

# **Acquiring Seismic Data in the Sahtu Region of the Northwest Territories of Canada: Operational Challenges and Potential Solutions\***

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## **Abstract**

Several significant hydrocarbon fields have been discovered in the past three decades within the Sahtu Region of the Northwest Territories of Canada. These fields are located in proximity to the proposed Mackenzie Valley Gas Pipeline. Potential reservoirs along the pipeline route include Basal Cambrian sandstones trapped in fault bounded structural closures and Devonian reefal carbonates. Future field mapping, development, and identification of additional prospects and leads will require the use of cost-effective, environmentally friendly, state of the art seismic acquisition. The Sahtu Region is a vast area of highly variable topography. Acquiring seismic data across this isolated, remote expanse of terrain provides a unique set of operational, logistical and technical challenges. Operationally seismic acquisition within the region, both the summer and winter, requires the utilization of equipment ranging from large tracked vehicles to fixed wing aircraft to lightweight heli-portable equipment with crew accommodation ranging from sleigh camps to private homes in small communities. From a technical standpoint, recent advances in digital 3-component seismic acquisition systems have given operators greater flexibility and control in the designing and recording of surveys within the region. A comparison of results from two separate digital 3-C acquisition projects will be presented. One of these was acquired using a dynamite source, the other with vibroseis, and one line was acquired with both dynamite and vibroseis sources. The high standard for consultation with local communities established by the regulators within the Sahtu settled aboriginal land claim area results in a high degree of interaction and collaboration with local aboriginal communities. Additionally, the development of regulatory mandated project-specific environmental protection plans results in a high degree of scrutiny and oversight by regulators and the local

communities for a multitude of operational modalities. This paper will compare the results from two separate digital 3-C acquisition projects. One of these was acquired using a dynamite source, the other with vibroseis, and one line was acquired with both dynamite and vibroseis sources. We will also discuss how several important technical advances in the environmental planning and monitoring both pre acquisition and during the acquisition stages resulted in significant costs savings, better community relations and smoother data acquisition.

### **Reference**

Morrow, D.W., B.C. MacLean, W.F. Miles, P. Tzeng, and D. Pana, 2006, Subsurface structures in southern Northwest Territories and northern Alberta; implications for mineral and petroleum potential: Bulletin Geological Survey of Canada, Report #591, p. 41-59.

# AAPG ICE 2010

ACQUIRING SEISMIC DATA  
IN THE SAHTU REGION, NWT, CANADA

OPERATIONAL CHALLENGES AND POTENTIAL  
SOLUTIONS

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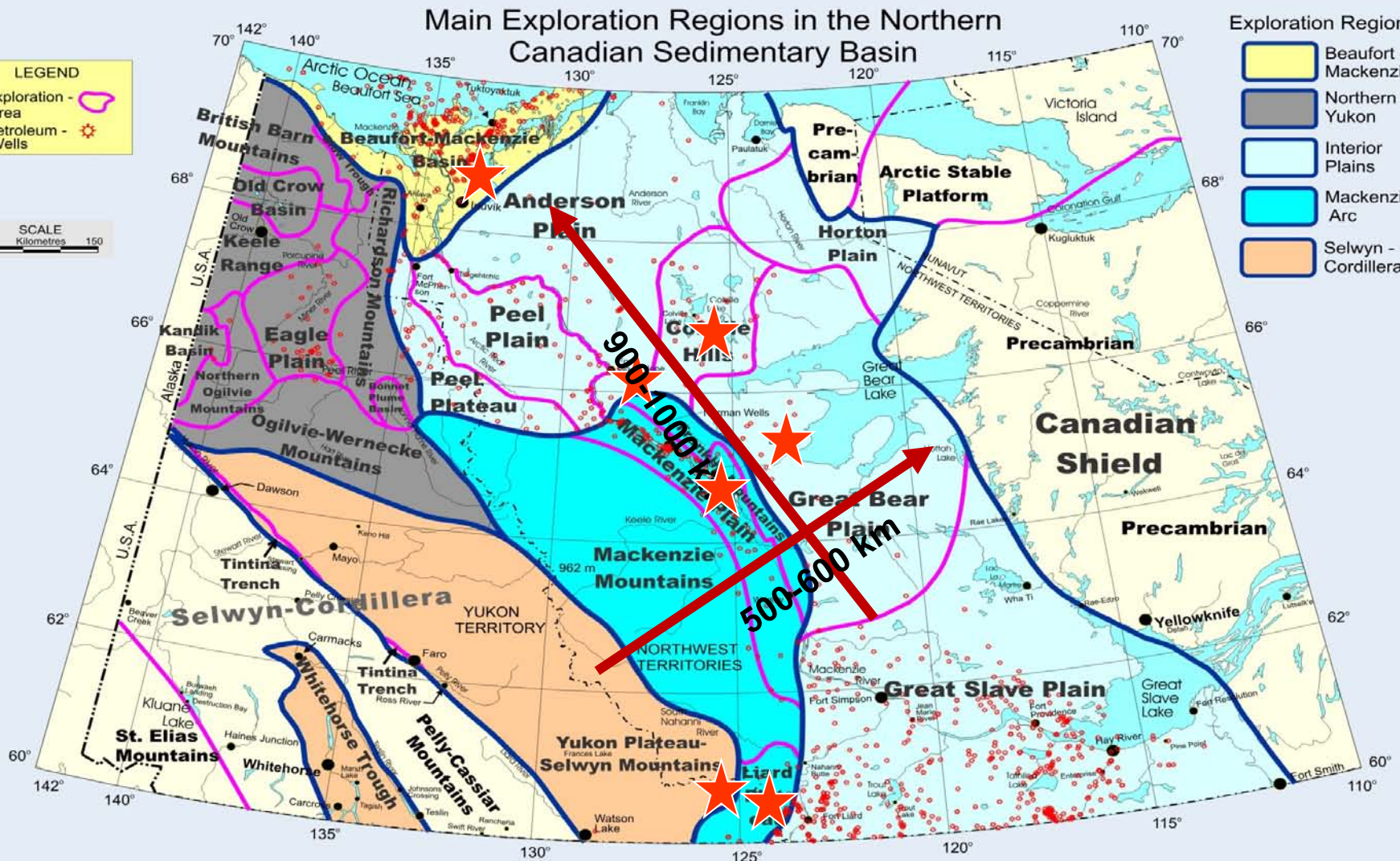
# Main Exploration Regions in the Northern Canadian Sedimentary Basin



SCALE  
 Kilometres 0 150

## Exploration Regions

- Beaufort - Mackenzie
- Northern Yukon
- Interior Plains
- Mackenzie Arc
- Selwyn - Cordillera



After Morrow et al., 2006

**explor**



# OVERVIEW NWT

- Large petroleum reserves
- Very remote
- Huge area
- Variable terrain
- Low population density
- Highly regulated

**explor**



# OVERVIEW

## NWT Political & Regulatory Setting

- Governments are major employer
- Aboriginal land claims
- Low level of real economic activity
- Many environmentalist agencies at work...



*Unbalanced Perception:  
Preserving Environment vs.  
Economic Development*

Notes by Presenter: At last count, 9,353 people in the NWT worked for the government, accounting for over 40% of the labour force, and government spending amounted to nearly 30% of the GDP, with over \$1 billion transferred from the federal government to the GNWT annually. Over half of the population of the NWT is aboriginal, and aboriginal land claims cover virtually the entire territory, and most of these are settled, with well-established local corporations. Some regions are virtually self-governing, while other regions are less politically developed. The only major goods-producing industry in the NWT is mining. In the past, there have been substantial gold and uranium mining efforts, but today, mining efforts revolve diamond mines, with diamond mining accounting for over 50% of the GNWT GDP of \$4 billion/annum. If the effect of exporting diamonds and government spending are excluded, it is clear that economic activity within the territory is very low. This dependence on government spending, a low level of real economic activity, along with the efforts of both government regulators and non-governmental organizations to carve out vast tracts of land for protected status of one sort or another has left the territory with a very unbalanced perception of what the economic cost of restricting exploration and development really is.

# Operational Challenges: Summary

- Vast, remote
- Terrain variability
- Aboriginal land claims
- Environmental issues
- Long project lead times
- Difficult logistics
- Expensive
- Highly regulated





# Potential Solutions: Environmental Planning

1. Define Exploration Objectives
2. Review Documentation, Imagery, Maps, Weather
3. Community Consultations & Field
4. Government Consultations
5. Comprehensive Survey Design & Operations Plan
  - Environmental Protection Planning built-in
  - Integrated Operational approach
6. Submit Environmental Protection Plan & Application
  - Direct control, drafted in house
7. Review formal regulatory feedback and revise
8. Finalize detailed operations plan

**explor**



Notes by Presenter: Integrated operational approach allows for mitigation of impacts collectively, instead of reactively addressing individual regulatory concerns.



# Environmental Planning Example: Tulita Project – Overview

- High resolution 3-component survey
- Tracked operations, vibroseis source
- Designed to make use of existing lines
- Terrain most suited to winter ops
- Mostly a burn area:
  - Left regrowth on existing lines
  - (Better than adjacent burn)
- LIS techniques deployed for all new

cut  
**explor**



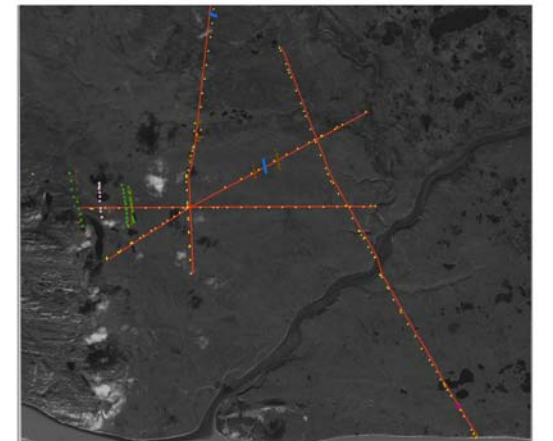
# Potential Solutions: Environmental Planning

## Implementation & Monitoring

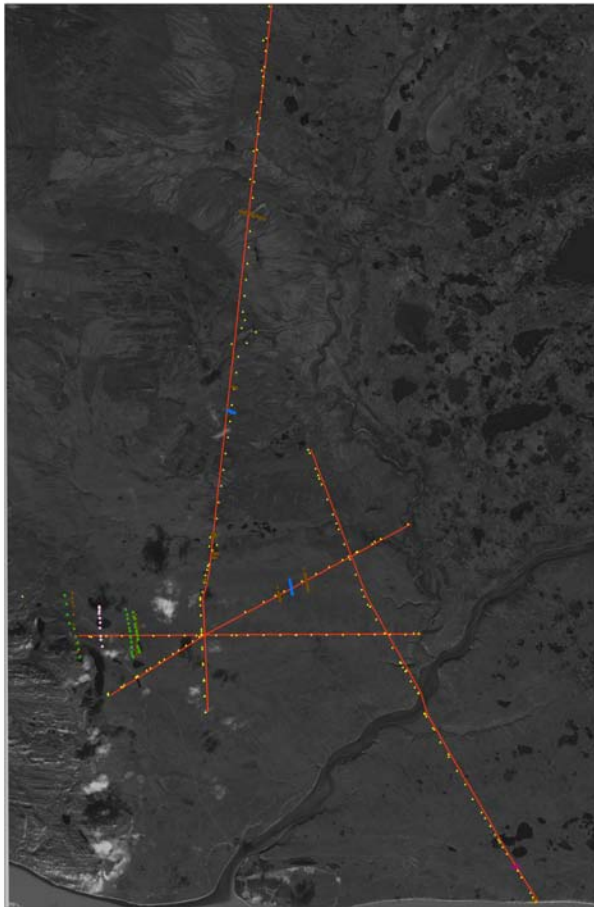
- Rigorous selection & training
- Ruggedized GPS Cameras
  - Thousands of geo-tagged photos
- Defined monitoring procedure,
- Clear deliverables
- Linked to SPOT5 Satellite imagery



Pre-Construction Survey and Wildlife Tracks



## Pre-Construction Survey and WildlifeTracks

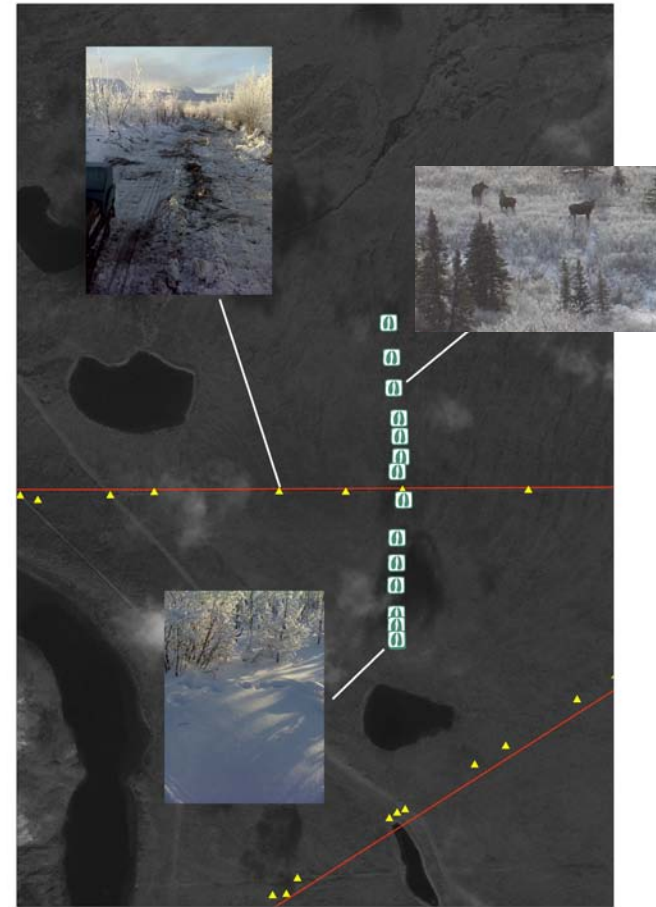


- Lynx Tracks
- Marten Tracks
- Moose Tracks
- Muskrat Tracks
- Wolverine Tracks
- Survey Points
- Tulita Proposed Seismic

0 0.5 1 2 3 4  
Kilometers  
Universal Transverse Mercator Projection  
NAD 1927 - UTM Zone 9



## Pre-Construction Survey and Moose Tracks



- Tulita Proposed Seismic
- Survey Points
- Moose Tracks

0 0.1 0.2 0.4 0.6 0.8  
Kilometers  
Universal Transverse Mercator Projection  
NAD 1927 - UTM Zone 9





# Potential Solutions: Environmental Planning

## Continuous Improvement

- Submit environmental report and data to community and government
- Post-project communications plan for follow up:
  - Presentations to community and regulators
  - Environmental report to regulators
- Post-project field inspections
- Press for base-lining, data basing

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# Potential Solutions: Aboriginal Collaboration

## Consultation Outcomes

- Continuous engagement critical for success
- Local knowledge of land aids planning
- Desperate for economic activity
- Regulatory environmental interaction constant
  - Economic impact of restrictions not considered
- Industry interaction often sporadic
  - Industry does not market itself well
- Creates imbalance in perceptions of risk of additional regulations vs. economic impact



# Potential Solutions: Local Resources

- ▣ Preference for local contractors
- ▣ Negotiated terms
- ▣ Delegating responsibility:
- ▣ Existing accommodations v. camps

Explor Sahtu, since 2008:

- ▣ 2008 local (Sahtu) spend: 78.6%
- ▣ 2010 local (Sahtu) spend: 84.5%

**explor**



Notes by Presenter: Over \$10.4 million in local contracts since 2008.

# Potential Solutions: Dialogue with Public, Government

- ▣ Improve our industry's image with the public, government.
- ▣ This begins with individuals, companies starting dialogue early, maintaining that communication over time.
  - ▣ “Closing the loop” – sharing success stories.
  - ▣ Listening actively, being responsive to concerns.
  - ▣ Sustained marketing campaign, even with smaller audiences.



# Potential Solutions: Summary

1. Improve planning process
2. Aboriginal collaboration
3. Local resource utilization
4. Improve dialogue with gov't,  
public





# Conclusion

Decades of experience in the Canadian Frontier have taught us that sustainable prosperity is possible when we:

- Ensure our practices lead regulatory requirements.
- Look for positive collaboration with local communities.
- Maximize our utilization of local resources.
- Maintain constant communication with communities, stakeholders.

This cooperative spirit of partnership makes great things possible.

