

FIELD ACQUISITION REPORT
FOR
NORMAN WELLS
1991 2D SEISMIC SURVEY

NEB Pgm. No. 9229-J1-5E

Shot for Esso Resources Canada Ltd.
By Western Geophysical Ltd.

Prepared by B.E. Barrie
August, 1992

A handwritten signature, likely of B.E. Barrie, written in dark ink. The signature is stylized and appears to be a cursive representation of the initials 'B.E.' followed by a surname.

NORMAN WELLS
1991 2D SEISMIC SURVEY

TABLE OF CONTENTS

LIST OF ENCLOSURES	1
I. INTRODUCTION	2
II. STATISTICAL SUMMARY	3
III. DATA ACQUISITION EQUIPMENT	4
IV. RECORDING PARAMETERS	5
V. DISCUSSION	5
VI. CONCLUSION	6
VII. APPENDIX	7

LIST OF ENCLOSURES

All enclosures are located in the appendix of this report.

- Map (page size) of 1991 Norman Wells 2D vibroseis layout.
- Itemized list of vibroseis crew composition.
- List of field and camp equipment.
- Contractor and sub-contractor information.
- Safety reports.
- Detailed list of personnel including nationality.
- Map of 1991 Norman Wells 2D seismic program - full size.

I. INTRODUCTION

Esso conducted a 2D vibroseis program in March, 1991 to determine if this seismic method could be helpful in delineating the reservoir and therefore reducing the risk on subsequent drilling locations. On one hand, the vibroseis source creates undesirable noise problems which deteriorate the data quality, while on the other hand it is relatively inexpensive and environmentally benign compared to conventional energy sources. This test will clarify the trade-off between technical shortcomings and cost/environmental impact of the ice vibroseis method.

II. STATISTICAL SUMMARY:

The following is a statistical summary of the vibroseis seismic operations:

- **Mob/demobilization dates:**

- Crew mobilized to Norman Wells on March 17, 1991.
- Crew demobilized from Norman Wells on March 23, 1991.

- **Significant dates:**

- Surveyors commenced on March 14, 1991.
- Recording commenced on March 18, 1991.
- Recording completed on March 21, 1991.
- Vibrators released on March 23, 1991.

- **Personnel:**

- Total number of personnel = 21.
- Number of technical personnel = 8.
- Number of non-technical personnel = 13.
- Nationalities
 - 60% native people from Colville Lake, Fort Good Hope, and Fort Norman.
 - 40% people from southern Alberta.

- **2D Production Data:**

- Number of kms shot = 7.16 kms.
- Number of shots taken = 671.
- Number of stations = 716.
- Number of recording days = 4.
- Average daily production = 168 Vp's/day

- **Weather conditions:**

- Temperatures ranged from -10 to -30 degrees Celsius.
- Winds variable gusting to 30 km/h.
- No downtime due to weather conditions.

III. DATA ACQUISITION EQUIPMENT:

The following equipment was used for the data acquisition operation on this program:

- **Positioning System:**

- One Wild T-16 Theodolite survey instrument.
- One Nikon DTM-A5 E.D.M. unit.

- **Energy Source:**

- One 'wheeled' LRS-315 vibrator.
- Average peak force = 32,000 lbs.

- **Detector Equipment:**

- SM-4,14 Hz, spiked base.
- Number of cables and detector strings used = 25.
- Length of cables = 400m.

- **Recording System:**

- DFS-V/Advance II electronics.
- Format = SEG-B, 1600 SPI.
- Number of channels = 120.

IV. RECORDING PARAMETERS:

- **Geophones:**

- Number of detectors per station = 9.
- Geophone spacing = 2.22 m.
- Station Interval = 10 m.

- **Vibrators:**

- Number of vibrators = 1.
- Vibrator moveup = 2.5 m.
- Drag length = 10 m.
- VP interval = 10 m.

- **Sweep parameters:**

- Sweep length = 6 sec.
- Sweep range = 5-120 Hz.
- Number of sweeps per VP = 4.

- **Other recording parameters:**

- Sample rate = 2 ms.
- Low cut filter = 8Hz @ 48 dB/oct.
- Alias filter = out.
- High cut filter = out.
- Record length = 3 sec.
- Fold = 6000%
- Far offset = 630 m.

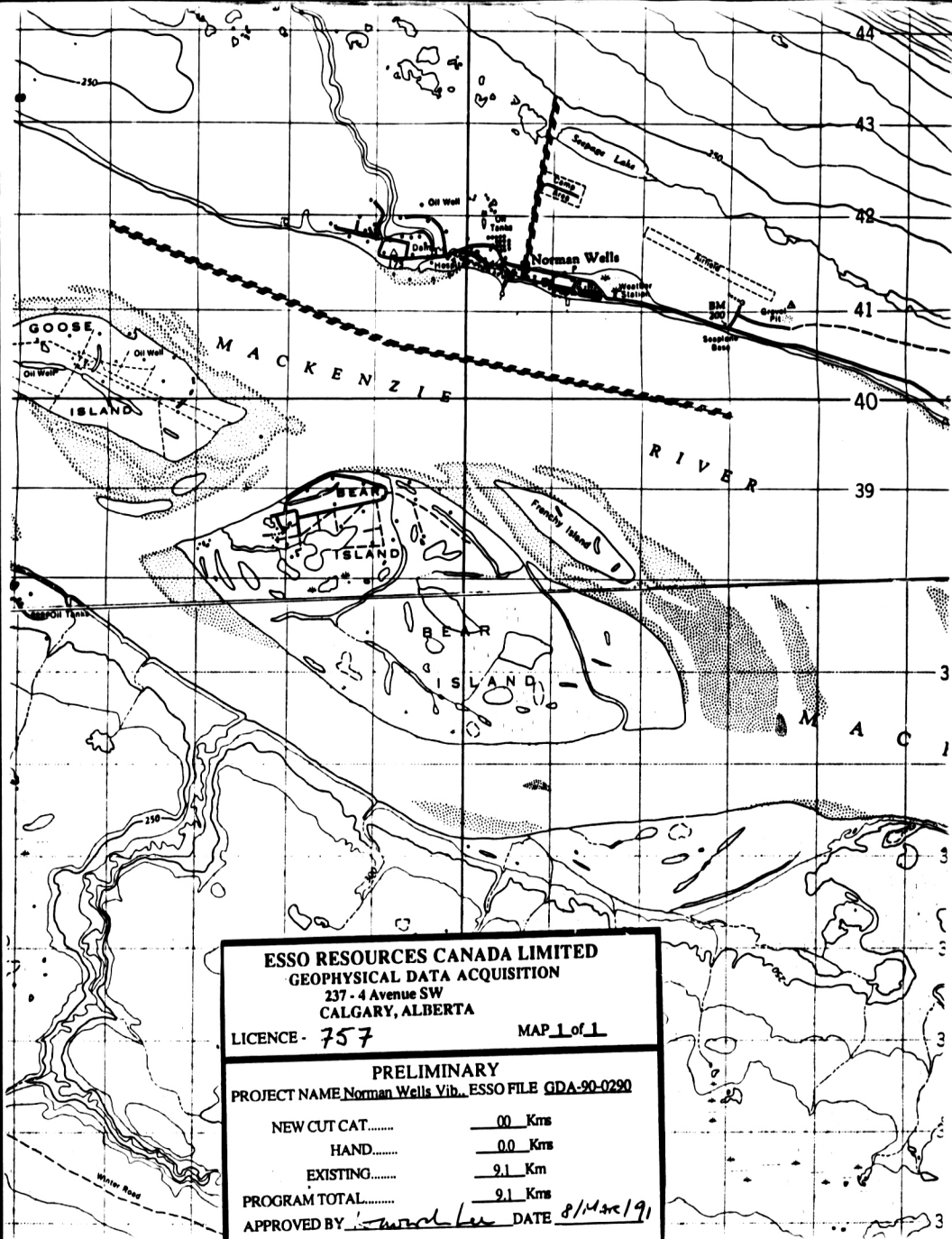
V. DISCUSSION

Analysis of the data collected from this 2D vibroseis test on the ice surface of the Mackenzie R. confirms that this is indeed an adverse seismic acquisition environment. The main problem arises from the ice flexural wave which is a dispersive source generated noise train. By virtue of the 10m spatial sampling interval, this energy is aliased into the useable band of reflection energy on the f-k plot. Attempts to remove the aliased ice flexural noise were met with some success and the processors were able to generate a useable 2D data set on the ice.

VI. CONCLUSION

Despite the adverse acquisition environment which characterizes the ice surface of the Mackenzie R. near Norman Wells, Esso was successful at obtaining an interpretable 2D seismic data set. The key learnings that were formulated through careful analysis of the data are: (1) the high fold level should be maintained for subsequent program so that the 'stackarray' criteria are fulfilled; (2) the group interval should be shortened from 10m to about 7m so that the predominant frequency components of the ice flexural energy are adequately sampled spatially; (3) the far offset could be increased from 600m to about 700m to take advantage of reflection data that is not being critically stretched through the NMO routine; (4) use two vibrators and a 24 hour crew to speed production and therefore reduce costs.

APPENDIX



ESSO RESOURCES CANADA LIMITED
GEOPHYSICAL DATA ACQUISITION
237 - 4 Avenue SW
CALGARY, ALBERTA

LICENCE - 757

MAP 1 of 1

PRELIMINARY

PROJECT NAME Norman Wells Vib. ESSO FILE GDA-90-0290

NEW CUT CAT..... 00 Kms
HAND..... 0.0 Kms
EXISTING..... 9.1 Km

PROGRAM TOTAL..... 9.1 Kms

APPROVED BY [Signature] DATE 8/14/91

CREW COMPOSITION:

Recording:

1 - Observer	
3 - Cable Truck Drivers	
7 - Recording Helpers	11 Men

Vibrators:

1 - Vib Operator	1 Man
------------------	-------

Surveying:

1 - Surveyor	
1 - Rodman	2 Men

Catering:

1 - Cook	
1 - Camp Attendant	2 Men

Additional:

1 - Party Manager	
1 - Clerk	
1 - Mechanic	
1 - Expeditor	
1 - Instrument Engineer	
1 - Geophysicist	
1 - Technician	7 Men

Line Cutting and Clearing:

3 - Machine Operators	3 Men
-----------------------	-------

Total Personnel	26 Men
------------------------	---------------

EQUIPMENT:

Full description of all vehicles/dozers/camp, etc.

Camp:

1 - Kitchen	Sleigh Mounted 10X40
1 - Utility Storage	Sleigh Mounted 10X40
1 - Generator (125 KW) Shop Storage	Sleigh Mounted 10X36
2 - Sleepers	Sleigh Mounted 10X40
1 - Fuel Sloop	3000 Gallon Capacity
1 - Office Sleeper	Permanent Base Camp

Recording & Survey:

1 - Track Recording Unit	FN-110
3 - Track Cable Units	FN-110
1 - Utility	GMC 4X4 1-Ton
1 - Party Manager Unit	Pick-Up
1 - Vibrator	LRS-315, Truck Mounted
2 - Water Trucks	FN-110
1 - Personnel Carrier	GMC Van
1 - Track Survey Unit	FN-60
1 - Garage	Permanent Shop With Tools

Cats:

- 1 - D7 Cat Cutting Line
- 1 - D6 Cat Cutting Line

CONTRACTORS:

Principal Contractor:

Western Geophysical,
A Division of Western Atlas Canada Ltd.
2612 - 37th Avenue N.E.
Calgary, Alberta
T1Y 5L2

Subcontractors:

Beaufort Mechanical Services Ltd.
P.O. Box 298
Norman Wells, N.W.T.

Franz Brouwer Contracting
376039 Alberta Ltd. Company
Calgary, Alberta

Matco Transportation Ltd.
Norman Wells, N.W.T.

Rebel Transport
Hay River, N.W.T.

Year 1991

$$\text{Frequency Rate} = \frac{\text{Number of Lost Time Injuries} \times 1,000,000}{\text{Manhours Worked}}$$

TEST LINE JOB 91-028

Name (In Full)	Home Community	Job Classification	Male/ Female	Any Disabilities	Aboriginal Yes/No	Visible Minority	Total Work Days	Gross Income
Ron MacMullen	Kelowna, B.C.	Party Manager	M	No	No	No	8	1,600.00
Jim Gard	Calgary, Alberta	Clerk	M	No	No	No	8	1,100.00
Brian Young	Calgary, Alberta	Observer	M	No	No	No	4	800.00
Walter Schawalter	Calgary, Alberta	Observer	M	No	No	No	4	800.00
Leon Andrew	Fort Norman, NWT	Observer	M	No	Yes	Yes	8	1,500.00
Al Clark	Calgary, Alberta	Vib Tech	M	No	No	No	9	1,575.00
Shawn McWeeny	Calgary, Alberta	Vib Supervisor	M	No	No	No	4	800.00
Perry Johanson	Calgary, Alberta	Face Operator	M	No	No	No	5	850.00
Jean Duguay	Falher, Alberta	Cook	M	No	No	No	9	1,170.00
Mary Bonnet Rouge	Norman Wells, NWT	Camp Attendent	F	No	Yes	Yes	8	960.00
Wilbert Kochon	Coleville Lake, NWT	Vib Operator	M	No	Yes	Yes	6	930.00
Jack Clark	Breadburry, Sask.	Mechanic	M	No	No	No	8	1,520.00
Jim Hill	Calgary, Alberta	Expeditior	M	No	No	No	9	1,710.00
Lawrence Manual	Ft Good Hope, NWT	Line Tr. Driver	M	No	Yes	Yes	6	840.00
Collin Pierrot	Ft Good Hope, NWT	Rec. Helper	M	No	Yes	Yes	5	720.00
Steven Kelly	Ft Good Hope, NWT	Rec. Helper	M	No	Yes	Yes	5	720.00
Peter Arron	Ft Good Hope, NWT	Rec. Helper	M	No	Yes	Yes	5	720.00
Harold Kelly	Ft Good Hope, NWT	Rec. Helper	M	No	Yes	Yes	5	720.00
Aron Elton	Ft Good Hope, NWT	Line Tr. Driver	M	No	Yes	Yes	6	840.00
Charles Gully	Ft Good Hope, NWT	Line Tr. Driver	M	No	Yes	Yes	6	840.00
Bruce Kelly	Ft Good Hope, NWT	Rec. Helper	M	No	Yes	Yes	5	720.00
Ronald Beyonnie	Fort Franklin, NWT	Rec. Helper	M	No	Yes	Yes	5	720.00
Roy MacCuaely	Fort Norman, NWT	Rec. Helper	M	No	Yes	Yes	5	720.00
Alexis Blacho	Coleville Lake, NWT	Rec. Helper	F	No	Yes	Yes	5	720.00