MAR 20040024: PIERRE RIVER

Received date: Dec 23, 2004
Public release date: Feb 02, 2006

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GRAYMONT WESTERN CANADA INC.

2004 EXPLORATION AND FIELDWORK FOR HIGH-QUALITY CARBONATES AT THE PIERRE RIVER PERMIT, NEAR FORT MCKAY, NORTHEAST ALBERTA

Metallic and Industrial Minerals Permit: 9302100859

Geographic Coordinates

57°27'13"N
111°37'31" W

NTS Sheet 74E/05

2004 12 20

by

J.R. Dahrouge, B.Sc., P.Geol.
R. Wolbaum, B.Sc., Geol.I.T.

Dahrouge Geological Consulting Ltd.
18, 10509 - 81 Avenue
Edmonton, AB T6E 1X7
Dear Hazel:

Re: Metallic & Industrial Minerals Permit No. 9302100859

In connection with the above noted metallic and industrial minerals (MAIM) permit, we are enclosing herewith one bound copy and one unbound copy of an assessment report entitled "2004 Exploration and Fieldwork for High-Quality Carbonates at the Pierre River Permit, Near Fort McKay, Northeast Alberta." Dahrouge Geological Consulting Ltd. is filing the aforementioned assessment on behalf of Graymont Western Canada Inc.

The entirety of Permit 9302100859 will be kept in good standing, it will not be amended. Excess expenditures, as discussed in Section 4.3 of the attached report, are to be assigned to permit 9302100859.

Also attached are the following:

a) a letter of authorization for the reproduction or copying of the attached report; and
b) a letter of authorization from Graymont Western Canada Inc. authorizing Dahrouge Geological Consulting Ltd. to act on their behalf.

Please advise if you require any additional information.

Yours very truly,

Jody Dahrouge, B.Sc., P.Geol.

Encl.

cc. Mr. Marc Gidluck
Graymont Western Canada Inc.
Mr. Peter Darbyshire
Graymont Western Canada Inc.
Re: Reproductions

Dahrouge Geological Consulting Ltd. hereby authorizes the Government of Alberta to reproduce or copy the attached Assessment Report, entitled "2004 Exploration and Fieldwork for High-Quality Carbonates at the Pierre River Permit, Near Fort McKay, Northeast Alberta" at the end of the one year confidentiality period.

Yours very truly,

DAHROUGE GEOLOGICAL

Jody Dahrouge, B.Sc., P.Geol.
December 22, 2004

Coal and Mineral Development Unit  
Alberta Department of Energy  
North Petroleum Plaza  
9945 - 108 Street  
Edmonton, Alberta  
T5K 2G6

To Whom It May Concern

Re: LETTER OF AUTHORIZATION

This letter authorizes Mr. Jody Dahrouge with Dahrouge Geological Consulting Ltd. to file assessment work on behalf of Graymont Western Canada Inc.

Yours truly,

Marcus J. Gidluck, P. Geol.  
Division Geologist  
Graymont Western Canada Inc.

cc. Jody Dahrouge, B.Sc., P.Geol.
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1. SUMMARY

In July, 2004, an area north of Fort McKay, Alberta, where Pierre River converges with Athabasca River, was explored for high-quality carbonate rocks. Within Metallic and Industrial Minerals (MAIM) Permit 9302100859, a carbonate unit of the Devonian Waterways Formation was examined and its stratigraphic thickness measured. Approximately 4½ metres of the Calumet Member of the Waterways Formation was examined along the west bank of Athabasca River.

Throughout this report attitudes of bedding and other planar features are given as $A^\circ/B^\circ$ SW, where $A^\circ$ is the azimuth of the strike and $B^\circ$ is the amount of dip in the direction indicated. A magnetic declination of $17^{1/2}\circ$ east was used.

2. INTRODUCTION

During the summer of 2004, Dahrouge Geological Consulting Ltd. conducted exploration, on behalf of Graymont Western Canada Inc., for high-quality carbonate lithotypes within north-east Alberta. This assessment report describes the exploration conducted within MAIM Permit 9302100859. It includes information on the geology and structure of the one location examined in 2004; as well as, a brief interpretation of the results. Peter Darbyshire, Vice President and General Manager for Graymont Western Canada Inc. authorized this work.

3. GEOGRAPHIC SETTING

MAIM Permit 9302100859 encompasses an area to the west of Athabasca River, approximately 30 km north of Fort McKay and 90 km north of Fort McMurray in northeastern Alberta (Figs. 3.1 and 3.2). Fort McMurray is a community of more than 55,000 and is the supply and services centre for the Alberta tar sands. It is located at the confluence of Athabasca and Clearwater rivers in Northeastern Alberta, about 437 km by paved highway from Edmonton.

In northeastern Alberta, Athabasca River has cut a steep-sided valley of up to 130 m into generally flat-lying topography. The valley bottom has gentle relief and is typically covered in a veneer of unconsolidated, fluvial silts, sands and gravels. Devonian outcrops are generally restricted to the edges of Athabasca River.

Near Fort McKay, the dominant vegetation is a mix of deciduous and coniferous trees. Occasionally with dense accumulations of alder and willows. Above the river-valleys the vegetation is typified by boreal forest cover and muskeg.
At Fort McMurray, mean annual snowfall is 47.2 inches, and mean annual precipitation is 16.32 inches. River breakup generally occurs in the third week of April. On rare occasions ice-jam floods can occur; since 1985 there have been 10 recorded floods.

4. PROPERTY, EXPLORATION AND EXPENDITURES

4.1 METALLIC AND INDUSTRIAL MINERALS PERMIT

In 2002, Graymont Western Canada Inc. acquired MAIM Permit 9302100859, which is located about 30 km due north of Fort McKay, Alberta, where Pierre River converges with Athabasca River (Fig. 3.2). MAIM Permit 9302100859 is located on the west bank of Athabasca River, and is within the Fort McMurray - Athabasca Oil Sands Integrated Resource Plan. Based on the 2004 expenditures of $4,300.01, the entirety of MAIM Permit 9302100859 will be maintained.

<table>
<thead>
<tr>
<th>TABLE 4.1</th>
<th>DESCRIPTION OF MAIM PERMIT 9302100859</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comm. Date</td>
<td>Expiry Date</td>
</tr>
<tr>
<td>October 10, 2002</td>
<td>October 10, 2004</td>
</tr>
</tbody>
</table>

* Portions lying to the north and west of the left bank of the Athabasca River

4.2 2004 EXPLORATION

On July 25, an area north of Fort McKay was examined by Dahrouge Geological Consulting Ltd. on behalf of Graymont Western Canada Inc. for high-quality carbonate rocks. One carbonate outcrop was examined along the bank of Athabasca River (Appendix 2; Fig.6.1). Two intervals representing about 4½ metres of strata were examined.

<table>
<thead>
<tr>
<th>TABLE 4.2</th>
<th>LOCATION EXAMINED AND MEASURED IN 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section Number</td>
<td>Location</td>
</tr>
<tr>
<td>Pierre River Permit</td>
<td>Along Athabasca River</td>
</tr>
<tr>
<td>2004-1</td>
<td>2</td>
</tr>
<tr>
<td>TOTALS:</td>
<td>2</td>
</tr>
</tbody>
</table>
4.3 EXPLORATION EXPENDITURES

During 2004, exploration expenditures for MAIM Permit 9302100859 totalled $4,300.01, resulting in excess credit of $3,590.81 which fulfilled expenditure requirements for assessment period 'Years 3 and 4,' 'Years 5 and 6,' and partially for 'Years 7 and 8.' These expenditures are allocated to MAIM Permit 9302100859 as follows:

<table>
<thead>
<tr>
<th>Assessment Period</th>
<th>Expiry Date</th>
<th>Required Expenditures</th>
<th>Assigned Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years 1 and 2</td>
<td>October 10, 2004</td>
<td>$ 709.20</td>
<td>$ 709.20</td>
</tr>
<tr>
<td>Years 3 and 4</td>
<td>October 10, 2006</td>
<td>$ 1,418.40</td>
<td>$ 1,418.40</td>
</tr>
<tr>
<td>Years 5 and 6</td>
<td>October 10, 2008</td>
<td>$ 1,418.40</td>
<td>$ 1,418.40</td>
</tr>
<tr>
<td>Years 7 and 8</td>
<td>October 10, 2010</td>
<td>$ 2,127.60</td>
<td>$ 754.01</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td><strong>$ 4,300.01</strong></td>
<td></td>
</tr>
</tbody>
</table>

5. REGIONAL GEOLOGY

The geology and stratigraphy of northeastern Alberta has previously been described by Carrigy (1959), Norris (1963), Holter (1976) and Cotterill and Hamilton (1995).

In north-east Alberta, the sedimentary strata is comprised of Paleozoic carbonates, evaporites and clastics, overlain unconformably by Mesozoic siliciclastics (Table 5.1, Fig.5.1). Near Fort McMurray, the Precambrian basement is at depths of 250 to 300 m and has a southwesterly regional slope of about 5.5 m per km (Halferdahl, 1985). The Precambrian basement is overlain by the middle Devonian strata of the Elk Point Group, followed by the Beaverhill Lake Group, and further west, the Woodbend Group. In turn, the Devonian is unconformably overlain by Cretaceous sediments of the Mannville, La Biche and Smoky groups. The oil-sands of the McMurray Formation are within the lowest part of the Mannville Group.

Above the Cretaceous siliciclastics are a variety of unconsolidated Quaternary sediments. Near Fort McMurray there is a basal diamicton derived from the Laurentide Ice Sheet, overlain by gravel, sand and clay from glacial Lake McMurray (Fisher and Smith, 1993). The valleys of the Clearwater and Athabasca rivers contain a complex mixture of spillway deposits. The spillway deposits consist of poorly sorted boulder-gravel-sand; with blocks of oil-sands and glacio-lacustrine sediments. Smith and Fisher (1993) interpret the spillway deposits as a result of a high-velocity flood, sourced from Glacial Lake Agassiz in northern Saskatchewan.
5.1 STRATIGRAPHY

The sedimentary succession of northeastern Alberta comprises a lithologically diverse suite of Devonian carbonates, clastics and evaporites, which are unconformably overlain by Cretaceous siliciclastics. Of the stratigraphic units in Table 5.1, carbonates are present within the Methy Formation, the Waterways Formation, and the Woodbend Group.

5.1.1 Methy Formation

The Methy Formation is within the upper Elk Point Group of the Middle Devonian. The formation is described as a reefal to non-reefal unit containing massive to bedded dolostone, dolomitic limestone and minor anhydrite and gypsum (Cotterill and Hamilton, 1995). The Methy outcrops along Clearwater River valley, and sparsely along Firebag and Marguerite rivers. It is generally a dolomitic unit with interbedded anhydrite that has been described as calcareous or strongly calcareous (Norris, 1963).

5.1.2 Slave Point Formation

The age of the Slave Point Formation has been debated in the past, placed within the Middle (Norris, 1963; Halferdahl, 1985) and Upper Devonian (Carrigy, 1973; Cotterill and Hamilton, 1995). Upper and lower contacts of the unit are defined by paraconformites. The Slave Point generally consists of limestone, siltstone and dolomitic limestone. It is characterized by brownish-grey, skeletal wackestones and argillaceous lime mudstones with interbedded dark brown shale laminations (Cotterill and Hamilton, 1995). The Slave Point Formation is generally less than several metres thick near Fort McMurray.

5.1.3 Waterways Formation

Members within the Waterways Formation include the Firebag, Calumet, Christina, Moberly, and Mildred. The carbonates of the Waterways Formation reach a thickness of over 250 m in western Alberta, and thin toward the Precambrian exposure. The Firebag Member is at the base of the Waterways Formation, and consists of an olive-green calcareous shale. Sequences of interbedded olive-green limestone, argillaceous limestone and shale are also present; Norris (1963) notes several thin brachiopod-rich beds throughout. The Firebag maintains a relatively uniform thickness of about 50 m in the Fort McMurray area.

The Calumet Member conformably overlies the Firebag Member, and consists dominantly of limestone. Other units within the member include variable amounts of argillaceous, skeletal
nodular lime mudstones and wackestones interbedded with grey-green calcareous shale (Cotterill and Hamilton, 1995). Norris (1963) notes significant brachiopod-rich beds in the Calumet Member. In the Fort McMurray area, the Calumet Member maintains a thickness of about 30 m.

**TABLE 5.1 GENERALIZED PALEOZOIC STRATIGRAPHY OF THE FORT MCMURRAY AREA, NORTHEASTERN ALBERTA***

<table>
<thead>
<tr>
<th>System or Subsystem</th>
<th>Group</th>
<th>Formation</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary</td>
<td>Smoky</td>
<td>La Biche</td>
<td>Smoky</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>La Biche Shaftesbury</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grand Rapids</td>
</tr>
<tr>
<td></td>
<td>Upper Cretaceous</td>
<td>La Biche</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clearwater</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wabiskaw</td>
</tr>
<tr>
<td>Upper Devonian</td>
<td>Mannville</td>
<td>McMurray</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grosmont</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Iretro</td>
</tr>
<tr>
<td></td>
<td>Woodbend</td>
<td>Cooking Lake</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Elk Point</td>
<td>Beaverhill Lake</td>
<td>Waterways</td>
<td>Mildred</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moberly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Christina</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Calumet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Firebag</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slave Point/ Fort Vermillion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Watt Mountain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prairie Evaporite</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Methy/Winnipegosis</td>
</tr>
<tr>
<td></td>
<td>Upper Elk Point</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Devonian</td>
<td></td>
<td>Meadow Lake/ McLean River/Contact Rapids</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>La Loche/ Granite Wash</td>
<td></td>
</tr>
<tr>
<td>Lower Paleozoic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precambrian</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Modified after Halferdahl (1985); Cotterill and Hamilton (1995)

The Christina Member consists dominantly of green-grey calcareous shale and conformably overlies the Calumet Member. Other lithologies within the upper section of the Christina Member include minor interbeds of argillaceous lime mudstone and occasional thin, skeletal wackestone
and packstone beds. In the Fort McMurray area, the Christina Member attains a thickness of approximately 25 m.

Conformably overlying the Christina is the Moberly Member. The lower third, labelled units 28 to 37 by Norris (1963), of the Moberly Member consists of an alternating sequence of light olive-green, rubbly, thinly-interbedded, variably argillaceous limestones and shales, and hard beds of pale brown, cryptograined limestones. The upper two-thirds, units 38 to 57, consists of thicker units of light to dark olive-green, variably calcareous shale, and thinner units of rubbly, variably argillaceous fragmental limestone. The Moberly Member attains a thickness of about 60 m in the Fort McMurray area.

The uppermost member of the Waterways Formation is the Mildred Member. This unit is characterized by variably argillaceous, nodular lime mudstone and calcareous shales. A thickness of 40 to 45 m is maintained by the Mildred Member.

5.1.4 Woodbend Group

The Woodbend Group consists of limestones from the Grosmont, Ireton, and Cooking Lake formations. The majority of examined Grosmont Formation limestones in the Fort McMurray area are dolomitic with minor anhydrite (Halferdahl, 1985). The underlying Ireton Formation has been described as an argillaceous, medium to coarse-grained limestone accompanied by limey shale. Some limestones of the Cooking Lake Formation have been noted as dolomitic and argillaceous (Halferdahl, 1985).

5.2 STRUCTURE

Within northeastern Alberta, the Devonian and Cretaceous sedimentary sequences onlap onto the Precambrian cratonic platform, forming two eastwardly converging sedimentary wedges. The southwest regional dip of the Devonian strata follows the contour of the underlying Precambrian basement, which has an apparent northwest strike and southwest dip. Near Fort McMurray the Precambrian basement is at depths of between 250 to 300 m and has a southwesterly regional slope of about 5½ m per km (Halferdahl, 1985).

The westward dipping wedge of Devonian and underlying sediments rest unconformably on the Precambrian basement. The Devonian sediments are younger to the west. The top of the wedge is marked by an erosional surface that is overlain by Lower Cretaceous strata (Section 5.1). Structural complexities within the sedimentary succession are thought to be due to salt dissolution of the Lower Devonian evaporites. The result is a set of small scale domes, basins and folds, with
amplitudes of between 15 and 30 m. Topographic structures of the sub-Cretaceous unconformity are due to differential erosion of the underlying Devonian sediments. The result is a generally northward trending set of ridges and valleys.

6. PERMIT GEOLOGY

6.1 MEASURED SECTIONS

The Calumet Member of the Waterways Formation was investigated along the Athabasca River on July 25, 2004. Two discrete intervals at one location were examined (Table 4.2) by chipping outcrops perpendicular to bedding. Where bedding could not be identified, chips were taken in directions appropriate to topography (Appendix 2). A solution of 5% HCl was used to assess the quality of the limestone from the measured sections in the field. The two intervals represent a stratigraphic thickness of about 4½ metres.

6.2 STRUCTURE AND STRATIGRAPHY

Within the Pierre River Permit, samples of the Calumet Member collected were composed of light-grey to buff, flat-lying, fossiliferous limestone. The poor quality, overlying recessive units had a significant clay component and were not sampled.

7. CONCLUSIONS

In 2004, an exposure of the Calumet Member of the Devonian Waterways Formation, within MAIM Permit 9302100859, was examined along Athabasca River. Two discrete intervals representing 4½ metres of stratigraphy were measured and described in detail.

Carbonate intervals comprised of fossiliferous limestone were examined and their stratigraphic thickness recorded. The overlying, poor-quality, clay-rich units were not examined.

R. Wolbaum, B.Sc., Geol.I.T.
J.R. Dahrouge, B.Sc., P.Geo.

Edmonton, Alberta
2004 12 20
8. REFERENCES


Halferdahl, L. B. (1985) Limestone Near Fort McMurray Northeastern Alberta and Northwestern Saskatchewan; private report by Halferdahl & Assoc. Ltd. for Steel Brothers Canada Ltd.


Notes
1) Geology after Cotterill and Hamilton (1995)
Fig. 6.1
Geology and Section Locations

MAIM Permit 9302100859

Legend

CRETACEOUS
KB - LaBiche Formation
Kj - Joli Fou Formation
Kac - Alice Creek Tongue, Grand Rapids Formation
Kg - Grand Rapids Formation
Kc - Clearwater Formation
Km - McMurray Formation
Kah - Shaftesbury Formation

DEVONIAN
Dm - Middle Devonian
Dw - Waterways Formation
Ca - Calumet Member

PRECAMBRIAN
Hmf - Manitou Falls Formation
Ag - Granitoids
Ar - Mylonitic Rocks

Symbols

Graymont MAIM Permit
Section location, number

Scale: 1:20 000
NTS 74E/05 NAD 27

GRAYMONT WESTERN CANADA INC.
DAHROUGE GEOLOGICAL CONSULTING LTD.
Edmonton, Alberta

Pierre River Permit,
Fort McMurray, Alberta

2004.12
APPENDIX 1: STATEMENT OF EXPENDITURES
FOR METALLIC AND INDUSTRIAL MINERALS PERMIT 9302100859

a) Personnel

J. Dahrouge, B.Sc., P.Geol. (Geologist)
0.2 days field work and travel between July 26 and 29, Aug. 15-17, Sept. 4-13, 2004
2.0 days preparing report

W. McGuire (Draftsman, Field Assistant)
2.0 days compile field data; drafting; prepare base maps, figures and other

R. Wolbaum, B.Sc. (Geologist)
0.2 days field work and travel July 26 and 29, 2004
2.0 days preparing report

N. McCallum, B.Sc. (Geologist)
0.2 days field work and travel July 26 and 29, 2004

J. Wolbaum (Field Assistant)
0.2 days field work and travel July 26 and 29, 2004

b) Food and Accommodation
n/a

c) Transportation
Helicopter: Helicopter Charter (July 29, 2004)

$1,521.86

$1,521.86

d) Instrument Rental
n/a

e) Drilling
n/a

f) Analyses
n/a

g) Report
Reproduction and assembly

$55.00

$55.00

h) Other
n/a

Total

$4,300.01

I, Jody R. Dahrouge, hereby certify that the costs outlined above were expended for the assessment of metallic and industrial minerals permit 9302100859.

Commissioner for Oaths

JACK LAMOUREULX
COMMISSIONER FOR OATHS
COMMISSION EXPIRES
MAY 21, 2005
APPENDIX 2: DESCRIPTIONS OF THE 2004 SECTIONS WITHIN MAIM PERMIT 9302100859, NEAR PIERRE RIVER

Note: Stratigraphic thicknesses are based on measured attitudes of bedding, as listed below, with appropriate interpolations. Attitudes are strike and dip. UTM coordinates are NAD83. Samples are listed in order from stratigraphic top to bottom. Most samples consist of chips at 30-cm intervals. * Denotes a grab sample.
Abbreviations: WW - Waterways Formation, Cal - Calumet Member

<table>
<thead>
<tr>
<th>Interval</th>
<th>Formation</th>
<th>Strat.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR2004-01 (UTM 462533E, 6367556N)</td>
<td>WW-Cal</td>
<td>4*</td>
<td>Clay - Shale, recessive, very poor outcrop</td>
</tr>
<tr>
<td>19314</td>
<td>WW-Cal</td>
<td>0.5</td>
<td>Fossiliferous Limestone, light-grey-buff weathered, micritic matrix, coarse-grained, abundant bivalves, massive, good reaction to HCl, flat lying beds</td>
</tr>
</tbody>
</table>

Abbreviations: WW - Waterways Formation, Cal - Calumet Member
APPENDIX 3: STATEMENT OF QUALIFICATIONS

The field work described in this report was supervised by Jody Dahrouge.

J.R. Dahrouge is a geological consultant with Dahrouge Geological Consulting Ltd. based in Edmonton, Alberta. He obtained degrees in geology and computing science from the University of Alberta, Edmonton in 1988 and 1994, respectively. He has more than 10 years of experience in mineral exploration. He is a member of the Canadian Institute of Mining and Metallurgy and is registered as P. Geol. with the Association of Professional Engineers, Geologists, and Geophysicists of Alberta.

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