NEB Operation Identifier No. 9237-C131-003E
Yukon Oil and Gas Division License #1103

Report on Geological Field Operation
July 7-15, 2001
Yukon and Northwest Territories Border
Liard Plateau

Confidential

Canadian Forest Oil Ltd.

Report by: James R. Taylor (Canadian Forest Oil Ltd.)

Date: April 30, 2002

Field photographs are submitted on two compact discs (CD I and II).
Report submitted as hard copy and on IBM compatible disk as a fixed format ASCII coded file as well as a Microsoft Word document (CD III).

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LIST OF COMPACT DISCS (CD) (see the compact discs in the pocket in the back of this report)

CD I 2001 Field Photographs

CD II 2001 Field Photographs

CD III This report as a fixed format ASC II coded file and as a Microsoft Word document file. Figure 1 is a .jpg and a .tif file.

Introduction

A Canadian Forest Oil Ltd. geological field party was based at Fort Liard, Northwest Territories (NWT) from July 7th to 15th, 2001. The field party members were Jim Taylor (Canadian Forest Oil Ltd., Party Chief), Todd Burlingame (Kee Scarp Ltd, Yellowknife, Assistant Party Chief)), Chuck Walker (Kaska First Nations, Guide and Assistant) and Andrew Kocstachin (First Nations, Consultant, Expeditor).

The geological field party examined surface exposures along the Northwest Territories – Yukon border. The purpose of the survey was to prospect for oil and gas. The geological survey was undertaken by Canadian Forest Oil Ltd, Calgary in support of their ongoing hydrocarbon exploration efforts in the areas to the east. The survey was licensed by the National Energy Board (#9237-C131-003E) and the Yukon Oil and Gas Division (#1103).

The closest effected communities were Fort Liard NWT and Watson Lake, Yukon. The Acho Dene Koe (ADK) community at Fort Liard was kept informed about the status of the project through Chief Judy Kotchea and Band Business Manager Shane Parrish. The Kaska First Nation was kept informed about the status of the project through their Oil and Gas Manager Allen Edzerza. The local outfitters and trap line holders in both Territories were contacted prior to initiating the program. The Mackenzie Valley Land and Water Board, Yellowknife and the Land Use Department of Indian and Northern Affaires, Whitehorse were informed about the project and correspondence was received from both agencies waiving any additional permitting requirements.

The geology crew was lodged at the Liard Valley Motel, Fort Liard. Catering was done through the Fort Liard camp of Beaver Enterprises. Deh Cho Helicopters subsidiary of Vancouver Island Helicopters, Fort Liard base, supplied helicopter services. Deh Cho Air provided fixed wing services for placement of a fuel cache at the Larson Creek, Yukon airport.

Index and Locality Map

Figure 1 shows the outcrop localities visited in 2001. These locations are grouped into five areas. Sample numbers are keyed to these location numbers. Area and sample locations are grouped as follows:

1. Last Mountain (60^0 50' N latitude, 126^0 30' W longitude)
2. Dendale (60^0 52' N latitude, 124^0 52' W longitude)
3. Jackfish (60^0 55' N latitude, 124^0 28' W longitude)
4. La Biche Range (60^0 27' N latitude, 124^0 25' W longitude)
5. Poole Creek (60^0 30' N latitude, 124^0 39' W longitude)

Existing Geological Survey of Canada Maps 11-1968 (95D) Coal River and 1380A (95C) La Biche River were used to guide sampling and structural observations.

Statistical Summary

Mobilization Date:
Friday, July 5, 2001

Demobilization Date:
Sunday, July 15, 2001

Significant Dates:
Drive to Fort Liard: July 5th, 2001
Helicopter operations: July 6 to July 15th (inclusive)
Helicopter operations were suspended at 8:00 am July 15th because of unsafe flying conditions and the operation was demobilized at that time. Overall 25 hours of helicopter time were billed
Poor weather day: July 7th, 14th and 15th, 2001
Closed operations: July 15th, 2001
Shipped Samples: July 15th, 2001to Yellowknife; July 18th Yellowknife to Calgary

Technical and non-technical personnel

4 Canadian citizens (two First Nations members). Flight crew was additional.

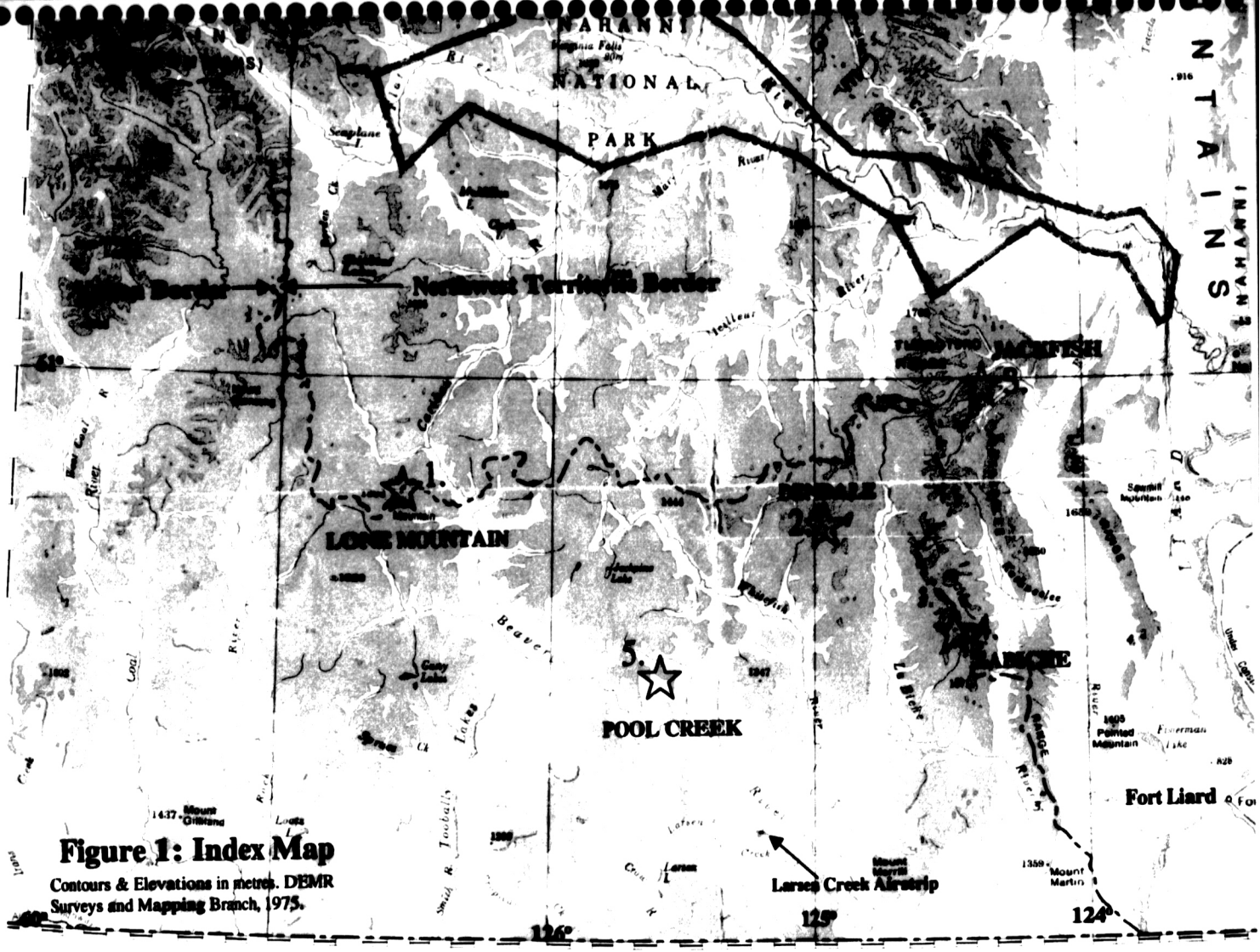

Figure 1: Index Map

Contours & Elevations in metres. DEMR Surveys and Mapping Branch, 1975.

Productivity Data

Total samples taken:
42 samples
Lost time:
Three days: July 7th, 14th and 15th, 2001
Daily Production:
Sampled on an average of six locations per day
Weather conditions:
Brisk, sunny with high winds on July 7th, several days were worked in the rain. Sunny, clear, warm, light winds on July 13th
Down Time factors:
Low ceiling on three days of program.

Description of Field procedures

Sample sites were all accessed by helicopter. An Astar helicopter was kept with the field party through out the program. Fuel was cached at the Larson Creek , Yukon airport. No fuel was cached at any remote sites.

Rock samples and structural measurements were taken at each location. Sample site locations and rock descriptions and other data were recorded in field notebooks. Samples were collected in gunnysacks and shipped to Calgary via Yellowknife. The samples were inspected in the Canadian Forest Oil offices in Calgary and stored at a warehouse facility.

31 shales samples were analyzed for total organic carbon (TOC), maximum burial and maximum burial temperature (TMAX).

Companion samples were analyzed for age determination using faunal identification of conodonts. Where present, macrofossils were also sampled for examination. Samples were collected in lined bags and labeled for identification.

Summary operational objectives and ties to regional geology

The field objectives were to identify and sample potential source rocks in the Lower Mattson and Besa River Formations and to field check unusual structures and structural closures.

The small scale of this field program made it necessary to ground truth previous work by re-sampling a limited number of select locations without duplicating the excellent previous work.

Sample descriptions

Samples chosen for various types of laboratory analysis are tabulated in Table 1.

Results of geochemical analysis and other analysis

See Appendix 1

Results of micro-paleontology as it relates to biostratigraphic correlations

See Appendix 2

Photographs

See Appendix 3 for an index and photograph captions. The field photographs are on two compact discs in the pocket found at the back of this report.

Scientific Research Report

A *nontechnical* report on the field party activities is a requirement for scientific research licenses. For completeness this is included in this report as Appendix 4. This report was required under Northwest Territories Scientists Act, Scientific Research License # 13245N File # 12 404 578 and Yukon Scientists and Explorers Act (1958) License # 01-42S&E. A copy of the Scientific Research report will be sent to the appropriate authorities.

TABLE 1.

Canadian Forest Oil 2001 NWT-YT geolog/ program
July, 2001

Samples foe analysis

Sample number F01-	Latitude, Longitude by GPS	Station number
1, Last Mountain (NWT-YT)		
S-1-6	N 60° 48.2' W 126° 32.4'	1-6
2. Dendale (YT)		
S-2-1	N 60° 46.0' W 124° 54.5'	2-1
S-2-2	N 60° 45.8' W 124° 54.5'	2-2
S-2-3	N 60° 45.2' W 124° 55.1'	2-3
S-2-4	N 60° 44.7' W 124° 54.6'	2-4
S-2-5	N 60° 53.9' W 124° 54.2'	2-6
S-2-6	N 60° 53.1' W 124° 53.0'	2-7
S-2-7	N 60° 43.8' W 124° 53.6'	2-9
S-2-8	N 60° 43.8' W 124° 53.8'	2-10
3. Jackfish (NWT)		
S-3-1	N 60° 50.2' W 124° 22.4'	3-1
S-3-2	N 60° 52.7' W 124° 28.0'	3-2
S-3-3	N 60° 56.8' W 124° 34.8'	3-6
S-3-4	N 60° 54.6' W 124° 22.4'	3-7
S-3-5	N 60° 55.6' W 124° 22.0'	3-8
S-3-6	N 60° 53.0' W 124° 21.2'	3-9
S-3-7	N 60° 53.3' W 124° 25.2'	3-10
S-3-8	N 60° 52.4' W 124° 21.8'	3-11
S-3-9	N 60° 51.4' W 124° 27.0'	3-12
S-3-10	N 60° 51.1' W 124° 24.6'	3-13
S-3-11	N 60° 50.9' W 124° 33.0'	3-14
4. LaBiche (NWT-YT)		
S-4-1	N 60° 40.6' W 124° 36.7'	4-1
S-4-2	N 60° 39.4' W 124° 35.7'	4-2
S-4-4	N 60° 39.8' W 124° 34.5'	4-4
S-4-5	N 60° 39.9' W 124° 31.1'	4-5
S-4-6	N 60° 40.1' W 124° 32.1'	4-6
S-4-7	N 60° 39.3' W 124° 32.0'	4-7
S-4-8	N 60° 38.8' W 124° 33.3'	4-8
S-4-9	N 60° 37.5' W 124° 31.0'	4-9
S-4-10	N 60° 37.6' W 124° 29.0'	4-10
S-4-11	N 60° 32.7' W 124° 25.3'	4-12
S-4-12	N 60° 20.5' W 124° 28.0'	4-13

Total 31 Samples. S = source rock samples, companion samples lettered C = conodont samples

Appendix 1.

Geochemistry Study

August 14, 2001
Confidential

Daniel M. Jarvie
Humble Geochemical Services
P.O. Box 789, Humble, Texas TX 77347
218 Higgins Street, Humble, Texas
TX 77338, USA

Liard Plateau Project, Northern Canada

Dear Daniel:

I have enclosed rock samples for source rock analyses from Northern Canada. A Humble Geochemical Services Sample Analysis Request Form is attached.

The surface rock samples, for the most part, are taken from Black Shales in the Upper Devonian – Mississippian section in the Liard Plateau which straddles the border between the Northwest Territories and the Yukon Territory. The Formation name is the Besa River although some samples come from the section immediately above the Besa River and can be identified as part of the Mattson Formation.

As previously discussed, there are some limitations on the amount of source rock data obtainable from over mature shales. Certain follow up tests involving vitrinite reflectance, pyrolysis and thermal extraction may be discretionary depending on initial testing. Please advise me on this as testing proceeds. I would appreciate being informed of costs in $US as the project progresses. Please verify costs before the project proceeds.

Results are expected according to the timing shown in your listing of *Standard Delivery Times*. Surcharges for rush jobs are not anticipated at this time.

Also be aware that all test results will be forwarded to the National Energy Board, Calgary, and that they place the information in the public domain in 5 years. The NEB reference is 9137-C131-003E. Results will also be forwarded to the Oil and Gas Branch, Yukon Government at Whitehorse. The Yukon reference

number is 1103. Please show both numbers on reports to simplify data distribution.

In 1999 I had some delays in releasing the rock shipment from US Customs at Houston. I will send the shipment by Express and describe them as "Rocks for Analysis" and hope that the shipment is not seized.

Yours sincerely,
Canadian Forest Oil Ltd.

James R. (Jim) Taylor, P. Geol.
Telephone (403) 292-8049, Fax (403) 292-8169, e-mail: jrtaylor@cfol.ab.ca

Attachments:
Sample Analysis Request Form
Sample Log

Enclosures: Rock samples in cloth bags

Canadian Forest Oil 2001 NWT-YT geology program
July, 2001

Sample log

Sample number F01-	Station number
1, Last Mountain (NWT-YT)	
S-1-6	1-6
2. Dendale (YT)	
S-2-1	2-1
S-2-2	2-2
S-2-3	2-3
S-2-4	2-4
S-2-5	2-6
S-2-6	2-7
S-2-7	2-8
S-2-8	2-10
3. Jackfish (NWT)	
S-3-1	3-1
S-3-2	3-2
S-3-3	3-6
S-3-4	3-7
S-3-5	3-8
S-3-6	3-9
S-3-7	3-10
S-3-8	3-11
S-3-9	3-12
S-3-10	3-13
S-3-11	3-14
4. LaBiche (NWT-YT)	
S-4-1	4-1
S-4-2	4-2
S-4-4	4-4
S-4-5	4-5
S-4-6	4-6
S-4-7	4-7
S-4-8	4-8
S-4-9	4-9
S-4-10	4-10
S-4-11	4-12
S-4-12	4-13

Total 31 Samples

Canadian Forest Oil Ltd.

HGS No.	Sample ID	Station No.	Location	TOC	Notes Checks
H01-1389-037275	F01-S-1-6	1-6	Last Mountain (NWT-YT)	3.89	
H01-1389-037276	F01-S-2-1	2-1	Dendale (YT)	3.70	
H01-1389-037277	F01-S-2-2	2-2	Dendale (YT)	3.85	
H01-1389-037278	F01-S-2-3	2-3	Dendale (YT)	3.82	
H01-1389-037279	F01-S-2-4	2-4	Dendale (YT)	3.66	
H01-1389-037280	F01-S-2-5	2-6	Dendale (YT)	3.56	
H01-1389-037281	F01-S-2-6	2-7	Dendale (YT)	3.78	
H01-1389-037282	F01-S-2-7	2-8	Dendale (YT)	4.01	
H01-1389-037283	F01-S-2-8	2-10	Dendale (YT)	4.35	
H01-1389-037284	F01-S-3-1	3-1	Jackfish (NWT)	3.17	
H01-1389-037285	F01-S-3-2	3-2	Jackfish (NWT)	1.89	c
H01-1389-037286	F01-S-3-3	3-6	Jackfish (NWT)	1.20	
H01-1389-037287	F01-S-3-4	3-7	Jackfish (NWT)	4.78	
H01-1389-037288	F01-S-3-5	3-8	Jackfish (NWT)	2.25	
H01-1389-037289	F01-S-3-6	3-9	Jackfish (NWT)	4.63	
H01-1389-037290	F01-S-3-7	3-10	Jackfish (NWT)	2.23	
H01-1389-037291	F01-S-3-8	3-11	Jackfish (NWT)	0.58	c
H01-1389-037292	F01-S-3-9	3-12	Jackfish (NWT)	3.11	
H01-1389-037293	F01-S-3-10	3-13	Jackfish (NWT)	1.29	c
H01-1389-037294	F01-S-3-11	3-14	Jackfish (NWT)	4.41	
H01-1389-037295	F01-S-4-1	4-1	LaBiche (NWT-YT)	2.92	
H01-1389-037296	F01-S-4-2	4-2	LaBiche (NWT-YT)	2.40	
H01-1389-037297	F01-S-4-4	4-4	LaBiche (NWT-YT)	3.67	
H01-1389-037298	F01-S-4-5	4-5	LaBiche (NWT-YT)	5.78	
H01-1389-037299	F01-S-4-6	4-6	LaBiche (NWT-YT)	2.47	
H01-1389-037300	F01-S-4-7	4-7	LaBiche (NWT-YT)	2.97	c
H01-1389-037301	F01-S-4-8	4-8	LaBiche (NWT-YT)	3.51	
H01-1389-037302	F01-S-4-9	4-9	LaBiche (NWT-YT)	3.28	
H01-1389-037303	F01-S-4-10	4-10	LaBiche (NWT-YT)	1.92	
H01-1389-037304	F01-S-4-11	4-12	LaBiche (NWT-YT)	2.18	
H01-1389-037305	F01-S-4-12	4-13	LaBiche (NWT-YT)	1.97	

TOC = weight percent organic carbon in rock

Appendix 2.

Conodont Study

e-mail
James Taylor
From: James Taylor
Sent: August 14, 2001 11:18 AM
To: 'crbarnes@uvic.ca'
Subject: 2001 Field samples
Chris

I want to check with you about running some more samples for conodonts as we have done for the last two years. I collected 31 samples of black shales from the Upper Devonian - Lower Mississippian age Besa River Formation along the Yukon - Northwest Territories border in July 2001. Please advise with a quote on the cost. I will be on vacation from August 23 to September 5, 2001.

Looking forward to hearing from you.

Kindest Regards,
Jim

Jim Taylor
Canadian Forest Oil Ltd.
Suite 600 - 800 - 6th Avenue SW
Calgary, Alberta
Canada T2P 3G3

e-mail
James Taylor
From: Chris Barnes [crbarnes@uvic.ca]
Sent: August 31, 2001 9:49 AM
To: James Taylor
Subject: Re: 2001 Field samples
Jim:

I too was on vacation when your email arrived.

We can process the black shale samples as noted below. However, black shales can be the most difficult lithology (other than orthoquartzite) to breakdown and to recover conodonts. If they are mildly calcareous, we will try the acetic acid techniques (which worked with those form the Road River Gp.), but if that fails then a variety of other techniques that are more time consuming and labour-intensive need to be employed. The heavy mineral separation with sodium polytunstate is also additionally expensive, since the high organic matter released tends to contaminate and discolour the heavy liquid and recovery for re-use is usually impractical.

Given these comments, the costs will be the same as before if we successfully use acetic acid; if additional/alternative methods are required then the processing fee per sample will be double the earlier quoted figure. The cost for identification and report preparation will be the same as before.

With best wishes,
Chris

October 1, 2001

2001 Conodont Study: University of Victoria -Canadian Forest Oil

CONFIDENTIAL

Centre for Earth and Ocean Research (CEOR)
University of Victoria
Petch Building, Room 169
P.O. Box 3055
Victoria, BC, Canada
V8W 3P6

Attention: Dr. Chris Barnes

Dear Chris:

Subject: 2001 Information package

The paperwork for the 'Conodont Study: University of Victoria -Canadian Forest Oil' from last year and 1999 is applicable to the 2001 study. The only change is to extend the confidentiality period on the 2001 study to July 30, 2007 to coincide with the expiry of confidentiality for the National Energy Board Report on the 2001 Field Party Report. Information from your report will also be supplied on a confidential basis to the Yukon Oil and Gas Branch in Whitehorse. Enclosed, for your information, and guidance in completing the report, is a sample list with notes on locations. All ages and correlations shown are tentative pending results of the conodont analysis.

The surface rock samples, for the most part, are taken from Black Shales in the Upper Devonian – Mississippian section in the Liard Plateau which straddles the border between the Northwest Territories and the Yukon Territory. They are sampled from the exposed cores of several anticlines. The Formation name is the Besa River (a catch-all for Upper Devonian through Mississippian section in this area) although some samples come from the section immediately above the Besa River and can be identified as part of the Carboniferous Mattson Formation.

I was personally involved in collecting many of the samples. It was indeed a treat to be back after being prevented , by medical reasons, from being in the field in the 2000 season. I was called away for a few days to a high level corporate meeting in Calgary in the middle of the survey. Todd Burlingame of Yellowknife carried on the work with his usual skill and enthusiasm, while I was absent from the party. Chuck Walker a very able representative from the Kaska First Nation assisted us in the field. Outcrop sampling in 2001 was done on the basis of and correlated to already described, Geologic Survey of Canada outcrops shown on maps mainly using GSC map 1380A NTS 95C LaBiche River.

Please call or e-mail if further information is needed.

I quote below from your e-mail dated August 31, 2001 including the shipping and contact information.

"We can process the black shale samples as noted below. However, black shales can be the most difficult lithology (other than orthoquartzite) to breakdown and to recover conodonts. If they are mildly calcareous, we will try the acetic acid techniques (which worked with those form the Road River Gp.), but if that fails then a variety of other techniques that are more time consuming and labour-intensive need to be employed. The heavy mineral separation with sodium polytunstate is also additionally expensive, since the high organic matter released tends to contaminate and discolour the heavy liquid and recovery for re-use is usually impractical.

Given these comments, the costs will be the same as before if we successfully use acetic acid; if additional/alternative methods are required then the processing fee per sample will be double the earlier quoted figure. The cost for identification and report preparation will be the same as before."

"Christopher R. Barnes, Director and Professor, School for Earth and Ocean Sciences (SEOS) P.O. Box 3055 (for courier: change this line to Rm 168, Petch Bldg.,3800 Finnerty Rd.) University of Victoria, Victoria, British Columbia 8W 3P6, Canada.Phone: (250) 721-6120 (SEOS office); direct: (250) 472-4345 (Director's office) or 250-721-8847 (research office); Fax:(250) 721-6200; web: http://www.uvic.ca/se.se"

Indeed the black shales have high total organic carbon. A set of companion samples have been analyzed for TOC %. I have included a copy of the spread sheet with the confidential analysis results in case they are useful to you. This TOC work was done by Humble Geochemical Services of Humble, Texas.

Regards,

Canadian Forest Oil Ltd.

James R. (Jim) Taylor, P. Geol.
Telephone (403) 292-8049, Fax (403) 292-8169, e-mail: jrtaylor@cfol.ab.ca

Enclosures: Two bags, in plastic shipping containers of rock samples.

Canadian Forest Oil 2001 NWT-YT geology program
July, 2001

Sample log

Sample number F01-	Station number
1, Last Mountain (NWT-YT)	
C-1-6	1-6
2. Dendale (YT)	
C-2-1	2-1
C-2-2	2-2
C-2-3	2-3
C-2-4	2-4
C-2-5	2-6
C-2-6	2-7
C-2-7	2-8
C-2-8	2-10
3. Jackfish (NWT)	
C-3-1	3-1
C-3-2	3-2
C-3-3	3-6
C-3-4	3-7
C-3-5	3-8
C-3-6	3-9
C-3-7	3-10
C-3-8	3-11
C-3-9	3-12
C-3-10	3-13
C-3-11	3-14
4. LaBiche (NWT-YT)	
C-4-1	4-1
C-4-2	4-2
C-4-4	4-4
C-4-5	4-5
C-4-6	4-6
C-4-7	4-7
C-4-8	4-8
C-4-9	4-9
C-4-10	4-10
C-4-11	4-12
C-4-12	4-13

Total 31 Samples

e-mail
From: Chris Barnes [crbarnes@uvic.ca]
Sent: Tuesday, February 19, 2002 1:32 AM
To: James Taylor
Subject: 2001 Field samples: Final Report

Jim:

We continued to process and pick the last few samples, but as with the others that I noted in a recent email, they too were barren of conodonts. As I noted in my email (below) of 31 August, 2001, black shales are difficult to process and this proved to be the case in all 31 of the samples that you sent me, which are detailed in the attachment. I regret that we were unable to recover any conodonts and provide some biostratigraphic control: limestones are always the preferred lithology for securing conodonts, when available.

I will arrange for the invoice to be issues by CEOR in the near future.

With kind regards,
Chris

P.S. If you wish this report to be also sent as a hard copy and on letterhead, please let me know.

To: James Taylor
Canadian Forest Oil Ltd.
Suite 600 - 800 - 6th Avenue SW
Calgary, Alberta
Canada T2P 3G3
Date: February 15, 2002
From: Christopher R. Barnes
Centre for Earth and Ocean Research,
University of Victoria, P.O. Box 3055,
Victoria, BC V8W 3P6
250-721-6200; crbarnes@uvic.ca

Description of Work: Samples F01-S-4-8 to F01-S-4-12 were processed using several changes of acetic acid followed by heavy liquid separation of the insoluble residue using sodium polytungstate. Breakdown was minimal for most samples and little residue was obtained and no fossils were recovered after picking through the residues under a binocular microscope. All samples were then processed further using Quaternary O, washed, sieved, and dried. Residues were magnetically separated if the size of the residue warranted, split (as shown in table) and picked. No conodonts were found in any of the samples.

Total Number of Samples: 31

Sample number	Magnetic separation	Split	Vials of residue	Sample number	Magnetic separation	Split	Vials of residue
F01-S-1-6	No	No	1	F01-S-3-8*	Yes	No	1
F01-S-2-1	Yes	No	1	F01-S-3-9	Yes	¼	4
F01-S-2-2	Yes	No	1	F01-S-3-10	No	¼	1
F01-S-2-3	Yes	No	1	F01-S-3-11	No	No	1
F01-S-2-4	Yes	No	1	F01-S-4-1	Yes	1/8	2
F01-S-2-5	Yes	No	1	F01-S-4-2	Yes	¼	2
F01-S-2-6	No	No	1	F01-S-4-4	No	¼	1
F01-S-2-7	Yes	No	1	F01-S-4-5	No	1/8	2
F01-S-2-8	Yes	No	1	F01-S-4-6	Yes	1/8	3
F01-S-3-1	No	1/8	2	F01-S-4-7	No	No	1
F01-S-3-2	Yes	1/8	2	F01-S-4-8	Yes	No	1
F01-S-3-3	No	No	1	F01-S-4-9	Yes	½	1
F01-S-3-4	Yes	No	1	F01-S-4-10	No	No	1
F01-S-3-5	No	No	1	F01-S-4-11	No	No	1
F01-S-3-6	No	½	1	F01-S-4-12	Yes	¼	2
F01-S-3-7	No	1/8	2				

Special Notes:
*For sample F01-S-3-8, a few crinoid ossicles were found in larger fractions and sponge spicules were seen in the smaller fractions – neither type was picked.

Appendix 3.

Field Photograph Index and Captions

Field Photographs
(see the compact disc in the pocket in the back of this report)

PHOTO INDEX WITH CAPTIONS
Canadian Forest Oil Ltd. Yukon NWT Border FIELD PROGRAM
2001

Photographs (Jim Taylor)
Roll # - Frame #

1-1 Amoco South Pointed Mountain L-68 well surface lease and road (NWT) looking SW. The Kotaneelee Gas Field (Yukon) is in the background.
1-2 As above with a close up of L-68 well surface lease partially ingrown with bushes. The Kotaneelee Range (Yukon) is in the background.
1-3 As above but closer to L-68 well lease. Kotaneelee River in near background.
1-4 Babiche thrusted anticlinal structure looking south. Note the steeply dipping west limb on the right. (Yukon)
1-5 Last Mountain (Area 1) views of complex structure from the air (Yukon and NWT). The flight path follows the SE limb of the Caribou Syncline NE and the NW limb from the NE to the SW. Photo 1-5 looks down the plunge of an F2 fold on the planar SE limb of the Caribou Syncline. The Formation is the interbedded sandstones and shales of the Permo-Carboniferous Mattson Formation.
1-6 As above
1-7 As above
1-8 As above
1-9 As above
1-10 As above
1-11 As above
1-12 As above
1-13 As above
1-14 As above
1-15 As above
1-16 As above
1-17 As above
1-18 As above
1-19 As above
1-20 As above
1-21 As above
1-22 Station 1-1 Last Mountain. Lichen-covered outcrop of Permo-Carboniferous Mattson Formation. A quarter to scale.
1-23 Station 1-2. Mattson outcrop. Fine-grained quartzose sandstone stands in relief while shalier interbeds weather out.
1-24 Slickenslides at Station1-2. Chuck Walker, Kaska representative as scale.
1-25 Slickensides. Notebook for scale.

1-26 As above. Notebook for scale.
1-27 As above. Fault zone in Mattson Formation. Geologist Todd Burlingame for scale.
1-28 As above. Lichen covered outcrop of bedding and jointing in Mattson Formation. Pencil on right for scale.

Roll 2

2-1 Mattson outcrop between Stations 1-2 and 1-3. Fine-grained quartzose sandstone stands in relief while shalier interbeds weather out.
2-2 As above. Massive bedding made it hard to verify bedding planes to measure bed orientation. Chuck Walker for scale.
2-3 SW view across the Caribou Syncline west from peak at Station 1-3.
2-4 As above
2-5 As above
2-6 Interbedded sandstone and shale of the Mattson Formation south of Station 1-3.
2-7 As above
2-8 Mattson outcrop Station 1-5. Chuck Walker measuring beddiong attitude.
2-9 View south of Station 1-5.
2-10 Sandstone and shale of the Mattson Formation at Station 1-6. Geological hammer for scale.
2-11 As above. Geologist Todd Burlingame for scale.
2-12 View north from Station 1-6
2-13 View south from Station 1-6
2-14 View north from and including Station 1-6.
2-15 Views shot from a short helicopter tour of the SW limb of the Caribou Syncline south of Station 1-6. The flight path was following the NW side of the limb and circling back to view the SE side of the limb.
2-16 As above
2-17 As above
2-18 As above
2-19 As above
2-20 As above
2-21 As above
2-22 As above
2-23 As above
2-24 As above
2-25 As above
2-26 As above
2-27 As above

Roll 3

3-1 View SW from Station 1-8.
3-2 View NW from Station 1-8.
3-3 View NE from just north of Station 8.
3-4 Refueling the Astar helicopter at Larson Airstrip. VIH pilot Steve Stanley.
3-5 As above.
3-6 Confluence of Liard and Pettitot Rivers. Fort Liard hamlet and airport in background..
3-7 As above.
3-8 As above
3-9 Geological Survey Crew, from left to right: Jim Taylor, Todd Burlingame, Chuck Walker
3-10 As above. Vertical
3-11 Mattson Formation ridge Station 1-9. Chuck Walker for scale
3-12 Station 10. Note that particular types and colours of vegetation follow bedding. Some prefer the shale-rich beds, others the sandstone-rich beds.
3-13 As above
3-14 As above
3-15 As above
3-16 As above
3-17 West to east panorama towards the north along the west ridge of the Caribou Syncline in the rain (photos 3-11 through 3-24).
3-18 continued
3-19 continued
3-20 continued
3-21 continued
3-22 continued
3-23 continued
3-24 continued
3-25 Station 1-12 looking north with the Astar helicopter in the distance.
3-26 East to west panorama (photos 3-26 through 3-27) of the limb syncline south of Station 12.
3-27 continued

Roll 4

4-1 Pool Creel (Area 5). Vertical outcrop faces along the east bank of Pool Creek. This is probably dolomite of the Middle Devonian.
4-2 As above
4-3 As above
4-4 As above
4-5 As above
4-6 As above
4-7 As above. Vertical.
4-8 As above. Cave.
4-9 As above

4-10 As above
4-11 Sandstone outcrop NW of Poole Creek. Station 5-1, Yukon
4-12 Astar helicopter heading up Beaver River Valley west.
4-13 Sandstone outcrop NW of Poole Creek. Station 5-1
4-14 Views of Sandstone outcrop at Station 5-2.
4-15 As above
4-16 As above
4-17 As above. Backpack for scale.
4-18 As above. Vertical
4-19 As above. Close-spaced joints. Hammer for scale.
4-20 View west up the valley of the Beaver River, Yukon Territory.
4-21 Views of Sandstone outcrop at Station 5-2.
4-22 As Above
4-23 Dendale (Area 2) Besa River black shale outcrop at Station 2-1. Sample bag.
4-24 Besa River black shale outcrop at Station 2-2. Geologist Todd Burlingame as scale
4-25 Besa River black shale outcrop at Station 2-2
4-26 Besa River black shale outcrop at Station 2-2
4-27 Besa River black shale outcrop at Station 2-3
4-28 Besa River black shale outcrop at Station 2-3. Vertical.

5-1 Jackfish (Area 3) Station 3-1. Surface section Mississippian black shale. Hammer for scale
5-2 Jackfish (Area 3) Station 3-1. Surface section Mississippian. Vertical.
5-3 As above. View southward from Station 3-1. Station 3-1 in foreground.. Vertical.
5-4 As above. Station 3-1.
5-5 As above.
5-6 View westward from Station 3-1.
5-7 Station 3-1. Todd Burlingame.
5-8 As above. Chuck Walker.
5-9 Station 3-1, View northward.
5-10 As above.
5-11 Photo Fort Liard at confluence of Pettitot.
5-12 Fort Liard with Mount Cody and Liard Range viewed from the south.
5-13 Fixed-wing aircraft at Fort Liard Airport. A Beech Kingair at left. Islander at right.
5-14 Views south of Fort Liard.
5-15 As above. Pipeline. Vertical.
5-16 As above
5-17 As above
5-18 As above
5-19 As above
5-20 As above
5-21 As above

5-22 As above
5-23 As above
5-24 Fort Liard From the south. Liard Range in background. Pettitot River in foreground
5-25 As above.
5-26 As above. Fort Liard from the south.
5-27 As above

6-1 Pointed Mountain with Fisherman Lake in the foreground.
6-2 Kotaneelee River gap as it crosses the Kotaneelee Anticline
6-3 Sandstone at Station 2-9. Sandstone.
6-4 As above
6-5 Sandstone and Shale at Station 2-10.
6-6 As abovr
6-7 South view of Station 2-10
6-8 View from across Tika Creek from Station 2-10.
6-9 Station 2-10
6-10 As above
6-11 As above close-up of bedding.
6-12 Station 2-12. Interbedded grey fine-grained sandstone and black shale.
6-13 As above
6-14 As above
6-15 As above. Helicopter.
6-16 As above
6-17 As above
6-18 Station 2-12
6-19 As above
6-20 Station 2-13
6-21 View from the air travelling north to the northern closure of the Dendale Anticline
6-22 As above
6-23 As above
6-24 As above
6-25 As above
6-26 View if north end of LaBiche West Structure, note a minor valley where the controlling LaBiche Thrust is traced.
6-27 Babiche structure steel dips looking north at La Biche River gap.

7-1 -
7-2 Outcrop along the LaBiche River in the core of the Babiche structure. View looking west upstream.
7-3 Babiche Anticline. Station 4-13. Core of Besa River black shale. Minor siltstone. Todd Burlingame for scale.
7-4 Station 4-13. Helicopter in gravel-boulder bar of LaBiche River.
7-5 Station 4-3. Siltstone in black shale. Pencil for scale.
7-6 Station 4-3. Besa River Shale.

7-7 As above. Vertical.
7-8 Labiche River Gap series of photo of south facing river cut east to west. Note abrupt change in bed attitude at southern continuation of the Labiche Thrust.
7-9 As above. Steeply westward dipping Mattson in middle ground. Shallow dipping Mattson in foreground. LaBiche Thrust separates the two attitudes. View from west. LaBiche River in lower part of photo.
7-10 As above
7-11 As above
7-12 As above
7-13 As above
7-14 As above
7-15 As above
7-16 As above
7-17 As above
7-18 As above
7-19 As above
7-20 As above
7-21 As above
7-22 As above
7-23 As above
7-24 As above
7-25 As above
7-26 As above
7-27 West limb of the West Labiche Structure looking north.

8-1 West limb of the West Labiche Structure looking north
8-2 Looking west at flat lying Mattson Formation.
8-3 Panorama (photos 8-3 through 8-8)
8-4 As above
8-5 As above
8-6 As above
8-7 As above
8-8 Similar to above but taken from a bit further north.
8-9 Station 4-16 looking north along gently dipping west limb of the West Labiche Structure and the steeply west dipping limb of the LaBiche Anticline.
8-10 As above
8-11 As above
8-12 As above
8-13 The LaBiche Thrust continuation south, west of the west limb of the Babiche Anticline.
8-14 As above
8-15 As above
8-16 As above
8-17 As above

8-18 As above
8-19 As above
8-20 As above
8-21 As above
8-22 As above
8-23 Station 4-17. Views south along the LaBiche Thrust fault along steeply dipping west limb of the Babiche Anticline.
8-24 As above
8-25 As above
8-26 Station 4-17. Looking north. Astar helicopter.
8-27 As above bot closer view of notch.

Photo log of Todd Burlingame

Roll 1

Photo	Description
1-1	L-68 well site (Pointed Mountain)
1-2, 1-3	Caribou Syncline
1-4	Station 1-2
1-5	Station 1-2, Vesicles
1-6	100 Meters south of Station 1-3 looking southwest
1-7	Jim and Chuck at Station 1-1
1-8 to 1-10	South of Station 1-12 looking south. Panarama from west to east looking across syncline
1-11	Station 3-2 west view
1-12, 1-13	Northcor well
1-14	Sample F01-S-3-2
1-15	Station 3-2 looking west
1-16	Heli Portable seismic line
1-17	Station 3-3 contact
1-18	Station 3-3 East view
1-19 to 1-21	Station 3-4
1-22 to 1-24	Station 3-5
1-25	Station 3-6 North view
1-26	Station 3-5 south view

Canadian Forest Oil 2001 NWT geology program
July, 2001

Photo log of Todd Burlingame
Roll 2

Photo	Description
2-1	Station 3-6 looking South
2-2	Station 3-7 looking Northeast
2-3	Station 3-7 looking Southwest
2-4	Station 3-7 looking east
2-5	Station 3-8 looking south
2-6	Station 3-10 looking north
2-7	Station 3-11 looking east
2-8	Helicopter shot
2-9	Station 3-13 Besa River shales
2-10 to 2-12	North view of west Etanda thrust
2-13	Personnel shot
2-14	North end of west Etanda thrust looking south
2-15	Station 3-15 south view
2-16	West Etanda thrust south view
2-17	Station 3-16 south view
2-18, 2-19	Clouds, July 11, '01
2-20	Station 4-1 south view
2-21	Station 4-2 south southeast view
2-22	Station 4-2 north northwest view
2-23	Station 4-3 east view

Canadian Forest Oil 2001 NWT geology program
July, 2001

Photo log of Todd Burlingame
Roll 3

Photo	Description
3-1	Pointed Mountain production facility
3-2	Lease 60°39' 124°35'
3-3	Station 4-1 south east view
3-4 to 3-7	Station 4-7 Panorama north to west
3-8	Personnel
3-9 to 3-10	Station 4-8
3-11	Personnel NNE view
3-12 to 3-15	Panorama SW to SE
3-16	Station 4-10 north view
3-17	Station 4-10 NW view
3-18	Station 4-11 west view
3-19	Station 4-12 SW view
3-20	Station 4-12 north view
3-21	Station 4-12 south view

APPENDIX 4
Report on Activities for Scientific Research Licenses

Report on Activities for Scientific Research Licenses

Northwest Territories Scientists Act, Scientific Research License # 13245N File # 12 404 578
Yukon Scientists and Explorers Act (1958) License # 01-42S&E

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Introduction

An eleven-day, helicopter supported, geological survey along the Yukon - Northwest Territories border was undertaken in 2001. The field crew was based at Fort Liard, Northwest Territories. A Canadian Forest geologist Jim Taylor was accompanied by consultant geologist Todd Burlingame of Kee Scarp Ltd., Yellowknife. Chuck Walker was seconded to the crew by the Kaska First Nations Council at Watson Lake, Yukon. Andrew Koostachin, a First Nations member and a logistics consultant was with the field crew for two days and organized the communications, transportation, lodging and catering arrangements in Fort Liard.

Two days were used by the crew for travel. Three days were lost to poor flying weather. There were no accidents reported and no wildlife incidents occurred.

Geology

Black shales of Devonian and Mississippian age have been uplifted, eroded and exposed in the vicinity of the Yukon-Northwest Territories border and are easy to sample and examine. For this reason the survey emphasis has been placed on examining and sampling the black shales of the Besa River Formation and the black shales interbedded with the sandstone (fine to medium-grained, siliceous, clastic rock) of the transition with the overlying Mattson Formation.

The Besa River Formation includes rocks that span both Upper Devonian and Lower Mississippian age (374 to 320 million years ago). It is impossible to identify the relative geological age of the rocks by strictly examining the lithology (rock type). The Lower Mississippian Flett Formation, a limestone in outcrops and wells east of the area, has shaled out westward and can not be mapped separately from the Besa River Formation black shales. Samples of the Besa River black shales were taken to analyze for conodonts, tiny extinct fossil worm or fish teeth. Conodonts changed their form over time and are used as geologic age indicators by paleontologists.

Dark-colored, organic-rich shales (extremely fine-grained, clastic sedimentary rocks) are believed to act, under the elevated pressures and temperatures of deep burial, as source rocks for the expulsion of hydrocarbons. Companion samples were taken for geochemical analyses to determine their suitability as petroleum source rocks and to interpret their burial history.

The geologic structures, folded and faulted rock, associated with the black shale exposures were also examined, noted and photographed. The attitude of surface structures are clues to the rock geometry at depth

Last Mountain

Outcrop of the Permo-Carboniferous age Mattson Formation sandstone was examined at Last Mountain. Locally the sandstone was uniformly fine-grained, light gray on fresh surfaces, well cemented with silica cement and massive-bedded (Figure 1). In places it was difficult to identify definite bedding surfaces for measuring bedding attitudes.

On a smaller scale the fine-grained sandstone outcropped in linear ridges separated by linear parallel lower relief areas (Figure 2). Where the bedrock could be examined these areas represented shale intervals of thinner-bedded sandstone interbedded with black shale. Several samples of the sandstone were taken and shale samples were bagged for laboratory analysis.

Figure 1. Massive bedded, lichen-covered (gives black and light green coloration to rock exposure) light-gray weathering sandstone. Matteon Formation at Last Mountain. Chuck Walker of the Kaska Nation, shown above, accompanied the field crew. Yukon – Northwest Territories border.

Figure 2. Sandstone stands in relief while intervening lower topography is caused by erosion of the interbedded softer shales. The black color of the sandstone ridges is from lichen growing on the rock. Matteon Formation at Last Mountain. Yukon – Northwest Territories border.

Dendale Lake

The Mississippian-Upper Devonian age black shales outcrop near Dendale Lake and at Tika Creek, south of Dendale. Black shales are characteristic if the Middle part of the Besa River, the lower part is not exposed. The up-section transition into the interbedded sandstones and shales of the Permo-Carboniferous Mattson Formation was examined. Samples were taken.

Figure 3. Transition zone between the Besa River and the overlying Mattson. Interbedded fine-grained sandstone (lighter beds) and black shale (darker beds). Geological hammer provides a scale. Tika Creek section just south of Dendale Lake. Yukon Territory.

Jackfish

A large, dome-like, structure is exposed at Jackfish Creek. Again, as at Dendale the upper part of the Besa River shale section is well exposed. Samples were taken and structural aspects of the area were noted.

Figure 4. The upper Besa River Formation black shale exposure in the Jackfish Dome, north of Etanda Lakes (Northwest Territories). This outcrop was sampled. Northwest Territories.

LaBiche

The course of the LaBiche River flows west to east across the Babiche Mountain Anticline. The upper part of the Besa River Formation black shale is exposed in a river cut in the core of the structure. The black fissile shale was sampled at this location.

Figure 5. Black shales of the upper Bosa River Formation exposed at a river cut in the core of the Mount Bablche Anticline. A mechanical pencil serves as a scale. At the Laliche River in the Yukon Territory.