

NEW FILE

BIRDTAIL

BAKKEN A + C Pool

WATERFLOOD APPLICATION

NOV 1981

10



December 11, 1998

Jeff Screen, P.Eng.  
Production-Operations Manager  
Progress Energy Ltd.  
Suite 520, 520 – 5<sup>th</sup> Avenue SW  
Calgary AB T2P 3R7

Dear Mr. Screen:

Re: **Birdtail Bakken A & C Pools**  
**Waterflood Order No.'s 7 & 8**

Your applications to conduct waterflood operations in the Birdtail Bakken A & C Pools have been approved. Attached are Waterflood Order No.'s 7 & 8 outlining conditions for operation of the waterfloods. Full-scale water injection is not to commence until all royalty and working interest owners have executed unit agreements, and the Branch has registered the agreements.


The Branch has not been advised by Progress of its unitization plans. Please provide the following information for each proposed unit:

- (a) an outline of the proposed unit area;
- (b) the proposed tract participation formula;
- (c) the proposed tract factor for each unit tract;
- (d) a copy of the draft unit agreement;
- (e) the status of unit negotiations; and
- (f) the proposed effective date of unitization.

The Branch has considered your request to commence injection into the A pool using the 7-5-16-27 well to evaluate injectivity. The Branch is prepared to approve injection at 7-5-16-27 on a temporary basis pending unitization, if Progress obtains the written consent of the royalty owners in the SE/4 & NE/4 of Section 5-16-27 (WPM). Upon receipt of the royalty owner consents, the Branch will authorize injection into the 7-5 well for a period not to exceed 90 days.

If you have any questions in respect of this approval, please contact the undersigned at (204) 945-6574.

Yours truly,

  
for John N. Fox, P.Eng.  
Chief Petroleum Engineer

December 11, 1998

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Production-Operations Manager  
Progress Energy Ltd.  
Suite 520, 520 – 5<sup>th</sup> Avenue SW  
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**Waterflood Order No.'s 7 & 8**

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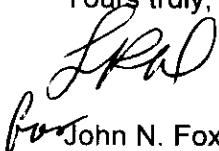
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- (f) the proposed effective date of unitization.

The Branch has considered your request to commence injection into the A pool using the 7-5-16-27 well to evaluate injectivity. The Branch is prepared to approve injection at 7-5-16-27 on a temporary basis pending unitization, if Progress obtains the written consent of the royalty owners in the SE/4 & NE/4 of Section 5-16-27 (WPM). Upon receipt of the royalty owner consents, the Branch will authorize injection into the 7-5 well for a period not to exceed 90 days.

If you have any questions in respect of this approval, please contact the undersigned at (204) 945-6574.

Yours truly,



John N. Fox, P.Eng.  
Chief Petroleum Engineer

**MINISTERIAL ORDER  
WATERFLOOD ORDER NO. 8**


**Pertaining to Waterflood Operations  
in the Birdtail Bakken C Pool**

**PETROLEUM DOCUMENT RE-**

Document No. 98-353  
Registered: December 11, 1998  
C.R. Macdonald  
Petroleum Registrar

- 1.0 The Operator shall conduct waterflood operations by injecting water into the Bakken Formation underlying the Birdtail Field through the wells listed in Schedule A. The Director may approve the conversion of additional wells to water injection.
- 1.1 Every injection well shall be completed as approved under Section 47 of the Drilling and Production Regulation.
- 1.2 The maximum wellhead pressure at which water may be injected is 9 000 Kpa.
- 1.3 The Director may, from time to time, establish a maximum or minimum rate at which water may be injected into a well.
- 1.4 The annulus of each injection well shall be pressure tested in accordance with Section 50 of the Drilling and Production Regulation.
- 2.0 The Operator shall conduct an annual survey to determine the level and distribution of reservoir pressure. A summary of the results of any pressure surveys conducted during the year are to be included in the annual waterflood progress report required under Section 73 of the Drilling and Production Regulation.
- 2.1 The frequency of pressure surveys may be reduced where the Director is satisfied that more frequent surveys will not assist the Unit Operator in monitoring the effectiveness of the waterflood.
- 2.2 The Operator is responsible for monitoring the effectiveness of the waterflood and for collecting such reservoir data and other information as is necessary to evaluate and optimize waterflood performance.
- 2.3 The Operator is to advise the Petroleum Branch of the suspension of water injection at any well, any indication of channeling or breakthrough of injected water to a producing well or out of zone and any other detrimental effects that may be attributable to the waterflood operations.
- 3.0 The Operator shall file a report of production or injection for each well in the Unit in accordance with Section 120 of the Drilling and Production Regulation.
- 4.0 The Operator shall file an annual waterflood progress report in accordance with Section 73 of the Drilling and Production Regulation.

Dec 10/98  
Date

  
Director of Petroleum for  
Minister of Energy and Mines

**Schedule A**

**Birdtail Bakken C Pool**

**Water Injection Wells**

**Progress Birdtail Prov. WIW 15-18-16-27 (WPM)**  
**Northrock Birdtail WIW 7-19-16-27 (WPM)**

**MINISTERIAL ORDER  
WATERFLOOD ORDER NO.**

**Pertaining to Waterflood Operations  
in the Birdtail Bakken A Pool**

**PETROLEUM DOCUMENT REGISTRY**

Document No. 98-352


Registered: December 11, 1998

C.D. Martineau

Petroleum Registrar

- 1.0 The Operator shall conduct waterflood operations by injecting water into the Bakken Formation underlying the Birdtail Field through the wells listed in Schedule A. The Director may approve the conversion of additional wells to water injection.
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Dec 10/98  
Date

  
Director of Petroleum for  
Minister of Energy and Mines

Schedule A

Birdtail Bakken A Pool

Water Injection Wells

Northrock Birdtail WIW 14-4-16-27 (WPM)  
Northrock Birdtail WIW 7-5-16-27 (WPM)



## Memorandum

Date: December 11, 1998

To: Bob Dubreuil

From: John Fox  
Chief Petroleum Engineer

Subject: Birdtail Bakken A & C Pools  
Waterflood Application

Telephone:

Progress Energy has made application to conduct a waterflood in the Birdtail Bakken A & C Pools. The Branch has published notice of the applications in the Birdtail Eyewitness and sent notices directly to the royalty owners and landowners in and within 0.5 km of the area of application. The notice period for objections and interventions expired November 27, 1998. No objections or interventions were received.

### Recommendations

It is recommended that Waterflood Orders No.'s 7 & 8 be issued approving the waterfloods. Copies of the proposed Waterflood Orders are attached.

Progress has requested approval to commence injection at 7-5-16-27 in the A Pool to evaluate injectivity, prior to unitization. Prior to granting approval to commence injection at 7-5 the Branch recommends Progress be requested to provide an update on the status of unit negotiations. Full-scale implementation of the waterfloods cannot commence until the royalty and working interest owners, including the Crown have executed unit agreements, and the Branch has registered the agreements.

### Discussion

The Birdtail Bakken A & C Pools were discovered in 1996 & 1997, respectively. The pools are approximately one section in size (see Fig. 1 & 2). The A Pool contains ten wells and the C Pool nine. Current production (Sep/98) from the pools is; A Pool – 12.4 m<sup>3</sup>/d with a water-cut of 74.4%; C Pool – 9.5 m<sup>3</sup>/d with a water-cut of 39.4%. Production from the pools has been characterized by a rapid decline in production as illustrate on Figures 3 & 4. Progress has limited pressure data from the pools. The Branch estimates original reservoir pressure of 4378kPa (-42 m subsea) based on DST information from the A9-8-16-27 well. A static gradient run in September 1998 at 7-5-16-27 showed the reservoir pressure had decreased to 3730 kPa. The estimated bubble point pressure is 834 kPa based on PVT data from 8-35-15-31 (WPM).

Table 1 lists reservoir parameters for both pools and estimates of primary and secondary recovery. Both pools contain a number of undeveloped spacing units. The recoverable reserve estimates are for the developed spacing units only. Progress's secondary recovery estimates, A Pool - 25% and C Pool 20%, are based on a mobile oil saturation of 29%, an areal sweep efficiency of 63% and vertical sweep efficiencies of 85% for the A Pool and 70% for the C Pool. Progress's primary and secondary production forecasts for the A & C Pools are shown on Figure 5.



**TABLE 1 - BIRDTAIL BAKKEN A & C POOL RESERVOIR PARAMETERS**

	A POOL	C POOL
<b>OOIP</b>		
Area (ha)	295.2	229.6
Net Pay (m)	1.09	1.50
Porosity (%)	16.4	17.3
Sw (%)	37	37
Boi (m3/m3)	1.02	1.02
OOIP (m3)	326756	366964
OOIP/Well (m3)	24481.3	31330
<b>Recoverable Reserves</b>		
Primary (m3)	28105	17895
Primary Recovery Factor (%)	8.6	4.9
Secondary (m3)	53600	55500
Secondary Recovery Factor (%)	16.4	15.1
Ultimate (m3)	81705	73395
Ultimate Recovery Factor (%)	25.0	20.0

Progress proposes to convert two wells in each pool to injection, with plans to eventually convert a third well to injection (see Fig. 1). In both pools the proposed injectors are located on the edge of the pool. The initial producer to injector ratios are A Pool – 4:1 and C Pool 3.5:1, the same or lower than for an inverted 5-spot injection pattern. Progress estimates maximum water injection requirements of 45 m3/d for the A Pool and 20 m3/d for the C Pool. Additional make-up water for injection will come from the 2-19-16-27 well, which was fractured out of zone into the Lodgepole.

The Branch is satisfied with Progress' s waterflood plans and recommends that the waterfloods be approved. The Crown is a royalty owner in the SW/4 of Section 4-16-27 (WPM) in the A Pool and the E/2 of Section 18-16-27 (WPM) and the SE/4 of Section 19-16-27 (WPM) in the C Pool. Progress has not contacted the Branch regarding its plans for unitization. Progress has also requested approval to commence injection at 7-5-16-27 in the A Pool to evaluate injectivity, prior to unitization. The Branch recommends that Progress be requested to submit a report on its unitization plans including the proposed unit areas and tract factors and a draft copy of the unit agreement for review by the Branch.

It is recommended that Progress be granted approval to inject into the 7-5 well provided the Branch is satisfied with Progress's unitization plans and the royalty owners in the SE/4 & NE/4 of Section 5-16-27 (WPM) provide their consent in writing.

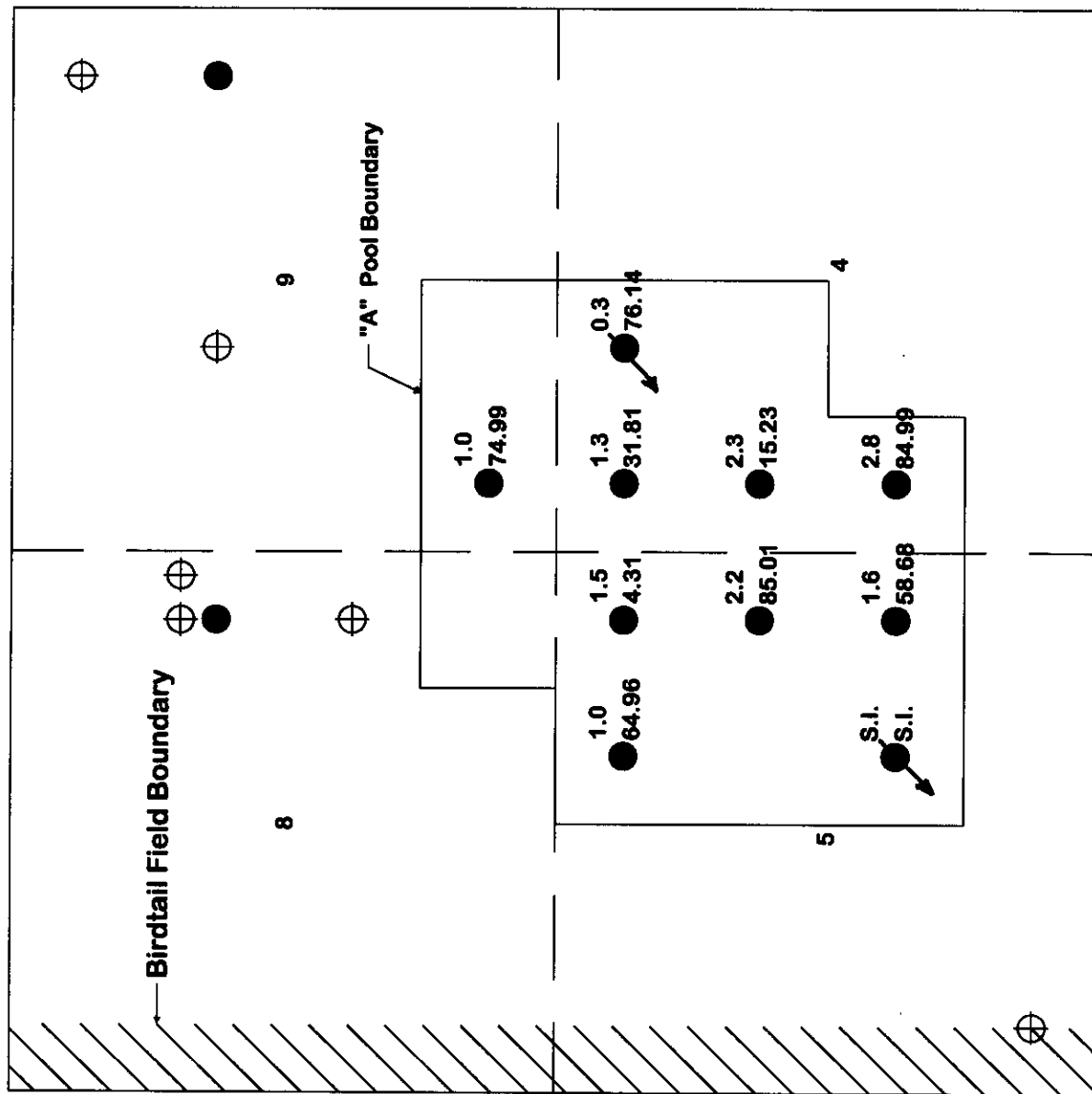
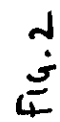


Fig. 1

**Aver. Daily Oil (Sept./98)**



# Birdtail Bakken A Pool Data 09/96-09/98

Monthly Oil FC 2 (Rate-Time)

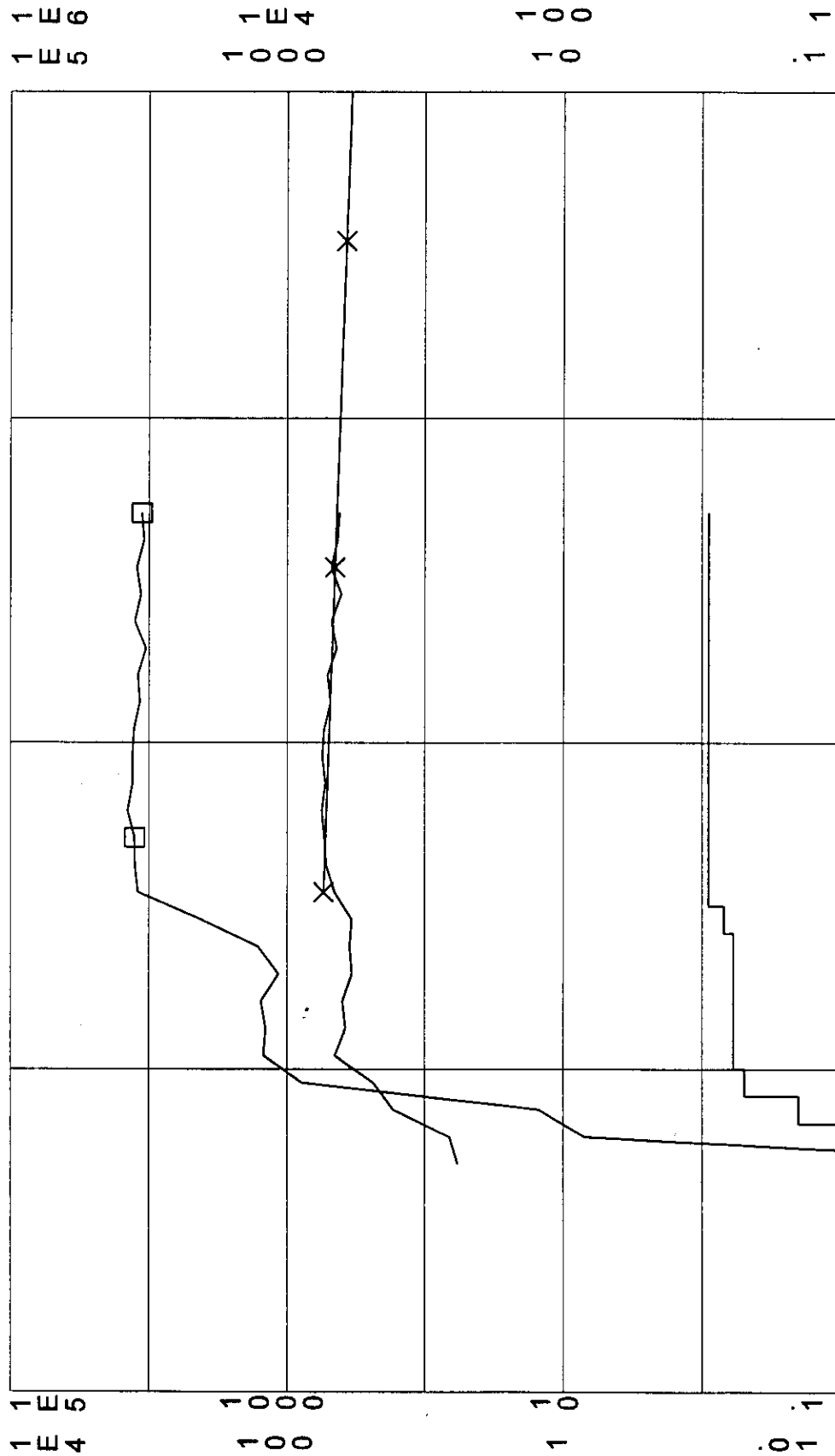
qi: 546.905 m3, Jul, 1997

qf: 1.78843 m3, Nov, 2027

di(Exp): 17.1511 CTD: 10035.7 m3

RR: 27456.4 m3 Tot: 37492.1 m3

Production Cums  
Oil: 10035.7 m3  
Gas: 0 E6m3  
Water: 19578.7 m3  
Cond: 0 m3



Birdtail Bakken C Pool Data 01/97-09/98

Operator:

Field:

Zone:

Type: Unknown

Group: Birdtail 60C

Monthly Oil FC 2 (Rate-Time)

qi: 389.245 m3, Jul, 1998

qf: 1.79062 m3, Dec, 2011

di(Exp): 32.8768 CTD: 3730.2 m3

RR: 10551.8 m3 Tot: 14282 m3

Production Cums

Oil: 3730.2 m3

Gas: 0 E6m3

Water: 1799.4 m3

Cond: 0 m3

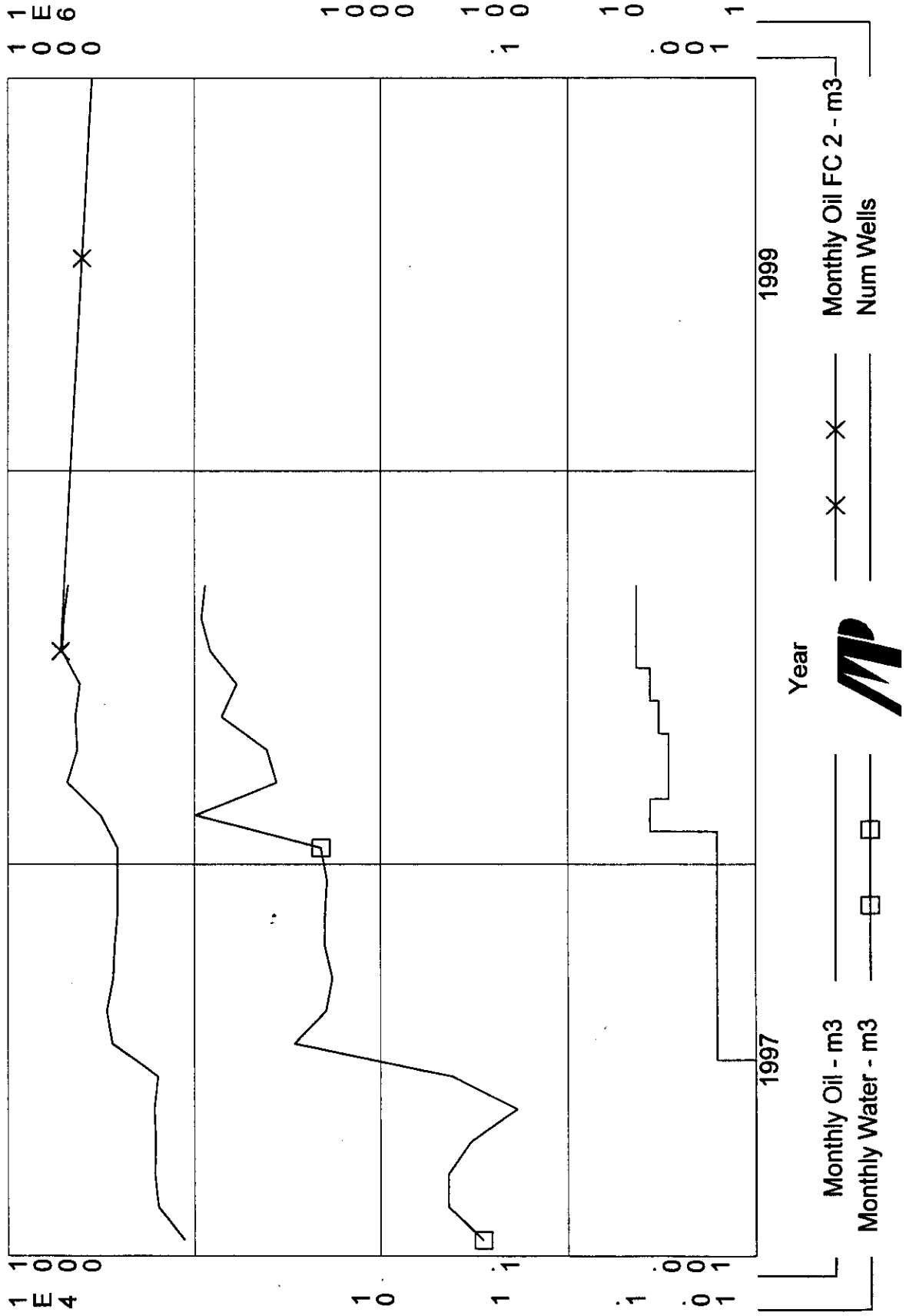


FIG. 4

# Birdtail Bakken A & C Pool Production Forecast

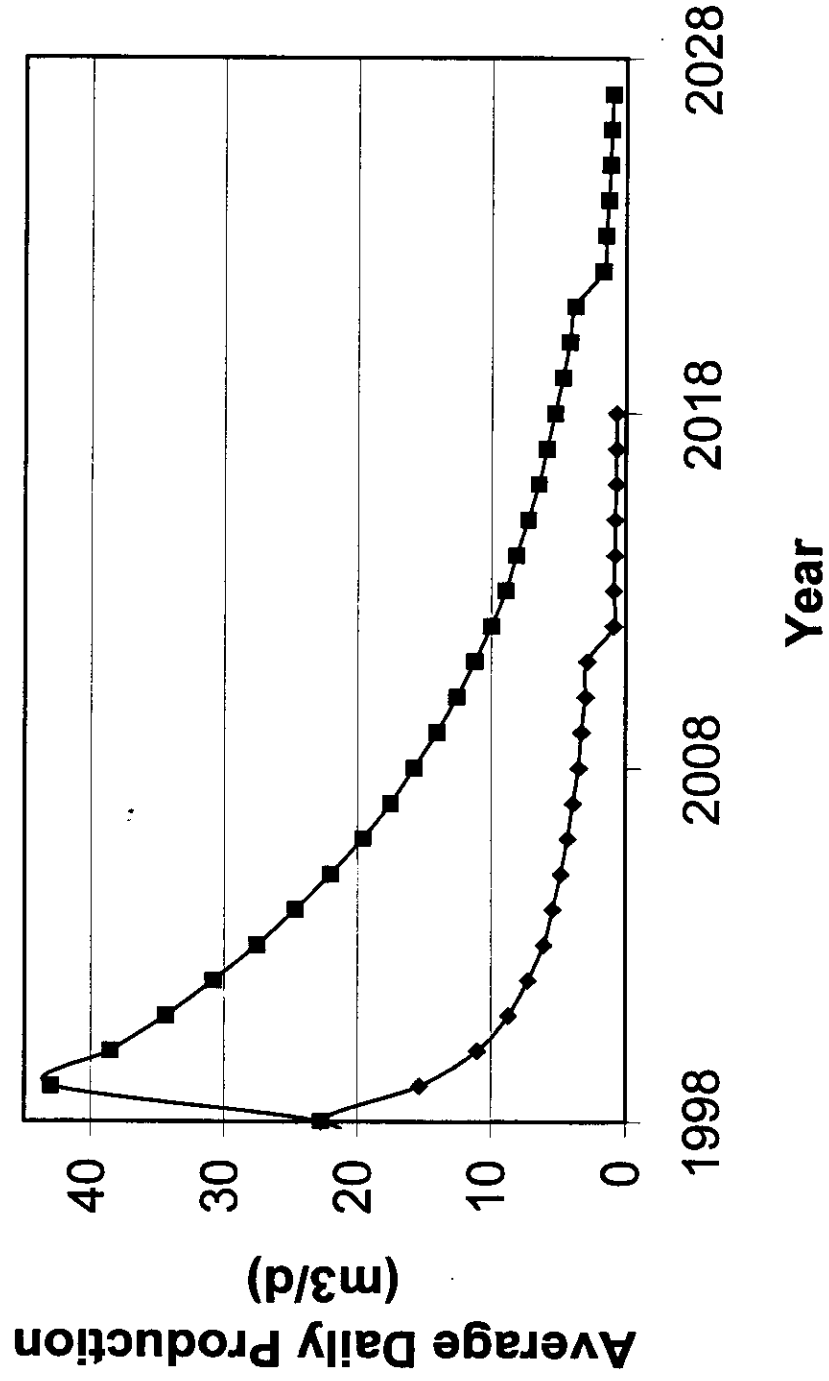
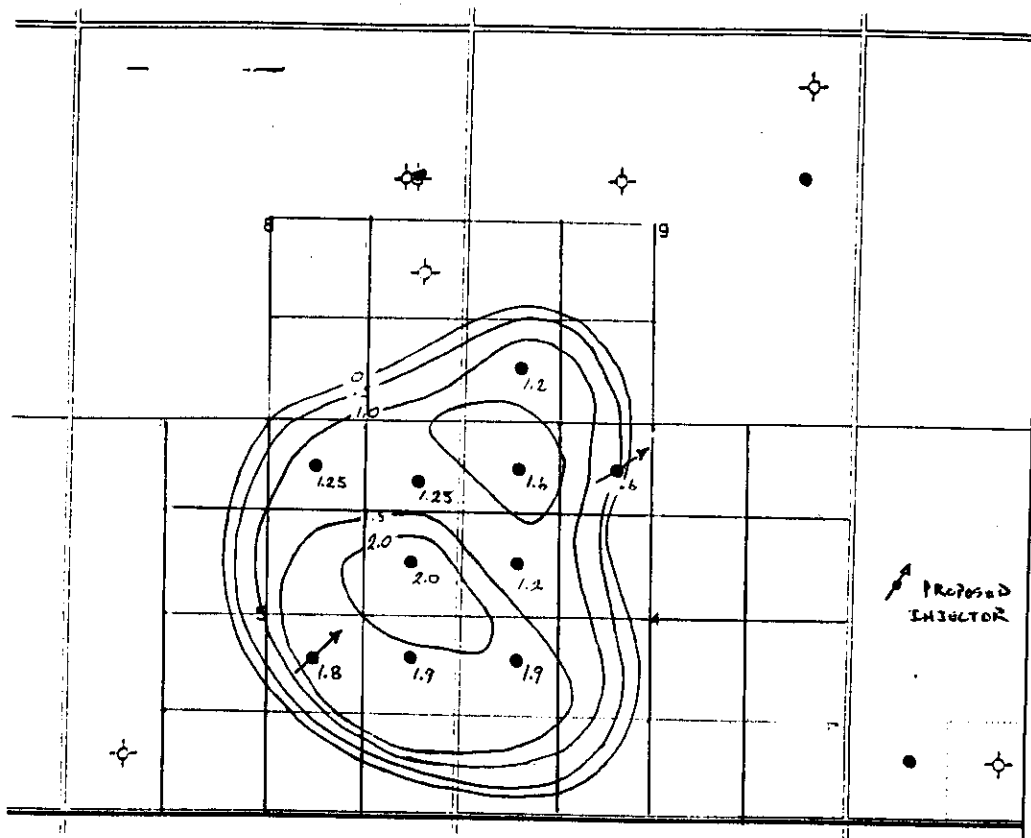


Fig. 5



1 - BIRDTAIL BAKKEN A POOL - NET PAY MAP

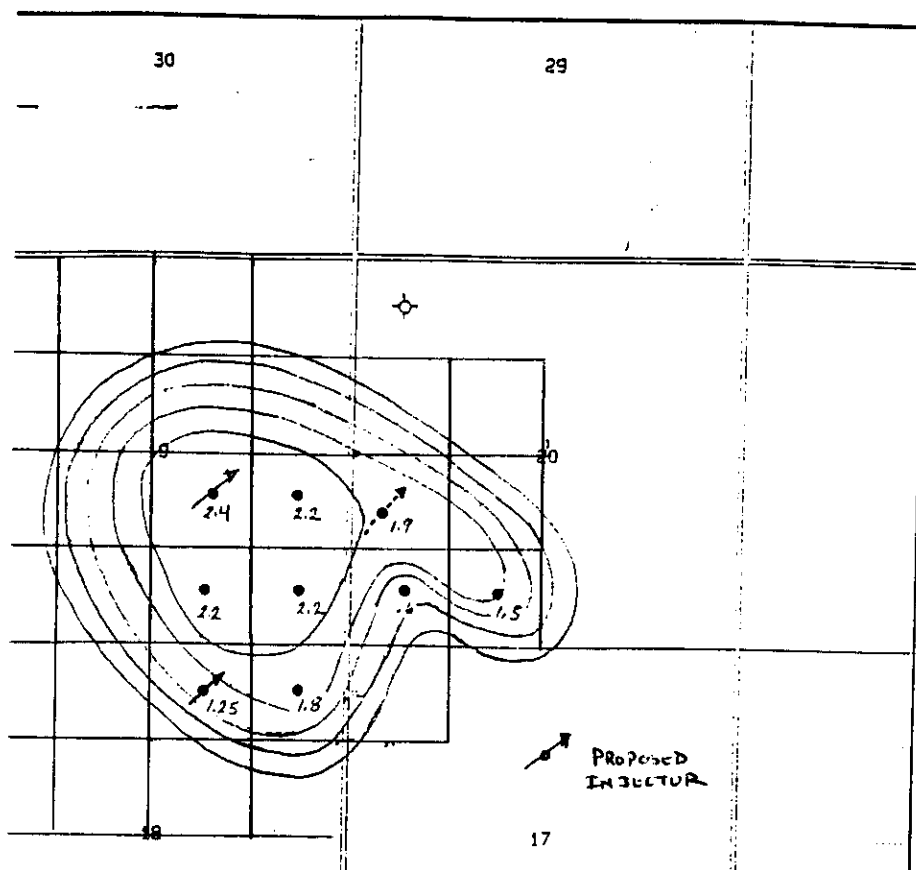
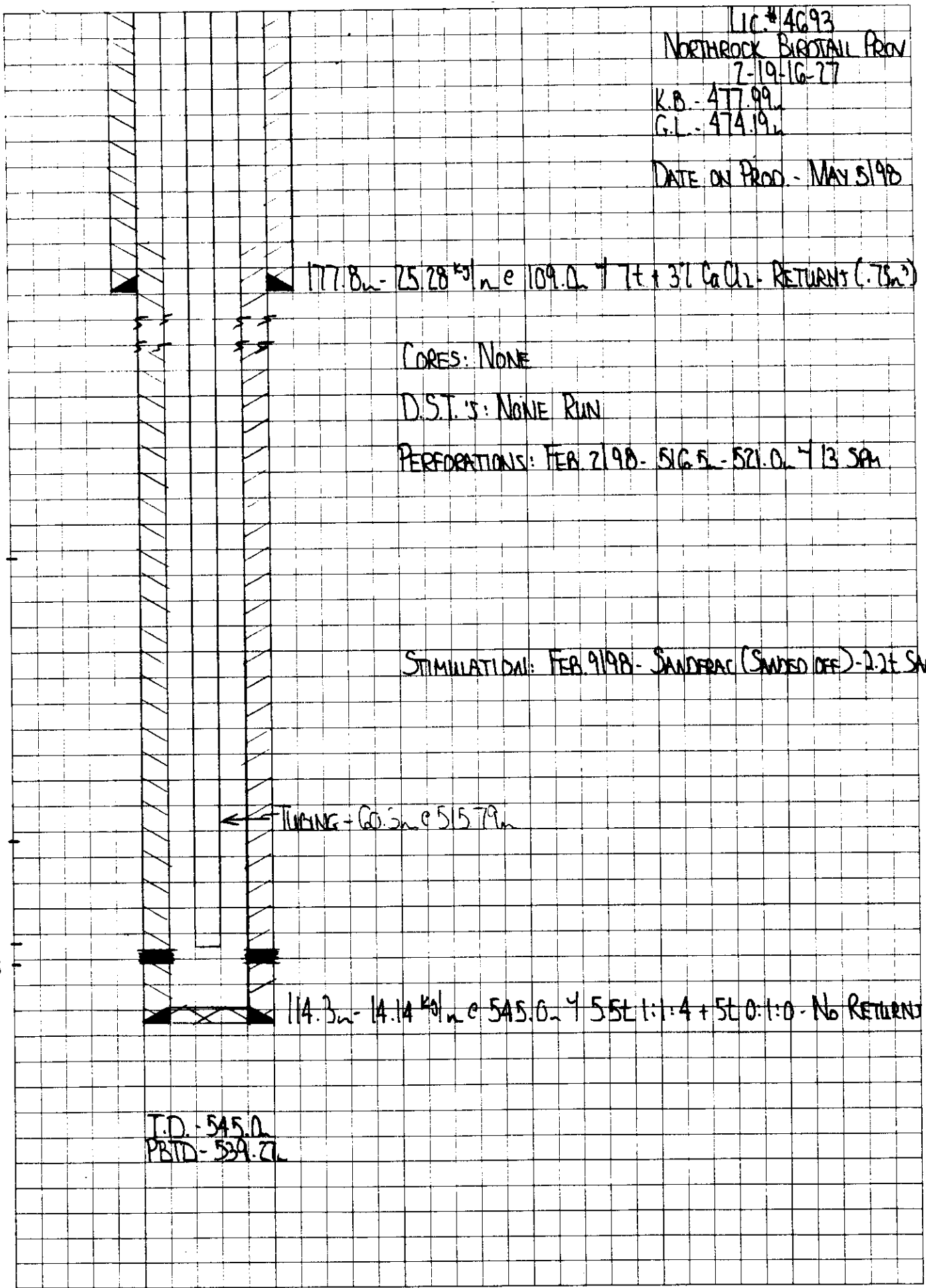


FIG. 2 - BIRDTAIL BAKKEN C POOL - NET PAY MAP

Lic. #4693  
 Northrock Birdtail Prov  
 7-19-16-27  
 K.B. - 477.99  
 G.L. - 474.19  
 DATE ON PROD. - MAY 5/98

DIETZEN CORPORATION  
 MADE IN U.S.A.  
 BLAIRMORE  
 DEPTH  
 400  
 (METRES)  
 DIETZEN GRAP  
 5 X 5 PAPER  
 LINDSEY  
 500  
 PAKKEN  
 NO. 3 FORKS





02-DEC-98

## Manitoba Energy and Mines

Report PPS1520

Page: 1

## Well Production Record

1998

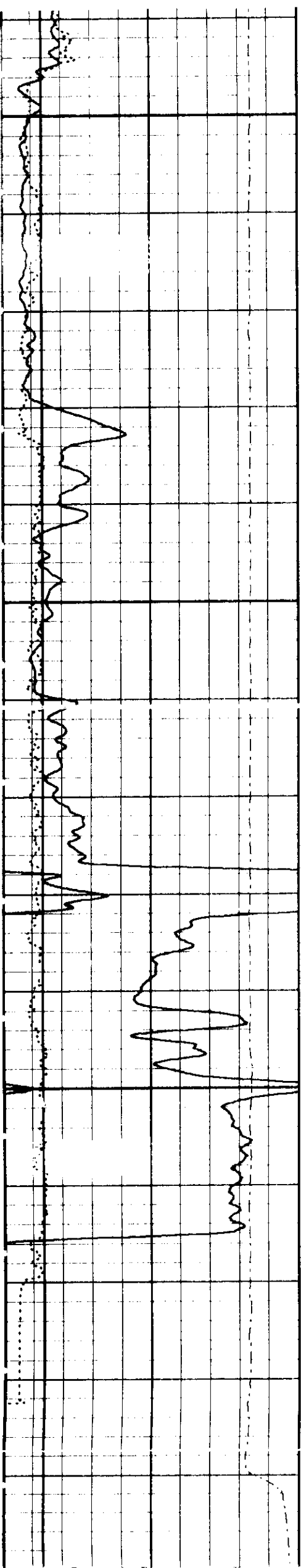
Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.02-19-016-27W1.00  
 Licence 4693

Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Prior Cum	0	0	0	
Jan	0	0	0	
Feb	1	0	140.4	
Mar	0	0	0	
Apr	0	0	0	
May	26	4.4	98.6	
Jun	1	4	0	
Jul	0	0	0	
Aug	0	0	0	
Sep	0	0	0	
Oct	0	0	0	
Nov	0	0	0	
Dec	0	0	0	
YTD	28	8.4	239	
Cumulative	0	0	0	

Status Date	Uwi Status
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05-MAY-98	COOP
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MISS

475

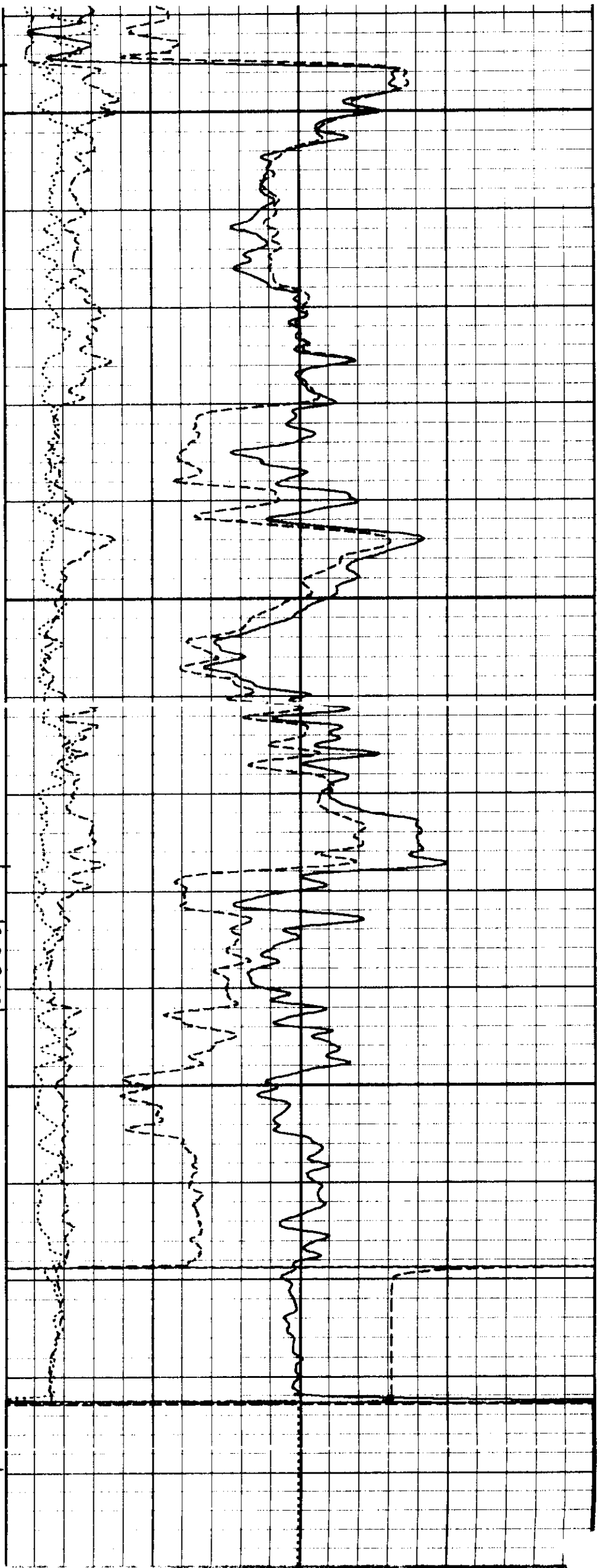
500

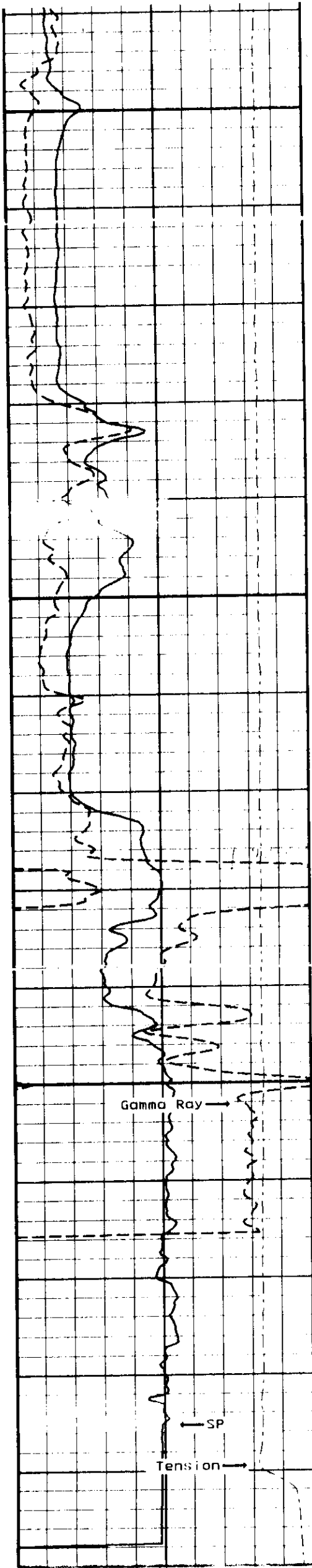
BKKN



525

TD





MISS.

475

500

BAKKEN



525

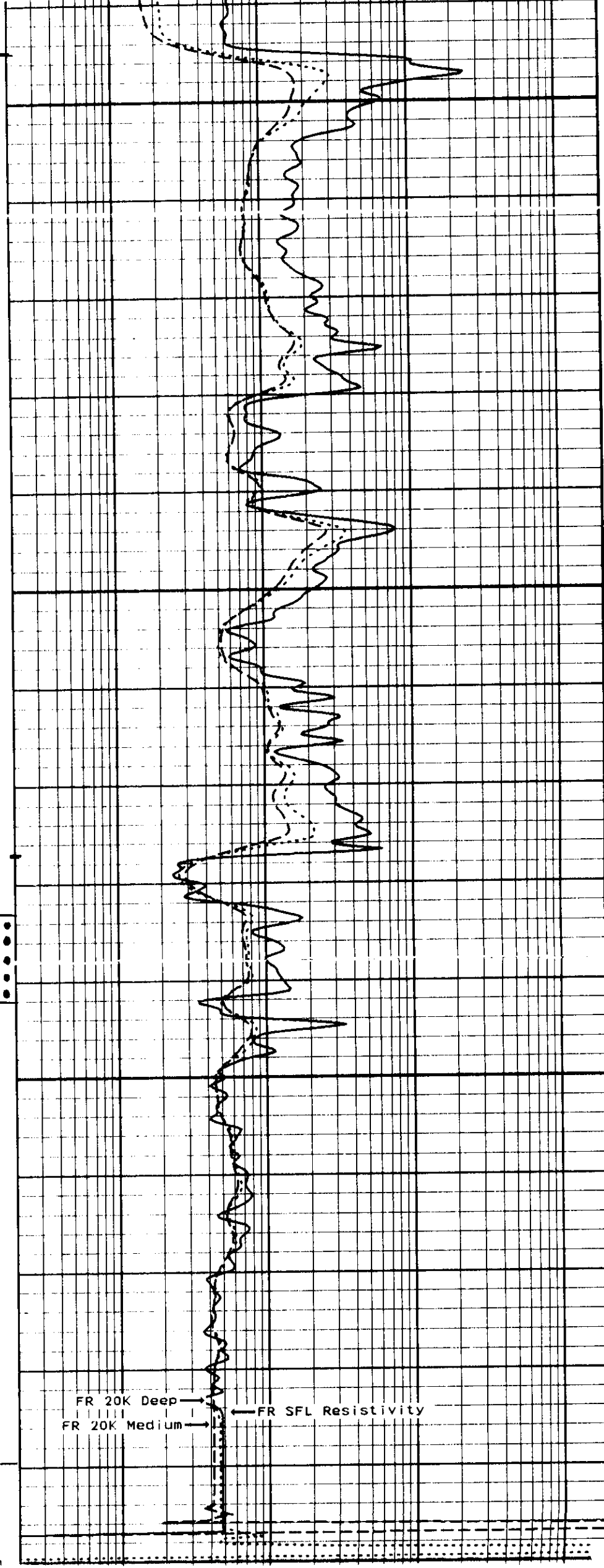
Gamma Ray

SP

Tension

TD

550



FR 20K Deep  
FR 20K Medium

FR SFL Resistivity

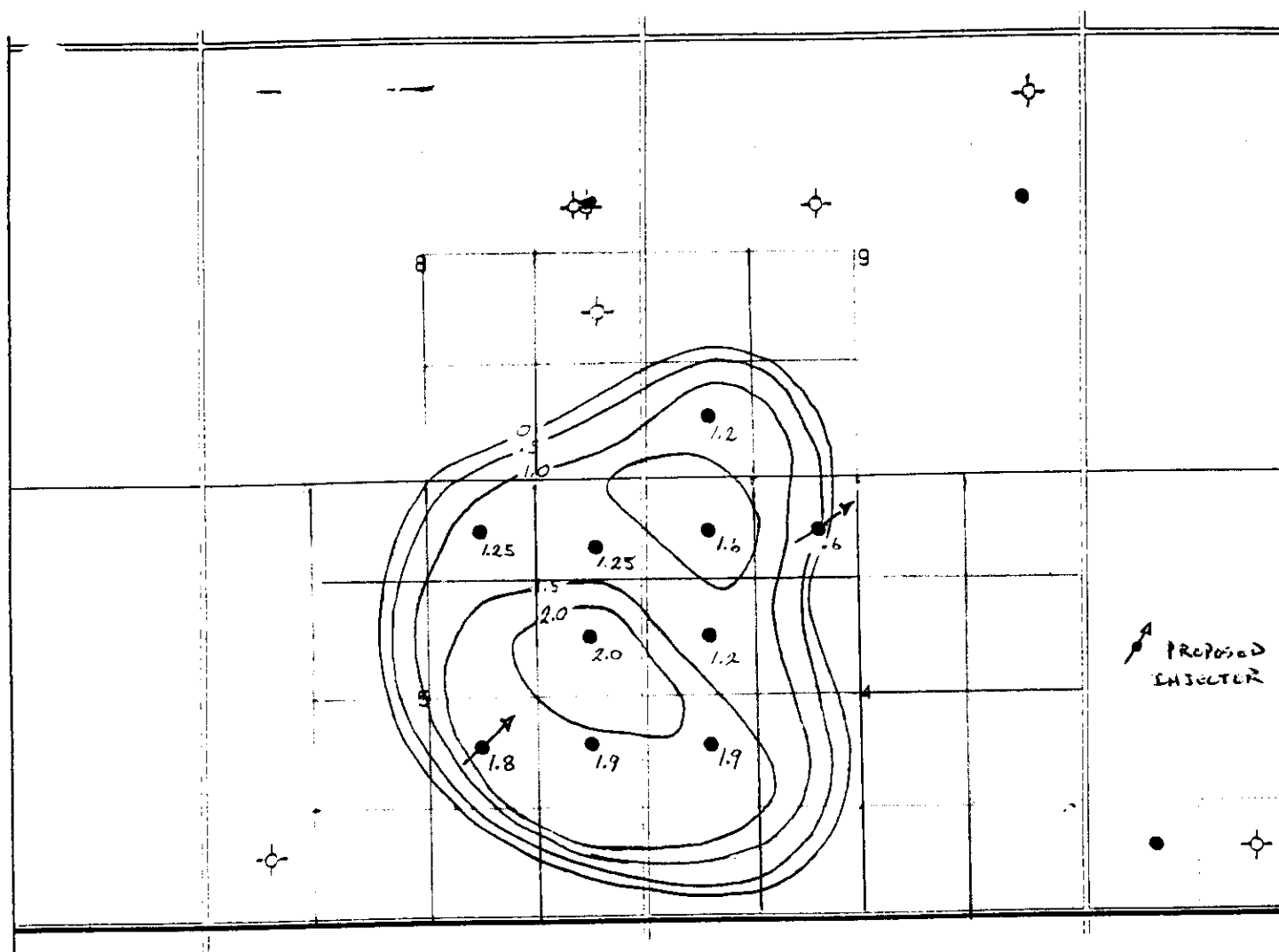


FIG. 1 - BIRDTAIL BAKKEN A POOL - NET PAY MAP

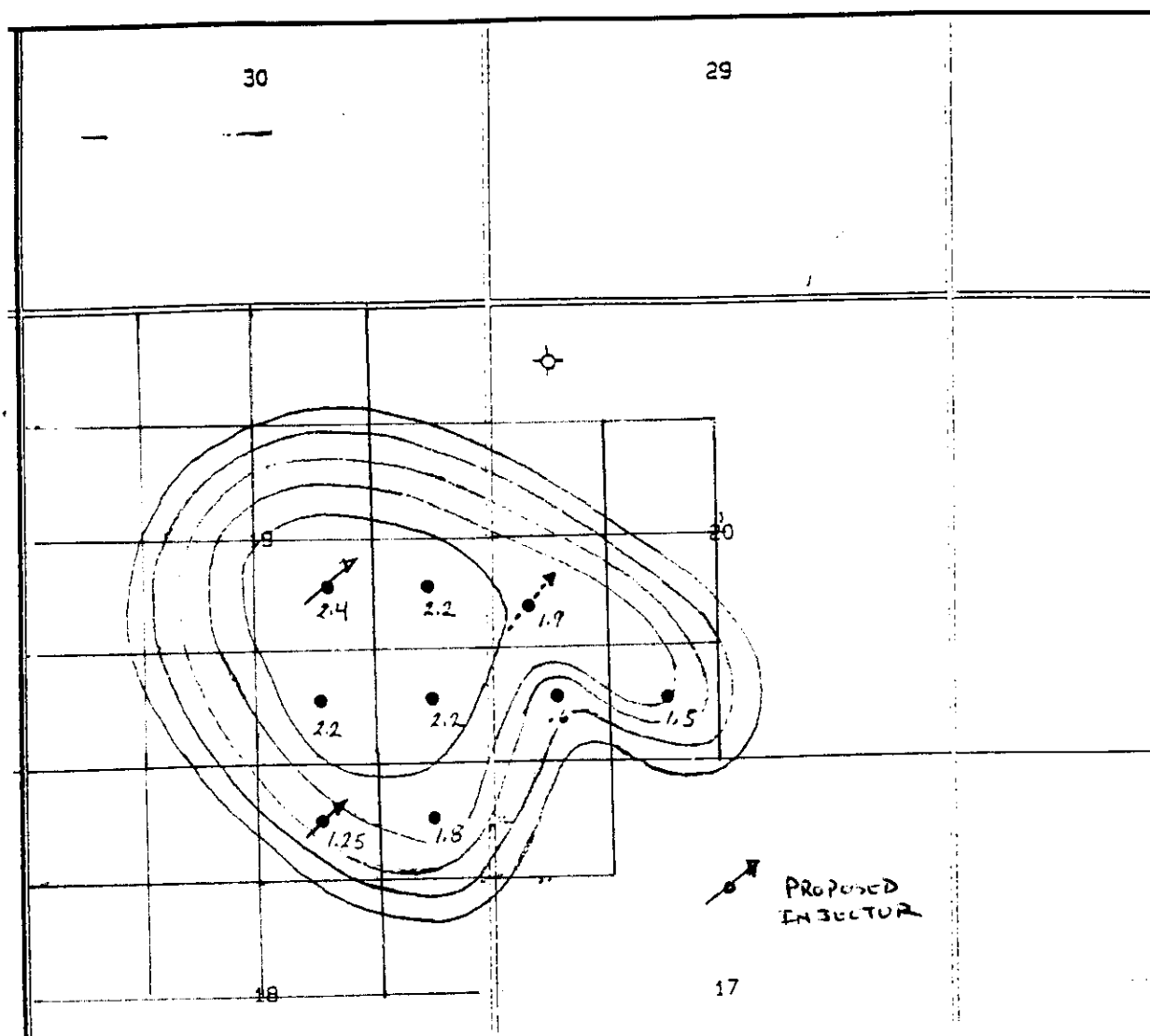
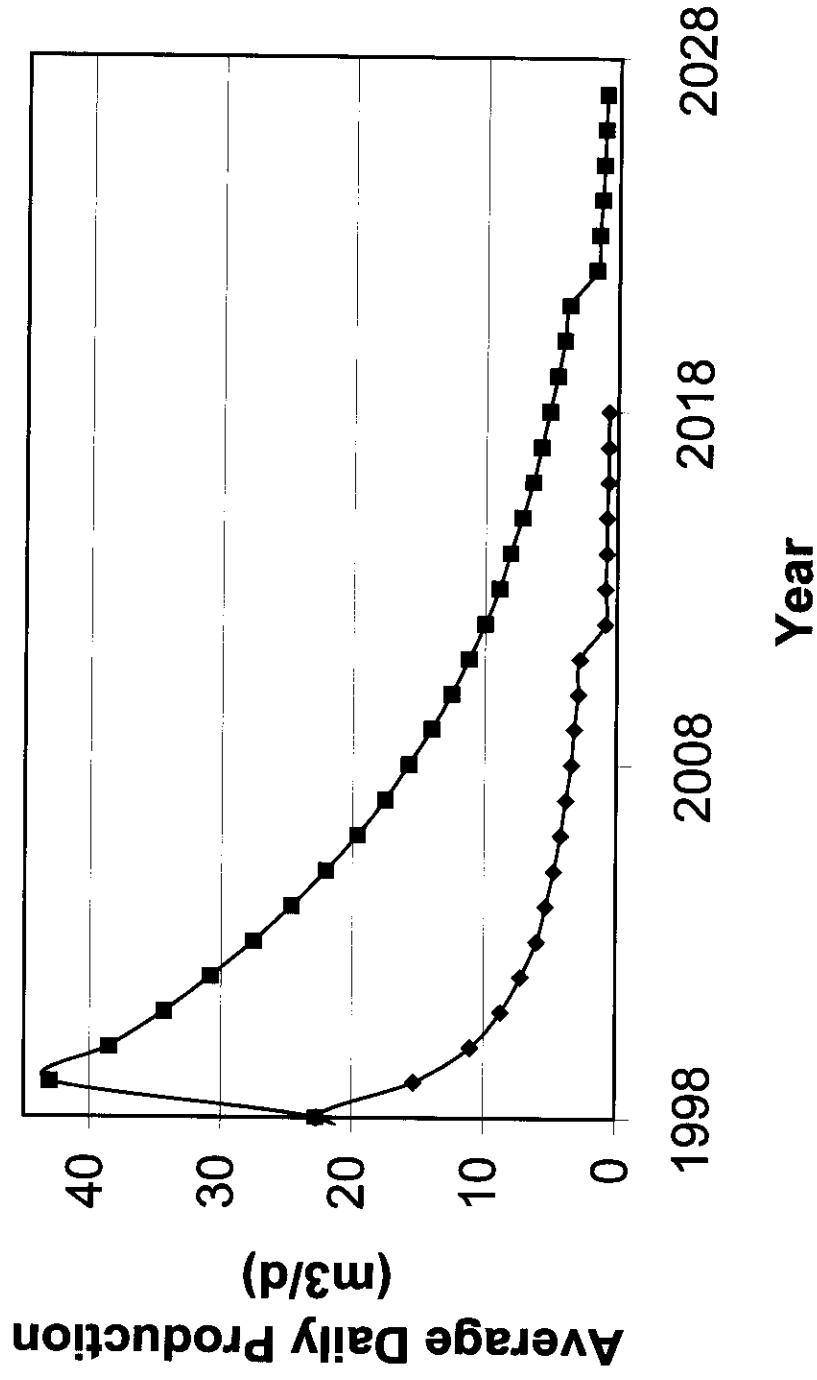


FIG. 2 - BIRDTAIL BAKKEN C POOL - NET PAY MAP

# Birdtail Bakken A & C Pool Production Forecast



**PROGRESS BIRDTAIL BAKKEN A 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	4.2	500	4.2	500
1997	13.5	5425	13.5	5425
1998	13.2	10232	13.2	10232
1999	9.0	13532	23.0	18627
2000	6.7	15994	20.5	26104
2001	5.4	17958	18.2	32765
2002	4.5	19593	16.3	38697
2003	3.8	20993	14.5	43981
2004	3.4	22218	12.9	48687
2005	3.0	23305	11.5	52879
2006	2.7	24284	10.2	56612
2007	2.4	25173	9.1	59938
2008	2.2	25988	8.1	62900
2009	2.1	26741	7.2	65539
2010	1.9	27439	6.4	67889
2011	1.8	28095	5.7	69982
2012			5.1	71846
2013			4.5	73507
2014			4.1	74986
2015			3.6	76303
2016			3.2	77477
2017			2.9	78522
2018			2.6	79453
2019			2.3	80282
2020			2.0	81020
2021			1.8	81678
Total		28095		81678

**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

## BIRDTAIL BARREN A Pool.

1) ooip  $326.8 \cdot 10^3 \text{ m}^3$

2) ultimate recovery primary  $28.1 \cdot 10^3 \text{ m}^3$  - 8.6% ooip

3) <sup>inc</sup> WF recovery  $A \cdot 53.6 \cdot 10^3 \text{ m}^3$  (16.4% ooip)

4) ult. WF recovery  $81.7 \cdot 10^3 \text{ m}^3$  (25% ooip) see EIT  
- analog Bakken WF in Rocanville commenced in '97  $1.8 \text{ L/d}$

5) peak WF prod.  $23 \text{ L/d}$

(6) res. fluid properties from 8-35-15-31

sol<sup>n</sup> CO<sub>2</sub>  $0.9 \text{ L}^3/\text{L}^3$

bubble pt. pressure  $834 \text{ kPa}$

$T_R = 32^\circ\text{C}$

oil density  $867.1 \text{ kg/L}^3$  32.5° API (14-4-16-27)

(7) water source 2-19-16-27 Lodgepole & produced Bakken in

max. inj. vol.  $45 \text{ L}^3/\text{d}$  <sup>with pressure</sup> both-hole i-p. press -14 MPa.

- wellhead i-p. press - 9 MPa.

(8) discovery well drilled in 1996

(9) 7 wells total prod.  $12.2 \text{ L}^3/\text{d}$

current prod to 31-Dec-98 -  $8441.1 \text{ L}^3$

majority of wells produce  $\Rightarrow$  relatively light WC 85%  
plot daily oil  
WC

(10) pressure data - N14. static grad. 7-5-16-27 (Sep 11/98)

$\overline{P_R} = 3716 \text{ kPa}$

Rocanville (see 445-16-31w1) initial reservoir pressure  
 $6200 \text{ kPa}$



(11) injectors 7-5 p 14-4, an addition inj. drilled at 3-6(?)

(12) single battery @ 1-19-16-27

(13) Summary of reservoir parameters.

OOIP	developed	244.8	$10^3 \text{ m}^3$	Sc	10	OOIP/well 24,481 $\text{m}^3$
	undeveloped	81,443	$10^3 \text{ m}^3$	Sc	8	10243 $\text{m}^3$

$$S_w = 0.37$$

$$A = 10 \times 16.4$$

$$B_{oi} = 1.02 \text{ v (Pot. loss)}$$

$$\phi h = 0.2405 \text{ devel.}$$

$$h = 1.47 \text{ m}$$

$$\phi = 16.4\%$$

$$\phi h = 0.1006 \text{ undevel.}$$

(14) plot prod. forecasts against A/C Pw.

(15) current prod. level.

(16) ult. WF rec. based on following assumption

$$\text{areal sweep eff.} = 0.63$$

$$\text{vt. " " } = 0.70 \text{ C Pw1} \quad 0.45 \text{ A Pw1}$$

$$S_{wi} = 0.37$$

$$S_{r1} = 34$$

vert. sweep eff. determine from a single core comparing  
fluid loss/gross pay. using 2nd cut-off

DEVELOPED 2448/3 ~ 28105 (11.48/1.0017) 53600 (21.871.)

Well	Well Status	Reserve Class	Net Pay x Por. Fr.	OoIP m3	Rec. Fr.	ROIP m3	Cum. to date m3	W.L. Fr.	Volume. Reserves m3	Decline Reserves m3	Prod. Rate m3/d
03-04-16-27w1	no well ✓		0.050	5,090							
04-04-16-27w1	no well ✓	Prob	0.150	15,269				1.00			
05-04-16-27w1	Producing	PDP	0.325	33,083 ✓	0.14	4,632	975	1.00	3,657	3950	4.40
06-04-16-27w1	no well ✓		0.120	12,215							
11-04-16-27w1	no well ✓		0.025	2,545							
12-04-16-27w1	Producing	PDP	0.230	23,412 ✓	0.14	3,278	1335	1.00	1,943	2160	2.70
13-04-16-27w1	Producing	PDP	0.270	27,484 ✓	0.10	2,748	1050	1.00	1,698	1532	2.00
14-04-16-27w1	Producing	PDP	0.070	7,126 ✓	0.04	285	175	1.00		0	0.20
01-05-16-27w1	no well		0.110	11,197							
07-05-16-27w1	Producing	PDP	0.190	19,341 ✓	0.04	774	95	1.00		0	0.20
08-05-16-27w1	Producing	PDP	0.325	33,083 ✓	0.14	4,632	0	1.00	4,632	3919	
09-05-16-27w1	Producing	PDP	0.370	37,663 ✓	0.10	3,766	1275	1.00	2,491	2225	2.80
10-05-16-27w1	no well ✓	Prob	0.250	25,448				1.00			
15-05-16-27w1	Producing	PDP	0.200	20,359 ✓	0.14	2,850	335	1.00	2,515	1890	1.80
16-05-16-27w1	Producing	PDP	0.225	22,903 ✓	0.10	2,290	1200	1.00	1,090	1100	1.70
01-08-16-27w1	no well		0.060	6,108							
03-09-16-27w1	no well		0.040	4,072							
04-09-16-27w1	Producing	PDP	0.200	20,359 ✓	0.14	2,850	550	1.00	2,300	1200	1.25
Totals			3.210	326,756		28,105	6,990		20,326	17,976	17.05
Totals barrels				2,056,232		176,862	43,987		127,912	113,121	107
Assumptions	Well spacing, ha	16.4									
	Water Saturation	0.37									
	Boi	1.02									
			DEVELOPED	244813	✓	28105	(11.46% OOIP)		206000	(21.89%)	
			UNDEVELOPED	81943		9407			17937	" "	

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

	<u>10<sup>3</sup>m<sup>3</sup></u>	<u>mbbls</u>
Original Oil in Place	326.8	2056.3
Primary Recovery Factor	8.6%	8.6%
Recoverable Oil in Place - Primary	28.1	176.9
Secondary Recovery Factor	16.4%	16%
Recoverable Oil in Place - Secondary	53.6	337.2
Total Recovery Factor	25.0%	25.0%
Total Recoverable Oil in Place with EOR	81.7	514.1

# BIZOTAN BAKKON C FOR

- 1/ OOIP  $367 \times 10^3 \text{ m}^3$  area of appl<sup>t</sup> 15-16 of 18, SE 19 & SW 20  
2x includes area of appl<sup>t</sup> + 3-19, 6-19, 9-19, 10-19
- 2/ Primary recovery 4.9% OOIP -  $17,900 \text{ m}^3$  (see limit  $0.5 \frac{\text{m}^3}{\text{d}}$ )
- 3/ Secondary recovery ASS500 -  $(15.1\% \text{ OOIP})$
- 4/ Ultimate recovery 73,400 (20% OOIP) based on cost performance in Rocaville & Dely  
see Appendix 3 Sec 4-15-16-3101  
new calculation -
- 5/ project commencement Dec/98
- 6/ PVT properties from 8-35-15-31 well -  $855.7 \text{ kg/L}^3$   
compare oil analysis @ 3-20-16-27 -  $860.8 \text{ kg/L}^3$   
32.8 °API
- 7/ source water 2-19-16-27 Lodgepole -  $20 \text{ m}^3/\text{d}$   
copy of Lodgepole/Belle water compatibility testing  
do we have any oil analysis
- 8/ current C Prod prod. 7 wells -  $10.3 \text{ m}^3/\text{d}$   
current prod Jul/98 -  $3787.7 \text{ m}^3 \text{ o.i.}$   
discovered Jan/97  $1440.3 \text{ m}^3 \text{ wtr}$  (wc 31.4%)  
plot -  $\frac{\text{daily oil}}{\text{wc}}$
- 9/ only pressure data 7-5-16-27 (Sep/98) static gradient  
 $P_2 = 3716 \text{ kPa}$  SI 95 days - review DSTs in area  
@ 511.75 - (CF) 471.2 including 19-8-16-27
- 10/ injections at 15-18 & 7-19-16-27 check to see  
if completed in zone w. low water-cut, future  
injection @ 6-20-16-27 (prod. histories) 15-18 - prod Jul 98  
7-19  $4.6 \text{ m}^3/\text{d}$  wc 46.7% 0.9 m<sup>3</sup>/d 17.2% wc
- 11/ estimated sandface inj. pressure 14000 kPa. wellhead  
max inj. press - 9000 kPa  
- review appropriateness, check treatment pressures

- 12/ proposed battery at 1-19-16.27 (status?) - no further  
 13/ Is statement 'existing pool has been well  
 delineated' true - how ~~unknown~~  
 oil/water  
 separated

14/ Pool average oil parameters Table 1

$$S_w = 0.37$$

$$\bar{T}_R = 20^\circ\text{C}$$

$$\rho_{oi} = 1.02$$

$$h = 1.78 \text{ m. } \phi = 17.3\%$$

$$\text{Area} = 9 \times 16.4$$

- average oil/well - 31192 m<sup>3</sup> developed 54%

15/ undrilled locations 3-19, 6-19, 9-19, 10-19 & 6-20 - 17000 m<sup>3</sup>/well

16/ calculate decline rate primary & secondary (Table 2)

17/ 1-j poles to be set within 15' - of top of  
 perf. interval

18/ Notice to Mineral Owners - Trwp 16-27.57

✓ NE 1/4 NW 1/4 - 17 ✓

N 1/2 - 18 ✓

All 19 ✓

All 20 -

+ Surface Owner

NE - 18

SW 20

SE - 19

Requires 100% lease

19/ CORE ANALYSIS 8-19-16-27  $\phi_{\text{aver}} = 19.9$   $K_{\text{aver}} = 79.22$   
 $h = 2.2$  ( $K_{\text{inter}} = 2.0 - d.$ )

20/ INJECTION PATTERNS - partial, if 6-20 converted 1:33 ratio  
1:35 injector:producer ratio  
- down dip injections.

21/ check ROCANVILLE SAKKEN POOL PROPERTIES.

Progress Energy Ltd.  
Birdtail North Bakken Reserves - C Total

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	no well			0.15		15,269							
06-19-16-27w1	no well			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	no well			0.16		16,287							
10-19-16-27w1	no well			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							
	DEVELOPED												
	UNDEVELOPED												
Totals						281966		17895	17895 (6.3% OOIP)		16,145	secondary (19.7% OOIP)	12
Totals, barrels						84998		5355	5355 (6.3% " )		101,600	16745 (19.7% OOIP)	73
						366,964		17,895					
						2,309,258		112,612					

Assumptions Well spacing, ha 16.4  
Water Saturation 0.37  
Boi 1.02  
Waterflood Recovery will be 20% of OOIP.

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

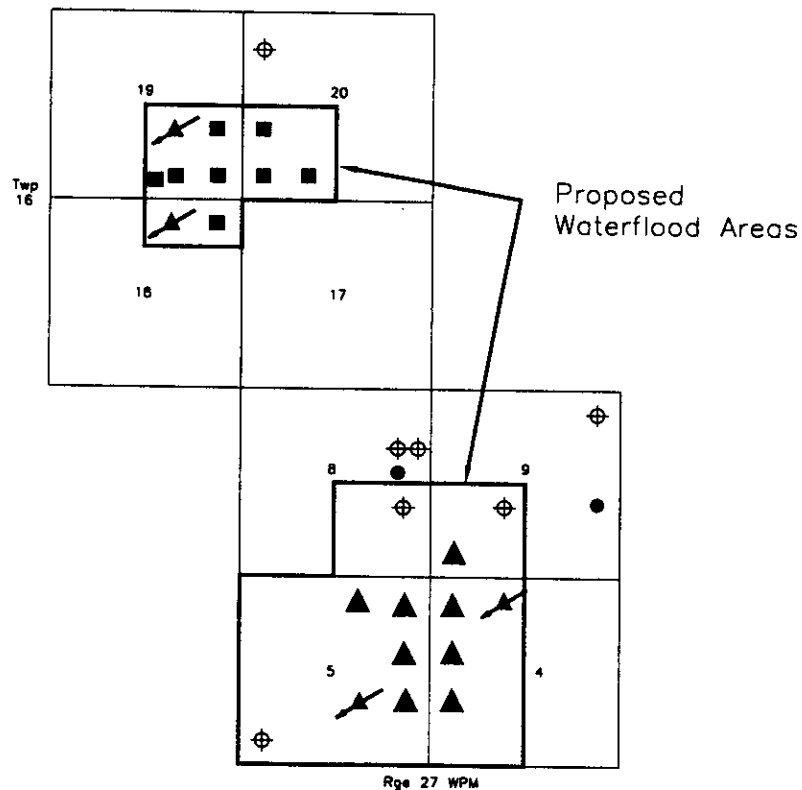
	<u>10<sup>3</sup>m<sup>3</sup></u>	<u>mbbls</u>
Original Oil in Place	367.0	2309.3
Primary Recovery Factor	4.9%	4.9%
Recoverable Oil in Place - Primary	17.9	112.6
Secondary Recovery Factor	15.1%	15.1%
Recoverable Oil in Place - Secondary	55.5	349.2
Total Recovery Factor	20.0%	20.0%
Total Recoverable Oil in Place with EOR	73.4	461.9





## NOTICE UNDER THE OIL AND GAS ACT BIRDTAIL OIL FIELD

Progress Energy Ltd. has made application under The Oil and Gas Act to conduct a waterflood in the Bakken Formation in the Birdtail Bakken A Pool and Birdtail Bakken C Pool as shown below.



- ▲ Bakken A Pool Producer
- Bakken C Pool Producer
- Proposed Water Injector
- ⊕ Abandoned Dry
- Producer

It is proposed to convert the wells, Northrock Birdtail 14-4-16-27 (WPM), Northrock Birdtail 7-5-16-27 (WPM), Progress Birdtail Prov. 15-8-16-27 (WPM) and Northrock Birdtail Prov. 7-19-16-27 (WPM) to water injection.

If no valid objection or intervention is received in writing by the Department of Energy and Mines, Petroleum and Energy Branch, at Suite 360, 1395 Ellice Avenue, Winnipeg, Manitoba R3G 3P2 before November 27, 1998, the Director may approve the applications.

Copies of the applications can be obtained from:


Jeff Screen, P. Eng.  
Manager, Production - Operations  
Progress Energy Ltd.  
Suite 520, 520 - 5<sup>th</sup> Avenue SW  
Calgary, AB T2P 3R7  
(403) 216-2510

These applications may be viewed at the offices of the Petroleum and Energy Branch:

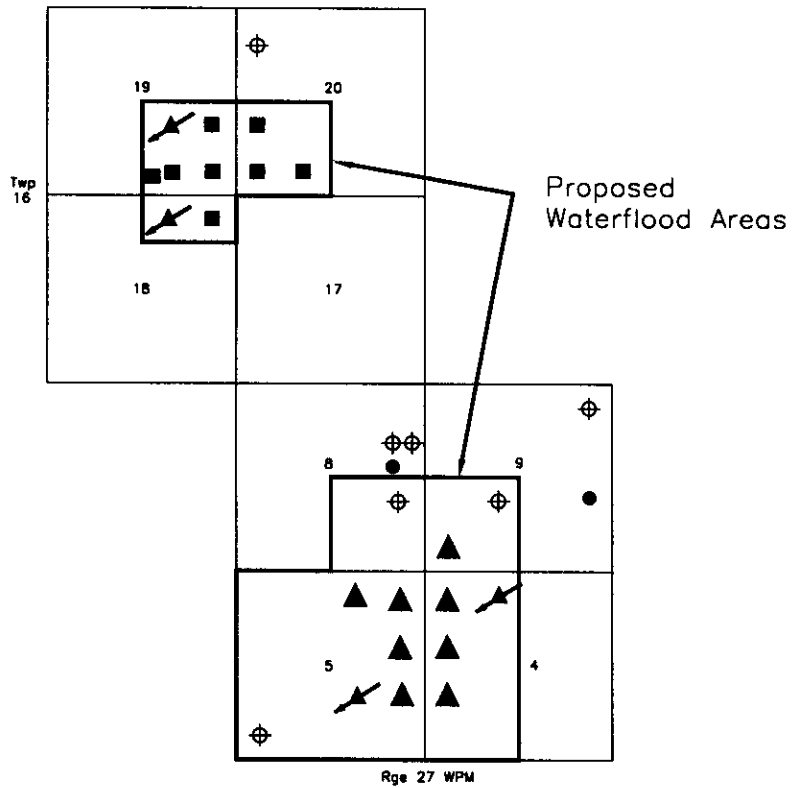
Suite 360, 1395 Ellice Avenue  
Winnipeg, MB R3G 3P2  
(204) 945-6577

227 King Street West  
Virden, MB R0M 2C0  
(204) 748-1557

Dated at Winnipeg, this 4<sup>th</sup> day of November 1998.

  
\_\_\_\_\_  
L.R. Dubreuil, Director  
Petroleum and Energy Branch

2017-01-10 10:10:10



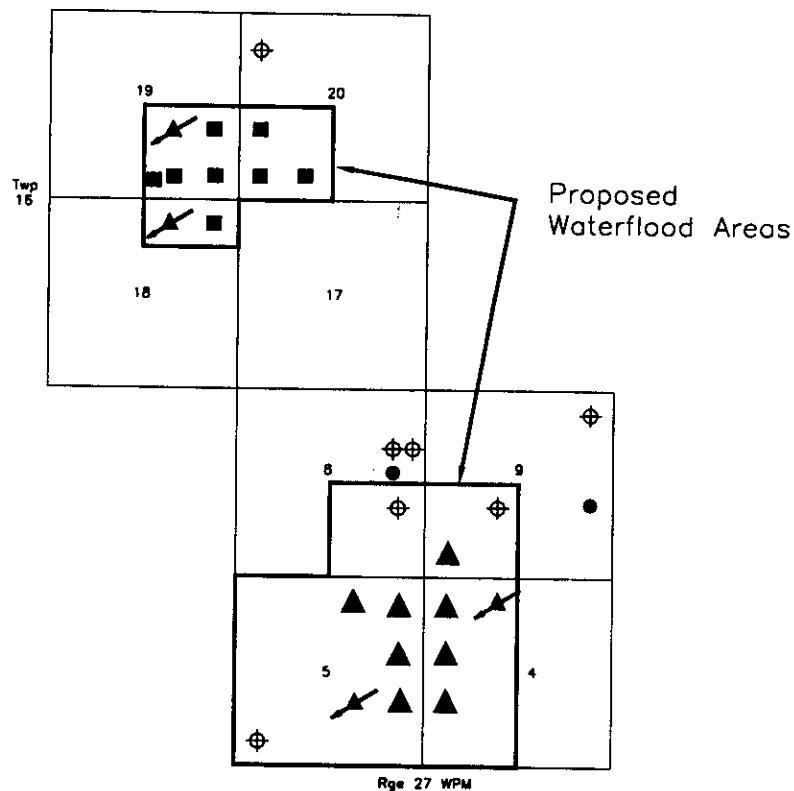
- ▲ Bakken A Pool Producer
- Bakken C Pool Producer
- Proposed Water Injector
- ⊕ Abandoned Dry
- Producer

**NOTICE**

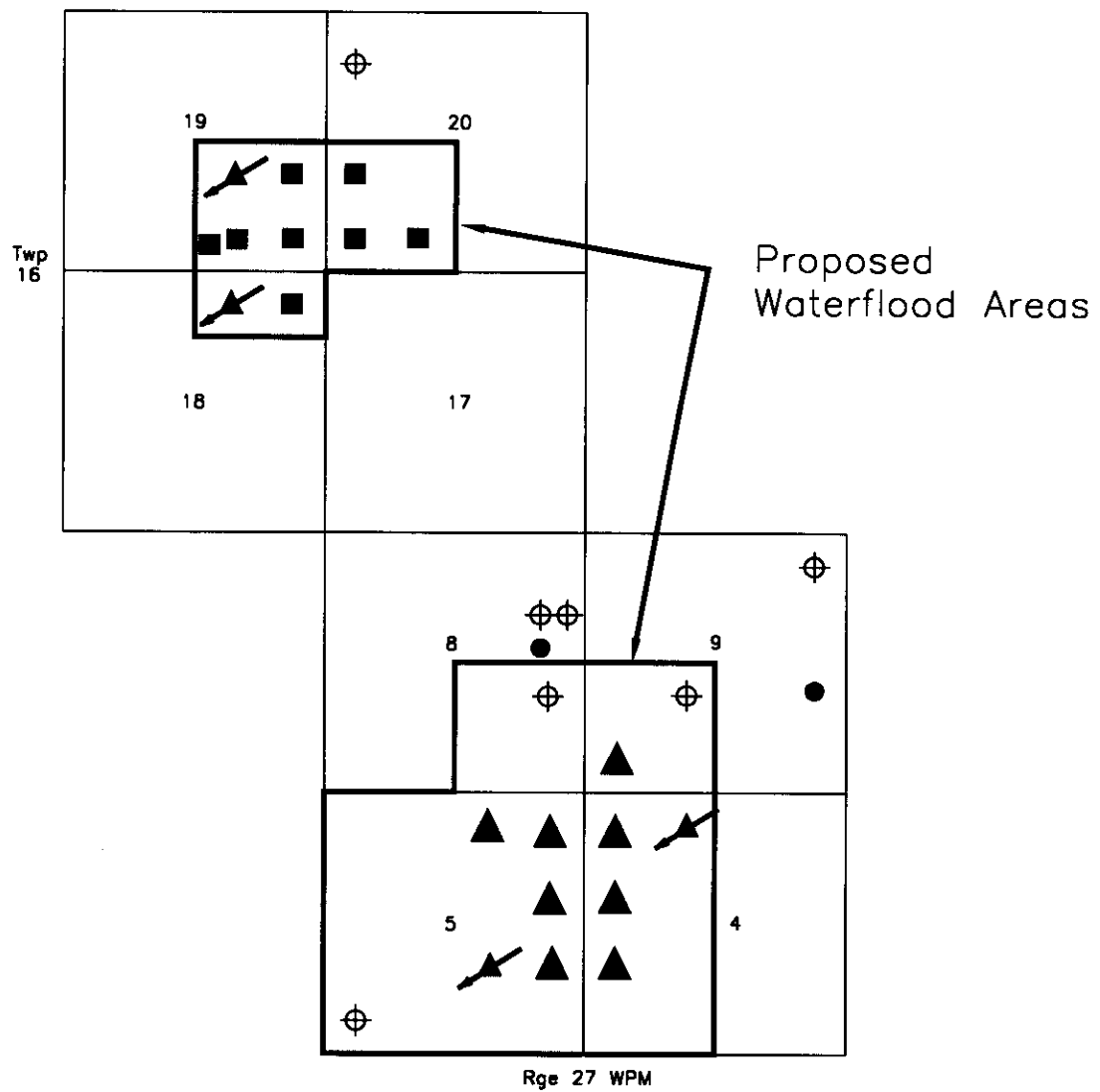
**UNDER THE OIL AND GAS ACT**

**BIRDTAIL OIL FIELD**

Progress Energy Ltd. has made application under The Oil and Gas Act to conduct a waterflood in the Bakken Formation in the Birdtail Bakken A Pool and Birdtail Bakken C Pool as shown below.



- ▲ Bakken A Pool Producer
- Bakken C Pool Producer
- ↘ Proposed Water Injector
- ⊕ Abandoned Dry
- Producer



- ▲ Bakken A Pool Producer
- Bakken C Pool Producer
- ▲ Proposed Water Injector
- ⊕ Abandoned Dry
- Producer

**From:** Dale Struksnes <dale@fekete.com>  
**To:** John Fox <jfox@em.gov.mb.ca>  
**Date:** 9/15/98 3:22am  
**Subject:** Re: Manitoba Waterflood Application Inquiry -Reply

Mr. Fox,

Thank you very much for your timely response, it was greatly appreciated. If you could send me a copy of the waterflood application for the Daly Bakken A Pool that would be great. Courier collect would be great as I would appreciate a quick turnaround in order to finalize a submission by later this week or early next week. Also, if you have a copy of your Manitoba reserves database (ideally in electronic format or alternatively in hard copy) that you could send via courier and charge us that would be great as well.

Our mailing address is:

Fekete Associates Inc.  
Suite 2000, 540 - 5th Avenue S.W.  
Calgary, Alberta T2P 0M2  
Attention: Dale Struksnes

Thanks in advance for your assistance!

At 12:01 PM 9/14/98 -0500, you wrote:

>Dale here are the answers to your questions:

>

>1. I will send you a copy of the waterflood application for the Daly  
>Bakken A Pool. This is the nearest Bakken pool outside the Birdtail Field.  
>Please provide me with your mailing address. Do you want the  
>application send courier collect?

>

>2. No, we have not compiled any reservoir parameters for the Birdtail  
>Bakken pools. I will send some reservoir data for the Daly Bakken A & D  
>Pools, the two largest Bakken pools in the province.

>

>3. The pressure history for the Birdtail Bakken pools should include any  
>DST results and pressure surveys run to date.

>

>4. The pools you listed have been designated ; Sec. 4 & 5-16-27W1,  
>Birdtail Bakken A Pool and Sec 18 & 19-16-27, Birdtail Bakken C Pool.

>

>5. Landowner notification in the past has typically been a letter advising  
>the landowner of the proposed scheme, a copy of which is included in  
>the application.

>

>6. With respect to submitting either a waterflood or water disposal  
>application, I suggest a waterflood application is more appropriate. The  
>application could indicate that the 1st phase is a pilot waterflood

>involving a single injection pattern. The application should then outline  
>possible subsequent phases expanding the waterflood to the remainder  
>of the pool. You should note that where there are differing royalty and  
>working interest owners within the waterflood project area, unitization  
>may be necessary.

>

>7. The application processing will take 4-6 weeks including the notice  
>period. The processing of a water disposal application will not be any  
>faster.

>

>8. Two copies of the application will be adequate.

>

>9. The applicant is to provide a list of the names and addresses of the  
>royalty and working interest owners in and within 0.5 km of the area of  
>application. The Branch will send notice of the application directly to  
>these owners.

>

>

Regards,

Dale Struksnes  
Fekete Associates Inc.  
dale@fekete.com  
(403)213-4253

**From:** John Fox  
**To:** smtpbb("dale@fekete.com")  
**Date:** 9/14/98 12:01pm  
**Subject:** Manitoba Waterflood Application Inquiry -Reply

Dale here are the answers to your questions:

1. I will send you a copy of the waterflood application for the Daly Bakken A Pool. This is the nearest Bakken pool outside the Birdtail Field. Please provide me with your mailing address. Do you want the application send courier collect?
2. No, we have not compiled any reservoir parameters for the Birdtail Bakken pools. I will send some reservoir data for the Daly Bakken A & D Pools, the two largest Bakken pools in the province.
3. The pressure history for the Birdtail Bakken pools should include any DST results and pressure surveys run to date.
4. The pools you listed have been designated ; Sec. 4 & 5-16-27W1, Birdtail Bakken A Pool and Sec 18 & 19-16-27, Birdtail Bakken C Pool.
5. Landowner notification in the past has typically been a letter advising the landowner of the proposed scheme, a copy of which is included in the application.
6. With respect to submitting either a waterflood or water disposal application, I suggest a waterflood application is more appropriate. The application could indicate that the 1st phase is a pilot waterflood involving a single injection pattern. The application should then outline possible subsequent phases expanding the waterflood to the remainder of the pool. You should note that where there are differing royalty and working interest owners within the waterflood project area, unitization may be necessary.
7. The application processing will take 4-6 weeks including the notice period. The processing of a water disposal application will not be any faster.
8. Two copies of the application will be adequate.
9. The applicant is to provide a list of the names and addresses of the royalty and working interest owners in and within 0.5 km of the area of application. The Branch will send notice of the application directly to these owners.



**From:** Dale Struksnes <dale@fekete.com>  
**To:** EMWPG1.EMPO2 (JFOX)  
**Date:** 9/12/98 12:38am  
**Subject:** Manitoba Waterflood Application Inquiry

Dear Mr. Fox,

I am currently preparing two waterflood applications for Progress Energy Ltd. in two Bakken pools located in the Birdtail field (township 16-27 W1M). In preparing these applications, I have a few questions which I hope you can answer:

1. Do you have any close offset Bakken waterflood applications which we could gain access to in order to prepare the application? We have prepared applications in Alberta and Saskatchewan on behalf of clients, but have not had experience with Manitoba applications.
2. Do you have pool reservoir parameter data available? Is it available electronically? I have reviewed your website and have found only limited field data.
3. These pools were primarily developed in 1997 and have limited pressure data. How much pressure history do you require, if any?
4. Have these pools been assigned a pool designation? The specific location of the pools are sections 4&5-16-27W1 and sections 18&19-16-27W1. If no pool designation is available, should we just quote them as currently undefined?
5. I understand that we need to inform area surface landowners. What form and level of detail should this letter take and how do we provide proof of these letters being sent?
6. Additionally, we were contemplating first submitting an application for a disposal well initially to at least dispose of some produced Bakken water. Would this be advisable? Would the processing of a disposal well application be faster? Or should we just submit the waterflood application?
7. What is your current turnaround time for processing of waterflood applications and disposal well applications?
8. How many copies do you need of the application?
9. Do offset mineral lessees have to be contacted? Who does this (Progress Energy or Manitoba Energy and Mines)?

Thanks in advance for your assistance.

Regards,

Dale Struksnes  
Fekete Associates Inc.  
dale@fekete.com  
(403) 213-4253

```

Merak Projects Ltd.   PFDB
Group      : Birdtail 60C
Well       : Birdtail Bakken C Pool
            : 000000239
Data       : 9701-9809
Operator   :
Type       :
Field      :
Zone       :

```

```
#well,AvOil,WC,MO,MW,CO,CW
```

Date	Num Wells	Avg Daily Oil m3/d	Water Cut %	Monthly Oil m3	Monthly Water m3	Cum Oil m3	Cum Water m3
TO DATE						0.0	0.0
Jan 1997	1	2.5	3.8	38.1	1.5	38.1	1.5
Feb 1997	1	2.2	4.5	62.2	2.9	100.3	4.4
Mar 1997	1	2.1	4.2	66.4	2.9	166.7	7.3
Apr 1997	1	2.3	2.8	65.6	1.9	232.3	9.2
May 1997	1	2.2	1.2	67.2	0.8	299.5	10.0
Jun 1997	1	2.1	4.1	62.6	2.7	362.1	12.7
Jul 1997	2	4.8	25.4	145.0	49.3	507.1	62.0
Aug 1997	2	5.2	14.6	160.5	27.5	667.6	89.5
Sep 1997	2	4.8	14.7	142.9	24.6	810.5	114.1
Oct 1997	2	4.5	16.8	139.5	28.2	950.0	142.3
Nov 1997	2	4.4	17.6	131.6	28.1	1081.6	170.4
Dec 1997	2	4.3	17.0	132.2	27.1	1213.8	197.5
Jan 1998	2	4.3	18.6	131.9	30.2	1345.7	227.7
Feb 1998	7	13.5	63.4	179.5	310.7	1525.2	538.4
Mar 1998	5	11.3	17.2	332.0	68.8	1857.2	607.2
Apr 1998	5	9.3	23.1	275.7	82.7	2132.9	689.9
May 1998	6	9.9	40.1	286.0	191.5	2418.9	881.4
Jun 1998	7	12.6	35.5	263.6	145.1	2682.5	1026.5
Jul 1998	9	13.5	39.2	365.3	235.9	3047.8	1262.4
Aug 1998	9	11.6	43.8	355.0	277.3	3402.8	1539.7
Sep 1998	9	11.9	44.2	327.4	259.7	3730.2	1799.4
TOTAL AVERAGE						28572.8	9393.5

# Birdtail Bakken C Pool Data 01/97-09/98

Operator:

Field:

Zone:

Type: Unknown

Group: Birdtail 60C

Monthly Oil FC 2 (Rate-Time)

qi: 389.245 m3, Jul, 1998

qf: 1.79062 m3, Dec, 2011

di(Exp): 32.8768 CTD: 3730.2 m3

RR: 10551.8 m3 Tot: 14282 m3

Production Cums

Oil: 3730.2 m3

Gas: 0 E6m3

Water: 1799.4 m3

Cond: 0 m3

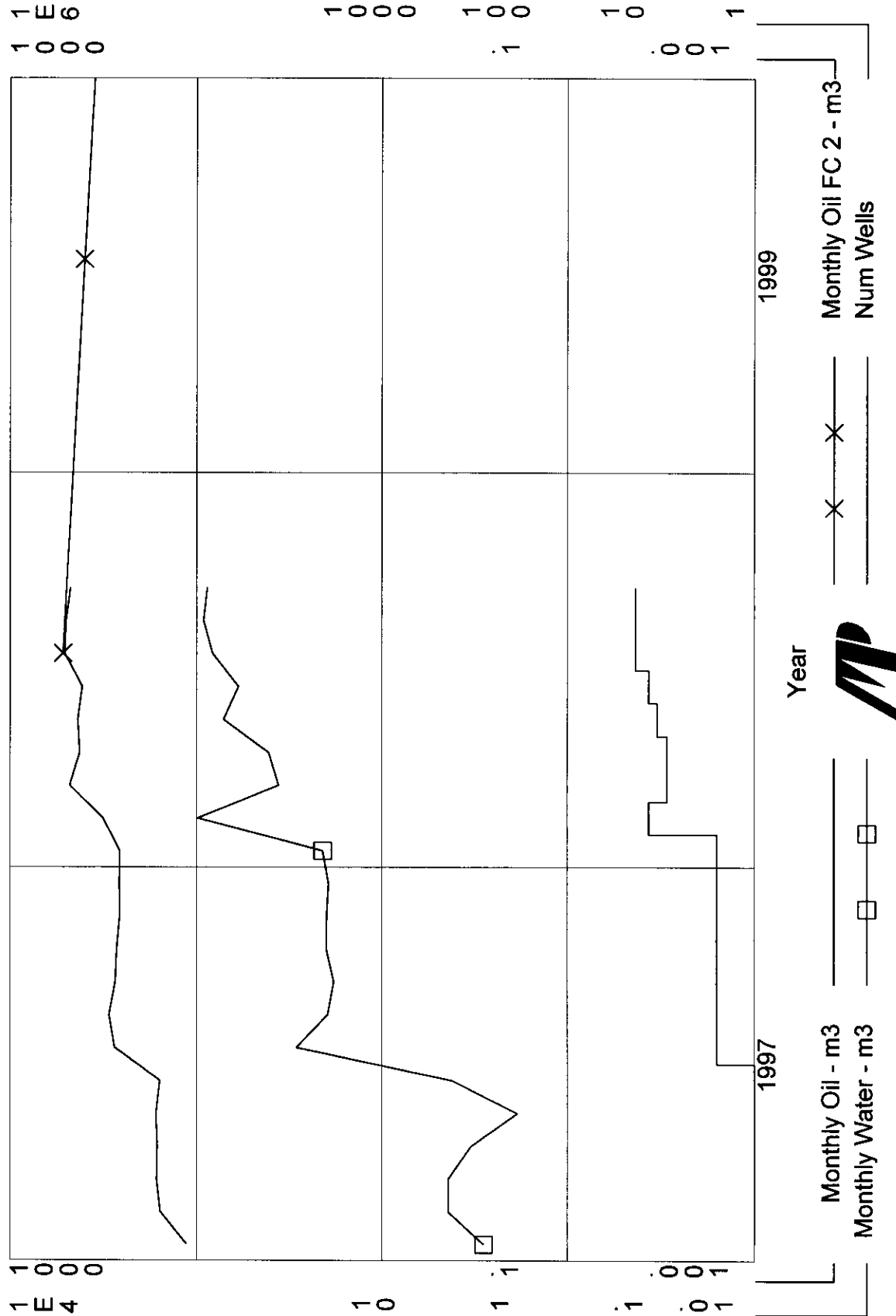


FIG. 4

# Birdtail Bakken C Pool Data 01/97-09/98

Operator:

Field:

Zone:

Type: Unknown

Group: Birdtail 60C

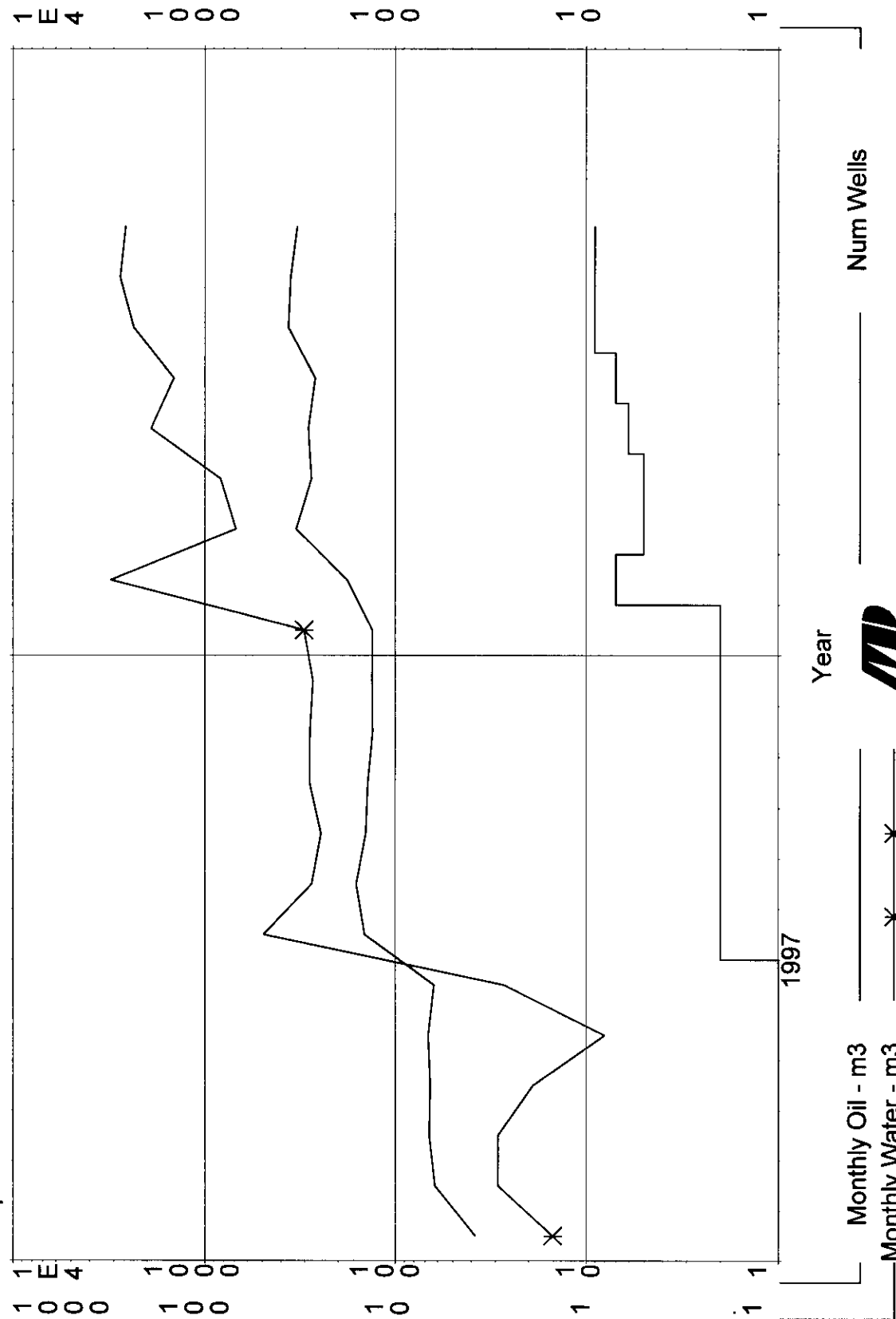
Production Cums

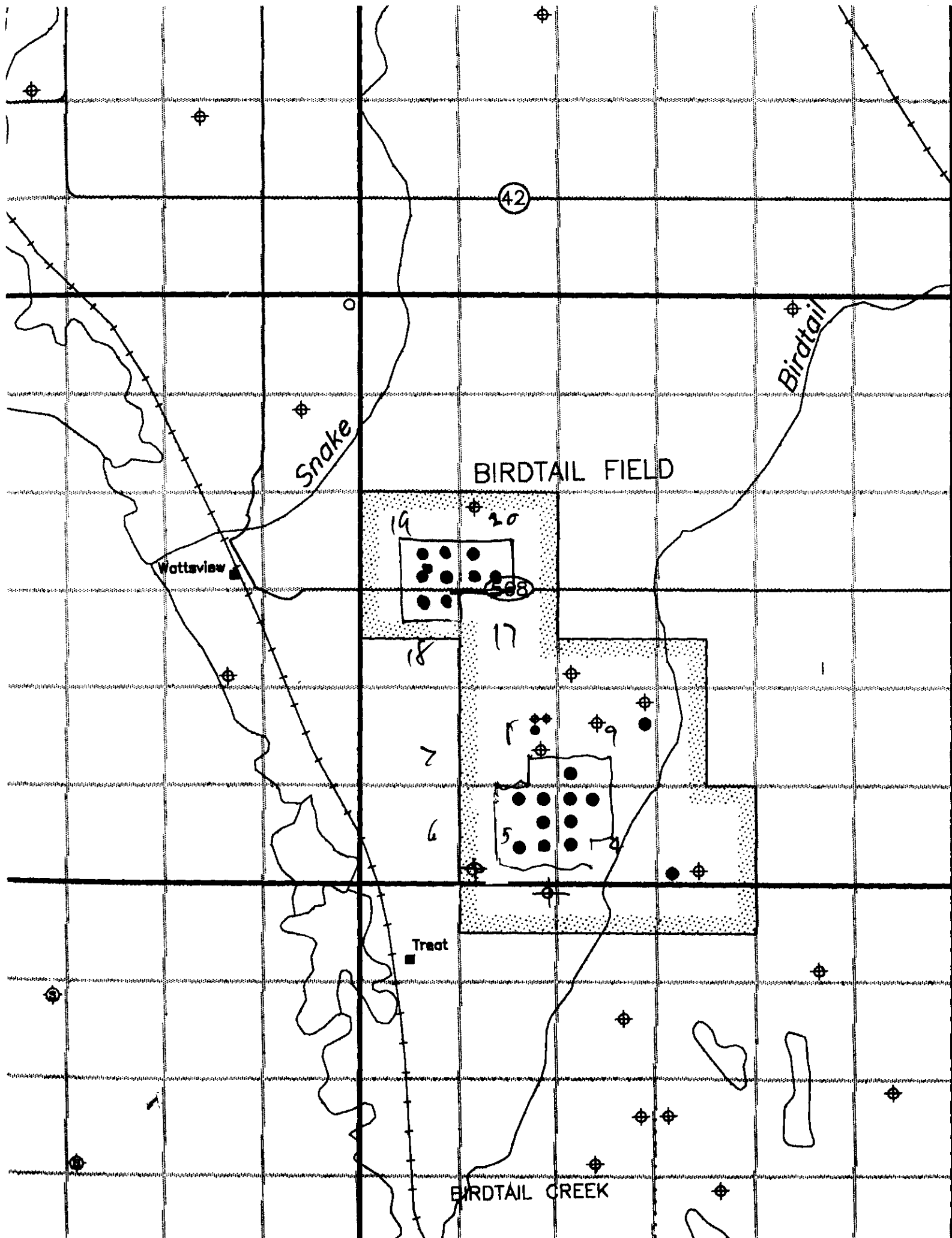
Oil: 3730.2 m3

Gas: 0 E6m3

Water: 1799.4 m3

Cond: 0 m3





# SASKATCHEWAN BAKKEN Pool

## ROCKVILLE

Primary Rec (NON-UNIT) - 12.7%  
 ULT. REC. UNIT - 28% waterflood

$h = 5.3 - 6.0$  m  
 $\phi = 18.9 - 21.6\%$   
 $B_o = 1.05 - 1.333$   
 $\rho = 843$   
 depth = 715 -

WELWYN Prim. Rec - 4.55%

$h = 3$  m  $S_w = 35\%$   $\rho = 888$   
 $\phi = 15.8\%$   $B_o = 1.333$  TD - 723 -

MISCELLANEOUS BAKKEN Pool - Prim Rec 5.2%

## PRESSURE DATA

3-3-16-27 DST #1 1725 - 1750 FSIP 590\*

KB 1576'

8-8-16-27 Refs 1696.7 - 1701.7

KB 1574.3'

Max. frac pres 1800\*

9-8-16-27 DST # 1701 - 19

KB 1576'

FSIP 635\* (4378 kPa)

FSIP 540\*

MB 1713' FSIP 625\*

A9-8-16-27

KB 491.036

DST 520 - 525 m

MD 523  
~~523~~ FSIP 4378 kPa  
 (-41.96m) FSIP 4288 kPa  
 54'

MB 514.7 EXTRA. P. +342 kPa

4-16-16-27

KB 483.7

DST \*2 519.5 - 524.5 FSIP 3958 (521.87 m)  
 \*1 519.5 - 524.5 FSIP 411 (521.87)

Merak Projects Ltd. PFDB  
 Group : Birdtail 60A  
 Well : Birdtail Bakken A Pool  
 : 000000228  
 Data : 9609-9809  
 Operator :  
 Type :  
 Field :  
 Zone :

#well,AvOil,WC,MO,MW,CO,CW

Date	Num Wells	Avg Daily Oil m3/d	Water Cut %	Monthly Oil m3	Monthly Water m3	Cum Oil m3	Cum Water m3
-----	-----	-----	-----	-----	-----	-----	-----
TO DATE						0.0	0.0
Jan 1996						0.0	0.0
Feb 1996						0.0	0.0
Mar 1996						0.0	0.0
Apr 1996						0.0	0.0
May 1996						0.0	0.0
Jun 1996						0.0	0.0
Jul 1996						0.0	0.0
Aug 1996						0.0	0.0
Sep 1996	1	2.3		57.8	0.0	57.8	0.0
Oct 1996	1	2.1	1.1	65.9	0.7	123.7	0.7
Nov 1996	2	6.2	0.9	168.7	1.5	292.4	2.2
Dec 1996	5	13.3	24.8	236.1	78.1	528.5	80.3
Jan 1997	6	15.1	25.0	446.8	149.2	975.3	229.5
Feb 1997	6	13.3	27.8	373.2	144.1	1348.5	373.6
Mar 1997	6	12.7	28.3	393.1	155.6	1741.6	529.2
Apr 1997	6	12.6	25.7	334.9	116.0	2076.5	645.2
May 1997	6	11.8	32.0	348.0	163.5	2424.5	808.7
Jun 1997	7	13.0	55.5	336.5	420.1	2761.0	1228.8
Jul 1997	9	15.8	72.9	447.8	1202.1	3208.8	2430.9
Aug 1997	9	16.8	71.0	516.4	1262.4	3725.2	3693.3
Sep 1997	9	18.7	70.4	533.5	1268.2	4258.7	4961.5
Oct 1997	9	17.9	71.9	556.0	1422.6	4814.7	6384.1
Nov 1997	9	17.7	71.5	524.2	1314.9	5338.9	7699.0
Dec 1997	9	17.8	70.6	550.4	1321.0	5889.3	9020.0
Jan 1998	9	17.9	70.6	534.0	1285.5	6423.3	10305.5
Feb 1998	9	17.5	70.9	479.7	1167.1	6903.0	11472.6
Mar 1998	9	16.4	70.4	505.6	1201.0	7408.6	12673.6
Apr 1998	9	14.8	70.7	434.8	1050.9	7843.4	13724.5
May 1998	9	15.5	72.8	474.0	1267.5	8317.4	14992.0
Jun 1998	9	15.1	74.0	401.9	1145.7	8719.3	16137.7
Jul 1998	9	15.4	72.1	474.3	1225.5	9193.6	17363.2
Aug 1998	9	14.6	71.7	428.5	1086.7	9622.1	18449.9
Sep 1998	9	14.0	73.2	413.6	1128.8	10035.7	19578.7



Merak Projects Ltd. PFDB  
Group : Birdtail 60A  
Well : Birdtail Bakken A Pool  
 : 000000228  
Data : 9609-9809

#well,AvOil,WC,MO,MW,CO,CW

Date	Num Wells	Avg Daily Oil m3/d	Water Cut %	Monthly Oil m3	Monthly Water m3	Cum Oil m3	Cum Water m3
-----	-----	-----	-----	-----	-----	-----	-----
=====							
TOTAL						114031.8	172784.7
AVERAGE		13.9					
=====							

# Birdtail Bakken A Pool Data 09/96-09/98

Monthly Oil FC 2 (Rate-Time)

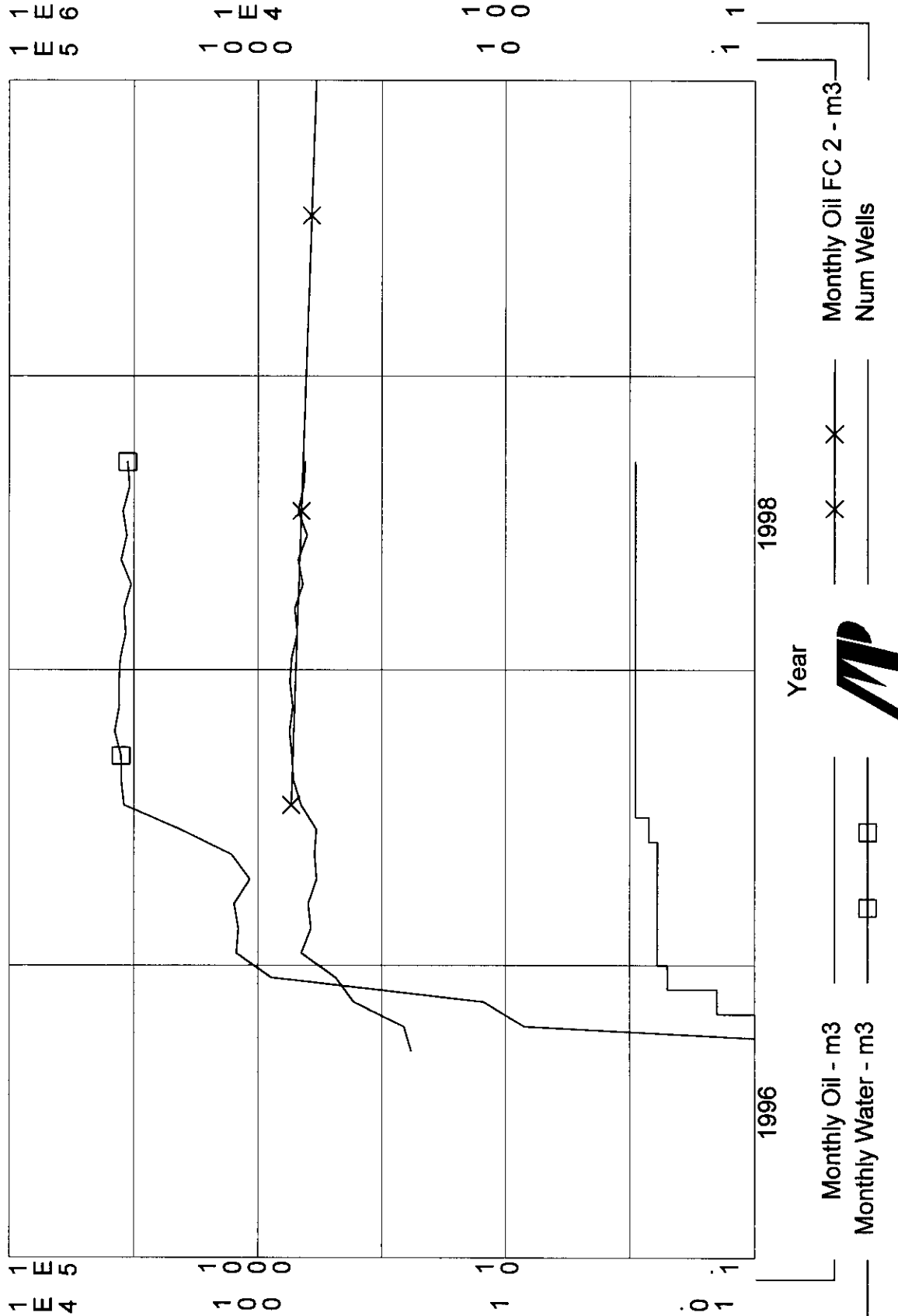
qi: 546.905 m3, Jul, 1997

qf: 1.78843 m3, Nov, 2027

di(Exp): 17.1511 CTD: 10035.7 m3

RR: 27456.4 m3 Tot: 37492.1 m3

Production Cums  
Oil: 10035.7 m3  
Gas: 0 E6m3  
Water: 19578.7 m3  
Cond: 0 m3



# Birdtail Bakken A Pool Data 09/96-09/98

Operator:

Field:

Zone:

Type: Unknown

Group: Birdtail 60A

Production Cums

Oil: 10035.7 m3

Gas: 0 E6m3

Water: 19578.7 m3

Cond: 0 m3



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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.05-04-016-27W1.00  
 Licence 4688

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	524.0	1895.2	8647.7	
Jan	23.0	63.4	464.6	
Feb	28.0	76.9	564.6	
Mar	31.0	82.2	602.8	
Apr	30.0	76.2	558.8	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	82.0	222.5	1632.0	
Cum To Date	606.0	2117.7	10279.7	

Status Date

UWI Status

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COOP

19-FEB-99

## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.05-04-016-27W1.00  
 Licence 4688

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	168.0	700.3	2675.7	
Jan	29.0	131.0	524.0	
Feb	28.0	122.4	489.6	
Mar	30.0	124.1	496.4	
Apr	27.0	106.1	465.4	
May	31.0	115.5	538.0	
Jun	29.0	90.2	510.3	
Jul	31.0	94.5	535.5	
Aug	31.0	87.4	495.1	
Sep	30.0	85.0	481.5	
Oct	31.0	84.3	477.1	
Nov	30.0	76.1	445.0	
Dec	29.0	78.3	514.1	
Ytd	356.0	1194.9	5972.0	
Cum To Date	524.0	1895.2	8647.7	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

Report PPS1520

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## Well Production Record

1999

Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.12-04-016-27W1.00  
 Licence 4631

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	721.0	2047.8	191.8	
Jan	26.0	60.7	10.8	
Feb	26.0	59.0	10.5	
Mar	31.0	73.1	12.9	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	83.0	192.8	34.2	
Cum To Date	804.0	2240.6	226.0	

Status Date

UWI Status

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COOP

19-FEB-99

## Manitoba Energy and Mines

Report PPS1520

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## Well Production Record

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.12-04-016-27W1.00  
 Licence 4631

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	360.0	1167.6	75.9	
Jan	31.0	82.3	5.9	
Feb	27.0	75.0	5.2	
Mar	31.0	80.0	5.6	
Apr	29.0	74.6	5.2	
May	31.0	79.5	6.9	
Jun	30.0	70.4	12.1	
Jul	31.0	71.5	12.9	
Aug	31.0	72.6	12.9	
Sep	30.0	67.9	12.2	
Oct	31.0	70.9	12.7	
Nov	30.0	67.9	12.1	
Dec	29.0	67.6	12.2	
Ytd	361.0	880.2	115.9	
Cum To Date	721.0	2047.8	191.8	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.13-04-016-27W1.00  
 Licence 4614

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	768.0	1461.7	211.0	
Jan	17.0	27.0	14.5	
Feb	28.0	36.5	23.5	
Mar	31.0	30.5	21.1	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	76.0	94.0	59.1	
Cum To Date	844.0	1555.7	270.1	

Status Date

UWI Status

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COOP



19-FEB-99

## Manitoba Energy and Mines

Report PPS1520

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## Well Production Record

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.13-04-016-27W1.00  
 Licence 4614

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	414.0	927.5	61.9	
Jan	28.0	59.9	4.5	
Feb	28.0	52.2	3.5	
Mar	30.0	58.1	4.0	
Apr	30.0	50.3	10.4	
May	31.0	49.4	10.1	
Jun	30.0	41.6	14.9	
Jul	31.0	42.6	16.1	
Aug	25.0	32.1	14.9	
Sep	30.0	39.0	18.2	
Oct	31.0	39.8	14.9	
Nov	30.0	34.0	18.5	
Dec	30.0	35.2	19.1	
Ytd	354.0	534.2	149.1	
Cum To Date	768.0	1461.7	211.0	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.14-04-016-27W1.00  
 Licence 4632

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	700.0	268.7	909.5	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	700.0	268.7	909.5	

Status Date

UWI Status

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COOP

## Well Production Record

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.14-04-016-27W1.00  
 Licence 4632

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	359.0	155.3	550.7	
Jan	28.0	10.1	31.9	
Feb	28.0	9.8	31.2	
Mar	31.0	10.6	33.4	
Apr	30.0	13.4	42.6	
May	31.0	11.1	34.9	
Jun	23.0	8.2	26.0	
Jul	31.0	10.0	31.5	
Aug	29.0	8.9	28.2	
Sep	30.0	8.8	28.1	
Oct	31.0	9.3	29.2	
Nov	30.0	8.0	25.5	
Dec	19.0	5.2	16.3	
Ytd	341.0	113.4	358.8	
Cum To Date	700.0	268.7	909.5	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.07-05-016-27W1.00  
 Licence 4684

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	350.0	129.8	479.7	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	350.0	129.8	479.7	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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Page: 1

## Well Production Record

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.07-05-016-27W1.00  
 Licence 4684

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	194.0	80.9	284.0	
Jan	28.0	7.7	30.8	
Feb	28.0	10.6	42.4	
Mar	31.0	11.5	46.0	
Apr	30.0	8.6	34.4	
May	31.0	9.3	37.2	
Jun	8.0	1.2	4.9	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	156.0	48.9	195.7	
Cum To Date	350.0	129.8	479.7	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.08-05-016-27W1.00  
 Licence 4689

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	183.0	313.6	377.7	
Jan	31.0	47.8	71.7	
Feb	28.0	37.2	55.9	
Mar	31.0	41.8	62.7	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	90.0	126.8	190.3	
Cum To Date	273.0	440.4	568.0	

Status Date

UWI Status

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COOP

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.08-05-016-27W1.00  
 Licence 4689

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	30.0	67.9	55.1	
Aug	31.0	64.6	54.9	
Sep	30.0	47.3	67.2	
Oct	31.0	45.6	68.4	
Nov	30.0	42.8	64.0	
Dec	31.0	45.4	68.1	
Ytd	183.0	313.6	377.7	
Cum To Date	183.0	313.6	377.7	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.09-05-016-27W1.00  
 Licence 4633

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	726.0	1918.7	8343.9	
Jan	31.0	49.9	333.6	
Feb	28.0	46.0	308.0	
Mar	31.0	50.6	338.4	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	90.0	146.5	980.0	
Cum To Date	816.0	2065.2	9323.9	

Status Date

UWI Status

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COOP



Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.09-05-016-27W1.00  
 Licence 4633

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	364.0	1092.1	3524.8	
Jan	31.0	89.2	507.8	
Feb	28.0	79.8	448.7	
Mar	31.0	78.7	441.3	
Apr	30.0	55.4	333.0	
May	31.0	80.3	453.7	
Jun	30.0	73.4	425.8	
Jul	31.0	74.0	419.0	
Aug	28.0	54.4	334.1	
Sep	30.0	65.8	373.2	
Oct	31.0	65.6	371.5	
Nov	30.0	56.5	362.5	
Dec	31.0	53.5	348.5	
Ytd	362.0	826.6	4819.1	
Cum To Date	726.0	1918.7	8343.9	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.15-05-016-27W1.00  
 Licence 4686

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	538.0	696.7	1597.3	
Jan	31.0	22.9	42.6	
Feb	28.0	20.7	38.3	
Mar	31.0	20.5	38.1	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	90.0	64.1	119.0	
Cum To Date	628.0	760.8	1716.3	

Status Date

UWI Status

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COOP

19-FEB-99

## Manitoba Energy and Mines

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## Well Production Record

1998

Field	15	Birdtail	Mineral Rights FREEHOLD
Pool	60A	Bakken A	
Unit	0		
Operator	143	Northrock	
UWI	100.15-05-016-27W1.00		
Licence	4686		

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	178.0	216.5	773.7	
Jan	31.0	61.2	91.8	
Feb	28.0	49.8	74.7	
Mar	31.0	56.0	84.0	
Apr	30.0	48.2	78.8	
May	30.0	52.9	98.2	
Jun	30.0	39.4	75.2	
Jul	31.0	37.6	69.9	
Aug	31.0	32.5	60.5	
Sep	30.0	28.9	53.6	
Oct	27.0	24.1	44.9	
Nov	30.0	25.2	46.8	
Dec	31.0	24.4	45.2	
Ytd	360.0	480.2	823.6	
Cum To Date	538.0	696.7	1597.3	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.16-05-016-27W1.00  
 Licence 4603

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	836.0	1661.3	66.7	
Jan	29.0	42.7	1.8	
Feb	28.0	43.2	1.8	
Mar	26.0	38.8	1.6	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	83.0	124.7	5.2	
Cum To Date	919.0	1786	71.9	

Status Date

UWI Status

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COOP

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.16-05-016-27W1.00  
 Licence 4603

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	479.0	1084.7	39.7	
Jan	31.0	56.0	3.4	
Feb	27.0	50.2	2.2	
Mar	31.0	49.0	2.4	
Apr	29.0	47.6	2.2	
May	29.0	47.2	2.2	
Jun	30.0	49.1	2.0	
Jul	31.0	47.9	2.2	
Aug	31.0	48.1	2.1	
Sep	26.0	39.9	1.8	
Oct	31.0	51.0	2.3	
Nov	30.0	44.9	2.0	
Dec	31.0	45.7	2.2	
Ytd	357.0	576.6	27.0	
Cum To Date	836.0	1661.3	66.7	

Status Date

UWI Status

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COOP

## Well Production Record

1999

Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.04-09-016-27W1.00  
 Licence 4635

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	690.0	804.4	2031.6	
Jan	31.0	21.7	105.6	
Feb	28.0	18.9	92.6	
Mar	31.0	19.1	92.9	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	90.0	59.7	291.1	
Cum To Date	780.0	864.1	2322.7	

Status Date

UWI Status

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COOP

1998

Field 15 Birdtail  
 Pool 60A Bakken A  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.04-09-016-27W1.00  
 Licence 4635

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	345.0	464.4	1033.6	
Jan	31.0	36.6	85.4	
Feb	24.0	29.9	69.6	
Mar	31.0	37.6	87.9	
Apr	30.0	30.6	78.9	
May	31.0	28.8	86.3	
Jun	30.0	28.4	74.5	
Jul	31.0	28.3	83.3	
Aug	27.0	27.9	84.0	
Sep	30.0	31.0	93.0	
Oct	31.0	27.4	90.1	
Nov	30.0	20.9	89.1	
Dec	19.0	12.6	75.9	
Ytd	345.0	340.0	998.0	
Cum To Date	690.0	804.4	2031.6	

Status Date

UWI Status

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COOP

25-MAY-99

## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 156 Progress  
 UWI 100.15-18-016-27W1.00  
 Licence 4806

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	54.0	17.0	26.5	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	54.0	17	26.5	

Status Date

UWI Status

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COOP



## Well Production Record

1998

Field 15 Birdtail Mineral Rights CROWN  
 Pool 60C Bakken C  
 Unit 0  
 Operator 156 Progress  
 UWI 100.15-18-016-27W1.00  
 Licence 4806

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	14.0	7.7	4.8	
Aug	31.0	7.5	17.5	
Sep	9.0	1.8	4.2	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	54.0	17.0	26.5	
Cum To Date	54.0	17	26.5	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 156 Progress  
 UWI 100.16-18-016-27W1.00  
 Licence 4807

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	175.0	146.1	34.5	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	175.0	146.1	34.5	

Status Date

UWI Status

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COMP

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## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail Mineral Rights CROWN  
 Pool 60C Bakken C  
 Unit 0  
 Operator 156 Progress  
 UWI 100.16-18-016-27W1.00  
 Licence 4807

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	29.0	37.8	7.2	
Aug	31.0	25.9	4.2	
Sep	30.0	24.2	4.2	
Oct	31.0	22.9	4.6	
Nov	30.0	18.5	7.1	
Dec	24.0	16.8	7.2	
Ytd	175.0	146.1	34.5	
Cum To Date	175.0	146.1	34.5	

Status Date

UWI Status

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COMP

1999

Field 15 Birdtail Mineral Rights CROWN  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.01-19-016-27W1.00  
 Licence 4714

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	546.0	1279.2	535.3	
Jan	31.0	60.2	32.4	
Feb	28.0	52.0	28.0	
Mar	31.0	58.1	31.3	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	90.0	170.3	91.7	
Cum To Date	636.0	1449.5	627.0	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1998

Field 99 Other Areas  
 Pool 60D Bakken D  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.01-19-016-27W1.00  
 Licence 4714

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	182.0	492.2	167.7	
Jan	31.0	81.6	27.4	
Feb	27.0	67.1	22.5	
Mar	31.0	80.5	26.9	
Apr	30.0	70.0	28.1	
May	31.0	62.7	33.8	
Jun	30.0	63.4	34.1	
Jul	31.0	62.7	33.8	
Aug	31.0	63.7	34.3	
Sep	30.0	60.2	32.4	
Oct	31.0	59.4	32.0	
Nov	30.0	57.6	31.0	
Dec	31.0	58.1	31.3	
Ytd	364.0	787.0	367.6	
Cum To Date	546.0	1279.2	535.3	

Status Date

UWI Status

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COOP

1999

Field 15 Birdtail Mineral Rights CROWN  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.02-19-016-27W1.00  
 Licence 4693

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	28.0	8.4	239.0	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	.0	.0	.0	
Cum To Date	28.0	8.4	239.0	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail Mineral Rights CROWN  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.02-19-016-27W1.00  
 Licence 4693

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	1.0	.0	140.4	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	26.0	4.4	98.6	
Jun	1.0	4.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	28.0	8.4	239.0	
Cum To Date	28.0	8.4	239.0	

Status Date

UWI Status

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COOP

19-FEB-99

## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 156 Progress  
 UWI 102.02-19-016-27W1.00  
 Licence 4811

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	.0	.0	.0	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	22.0	18.0	60.6	
Aug	31.0	22.1	68.6	
Sep	30.0	19.0	68.0	
Oct	31.0	5.7	80.8	
Nov	30.0	7.9	71.1	
Dec	31.0	8.4	75.2	
Ytd	175.0	81.1	424.3	
Cum To Date	175.0	81.1	424.3	

Status Date

UWI Status

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COOP



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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.07-19-016-27W1.00  
 Licence 4754

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	192.0	180.1	542.2	
Jan	31.0	25.5	76.5	
Feb	28.0	14.6	62.7	
Mar	31.0	22.2	66.6	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	90.0	62.3	205.8	
Cum To Date	282.0	242.4	748.0	

Status Date

UWI Status

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COOP

19-FEB-99

## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail Mineral Rights CROWN  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.07-19-016-27W1.00  
 Licence 4754

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	14.0	3.7	134.1	
Mar	.0	.0	.0	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	1.0	4.7	31.3	
Jul	27.0	42.1	36.9	
Aug	28.0	27.2	63.3	
Sep	30.0	27.3	63.7	
Oct	31.0	26.0	65.5	
Nov	30.0	24.9	74.6	
Dec	31.0	24.2	72.8	
Ytd	192.0	180.1	542.2	
Cum To Date	192.0	180.1	542.2	

Status Date

UWI Status

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail Mineral Rights CROWN  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.08-19-016-27W1.00  
 Licence 4784

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	307.0	422.4	169.9	
Jan	14.0	21.5	11.5	
Feb	22.0	21.8	16.0	
Mar	31.0	34.1	18.3	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	67.0	77.4	45.8	
Cum To Date	374.0	499.8	215.7	

Status Date

UWI Status

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## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.08-19-016-27W1.00  
 Licence 4784

Mineral Rights CROWN

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	9.0	16.8	3.5	
Mar	28.0	50.0	5.6	
Apr	29.0	45.1	7.8	
May	29.0	54.0	10.0	
Jun	30.0	31.9	22.1	
Jul	29.0	35.8	19.2	
Aug	31.0	38.0	20.5	
Sep	30.0	38.0	20.5	
Oct	31.0	38.4	20.6	
Nov	30.0	37.7	20.3	
Dec	31.0	36.7	19.8	
Ytd	307.0	422.4	169.9	
Cum To Date	307.0	422.4	169.9	

Status Date

UWI Status

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COOP

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.03-20-016-27W1.00  
 Licence 4755

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	310.0	961.6	374.2	
Jan	31.0	82.6	35.4	
Feb	28.0	74.9	32.5	
Mar	31.0	81.2	34.4	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	90.0	238.7	102.3	
Cum To Date	400.0	1200.3	476.5	

Status Date

UWI Status

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## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.03-20-016-27W1.00  
 Licence 4755

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	6.0	32.9	7.9	
Mar	31.0	135.4	33.6	
Apr	30.0	102.3	40.2	
May	31.0	98.1	39.9	
Jun	30.0	89.3	36.7	
Jul	30.0	88.9	38.1	
Aug	31.0	88.2	37.8	
Sep	29.0	82.2	35.3	
Oct	31.0	84.0	36.0	
Nov	30.0	78.4	33.6	
Dec	31.0	81.9	35.1	
Ytd	310.0	961.6	374.2	
Cum To Date	310.0	961.6	374.2	

Status Date

UWI Status

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## Manitoba Energy and Mines

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## Well Production Record

1999

Field	15	Birdtail	Mineral Rights FREEHOLD
Pool	60C	Bakken C	
Unit	0		
Operator	143	Northrock	
UWI	100.04-20-016-27W1.00		
Licence	4785		

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	291.0	244.4	182.9	
Jan	12.0	13.1	17.3	
Feb	25.0	19.8	26.3	
Mar	31.0	25.7	34.2	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	68.0	58.6	77.8	
Cum To Date	359.0	303	260.7	

Status Date

UWI Status

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## Manitoba Energy and Mines

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## Well Production Record

1998

Field 15 Birdtail Mineral Rights FREEHOLD  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.04-20-016-27W1.00  
 Licence 4785

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	.0	.0	.0	
Jan	.0	.0	.0	
Feb	8.0	7.4	.1	
Mar	26.0	13.5	.2	
Apr	30.0	12.7	.3	
May	26.0	22.1	.4	
Jun	25.0	22.7	15.3	
Jul	31.0	29.1	29.4	
Aug	31.0	37.2	24.8	
Sep	30.0	31.1	25.4	
Oct	31.0	25.3	29.7	
Nov	30.0	23.7	31.3	
Dec	23.0	19.6	26.0	
Ytd	291.0	244.4	182.9	
Cum To Date	291.0	244.4	182.9	

Status Date

UWI Status

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COOP



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## Manitoba Energy and Mines

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## Well Production Record

1999

Field 15 Birdtail  
 Pool 60C Bakken C  
 Unit 0  
 Operator 143 Northrock  
 UWI 100.05-20-016-27W1.00  
 Licence 4656

Mineral Rights FREEHOLD

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	710.0	1274.5	94.5	
Jan	15.0	30.0	4.0	
Feb	23.0	33.4	4.6	
Mar	31.0	42.3	5.7	
Apr	.0	.0	.0	
May	.0	.0	.0	
Jun	.0	.0	.0	
Jul	.0	.0	.0	
Aug	.0	.0	.0	
Sep	.0	.0	.0	
Oct	.0	.0	.0	
Nov	.0	.0	.0	
Dec	.0	.0	.0	
Ytd	69.0	105.7	14.3	
Cum To Date	779.0	1380.2	108.8	

Status Date

UWI Status

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## Manitoba Energy and Mines

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## Well Production Record

1998

Field	99	Other Areas	Mineral Rights FREEHOLD
Pool	60D	Bakken D	
Unit	0		
Operator	143	Northrock	
UWI	100.05-20-016-27W1.00		
Licence	4656		

Month	Days on Production	Oil Produced m 3	Water Produced m 3	Water Injection Disposed m 3
Cumulative Prior	348.0	721.6	29.8	
Jan	30.0	50.3	2.8	
Feb	28.0	51.6	2.2	
Mar	31.0	52.6	2.5	
Apr	30.0	45.6	6.3	
May	31.0	44.7	8.8	
Jun	30.0	47.6	5.6	
Jul	31.0	43.2	5.9	
Aug	31.0	45.2	6.3	
Sep	30.0	43.6	6.0	
Oct	31.0	43.3	6.2	
Nov	30.0	43.2	6.2	
Dec	29.0	42.0	5.9	
Ytd	362.0	552.9	64.7	
Cum To Date	710.0	1274.5	94.5	

Status Date

UWI Status

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COOP

