

Progress Energy Ltd.

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October 21, 1998

Manitoba Energy and Mines
Petroleum and Energy Branch
360 – 1395 Ellice Avenue
Winnipeg, Manitoba
R3G 3P2

ATTENTION: MR. JOHN FOX

Dear Sir:

**RE: APPLICATION FOR APPROVAL TO WATERFLOOD
THE BAKKEN C POOL- BIRDTAIL FIELD**

Progress Energy Ltd., as the working interest owner in the Birdtail Bakken C Pool located in sections 18, 19 and 20-16-27W1M requests approval of a plan to repressurize by water injection the Bakken sands for enhanced oil recovery. An outline of the subject lands is attached as Figure 1. The above noted lands are currently subject to unitization proceedings to address freehold mineral lessor considerations.

The following discussions are set out in accordance with the guidelines for "Application for Approval of Enhanced Oil Recovery" issued by Manitoba Energy and Mines, Petroleum and Energy Branch.

1. (a) **The Results of Reservoir Studies**

- (i) Original oil-in-place underlying the subject lands is estimated at 367.0 $10^3 m^3$ (2309.3 MSTB) based on the reservoir parameters and reserve calculations shown in Table 1.

- (ii) Ultimate oil recovery under continued primary production is expected to be $17.9 \times 10^3 \text{ m}^3$ (112.6 MSTB) representing 4.9% of the original oil-in-place.
- (iii) Repressurization by water injection is expected to result in an incremental recovery of $55.5 \times 10^3 \text{ m}^3$ (349.2 MSTB), 15.1% of OOIP, yielding an ultimate primary plus waterflood recovery of $73.4 \times 10^3 \text{ m}^3$ (461.9 MSTB), 20.0% of OOIP.
- (iv) Performance predictions under primary and waterflood recovery mechanisms have been prepared based upon analogous Bakken waterflood patterns offsetting the area of application. The waterfloods implemented in the nearby Rocanville, Saskatchewan Bakken pools as well as the Kola Bakken A pool and the Daly Bakken D pool provide analogous support for the implementation of a successful waterflood in the application area given similar geology and reservoir parameters.
- (v) The primary reserves and production forecasts were generated from offset reservoir simulation studies, decline analysis and volumetric calculations of the individual wells on the subject lands. Appendix 1 shows the production history of the subject lands. An economic limit of $.5 \text{ m}^3$ (3 BOPD) per well was used. The consolidated primary production forecast is shown in Table 2.
- (vi) The waterflood production forecast was generated based upon analogous waterflood projects and projections of calculated waterflood recovery factors. Oil production under waterflood was forecast to attain a maximum peak production rate of $20 \text{ m}^3/\text{d}$ (126 BOPD). Decline rates during the early stages of the waterflood may be slightly higher than the current base production case, with declines moderating and approaching the base case declines through the mid to late stages of the waterflood forecast (ie 2010 to 2027). It was assumed that water injection would commence by

December, 1998 (subject to waterflood approval) and the economic limit for the project would be 1.0 m³/d (6 BOPD). The primary plus waterflood production forecast is shown in Table 2.

- (vii) The original reservoir fluid in the subject reservoir consisted of undersaturated crude oil with a relative density of 860.8 kg/m³ (32.8° API) based upon an oil analysis conducted on the well 03-20-16-27W1 attached in Appendix 2. A complete reservoir fluid study on fluid recovered from the offset Rocanville well 08-35-15-31 W1M is attached in Appendix 2, and indicates a solution GOR of 0.9 m³ / m³ (5.1 SCF/STB) at a bubble point pressure of 834 kPa (121 psi) and temperature of 32° C (89.6° F).

(viii) **Geology**

The Bakken formation lies at the base of the Mississippian system. It is overlain by the Mississippian Lodgepole formation of the Lower Madison Group, which in this area is a finely crystalline limestone. The Bakken is underlain by the very silty argillaceous dolomites of the Devonian Torquay formation. Both upper and lower contacts represent disconformities with the Bakken formation.

The Bakken is commonly divided into three members: the upper member, a black highly radioactive shale; middle member, a sandstone-siltstone sequence in which the hydrocarbons are trapped and; the lower member, another highly radioactive shale. The lower shale member is generally present except where it was truncated by uplift of the shale underlying Devonian. This is the case in the Birdbear area where the lower Bakken shale is not usually present.

The Bakken sand-siltstone facies represents a series of offshore bars deposited in a shallow marine environment. These were influenced by tidal currents and by adjacent fluvial systems. These tidal channels are fairly sinuous and generally follow a fairly broad flow pattern. The over and underlying shales were deposited in a deeper, quiet water environment.

The best reservoirs are found in high-energy current type of sediment. The reservoir is composed of a very fine grained sand which can be laminated with clay layers. Core analysis shows that the Bakken reservoir contains alternating bands of high and low porosity and permeability sands. In the Birdtail area Bakken sands have porosities and permeabilities ranging from 16-24% and 80-250 md respectively. Net pay for the sand is typically less than 2.5 meters. The silty tidal flat sediments have lower porosities and permeabilities and are not of reservoir quality.

Geological Maps and Cross Sections are included as Appendix 4.

(ix) **Water Sources**

Make-up water is expected to come from the Lodgepole formation in the 00/02-19-16-27 W1M well, subject to testing and fluid compatibility. Additional makeup source water will come from produced Bakken water from the existing wells in the pool.

The peak demand for Lodgepole water for the proposed Progress Birdtail Bakken C waterflood is estimated to be approximately 20 m³/d (126 BWPD).

Water analyses available at this time consist of geochemical modeling conducted by Core Laboratories on formation waters from the Bakken,

Lodgepole and Birdbear formations in the adjacent Rocanville, Saskatchewan area. All three formation waters were subjected to geochemical modeling to predict the scaling tendencies of the water mixtures. Per results outlined in Appendix 5, it appears that the various combinations of Bakken, Lodgepole and Birdbear formation waters are compatible. However, further physical analyses will be obtained and the water's compatibility with the Bakken sand will be determined prior to injection.

(b)(i) Development and Production History

The Birdtail Bakken pools are located in southwestern Manitoba, in Township 16, Range 27 W1M. Within the Bakken formation in this area, there appears to be two distinct pools: the Bakken C Pool in sections 18, 19 and 20 as well as the Bakken A Pool in sections 4, 5, 8 and 9.

Development drilling began in the Birdtail area in 1996 with the first production commencing in January, 1997. Additional wells were drilled and placed on production through 1997 and 1998. The analogous Progress Rocanville waterflood project commenced operation in 1997 and encouraging results have prompted initiation of this waterflood application.

Wells in the subject area lands are currently produced under a primary drive mechanism. Currently there are 7 producing wells on the subject lands with a total producing rate of 10.3 m³/d (65 BOPD). To the end of July, 1998, the pool has produced 3787.7 m³ (23,832 STB) of oil, and 1440.3 m³ (9074 STB) of water. The majority of the wells are producing with relatively low water cuts with a current water cut for the overall pool of 31%. Gas production has been so small as to be immeasurable. Production history data and plots for the subject wells are attached in Appendix 1.

There is no initial reservoir pressure data for this pool. Pressure data is limited during the producing life of the wells in the proposed waterflood area, given the recent development drilling activity within the pool primarily during 1996 and 1997. Also, given the low permeability of the Bakken formation, fully built up reservoir pressures have been difficult to obtain. However, primary production in the Bakken is typically characterized by a rapid decline in reservoir pressure. This is evidenced by a static reservoir pressure measurement taken at 07-05-16-27W1 on September 11, 1998 of 3716 kPag (539 psig). The available pressure shown in Table 3 indicate that this reservoir is an undersaturated reservoir which requires pressure maintenance through waterflood to maintain an effective drive mechanism for optimal oil recovery.

Offset pressure data for a waterflood project located in the Saskatchewan Rocanville field in sections 04 and 05-16-31W1 indicates initial reservoir pressures of 6200 kPa in 1957 with pressures dropping substantially to 1700 kPa by 1984 during the course of infill drilling. The substantial drop in reservoir pressure in this offset pool provides further support for the requirement for pressure maintenance via waterflood.

- (ii) The wells 15-18 and 07-19-16-27 W1M are expected to be converted to water injection. An additional injector will be drilled at 06-20-16-27 W1M. It is expected that the maximum injection requirement will be 20 m³/d (126 BWPD). The proposed injection wells will have a sandface injection pressure of approximately 14 mPa (2030 psi). The maximum wellhead injection pressures are expected to be approximately 9 mPa (1305 psi). The surface land impact of this project will be minor as all wells will be pipelined to a central battery location at 01-19-16-27 W1M.
- (c)(i) Figure 1 is a map identifying the wells and showing the outline of the proposed injection patterns.

- (ii) The lessors and lessees within the subject area are tabulated in Figure 4.
- (d) The proposed completions for the injection wells are illustrated in Figure 2.
- (e) A schematic of the proposed surface facilities is shown in Figure 3.
- (f) Corrosion protection will be achieved through:
 - i) fibreglass water injection pipelines of sufficient pressure rating to transport high pressure injection water
 - ii) all water storage tanks are of fibreglass construction
 - iii) water injection pump internals are constructed of corrosion resistant brass and stainless steel
 - iv) wellhead master valve internals are brass
 - v) water injection well tubulars are internally TK-99 coated
 - vi) water injection well packers will be impreglon coated
 - vii) Inhibited fluid will be placed in annulus of injectors for protection of casing and tubing.
- (g) The lands involved in this waterflood application are currently subject to unitization proceedings to address freehold mineral lessor considerations. The existing pool has been well delineated and no offset mineral owners should be negatively impacted by this waterflood scheme. Given extent of the pool, placement of injectors and resultant sweep patterns there should be no adverse effects on lessees or lessors adjacent to the proposed waterflood scheme.
- (h) An information package regarding this proposed enhanced recovery scheme has been submitted to area landowners. Copies of the covering letters for these related submissions are included in Appendix 6.
- (i) The project will be built using CSA Z662-96 for the pipelines, B51 for pressure vessels and B31.1 for plant piping.

If further information is required or you have any questions, please contact the undersigned at (403) 216-2510 (extension 105).

Yours truly,
PROGRESS ENERGY LTD.

A handwritten signature in black ink, appearing to read "Jeff Screen for". The signature is written in a cursive, flowing style.

Jeff Screen, P.Eng.
Manager, Production - Operations

TABLE OF CONTENTS

LETTER OF APPLICATION

TABLES

1. Calculation of Original Oil in Place
2. Primary and Primary Plus Waterflood Production Forecasts
3. Pressure History

FIGURES

1. Application Area
2. Waterflood Injection Well Schematic
3. Water Injection Facilities Schematic
4. Mineral Owners
5. Surface Landowners

APPENDICES

1. Birdtail Production Summary
2. Reservoir Fluid Analysis
3. Core Studies
4. Geological Maps and Cross Sections
5. Water Compatibility Geochemical Modeling Results
6. Surface Landowner Information Letters

TABLES

TABLES

1. Calculation of Original Oil in Place
2. Primary and Primary Plus Waterflood Production Forecast
3. Pressure History

TABLE 1

Calculation of Original Oil in Place

**BIRDTAIL FIELD
BAKKEN C POOL
PRIMARY AND SECONDARY RESERVES CALCULATION**

	<u>10³m³</u>	<u>mbbls</u>
Original Oil in Place	367.0	2309.3
Primary Recovery Factor	4.9%	4.9%
Recoverable Oil in Place - Primary	17.9	112.6
Secondary Recovery Factor	15.1%	15.1%
Recoverable Oil in Place - Secondary	55.5	349.2
Total Recovery Factor	20.0%	20.0%
Total Recoverable Oil in Place with EOR	73.4	461.9

Progress Energy Ltd.
Birdtail North Bakken Reserves

Manitoba

Well	Well Status	Reserve Class	Net Pay m	Net Pay x Por. Fr.	Water Sat. Fr.	OOIP m3	Rec. Fr.	ROIP m3	Cum. to date m3	W.I. Fr.	Volume. Reserves m3	Decline Reserves m3	Prod. Rate m3/d
15-18-16-27w1	Producing	PDP		0.20		20,359	0.04	814	0	1.00	814		
16-18-16-27w1	Producing	PDP		0.25		25,448	0.04	1,018	0	1.00	1,018		
01-19-16-27w1	Producing	PDP		0.40		40,717	0.08	3,257	875	1.00	2,382		2.4
02-19-16-27w1	Producing	PDP		0.38		38,172	0.04	1,527	0	1.00	1,527		
03-19-16-27w1				0.15		15,269							
06-19-16-27w1				0.20		20,359							
07-19-16-27w1	Producing	PDP		0.42		42,753	0.04	1,710	0	1.00	1,710		
08-19-16-27w1	Producing	PDP		0.40		40,717	0.06	2,443	0	1.00	2,443		1.8
09-19-16-27w1				0.16		16,287							
10-19-16-27w1				0.20		20,359							
03-20-16-27w1	Producing	PDP		0.25		25,448	0.14	3,563	0	1.00	3,563		4.5
04-20-16-27w1	Producing	PDP		0.15		15,269	0.06	916	0	1.00	916		1.1
05-20-16-27w1	Producing	PDP		0.33		33,083	0.08	2,647	875	1.00	1,772		1.8
06-20-16-27w1	no well	Prob		0.13		12,724		0			0		
Totals						366,964		17,895			16,145		12
Totals, barrels						2,309,258		112,612			101,600		73

Assumptions	Well spacing, ha	16.4
	Water Saturation	0.37
	Boi	1.02

Waterflood Recovery will be 20% of OOIP.

TABLE 2

Primary and Primary Plus Waterflood Production Forecast

**PROGRESS BIRDTAIL BAKKEN C POOL
PRIMARY AND PRIMARY PLUS WATERFLOOD
PRODUCTION FORECASTS**

YEAR	PRIMARY		PRIMARY PLUS WATERFLOOD	
	OIL RATE (M3/D)	CUM PROD (M3)	OIL RATE (M3/D)	CUM PROD (M3)
1996	0.0	0	0.0	0
1997	4.7	1706	4.7	1706
1998	9.5	5184	9.5	5184
1999	6.3	7495	20.0	12484
2000	4.3	9076	18.0	19036
2001	3.3	10279	16.1	24918
2002	2.7	11250	14.5	30197
2003	2.2	12065	13.0	34936
2004	1.9	12766	11.7	39189
2005	1.7	13382	10.5	43007
2006	1.5	13931	9.4	46434
2007	1.4	14426	8.4	49510
2008	1.2	14878	7.6	52271
2009	1.1	15292	6.8	54749
2010	1.0	15675	6.1	56974
2011	1.0	16031	5.5	58971
2012	0.9	16363	4.9	60763
2013	0.9	16675	4.4	62372
2014	0.8	16969	4.0	63816
2015	0.8	17247	3.6	65112
2016	0.7	17510	3.2	66275
2017	0.7	17761	2.9	67319
2018	0.7	17895	2.6	68257
2019			2.3	69098
2020			2.1	69853
2021			1.9	70531
2022			1.7	71140
2023			1.5	71686
2024			1.3	72176
2025			1.2	72616
2026			1.1	73011
2027			1.0	73365
Total		17895		73365

TABLE 3
Pressure History

Testing

Progress et al Birdtail 07-05

07-05-016-27W1

Bakken Zone

Wireline

Static Gradient Test

Sep 11, 98

07-05-016-27W1
SEP 11 1998

SUBSURFACE PRESSURE MEASUREMENTS

1. BASIC DATA JOB 6057

PAGE 1 OF 1

COMPANY Progress Energy Inc.		WELL NAME Progress et al Birdtail 07-05	
ADDRESS 520, 520 - 5 Ave. S.W.		UNIQUE WELL ID 07-05-016-27W1	
FIELD Birdtail	STATUS Oil	SUBSURFACE LOCATION	
POOL and FORMATION Bakken			
PRODUCING THROUGH	mm TUBING <input checked="" type="checkbox"/>	mm CASING <input type="checkbox"/>	
PERFS INTERVAL (CF) 510.4-513.1		m PERF <input checked="" type="checkbox"/>	OH <input type="checkbox"/>
MID POINT OF PRODUCING (MPP) INTERVAL (CF) 511.75 m	TUBING DEPTH	m CF CASING DEPTH	m CF
POOL DATUM (SUBSEA)	m DATUM DEPTH OF WELL (FROM CF)		m
ELEVATION (CF) 471.20 m (KB) 474.80 m	(KB) to (CF) 3.60 m		

2. SUBSURFACE TEST

PRESSURE (GUAGE) TUBING	N/A kPa	GAUGE <input type="checkbox"/>	DWG <input type="checkbox"/>	SHUT IN DATE 98/06/08	DURATION @ 2275:7000	h
CASING	0 kPa	GAUGE <input type="checkbox"/>	DWG <input checked="" type="checkbox"/>	SHUT IN TIME 18:00		h
SECONDARY (GUAGE) TUBING PRESSURE:		kPa		DATE ON BOTTOM 98/09/11 @		13:32 h
RUN DEPTH (FROM CF) 521.00 m				DATE OFF BOTTOM 98/09/11 @		13:42 h
B.H. TEMP. 20.00 °C	SURFACE TEMP. °C			MPP PRESSURE (GAUGE)	3,716.29	kPa
RUN DEPTH PRESSURE (GAUGE) 3,809.90 kPa				DATUM DEPTH PRESSURE (GAUGE)		kPa
RUN DEPTH GRADIENT: 10.120 kPa/m				LIQUID LEVEL:	134.00	m
RUN DEPTH GRADIENT ASSUMED? No				ELEMENT SERIAL NO. 1032		
RECORDER TYPE Sunada Electronic Recorders				RANGE (GAUGE)	17,237.00	kPa
TEST TYPE: Static Gradient				CLOCK RANGE	h	LAST CALIBRATION

3. TEST COMMENTS

<p>Estimated liquid level @ 134 m, CF.</p>
--

4. OTHER OPERATIONS

<p>COMMENTS:</p>

Remarks:

SURVEY COMPANY Opsco '92 Industries Ltd.

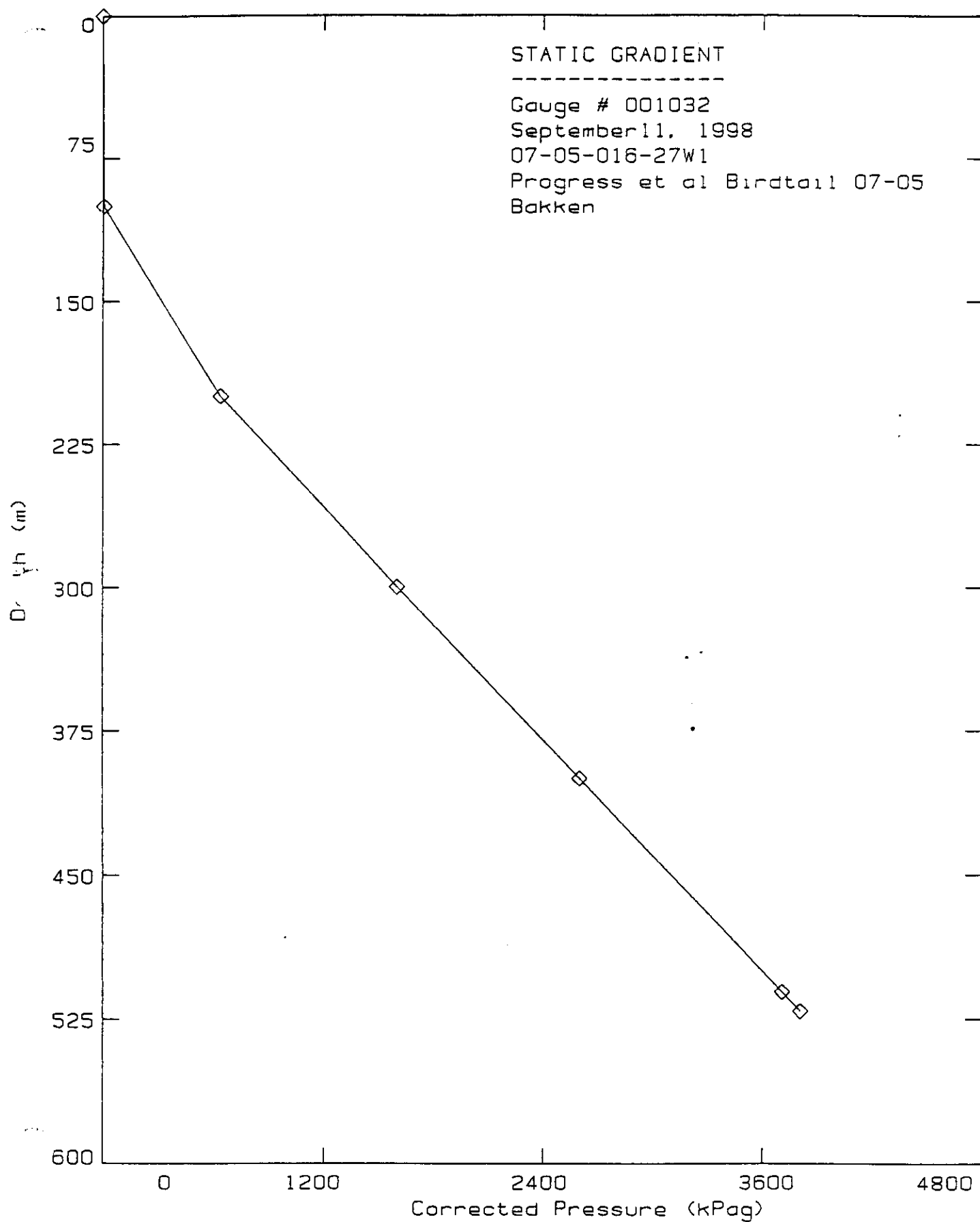
TEST BY Murray B

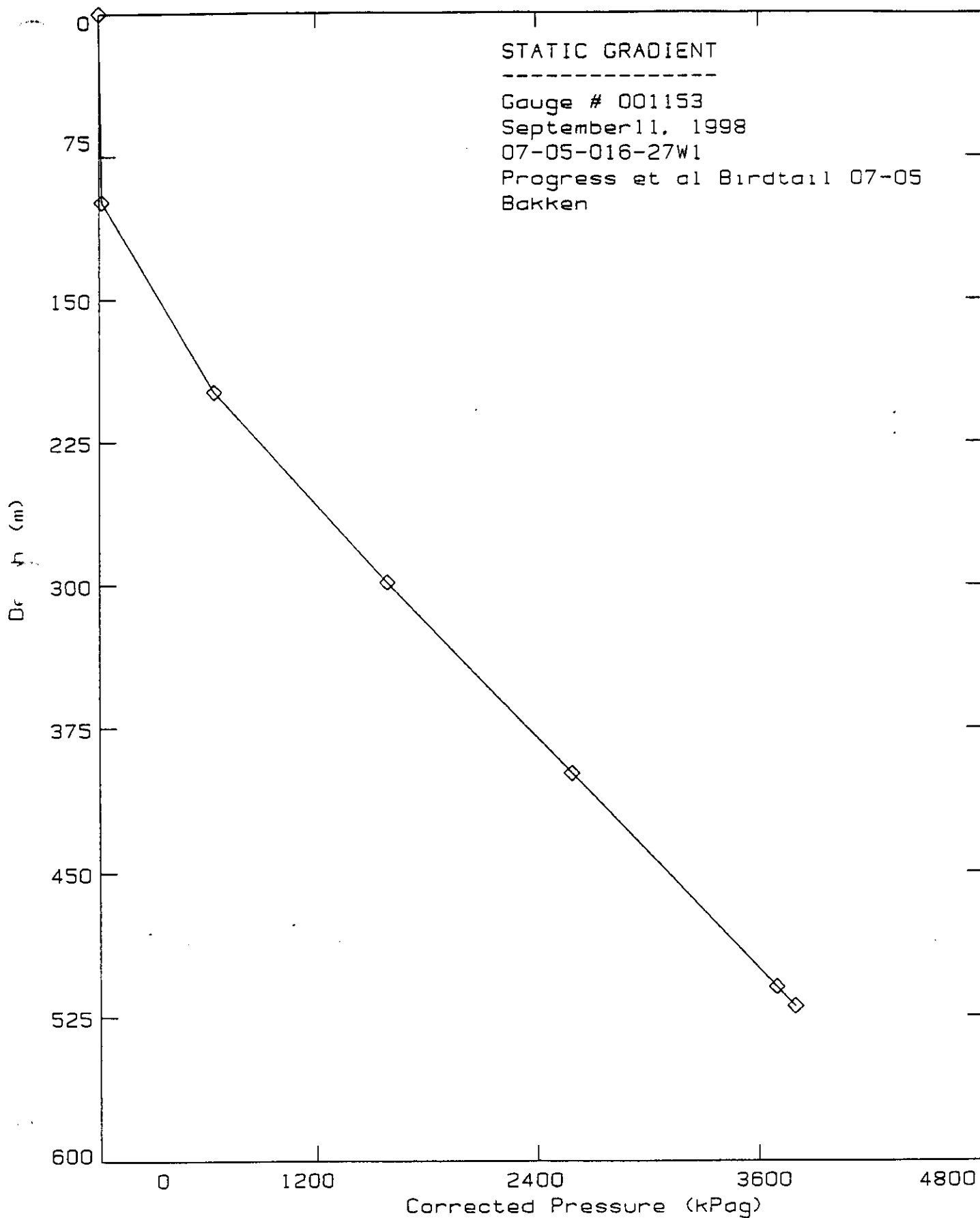
COMPUTED BY Keith A

CHECKED BY Robert H

O-12-81-08

Opsco '92





Reporting Date: Sep 14, 1998,

Page

WellName: Progress et al Birdtail 07-05
Pool : BakkenLocation : 07-05-016-27W1
Date Of Test: September 11, 1998----- Upper Gauge -----
Serial # 001153 Range 17237----- Lower Gauge -----
Serial # 001032 Range 17237

Start Time	End Time	Depth	Deflect	Corrected Pressure	Grad.	Depth	Deflect	Corrected Pressure	Grad.
hh:mm	hh:mm	CF(m)	(mm)	(kPag)	(kPa/m)	CF(m)	(mm)	(kPag)	(kPa/m)
12:10	12:15	SURF		0.0		SURF		0.0	
12:17	12:27	99.0		12.4	0.125	100.0		4.1	0.041
12:28	12:38	199.0		633.8	6.214	200.0		640.8	6.367
12:39	12:49	299.0		1592.8	9.590	300.0		1599.9	9.591
12:50	13:00	399.0		2589.6	9.968	400.0		2603.6	10.037
13:01	13:31	510.0		3697.7	9.983	511.0		3708.7	9.956
13:32	13:42	520.0		3797.3	9.960	521.0		3809.9	10.120
13:48	13:53	SURF		0.0		SURF		0.0	

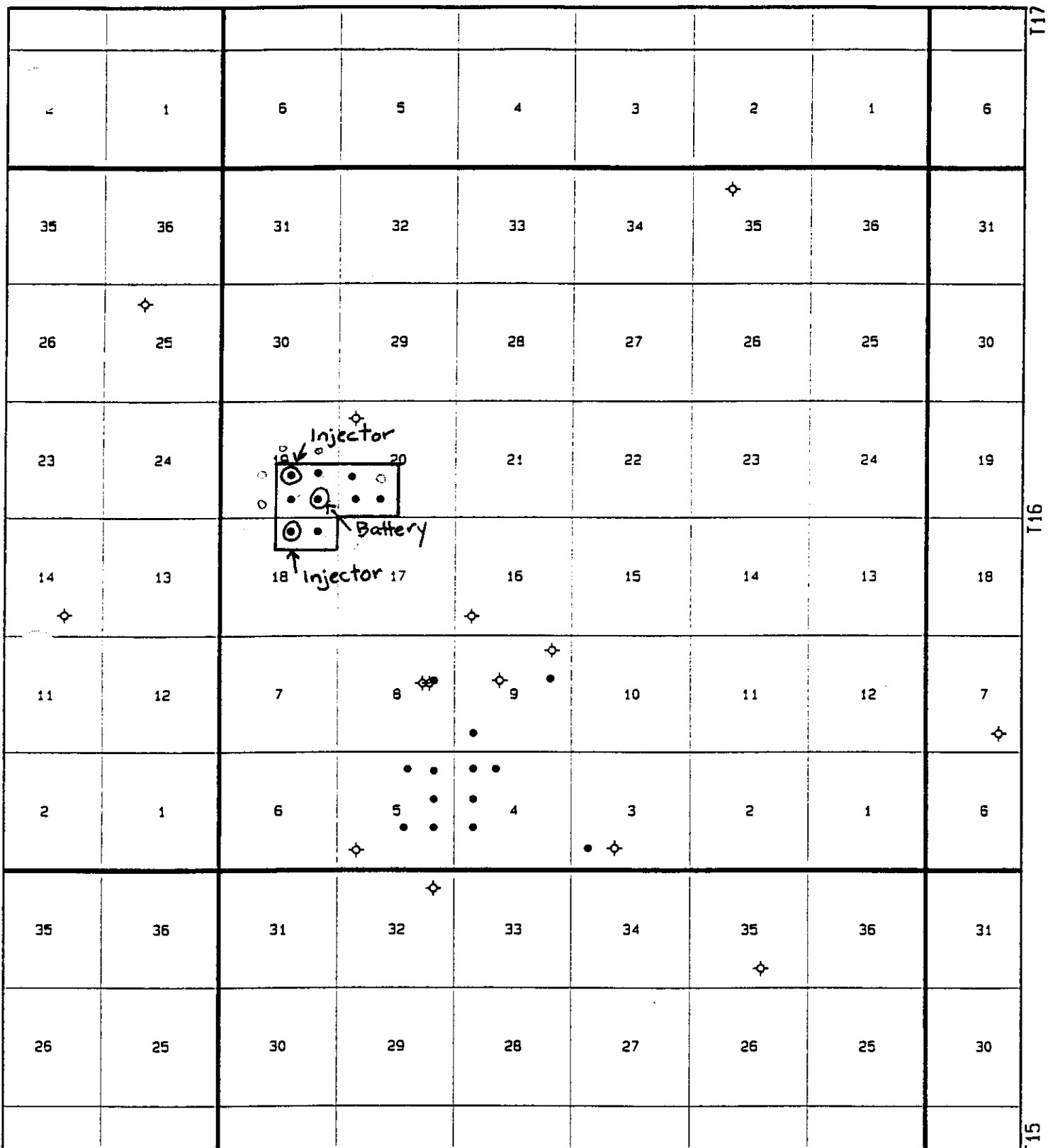
Comments:

TBG pressure by DWG = N/A
CSG pressure by DWG = 0 kPag
Temperature at run depth = 20 C
Estimated liquid level @ 134 m, CF

FIGURES

FIGURES

1. Application Area
2. Waterflood Injection Well Schematic
3. Water Injection Facilities Schematic
4. Mineral Owners
5. Surface Landowners



Well Symbols		Progress Energy Ltd.	
<ul style="list-style-type: none">LocationOilSusp OilAbnd OilSusp H OilAbnd H OilSusp UndesServiceInjection	<ul style="list-style-type: none">DrillingGasOil&GasSusp GasAbnd GasSusp Oil&GasAbnd Oil&GasO & AAbnd ServiceGas Injection	APPLICATION AREA	
No Well Postings Specified			
<p>Scale 1: 75000</p> <p>0 4 Kilometers</p> <p>0 2 Miles</p>		Author: Date: September 23, 1998	

FIGURE 2
Waterflood Injection Well Schematic

**Progress Birdtail
Typical Water Injection
Wellbore Diagram**

UWI: 100/07-05-016-27W1/0

Licence No.: 4684

Date: 22-Sep-98
Drawn by: Jeff Screen

KB: 474.8 m spudded: 97/03/10
GL: 471.2 m rig release: 97/03/12

Current Well Status: Proposed Water Injector

Wellhead: Kvaerner, 229 x 177.8 x 14 MPa

Surface Casing:

177.8 mm, 25.3 kg/m, H-40, ST&C

Landed at 108.0 mKB

Cement:

9 t, 0:1:0 "G" + 3% CaCl₂

2.0 m³ cement returns

Production Casing:

114.3 mm, 14.1 kg/m, J-55, ST&C

Landed at 542.0 mKB

Cement:

6 t, 1:1:4 "G" + 0.5% FRC-3 + 0.1% DEF-3

Tailed in W/

5.5 t, Telmaster + 0.1% CA-2 + 0.15% DEF-3

2.0 m³ cement returns

Annulus:

Filled with inhibited fresh water

Topped off w/ diesel

Tubing Detail:

60.3 mm TK-99 internally coated tubing

Double Grip, internally coated packer

Nipple w/ No-Go

Perforations:

Bakken

514.0 - 516.7 mKB

Float Collar: 534.4 mKB

TD: 542.0 mKB

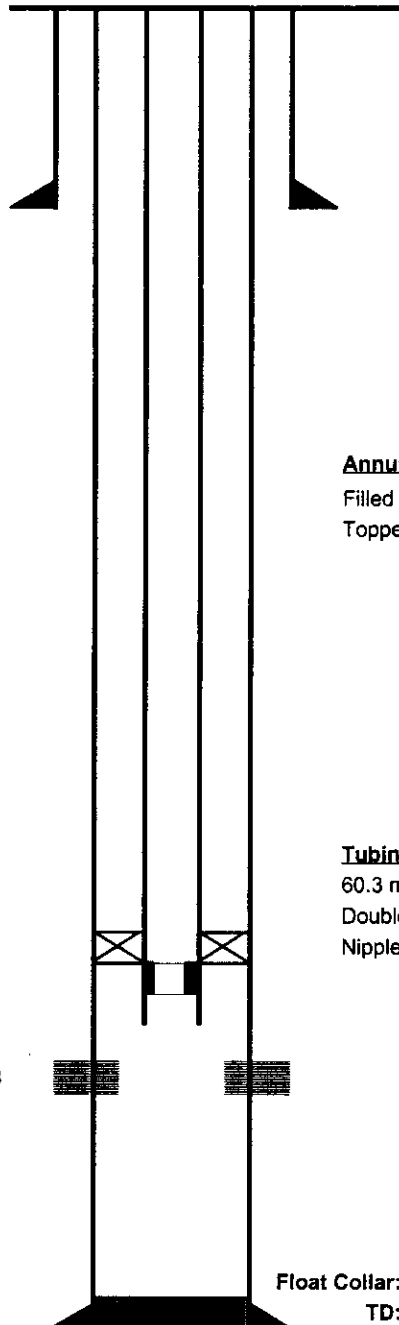


FIGURE 3

Water Injection Facilities Schematic

Birdtail Battery PFD

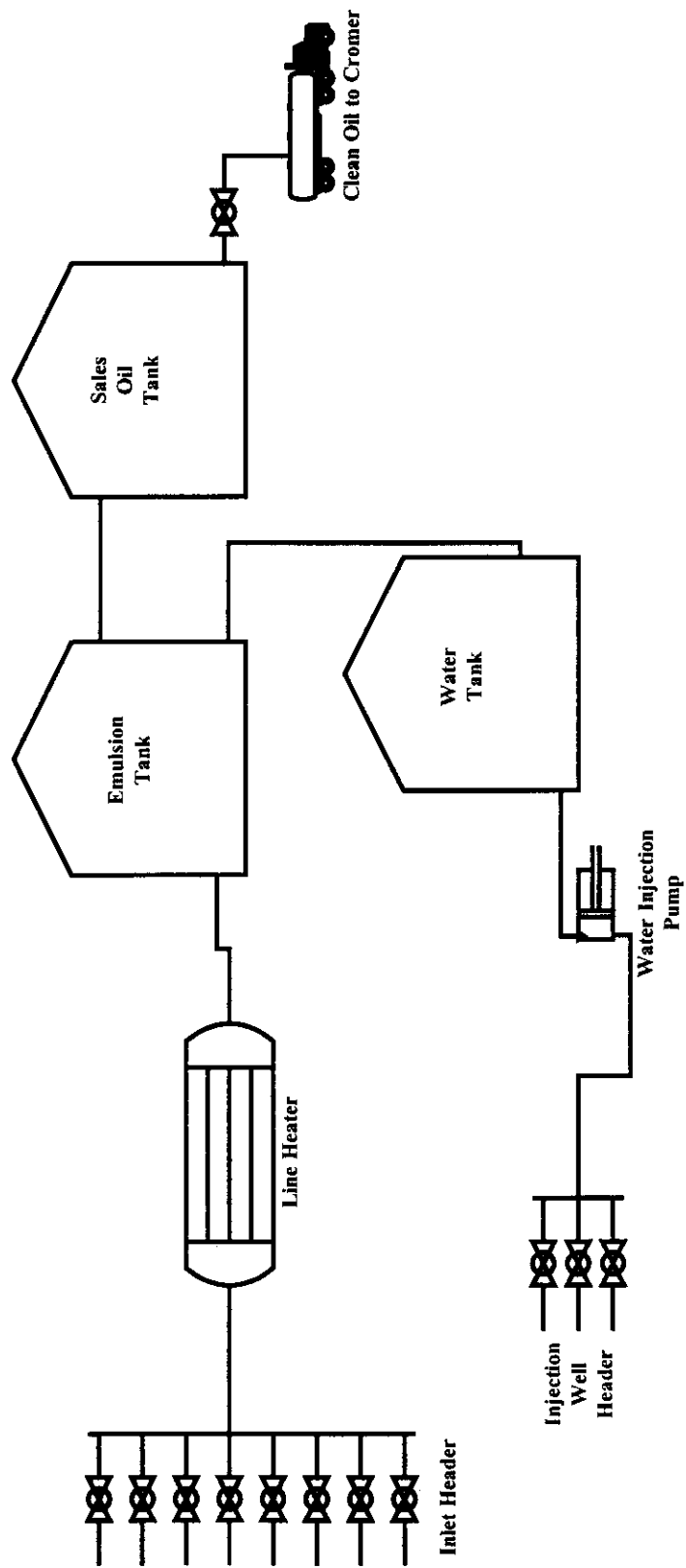


FIGURE 4
Mineral Owners

**BIRDTAIL FIELD
MINERAL LESSEES FOR THE FOLLOWING LANDS
OCTOBER, 1998**

16-27W1	16	All	Progress Energy Ltd.	100.000
16-27W1	17	S/2,NE/4	Progress Energy Ltd.	100.000
16-27W1	17	NW/4	Renaissance Energy Ltd.	100.000
16-27W1	18	All	Progress Energy Ltd.	100.000
16-27W1	19	S/2,NW/4	Progress Energy Ltd.	100.000
16-27W1	19	NE/4	Lila G. Whitmore, Victoria, B.C.	100.000
16-27W1	20	All	Progress Energy Ltd.	100.000
16-27W1	21	All	Progress Energy Ltd.	100.000
16-27W1	28	All	Progress Energy Ltd.	100.000
16-27W1	29	All	Progress Energy Ltd.	100.000
16-27W1	30	All	Progress Energy Ltd.	100.000
16-28W1	12	All	Progress Energy Ltd.	100.000
16-28W1	13	All	Progress Energy Ltd.	100.000
16-28W1	24	All	Progress Energy Ltd.	100.000
16-28W1	25	All	Progress Energy Ltd.	100.000

PROGRESS ENERGY LTD.
MANITOBA WATERFLOOD PROJECT
 Mineral
 Our File #120
 LINE LIST

September 25, 1998

PROGRESS FILE NO.	LAND DESCRIPTION	OWNER/OCCUPANT	ADDRESS	TELEPHONE NUMBER	REMARKS
120	20% NW 31-15-27-W1M	Edward Alexander Stoughton	Box Oakville, MB R0H 0Y0	204-767-2064	
	20% NW 31-15-27-W1M	Gerrine Bohn			
	20% NW 31-15-27-W1M	James Stanley Stoughton			
	20% NW 31-15-27-W1M	Cheryl Wilson			
	20% NW 31-15-27-W1M	Allan Stoughton	Box Oakville, MB R0H 0Y0		
	75% Ptn. SW 31-15-27- W1M	Gladys Marie Edwards (Life Estate), Nelsia Courtney Edwards, Paula Frances Verley (Estate in Remainder Expectant)			
	12% Ptn. SW 31-15- 27-W1M	Jacynthe Marie Fouillard	Box 28 St. Lazare, MB R0M 1Y0		
	12% Ptn. SW 31-15- 27-W1M	Aline Gabrielle Fouillard	Box 118 St. Lazare, MB R0M 1Y0		
	100% NE 32-15-27-W1M	Crown Minerals		204-945-6577	
	100% NW 32-15-27-W1M	R.M. of Miniota	Box 70 Miniota, MB R0M 1M0	204-567-3683	
	100% SE 32-15-27-W1M	Crown Minerals		204-945-6577	

100% SW 32-15-27-W1M	R.M. of Manitoba	Box 70 Manitoba, MB R0M 1M0	204-567-3683	
100% NW 33-15-27-W1M	R.M. of Manitoba	Box 70 Manitoba, MB R0M 1M0	204-567-3683	
100% SE 33-15-27-W1M	The Soldier Settlement Board of Canada	National Resources Canada-Public Land ResourceMgmt.Division 10th Floor, 580 Booth St. Ottawa, ON K1A 0E4	613-943-2910	
100% SW 33-15-27-W1M	R.M. of Manitoba	Box 70 Manitoba, MB R0M 1M0	204-567-3683	
75% NE 34-15-27-W1M	Joseph Stech			
12% NE 34-15-27-W1M	Arthur Douglas Radalinsky			
12% NE 34-15-27-W1M	Tony Berlago			
50% NW 34-15-27-W1M	Canada Trust Company	Montreal Trust Co. of Canada 530-8th Ave. S.W. Calgary, AB T2P 3S8	403-267-6887	
50% NW 34-15-27-W1M	Donald Glen Darker	Box 89 Manitoba, MB R0M 1M0	204-567-3711	
100% SE 34-15-27-W1M	Crown Minerals		204-945-6577	
100% NE 3-16-27-W1M	Adolph Bezo			
100% SE 3-16-27-W1M	Linda Helen Butcher	1175 Lake Placid Dr. SE Calgary, AB T2J 5J2		
100% NW 3-16-27-W1M	R.M. of Birtle	Box 70 Birtle, MB R0M 0C0	204-842-3403	
100% NW 4-16-27-W1M	R.M. of Birtle	Box 70 Birtle, MB R0M 0C0	204-842-3403	

100% E½ 4-16-27-W1M	Crown Minerals		204-945-6577	
100% SW 4-16-27-W1M				
100% N½ 5-16-27-W1M	R.M. of Birtle	Box 70 Birtle, MB ROM OC0	204-842-3403	
100% SW 5-16-27-W1M				
50% SE 5-16-27-W1M	George Bartheaux	Box Birtle, MB ROM OC0	204-842-3346	
50% SE 5-16-27-W1M	John Bartheaux	Box Birtle, MB ROM OC0	204-842-5222	
50% N½ 6-16-27-W1M	Andrew Bertram			
50% N½ 6-16-27-W1M	Joan Bertram			
16.66% Ptn.S½ 6-16-27-W1M	Marjorie Marie Butterworth			
16.66% Ptn.S½ 6-16-27-W1M	Arthur Harrison Doig			
16.66% Ptn.S½ 6-16-27-W1M	Harrison Doig			
16.66% Ptn.S½ 6-16-27-W1M	John Andrew Doig			
33.33% Ptn.S½ 6-16-27-W1M	Douglas Scantlebury	Box 465 Birtle, MB ROM OC0	204-842-5187	
50% NE 7-16-27-W1M	Carrol Langford			
37% NE 7-16-27-W1M	Clifford Bartheaux			
12% NE 7-16-27-W1M	John Edgar Bartheaux Estate	Box 398 Birtle, MB ROM OC0	204-842-3721	
50% NW 7-16-27-W1M	Alberta Bartheaux Estate			
50% NW 7-16-27-W1M	Prudential Trust Company	Montreal Trust Co. of Canada 530-8th Ave. S.W. Calgary, AB T2P 3S8	403-267-6887	

	100% S½ 7-16-27-W1M	Joan Bertram	Box 106 Birtle, MB ROM OC0			
	100% N½ 8-16-27-W1M	Robert Corr	Box Birtle, MB ROM OC0	204-842-3806		
	50% S½ 8-16-27-W1M	Prudential Trust Company	Montreal Trust Co. of Canada 530-8th Ave. S.W. Calgary, AB T2P 3S8	403-267-6887		
	50% S½ 8-16-27-W1M	Kenton Salmon	Box 518 Birtle, MB ROM OC0	204-842-3664		
	100% SEC 9-16-27-W1M	R.M. of Birtle	Box 70 Birtle, MB ROM OC0	204-842-3403		
	100% NE 10-16-27-W1M	Crown Minerals		204-945-6577		
	100% NW 10-16-27-W1M	2992770 Manitoba Ltd.	Box 310 Birtle, MB ROM OC0			
	50% SE 10-16-27-W1M	Douglas Scantlebury	Box 465 Birtle, MB ROM OC0	204-842-5187		
	50% SW 10-16-27-W1M	William Zapuchlak				
	50% S½ 10-16-27-W1M	Prudential Trust Company	Montreal Trust Co. of Canada 530-8th Ave. S.W. Calgary, AB T2P 3S8	403-267-6887		
	100% SEC 16-16-27-W1M	Douglas Foster Wilson "et al"	Box 315 Birtle, MB ROM OC0			
X	25% E½ 17-16-27-W1M	George Thomas Wady				
X	25% E½ 17-16-27-W1M	George B. Wady				
X	50% E½ 17-16-27-W1M	Cynthia Slevin	314-167 Bannatyne Ave. Winnipeg, MB R3B 0R4			

notice

✓	100% NW 17-16-27-W1M	David Henry Nettle "et al"	Box 398 Birtle, MB ROM 0C0		
	25% SW 17-16-27-W1M	George B. Wady			
	25% SW 17-16-27-W1M	Thomas George Wady			
	50% SW 17-16-27-W1M	Cynthia Slewin	314-167 Bannatyne Ave. Winnipeg, MB R3B 0R4		
✓	100% E½ 18-16-27-W1M	Crown Minerals		204-945-6577	
✓	100% NW 18-16-27-W1M	William Kuch	Box 268 Birtle, MB ROM 0C0		
	50% SW 18-16-27-W1M	Carrol Wallace Langford			
	37½% SW 18-16-27-W1M	Clifford Smith Barteaux			
	12½% SW 18-16-27-W1M	John Edgar Barteaux Estate	Box 398 Birtle, MB ROM 0C0	204-842-3721	
✓	100% Ptn.NE 19-16-27-W1M	David Pittendreigh "et al"	94 Lismer Crescent Winnipeg, MB R3R 1N6		
✓	100% Ptn.NE 19-16-27-W1M	Leila Gwendolyn Whitmore	460-2251 Cadbord Bay Victoria, BC V8R 5H3		
✓	50% NW 19-16-27-W1M	Crown Trust Company	Montreal Trust Co. of Canada 530-8th Ave. S.W. Calgary, AB T2P 3S8	403-267-6887	
✓	50% NW 19-16-27-W1M	Linda Helen Butcher	1175 Lake Placid Dr. SE Calgary, AB T2J 5J2		
✓	100% SW 19-16-27-W1M	Noah Bartley			
✓	100% SE 19-16-27-W1M	Crown Minerals		204-945-6577	
✓	100% NE 20-16-27-W1M	George Harrison Barteaux			
✓	100% SE 20-16-27-W1M	Phillip Tillson Barteaux			

	50% WX 20-16-27-W1M	Wattview Resources Ltd.	Box 2504 The Pas, MB R9A 1M3		
	50% WX 20-16-27-W1M	Cynthia Slevin	404-15 Cornish Ave. Winnipeg, MB R3C 0Z7		
	50% NX 21-16-27-W1M 50% SW 21-16-27-W1M	Cynthia Slevin	404-15 Cornish Ave. Winnipeg, MB R3C 0Z7		
	25% NX 21-16-27-W1M 25% SW 21-16-27-W1M	George B. Wady			
	25% NX 21-16-27-W1M 25% SW 21-16-27-W1M	George Thomas Wady			
	100% SE 21-16-27-W1M	Douglas Scantlebury	Box 465 Birtle, MB R0M 0C0		
	100% SEC 28-16-27-W1M	Francis William Crew			
	100% SEC 29-16-27-W1M	Crown Minerals		204-945-6577	
	100% NX 30-16-27-W1M	Allan Barteaux "et al"	Box 52 Birtle, MB R0M 0C0		
	50% SX 30-16-27-W1M	Crown Trust Company	Montreal Trust Co. of Canada 530-8th Ave. S.W. Calgary, AB T2P 3S8	403-267-6887	
	50% SX 30-16-27-W1M	Linda Helen Butcher	1175 Lake Placid Dr. SE Calgary, AB T2J 5J2		
	50% NE 13-16-28-W1M 50% NE 13-16-28-W1M	Henry Melville Doig Estate William Kuch	Box 268 Birtle, MB R0M 0C0		
	100% SE 13-16-28-W1M 100% Ptn. WX 13-16-28-W1M	Crown Minerals Robert Corr		204-945-6577	

	100% Ex 24-16-28-W1M	Frances Marie Lundeen	1371-17th Ave. SE Salmon Arm, BC V1E 2G2		
	50% NW 24-16-28-W1M	George Richard Leaming			
	50% NW 24-16-28-W1M	Prudential Trust Company	Montreal Trust Co. of Canada 530-8th Ave. S.W. Calgary, AB T2P 3S8	403-267-6887	
	100% SW 24-16-28-W1M	Crown Minerals		204-945-6577	
	100% NE 25-16-28-W1M	Robert Andrew Dupont	Box 73 St. Lazare, MB R0M 1Y0		
	100% NW 25-16-28-W1M	Georgette Sharon Dupont	Box 1317 Russell, MB R0J 1W0		
	100% Ex of SE 25-16-28-W1M	Orville David Dandridge			
	100% W1/2 of SE 25-16-28-W1M	Linda Helen Butcher	1175 Lake Placid Dr. SE Calgary, AB T2J 5J2		
	100% SW 25-16-28-W1M	Kenneth Raymond Dupont	Box St. Lazare, MB R0M 1Y0		

FIGURE 5
Surface Landowners

PROGRESS ENERGY LTD.
MANITOBA WATERFLOOD PROJECT
 Surface
 Our File #120
 LINE LIST

September 25, 1998

PROGRESS FILE NO.	LAND DESCRIPTION	OWNER/OCCUPANT	ADDRESS	TELEPHONE NUMBER	REMARKS
120	100% NW 32-15-27-W1M NE 31-15-27-W1M Ptn. NW 31-15-27-W1M	John "Harvey" Fulton	Box 171 Birtle, MB ROM OCO	204-842-3260	
	Ptn. NW 31-15-27-W1M	Grand Truck Pacific Railway Co.	Pan Canadian		
	S½ 31-15-27-W1M	Louise Irene Marie Fouillard "et al"	Box 28 St. Lazare, MB ROM 1Y0		
	NE 32-15-27-W1M	Allan Dale Bartheaux	Box 52 Birtle, MB ROM OCO	204-842-3428	
	NE 33-15-27-W1M	David Robert Lane and James Wilfred Lane	Birtle, MB	204-842-3692 - Dave 204-842-3658 - Jim	
	NW 33-15-27-W1M	Ruby Isabel Lindsey	Winnipeg, MB		
	SE 33-15-27-W1M	Elsie May Gies	Miniota, MB		
	SW 33-15-27-W1M	Allan "Dale" Gies	Birtle, MB	204-842-3378	
	SE 34-15-27-W1M NE 34-15-27-W1M SE 3-16-27-W1M	Scantlebury Farms Ltd.	Box 95 Birtle, MB ROM OCO	204-842-3606	
	W½ 34-15-27-W1M	Donald Glen Darker and Leila Ethel Darker	Box 89 Miniota, MB ROM 1MO	204-567-3716	

	NE 3-16-27-W1M	Michael Radlinsky	General Delivery Birtle, MB ROM OCO	204-842-3282	
	W½ 3-16-27-W1M	Robert Bruce Still and Brenda Marie Still	Box 16 Isabella, MB ROM OYO	204-586-4574	
	E½ 4-16-27-W1M	George Argyle Salmon	Box 45 Birtle, MB ROM OCO	204-842-3765	
	W½ 4-16-27-W1M	George Argyle Salmon and Vera Merelene Salmon	Box 45 Birtle, MB ROM OCO	204-842-3765	
	NE 5-16-27-W1M	Murray Ephraim Salmon	Box 518 Birtle, MB ROM OCO	204-842-3680	
	W½ 5-16-27-W1M	Fassie Fern Farm Ltd.	Box 261 Birtle, MB ROM OCO	204-842-5112 Francis Crew	
	SE 5-16-27-W1M	Philip Tillson Barteaux	Birtle, MB	204-842-3761	
	N½ 6-16-27-W1M	Douglas Glen Scantlebury	Box 465 Birtle, MB ROM OCO	204-842-5187	
	S½ 6-16-27-W1M	The Manitoba Agricultural Credit Corporation	Unit 100, 1525-1st St S Brandon, MB R7A 7A1	204-726-6850	
	NE 7-16-27-W1M	Glen Tillson Barteaux	Box 88 Birtle, MB ROM OCO	204-842-3646	
	SW 32-15-27-W1M NW 7-16-27-W1M SE 7-16-27-W1M	Ronald Bruce Barteaux	Box 425 Birtle, MB ROM OCO	204-842-3613	
	SW 7-16-27-W1M (2 Titles)	Albert Bruce Bartram	Box 116 Birtle, MB ROM OCO	204-842-3848	
	N½ 8-16-27-W1M	Robert Allen Corr		204-842-3806	

	SX 8-16-27-WIM	Clifford Kenton Clarence Salmon	Box 518 Birtle, MB ROM OCO	204-842-3664	
	NX 9-16-27-WIM	Janice Pauline Meseyton	Box 1581 Portage La Prairie, MB R1N 3P1		
	SE 9-16-27-WIM SW 9-16-27-WIM	William Roger Wilson	Box 315 Birtle, MB ROM OCO	204-842-3861	
	NX 10-16-27-WIM SW 10-16-27-WIM	2992770 Manitoba Ltd.	Box 310 Birtle, MB ROM OCO		
	SE 10-16-27-WIM	John Radlinsky	346 Kilbride Winnipeg, MB	204-339-2943	
	NE 16-16-27-WIM SE 16-16-27-WIM	Douglas Foster Wilson, Edith Lillian Wilson and William Roger Douglas Wilson	Box 315 Birtle, MB ROM OCO	204-842-3861	
	WX 16-16-27-WIM	William Roger Wilson	Box 315 Birtle, MB ROM OCO	204-842-3861	
	NE 17-16-27-WIM	Robert John Barteaux and Marjorie Lynne Barteaux	Box 355 Birtle, MB ROM OCO	204-842-3779	
	NW 17-16-27-WIM	David Henry Nettle and Aynsley Celeste Nettle	Box 398 Birtle, MB ROM OCO	204-842-3721	
	SE 17-16-27-WIM SW 17-16-27-WIM NX 18-16-27-WIM	Bruce Henry Bertram and Louise Hilda Bertram William Kuch		204-842-5189	
	SX 18-16-27-WIM	Ronald Bruce Barteaux	Box 268 Birtle, MB ROM OCO	204-842-5106	
	Ptn. NE 19-16-27-WIM Ptn. NE 19-16-27-WIM	Glen Tilson Barteaux David William Pittendreigh and Sandra Grace Pittendreigh		204-842-3613 204-842-3646 204-895-7901	

	NW 19-16-27-W1M	David Robert Paul Barteaux	Box 81 Birtle, MB ROM OCO	204-842-3654	
N	Ptn. SE 19-16-27-W1M SW 19-16-27-W1M	Frederick George Barteaux and Shirley Diane Barteaux	Box 444 Birtle, MB ROM OCO	204-842-3655	
*	Ptn. SE 19-16-27-W1M (2 Titles)	Bruce Henry Bertram		204-842-5189	
	Ex 20-16-27-W1M	Philip Tillson Barteaux		204-842-3761	
*	Ptn. SW 20-16-27-W1M NW 20-16-27-W1M	Kelvin Bruce Gooda and Nona Marie Ada Gooda	Box 125 Birtle, MB ROM OCO	204-842-3604	
*	Ptn. SW 20-16-27-W1M	Neil Owen Bertram	Box 613 Birtle, MB ROM OCO	204-842-3716	
	NW 21-16-27-W1M	Glen Tillson Barteaux		204-842-3646	
	SE 21-16-27-W1M	Douglas Glen Scantlebury	Box 465 Birtle, MB ROM OCO	204-842-5187	
	SW 21-16-27-W1M	Charles Harold Bertram	Box 106 Birtle, MB ROM OCO	204-842-3758	
	SEC. 28-16-27-W1M	Francis William Crew		204-842-5112	
	NW 29-16-27-W1M	Crown			
	NE 29-16-27-W1M				
	SE 29-16-27-W1M				
	SW 29-16-27-W1M	Glen Tillson Barteaux		204-842-3646	
	NW 30-16-27-W1M	Allan Dale Barteaux and Evelyn Marie Barteaux	Box 52 Birtle, MB ROM OCO	204-842-3428	
	SE 30-16-27-W1M	Murray Walter Barteaux	Box 106 Birtle, MB ROM OCO		
	SW 30-16-27-W1M	Charles Harold Bertram	Box 106 Birtle, MB ROM OCO	204-842-3758	

	NE 13-16-28-W1M	William Kuch	Box 268 Birtle, MB ROM OCO	204-842-5106	
	NW 13-16-28-W1M SW 13-16-28-W1M	Robert Allen Corr		204-842-3806	
	SE 13-16-28-W1M	Bruce Henry Bertram and Hilda Louise Bertram	Box 172 Birtle, MB ROM OCO	204-842-5189	
	EX 24-16-28-W1M SW 24-16-28-W1M	David Robert Paul Barteaux	Box 81 Birtle, MB ROM OCO	204-842-3654	
	NW 24-16-28-W1M	Thomas Farms Ltd.	Box 73 Birtle, MB ROM OCO		
	NE 25-16-28-W1M	Robert Andrew George Dupont	Box 73 St. Lazare, MB ROM 1Y0		
	NW 25-16-28-W1M	Georgette Sharon Margaret Dupont	Box 1317 Russell, MB ROJ 1W0		
	SE 25-16-28-W1M SW 25-16-28-W1M	Orville David Dandridge Kenneth Raymond John Dupont	General Delivery St. Lazare, MB ROM 1Y0	204-842-3437 204-683-2364	

APPENDICES

APPENDICES

1. Birdtail Production Summary
2. Reservoir Fluid Analysis
3. Core Studies
4. Geological Maps and Cross Sections
5. Water Compatibility Geochemical Modeling Results
6. Surface Landowner Information Letters

APPENDIX 1

Birdtail Production Summary

North Birdtail Summary W

North Birdtail Summary W

Operator:

Field:

Zone:

Type: Other

Group: North Birdtail

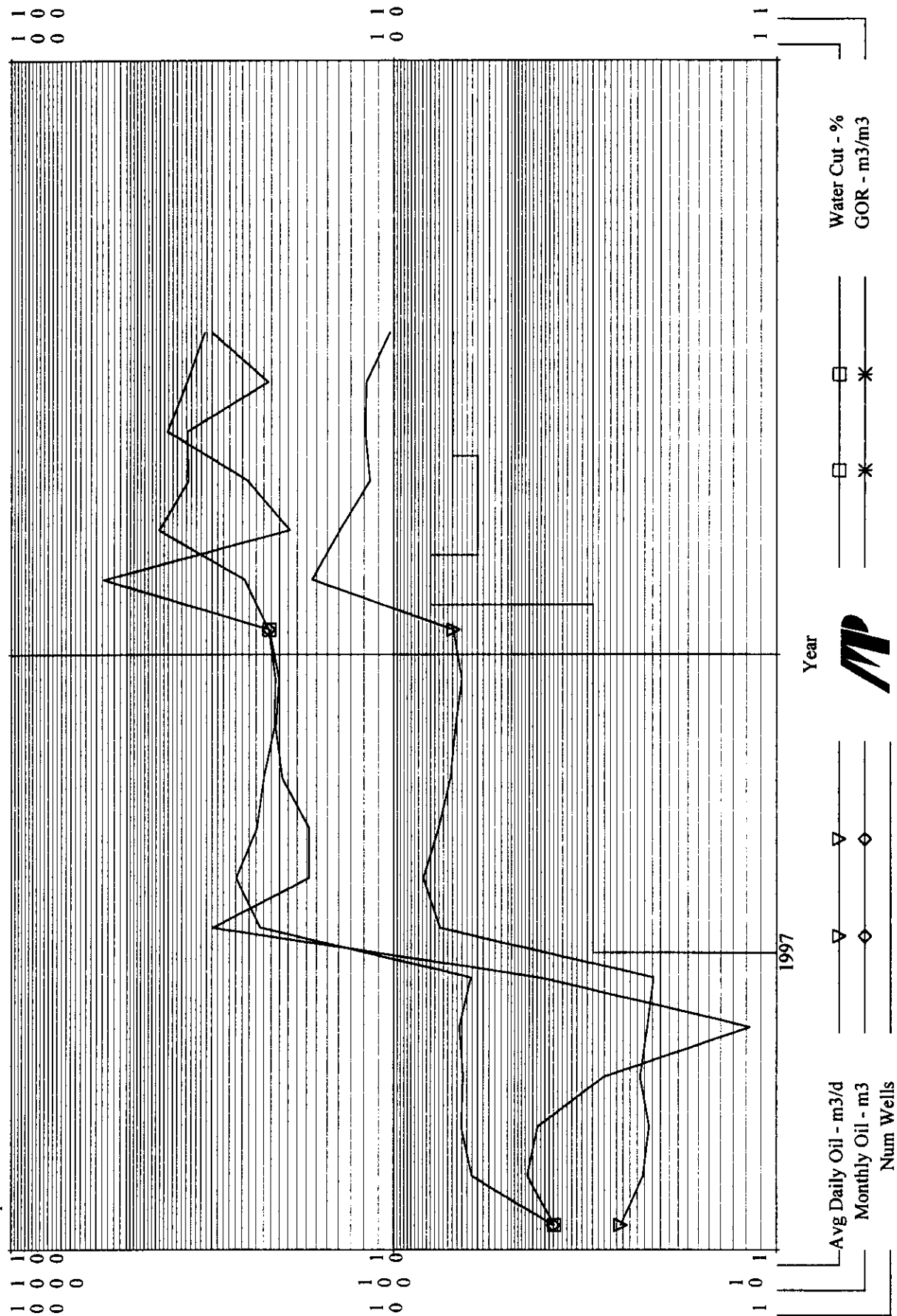
Production Cums

Oil: 3787.7 m3

Gas: 0 E6m3

Water: 1440.3 m3

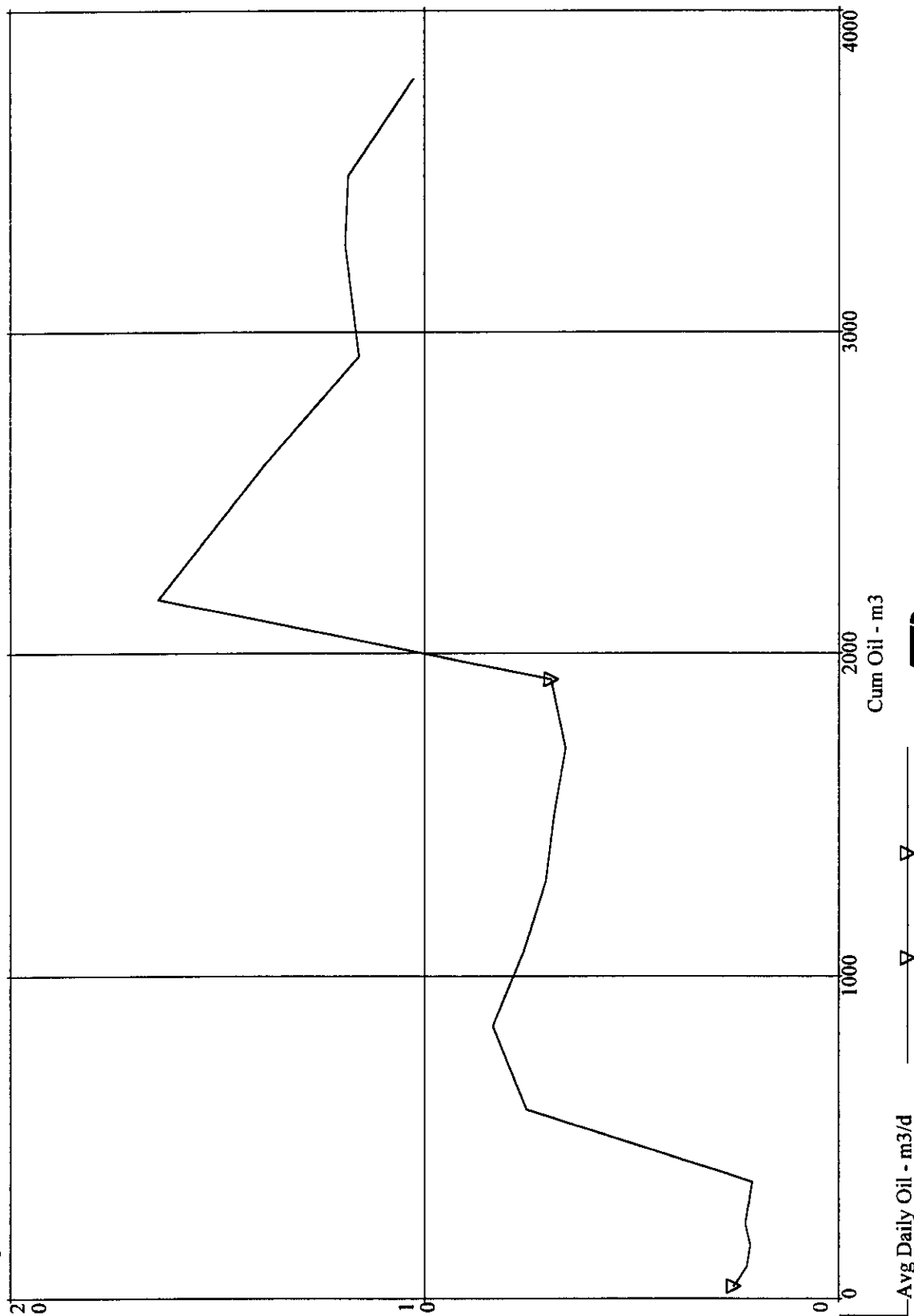
Cond: 0 m3



North Birdtail Summary Data 01/97-07/98

Operator:
Field:
Zone:
Type: Other
Group: North Birdtail

Production Cums
Oil: 3787.7 m3
Gas: 0 E6m3
Water: 1440.3 m3
Cond: 0 m3

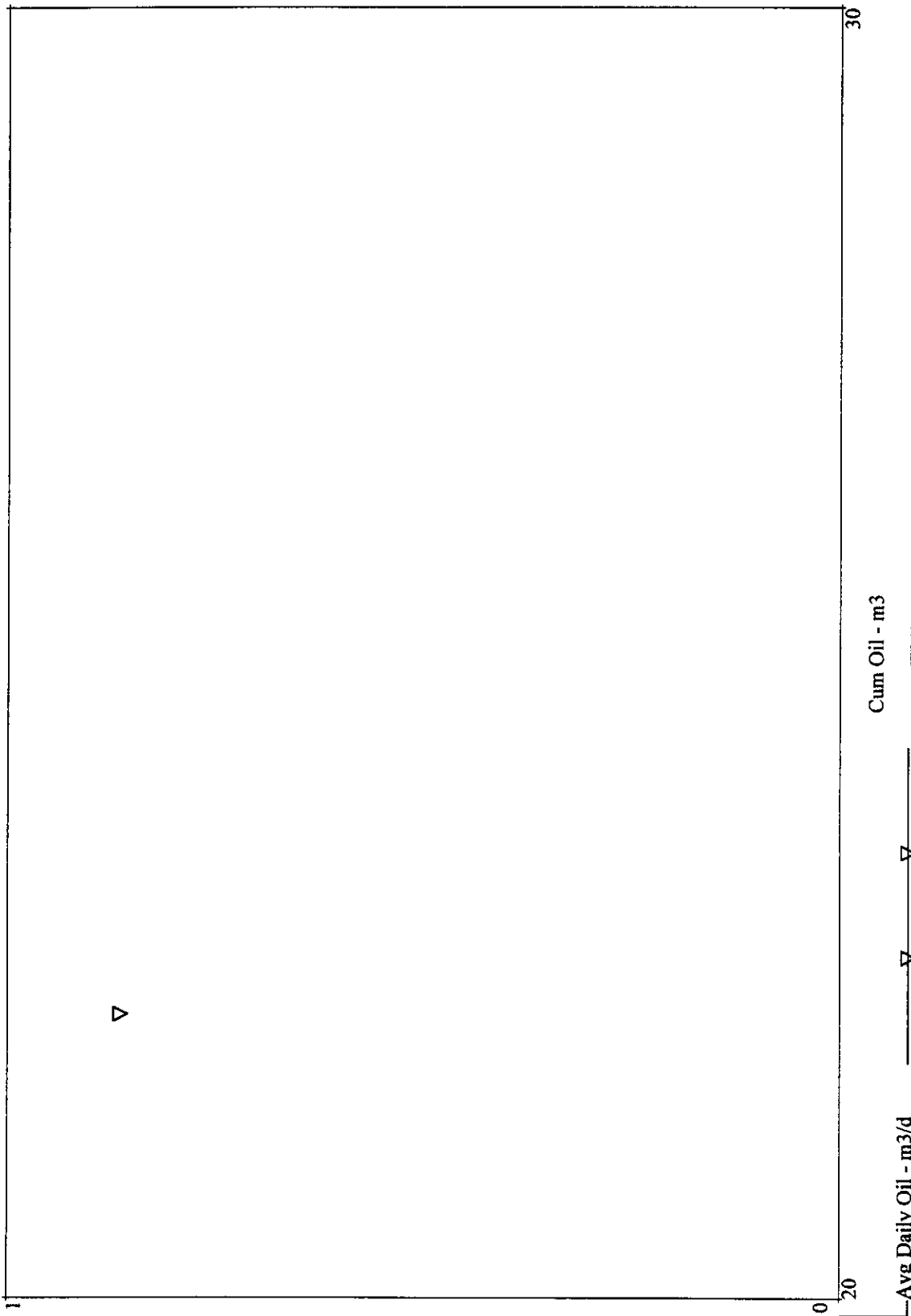




00/15-18-016-27W1/0 (Progress Birdtail 15-18-16-27) Data 06/98-07/98

Operator:
Field:
Zone:
Type: Other
Group: North Birdtail

Production Cums
Oil: 22.2 m3
Gas: 0 E6m3
Water: 4.8 m3
Cond: 0 m3



Cum Oil - m3



Avg Daily Oil - m3/d

Operator:

Field:

Zone:

Type: Other

Group: North Birdtail

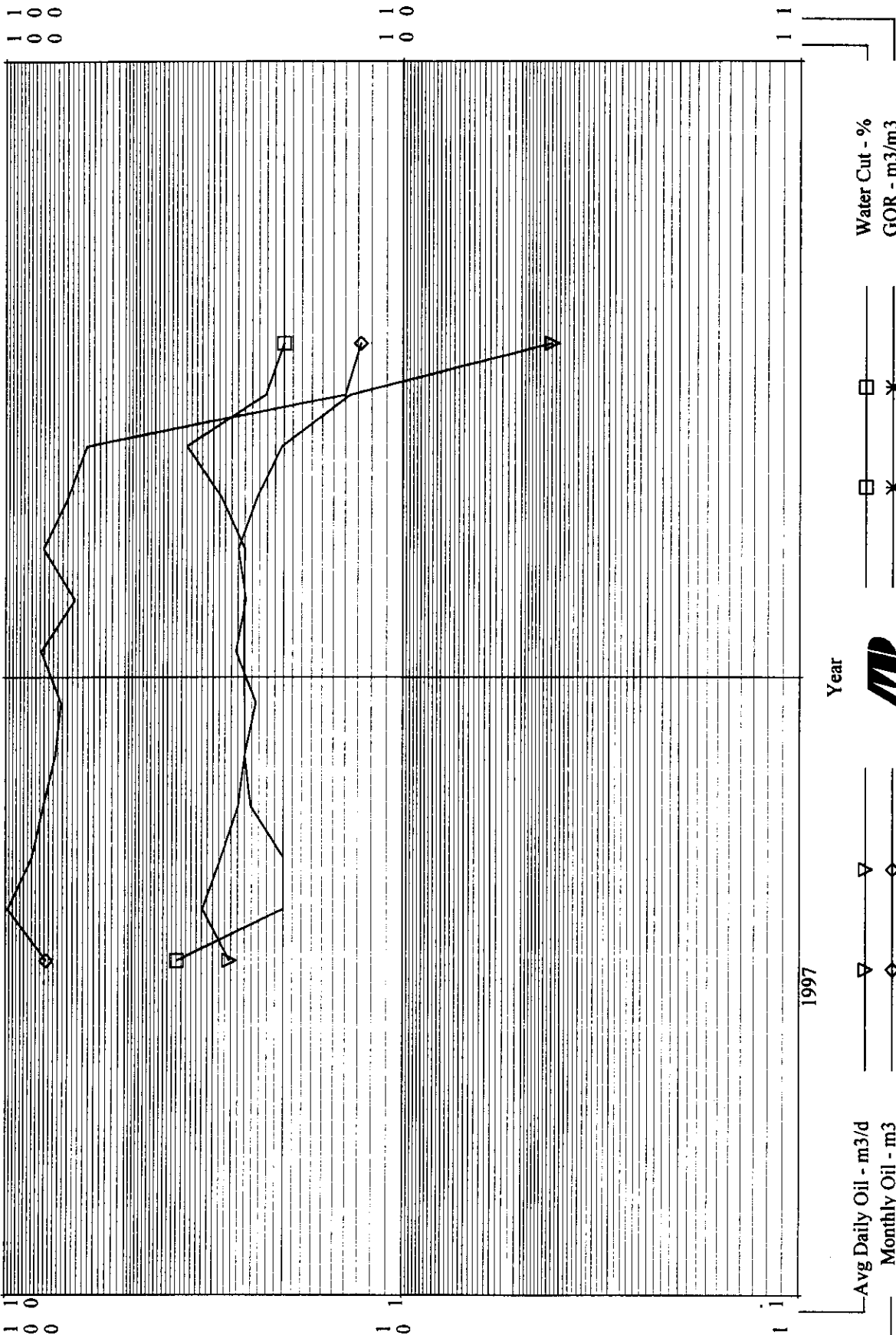
Production Cums

Oil: 880.9 m3

Gas: 0 E6m3

Water: 313.6 m3

Cond: 0 m3



Progress Energy (00/16-18-016-...W1/0) Data 07/97-07/98

Operator:

Field:

Zone:

Type: Other

Group: North Birdtail

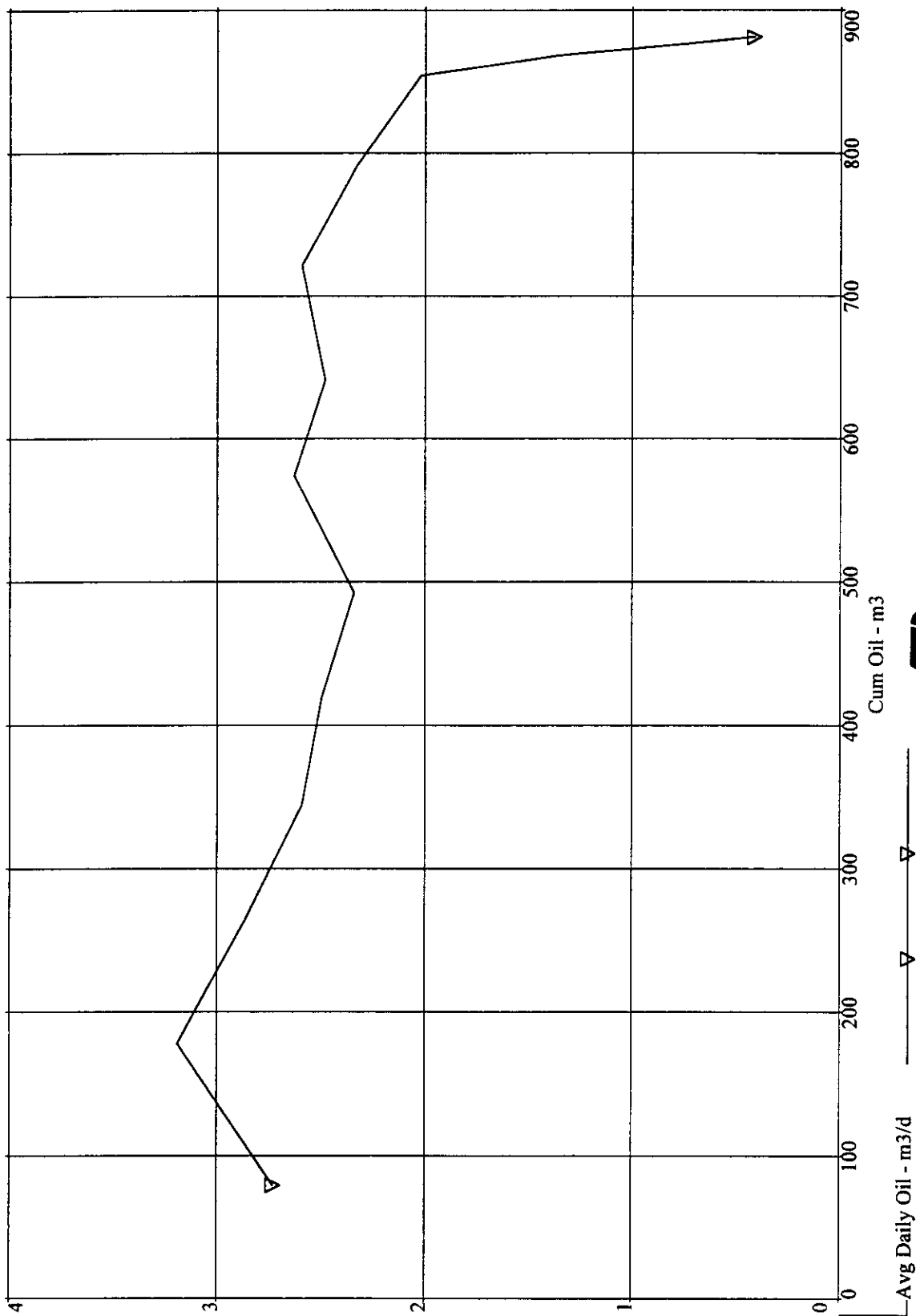
Production Cums

Oil: 880.9 m3

Gas: 0 E6m3

Water: 313.6 m3

Cond: 0 m3

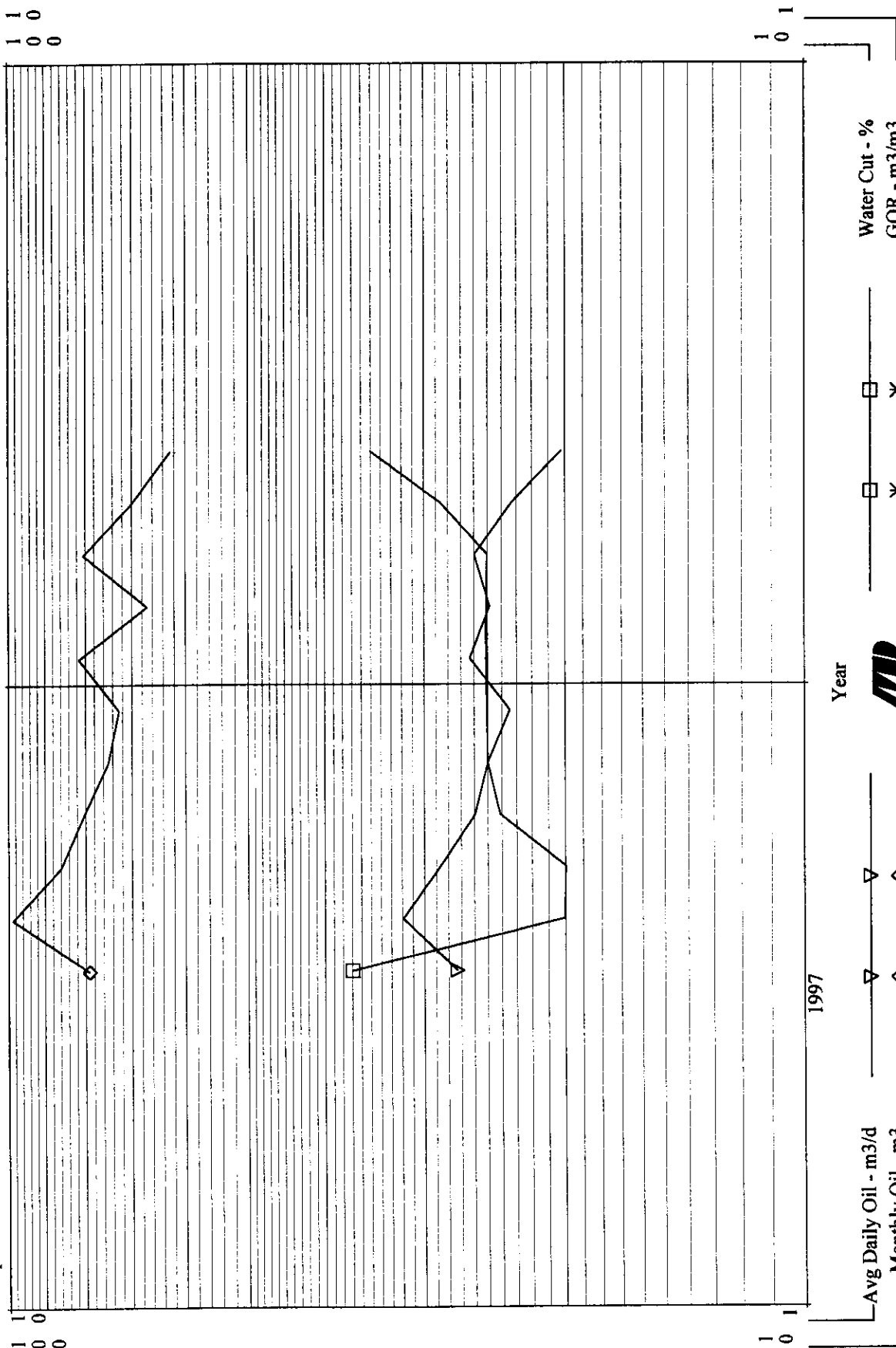


MP

00/01-19-016-27W1/0 (Northrock Birdtail) 01-19-16-27W1) Data 07/97-05/98

Operator:
Field: 99
Zone: 60D
Type: Unknown
Group: North Birdtail

Production Cums
Oil: 854.1 m3
Gas: 0 E6m3
Water: 306.4 m3
Cond: 0 m3



00/01-19-016-27W1/0 (Northrock Birdtail) Data 07/97-05/98

Operator:

Field: 99

Zone: 60D

Type: Unknown

Group: North Birdtail

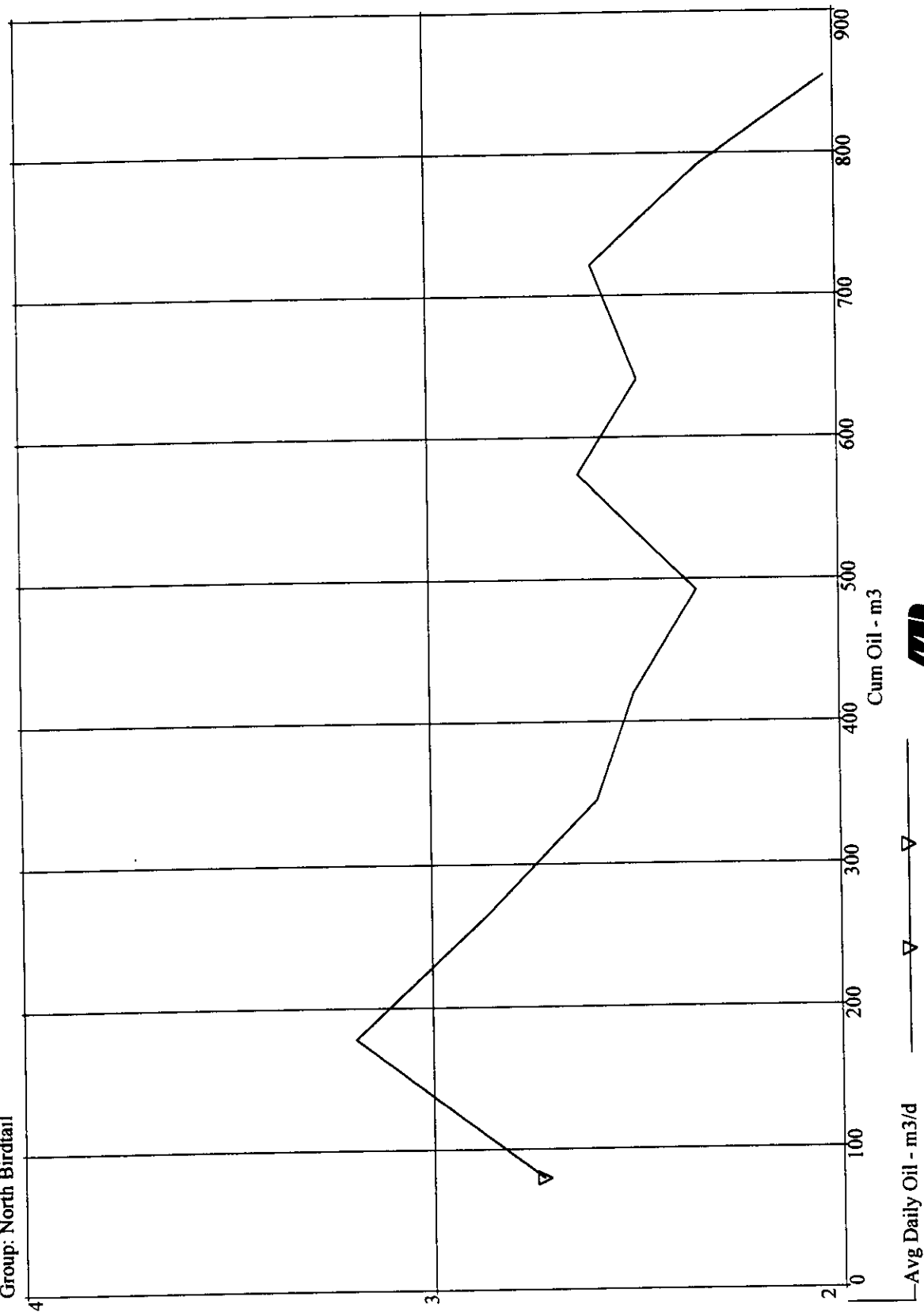
Production Cums

Oil: 854.1 m3

Gas: 0 E6m3

Water: 306.4 m3

Cond: 0 m3



MP

00/02-19-016-27W1/0 (Progress Birc 2-19-16-27) Data 02/98-07/98

Operator:

Field:

Zone:

Type: Other

Group: North Birdtail

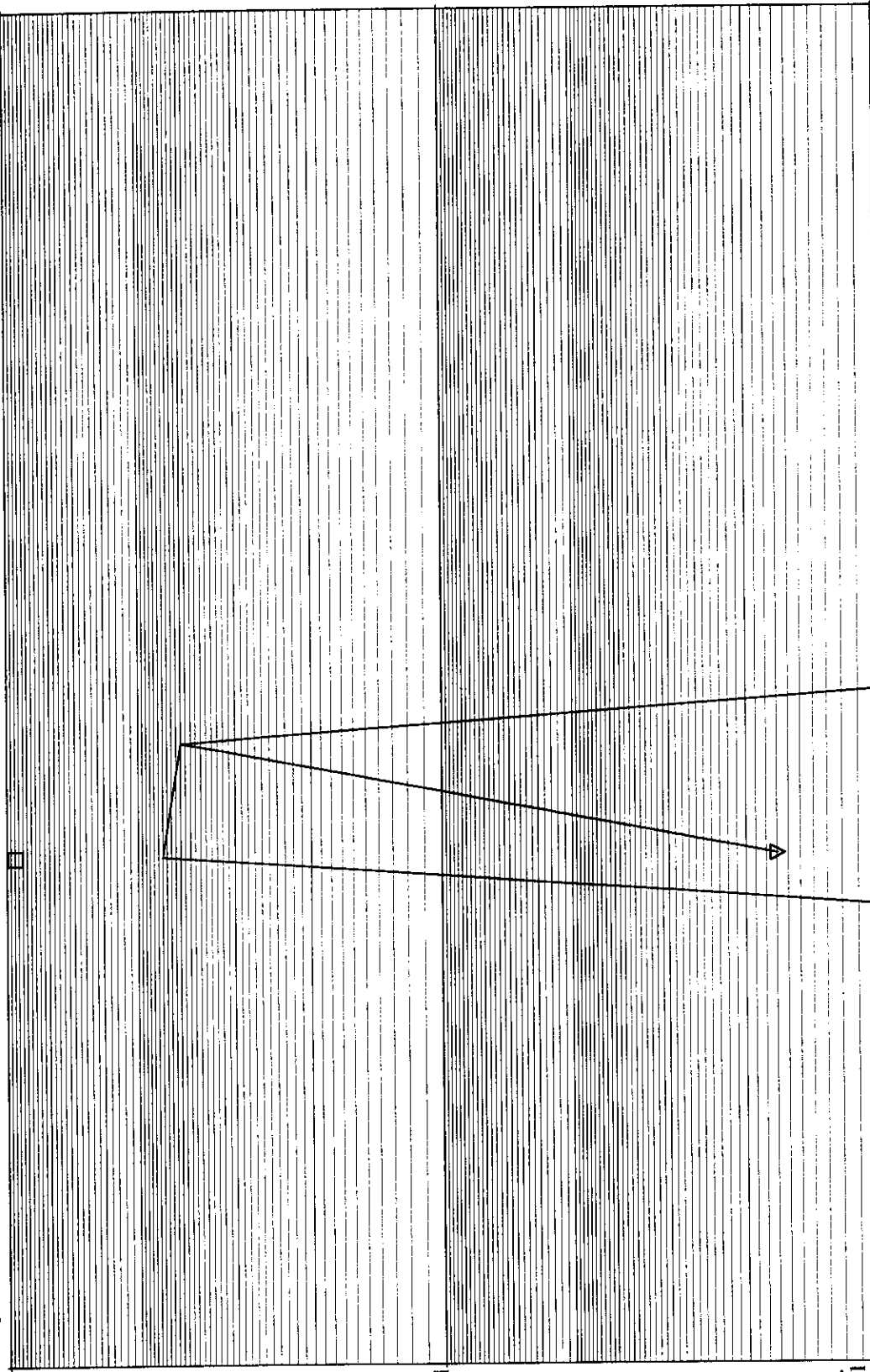
Production Cums

Oil: 8.4 m3

Gas: 0 E6m3

Water: 239 m3

Cond: 0 m3



Avg Daily Oil - m3/d

Monthly Oil - m3

Water Cut - %

GOR - m3/m3

1998

Year



00/02-19-016-27W1/0 (Progress Bira. 2-19-16-27) Data 02/98-07/98

Operator:

Field:

Zone:

Type: Other

Group: North Birdtail

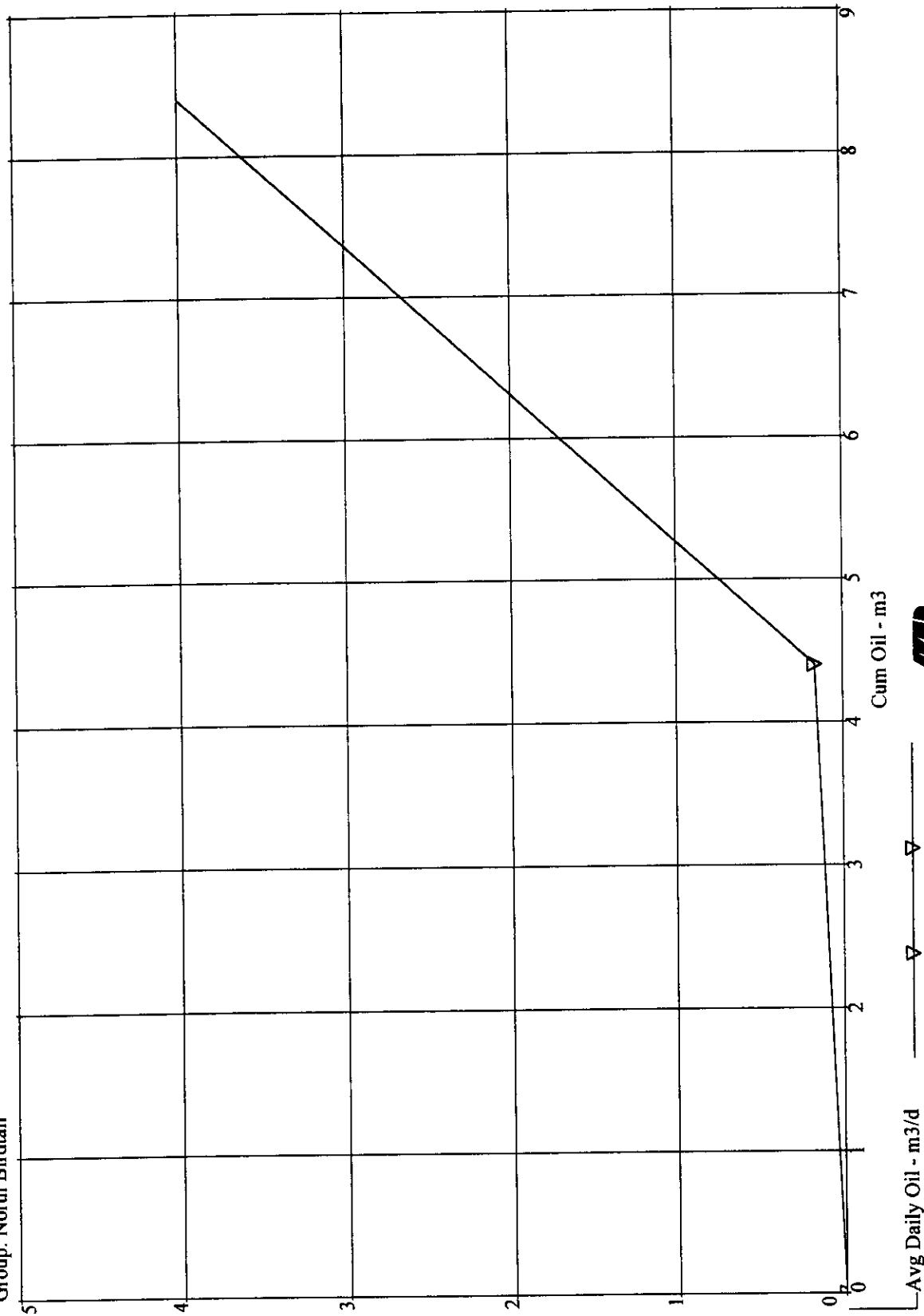
Production Cums

Oil: 8.4 m3

Gas: 0 E6m3

Water: 239 m3

Cond: 0 m3

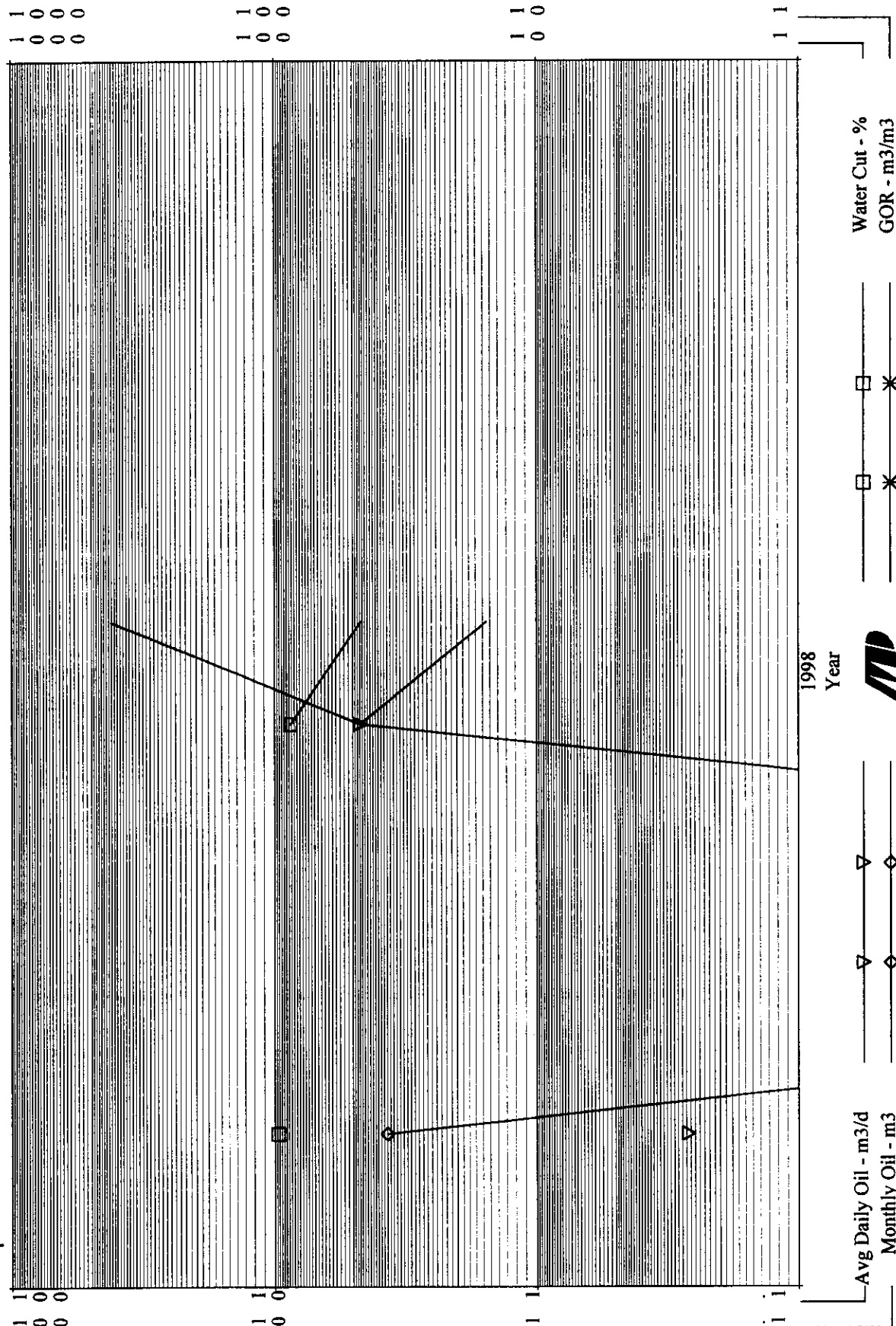


M

00/07-19-016-27W1/0 (Northrock Birdt.)

Operator: _____
Field: 15 _____
Zone: 60C _____
Type: Other _____
Group: No _____

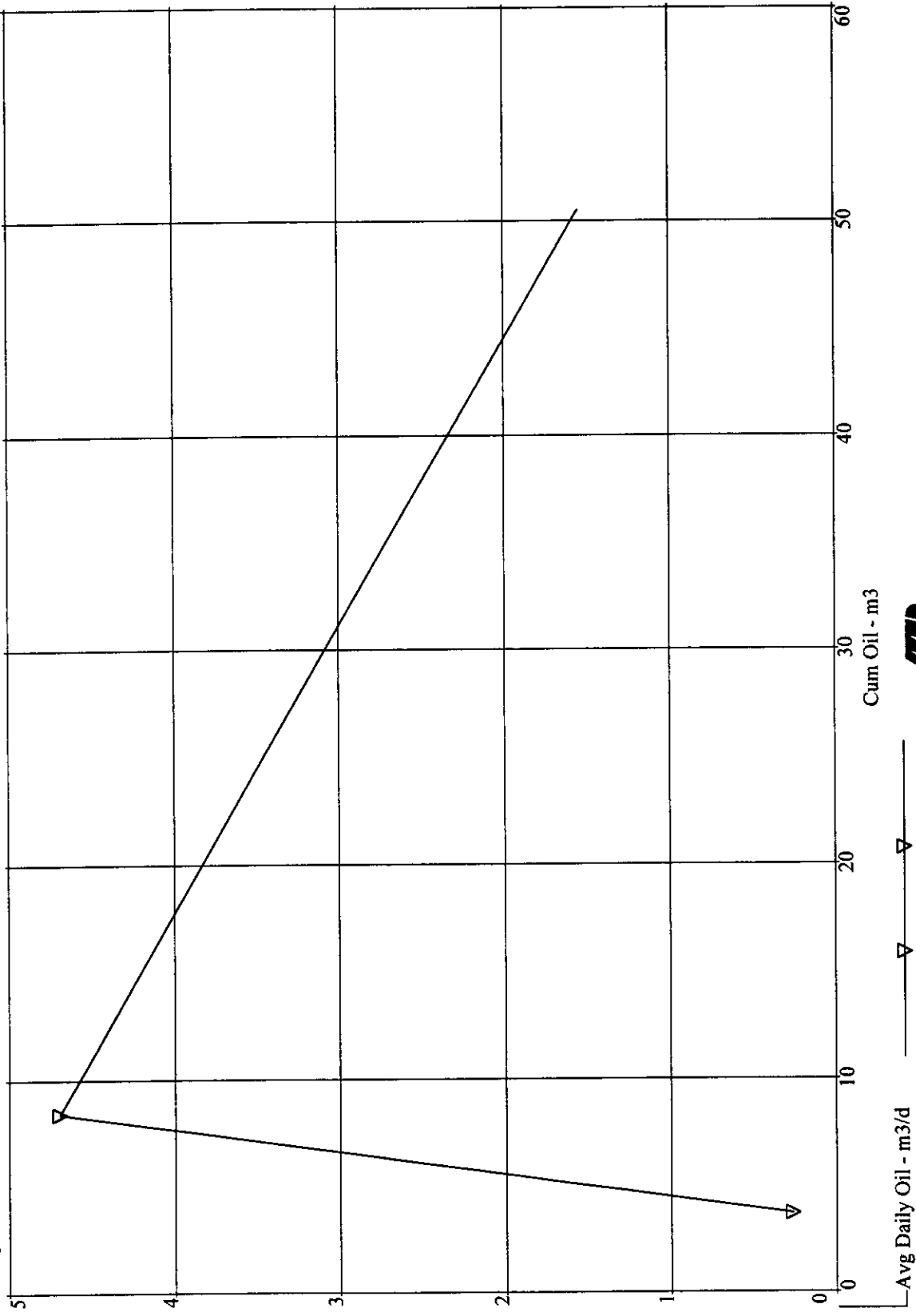
Production Cums
Oil: 50.5 m3
Gas: 0 E6m3
Water: 202.3 m3
Cond: 0 m3



00/07-19-016-27W1/0 (Northrock Birdtail 7-19-16-27W1) Data 02/98-07/98

Operator:
Field: 15
Zone: 60C
Type: Other
Group: North Birdtail

Production Cums
Oil: 50.5 m3
Gas: 0 E6m3
Water: 202.3 m3
Cond: 0 m3



MP

00/08-19-016-27W1/0 (Northrock Birdtail L. .08-19-16-27W1) Data 02/98-07/98

Operator:

Field: 15

Zone: 60C

Type: Other

Group: North Birdtail

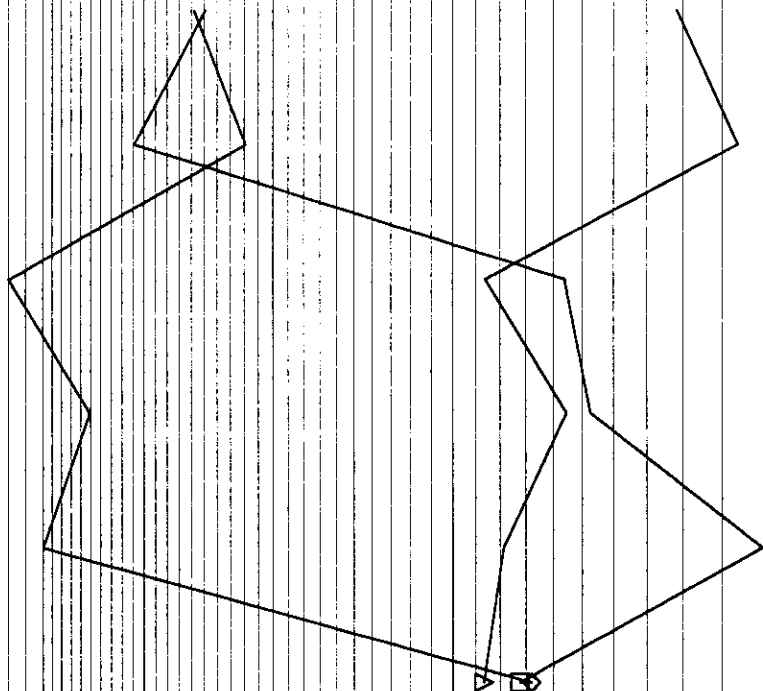
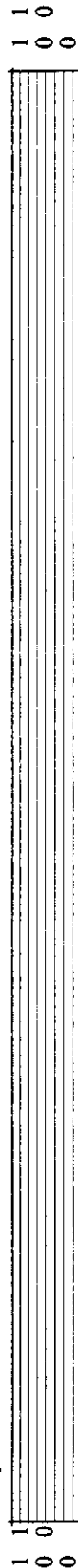
Production Cums

Oil: 233.6 m3

Gas: 0 E6m3

Water: 68.2 m3

Cond: 0 m3



Avg Daily Oil - m3/d

Monthly Oil - m3

Water Cut - %

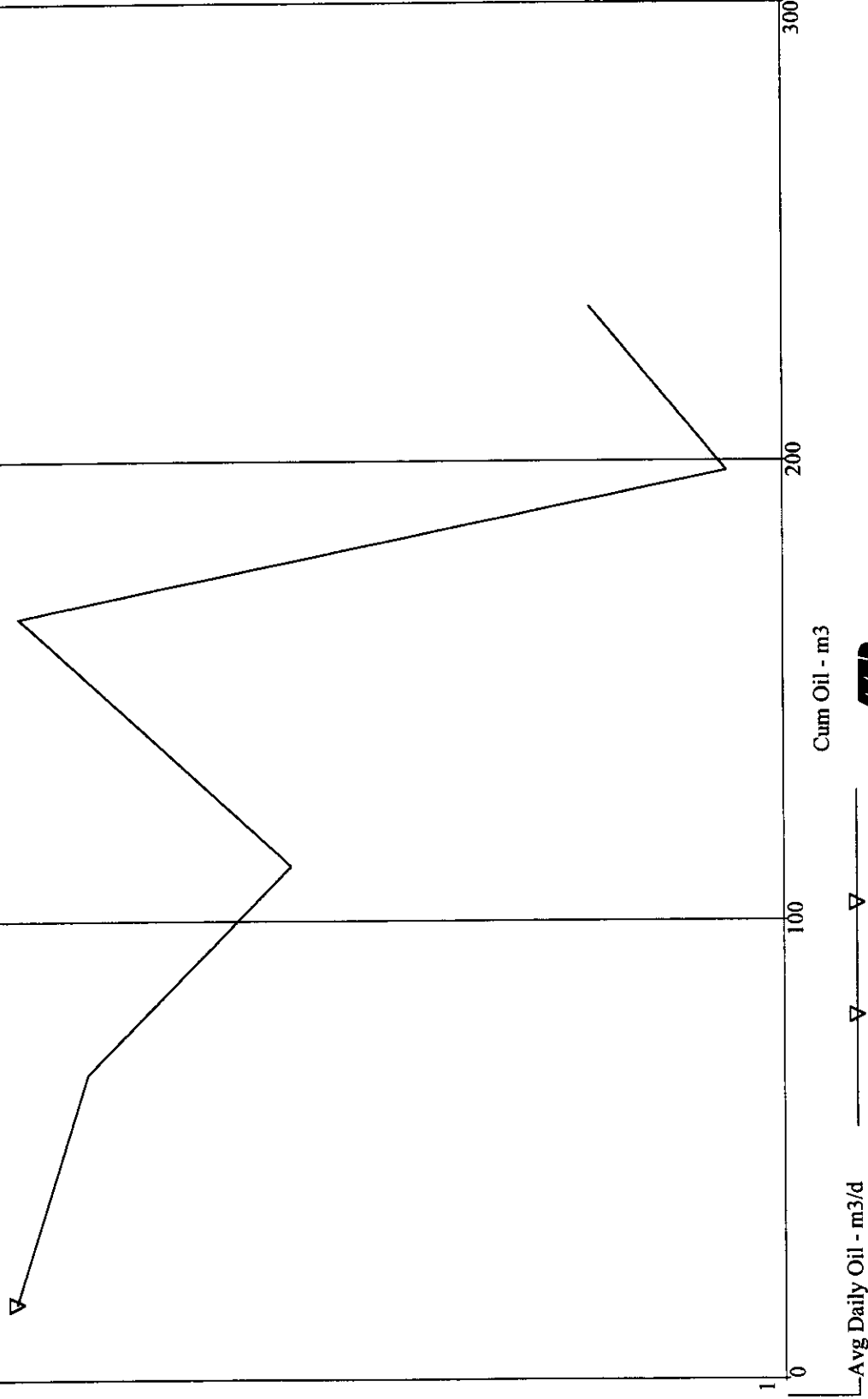
GOR - m3/m3



00/08-19-016-27W1/0 (Northrock Birdtail) Data 02/98-07/98

Operator:
Field: 15
Zone: 60C
Type: Other
Group: North Birdtail

Production Cums
Oil: 233.6 m3
Gas: 0 E6m3
Water: 68.2 m3
Cond: 0 m3



MP

00/03-20-016-27W1/0 (Northrock Birdh. 3-20-16-27W1) Data 02/98-07/98

Operator:

Field: 15

Zone: 60C

Type: Other

Group: North Birdtail

Production Cums

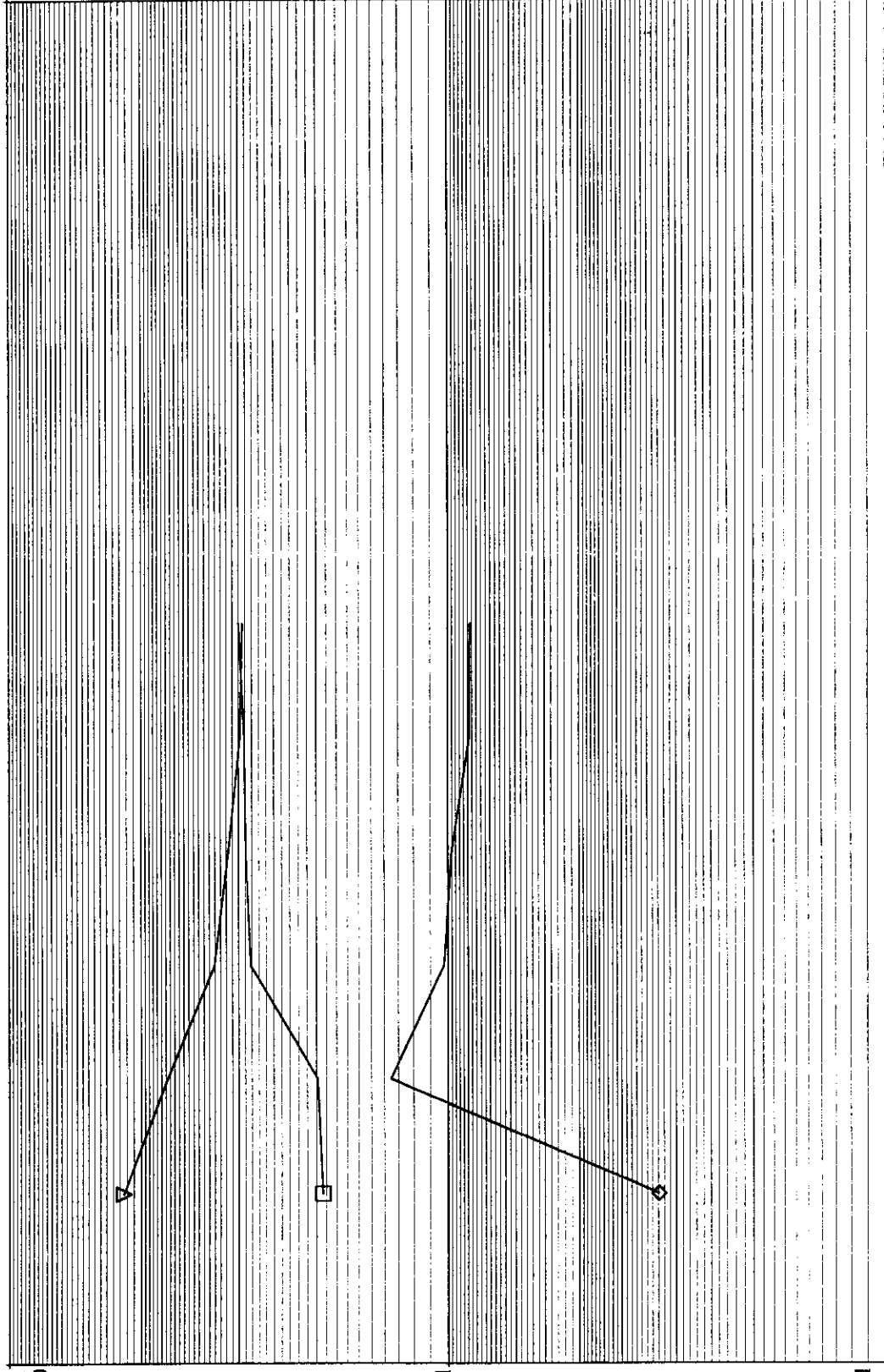
Oil: 546.9 m3

Gas: 0 E6m3

Water: 196.4 m3

Cond: 0 m3

1 1
0 0
0 0
0 0



1 1
0 0
0 0

1 1
0 0
0 0

Avg Daily Oil - m3/d

Monthly Oil - m3

Water Cut - %

GOR - m3/m3

1998

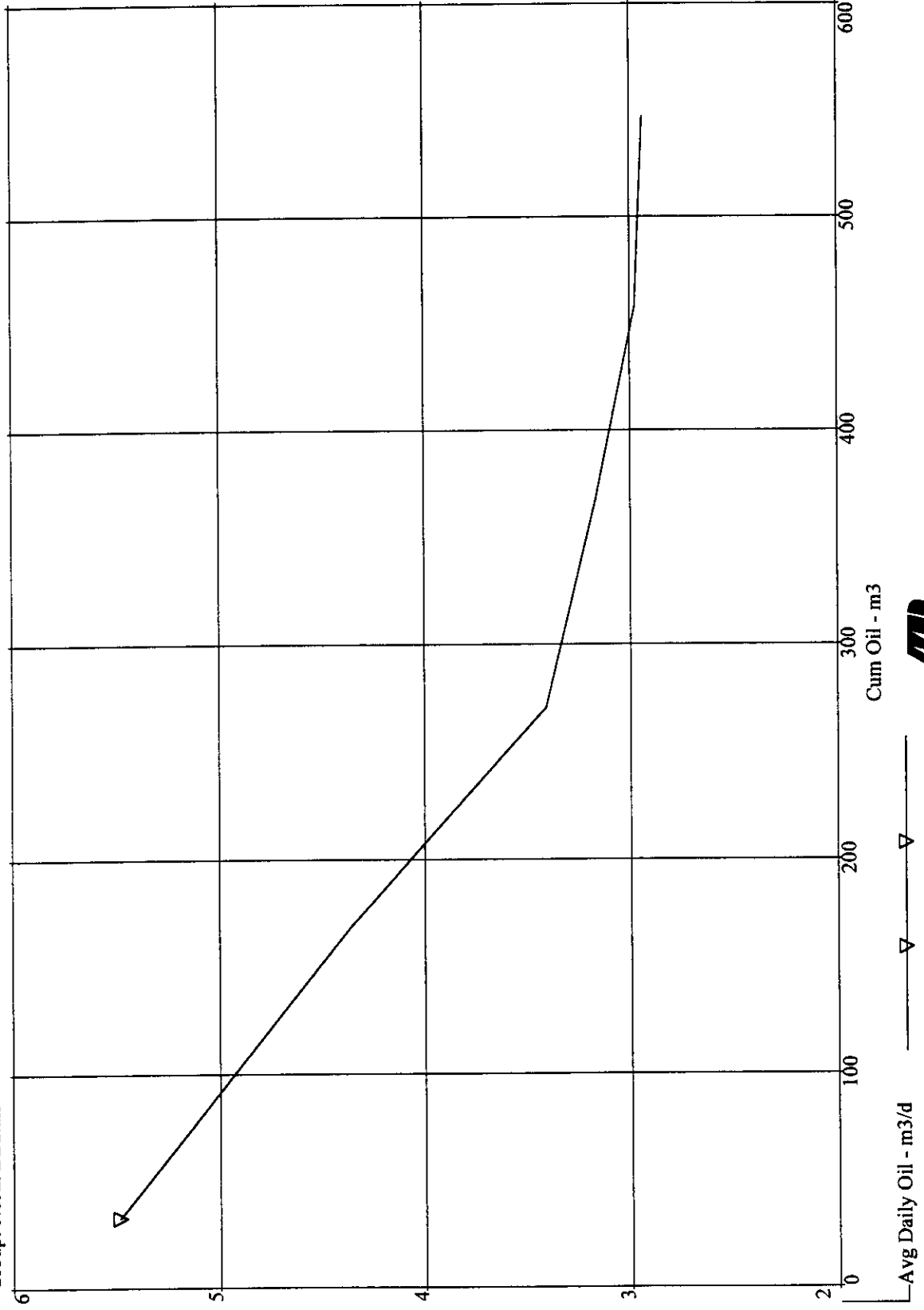
Year



00/03-20-016-27W1/0 (Northrock Birdta. J-20-16-27W1) Data 02/98-07/98

Operator:
Field: 15
Zone: 60C
Type: Other
Group: North Birdtail

Production Cums
Oil: 546.9 m3
Gas: 0 E6m3
Water: 196.4 m3
Cond: 0 m3

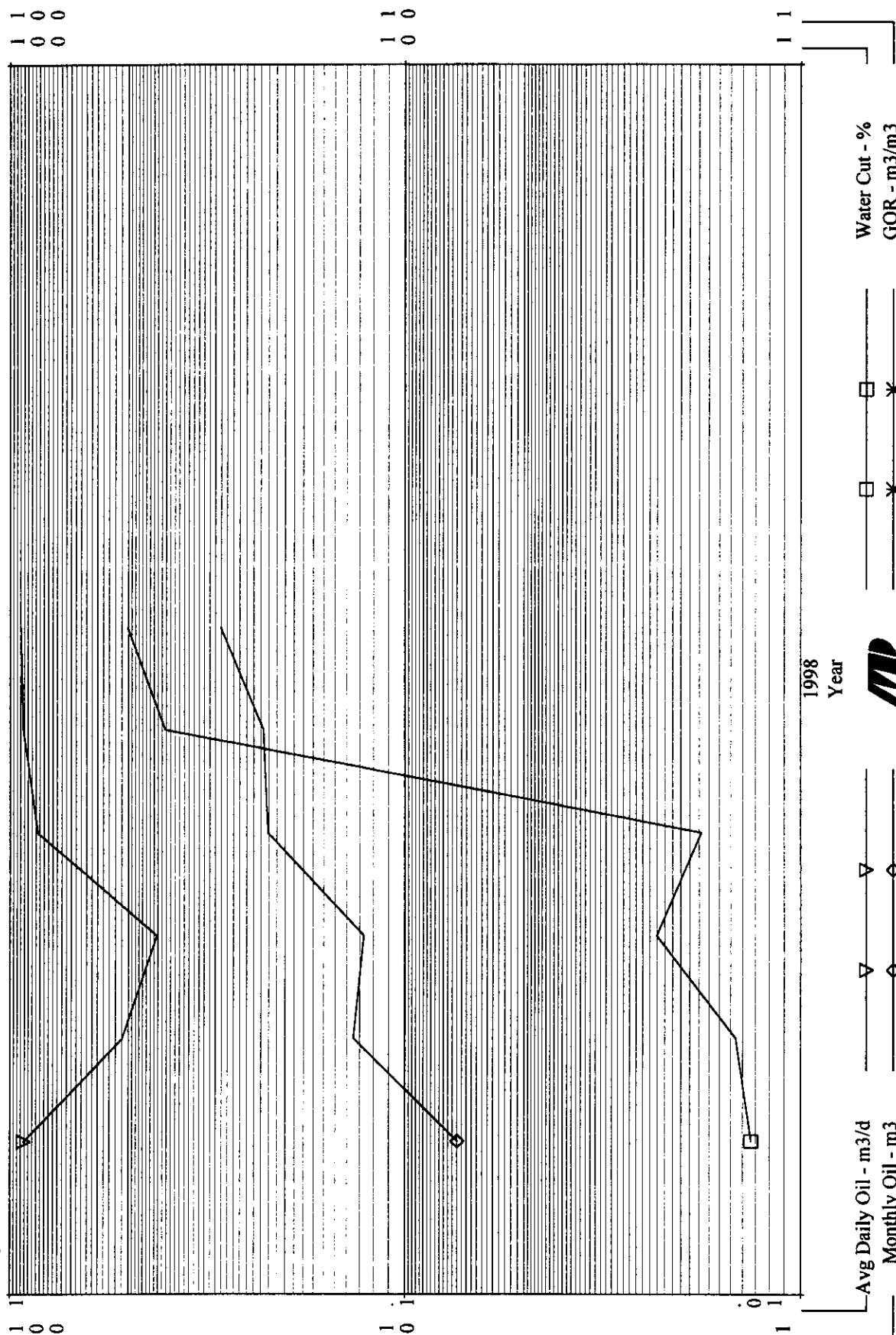


MP

00/04-20-016-27W1/0 (Northrock Birdta -20-16-27W1) Data 02/98-07/98

Operator:
Field: 15
Zone: 60C
Type: Other
Group: North Birdtail

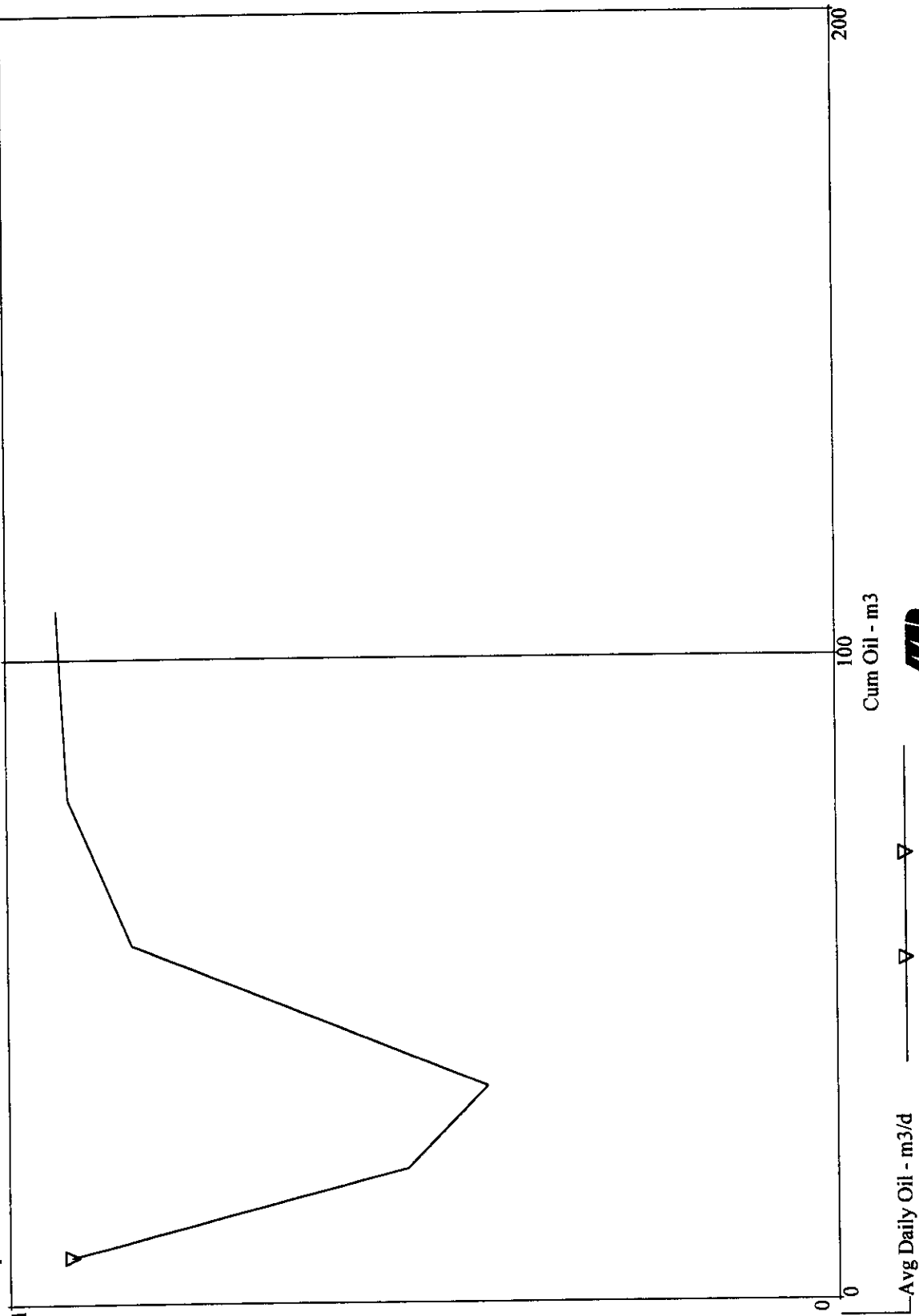
Production Cums
Oil: 107.5 m3
Gas: 0 E6m3
Water: 45.7 m3
Cond: 0 m3



00/04-20-016-27W1/0 (Northrock Birdtail 04-20-16-27W1) Data 02/98-07/98

Production Cums
Oil: 107.5 m3
Gas: 0 E6m3
Water: 45.7 m3
Cond: 0 m3

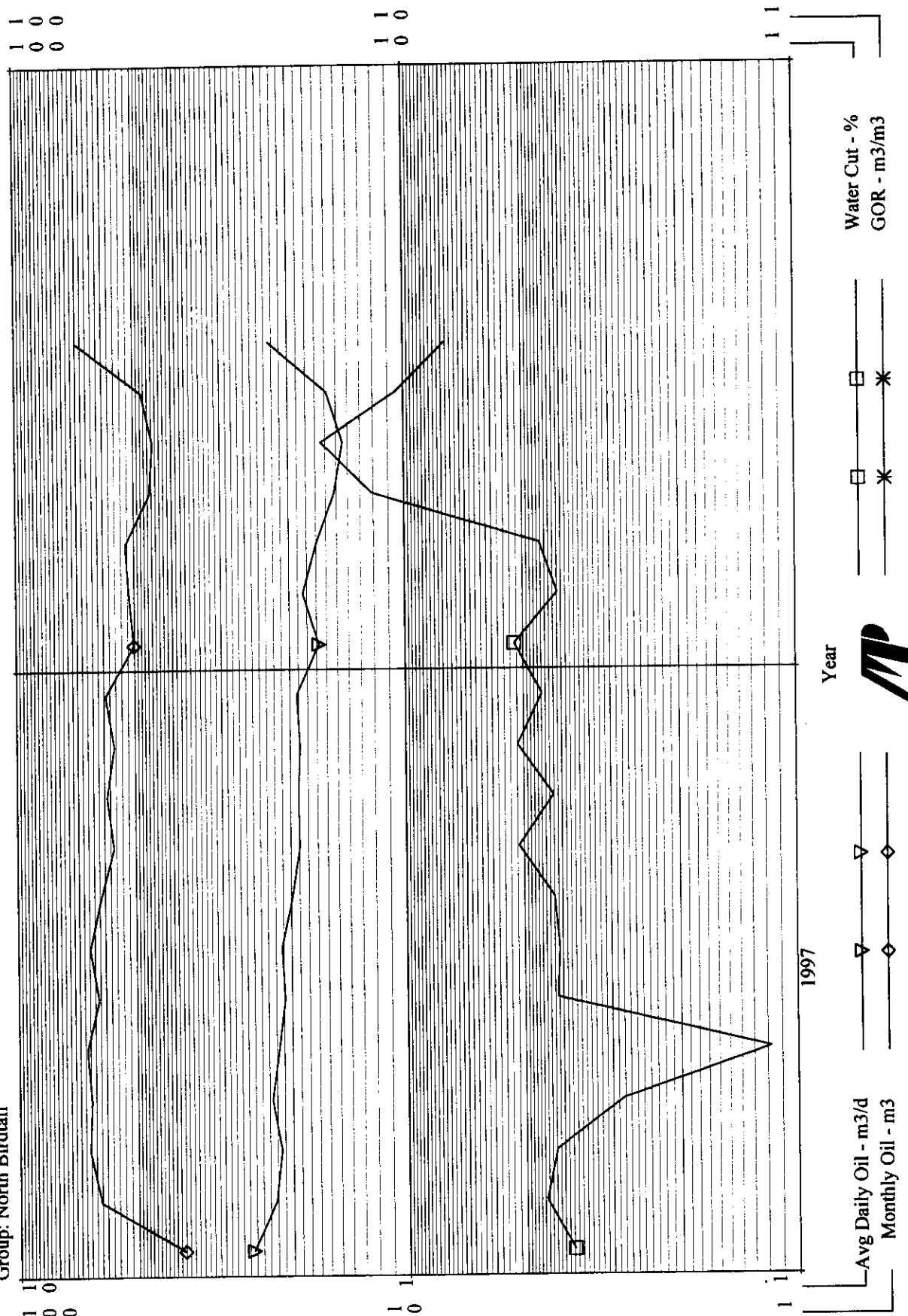
Operator:
Field: 15
Zone: 60C
Type: Other
Group: North Birdtail



MP

Production Cums
Oil: 1083.6 m3
Gas: 0 E6m3
Water: 63.9 m3
Cond: 0 m3

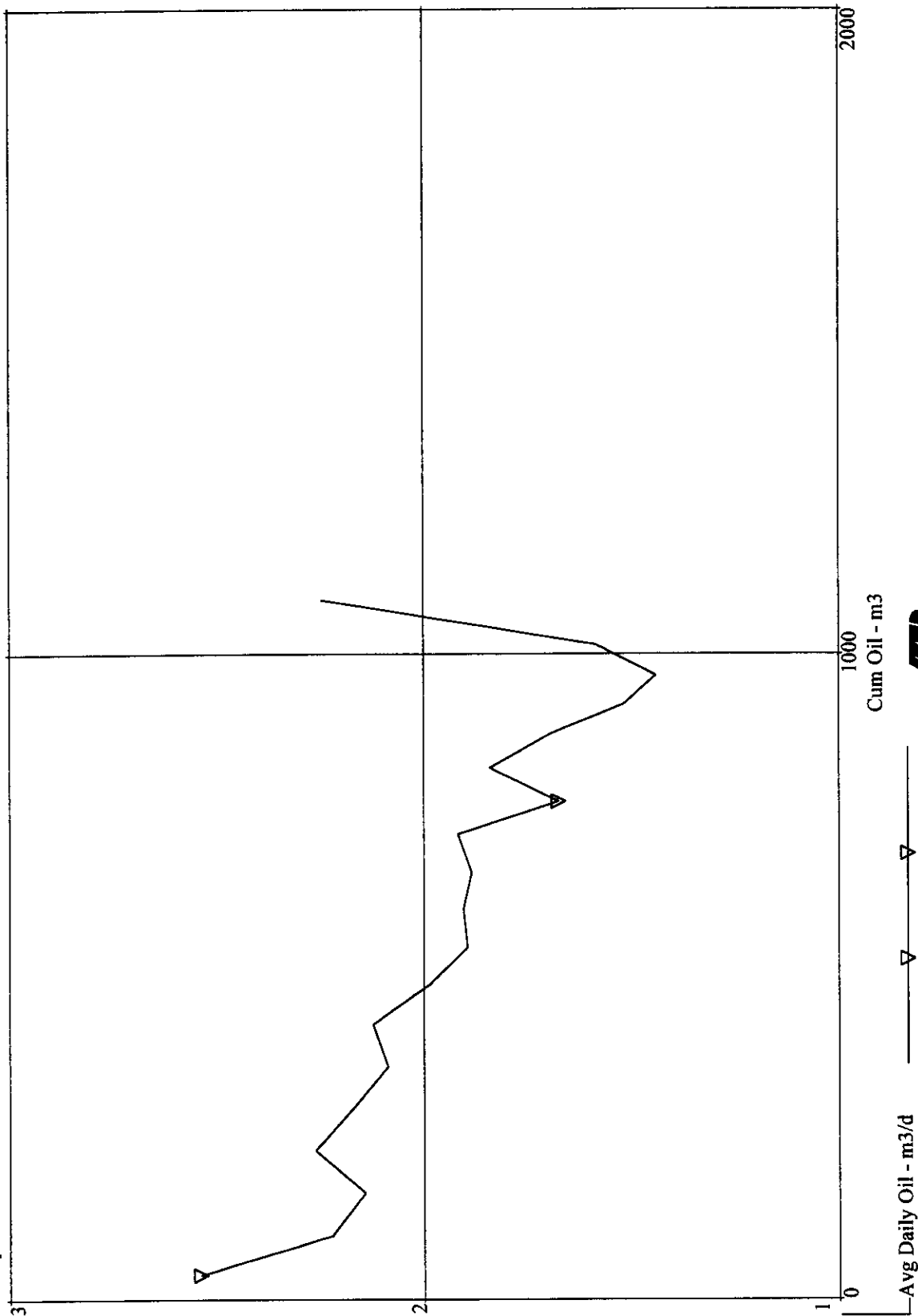
Operator:
Field: 99
Zone: 60D
Type: Other
Group: North Birdtail



00/05-20-016-27W1/0 (Northrock Birdtail) 5-20-16-27W1) Data 01/97-07/98

Operator:
Field: 99
Zone: 60D
Type: Other
Group: North Birdtail

Production Cums
Oil: 1083.6 m3
Gas: 0 E6m3
Water: 63.9 m3
Cond: 0 m3



MP

Production Report

Group : North Birdtail	Date : October 15, 1998 11:50:04 am
Vell : North Birdtail Summary Well	User : dale
: 000000001	
Hist.Data : 01/97-07/98	On Prod : 02/09
Operator :	Status : Other
Field :	Zone :

Production Data from January, 1997 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Num Wells	Water Cut %	GOR m3/m3
Jan., 1997	2.54	38.1	1	3.78627	
Feb., 1997	2.22143	62.2	1	4.45281	
Mar., 1997	2.14194	66.4	1	4.18294	
Apr., 1997	2.26207	65.6	1	2.81361	
May., 1997	2.16774	67.2	1	1.17596	
Jun., 1997	2.08667	62.6	1	4.13302	
Jul., 1997	7.5573	224.2	3	29.9283	
Aug., 1997	8.36774	259.4	3	16.7728	
Sep., 1997	7.63	228.9	3	16.7575	
Oct., 1997	7.09355	219.9	3	19.6496	
Nov., 1997	6.88667	206.6	3	20.4395	
Dec., 1997	6.60968	204.9	3	20.0476	
Jan., 1998	6.96196	213.5	3	21.2394	
Feb., 1998	16.44	246.6	8	57.4573	
Mar., 1998	13.9045	412.5	6	18.8244	
Apr., 1998	11.5877	345.7	6	24.2635	
May., 1998	11.9214	348.7	7	39.2404	
Jun., 1998	11.8452	214.2	7	34.9232	
Jul., 1998	10.2735	300.5	7	31.3832	

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:51:04 am
Well	: Progress Birdtail 15-18-16-27	User	: dale
	: 00/15-18-016-27W1/0		
Hist.Data	: 06/98-07/98	On Prod	: 09/98
Operator	:	Status	: Other
Field	:	Zone	:

Production Data from June, 1998 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Jun., 1998		0	0		
Jul., 1998	0.864935	22.2	0.871283	17.7713	

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:51:17 am
Well	: Northrock Birdtail Prov. 01-19-16-27W1	User	: dale
	: 00/01-19-016-27W1/0		
Hist.Data	: 07/97-05/98	On Prod	: 02/09
Operator	:	Status	: Unknown
Field	: 99	Zone	: 60D

Production Data from July, 1997 to May, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Jul., 1997	2.73103	79.2	4.05596	36.9826	
Aug., 1997	3.19032	98.9	3.99173	20.0414	
Sep., 1997	2.86667	86	3.5846	19.993	
Oct., 1997	2.59355	80.4	3.4205	24.1429	
Nov., 1997	2.5	75	3.33443	24.9917	
Dec., 1997	2.34516	72.7	3.13007	25.0433	
Jan., 1998	2.63226	81.6	3.51729	25.1293	
Feb., 1998	2.48519	67.1	3.20106	25.1033	
Mar., 1998	2.59677	80.5	3.46566	25.0383	
Apr., 1998	2.33333	70	3.27103	28.6352	
May., 1998	2.02258	62.7	3.11379	35.0159	

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:51:32 am
Well	: Progress Birdtail 2-19-16-27	User	: dale
	: 00/02-19-016-27W1/0		
Hist.Data	: 02/98-07/98	On Prod	: 06/98
Operator	:	Status	: Other
Field	:	Zone	:

Production Data from February, 1998 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Feb., 1998	0	0	5.01429		
Mar., 1998		0	0		
Apr., 1998		0	0		
May., 1998	0.169231	4.4	3.32264	95.7264	
Jun., 1998	4	4	0.133392		
Jul., 1998		0	0		

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:51:46 am
Well	: Northrock Birdtail 07-19-16-27W1	User	: dale
	: 00/07-19-016-27W1/0		
Hist.Data	: 02/98-07/98	On Prod	: 06/98
Operator	:	Status	: Other
Field	: 15	Zone	: 60C

Production Data from February, 1998 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Feb., 1998	0.264286	3.7	4.92149	97.3138	
Mar., 1998		0	0		
Apr., 1998		0	0		
May., 1998		0	0		
Jun., 1998	4.7	4.7	1.20007	86.9394	
Jul., 1998	1.55207	42.1	2.54899	46.6979	

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:51:57 am
Well	: Northrock Birdtail Prov. 08-19-16-27W1	User	: dale
	: 00/08-19-016-27W1/0		
Hist.Data	: 02/98-07/98	On Prod	: 06/98
Operator	:	Status	: Other
Field	: 15	Zone	: 60C

Production Data from February, 1998 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Feb., 1998	1.86667	16.8	0.725264	17.2351	
Mar., 1998	1.78571	50	1.79426	10.068	
Apr., 1998	1.55517	45.1	1.764	14.7393	
May., 1998	1.86207	54	2.06528	15.6192	
Jun., 1998	1.06333	31.9	1.80047	40.9153	
Jul., 1998	1.217	35.8	1.7747	34.8991	

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:52:10 am
Well	: Northrock Birdtail 03-20-16-27W1	User	: dale
	: 00/03-20-016-27W1/0		
Hist.Data	: 02/98-07/98	On Prod	: 06/98
Operator	:	Status	: Other
Field	: 15	Zone	: 60C

Production Data from February, 1998 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Feb., 1998	5.48333	32.9	1.45766	19.3559	
Mar., 1998	4.36774	135.4	5.45354	19.8746	
Apr., 1998	3.41	102.3	4.7515	28.2016	
May., 1998	3.16452	98.1	4.45301	28.904	
Jun., 1998	2.97667	89.3	4.20131	29.1179	
Jul., 1998	2.93884	88.9	4.09804	29.9908	

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:52:21 am
/ell	: Northrock Birdtail 04-20-16-27W1	User	: dale
	: 00/04-20-016-27W1/0		
Hist.Data	: 02/98-07/98	On Prod	: 06/98
Operator	:	Status	: Other
Field	: 15	Zone	: 60C

Production Data from February, 1998 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Feb., 1998	0.925	7.4	0.267974	1.33275	
Mar., 1998	0.519231	13.5	0.442127	1.45922	
Apr., 1998	0.423333	12.7	0.43352	2.3067	
May., 1998	0.85	22.1	0.72612	1.77701	
Jun., 1998	0.926531	22.7	1.267	40.2526	
Jul., 1998	0.93871	29.1	1.88751	50.2454	

Production Report

Group	: North Birdtail	Date	: October 15, 1998 11:52:32 am
Well	: Northrock Birdtail 05-20-16-27W1	User	: dale
	: 00/05-20-016-27W1/0		
Hist.Data	: 01/97-07/98	On Prod	: 06/98
Operator	:	Status	: Other
Field	: 99	Zone	: 60D

Production Data from January, 1997 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Jan., 1997	2.54	38.1	1.27796	3.78627	
Feb., 1997	2.22143	62.2	2.32598	4.45281	
Mar., 1997	2.14194	66.4	2.23643	4.18294	
Apr., 1997	2.26207	65.6	2.25096	2.81361	
May., 1997	2.16774	67.2	2.1945	1.17596	
Jun., 1997	2.08667	62.6	2.17759	4.13302	
Jul., 1997	2.12258	65.8	2.21384	4.07991	
Aug., 1997	1.9871	61.6	2.07507	4.1973	
Sep., 1997	1.89667	56.9	2.00084	5.16451	
Oct., 1997	1.90645	59.1	1.99116	4.21216	
Nov., 1997	1.88667	56.6	1.99083	5.19046	
Dec., 1997	1.91935	59.5	2.01052	4.49249	
Jan., 1998	1.67667	50.3	1.71362	5.27087	
Feb., 1998	1.84286	51.6	1.92224	4.08749	
Mar., 1998	1.69677	52.6	1.77817	4.5353	
Apr., 1998	1.52	45.6	1.73067	12.134	
May., 1998	1.44194	44.7	1.72644	16.4425	
Jun., 1998	1.58667	47.6	1.77403	10.5222	
Jul., 1998	2.24516	69.6	2.43647	7.8114	

Production Report

Group : North Birdtail	Date : October 15, 1998 11:52:54 am
Well : 00/16-18-016-27W1/0	User : dale
: Progress Energy	
Hist.Data : 07/97-07/98	On Prod : 09/98
Operator :	Status : Other
Field :	Zone :

Production Data from July, 1997 to July, 1998

Year	Avg Daily Oil m3/d	Monthly Oil m3	Cal Day Fluid m3/d	Water Cut %	GOR m3/m3
Jul., 1997	2.73103	79.2	4.05596	36.9826	
Aug., 1997	3.19032	98.9	3.99173	20.0414	
Sep., 1997	2.86667	86	3.5846	19.993	
Oct., 1997	2.59355	80.4	3.4205	24.1429	
Nov., 1997	2.5	75	3.33443	24.9917	
Dec., 1997	2.34516	72.7	3.13007	25.0433	
Jan., 1998	2.63226	81.6	3.51729	25.1293	
Feb., 1998	2.48519	67.1	3.20106	25.1033	
Mar., 1998	2.59677	80.5	3.46566	25.0383	
Apr., 1998	2.33333	70	3.27103	28.6352	
May., 1998	2.02258	62.7	3.11379	35.0159	
Jun., 1998	1.36032	14	0.600206	22.2146	
Jul., 1998	0.419672	12.8	0.516311	19.993	

APPENDIX 2
Reservoir Fluid Analysis

HYDROCARBON LIQUID ANALYSIS

V3725

CONTAINER IDENTITY

52134-97-0711

LABORATORY NUMBER

Northrock Resources Ltd.

OPERATOR

1

PAGE

101/08-35-015-31W1/00

LOCATION

Northrock et al Rocanville 8-35-15-31

WELL OR SAMPLE LOCATION

KB ELEV. (m)

GR ELEV. (m)

Rocanville

FIELD OR AREA

POOL OR ZONE

CORE Laboratories

SAMPLER

TEST TYPE & NO.

TEST RECOVERY

Wellhead

POINT OF SAMPLE

AMT. & TYPE CUSHION

MUD RESISTIVITY

PUMPING

FLOWING

GAS LIFT

SWAB

WATER

m³/d

OIL

m³/d

GAS

m³/d

TEST INTERVAL (meters)

834

°C

°C

32.0

SEPARATOR

RESERVOIR

CONTAINER
WHEN SAMPLED

CONTAINER
WHEN RECEIVED

SEPARATOR

Pressures, kPa (gauge)

Temperatures, °C

97 03 26

DATE SAMPLED (Y/M/D)

97 03 31

DATE RECEIVED (Y/M/D)

97 04 23

DATE ANALYZED (Y/M/D)

RS

ANALYST

SIGNATURE

COMPONENT	MOLE FRACTION	MASS FRACTION	LIQUID VOLUME FRACTION	mL/m ³
N ₂	0.0066	0.0008	0.0008	9.7
CO ₂	0.0009	0.0002	0.0002	2.0
H ₂ S	0.0000	0.0000	0.0000	0.0
C ₁	Trace	Trace	Trace	Trace
C ₂	Trace	Trace	Trace	Trace
C ₃	Trace	Trace	Trace	Trace
iC ₄	Trace	Trace	Trace	Trace
C ₄	Trace	Trace	Trace	Trace
iC ₅	0.0022	0.0007	0.0009	10.8
C ₅	0.0033	0.0010	0.0014	16.0
C ₆₊	0.9870	0.9973	0.9967	11426.3
Total	1.0000	1.0000	1.0000	11464.7

OBSERVED PROPERTIES OF C₆₊ RESIDUE (15/15°C)

855.0 kg/m³
DENSITY

0.8557
RELATIVE DENSITY

34.0
API @ 15.5°C

234
RELATIVE MOLECULAR MASS

CALCULATED PROPERTIES OF TOTAL SAMPLE (15/15°C)

854.4 kg/m³
DENSITY

0.8551
RELATIVE DENSITY

34.1
API @ 15.5°C

231.61
RELATIVE MOLECULAR MASS

REMARKS:

Refer to page 2 for the extended analysis of hexanes plus.

NOTE: All Properties have been calculated utilizing GPA 2145-98 physical constants.

HYDROCARBON LIQUID ANALYSIS

Operator: Northrock Resources Ltd.
Well: Northrock et al Rocanville 8-35-15-31
Sample Point: Wellhead

Page: 2
File: 52134-97-0711
Date: 97 04 23

Analysis of C₆₊ Fraction

Boiling Point: Range (°C)	Component	Carbon Number	Mole Fraction	Mass Fraction	Liq. Vol. Fraction
36.1- 68.9	Hexanes	C ₆	0.0284	0.0106	0.0124
68.9- 98.3	Heptanes	C ₇	0.0620	0.0268	0.0303
98.3-125.6	Octanes	C ₈	0.0921	0.0454	0.0500
125.6-150.6	Nonanes	C ₉	0.0654	0.0362	0.0391
150.6-173.9	Decanes	C ₁₀	0.0677	0.0416	0.0442
173.9-196.1	Undecanes	C ₁₁	0.0614	0.0414	0.0433
196.1-215.0	Dodecanes	C ₁₂	0.0659	0.0485	0.0501
215.0-235.0	Tridecanes	C ₁₃	0.0531	0.0423	0.0433
235.0-252.2	Tetradecanes	C ₁₄	0.0490	0.0419	0.0426
252.2-270.6	Pentadecanes	C ₁₅	0.0418	0.0384	0.0387
270.6-287.8	Hexadecanes	C ₁₆	0.0415	0.0405	0.0407
287.8-302.8	Heptadecanes	C ₁₇	0.0329	0.0341	0.0340
302.8-317.2	Octadecanes	C ₁₈	0.0279	0.0307	0.0304
317.2-330.0	Nonadecanes	C ₁₉	0.0261	0.0302	0.0298
330.0-344.4	Eicosanes	C ₂₀	0.0230	0.0280	0.0276
344.4-357.2	Heneicosanes	C ₂₁	0.0197	0.0252	0.0247
357.2-369.4	Docosanes	C ₂₂	0.0162	0.0217	0.0212
369.4-380.0	Tricosanes	C ₂₃	0.0147	0.0206	0.0200
380.0-391.1	Tetracosanes	C ₂₄	0.0125	0.0184	0.0177
391.1-401.7	Pentacosanes	C ₂₅	0.0115	0.0177	0.0169
401.7-412.2	Hexacosanes	C ₂₆	0.0097	0.0153	0.0148
412.2-422.2	Heptacosanes	C ₂₇	0.0089	0.0147	0.0140
422.2-431.7	Octacosanes	C ₂₈	0.0073	0.0125	0.0119
431.7-441.1	Nonacosanes	C ₂₉	0.0072	0.0128	0.0122
441.1 PLUS	Triacontanes Plus	C ₃₀₊	0.1117	0.2892	0.2749
80.0	Benzene	C ₆ H ₆	0.0003	0.0001	0.0001
110.6	Toluene	C ₇ H ₈	0.0013	0.0005	0.0005
136.1-138.9	Ethylbenzene, p + m-Xylene	C ₈ H ₁₀	0.0063	0.0029	0.0026
144.4	o-Xylene	C ₈ H ₁₀	0.0052	0.0024	0.0021
168.9	1,2,4 Trimethylbenzene	C ₉ H ₁₂	0.0018	0.0009	0.0008
48.9	Cyclopentane	C ₅ H ₁₀	0.0010	0.0003	0.0003
72.2	Methylcyclopentane	C ₆ H ₁₂	0.0017	0.0006	0.0006
81.1	Cyclohexane	C ₆ H ₁₂	0.0014	0.0005	0.0005
101.1	Methylcyclohexane	C ₇ H ₁₄	0.0104	0.0044	0.0044
	TOTAL		0.9870	0.9973	0.9967
	Mole Fraction of C7+				0.9576
	Mass Fraction of C7+				0.9864
	Liquid Volume Fraction of C7+				0.9840
	Calculated Relative Molecular Mass of C7+				239
	Calculated Relative Density of C7+				0.8584
	Calculated Density of C7+ (kg/m3)				857.6

Northrock Resources Ltd.
Northrock et al Rocanville 8-35-15-31 (W1M)
52134-97-0711

VOLUMETRIC DATA
(at 32.0 °C)

Saturation Pressure (P _{sat})	834 kPa(g)
Thermal Exp. @ 12 411 kPa(g)	1.01482 V at 32.0 °C / V at 15.0 °C

AVERAGE SINGLE-PHASE COMPRESSIBILITIES

Pressure Range kPa(g)			Single-Phase Compressibility v/v/kPa
12 411	to	10 342	7.42 E -7
10 342	to	6 895	7.63 E -7
6 895	to	3 447	8.03 E -7
3 447	to	2 758	8.42 E -7
2 758	to	2 068	8.64 E -7
2 068	to	1 379	8.95 E -7
1 379	to	834	9.37 E -7

Northrock Resources Ltd.
Northrock et al Rocanville 8-35-15-31 (W1M)
52134-97-0711
PRESSURE-VOLUME RELATIONS
(at 32.0 °C)

Pressure kPa(g)	Relative Volume (A)
12 411	0.9908
10 342	0.9923
8 895	0.9949
3 447	0.9977
2 758	0.9983
2 068	0.9989
1 379	0.9995
688 834	1.0000

(A) Relative Volume: V/V_{sat} or volume at indicated pressure per volume at saturation pressure.

Northrock Resources Ltd.
Northrock et al Rocanville 8-35-15-31 (W1M)
52134-97-0711

RESERVOIR FLUID VISCOSITY

(at 32.0 °C)

Pressure kPa(g)	Oil Viscosity mPa·s
12 411	4.54
10 342	4.39
6 895	4.14
3 447	3.89
2 758	3.84
2 068	3.79
1 379	3.74
bx 834	3.70

Northrock Resources Ltd.
Northrock et al Rocanville 8-35-15-31 (W1M)
 52134-97-0711

SEPARATOR TEST OF RESERVOIR FLUID

Flash Conditions		Gas/Oil Ratio (m ³ /m ³) (A)	Gas/Oil Ratio (m ³ /STm ³) (B)	Stock Tank Oil Gravity at 15.6 °C (°API)	Formation Volume Factor Bofb (C)	Separator Volume Factor (D)	Specific Gravity of Flashed Gas (Air=1.000)	Oil Phase Density (kg/m ³)
kPa(g)	°C							

834	32.0							842.0 *
0	20.0	0.9	0.9	34.1	1.015	1.004	1.072	850.3
			Rsfb = 0.9					

* Calculated by material balance of separator test volumetrics.

(A) Cubic metres of gas at 101.325 kPa(a) and 15.0 °C per cubic metre of oil at indicated pressure and temperature.

(B) Cubic metres of gas at 101.325 kPa(a) and 15.0 °C per cubic metre of stock tank oil at 15.0 °C.

(C) Cubic metres of saturated oil at 834 kPa(g) and 32.0 °C per cubic metre of stock tank oil at 15.0 °C.

(D) Cubic metres of oil at indicated pressure and temperature per cubic metre of stock tank oil at 15.0 °C.

APPENDIX 3

Core Studies

PROGRESS BAKKEN A AND C POOL
RESERVOIR PARAMETERS
(>2.0 mD. CUT-OFF)

<u>Location</u>	<u>Interval</u>		<u>Avg ϕ</u> (%)	<u>Avg Perm (k)</u> (mD)	<u>Net Pay (h)</u> (m)
	<u>Top</u> (m)	<u>Bottom</u> (m)			
08-19-16-27W1M	523.0	525.2	19.9%	79.22	2.2
16-05-16-27W1M	516.1	518.0	24.1%	152.01	0.9

PROGRESS BAKKEN POOL
CORE ANALYSIS RESULTS

<u>Location</u>	<u>Interval</u>		<u>Residual Oil Saturation</u> (%)	<u>Amount of Net Pay >20 mD Permeability</u> (%)
	<u>Top</u> (m)	<u>Bottom</u> (m)		
08-19-16-27W1M	523.0	525.2	32%	70%
16-05-16-27W1M	516.1	518.0	36%	100%
Average			<u>34%</u>	<u>85%</u>

Recovery Factor - Birdtail Bakken C Pool

$$R.F. = EA \times EV \frac{(1 - SW - SOR)}{(1 - SW)}$$

EA 0.63
EV 0.70
SW 0.37
SOR 0.34

$$R.F. = 0.20$$

Recovery Factor - Birdtail Bakken A Pool

$$R.F. = EA \times EV \frac{(1 - SW - SOR)}{(1 - SW)}$$

EA 0.63
EV 0.85
SW 0.37
SOR 0.34

$$R.F. = 0.25$$

PROGRESS BIRDTAIL BAKKEN C SANDS
CORE ANALYSIS RESULTS

NORTHROCK BIRDTAIL 08-19-16-27W1M

DEPTH	DEPTH	INTERVAL	PERM	CAPACITY	POROSITY	CAPACITY	SATURATION	CUTOFF	CUTOFF	CUTOFF	CUTOFF	CUTOFF	CUTOFF
m	m	REP	K AIR	mD-m	fraction	↑ - m	PORE VOLUME	>20 MD	>20 MD	>2 MD	>2 MD	>2 MD	>2 MD
		m	mD				OIL	mD-m	m	↑	m	↑	OIL SAT
							WATER						
522.99	523.24	0.25	15.5	3.875	0.160	0.040	0.308	-	-	-	0.25	0.04	0.308
523.24	523.44	0.20	18.4	3.680	0.165	0.033	0.233	3.68	3.68	0.2	0.033	0.233	0.0765
523.44	523.63	0.19	81.0	15.390	0.216	0.041	0.225	15.39	15.39	0.19	0.04104	0.225	0.0468
523.63	523.89	0.26	74.6	19.396	0.225	0.058	0.569	19.396	19.396	0.26	0.0585	0.275	0.04275
523.89	524.15	0.26	81.8	23.816	0.207	0.054	0.464	23.816	23.816	0.26	0.05382	0.351	0.0715
524.15	524.37	0.22	17.8	3.916	0.165	0.036	0.319	-	-	-	0.22	0.0363	0.319
524.37	524.62	0.25	135.0	33.750	0.231	0.058	0.545	33.75	33.75	0.25	0.05775	0.347	0.08715
524.62	524.77	0.15	248.0	37.200	0.209	0.031	0.188	37.2	37.2	0.15	0.03135	0.188	0.0282
524.77	524.98	0.21	60.9	12.789	0.217	0.048	0.433	12.789	12.789	0.21	0.04557	0.422	0.08862
524.98	525.20	0.22	96.7	21.274	0.191	0.042	0.402	21.274	21.274	0.22	0.04202	0.458	0.10078
Totals		2.21		175.086				163.815	154	0.33005	2.21	0.43935	0.70312
				175.086				108.2435	0.214318		0.198601		0.318154

PROGRESS BIRDTAIL BAKKEN A SANDS
CORE ANALYSIS RESULTS

NORTHROCK BIRDTAIL 18-05-16-27W1M

DEPTH	DEPTH	INTERVAL	PERM	CAPACITY	POROSITY	CAPACITY	SATURATION	CUTOFF	CUTOFF	CUTOFF	CUTOFF	CUTOFF	CUTOFF
m	m	REP	K AIR	mD-m	fraction	↑ - m	(PORE VOLUME)	>20 MD	>20 MD	>2 MD	>2 MD	>2 MD	>2 MD
		m	mD				OIL	mD-m	m	↑	m	↑	OIL SAT
							WATER						
							fraction						
516.13	516.30	0.17	279.0	47.430	0.285	0.045	0.473	47.43	47.43	0.17	0.04505	0.473	0.08041
516.30	516.62	0.32	387.0	0.000	0.269	0.000	0.416	-	-	-	-	-	0.08041
516.62	516.71	0.09	0.09	34.830	0.072	0.024	0.327	34.83	34.83	0.09	0.02421	0.416	0.03744
516.71	516.89	0.18	0.1	0.018	0.072	0.013	0.541	-	-	-	-	-	0.03744
516.89	517.09	0.20	108.0	21.600	0.236	0.047	0.589	21.6	21.6	0.2	0.0472	0.283	0.0566
517.09	517.31	0.22	76.5	16.830	0.226	0.050	0.568	16.83	16.83	0.22	0.04972	0.328	0.07216
517.31	517.52	0.21	89.5	14.595	0.231	0.049	0.519	14.595	14.595	0.21	0.04851	0.364	0.07644
517.52	517.73	0.21	0.1	0.027	0.076	0.016	0.444	-	-	-	-	-	0.07644
517.73	518.00	0.27	0.5	0.124	0.092	0.025	0.522	-	-	-	-	-	0.07644
Totals		1.87		88.025				135.285	0.89	0.21469	0.89	0.21469	0.32305
								152.0056	0.241225		0.241225		0.362878

CORE LABORATORIES

Company : PROGRESS ENERGY INC.
 Well : NORTHROCK BIRDTAIL 8-19-16-27
 Location : LSD 00/08-19-016-27 W2/O
 Province : MANITOBA, CANADA

Field : BIRDTAIL
 Formation : BAKKEN SAND
 Coring Equip.: DIAMOND
 Coring Fluid : WATER BASE MUD

File No.: 52138-98-5008
 Date : 1998 01 25
 Analysts: RJH/JP
 Core Dia: 75 mm

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH m	INTVL REP m	SATURATION		DESCRIPTION
			(PORE VOLUME) OIL frac	WATER frac	
CORE NO. 1 520.00 - 529.00m (CORE RECEIVED 8.65m)(6 BOXES)					
	520.00- 20.84	0.84			sh
	520.84- 21.75	0.91			sh ssdy pyr
1	521.75- 22.07	0.32	0.180	0.671	ss
2	522.07- 22.99	0.92			ss shy pyr
3	522.99- 23.24	0.25	0.306	0.496	ss
4	523.24- 23.44	0.20	0.233	0.609	ss
5	523.44- 23.63	0.19	0.225	0.604	ss
6	523.63- 23.89	0.26	0.275	0.589	ss
7	523.89- 24.15	0.26	0.351	0.464	ss
8	524.15- 24.37	0.22	0.319	0.559	ss
9	524.37- 24.62	0.25	0.347	0.545	ss
10	524.62- 24.77	0.15	0.188	0.693	ss
11	524.77- 24.98	0.21	0.422	0.433	ss
	524.98- 25.20	0.22	0.458	0.402	ss
	525.20- 26.11	0.91			do1 sdy shbks pyr
	526.11- 28.65	2.54			sh ssdy pyr
	528.65- 29.00	0.35			Lost core
					<i>Slightly sand.</i>

Slightly sand.

CORE LABORATORIES

Company : PROGRESS ENERGY INC.
 Well : NORTHROCK BIRDTAIL PROV. 8-19-16-27
 Location : LSD 00/08-19-016-27 W1/O
 Province : MANITOBA, CANADA

Field : BIRDTAIL
 Formation : BAKKEN SAND
 Coring Equip.: DIAMOND
 Coring Fluid : WATER BASE MUD

File No.: 52138-98-5008
 Date : 1998 01 25
 Analysts: RJH/JP
 Core Dia: 75 mm

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH m	INTVL REP m	SAMPLE LENGTH m	PERMEABILITY			CAPACITY (MAXIMUM) Kair mD-m	POROSITY (HELIUM) fraction	CAPACITY (HELIUM) ϕ -m	BULK DENSITY kg/m3	GRAIN DENSITY kg/m3	SATURATION		DESCRIPTION
				(MAXIMUM) Kair mD	(90 DEG) Kair mD	(VERTICAL) Kair mD						(PORE VOLUME) OIL frac	WATER frac	
CORE NO. 1 520.00 - 529.00m (CORE RECEIVED 8.85m)(6 BOXES)														
-	520.00-20.80	0.04												sh
-	520.84-21.75	0.91												sh ssdy pyr
1	521.75-22.07	0.32	0.11	6.11	3.65	0.01	1.955	0.127	0.042	2450.	2810.	0.180	0.671	ss vf f ssdy pyr
-	522.07-22.99	0.92												ss ssdy pyr
2	522.99-23.24	0.25	0.10	15.5	13.8	0.32	3.875	0.169	0.040	2270.	2700.	0.306	0.496	ss vf f sh-lam pyr
3	523.24-23.44	0.20	0.08	18.4	16.7	0.14	3.680	0.185	0.034	2280.	2730.	0.233	0.609	ss vf f sh-lam pyr
4	523.44-23.63	0.19	0.06	81.0	79.6	1.14	15.390	0.216	0.042	2150.	2740.	0.225	0.604	ss vf f sh-lam pyr
5	523.63-23.89	0.26	0.08	74.6	74.1	0.80	19.396	0.225	0.057	2120.	2730.	0.275	0.589	ss vf f sh-lam pyr
6	523.89-24.15	0.26	0.07	91.6	85.8	1.92	23.816	0.207	0.055	2160.	2730.	0.351	0.464	ss vf f lam pyr
7	524.15-24.37	0.22	0.08	17.8	16.1	0.27	3.916	0.166	0.037	2290.	2740.	0.319	0.559	ss vf f lam pyr
8	524.37-24.62	0.25	0.08	135.	129.	1.89	33.750	0.231	0.058	2100.	2730.	0.347	0.545	ss vf f lam pyr
9	524.62-24.77	0.15	0.09	248.	185.	1.14	37.200	0.209	0.032	2140.	2710.	0.188	0.693	ss vf f lam pyr
10	524.77-24.98	0.21	0.09	60.9	59.3	4.74	12.789	0.217	0.046	2120.	2710.	0.422	0.433	ss vf f pyr
11	524.98-25.20	0.22	0.06	96.7	93.3	0.48	21.274	0.191	0.042	2190.	2730.	0.458	0.402	ss vf f lam pyr
12	525.20-26.11	0.91	0.19	4.22	3.10	0.21	3.840	0.164	0.146	2390.	2860.	-	-	dol i ppv ssdy pyr frac
13	526.11-26.60	0.49	0.15	1.52	0.34	0.01	0.745	0.108	0.054	2540.	2840.	-	-	dol i ppv ssdy pyr vfrac
-	526.60-26.65	2.05												sh ssdy pyr
-	528.65-29.00	0.35												lost core

PROGRESS & ARGY INC.

NORTHROCK BIRDTAIL PROV

8-19-16-27 W1M

BIRDTAIL, MANITOBA

FILE NO. 52138-98-5008

FORMATION: BAKKEN SAND

(520.00 - 528.65m)

Core Laboratories Canada Ltd.

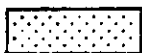
Vertical Scale

10.00 cm = 24.0 meter

- Lithology Legend -



Shale



Sandstone



Dolomite

**Core Gamma
API**

150

**Depth
Meter
500**

510

520

530

540

CORE ANALYSIS REPORT

FOR

NORTHROCK RESOURCES LTD.

**NORTHROCK BIRDTAIL 16-5-16-27
LSD XX/16-005-016-27 WIM/X
BIRDTAIL, MANITOBA**

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom; and for whose exclusive and confidential use; this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories (all errors and omissions excepted); but Core Laboratories and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitability of any oil, gas or mineral well or formation in connection with which such report is used or relied upon.

CORE LABORATORIES

Company : NORTHRICK RESOURCES LTD.
 Well : NORTHRICK BIRDTAIL 16-5-16-27
 Location : LSD XX/16-005-016-27 WIM/X
 Province : MANITOBA, CANADA

Field : BIRDTAIL
 Formation : BAKKEN SAND
 Coring Equip.: DIAMOND
 Coring Fluid : WATER BASE MUD

File No.: 52138-96-5044
 Date : 1996 08 19
 Analysts: RJH
 Core Dia: 76 mm

CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH m	INTVL REP m	PERMEABILITY (MAXIMUM) Kair mD	CAPACITY (MAXIMUM) Kair mD-m	POROSITY (HELIUM) fraction	CAPACITY (HELIUM) φ-m	BULK DENSITY kg/m3	GRAIN DENSITY kg/m3	SATURATION		DESCRIPTION
									(PORE VOLUME) OIL frac	WATER frac	
CORE NO. 1 514.00 - 523.00m (Core Received 9.00m) (7 Boxes)											
-	514.00- 14.51	0.51									sh
-	514.51- 15.23	0.72									sh sdy
NA	515.23- 16.13	0.90									ss shy
1	516.13- 16.30	0.17	279.	47.430	0.265	0.044	1980.	2690.	0.473	0.396	ss f vf pyr 37.5 API
NA	516.30- 16.62	0.32									ss shy
2	516.62- 16.71	0.09	387.	34.830	0.269	0.024	1950.	2670.	0.416	0.394	ss f vf
3	516.71- 16.89	0.18	0.10	0.018	0.072	0.013	2470.	2670.	0.327	0.541	ss vf f sschy lam
4	516.89- 17.09	0.20	108.	21.600	0.236	0.048	2050.	2690.	0.283	0.589	ss f vf sschy lam 37.0 API
5	517.09- 17.31	0.22	76.5	16.830	0.226	0.051	2080.	2690.	0.328	0.568	ss vf f sschy lam
6	517.31- 17.52	0.21	69.5	14.595	0.231	0.048	2070.	2690.	0.364	0.519	ss vf f sschy lam
7	517.52- 17.73	0.21	0.13	0.027	0.076	0.017	2450.	2650.	0.444	0.435	ss vf f sschy lam
8	517.73- 18.00	0.27	0.46	0.124	0.092	0.024	2410.	2650.	0.324	0.522	ss vf f sschy lam 36.5 API
-	518.00- 20.65	2.65									sh ssdy
-	520.65- 23.00	2.35									sh

CORE LABORATORIES

Company : NORTHROCK RESOURCES LTD.
Well : NORTHROCK BIRDTAIL 16-5-16-27

Field : BIRDTAIL
Formation : BAKKEN SAND

File No.: 52138-96-5044
Date : 1996 08 19

TABLE I
SUMMARY OF CORE DATA

ZONE AND CUTOFF DATA

ZONE:
Identification ----- BAKKEN SAND
Top Depth ----- 514.00 m
Bottom Depth ----- 523.00 m
Number of Samples ----- 8

DATA TYPE:
Porosity ----- (HELIUM)
Permeability ----- (MAXIMUM) Kair

CUTOFFS:
Porosity (Minimum) ----- 0.000 frac
Porosity (Maximum) ----- 1.000 frac
Permeability (Minimum) ----- 0.0000 mD
Permeability (Maximum) ----- 100000. mD
Water Saturation (Maximum) ----- 1.000 frac
Oil Saturation (Minimum) ----- 0.000 frac
Grain Density (Minimum) ----- 2000. kg/m3
Grain Density (Maximum) ----- 3000. kg/m3
Lithology Excluded ----- NONE

CHARACTERISTICS REMAINING AFTER CUTOFFS

ZONE:
Number of Samples ----- 8
Thickness Represented ----- 1.55 m

POROSITY:
Storage Capacity ----- 0.268 ϕ -m
Arithmetic Average ----- 0.173 frac
Minimum ----- 0.072 frac
Maximum ----- 0.269 frac
Median ----- 0.229 frac
Standard Deviation ----- \pm 0.088 frac

PERMEABILITY:
Flow Capacity ----- 135.46 mD-m
Arithmetic Average ----- 87.4 mD
Geometric Average ----- 8.00 mD
Harmonic Average ----- 0.39 mD
Minimum ----- 0.10 mD
Maximum ----- 387. mD
Median ----- 73.0 mD
Standard Dev. (Geom) ----- K-10⁴1.545 mD

GRAIN DENSITY:
Arithmetic Average ----- 2674. kg/m3
Minimum ----- 2650. kg/m3
Maximum ----- 2690. kg/m3
Median ----- 2680. kg/m3
Standard Deviation ----- \pm 18. kg/m3

PERMEABILITY:
Dykstra-Parsons Var. ----- 0.987
Lorenz Coefficient ----- 0.498

AVERAGE SATURATIONS (Pore Volume):
Oil ----- 0.365 frac
Water ----- 0.505 frac

HETEROGENEITY (Permeability):

CORE LABORATORIES

Company : NORTHROCK RESOURCES LTD. File No.: 52138-96-5044
 Well : NORTHROCK BIRDTAIL 16-5-16-27 Date : 1996 08 19

Field : BIRDTAIL
 Formation : BAKKEN SAND

ANALYTICAL PROCEDURES AND QUALITY ASSURANCE

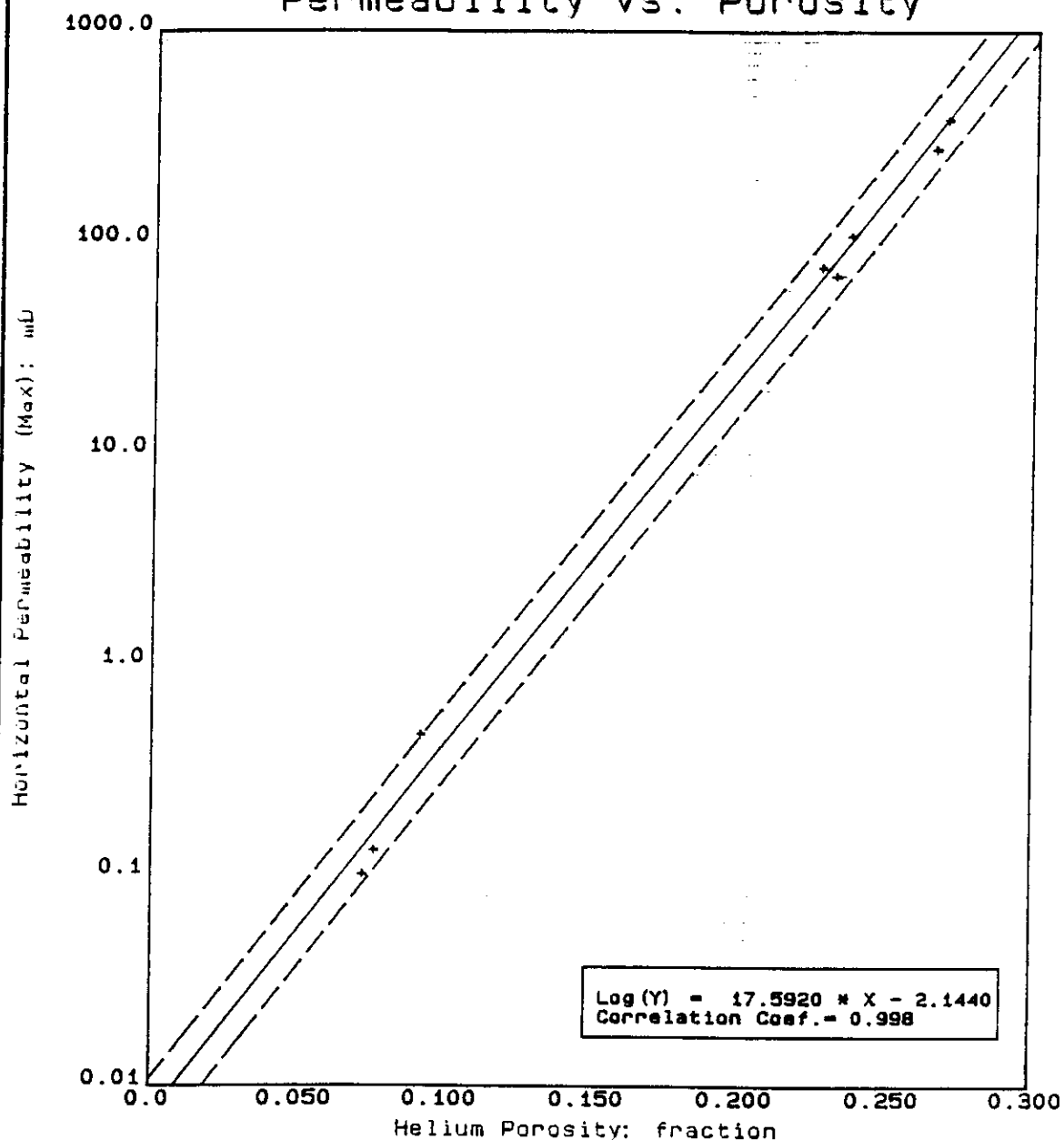
HANDLING & CLEANING	ANALYSIS
Core Transportation : A & A CORING Solvent : TOLUENE Extraction Equipment : CENTRIFUGE Extraction Time : 7.5 HOURS Drying Equipment : GRAVITY OVEN Drying Time : 1 HOUR Drying Temperature : 100 DEG. C.	Grain volume measured by Boyle's Law in a matrix cup using He Bulk volume by Archimedes Principle Fluid saturations by retort Permeabilities measured on 25.4 mm diameter drilled plugs Core Gamma Composite
REMARKS THE PERMEABILITY AND HELIUM POROSITY VALUES REPRESENT MEASUREMENTS ON PARTIALLY EXTRACTED SAMPLES ONLY.	

CORELAB

CODE KEY - DESCRIPTIONS

A	= (Prefix A) Horizontal matrix permeability measured by pressure decay profile permeametry through a probe tip due to induced fractures	incl	= Inclusions	shy	= Moderately shaly (20% - 40%)
ACA	= Removed for advanced core analysis	lam	= Laminae (laminated)	sid	= Siderite
AST	= Appears similar to	lmy	= Limy	siltst	= Siltstone
bit	= Bitumen	ls	= Limestone	silty	= Silty
bkr	= Break	lv	= Large vug	SP	= Small plug (sample drilled from core in maximum horizontal direction and parallel to bedding plane where possible) permeability, porosity and grain density are measured
bldr	= Boulder	m	= Medium		= Sandstone
c	= Coarse	mi	= Mud invaded	ss	= Slightly shaly (<20%)
calc	= Calcite (calcareous)	mic	= Micaceous	sshy	= Stylolite (ic)
carb	= Carbonaceous	mv	= Medium vug	sulf	= Sulphur
cbl	= Cobble	NA	= Not analyzed by request	sv	= Small vug
CEC	= Cation exchange capacity	NP	= No permeability measurement possible due to poor sample quality	TEC	= Thermal Extraction Chromatography to determine oil richness
cem	= Cemented	NR	= Not received	TS	= Thin section
cgl	= Conglomerate	ool	= Oolitic	uncon	= Unconsolidated
cht	= Chert	OB	= Overburden sample (permeability and porosity measured at net overburden stress)	vc	= Very coarse
coal	= Coal/coal inclusion			vfrac	= Vertical fracture
dol	= Dolomite	P	= Preserved for future studies	vf	= very fine
f	= Fine	pbl	= Pebble	VIS	= Viscosity of oil measured
foss	= Fossil (fossiliferous)	PET	= Removed for petrographic analysis	VOB	= Vertical overburden sample (vertical permeability measured at net overburden stress)
frac	= Fracture (undifferentiated)	ppv	= Pinpoint vug		= Very shaly (>40%)
fri	= Friable	PSA	= Particle size analysis	VSP	= Vertical small plug drilled from whole core to measure vertical permeability and occasionally porosity
glau	= Glauconite (glauconitic)	pyr	= Pyrite (pyritic)	vug	= Vuggy (vuggy)
grnl	= Granule	pyrbit	= Pyrobitumen	ws	= Water sand
gyp	= Gypsum	ru	= Rubble	XRD	= X-ray diffraction
hfrac	= Horizontal fracture	SA	= Sieve analysis		= Perm unavailable due to broken core
hal	= Halite (salt)	sdv	= Sandy		
i	= Intercrystalline	SEM	= Scanning electron microscope analysis		
		sh	= Shale		
		SPH	= Humidity analysis of small plug sample at 60 degrees Celsius and 50 percent relative humidity		
		SPT	= Small Plug used for tracer analysis		

Permeability vs. Porosity



NORTHROCK RESOURCES LTD.

NORTHROCK BIRDTAIL

16-5-16-27 W1M

BIRDTAIL, SASKATCHEWAN

FILE NO. 52138-96-5044

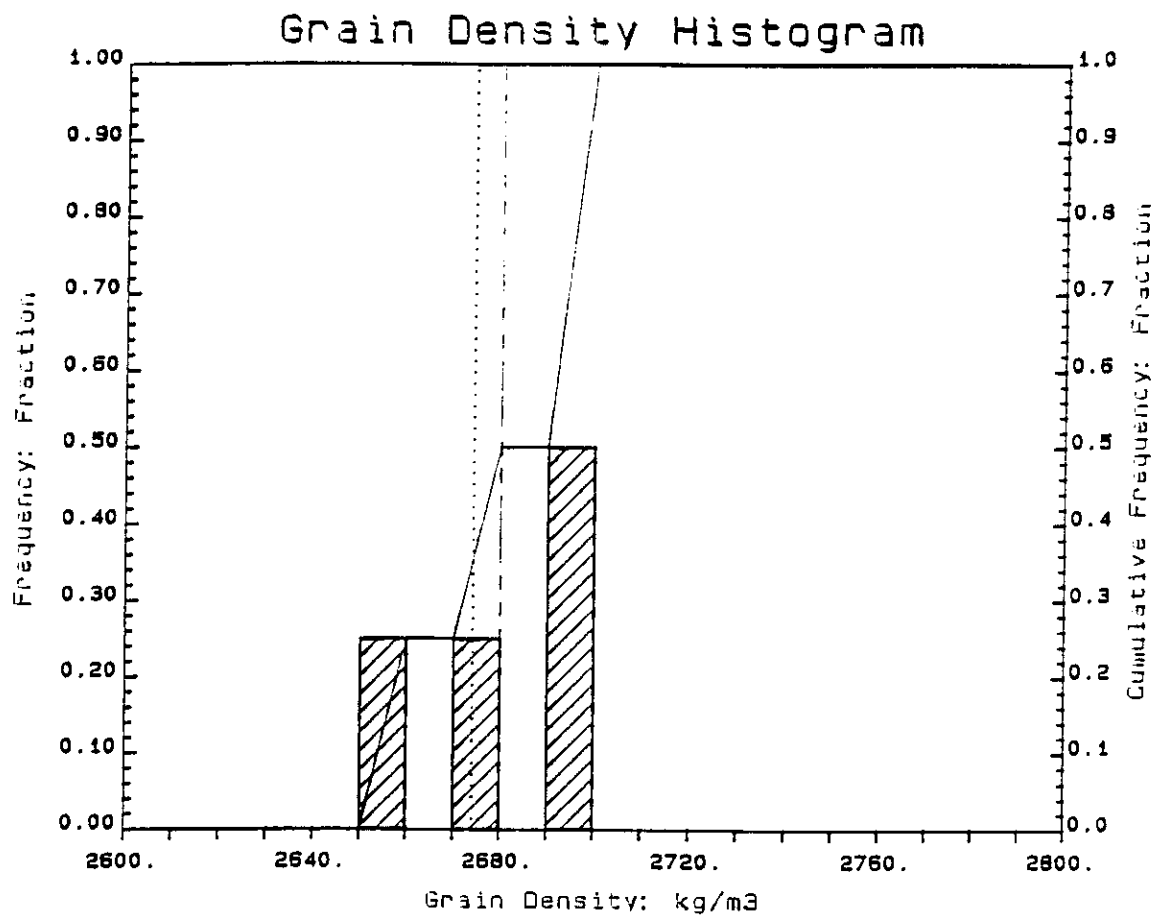
FORMATION: BAKKEN SAND

(514.00 - 523.00m)

Core Laboratories Canada Ltd.

- LEGEND -

BAKKEN SAND



NORTHROCK RESOURCES LTD.

NORTHROCK BIRDTAIL

16-5-16-27 W1M

BIRDTAIL, SASKATCHEWAN

FILE NO. 52138-96-5044

FORMATION: BAKKEN SAND

(514.00 - 523.00m)

Core Laboratories Canada Ltd.

- LEGEND -

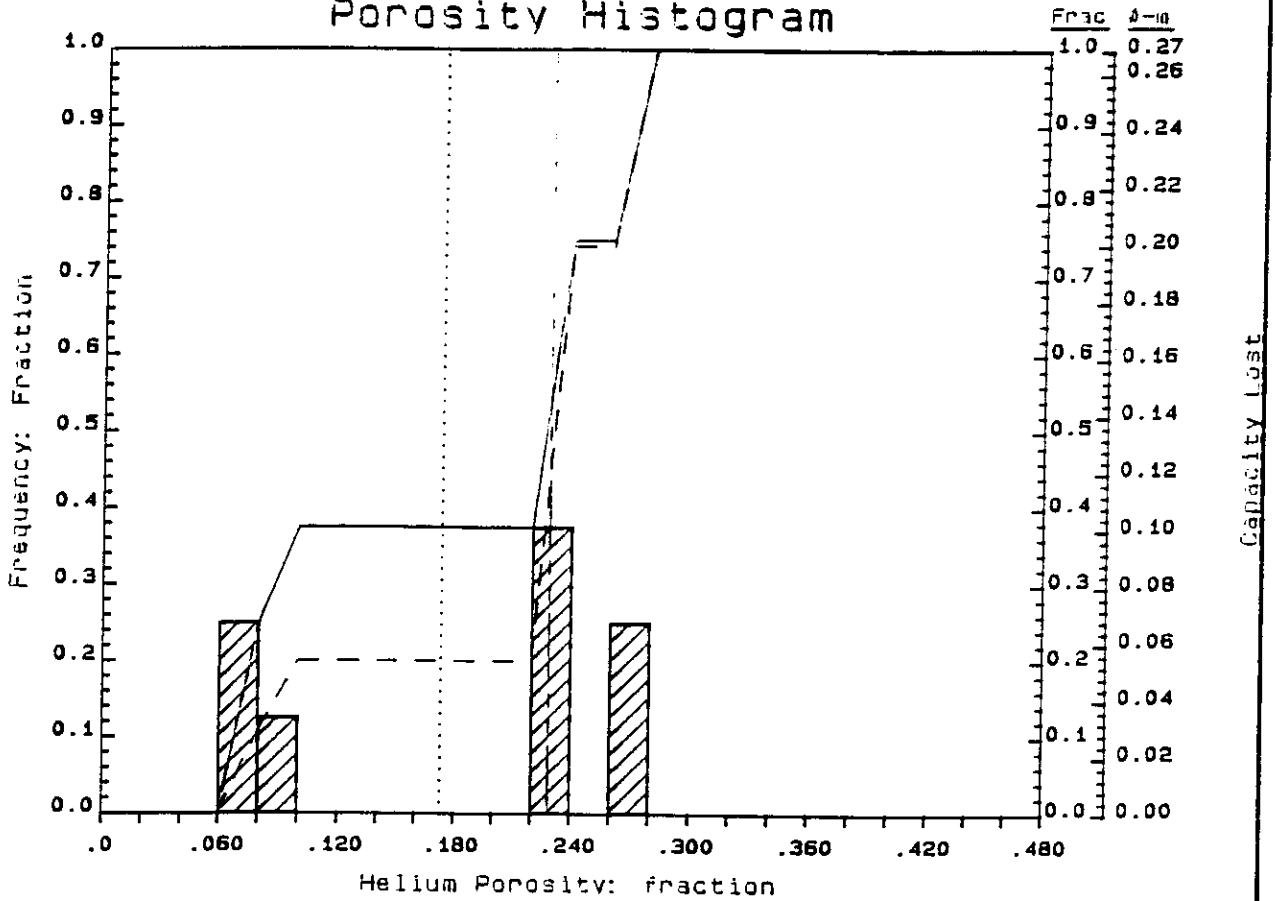
—— - Median Value (2680)

..... Arith. Average (2674)

—— Cumulative Frequency

8 Samples

Porosity Histogram



NORTHROCK RESOURCES LTD.

NORTHROCK BIRDTAIL

16-5-16-27 W1M

BIRDTAIL, SASKATCHEWAN

FILE NO. 52138-96-5044

FORMATION: BAKKEN SAND

(514.00 - 523.00m)

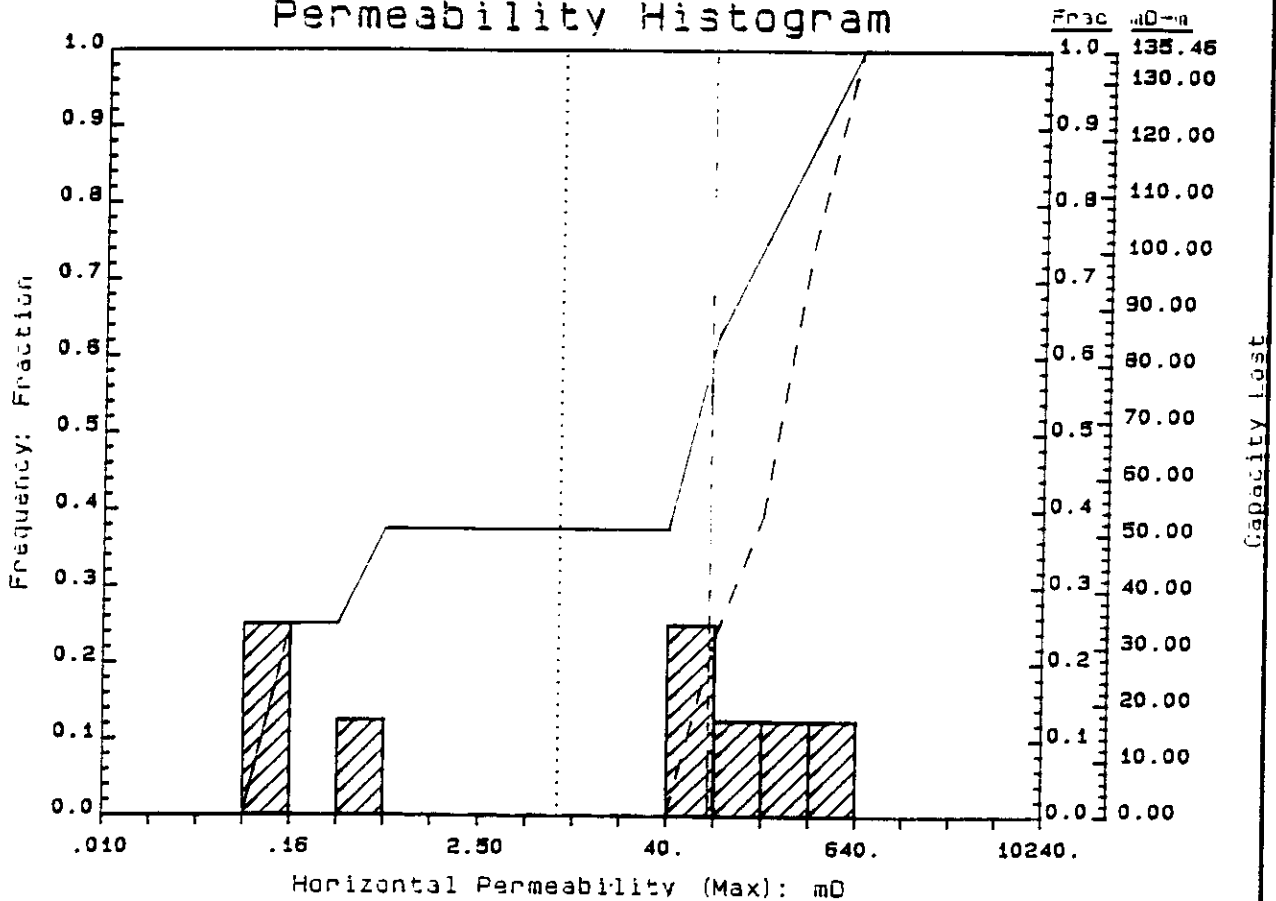
Core Laboratories Canada Ltd.

- LEGEND -

- Median Value (0.229)
- Arith. Average (0.173)
- Cumulative Frequency
- - - Cumulative Capacity Lost

8 Samples

Permeability Histogram



NORTHROCK RESOURCES LTD.

NORTHROCK BIRDTAIL

16-5-16-27 W1M

BIRDTAIL, SASKATCHEWAN

FILE NO. 52138-96-5044

FORMATION: BAKKEN SAND

(514.00 - 523.00m)

Core Laboratories Canada Ltd.

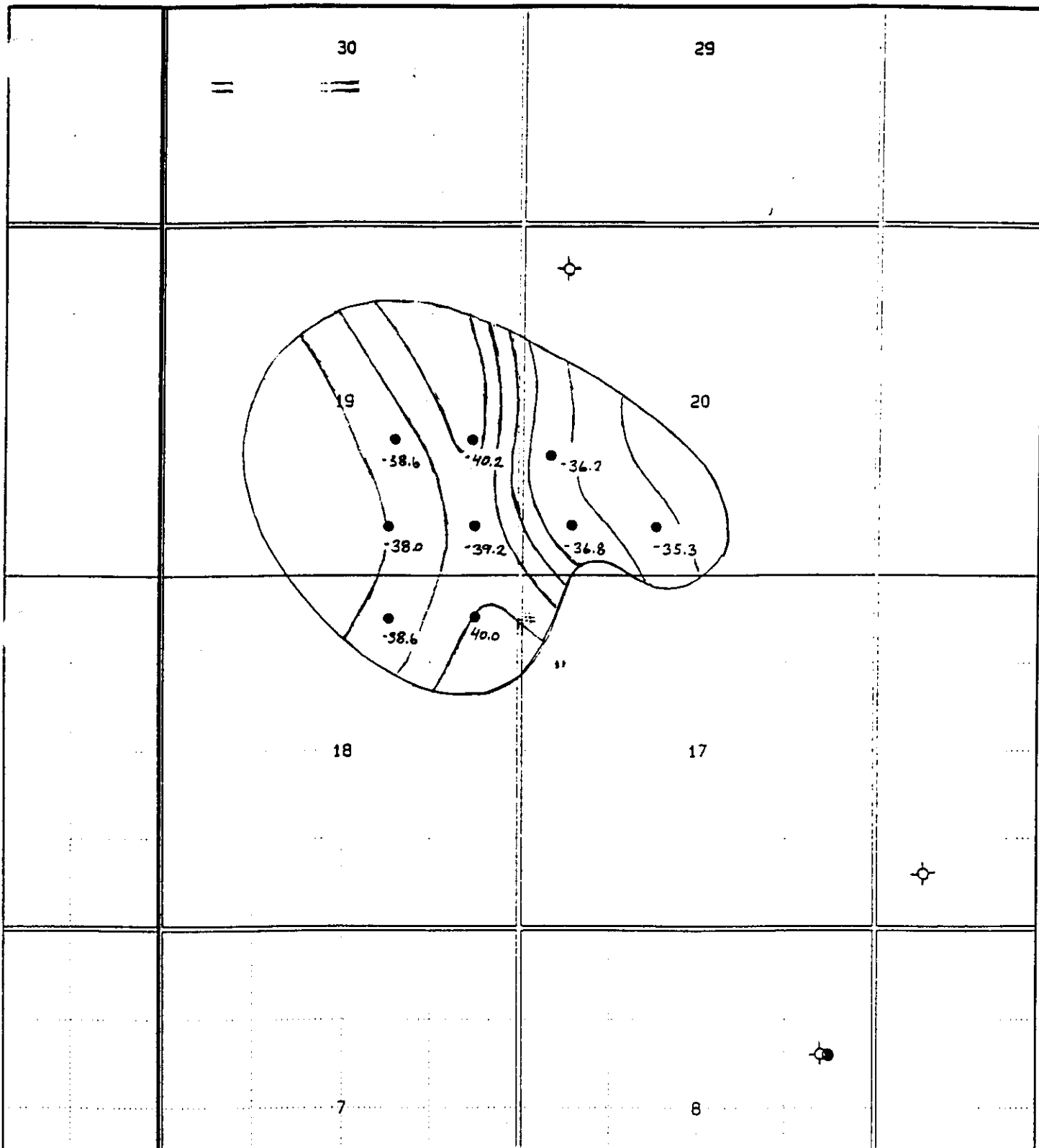
- LEGEND -

- Median Value (73.0)
- Geom. Average (8.00)
- Cumulative Frequency
- - - Cumulative Capacity Lost

8 Samples

APPENDIX 4

Geological Maps and Cross Sections



T16

R28

R27W1

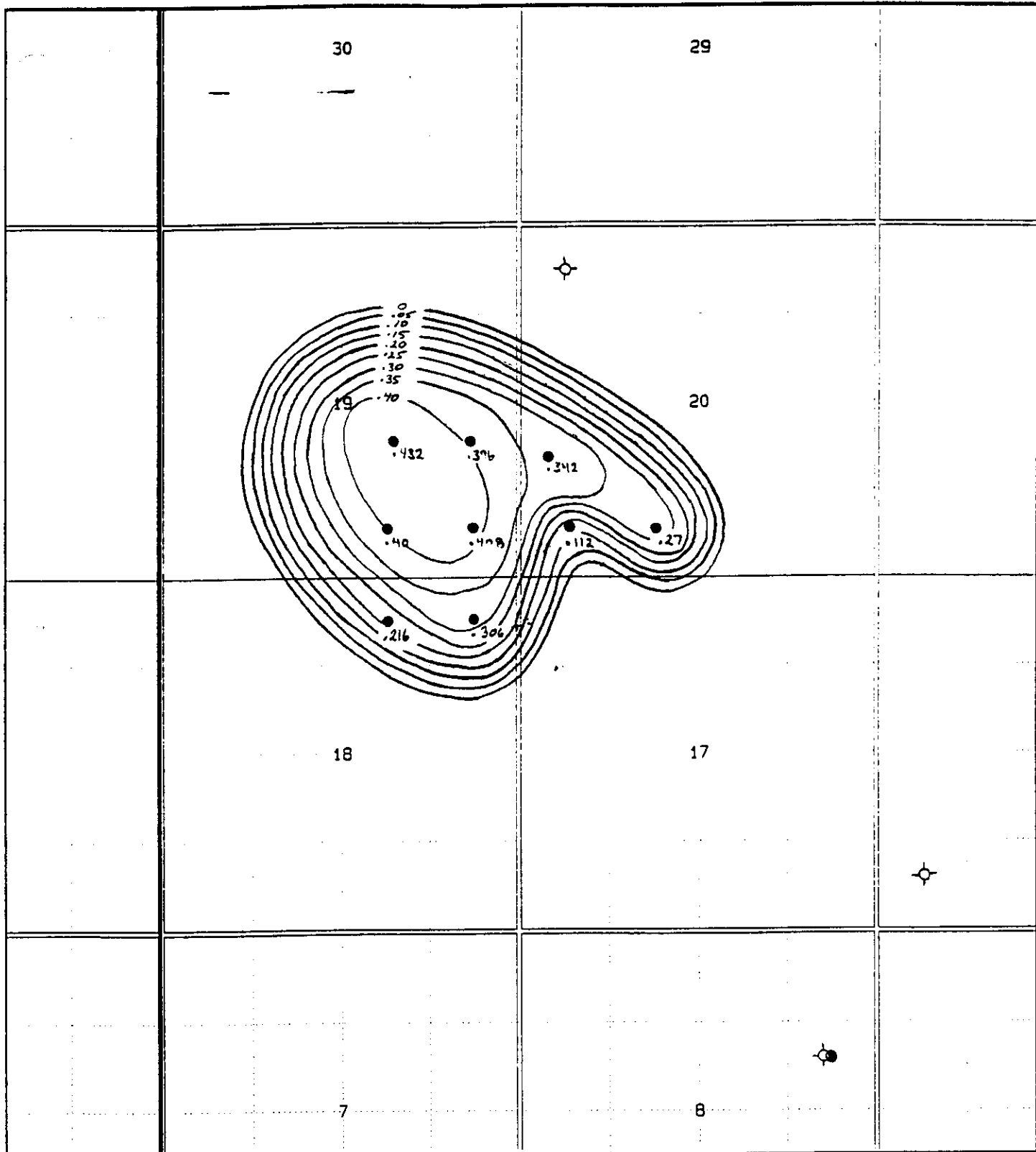
Well Symbols	
○ Drilling	
* Gas	
* Oil&Gas	
* Susp Gas	
* Abnd Gas	
* Susp Oil&Gas	
* Abnd Oil&Gas	
◇ O & A	
✕ Abnd Service	
* Gas Injection	
No Well Postings Specified	



Progress Energy

BIRDTAIL North
Structure Top Bakken Sand (m)

Author:
Date: September 18, 1998

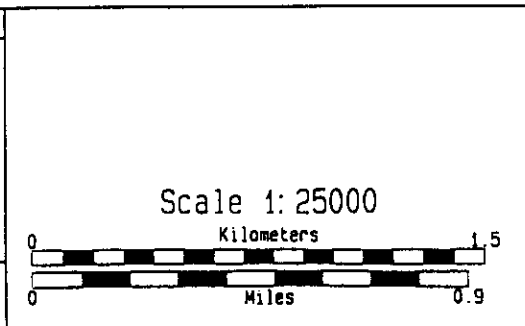


T16

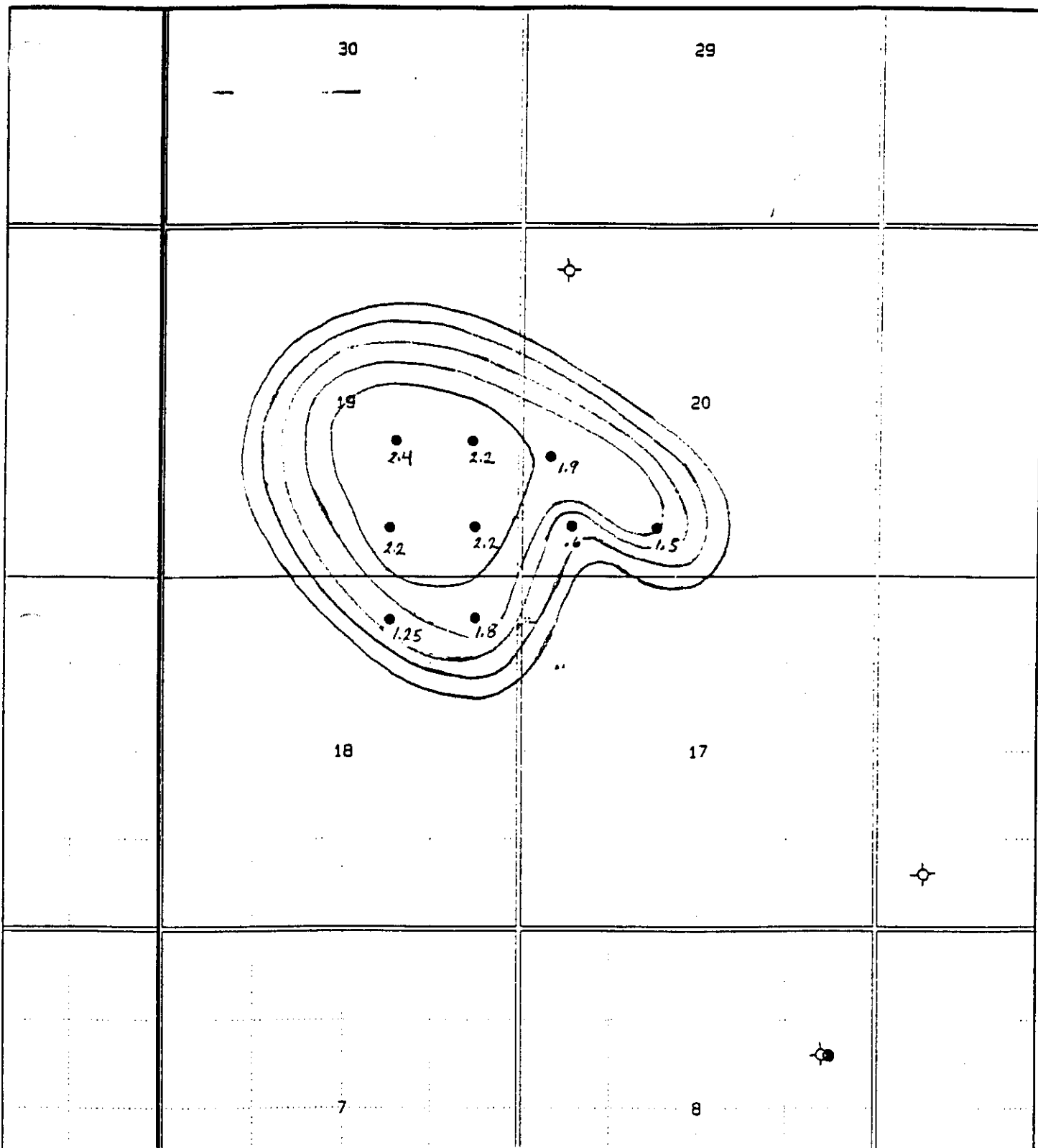
R28

R27W1

Well Symbols	
Location	Drilling
Oil	Gas
Susp Oil	Oil&Gas
Abnd Oil	Susp Gas
Susp H Oil	Abnd Gas
Abnd H Oil	Susp Oil&Gas
Susp Undes	Abnd Oil&Gas
Service	D & A
Injection	Abnd Service
	Gas Injection
No Well Postings Specified	



Progress Energy	
BIROTAIL North Bakken Sand (dm)	
Author:	
Date:	September 18, 1998



T16

R28

R27W1

Well Symbols		Progress Energy	
<ul style="list-style-type: none"> ○ Drilling * Gas * Oil&Gas * Susp Oil * Susp Gas * Abnd Oil * Abnd Gas * Susp H Oil * Susp Oil&Gas * Abnd H Oil * Abnd Oil&Gas ○ Susp Undes ○ O & A □ Service * Abnd Service □ Injection * Gas Injection 	<p>No Well Postings Specified</p> <p>*</p>	<p>BIRDTAIL North</p> <p>Net Oil Pay (m)</p>	
<p>Scale 1: 25000</p> <p>Kilometers</p> <p>0 1.5</p> <p>Miles</p> <p>0 0.9</p>		<p>Author:</p> <p>Date: September 18, 1998</p>	

TYPE LOG

NORT ROCK BIRDTAIL

9-5-16-27 (U)

K.B. 481.7

MISS/ADDERPOTE

U. BAKKEN SHALE

BAKKEN SAND

DEVONIAN
TORQUAY

PR Y Caliper
PR Gamma Ray

PR X Caliper

PR 20K Deep
PR SFL Resistivity

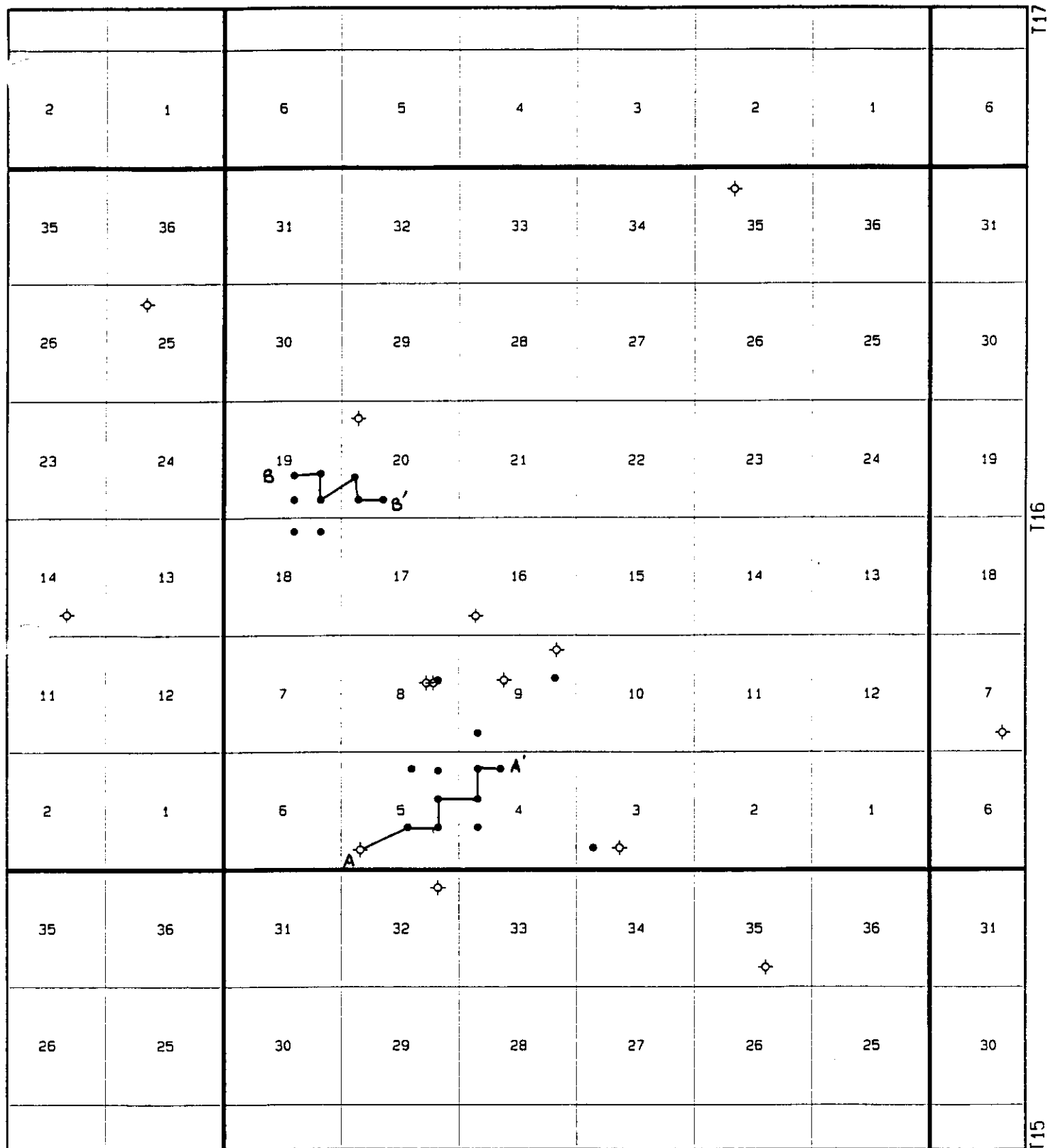
PR A. Medium

Tension

TENSION

Bit Size

NO DST
NO CORES



R22		R21		R20W1	
Well Symbols • Location • Oil • Susp Oil • Abnd Oil • Susp H Oil • Abnd H Oil • Susp Undes • Service • Injection No Well Postings Specified		◊ Drilling * Gas * Oil&Gas * Susp Gas * Abnd Gas * Susp Oil&Gas * Abnd Oil&Gas ◊ O & A * Abnd Service * Gas Injection		Progress Energy Ltd. BIRDTAIL X-SECTIONS Author: Date: September 28, 1998	
Scale 1: 75000 0 Kilometers 4 0 Miles 2		Produced by: AccuMap EnerData Corp. Map File: WATER.MAP Licence Data to: July 31, 1998 / Production Data to: June 30, 1998			

X-SECTION B-B'

NOT SCANNED
(Oversized)

FOR AVAILABILITY
CONTACT THE
PETROLEUM BRANCH
(Engineering Section)

APPENDIX 5

Water Compatibility Geochemical Modeling Results



CORE LABORATORIES

CORE Laboratories Reservoir Fluids Report - Calgary

**Geochemical Modeling
for
Northrock Resources Ltd.
Various Locations**

File Number: 52137-97-1348

Date: May 27, 1997

Report Distribution: Jeff Shaw, Northrock (Calgary) - 2 copies and invoice

APPROVED BY:

M. Mills

**Marcia Mills
Technical Specialist
Phone # 250-4059**

Please contact the above person should there be any questions concerning the contents of this report.

The analysis, opinions or interpretations contained in this report are based upon observations and material supplied by the client for whose exclusive and confidential use this report has been made. The interpretations or opinions expressed represent the best judgement of CORE Laboratories. CORE Laboratories assumes no responsibility and makes no warranty or representations, expressed or implied, as to the productivity, proper operations, or profitability however of any oil, gas, coal or other mineral, proper well or sand in connection with which such report is used or relied upon for any reason whatsoever.

COMPANY Northrock Resources Ltd.
WELL Various Locations
PROJECT Geochemical Modeling

PAGE 1 of 5
FILE 52137-97-1348
DATE 97-05-27

Introduction

Three ionic compositions were received at Core Laboratories (see Page 5). All three waters were subjected to geochemical modeling which will predict the scaling tendencies of the water mixtures.

Compositions Received

Water #1:	100/02-29-015-30W1/00	Depth:	659.5 - 662.0 m
Formation:	Bakken		
Water #2:	100/10-28-015-27W1/00	Depth:	463.3 - 474.0 m
Formation:	Lodgepole		
Water #3:	100/14-17-015-31W1/00	Depth:	778.5 - 790.7 m
Formation:	Birdbear		

Discussion

The analytical data of the composition of the three fluids were entered into a Geochemical Modeling program and mathematically mixed. The scaling indices for the most common scaling compounds were calculated for each of the mixes (see Table 1-4).

The scaling tendency can be inferred from the scaling indices as well as the concentration of the ionic species involved in that compound. The scaling indices can be viewed as follows:

- If the index is negative, the water is not saturated with the component and scale formation is unlikely.
- If the index is positive, the water is supersaturated with the component and scale formation is possible.
- If the index is zero, the component is in equilibrium with the saturation point, and precipitation may or may not occur.

The larger the variance from zero, the greater the variance from a saturated solution.

Whether or not scale formation is indicated by the calculation, it does not mean that the outcome is a certainty. These calculations provide an insight to what may happen in a system. Relating these values to the analyses and historical data is necessary to make proper inferences.

COMPANY Northrock Resources Ltd.
 WELL Various Locations
 PROJECT Geochemical Modeling

PAGE 2 of 5
 FILE 52137-97-1348
 DATE 97-05-27

Modeling Data and Interpretation

The following pages contain the charts of the data calculated from the provided water analyses.

Table 1 - Bakken & Lodgepole @ 31°C and 3300 kPa

Bakken	0%	10%	20%	50%	80%	90%	100%
Lodgepole	100%	90%	80%	50%	20%	10%	0%
Calcium Carbonate CaCO ₃ (Calcite)	1.332	1.306	1.276	1.154	0.998	0.942	0.885
Calcium Sulphate CaSO ₄ (Gypsum)	-0.536	-0.470	-0.410	-0.256	-0.131	-0.094	-0.060

Table 2 - Bakken & Lodgepole @ 31°C and 10 mPa

Bakken	0%	10%	20%	50%	80%	90%	100%
Lodgepole	100%	90%	80%	50%	20%	10%	0%
Calcium Carbonate CaCO ₃ (Calcite)	1.275	1.250	1.219	1.097	0.940	0.883	0.827
Calcium Sulphate CaSO ₄ (Gypsum)	-0.571	-0.504	-0.444	-0.290	-0.166	-0.129	-0.094

Table 3 - Bakken & Birdbear @ 31°C and 3300 kPa

Bakken	0%	10%	20%	50%	80%	90%	100%
Birdbear	100%	90%	80%	50%	20%	10%	0%
Calcium Carbonate CaCO ₃ (Calcite)	0.463	0.489	0.517	0.616	0.751	0.811	0.885
Calcium Sulphate CaSO ₄ (Gypsum)	-0.437	-0.424	-0.409	-0.346	-0.225	-0.156	-0.060

Table 4 - Bakken & Birdbear @ 31°C and 10 mPa

Bakken	0%	10%	20%	50%	80%	90%	100%
Birdbear	100%	90%	80%	50%	20%	10%	0%
Calcium Carbonate CaCO ₃ (Calcite)	0.413	0.439	0.466	0.564	0.695	0.754	0.827
Calcium Sulphate CaSO ₄ (Gypsum)	-0.466	-0.453	-0.439	-0.376	-0.257	-0.189	-0.094

* -gray shading denotes mixes with a significant increase in scaling tendency

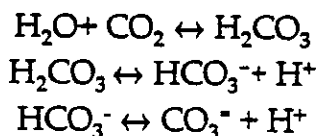
COMPANY Northrock Resources Ltd.
WELL Various Locations
PROJECT Geochemical Modeling

PAGE 3 of 5
FILE 52137-97-1348
DATE 97-05-27

Calcium Carbonate

The Calcium Carbonate values for the end-members and all the mixes are above zero, which is not unusual for most formation waters. This indicates that some scaling may occur. The main concern is whether the tendency increases for any of the mixes. In this case, all scaling indices are less than the highest end member, which indicates that the waters are compatible.

An increase in pressure actually reduces the likelihood of precipitating calcium carbonate by increasing the partial pressure of carbon dioxide. The partial pressure of carbon dioxide increases CaCO_3 solubility in water. When CO_2 dissolves in water, it forms carbonic acid, which ionizes according to the following equations:



Bakken-Lodgepole Blend

As the amount of Bakken increases the scaling tendency of calcite decreases; conversely, as Lodgepole concentration increases the scaling tendency increases. This means that adding Lodgepole to Bakken would decrease the water quality but adding Bakken to Lodgepole would improve the quality of the water.

Bakken-Birdbear Blend

As the amount of Birdbear increases the scaling tendency of calcite decreases; conversely, as Bakken concentration increases the scaling tendency increases. This means that adding Bakken to Birdbear would decrease the water quality but adding Birdbear to Bakken would improve the quality of the water.

Calcium Sulphate

The Calcium Sulphate values remain well below zero during the entire series, for all the blends indicating that precipitation will likely not occur.



COMPANY Northrock Resources Ltd.
WELL Various Locations
PROJECT Geochemical Modeling

PAGE 4 of 5
FILE 52137-97-1348
DATE 97-05-27

Summary

If there has been no significant scaling historically occurring on these wells then there may be little, if any, scaling of the noted species likely to occur in the future. If there has been significant scaling of the noted species, then caution needs to be exercised.

These difficulties could be mitigated by using chemical treatment programs.

Further testing could also include physical tests to determine if the predicted tendencies actually support what occurs when the two waters are combined.

Caution should be exercised when assessing whether the waters will scale. Barite and Strontianite scale were not included in this analysis. These are very common types of oilfield scales and all the waters have elevated levels of sulphate ions. However, waters with high sulphate concentration generally have low amounts of barium.

COMPANY Northrock Resources Ltd.
WELL Various Locations
PROJECT Geochemical Modeling

PAGE 5 of 5
FILE 52137-97-1348
DATE 97-05-27

Constituent and/or Property	Rakken 100/02-29-015-30W100	Lodgepole 100/10-28-015-27W100	Birdbear 100/14-17-015-31W100
	mg/L		
Sodium, Na + K	13118	10879	73218
Calcium, Ca	1395	814	1922
Magnesium, Mg	561	463	778
Chloride, Cl	20843	17395	114000
Sulphate, SO ₄	5123	2500	6071
Bicarbonate, HCO ₃	437	566	230
pH	7.3	7.9	7.1
Density (g/cm ³)	1.031	1.030	1.130
Total Solids	41477	32617	196219

APPENDIX 6

Surface Landowner Information Letters

Progress Energy Ltd.

Suite 520, 520 – 5th Ave. SW
Calgary, AB
T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 268
Birtle, Manitoba
R0M 0C0

Attention: William Kuch

Dear Mr. Kuch:

**Re: Application for Approval to Waterflood
the Bakken C Pool – Birdtail Field**

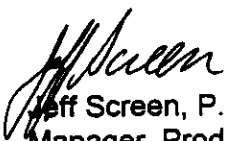
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This enhanced oil recovery project will involve waterflooding the Bakken C Pool by re-injecting produced formation water. This will result in the increase of total recoverable oil from this pool.

The surface land impact from this project will be minor as all wells will be pipelined to a central battery location at 01-19-16-27 W1M, and all pumpjack engines will be converted to electric motors. A Progress Energy Ltd. representative will discuss any surface land issues arising from this development with the directly affected landowners.

Should you have any questions or concerns in this matter please feel free to contact me at 216-2510 (ext. 105).

Yours truly,
PROGRESS ENERGY LTD.


Jeff Screen, P.Eng.
Manager, Production - Operations

Progress Energy Ltd.

Suite 520, 520 – 5th Ave. SW
Calgary, AB
T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 425
Birtle, MB
R0M 0C0

Attention: Ronald Bruce Barteaux

Dear Mr. Barteaux:

**Re: Application for Approval to Waterflood
the Bakken C Pool – Birdtail Field**

As part of the application procedure Progress Energy Ltd. wishes to notify surface land owners in the area of the Bakken C pool, that we have made application to the Manitoba Energy and Mines for approval of enhanced oil recovery from this pool. The Bakken C Pool is located within Sections 18, 19 & 20-16-27 W1M. An outline of the lands involved in this application is attached.

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PROGRESS ENERGY LTD.



Jeff Screen, P.Eng.
Manager, Production - Operations

Progress Energy Ltd.

Suite 520, 520 - 5th Ave. SW
Calgary, AB
T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 88
Birtle, MB
R0M 0C0

Attention: Glen Tilson Barteaux

Dear Mr. Barteaux:

**Re: Application for Approval to Waterflood
the Bakken C Pool - Birdtail Field**

As part of the application procedure Progress Energy Ltd. wishes to notify surface land owners in the area of the Bakken C pool, that we have made application to the Manitoba Energy and Mines for approval of enhanced oil recovery from this pool. The Bakken C Pool is located within Sections 18, 19 & 20-16-27 W1M. An outline of the lands involved in this application is attached.

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Progress Energy Ltd.

Suite 520, 520 - 5th Ave. SW
Calgary, AB
T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

94 Lismer Crescent
Winnipeg, Manitoba
R3R 1N6

Attention: David William Pittendreigh and Sandra Grace Pittendreigh

Dear Mr. & Mrs. Pittendreigh:

**Re: Application for Approval to Waterflood
the Bakken C Pool - Birdtail Field**

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T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 81
Birtle, Manitoba
R0M 0C0

Attention: David Robert Paul Barteaux

Dear Mr. Barteaux:

**Re: Application for Approval to Waterflood
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Manager, Production - Operations

Progress Energy Ltd.

Suite 520, 520 – 5th Ave. SW
Calgary, AB
T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 444
Birtle, Manitoba
R0M 0C0

Attention: Frederick George Barteaux and Shirley Diane Barteaux

Dear Mr. & Mrs. Barteaux:

**Re: Application for Approval to Waterflood
the Bakken C Pool – Birdtail Field**

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T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 172
Birtle, Manitoba
R0M 0C0

Attention: Bruce Henry Bertram

Dear Mr. Bertram:

**Re: Application for Approval to Waterflood
the Bakken C Pool – Birdtail Field**

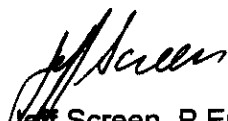
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Calgary, AB
T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 341
Birtle, MB
R0M 0C0

Attention: Phillip Tillson Barteaux

Dear Mr. Barteaux:

**Re: Application for Approval to Waterflood
the Bakken C Pool – Birdtail Field**

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Calgary, AB
T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 125
Birtle, Manitoba
R0M 0C0

Attention: Kevin Bruce Gooda and Nona Marie Ada Gooda

Dear Mr. & Mrs. Gooda:

**Re: Application for Approval to Waterflood
the Bakken C Pool – Birdtail Field**

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T2P 3R7
Phone: 403-216-2510
FAX: 403-216-2514

October 21, 1998

Box 613
Birtle, Manitoba
R0M 0C0

Attention: Neil Owen Bertram

Dear Mr. Bertram:

**Re: Application for Approval to Waterflood
the Bakken C Pool – Birdtail Field**

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