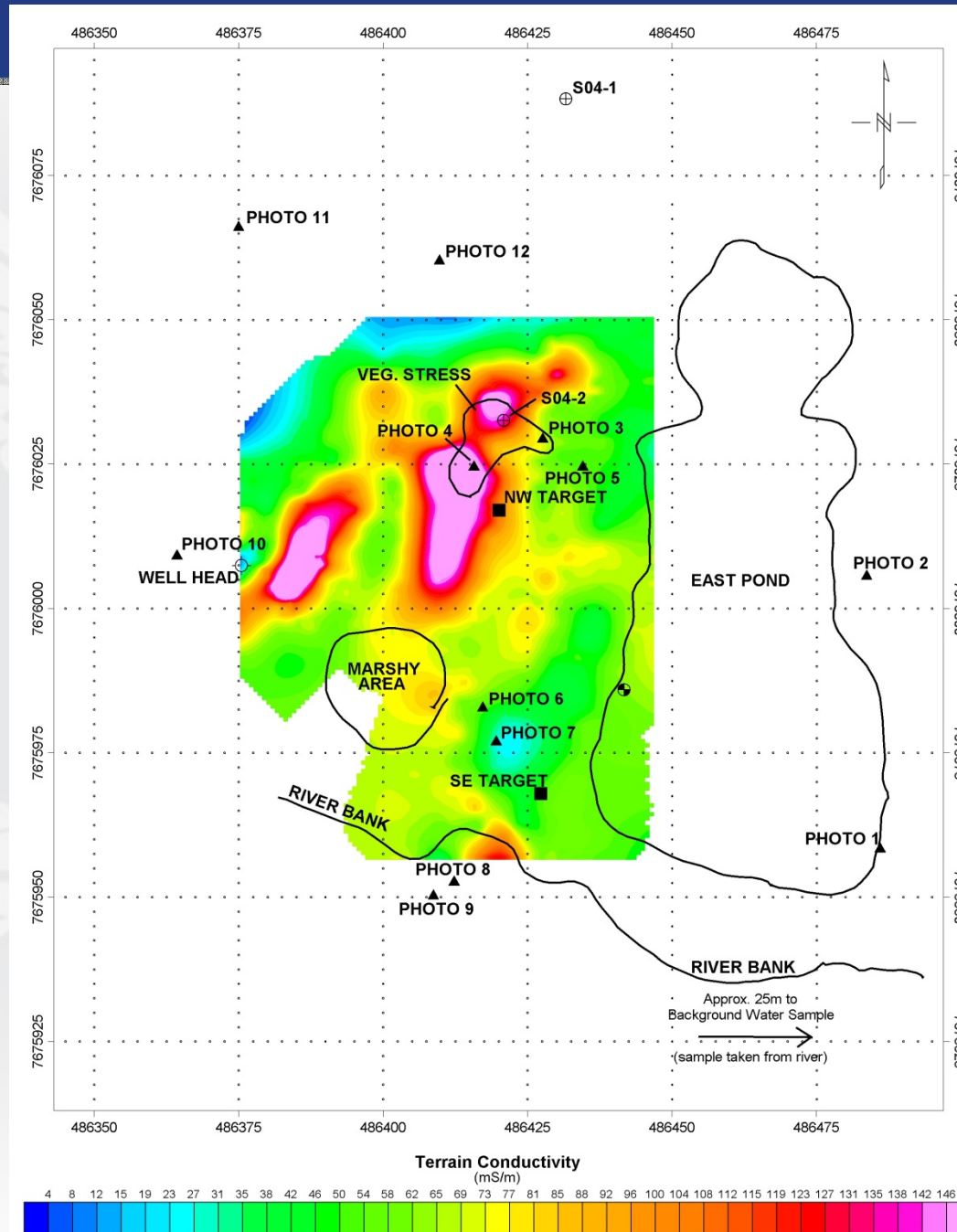
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