MAR 19770026: NORTHEASTERN ALBERTA

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NORCEN ENERGY RESOURCES LIMITED

FINAL REPORT
1977 EXPLORATION PROGRAM
QUARTZ MINERAL EXPLORATION PERMIT
6876120003

November, 1977

G. McWilliams
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1. Location of Athabasca Type uranium Deposits (Figure 1)
2. Location of Drill Sites (Figure 2 and 3)
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SUMMARY

Norcen Energy Resources Limited, on behalf of the uranium joint venture with Campbell Chibougamau Mines Limited, E & B Explorations Limited and Ontario Hydro holds two blocks of Quartz Mineral Exploration Permits in Northeastern Alberta. The Archer permits which cover 179,200 acres include permits 208, 209, 210 and 211 which were acquired on January 28, 1976. The five Richardson Permits totalling 229,600 acres include permits 6 876 120002 to 6 876 120006 acquired on December 23, 1976.

A surface prospecting and geochemical survey conducted over the Archer permits during the summer of 1976 indicated that the edge of the Athabasca Formation was further west than anticipated. This survey also revealed that the pervasive cover of glacial overburden in the area prevented the useful application of any further surface prospecting in the area. In evaluating the situation, the authors felt that present exploration techniques limited the search for unconformity type Athabasca sandstone uranium deposits to areas where the unconformity between the Athabasca Formation and the underlying basement was less than 152.5 metres (500 feet) below the topographic surface. As a result, 2 permits 212 and 213 were surrendered to the Crown and the five Richardson permits were acquired.

The lack of outcrop and the far travelled nature of the overburden in Northeastern Alberta coupled with the importance of locating the margin of the Athabasca Formation indicated to the authors that a reconnaissance stratigraphic drilling program would be required to narrow search area. The 1977 drilling program over the permit areas was designed to:

a) define the edge of the Athabasca Formation

b) outline the areas where the combined thickness of Athabasca sandstone and overburden was less than 152.5 metres (500 feet).

c) examine the unconformity at the base of the Athabasca Formation

d) determine whether the Athabasca Formation in Norcen permit areas contained a favourable physical and chemical environment for uranium deposition.
e) examine the basement for its potential as a site for trapping uranium from supergene solutions percolating along the unconformity.

The Richardson permits lying to the west of the Richardson River, lie outside the margin of the Athabasca Formation. Drilling in these areas encountered 27.8 metres (91 feet) to 62.5 metres (205 feet) of overburden and 20.5 metres (74 feet) to 133 feet (70.6 metres) of Lower and Middle Devonian sandstone and mudstone overlying Archaean basement rocks.
INTRODUCTION

History

Exploration for uranium in northeastern Alberta was sparked by the announcement by Gulf Minerals of their discovery of a uranium deposit at Rabbit Lake, Saskatchewan in 1968. A massive land acquisition covering most of the Athabasca Sandstone Basin attracted various companies to conduct airborne spectrometer surveys in northeastern Alberta. The absence of outcrop in this area produced discouraging results and very little ground follow-up was attempted. The following list of companies were active in the area:

R.H. King, 1969
Pacific Silver Mines & Oil Ltd., 1969
Fort Reliance Limited & Ensign Oils Ltd., 1969
National Nickel
Geo X
Velocity Surveys
Meyers & Paulson, 1970
MacIntyre Mines, 1969
Canada Southern Petroleum, 1969
Anco Exploration Ltd., 1968
North Canadian Oils Ltd., 1969
Leal Mines, 1969
Radex Minerals, 1969

In 1974 Eldorado Nuclear acquired several permits in northeastern Alberta initiating a second phase of uranium exploration and prospecting. Norcen, under the name of its wholly owned subsidiary, Great Plains Development Company Limited, acquired 6 permits in January of 1976. Several other companies acquired permits and by June, 1976 most of the area available for acquisition over the Athabasca Formation in northeastern Alberta was covered by exploration permits. (Consult the accompanying map for details on the land status in northeastern Alberta and northwestern Saskatchewan).
Drilling

The 1977 exploration program on the Norcen Quartz Mineral Exploration permits consisted of eight diamond drill holes. One hole was drilled on each of the five Richardson Permits and three holes on the four Archer permits. Drilling commenced on August 18 and the last hole completed on September 29, 1977. The drill was mobilized from Leduc to Fort McMurray via truck and from Fort McMurray to Embarras via barge down the Athabasca River. The winter road southeast to Embarras provided good access to the first four drill sites. The drill mounted on a Nodwell trailer and a camp consisting of three 10 x 18 foot tents mounted on trailers provided good mobility. Moves and crew changes to the four holes not accessible by road were carried out with a Bell 206B helicopter from a base camp located at the Embarras air strip.

Drilling Summary

Hole #1

Location:  Tp. 107 R9 Sec. 4 NW West of the 4th Meridian
Permit No. 6876120003  N.T.S. Ref. 74L
Started:  August 18, 1977  Completed August 20, 1977
0-142 feet  0-43.3 metres  -  overburden
142-189 feet 43.3-57.7 metres  -  dolomite
189-275 feet 57.7-83.9 metres  -  mudstone
275-305 feet 83.9-93.0 metres  -  granitic gneiss
LOCATION OF ATHABASCA SANDSTONE TYPE URANIUM DEPOSITS

SCALE IN MILES

FIG. 1
DRILL SITE

FIGURE 2.

LOCATION OF DRILL SITE
REGIONAL GEOLOGY

The northeast corner of Alberta is occupied by 6,000 square miles of the Canadian Shield, consisting of a complex of igneous, metamorphic and sedimentary rocks ranging in age from 1.7 to 2.3 billion years and forming part of the Churchill Structural Province.

South of Lake Athabasca lie rocks of the Athabasca Formation within the Athabasca intracratonic basin. This Formation covers an area of 40,000 square miles mainly in Saskatchewan and reaches a thickness of 6,000 feet. However, approximately 1,200 square miles of this Athabasca Sandstone occurs in Alberta and appears on islands in Lake Athabasca as well as small peninsulas located as Shelter Point and Fidler Point on the north shore of Lake Athabasca.

The Athabasca Formation is considered to belong to the Paleohelikian Era (1.3 - 1.7 billion years).

DESCRIPTION OF THE ATHABASCA FORMATION

The formation consists of quartz sandstone with minor interbeds of shale and siltstone and a basal gritty sandstone conglomerate unit. The formation lies in an oval shaped basin covering in excess of 98,800 square kilometres (38,000 square miles) in northwestern Saskatchewan and approximately 31,000 square kilometres (12,000 square miles) in northeastern Alberta. The formation dips toward the centre of the basin where it reaches a thickness of 1,800 metres (6,000 feet). A pronounced unconformity underlies the Athabasca Formation and in some localities probably depending on the composition of the Archaean basement rocks a regolith is developed.
DESCRIPTION OF THE PALEozoIC FORMATIONS OVERLAPPING
THE PRECAMBRIAN SHIELD IN NORTHEASTERN ALBERTA

A wedge of middle and upper Devonian rock unconformably
overlaps the edge of the Precambrian Shield in northeastern
Alberta. These rocks are not found in outcappings due to a
thick blanket of glacial outwash which covers all of the
Norcen permit areas. The closest exposure of these forma-
tions occur on the southwest shore of Lake Claire 25.6 kilo-
metres (16 miles) to the northwest and along the banks of
the Firebag River 16 kilometres (10 miles) south of the permit
area. The author of this report is unfamiliar with Devonian
stratigraphy and with the limited drill hole information
available has made no attempt at correlating the Devonian
rocks with the established stratigraphy of the area. A
comprehensive report on the Devonian stratigraphy of north-
eastern Alberta and northwestern Saskatchewan has been com-

Description of the Paleozoic Formations in the Norcen Core.

The glacial outwash covering the Paleozoic rocks ranges
in thickness from 27.8 metres (91 feet) to 62.5 metres (205
feet) with an average thickness over the four holes of 49
metres (146 feet). The thickness of Paleozoic rocks ranged
from 22.6 metres (74 feet) to 40.5 metres (133 feet) with an
average thickness of 32.4 metres (106.2 feet) in the four
holes drilled. The strata encountered in the four holes
varied considerably from one hole to the next. For details
in the stratigraphy the reader should refer to the drill logs
in the appendix. In general the sequence from top to bottom
consists of dolomite, dolomitic mudstone, mudstone gypsum,
mudstone sandstone grading down into a coarse rubbly sand-
stone unconformably overlying the granitic basement complex.

Dolomite is generally massive to laminated, brown in
colour forming beds up to 4.3 metres (14 feet) thick. Locally
the dolomite shows a wide range in colour from grey to dark
brown. Fossils, although not prolific, do occur in the form
of crinoid stems and brachiopods.

Mudstones show a considerable range in colour, colours
include grey, grey brown, dark brown, red brown and green grey.
Mudstones occur interbedded with sandstone, dolomite and
gypsum in beds ranging from several centimetres (1 inch) to
.3 metres (1 foot).
Gypsum, occurs within the mudstones in thin beds ranging from less than a centimetre (2.5 inches) up to 15 centimetres (6 inches).

Sandstones occur at the bottom of the sequence overlying the unconformity. The best section of the sandstone was encountered in hole number 2 where a sandstone mudstone unit graded down into a very coarse immature rubbly sandstone 4 metres (13 feet) thick. This coarse, grey, poorly sorted, unstratified unit is composed of angular to sub-rounded quartz and feldspar grains up to 5 millimetres (.2 inches) in diameter. This coarse sandstone unit grades down into a regolithic unit 3 metres (9.9 feet) thick composed of broken fragments of granite gneiss and chert in a coarse sandy matrix which overlies a weathered fractured paragneiss.

No anomalous radioactivity was encountered in the Paleozoic rocks, readings of 1.5 times background were recorded over the rubbly sandstone encountered in hole number 2.
CONCLUSIONS

The primary objective of the 1977 drilling program in northeastern Alberta was to outline the western margin of the Athabasca Formation. Drilling results indicate that Permit 6876120003 lies outside the margin of the Athabasca Basin. The marine Devonian sediments overlying the Archean Basement in this area do not represent a prime exploration target for uranium exploration.

RECOMMENDATIONS

No further work is recommended for this area. This permit should be surrendered to the crown on its anniversary date.
APPENDIX 1

Drill Logs
**Property:** Richardson Quartz Mineral Permits  
**Sheet Number:** 1  
**N.T.S. No.:** 74 L  
**Collar:** TP 107 R9 Sec. 4NW  
**Claim No.:** Permit 687612003  
**W of the 4th Meridian:**  
**Elevation:** 750 ft./229 m  
**Dip:** .90  

**Hole No.:** 1  
**Started:** August 18, 1977  
**Completed:** August 20, 1977  
**Ultimate Depth:** 305 ft./93.03 m

<table>
<thead>
<tr>
<th>Depth (ft./m)</th>
<th>Description</th>
<th>Mineralization</th>
<th>Core Recov.</th>
<th>Assay</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-43.3</td>
<td>Overburden - glacial outwash</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-12.2 unconsolidated sand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.2 - 42.7 sand and clay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>42.7 - 43.3 sand pebbles and boulders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.3-48.2</td>
<td>Dolomite - grey brown, massive beds</td>
<td>4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>local vugs carbonate filled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.2-48.5</td>
<td>Dolomite - grey with light brown calcite</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>blotches, local vugs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.5-51.2</td>
<td>Dolomite - grey banded, dark brown (cont'd)</td>
<td>2.7</td>
<td></td>
<td></td>
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</table>

**Logged By:**  
**Drilled By:**  
**Core Stored:**
<table>
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<tr>
<th>Depth (ft/m)</th>
<th>Description</th>
<th>Mineralization</th>
<th>Core Recovery</th>
<th>Assay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bands of organic matter vary in thickness from a fraction of a mm to 7.5 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51.2-57.7</td>
<td>Dolomite - grey massive, vugs filled with gypsum (selenite)</td>
<td>6.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.7-58.0</td>
<td>Calcareous Mudstone - banded</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58 - 59.1</td>
<td>Mudstone Breccia - angular fragments of dolomite up to 3 cm diameter in a calcareous mudstone matrix.</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59.1-59.5</td>
<td>Dolomite and Mudstone - interlayered with local gypsum laminations</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59.5-70.2</td>
<td>Mudstone and Gypsum - interbanded the gypsum beds up to 3 cm thick constitute 5% of the rock at the top of the section increasing to 60% of the rock by volume at the</td>
<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth (ft/ft/m)</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>----------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>bottom of the section, mudstone is grey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>to green grey and the gypsum is white or clear.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70.2-73.8</td>
<td>Mudstone - green calcareous with 2% gypsum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73.8-74.7</td>
<td>Dolomite - light brown muddy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74.7-83.1</td>
<td>Mudstone - red brown with thin gypsum horizons, locally</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the reduced horizons and blotches are green</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83.1-83.9</td>
<td>Unconformity - angular fragments of granitic gneiss in a</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>matrix of mudstone and gypsum.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83.9-93.3</td>
<td>Paragneiss - biotite (25%) quartz (30%) feldspar (45%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>gneissosity near vertical.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End</td>
<td>Dip test - 89°</td>
<td></td>
<td></td>
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</table>
APPENDIX 2

Summary of Expenditures
SUMMARY OF EXPENDITURES FOR 1977
QUARTZ MINERAL EXPLORATION PERMIT 6876120003

Drilling Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Mobilization and Demobilization</td>
<td>$591</td>
</tr>
<tr>
<td>Drilling Costs 305 feet (93 metres)</td>
<td>$7,414</td>
</tr>
<tr>
<td>Additional Charges (labour, core boxes, etc.)</td>
<td>$71</td>
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</table>

$8,076

Other Costs

<table>
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<tr>
<th>Description</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Salaries (geologist in field and report writing) 8 days</td>
<td>$572</td>
</tr>
<tr>
<td>Telephone (mobile radio telephone)</td>
<td>$78</td>
</tr>
<tr>
<td>Shipping Core</td>
<td>$21</td>
</tr>
<tr>
<td>Spectrometer rental 5 days</td>
<td>$31</td>
</tr>
<tr>
<td>Accommodation for geologist</td>
<td>$105</td>
</tr>
<tr>
<td>Transportation (Norcen personnel)</td>
<td>$43</td>
</tr>
</tbody>
</table>

$8,926

80%   17,000
QUARTZ MINERAL EXPLORATION PERMIT NO. 6876120003

CANCELLED

NORCEN ENERGY RESOURCES LIMITED,
715 - 5TH AVENUE S.W.,
CALGARY, ALBERTA.
T2P 0N2

DATE OF ISSUE - DECEMBER 23, 1976
AREA - 39,480 ACRES

/// - NOT IN PERMIT

- NO LEASES SELECTED