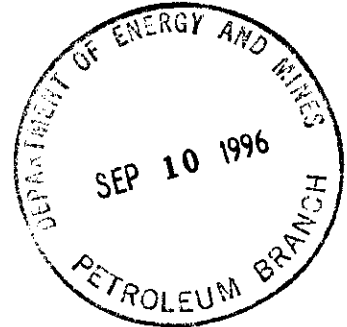


September 9, 1996

Manitoba Energy and Mines  
Petroleum Branch  
1395 Ellice Avenue, Suite 360  
Winnipeg, Manitoba  
R3G 0G3

**Attention: Mr. J. Fox, P.Eng.**  
**Chief Petroleum Engineer**



Dear John,

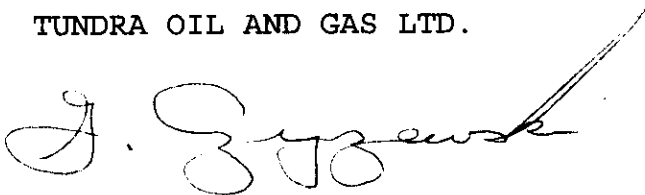
**RE: Kola Unit No.2**  
**Pressure Maintenance Application**

Please find attached an additional copy of the referenced application.

Should you have any further questions, please contact me at 934-5853.

Yours truly,

TUNDRA OIL AND GAS LTD.



George Czyzewski, P.Eng.  
Senior Reservoir Engineer

**TUNDRA OIL AND GAS LTD.**



**KOLA UNIT NO. 2**

**PRESSURE MAINTENANCE  
APPLICATION**

**AUGUST, 1996**

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August 30, 1996

Manitoba Energy and Mines  
Petroleum Branch  
1395 Ellice Avenue, Suite 360  
Winnipeg, Manitoba  
R3G 0G3

Attention: **Mr. J. Fox, P.Eng.**  
**Chief Petroleum Engineer**

Dear John,

**RE: North Kola Field**  
**Pressure Maintenance Application**

---

#### **A. EXECUTIVE SUMMARY**

##### **A.1 Introduction**

The North Kola Field is located north of Kola Unit No.1 (refer to Attachment No.1). The total land area of North Kola consists of 26.75 sections, which is currently on 32 hectare spacing (MB. EMR Spacing Order No.11). The principal producing horizon is the Bakken "A" Pool with 11 producing wells both on 16 and 32 hectare spacing. Current oil production from the 11 producing wells is about 36 m3/day at a field watercut of 19%. The purpose of the pressure maintenance application is to install waterflood operations to maximize oil recovery in the area (291.4 hectares) outlined on Attachment No.3.

##### **A.2 Conclusions**

1. The Bakken "A" Pool has been determined to be a good candidate for waterflood operations based on actual field performance in the Kola Unit No.1.
2. Based on engineering studies and actual field performance, the ultimate primary and secondary recovery from the Bakken "A" Pool is estimated to be about 30% of the oil-in-place.
3. The waterflood program will be staged in the the proposed Kola Unit No.2 area. Staging is recommended to test the feasibility of a combined 16 and 32 hectare waterflood. The

initial injection well will be 1-32-10-29. Incremental oil production from the initial waterflood pattern is estimated at 5,400 m3 (34,000 STB).

4. The waterflood program will be expanded to other areas of the Unit pending a favourable production response from the initial area of waterflooding. The initial area of waterflooding is outlined in Figure No.3.

### **A.3 Discussion**

The following highlights have been summarized from the subsequent sections of the pressure maintenance application.

#### **UNIT NAME**

Tundra suggests that the official unit name of the new pressure maintenance scheme in the North Kola Field shall be the Kola Unit No.2.

#### **OPERATORSHIP**

Tundra Oil and Gas Ltd. will be the operator of record of the Kola Unit No.2.

#### **UNIT WELLS**

The wells to be included in the Unit are outlined in Table No.2.

#### **UNITIZED ZONE**

The unitized zone in the proposed Kola Unit No.2 will be the Bakken "A" Pool.

#### **TRACT FACTORS**

The tract factors of the proposed Kola Unit No.2 lands are outlined in Table No.7. The Unit working interest owners have agreed to determine the tract factors based on oil production during the last 90 operating days (referenced to June 30, 1996). This formula has been used in unitizing the Bakken formation in Kola Unit No.1.

**WORKING INTEREST OWNERS**

The working interest owners in the Kola Unit No.2 will be Tundra Oil and Gas Ltd., and Corvair Oils Ltd. The working interests in the Unit will be as follows:

Tundra Oil and Gas Ltd.	98.60700 %
Corvair Oils Ltd.	<u>1.39300 %</u>
Total	100.00000 %

Appendix I (Letter Agreement) outlines the agreed upon working interests in the Unit.

**TECHNICAL STUDIES**

The waterflood performance predictions for the Bakken "A" Pool in the proposed Kola Unit No.2 are based on several geological and engineering studies.

Geological work included a review of the available open-hole logs and core data to establish reservoir continuity and to develop an effective oil pore volume map.

Engineering reviews included reserve estimation, historical production assessment, and ultimate recovery predictions. A review was also undertaken of the following studies: a) relative permeability data developed from the Kola Unit No.1, b) the Kola Unit No.1 pressure maintenance application dated July, 1993, c) the Kola Bakken "A" Pool reservoir simulation study, and the recent Kola 32 hectare spacing application dated July, 1994 to further support commencement of waterflood operations at North Kola. Waterflood performance in the proposed Kola Unit No.2 will be piston displacement as historically observed in North Ebor Units No.1 and No.2. Similar waterflood performance is expected in the Kola Unit No.1 where secondary operations were initiated in October, 1993. Piston waterflood displacement is characterized by low watercuts until breakthrough. Once water breakthrough occurs, the majority of the oil will have been recovered with the current spacing. Watercuts will increase rapidly after breakthrough. The piston displacement process in this reservoir has been assessed as providing effective oil sweep and recovery.

### **HISTORICAL PRODUCTION**

Figure No.1 outlines the production history of the proposed Kola Unit No.2. The oil production profile has progressively increased due to development drilling and workovers. Current oil production is about 36 m<sup>3</sup>/day (June, 1996) and has increased significantly since late 1995 due to development drilling and workovers. Cumulative oil production in the proposed Unit to 96.06.30 was 25,848 m<sup>3</sup> (163 M STB). Ultimate primary oil recovery is estimated at 65,300 m<sup>3</sup> (410 M STB). Ultimate primary oil recovery of 21.5% of the oil-in-place is estimated based on log derived volumetrics. Table No.4 outlines the primary production forecast for the proposed Unit.

### **RESERVES**

The Bakken volumetric oil-in-place estimates for the proposed Unit are outlined in Table No.3. The ultimate recovery factors for each of the individual wells under primary recovery are outlined in Table No.5. The ultimate primary recovery prediction at this time from the proposed Unit is outlined in Figure No.2.

### **WATERFLOOD RECOVERY**

Based on reservoir simulation and actual waterflood performance in the Bakken "A" Pool, incremental waterflood oil recovery of 5% of the oil-in-place is estimated. Total primary and waterflood oil recovery in the proposed Kola Unit No.2 is estimated at 26.5% of the oil-in-place. Incremental oil recovery of 34 M STB is estimated from the initial area of waterflood operations (refer to Table No.6). Forecasted primary and waterflood recovery in the initial area of waterflooding is outlined in Figure No.4.

### **WATERFLOOD PATTERN**

An inverted 5-spot waterflood pattern is recommended in the Unit. This configuration has been selected based on good historical performance in other Bakken waterfloods that are operated by Tundra Oil and Gas Ltd. The optimal ratio between producers and injectors is 2:1. Figure No.3 outlines the proposed configuration of the waterflood patterns in the Unit. Initially well 1-32-10-29 will be converted to injection service. Pending good waterflood response, the next well proposed for water injection service would be 3-33-10-29.



**FACILITIES**

The Kola Unit No.2 will utilize the battery facilities from Kola Unit No.1 located at 4-28-10-29. The water injection pump will be located at injector 1-32-10-29 W1M. Make-up injection water will be procured that is compatible with produced Bakken water. Figure No.5 outlines the location of the facilities, and existing flowlines in the proposed Unit.

**NOTIFICATION OF MINERALS AND SURFACE RIGHTS OWNERS**

Tundra is in the process of notifying all mineral rights and surface owners of the unitization of Kola Unit No.2 and subsequent commencement of waterflood operations.

Respectfully Submitted,

**TUNDRA OIL AND GAS LTD.**

A handwritten signature in cursive script, appearing to read 'G. Czyzewski', with a long, sweeping horizontal line extending to the right.

George Czyzewski, P.Eng.  
Senior Reservoir Engineer

## **B. GEOLOGY**

### **B.1 Description**

The productive formation in the Kola Unit No.2 is the Bakken "A" Pool which extends northward from Kola Unit No.1. The Bakken "A" Pool is a fine to medium grained dolomitic sandstone developed at the base of the Middle Bakken Member (refer to Attachment No.4). The productive interval ranges from 0.75 to 3.25 metres in the Kola Unit No.2. A porosity cutoff of 15%, corresponding to a permeability cutoff of 1 md, has been used to define effective hydrocarbon pore volume.

The majority of production is obtained from the basal layer of the Middle Bakken Member. The basal layer is below the porosity cutoff at wells 15-28 and 11-33-10-29. Production from the two aforementioned wells is obtained from the upper layer of the Middle Bakken Member.

Top seal for the reservoir is provided by the overlying black shale of the Upper Bakken Member (refer to Attachment No.4). Seat seal is the red and green dolomitic shales of the Devonian Lyleton formation. Lateral changes in porosity, permeability, and depositional texture provide an important component of the trapping mechanism for the Middle Bakken sandstones.

### **B.2 Mapping**

The following mapping is available for the Kola Unit No.2:

- \* Attachment No.4: Bakken Formation Stratigraphic Column
- \* Attachment No.5: Bakken Pore Volume Map

### **B.3 Core Analysis**

Core data is available for wells 1-32-10-29 and 3-33-10-29 (refer to Appendix E).

## **C. RESERVOIR PARAMETERS**

### **C.1 Rock Parameters**

Rock parameters and minimum cutoffs such as porosity and permeability were determined from the available core data. Core data was then calibrated to log response to

provide parameters for non-cored wells.

## **C.2 Fluid Parameters**

Table No.1 summarizes the fluid parameters of the Bakken "A" Pool in the Unit. The fluid parameters were determined from PVT analysis and correlation charts. A PVT test was initially done at well 3-28-10-29 in 1988 and repeated with reservoir fluids in 1994 to ensure for reliability.

## **D. PRESSURE SURVEYS**

### **D.1 Field History**

The Bakken "A" Pool pressure history consists of recent DST's from new wells and conventional pressure buildup tests after well completion. The initial delineation well at 7-33-10-29 in December, 1993 indicated a measured static reservoir pressure of 7,824 kPag. Original reservoir pressure in the Bakken "A" Pool is estimated at 8,600 kPa. Further development drilling in 1994 at 3-33-10-29 on 32 hectare spacing indicated a static reservoir pressure of 6,944 kPag. A DST run at 1-33-10-29 (1995 development well) indicated an extrapolated static reservoir pressure of 7,875 kPag. More recently, two development wells (15-28 and 5-33-10-29) were drilled during the first quarter of 1996 on 32 hectare spacing. Well 15-28-10-29 indicated a static reservoir pressure of 5,923 kPag. A conventional pressure buildup test at well 5-33-10-29 indicated a static reservoir pressure of 5,840 kPag. Based on the available pressure survey data, the average static reservoir pressure in the Unit is estimated at about 6,000 kPa. The historical pressure survey data confirms that drainage of Kola Unit No.2 oil reserves has occurred from the wells located to the south in Kola Unit No.1. This reservoir phenomenon supports the current reservoir management strategy of continuing development of the Bakken "A" Pool on 32 hectare spacing. Appendix F outlines the available pressure survey data.

## **E. RESERVES AND PRODUCTION HISTORY**

### **E.1 Original Oil-In-Place Estimate**

The oil-in-place estimate for the Kola Unit No.2 is based on volumetrics. The volumetric method was based on log and core derived parameters of net pay and porosity. The initial formation water saturation was based on the relative permeability study completed for the Bakken "A" Pool at well 4-28-10-29. No material balance work was done since there is inadequate pressure survey data to obtain a reliable estimate. A porosity cutoff of 15% was used to determine

effective hydrocarbon oil pay. Initial irreducible water saturation is estimated at 58% from the relative permeability study. Total oil-in-place in the Unit is estimated at 1.9 MM STB (303,476 m<sup>3</sup>). Table No.3 outlines the individual well oil-in-place estimates.

## **E.2 Field Production History**

Figure No.1 outlines the total production history of the wells that are to be included in the Kola Unit No.2. Oil production averaged about 32 m<sup>3</sup>/day during 1994 to 1995 from the Unit oil wells. More recently, total oil production was 36 m<sup>3</sup>/day at a watercut of 19% at 96.06.30. Cumulative oil production to 96.06.30 was 25,848 m<sup>3</sup>. Appendix A outlines the total Unit production history. The individual well histories and production time plots are outlined in Appendix B and Appendix C, respectively.

## **E.3 Primary Production Forecast**

The Unit primary oil production forecast for the remaining proved producing reserves is outlined in Table No.4.

## **E.4 Recovery Profiles**

Ultimate primary oil recovery of 65 M m<sup>3</sup> (410 M STB) is estimated from the Unit wells. Figure No.2 outlines the total Unit ultimate primary oil recovery prediction at this time. The production history of 1996 development wells 15-28 and 5-33-10-29 was too short to provide a reliable ultimate primary recovery prediction. As a result, the pore volume and initial production rates of wells 15-28 and 5-33-10-29 were compared to analogous wells to derive a preliminary primary recovery estimate. Current oil recovery of 8.5% of the oil-in-place is estimated in the Unit to 96.06.30. Ultimate primary oil recovery from the Unit is estimated at 21.5% of the oil-in-place. Table No.5 outlines the individual well oil recovery profiles. Appendix D outlines the individual well ultimate recovery prediction plots.

## **F. WATERFLOOD PROGRAM**

### **F.1 Unit Lands and Wells**

The Kola Unit No.2 lands are outlined in Attachment No.3. The Kola Unit No.2 will comprise a total land area of 291 hectares (720 acres). The initial area for waterflooding is outlined in Figure No.3, and will comprise a total area of 113.3 hectares (280 acres). The initial waterflood area

represents 39% of the total Kola Unit No.2 lands. Table No.2 outlines the Kola Unit No.2 wells. Table No.6 outlines the initial wells in the Unit selected for waterflood operations.

## **F.2 Tract Factors and Working Interests**

The method approved in the Kola Unit No.1 to determine tract factors and equity interests has been adopted for the same in Kola Unit No.2. Oil production during the last 90 operating days for each well has been used as the basis to determine the tract factors at Kola Unit No.2. Historically, current production has been assessed as the most reliable indicator of a wells production potential and ultimate recovery in the Kola Bakken "A" Pool. Pore volume in this pool has not been an appropriate parameter in determining working interests because of completion problems, which has resulted in poor production performance in several wells with good pore volume.

The last 90 operating days in the Kola Unit No.2 represented the period from February, 1996 to June 30, 1996 (refer to Table No.7). Table No.8 outlines the agreed upon tract factors for Kola Unit No.2.

## **F.3 Engineering Studies**

The special core analysis completed at well 4-28-10-29 in the Kola Unit No.1 would be representative of the waterflood performance expected in Kola Unit No.2. The engineering analysis that followed from the relative permeability analysis included the assessment of (a) mobility ratio, (b) cumulative production vs cumulative injection profile, (c) injection pressure vs cumulative injection, (d) review of  $K_{ro}$  and  $K_{rw}$  curves, and (e) sweep efficiency. Waterflood performance in Kola Unit No.2 will be primarily characterized by piston displacement (low watercut during the majority of the producing life, with water breakthrough towards the end of the wells producing life). For more information pertaining to the aforementioned performance parameters, refer to the Kola Unit No.1 Pressure Maintenance Application(July,1993) at the Manitoba Petroleum Branch.

## **F.4 Waterflood Pattern Selection**

Figure No.3 outlines the waterflood patterns proposed for the Kola Unit No.2. The waterflood patterns are essentially inverted 5-spots on 80 acre spacing. Initially well 1-32-10-29 will be converted to water injection service. The waterflood pattern impacted by proposed

injection well 1-32-10-29 represents an area on 40 acre spacing. From an areal standpoint, well 1-32 is the best location to deliver pressure maintenance to the offsetting wells on 40 acre spacing. The next logical choice for water injection will be well 3-33-10-29. This waterflood pattern will test pressure maintenance on 80 acre spacing. The timing for conversion of 3-33 to injection service will be when oil production drops below 1 m<sup>3</sup>/day. Well 11-33 is not included in any waterflood pattern, since the lower layer of the middle Bakken Member is absent at this location (upper layer only at 11-33). Waterflooding in the Bakken "A" Pool has only been effective in the lower layer of the Middle Bakken Member. Well 1-33-10-29 is in a area with an incomplete waterflood pattern. Either further exploration is required to the east of 1-33 to develop an inverted 5-spot waterflood pattern, or 1-33 can be converted to injection service in the future. Converting 1-33 to injection service at a later date will complete waterflood sweep in the existing Unit area.

#### **F.5 Incremental Reserves and Forecast**

Incremental oil reserves of 5,400 m<sup>3</sup> (34,000 STB) are estimated in the initial area of waterflooding at Kola Unit No.2. The wells comprising the initial area of waterflooding in the Unit are outlined in Table No.6. Incremental oil recovery of 3.5% of the oil-in-place is estimated with waterflood operations in the initial area of secondary operations. Total primary and secondary recovery in the initial area of waterflooding is estimated at 30% of the oil-in-place. Table No.6 also outlines the primary and waterflood oil forecasts in the initial area of the Unit designated for pressure maintenance. Total incremental oil recovery of 95,000 STB is estimated in the Unit with waterflood operations. This would require installing two additional injectors at 1-33 and 3-33-10-29. Table No.9 provides a summary of the reserve and recovery factor profiles estimated in the Unit.

#### **F.6 Water Injection Rate**

The water injection rate recommended at injection well 1-32-10-29 is 25 m<sup>3</sup>/day. Tundra has found from actual field experience that this is the maximum injection rate possible without exceeding the fracture gradient in this formation. The total fluid production from the waterflood pattern wells is estimated at 25 m<sup>3</sup>/day. However, the majority of the fluid from well 2-32-10-29 is coming from out of zone. Therefore, an initial injection rate of 25 m<sup>3</sup>/day should replace current and cumulative voidage. Maximum wellhead operating injection pressure will be 9,500 kPag.

**F.7 Facilities**

The wells in Kola Unit No.2 are tied into the central battery facilities at 4-28-10-29 in Kola Unit No.1. Water treatment facilities will also be located at the central battery facilities with the injection pump at the 1-32-10-29 well site. Wells that are not tied in at this time will continue to produce to their existing lease tanks. Figure No.5 outlines the central battery facilities at 4-28-10-29.

## **LIST OF ATTACHMENTS**

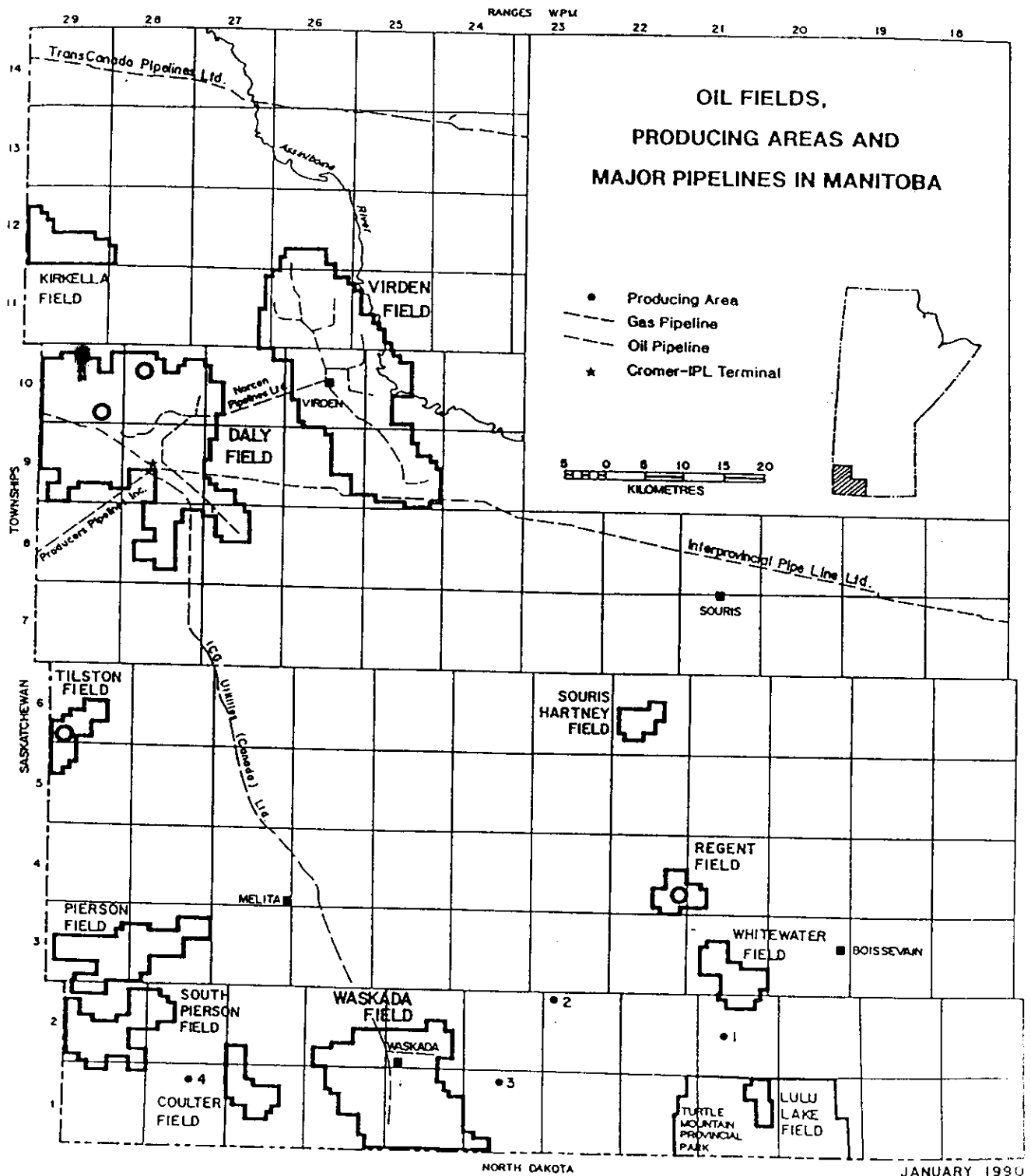
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- **ATTACHMENT NO.1: LOCATION MAP OF KOLA FIELD**
- **ATTACHMENT NO.2: KOLA FIELD SPACING DESIGNATION**
- **ATTACHMENT NO.3: KOLA UNIT NO.2 LANDS**
- **ATTACHMENT NO.4: BAKKEN FORMATION STRATIGRAPHIC COLUMN**
- **ATTACHMENT NO.5: BAKKEN PORE VOLUME MAP**



# ATTACHMENT NO.1

## LOCATION MAP OF KOLA FIELD



### OTHER PRODUCING AREAS

- |                 |              |
|-----------------|--------------|
| 1. Mountainside | 3. Goodlands |
| 2. Deloraine    | 4. Lyleton   |

 KOLA UNIT NO.2

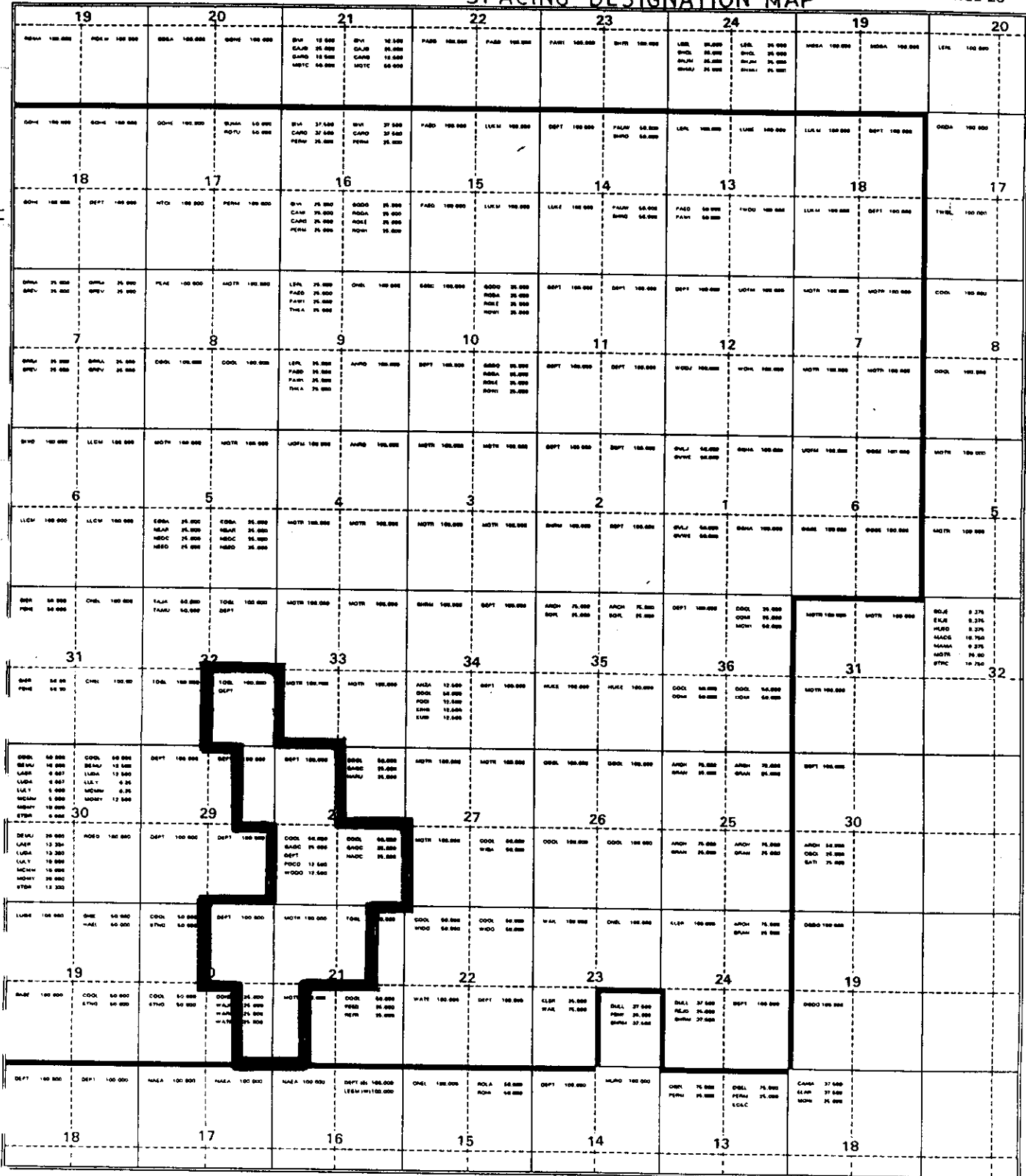
# ATTACHMENT NO.2

## MINES AND MINERALS - OWNERS

RGE 29

### SPACING DESIGNATION MAP

RGE 28



RGE 29

RGE 28

32 HECTARE APPLICATION AREA

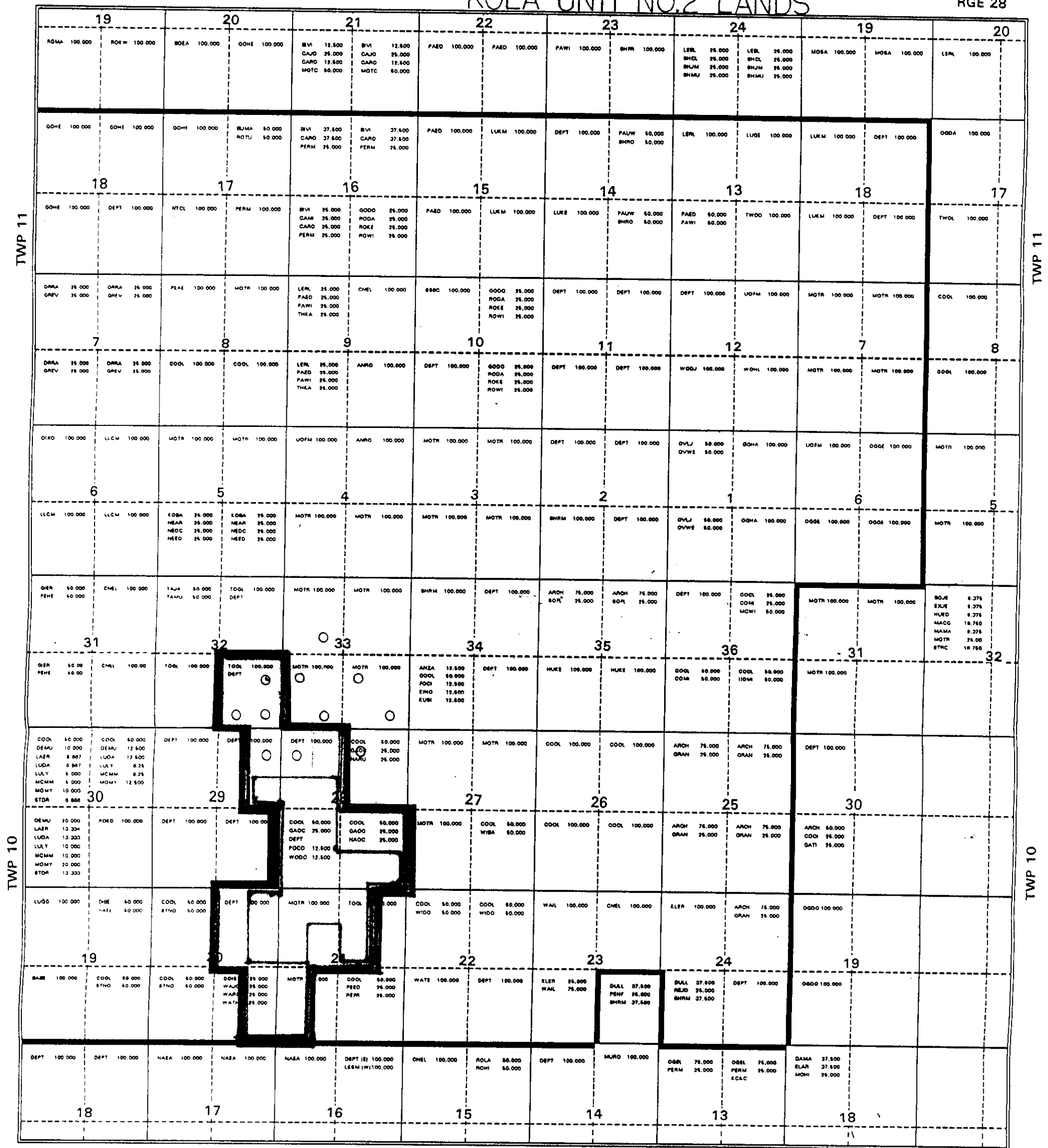
16 HECTARE AREA OF EXCLUSION

## MINES AND MINERALS - OWNERS

RGE 29

## KOLA UNIT NO.2 LANDS

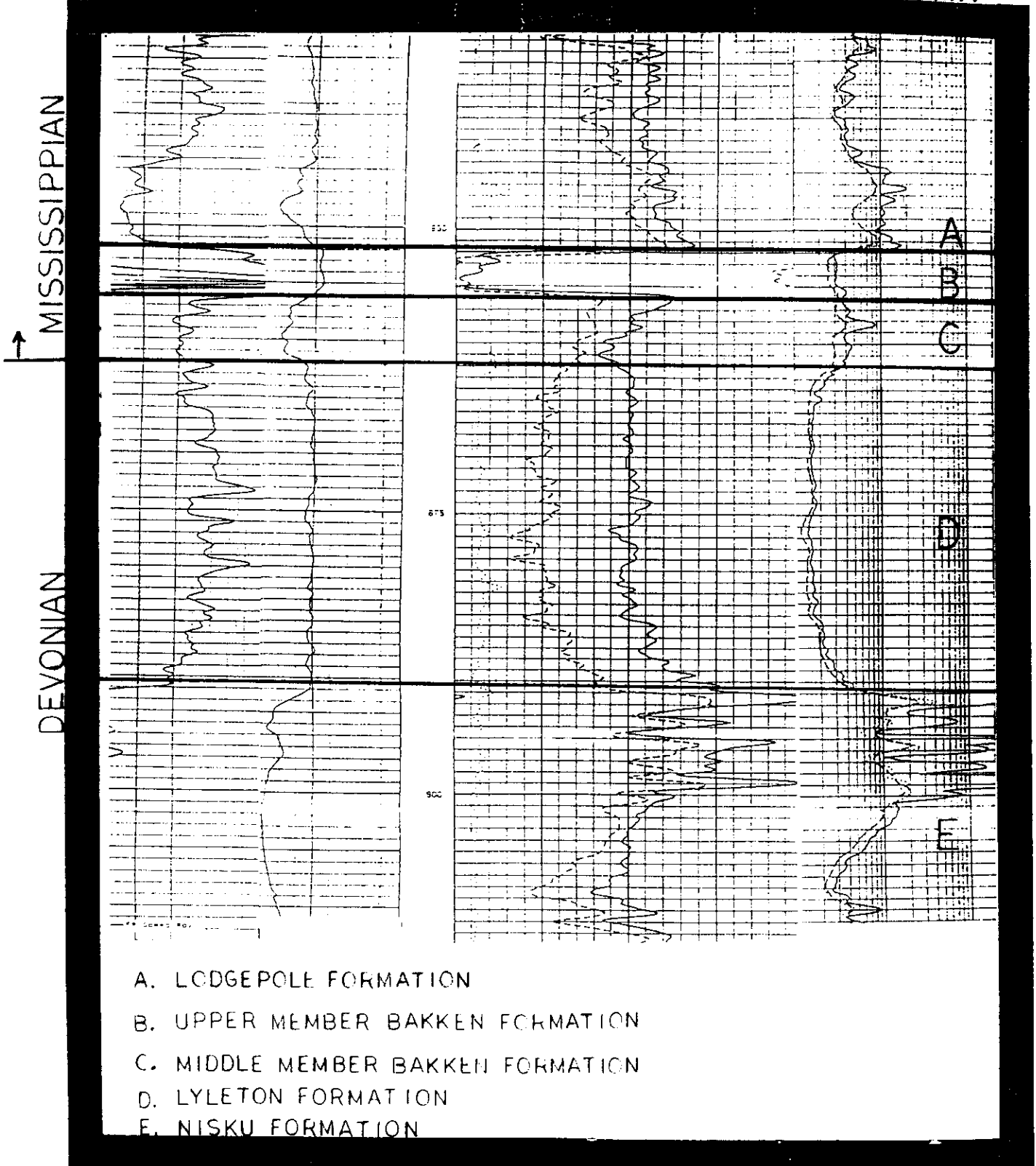
RGE 28



RGE 29

RGE 28

# BAKKEN FORMATION STRATIGRAPHIC COLUMN



COMPOSITE LOG

TUNDRA 3-33-10-29



**Tundra** oil and gas ltd.

INDUCTION LOG

CNL-DENSITY LOG

ND

1.5

T T T

$$\begin{array}{r} 1 \\ \hline 34 \end{array}$$


15

40000

## LIST OF TABLES

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- TABLE NO.1: BAKKEN "A" POOL FLUID PARAMETERS
- TABLE NO.2: KOLA UNIT NO.2 WELL LIST
- TABLE NO.3: UNIT WELLS OIL-IN-PLACE ESTIMATES
- TABLE NO.4: UNIT PRIMARY PRODUCTION FORECAST
- TABLE NO.5: UNIT PRODUCTION RATES AND RECOVERY PROFILES
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- TABLE NO.7: UNIT PRODUCTION FEBRUARY - JUNE, 1996
- TABLE NO.8: UNIT TRACT FACTORS AND WORKING INTERESTS
- TABLE NO.9: UNIT RESERVES AND RECOVERY FACTOR SUMMARY

**TABLE NO.1**  
**BAKKEN 'A' POOL FLUID PARAMETERS**

---

**BAKKEN 'A' POOL**

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Reservoir Temperature	31 deg. C
Bubble point Pressure	2,101 kPa
Oil API	41 deg. API
Boi	1.063 Rm3/m3
Solution GOR	27 m3/m3
Oil Compressibility @ Pi	1.15 E-6 (1/kPa)
Water Compressibility	4.5 E-7 (1/kPa)
Rock Compressibility	5.8 E-7 (1/kPa)
Water Salinity	90,000 ppm

**TABLE NO. 2**  
**KOLA UNIT NO.2 WELL LIST**

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**TOTAL UNIT WELLS**

---

**13-28-10-29 W1M**

**15-28-10-29 W1M**

**16-29-10-29 W1M**

**1-32-10-29 W1M**

**2-32-10-29 W1M**

**8-32-10-29 W1M**

**1-33-10-29 W1M**

**3-33-10-29 W1M**

**5-33-10-29 W1M**

**7-33-10-29 W1M**

**11-33-10-29 W1M**



TABLE NO.3									
KOLA UNIT NO.2									
VOLUMETRIC OIL-IN-PLACE ESTIMATES									
BAKKEN "A" POOL									
POROSITY CUT-OFF = 15%									
WELL	Constant	Area (hectares)	Net Pay (metres)	Porosity (fraction)	Sw (fraction)	Boi R (m3/m3)	OOIP (m3)	OOIP (STB)	
13-28-10-29	10,000	32.4	2	0.17	0.58	1.1	42,061	264,564	
15-28-10-29	10,000	32.4	0.75	0.15	0.58	1.1	13,917	87,540	
16-29-10-29	10,000	16.19	1.75	0.18	0.58	1.1	19,472	122,480	
1-32-10-29	10,000	16.19	2	0.18	0.58	1.1	22,254	139,977	
2-32-10-29	10,000	16.19	1.2	0.16	0.58	1.1	11,869	74,654	
8-32-10-29	10,000	16.19	1.5	0.19	0.58	1.1	17,618	110,815	
1-33-10-29	10,000	32.4	1	0.165	0.58	1.1	20,412	128,391	
3-33-10-29	10,000	32.4	3.25	0.18	0.58	1.1	72,370	455,206	
5-33-10-29	10,000	32.4	2	0.17	0.58	1.1	42,061	264,564	
7-33-10-29	10,000	32.4	1.5	0.17	0.58	1.1	31,546	198,423	
11-33-10-29	10,000	32.4	0.5	0.16	0.58	1.1	9,897	62,250	
Total							303,476	1,908,866	



TABLE NO.5											
KOLA UNIT NO.2											
CURRENT RATES AND RECOVERY PROFILES											
Well	Oil Rate (m3/day)	Water-cut (%)	Total Rate (m3/day)	Cum. Oil (m3)	OOIP (m3)	Ultimate Rec. (m3)	Rem. Oil (m3)	Cur. Rec. Fac. (% of OOIP)	Ult. Rec. Fac. (% of OOIP)		
	96.06.30	96.06.30	96.06.30	96.06.30			96.06.30	96.06.30			
13-28-10-29	1.5	1	1.6	2,404.1	42,061	4,119	1,715	5.7	9.8		
15-28-10-29	1.0	70	3.1	76.9	13,917	2,508	2,431	0.6	18.0		
16-29-10-29	0.6	2	0.6	1,261.4	19,472	1,770	509	6.5	9.1		
1-32-10-29	1.3	0	1.3	2,781.0	22,254	5,030	2,249	12.5	22.6		
2-32-10-29	0.5	92	6.3	1,187.6	11,869	2,375	1,187	10.0	20.0		
8-32-10-29	7.2	0	7.2	7,319.4	17,618	17,365	10,046	41.5	98.6		
1-33-10-29	4.1	5	4.3	1,800.3	20,412	3,930	2,130	8.8	19.3		
3-33-10-29	4.1	0	4.1	3,537.1	72,370	8,385	4,848	4.9	11.6		
5-33-10-29	12.0	1	12.1	1,414.5	42,061	10,515	9,101	3.4	25.0		
7-33-10-29	1.8	1	1.8	2,558.3	31,546	5,187	2,629	8.1	16.4		
11-33-10-29	2.2	6	2.3	1,507.5	9,897	4,128	2,621	15.2	41.7		
<b>TOTALS</b>	<b>36.2</b>	<b>18.9</b>	<b>44.6</b>	<b>25,848</b>	<b>303,477</b>	<b>65,312</b>	<b>39,464</b>	<b>8.5</b>	<b>21.5</b>		

TABLE NO.6

TABLE NO.6											
KOLA UNIT NO.2											
PRODUCTION FORECAST											
INITIAL WATERFLOOD AREA											
Year	Primary Oil (m3/day)	Waterflood Oil (m3/day)	Annual Prod. (m3)	Cum. Oil (m3)	Rec. Factor (% of OOIP)	Well	OOIP (m3)	Ult. Rec. Primary (m3)	Ult. Primary Rec. Fac. (% of OOIP)	Increm. Rec. Waterflood (m3)	Ult. Waterflood Rec. Fac. (% of OOIP)
1995	11	11.0		12,600	8.1						
1996	19	19.0	6,935	19,535	12.6	13-28-10-29	42,061	4,119	9.8	500	11
1997	14	16.0	5,840	25,375	16.3						
1998	10	13.2	4,817	30,192	19.4	16-29-10-29	19,472	1,770	9.1	500	12
1999	8	9.9	3,613	33,805	21.8						
2000	6	7.7	2,796	36,601	23.6	1-32-10-29	22,254	5,030	22.6		23
2001	4	6.1	2,237	38,838	25.0						
2002	4	4.9	1,790	40,627	26.2	2-32-10-29	11,869	2,375	20.0	200	22
2003	3	3.9	1,432	42,059	27.1						
2004	3	3.1	1,145	43,204	27.8	8-32-10-29	17,618	17,365	98.6	2,200	111
2005	2	2.5	916	44,121	28.4						
2006	2	2.0	733	44,854	28.9						
2007	2	1.6	586	45,440	29.3	5-33-10-29	42,061	10,515	25.0	2,000	30
2008	2	1.3	469	45,909	29.6						
2009	2	1.0	376	46,285	29.8	Totals	155,335	41,174	26.5	5,400	30.0
2010	1	0.8	300	46,585	30.0						

TABLE NO.7														
KOLA UNIT NO.2														
FEB/96 - MAY /96 OIL PRODUCTION														
WELL	W.I. IN LSD.	Feb-96		Mar-96		Apr-96		May-96		Jun-96		Last 90		Total
		PROD.	DAYS	PROD.	DAYS	PROD.	DAYS	PROD.	DAYS	PROD.	DAYS	PROD.	DAYS	
	(%)	(m3)		(m3)		(m3)		(m3)		(m3)		(m3)		(m3)
13-28-10-29	100	53.1	28	59.9	31	58.6	30	64.0	30	46.3	30	168.9	90	168.9
15-28-10-29	100	11	8	18.7	19	18.5	30	14.4	19	14.3	15	75.5	90	75.5
16-29-10-29	100	17.3	21	12.9	22	20.1	30	17.4	30	18.3	30	65.8	90	65.8
1-32-10-29	100	42.7	28	45.5	31	44.4	30	47.2	30	37.7	30	129.3	90	129.3
2-32-10-29	100	26.2	28	27.7	31	21.3	29	14.9	30	15.8	30	62.9	90	62.9
8-32-10-29	100	181.9	23	269.9	31	227.9	30	214	28	215.8	30	676.1	90	676.1
1-33-10-29	100	115.7	20	129.9	28	128.7	29	125	30	105.5	26	382.4	90	382.4
3-33-10-29	100	138	28	135.6	31	130.1	30	134	30	122.8	30	386.9	90	386.9
5-33-10-29	100	108.9	9	332.4	29	326.9	30	285.8	23	360.5	30	1,053.4	90	1,053.4
7-33-10-29	100	65.6	28	61.6	31	56.8	30	55.8	30	52.9	30	166.5	90	166.5
11-33-10-29	80	102.1	28	108.6	31	95.2	28	68.7	30	64.6	30	236.5	90	236.5

TABLE NO.8

TABLE NO.8										
	KOLA UNIT NO.2									
	WORKING INTEREST OWNERS									
	TRACT FACTOR DETERMINATION									
WELL	Tundra W.I. in LSD (%)	Corvaie W.I. in LSD (%)	Total W.I. in LSD (%)	Total Operating Days	Total Production (m3)	Average Oil Rate Per Operating Day (m3/day)	Tract Factor Per LSD (%)	Tundra Tract Factor (%)	Corvaie Tract Factor (%)	Total Unit Tract Factor (%)
13-28-10-29	100	0	100	90	168.9	1.88	4.99527	4.99527	0	4.99527
15-28-10-29	100	0	100	90	75.5	0.84	2.23294	2.23294	0	2.23294
16-29-10-29	100	0	100	90	55.8	0.62	1.65030	1.65030	0	1.65030
1-32-10-29	100	0	100	90	129.3	1.44	3.82409	3.82409	0	3.82409
2-32-10-29	100	0	100	90	52.9	0.59	1.56453	1.56453	0	1.56453
8-32-10-29	100	0	100	90	675.1	7.50	19.96628	19.96628	0	19.96628
1-33-10-29	100	0	100	90	382.4	4.25	11.30959	11.30959	0	11.30959
3-33-10-29	100	0	100	90	386.9	4.30	11.44268	11.44268	0	11.44268
5-33-10-29	100	0	100	90	1053.4	11.70	31.15462	31.15462	0	31.15462
7-33-10-29	100	0	100	90	165.5	1.84	4.89471	4.89471	0	4.89471
11-33-10-29	80	20	100	90	235.5	2.62	6.96498	5.57199	1.39	6.96498
Totals					3,381.2	37.568889	100.00000	98.60700	1.39300	100.00000

**TABLE NO.9**  
**KOLA UNIT NO.2**  
**RESERVE AND RECOVERY FACTOR SUMMARY**

RESERVES	TOTAL UNIT	INITIAL WATERFLOOD AREA
RESERVES		
-----		
CUM. PROD.(96.06.30)	162,585 STB	102,955 STB
REMAINING PRIMARY	248,275 STB	156,030 STB
	-----	-----
TOTAL PRIMARY	410,860 STB	258,985 STB
SECONDARY	95,000 STB	34,000 STB
	-----	-----
TOTAL	505,860 STB	292,985 STB
RECOVERY FACTOR(% OOIP)		
-----		
CUM. PROD.(96.06.30)	8.5%	10.5%
REMAINING PRIMARY	13.0%	16.0%
	-----	-----
TOTAL PRIMARY	21.5%	26.5%
SECONDARY	5%	3.5%
TOTAL	26.5%	30.0%

## LIST OF FIGURES

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- FIGURE NO.1: KOLA UNIT NO.2 PRODUCTION HISTORY
- FIGURE NO.2: KOLA UNIT NO.2 ULTIMATE PRIMARY RECOVERY PREDICTION
- FIGURE NO.3: KOLA UNIT NO.2 WATERFLOOD PATTERNS
- FIGURE NO.4: PRODUCTION FORECAST INITIAL WATERFLOOD AREA
- FIGURE NO.5: LOCATION OF CENTRAL BATTERY FACILITIES



FIGURE NO.1

KOLA UNIT NO.2 PRODUCTION HISTORY

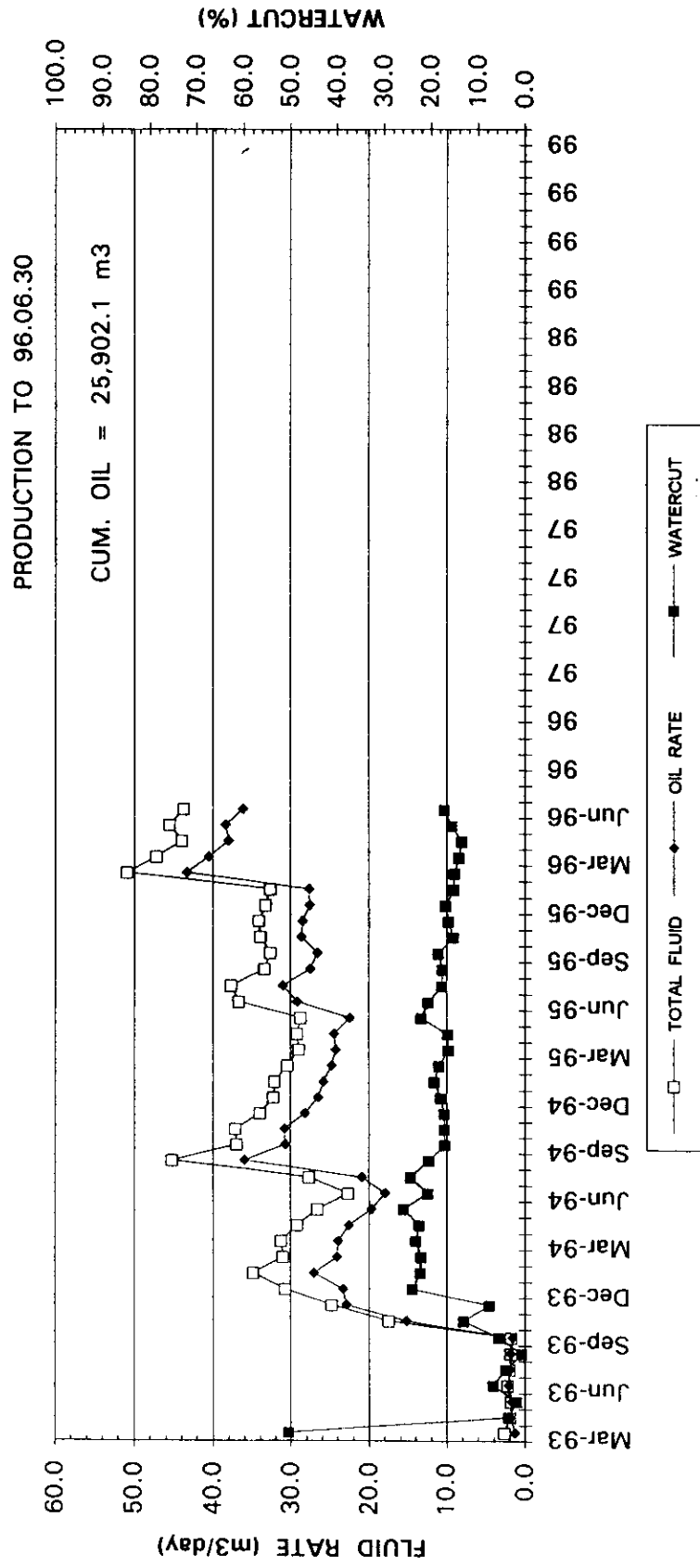
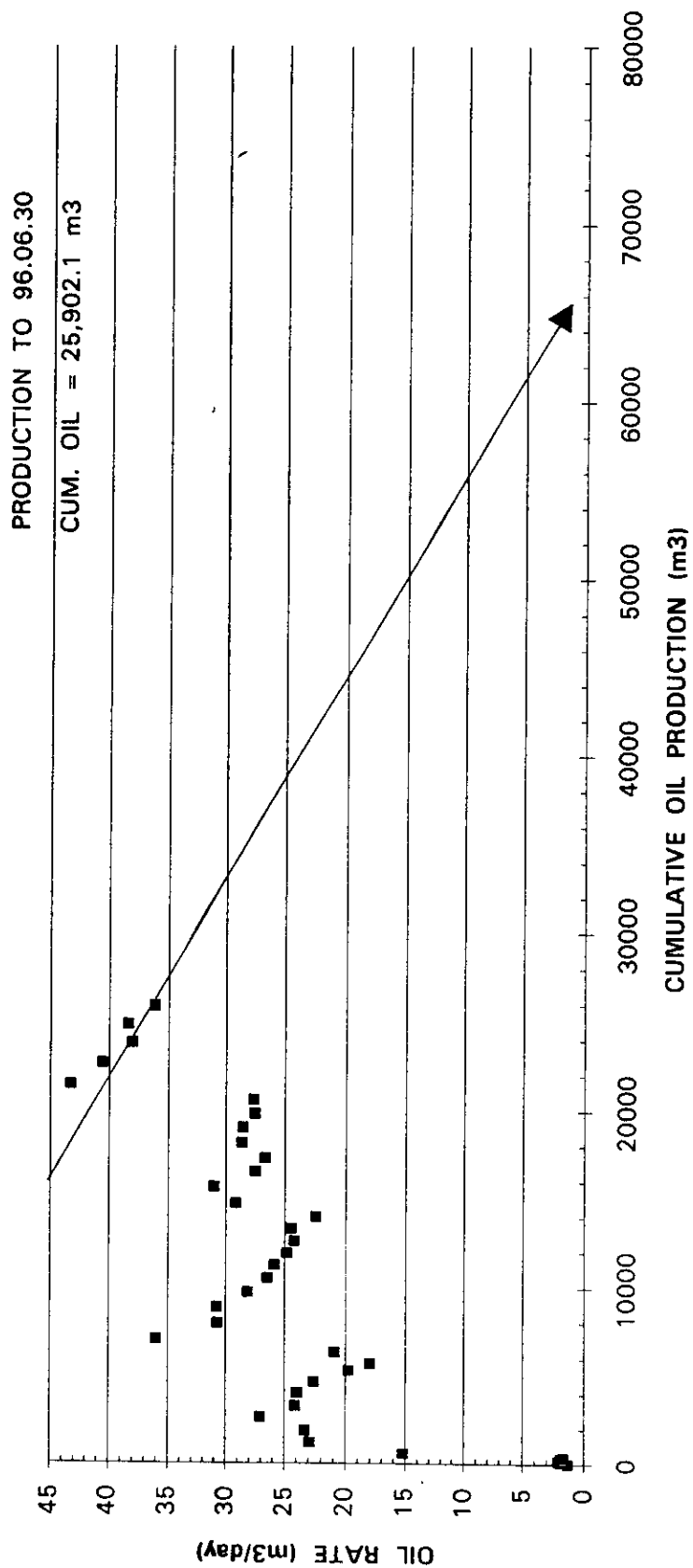


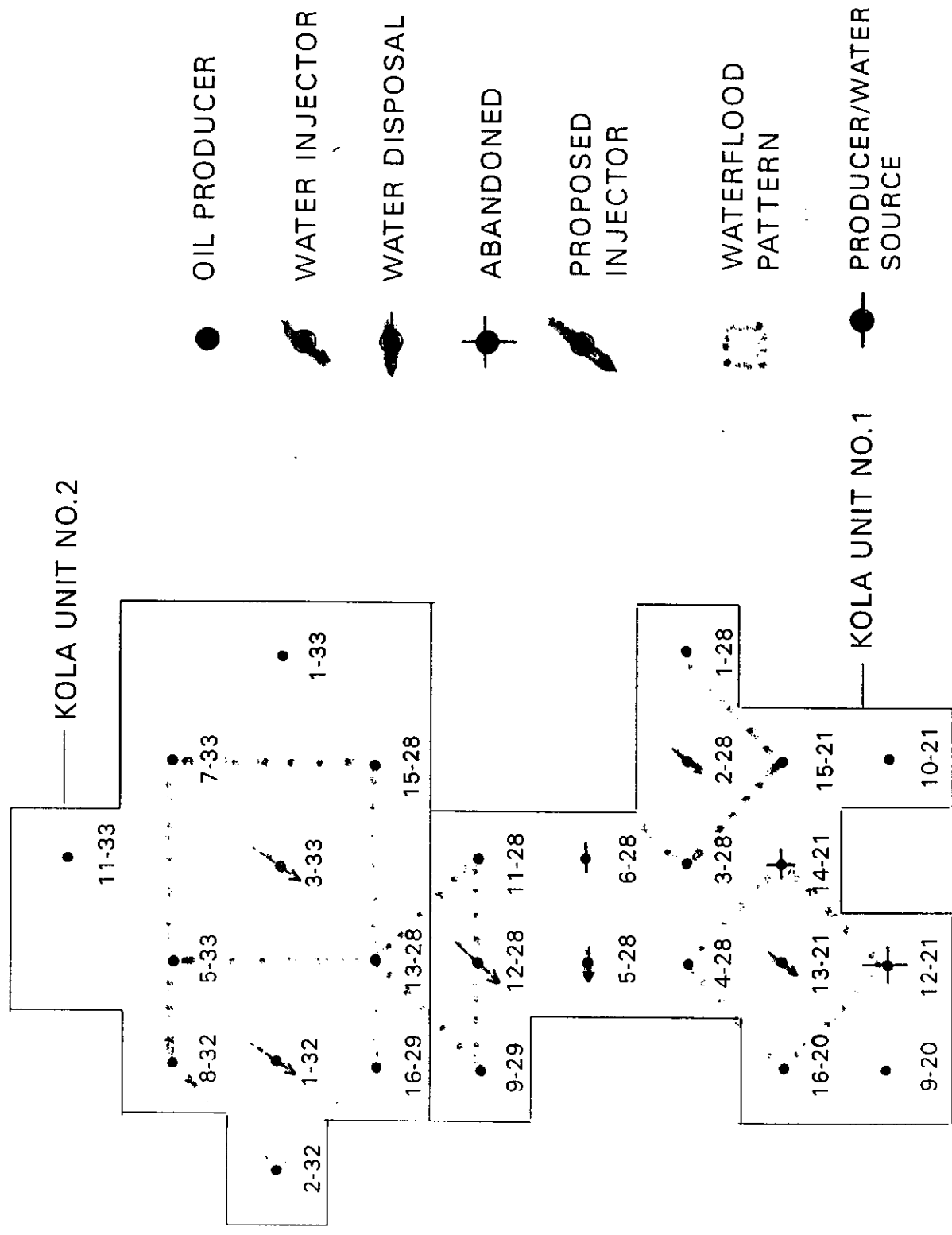
FIGURE NO.2

PROPOSED KOLA UNIT NO.2 ULTIMATE RECOVERY PREDICTION

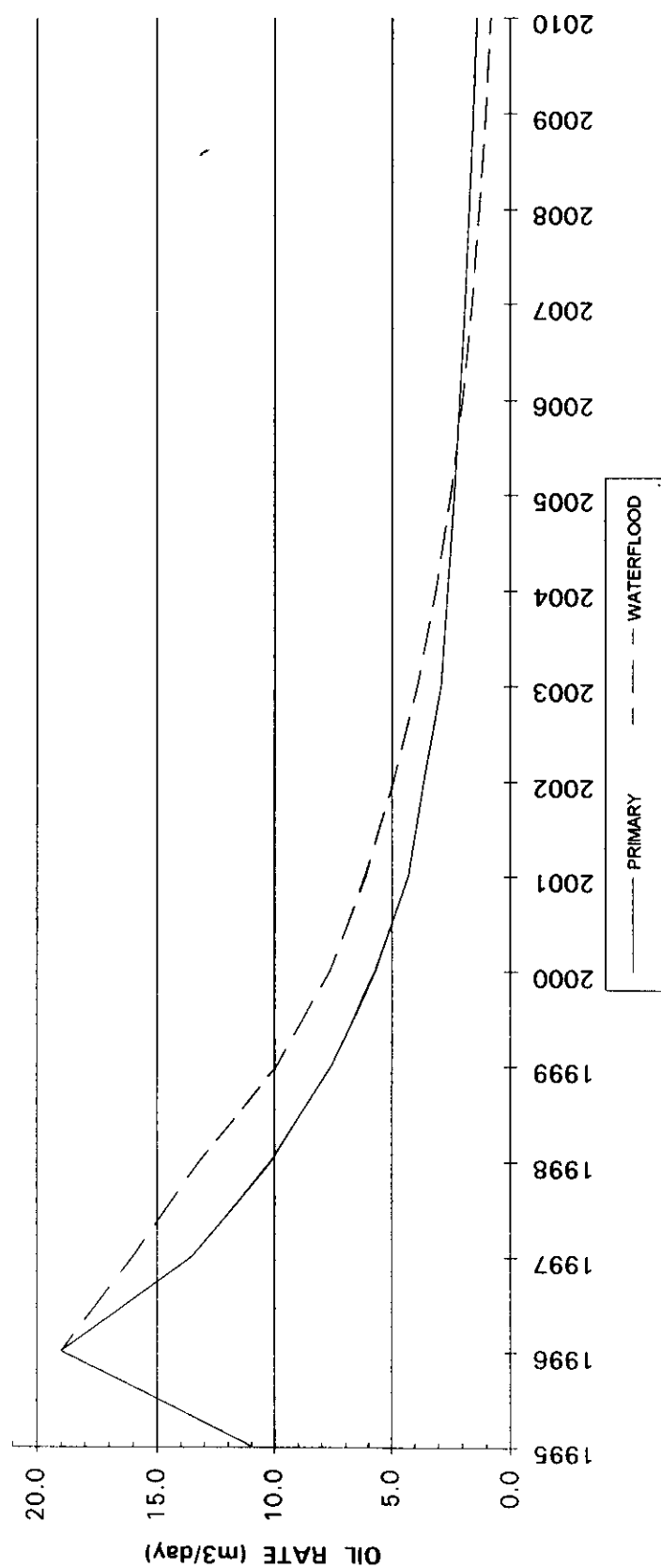


# FIGURE NO. 3

## WATERFLOOD PATTERNS

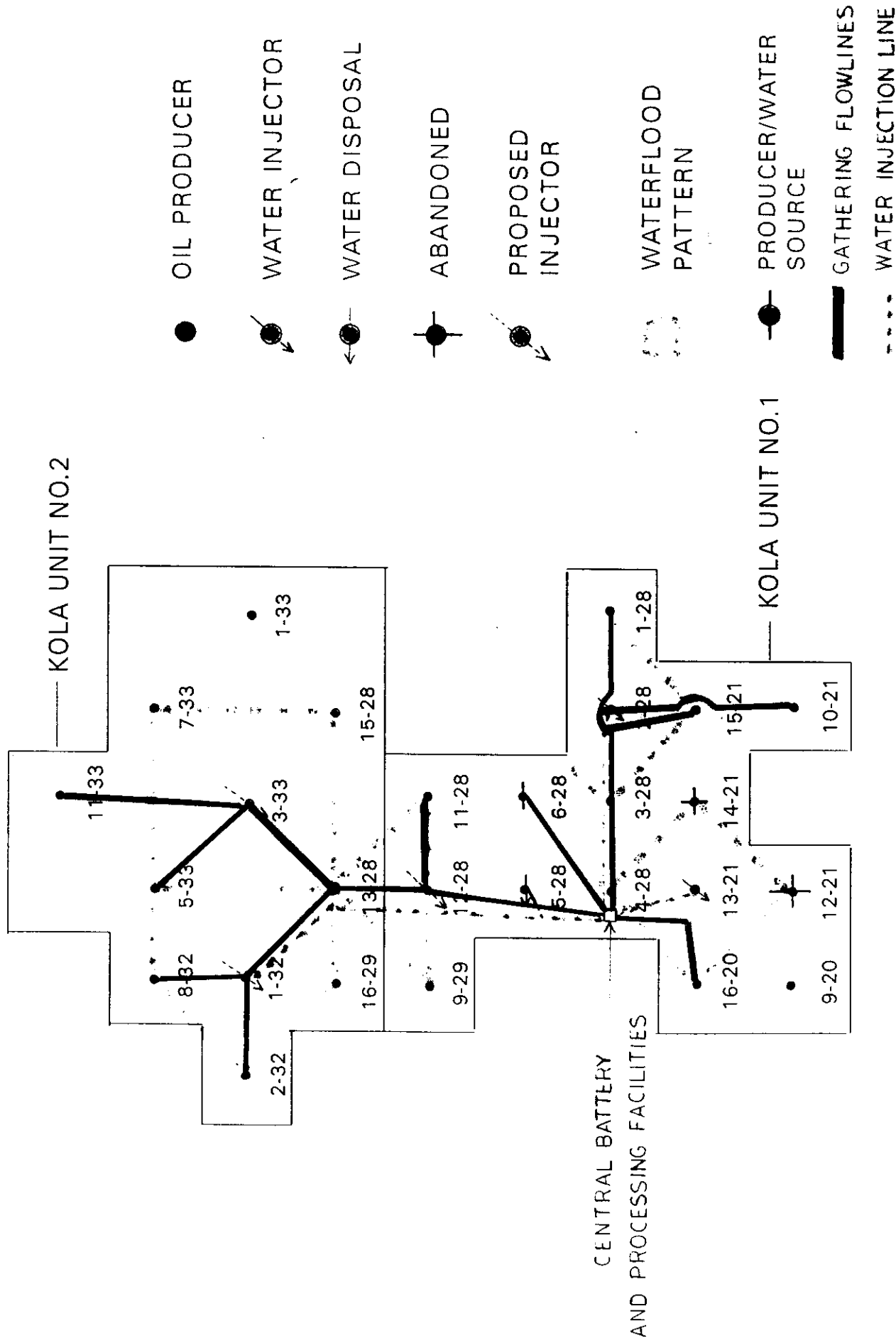


**FIGURE NO.4**  
**KOLA UNIT NO.2 PRODUCTION FORECAST INITIAL WATERFLOOD AREA**



# FIGURE NO. 5

## WATERFLOOD PATTERNS



# LIST OF APPENDICES

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- **Appendix A: Total Unit Production History**
- **Appendix B: Individual Well Production Histories**
- **Appendix C: Individual Well Production Plots**
- **Appendix D: Individual Well Ultimate Recovery Predictions**
- **Appendix E: Core Reports**
- **Appendix F: Pressure Surveys**
- **Appendix G: Mineral Owners and Addresses**
- **Appendix H: Conversion Program 1-32-10-29**
- **Appendix I: Letter Agreement Assigning Working Interests**

## APPENDIX A

### TOTAL UNIT PRODUCTION HISTORY

KULA UNIT NO.4										NKOLAPT.XLS	
PRODUCTION HISTORY											
Year	Month Oil (m3)	Cum Oil (m3)	Oil Rate (m3/day)	Year	Total Fluid (m3/day)	Oil Rate (m3/day)	Watercut (%)	Month Water (m3)	Cum Water (m3)		
93	0	0	0	Jan-93	0	0	0	0	0		
93	0	0	0	Feb-93	0	0	0	0	0		
93	29.8	29.8	1.35	Mar-93	2.7	1.35	50.6	30.5	31		
93	56.6	86.4	1.89	Apr-93	2.0	1.89	3.6	2.1	33		
93	54	140.4	1.74	May-93	1.8	1.74	1.8	1	34		
93	61.8	202.2	2.06	Jun-93	2.2	2.06	6.9	4.6	38		
93	60.2	262.4	1.94	Jul-93	2.0	1.94	4.1	2.6	41		
93	58.1	320.5	1.87	Aug-93	1.9	1.87	0.7	0.4	41		
93	50.1	370.6	1.67	Sep-93	1.8	1.67	5.6	3	44		
93	236	606.6	15.19	Oct-93	17.5	15.19	13.1	35.5	80		
93	633.6	1,240.2	22.9	Nov-93	24.8	22.9	7.6	52.4	132		
93	684.6	1,924.8	23.32	Dec-93	30.7	23.32	24.1	216.9	349		
94	741.1	2,665.9	27.05	Jan-94	34.8	27.05	22.4	213.6	563		
94	655.9	3,321.8	24.12	Feb-94	31.0	24.12	22.2	186.9	750		
94	742.1	4,063.9	23.95	Mar-94	31.2	23.95	23.3	225.5	975		
94	643.8	4,707.7	22.59	Apr-94	29.2	22.59	22.6	188.2	1,163.2		
94	611.6	5,319.3	19.72	May-94	26.6	19.72	26.0	214.5	1,377.7		
94	421	5,740.3	17.97	Jun-94	22.7	17.97	20.7	110	1,487.7		
94	612.1	6,352.4	20.89	Jul-94	27.7	20.89	24.5	198.8	1,686.5		
94	717.6	7,070.0	36	Aug-94	45.2	36	20.4	184.2	1,870.7		
94	897.2	7,967.2	30.72	Sep-94	37.0	30.72	17.0	183.6	2,054.3		
94	915.2	8,882.4	30.76	Oct-94	37.1	30.76	17.1	189.4	2,243.7		
94	835.6	9,718.0	28.17	Nov-94	34.0	28.17	17.2	173.1	2,416.8		
94	812.5	10,530.5	26.49	Dec-94	32.3	26.49	17.9	176.8	2,593.6		
95	736.1	11,266.6	25.86	Jan-95	32.1	25.86	19.3	176.5	2,770.1		
95	675.1	11,941.7	24.82	Feb-95	30.4	24.82	18.3	151.2	2,921.3		
95	688.2	12,629.9	24.23	Mar-95	28.9	24.23	16.3	133.8	3,055.1		
95	703.6	13,333.5	24.45	Apr-95	29.2	24.45	16.3	137.4	3,192.5		
95	672.6	14,006.1	22.42	May-95	28.8	22.42	22.1	190.3	3,382.8		
95	756.6	14,762.7	29.16	Jun-95	36.7	29.16	20.5	195.3	3,578.1		
95	930.8	15,693.5	31.03	Jul-95	37.7	31.03	17.6	199.4	3,777.5		
95	852.1	16,545.6	27.49	Aug-95	33.3	27.49	17.6	181.5	3,959.0		
95	792.7	17,338.3	26.64	Sep-95	32.6	26.64	18.4	178.3	4,137.3		
95	843.7	18,182.0	28.68	Oct-95	33.9	28.68	15.3	152.5	4,289.8		
95	855.7	19,037.7	28.54	Nov-95	34.1	28.54	16.3	166.4	4,456.2		
95	793.1	19,830.8	27.59	Dec-95	33.2	27.59	16.9	161.3	4,617.5		
Jan-96	781.9	20,612.7	27.67	Jan-96	32.6	27.67	15.1	139.5	4,757.0		
Feb-96	862.5	21,475.2	43.29	Feb-96	50.9	43.29	14.9	151.6	4,908.6		
Mar-96	1,202.7	22,677.9	40.53	Mar-96	47.2	40.53	14.1	197.5	5,106.1		
Apr-96	1,128.5	23,806.4	38.02	Apr-96	43.9	38.02	13.4	174.9	5,281.0		
May-96	1,041.2	24,847.6	38.4	May-96	45.5	38.4	15.7	193.6	5,474.6		
Jun-96	1,054.5	25,902.1	36.16	Jun-96	43.7	36.16	17.2	218.6	5,693.2		



## APPENDIX B

### INDIVIDUAL WELL PRODUCTION HISTORIES

					13-28-10-29				
Year	Month Oil (m3)	Cum Oil (m3)	Oil Rate (m3/day)	Year	Total Fluid (m3/day)	Oil Rate (m3/day)	Watercut (%)	Month Water (m3)	Cum Water (m3)
93	120.4	120.4	5.02	93	5.1	5.02	2.4	2.9	2.9
93	127.6	248	3.75	93	3.8	3.75	0.2	0.2	3.1
94	117.6	365.6	3.92	94	3.9	3.92	0.7	0.8	3.9
94	93.9	459.5	3.35	94	3.4	3.35	0.3	0.3	4.2
94	97.9	557.4	3.16	94	3.2	3.16	2.3	2.3	6.5
94	88.7	646.1	3.06	94	3.1	3.06	1.8	1.6	8.1
94	78.2	724.3	2.52	94	2.6	2.52	2.5	2	10.1
94	60	784.3	2.4	94	2.4	2.4	0.8	0.5	10.6
94	69.7	854	2.4	94	2.5	2.4	3.7	2.7	13.3
94	76.7	930.7	2.64	94	2.7	2.64	2.4	1.9	15.2
94	93.7	1024.4	3.23	94	3.3	3.23	1.7	1.6	16.8
94	94.2	1118.6	3.14	94	3.2	3.14	2.0	1.9	18.7
94	81.8	1200.4	2.73	94	2.8	2.73	2.6	2.2	20.9
94	81.8	1282.2	2.64	94	2.7	2.64	0.6	0.5	21.4
95	80.5	1362.7	2.6	95	2.6	2.6	0.4	0.3	21.7
95	66.9	1429.6	2.39	95	2.5	2.39	2.8	1.9	23.6
95	68.9	1498.5	2.22	95	2.3	2.22	2.7	1.9	25.5
95	68.5	1567	2.28	95	2.3	2.28	2.3	1.6	27.1
95	64.6	1631.6	2.15	95	2.2	2.15	1.2	0.8	27.9
95	64.2	1695.8	2.14	95	2.2	2.14	2.0	1.3	29.2
95	60.8	1756.6	2.03	95	2.2	2.03	6.0	3.9	33.1
95	64.2	1820.8	2.07	95	2.1	2.07	2.3	1.5	34.6
95	55.2	1876	1.9	95	2.0	1.9	6.0	3.5	38.1
95	60.1	1936.1	2	95	2.1	2	3.8	2.4	40.5
95	63	1999.1	2.1	95	2.2	2.1	4.0	2.6	43.1
95	62.2	2061.3	2.01	95	2.1	2.01	4.3	2.8	45.9
Jan-96	64.4	2125.7	2.08	96	2.2	2.08	3.3	2.2	48.1
Feb-96	53.1	2178.8	1.9	96	2.0	1.9	3.1	1.7	49.8
Mar-96	59.9	2238.7	1.93	96	2.0	1.93	1.2	0.7	50.5
Apr-96	58.6	2297.3	1.95	96	2.0	1.95	1.2	0.7	51.2
May-96	64	2361.3	2.13	96	2.1	2.13	0.9	0.6	51.8
Jun-96	46.3	2407.6	1.54	96	1.6	1.54	1.1	0.5	52.3

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Year	Month Oil (m3)	Cum Oil (m3)	Oil Rate (m3/day)	Year	2-32-10-29		Oil Rate (m3/day)	Total Fluid (m3/day)	Watercut (%)	Month Water (m3)	Cum Water (m3)
93	1	1	0.04	93			0.04	0.8	95	19.5	19.5
93	21.3	22.3	0.97	93			0.97	3.0	68	44.7	64.2
93	79	101.3	2.63	93			2.63	9.5	72	206.4	270.6
94	72.8	174.1	2.42	94			2.42	9.3	74	207.2	477.8
94	55	229.1	1.96	94			1.96	8.5	77	184	661.8
94	68.9	298	2.22	94			2.22	9.2	76	216.5	878.3
94	66.1	364.1	2.36	94			2.36	8.7	73	178.1	1056.4
94	49.1	413.2	1.58	94			1.58	8.1	80	202.4	1258.8
94	27.9	441.1	1.64	94			1.64	7.8	79	105.6	1364.4
94	40.7	481.8	1.4	94			1.4	7.9	82	188.9	1553.3
94	53.3	535.1	1.72	94			1.72	7.4	77	175.2	1728.5
94	47.4	582.5	1.58	94			1.58	7.0	77	161.7	1890.2
94	38.9	621.4	1.3	94			1.3	7.1	82	174.2	2064.4
94	38.3	659.7	1.28	94			1.28	6.6	81	158.7	2223.1
94	33.2	692.9	1.07	94			1.07	6.4	83	165.9	2389
95	26.8	719.7	0.89	95			0.89	6.5	86	167.5	2556.5
95	34.1	753.8	1.22	95			1.22	6.3	81	141	2697.5
95	24	777.8	1.04	95			1.04	6.3	84	122.2	2819.7
95	29.9	807.7	1.5	95			1.5	7.7	80	122.7	2942.4
95	34	841.7	1.13	95			1.13	7.1	84	179.2	3121.6
95	30.8	872.5	1.03	95			1.03	6.5	84	163.3	3284.9
95	32	904.5	1.07	95			1.07	6.3	83	157.3	3442.2
95	34.8	939.3	1.12	95			1.12	6.1	82	154.6	3596.8
95	27.4	966.7	0.91	95			0.91	6.1	85	155.1	3751.9
95	31	997.7	1.03	95			1.03	5.4	81	130.1	3882
95	32.4	1030.1	1.08	95			1.08	5.7	81	137.3	4019.3
95	30	1060.1	1.03	95			1.03	5.7	82	137.1	4156.4
Jan-96	20.6	1080.7	0.98	96			0.98	6.6	85	117.9	4274.3
Feb-96	26.2	1106.9	0.94	96			0.94	5.9	84	137.3	4411.6
Mar-96	27.7	1134.6	0.89	96			0.89	6.5	86	173.3	4584.9
Apr-96	21.3	1155.9	0.73	96			0.73	6.2	88	160.3	4745.2
May-96	14.9	1170.8	0.5	96			0.5	6.2	92	170.3	4915.5
Jun-96	15.8	1186.6	0.53	96			0.53	6.3	92	172.6	5088.1

							8-32-10-29					
Year	Month Oil (m3)	Cum Oil (m3)	Oil Rate (m3/day)	Year	Total Fluid (m3/day)	Oil Rate (m3/day)	Watercut (%)	Month Water (m3)	Cum Water (m3)			
93	61	61	6.78	93	8.4	6.78	19.2	14.5	14.5			
93	231.2	292.2	7.71	93	7.8	7.71	1.3	3.1	17.6			
93	242.5	534.7	8.08	93	8.1	8.08	0.7	1.7	19.3			
94	239.1	773.8	7.71	94	7.8	7.71	0.9	2.1	21.4			
94	233	1006.8	8.3	94	8.3	8.3	0.1	0.3	21.7			
94	288	1294.8	9.3	94	9.4	9.3	1.0	2.9	24.6			
94	250.6	1545.4	8.95	94	9.1	8.95	1.6	4	28.6			
94	269.4	1814.8	8.69	94	8.9	8.69	1.8	5	33.6			
94	157.9	1972.7	7.89	94	8.0	7.89	1.0	1.6	35.2			
94	304.2	2276.9	10.5	94	10.5	10.5	0.1	0.2	35.4			
94	246.4	2523.3	8.2	94	8.2	8.2	0.1	0.3	35.7			
94	209.4	2732.7	7.2	94	7.3	7.2	1.9	4.1	39.8			
94	211.5	2944.2	7.05	94	7.1	7.05	0.7	1.5	41.3			
94	185.9	3130.1	6.41	94	6.5	6.41	1.2	2.2	43.5			
94	186.1	3316.2	6	94	6.1	6	0.9	1.6	45.1			
95	178.7	3494.9	5.96	95	6.0	5.96	1.0	1.8	46.9			
95	150.1	3645	5.36	95	5.4	5.36	1.1	1.7	48.6			
95	158.3	3803.3	5.11	95	5.2	5.11	0.8	1.3	49.9			
95	179.1	3982.4	5.97	95	6.1	5.97	1.4	2.6	52.5			
95	201.8	4184.2	6.73	95	6.8	6.73	1.1	2.3	54.8			
95	207.9	4392.1	9.04	95	9.1	9.04	0.8	1.6	56.4			
95	277.5	4669.6	9.25	95	9.3	9.25	0.9	2.6	59			
95	259.7	4929.3	8.38	95	8.5	8.38	0.9	2.4	61.4			
95	236.9	5166.2	7.9	95	8.0	7.9	0.7	1.7	63.1			
95	257.5	5423.7	8.6	95	8.7	8.6	0.8	2.2	65.3			
95	269.9	5693.6	9	95	9.1	9	0.8	2.3	67.6			
95	266.1	5959.7	8.58	95	8.7	8.58	0.9	2.4	70			
Jan-96	210.5	6170.2	7.52	96	7.5	7.52	0.0	0	70			
Feb-96	181.9	6352.1	7.91	96	7.9	7.91	0.0	0	70			
Mar-96	269.9	6622	8.71	96	8.7	8.71	0.0	0	70			
Apr-96	227.9	6849.9	7.6	96	7.6	7.6	0.0	0	70			
May-96	214	7063.9	7.64	96	7.6	7.64	0.0	0	70			
Jun-96	215.8	7279.7	7.19	96	7.2	7.19	0.0	0	70			

							1-33-10-29						
Year	Month Oil	Cum Oil	Oil Rate	Year	Total Fluid	Oil Rate	Watercut	Month Water	Cum Water				
Feb-95	12.1	12.1	1	95	1.0	1	1	0.1	0.1				
Mar-95	31	43.1	1	95	1.0	1	0	0.1	0.2				
Apr-95	30.4	73.5	1.01	95	1.1	1.01	5	1.6	1.8				
May-95	33	106.5	1.1	95	1.1	1.1	1	0.5	2.3				
Jun-95	84.3	190.8	4.01	95	4.7	4.01	14	13.8	16.1				
Jul-95	191.9	382.7	6.4	95	7.0	6.4	8	17.2	33.3				
Aug-95	134.5	517.2	4.34	95	4.7	4.34	7	9.7	43				
Sep-95	145.1	662.3	5	95	5.2	5	3	4.8	47.8				
Oct-95	145.3	807.6	5.38	95	5.7	5.38	5	7.5	55.3				
Nov-95	134.7	942.3	4.49	95	4.9	4.49	8	11.7	67				
Dec-95	140	1082.3	5	95	5.2	5	4	6	73				
Jan-96	113.2	1195.5	4.53	96	4.7	4.53	4	5.2	78.2				
Feb-96	115.7	1311.2	5.79	96	6.1	5.79	5	6.3	84.5				
Mar-96	129.9	1441.1	4.64	96	5.0	4.64	8	10.6	95.1				
Apr-96	128.7	1569.8	4.44	96	4.5	4.44	2	2.9	98				
May-96	125	1694.8	4.17	96	4.4	4.17	5	7.2	105.2				
Jun-96	105.5	1800.3	4.06	96	4.3	4.06	5	5.8	111				



							3-33-10-29						
Year	Month Oil	Cum Oil	Oil Rate	Year	Total Fluid	Oil Rate	Watercut	Month Water	Cum Water				
Sep-94	183.9	191.9	6.57	94	6.7	6.57	2	2.9	2.9				
Oct-94	218.1	410	7.52	94	7.6	7.52	2	3.5	6.4				
Nov-94	216.8	626.8	7.23	94	7.3	7.23	1	2.5	8.9				
Dec-94	200.5	827.3	6.47	94	6.6	6.47	2	5.1	14				
Jan-95	195.5	1022.8	6.52	95	6.6	6.52	1	1.3	15.3				
Feb-95	164.6	1187.4	5.88	95	6.0	5.88	2	3.3	18.6				
Mar-95	154.2	1341.6	5.93	95	6.1	5.93	2	3.4	22				
Apr-95	164.9	1506.5	5.5	95	5.6	5.5	2	2.8	24.8				
May-95	164.5	1671	5.48	95	5.5	5.48	1	1.8	26.6				
Jun-95	154.4	1825.4	5.15	95	5.3	5.15	2	3	29.6				
Jul-95	151.3	1976.7	5.04	95	5.2	5.04	4	6.3	35.9				
Aug-95	149.3	2126	4.82	95	5.0	4.82	3	4.1	40				
Sep-95	142.9	2268.9	4.76	95	4.8	4.76	2	2.6	42.6				
Oct-95	150.5	2419.4	5.02	95	5.1	5.02	2	3.8	46.4				
Nov-95	157.7	2577.1	5.26	95	5.4	5.26	2	4	50.4				
Dec-95	145.6	2722.7	5.02	95	5.2	5.02	3	4	54.4				
Jan-96	153.5	2876.2	4.95	96	5.1	4.95	3	4.8	59.2				
Feb-96	138	3014.2	4.93	96	4.9	4.93	0	0	59.2				
Mar-96	135.6	3149.8	4.37	96	4.4	4.37	0	0	59.2				
Apr-96	130.1	3279.9	4.34	96	4.3	4.34	0	0	59.2				
May-96	134	3413.9	4.47	96	4.5	4.47	0	0	59.2				
Jun-96	122.8	3536.7	4.09	96	4.1	4.09	0	0	59.2				

Year	Month Oil (m3)	Cum Oil (m3)	Oil Rate (m3/day)	Year	Total Fluid (m3/day)	Oil Rate (m3/day)	Watercut (%)	Month Water (m3)	Cum Water (m3)
Feb-96	108.9	108.9	12.1	Feb-96	12.18	12.1	0.64	0.7	0.7
Mar-96	332.4	441.3	11.46	Mar-96	11.51	11.46	0.47	2.1	2.8
Apr-96	326.9	768.2	10.9	Apr-96	10.90	10.9	0.03	0.2	3
May-96	285.9	1054	12.43	May-96	12.43	12.43	0.03	0.3	3.3
Jun-96	366.3	1414.3	12.02	Jun-96	12.02	12.02	0.13	1.9	5.2
					5-33-10-29				



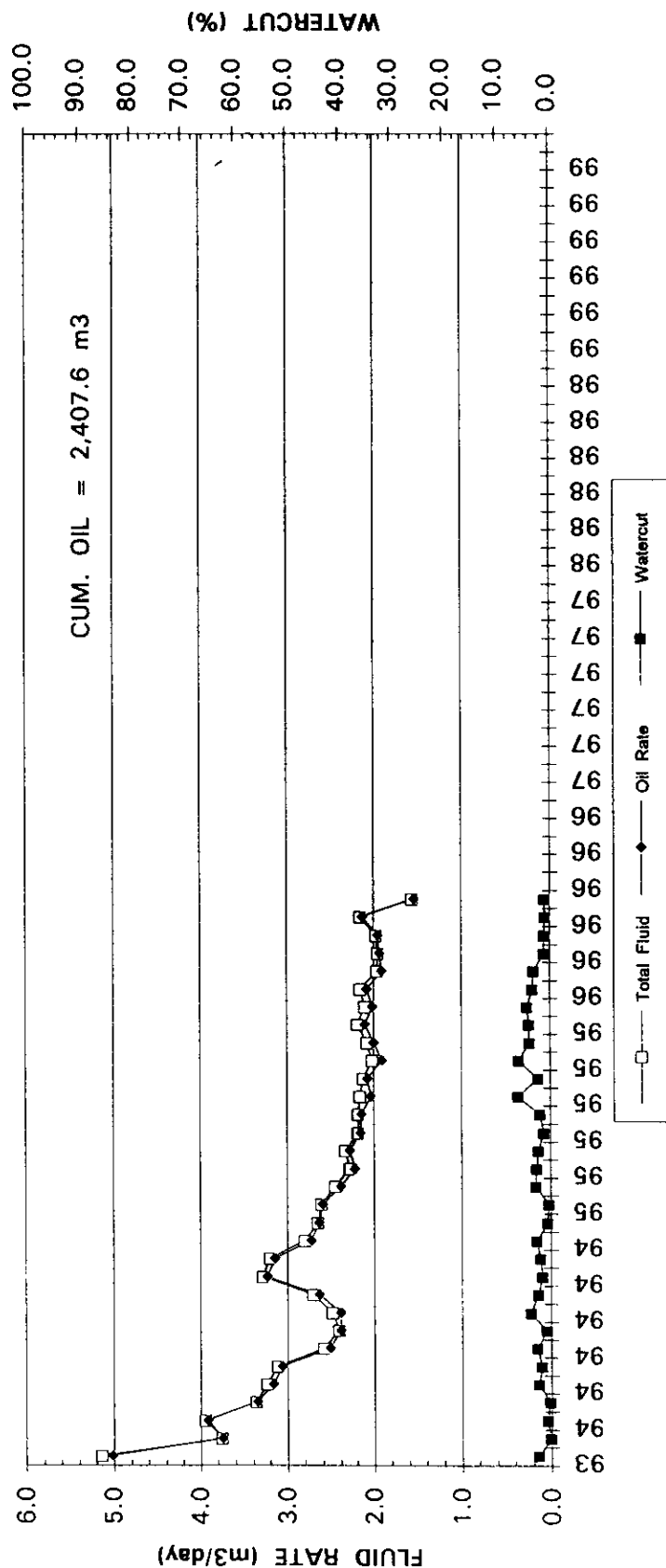


## APPENDIX C

### INDIVIDUAL WELL PRODUCTION PLOTS

# WELL 13-28-10-29 PRODUCTION HISTORY

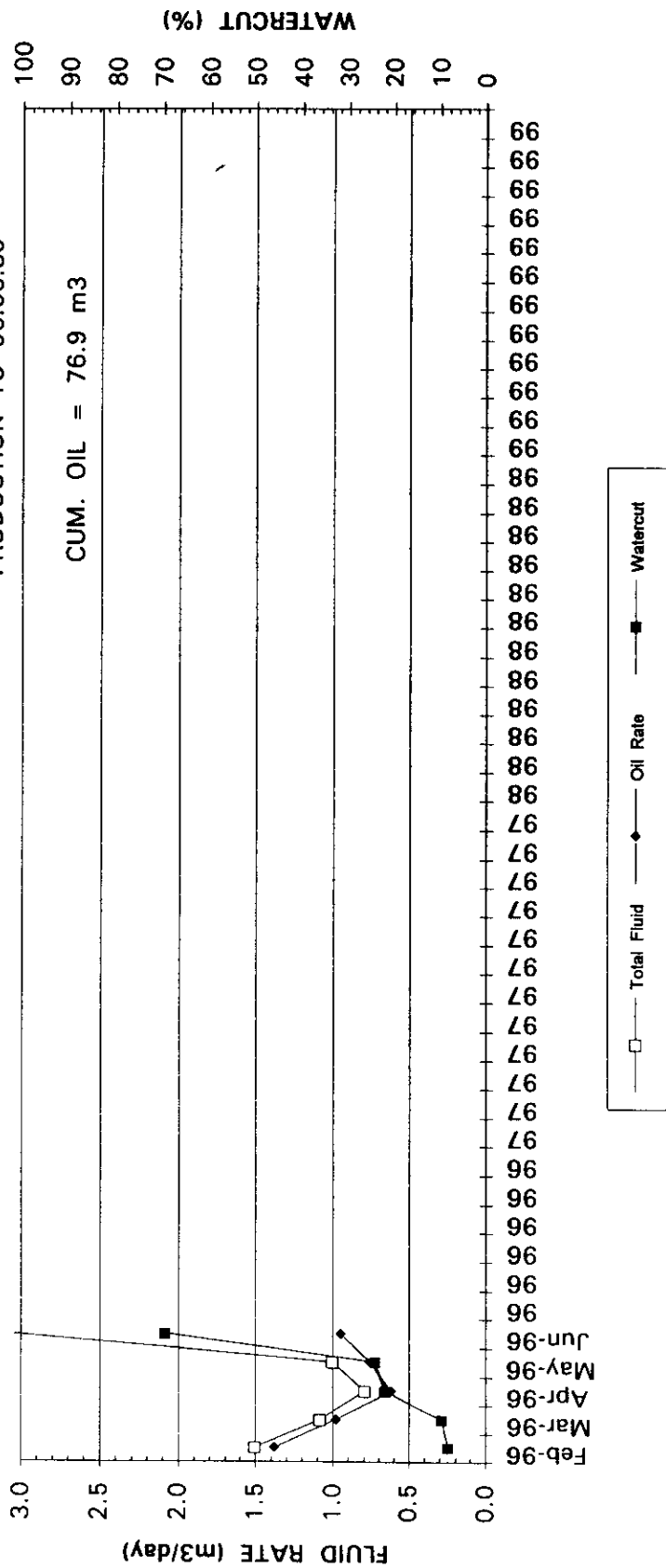
PRODUCTION TO 96.06.30



# WELL 15-28-10-29 PRODUCTION HISTORY

PRODUCTION TO 96.06.30

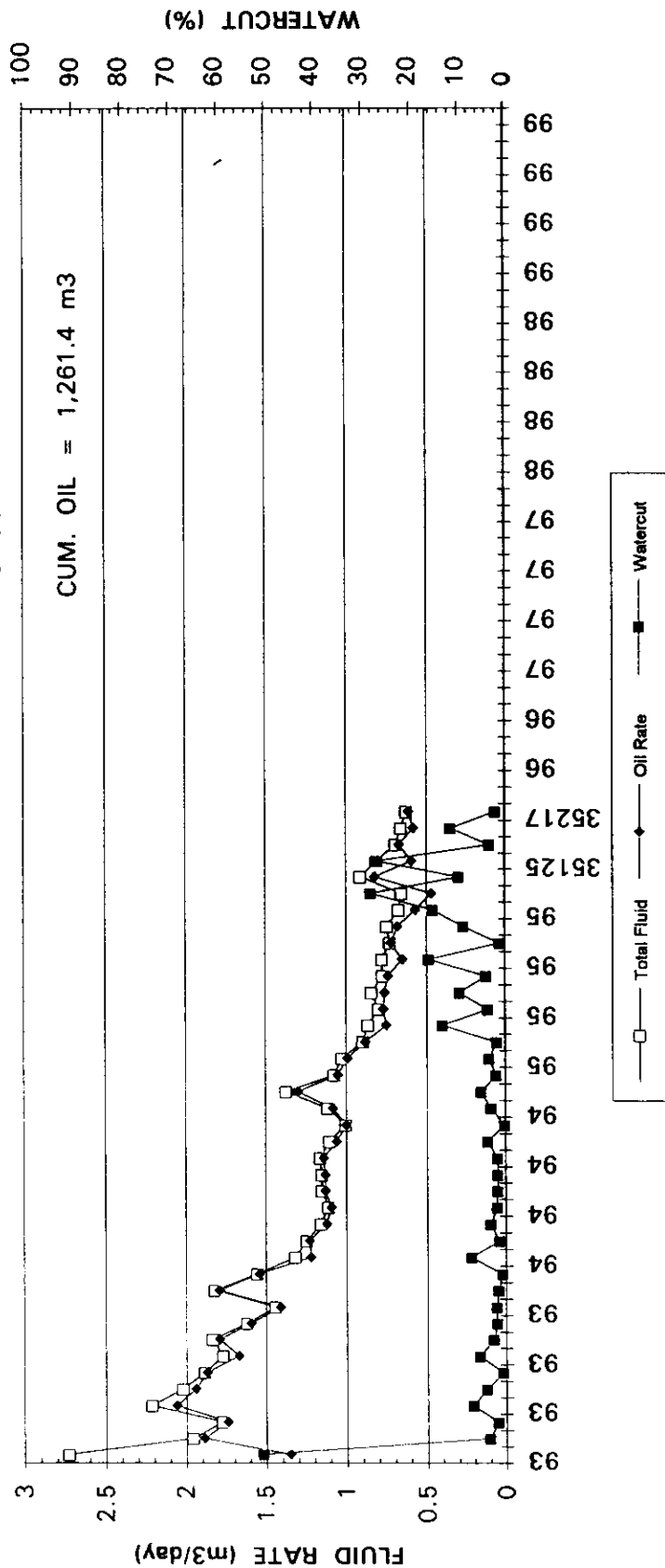
CUM. OIL = 76.9 m3



# WELL 16-29-10-29 PRODUCTION HISTORY

PRODUCTION TO 96.06.30

CUM. OIL = 1,261.4 m3

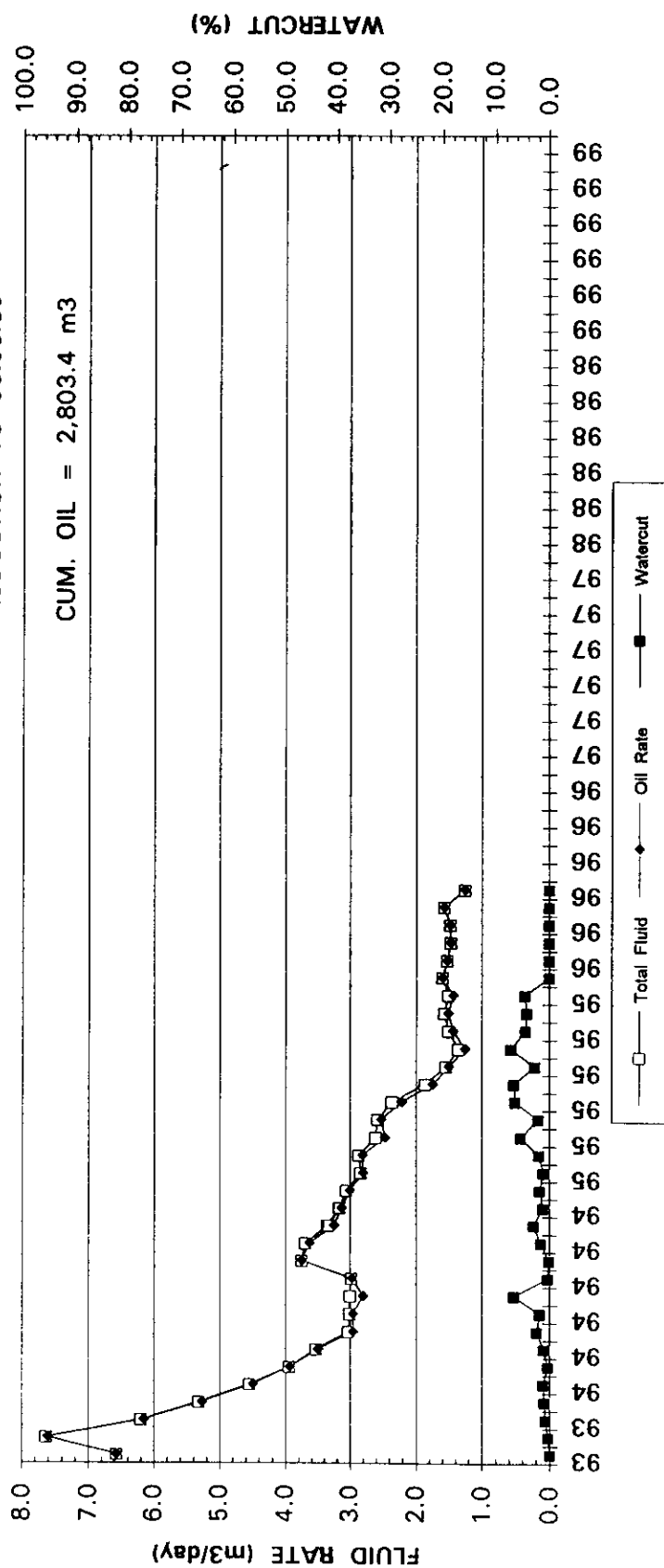




# WELL 1-32-10-29 PRODUCTION HISTORY

PRODUCTION TO 96.06.30

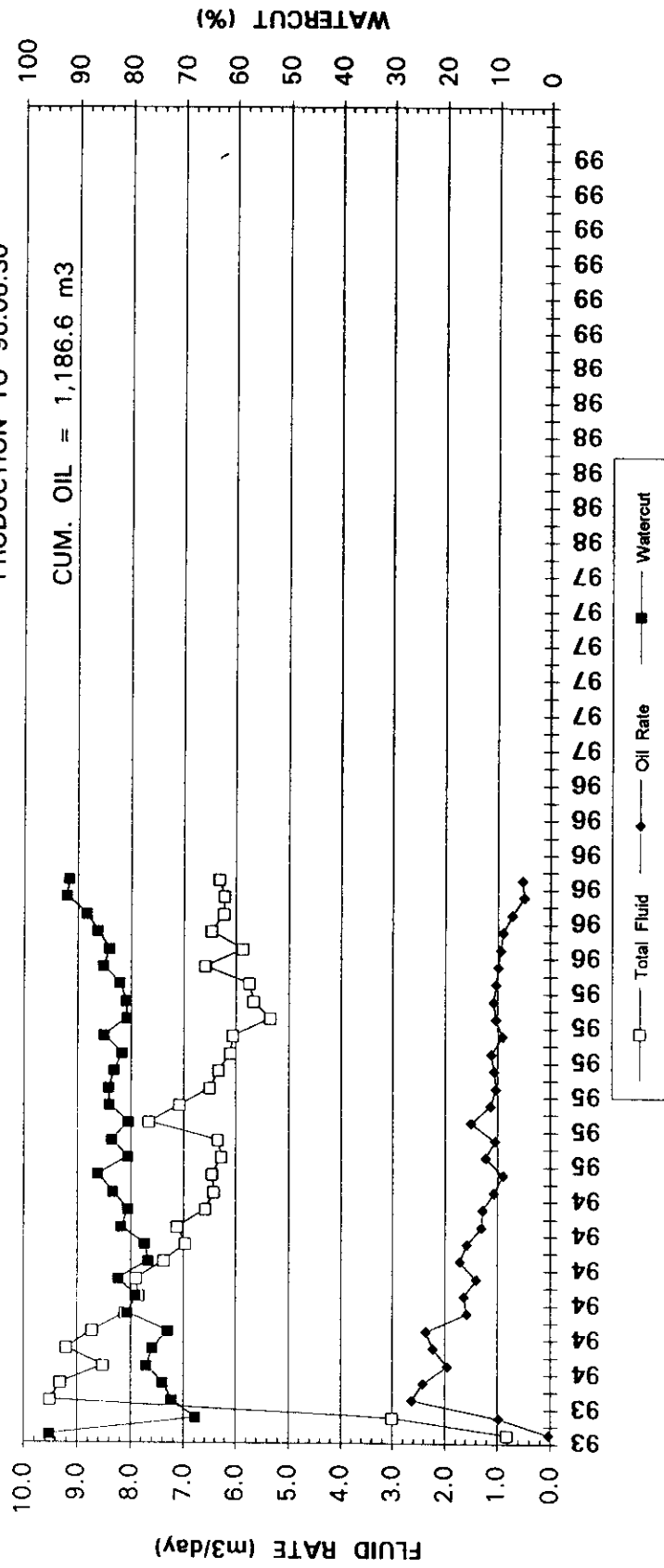
CUM. OIL = 2,803.4 m3



# WELL 2-32-10-29 PRODUCTION HISTORY

PRODUCTION TO 96.06.30

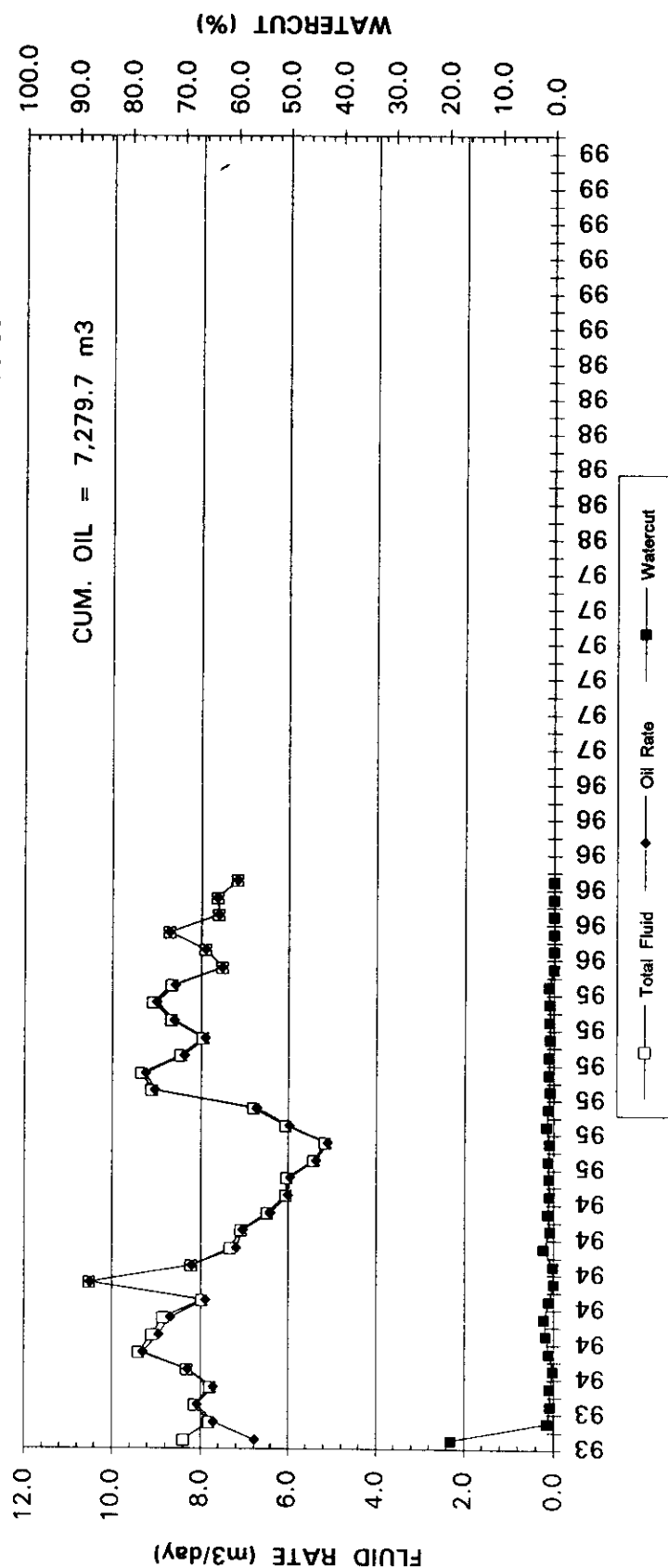
CUM. OIL = 1,186.6 m3



# WELL 8-32-10-29 PRODUCTION HISTORY

PRODUCTION TO 96.06.30

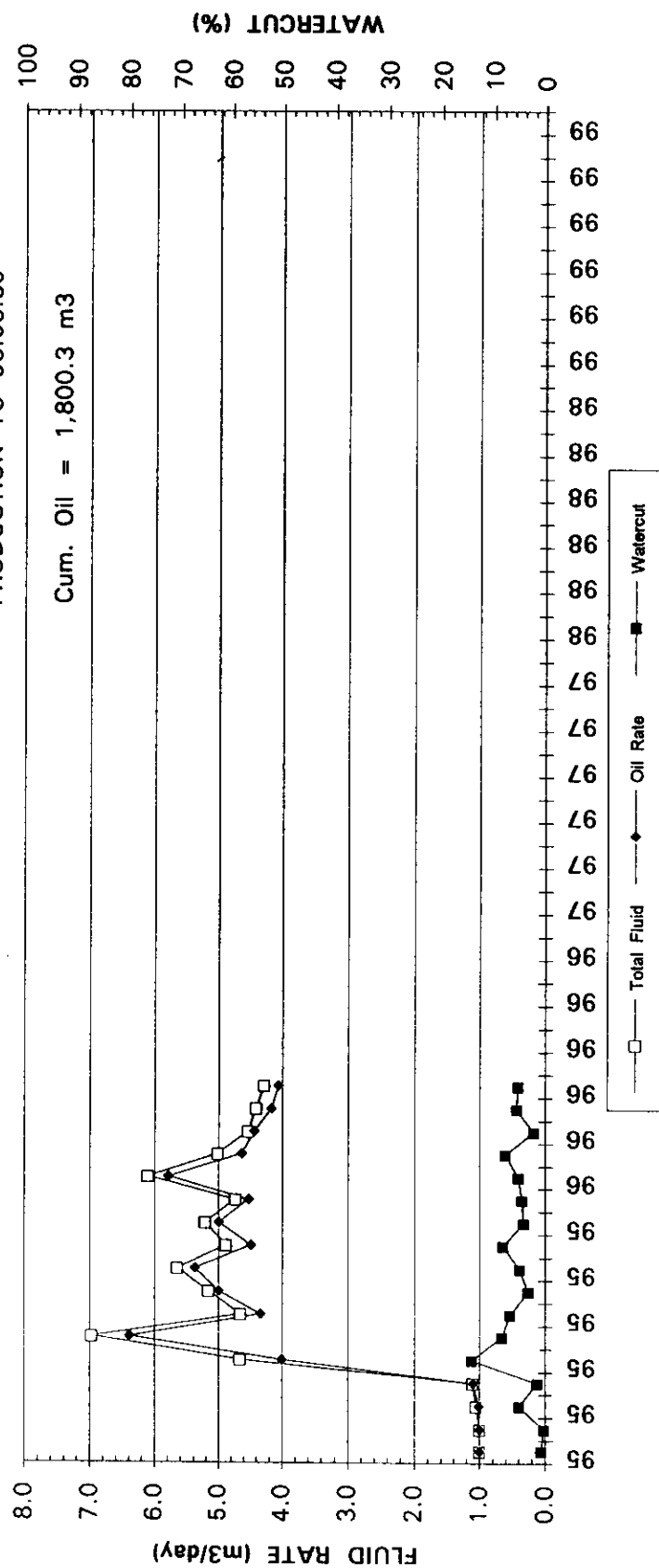
CUM. OIL = 7,279.7 m3



# WELL 1-33-10-29 PRODUCTION HISTORY

PRODUCTION TO 96.06.30

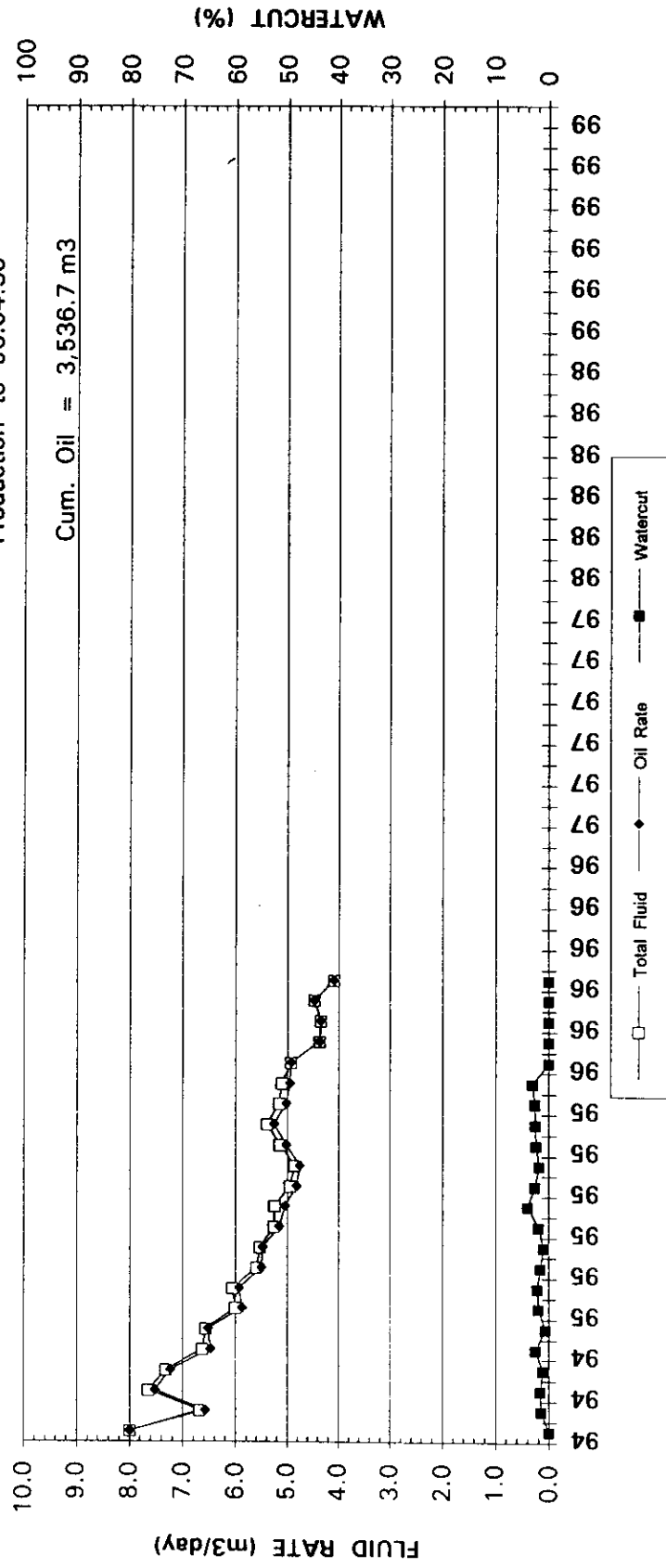
Cum. Oil = 1,800.3 m3



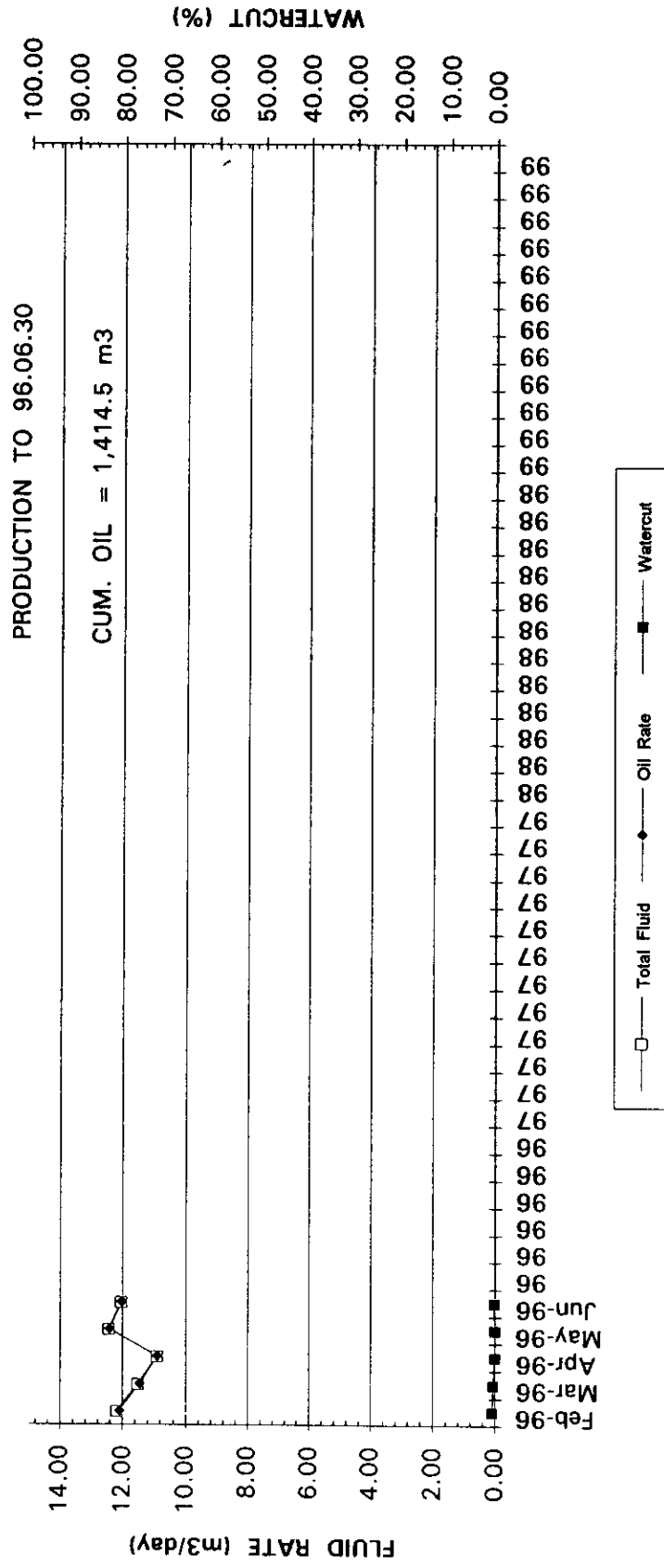
# WELL 3-33-10-29 PRODUCTION HISTORY

Production to 96.04.30

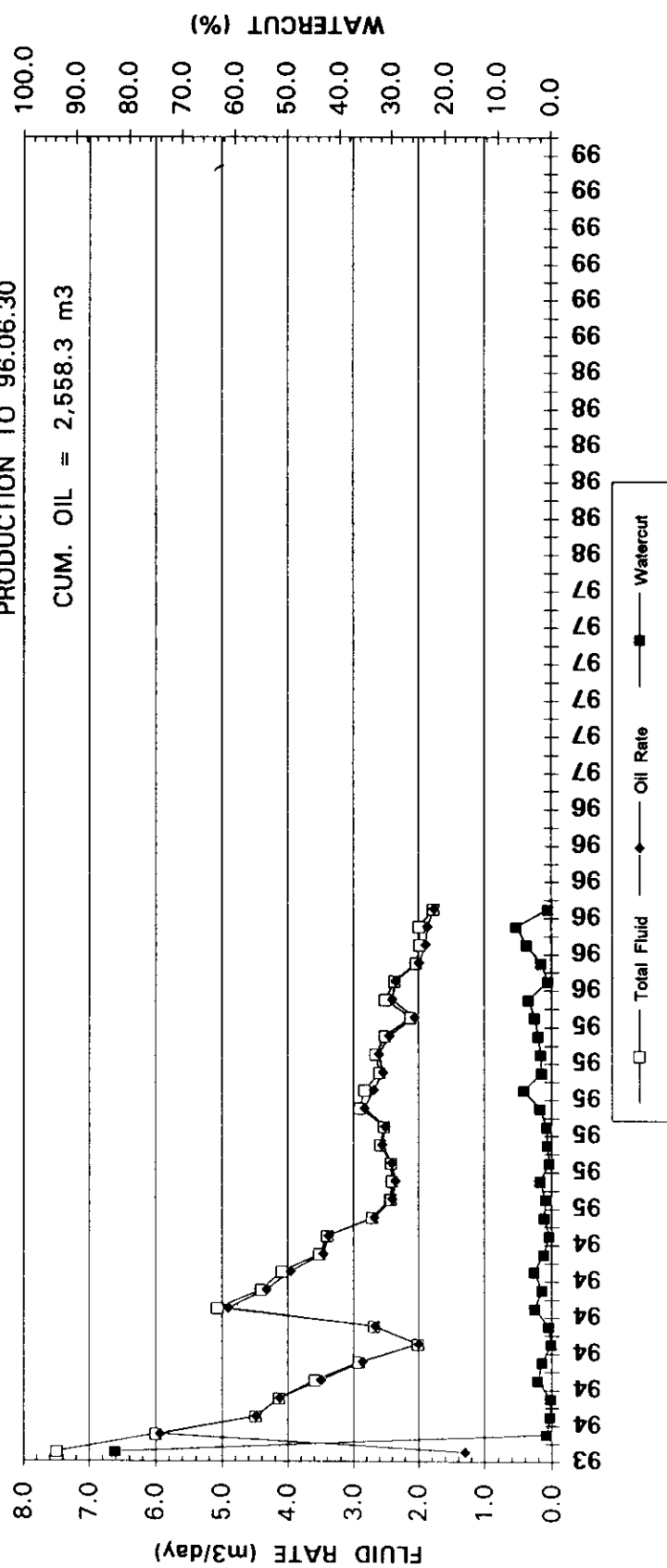
Cum. Oil = 3,536.7 m3



# WELL 5-33-10-29 PRODUCTION HISTORY



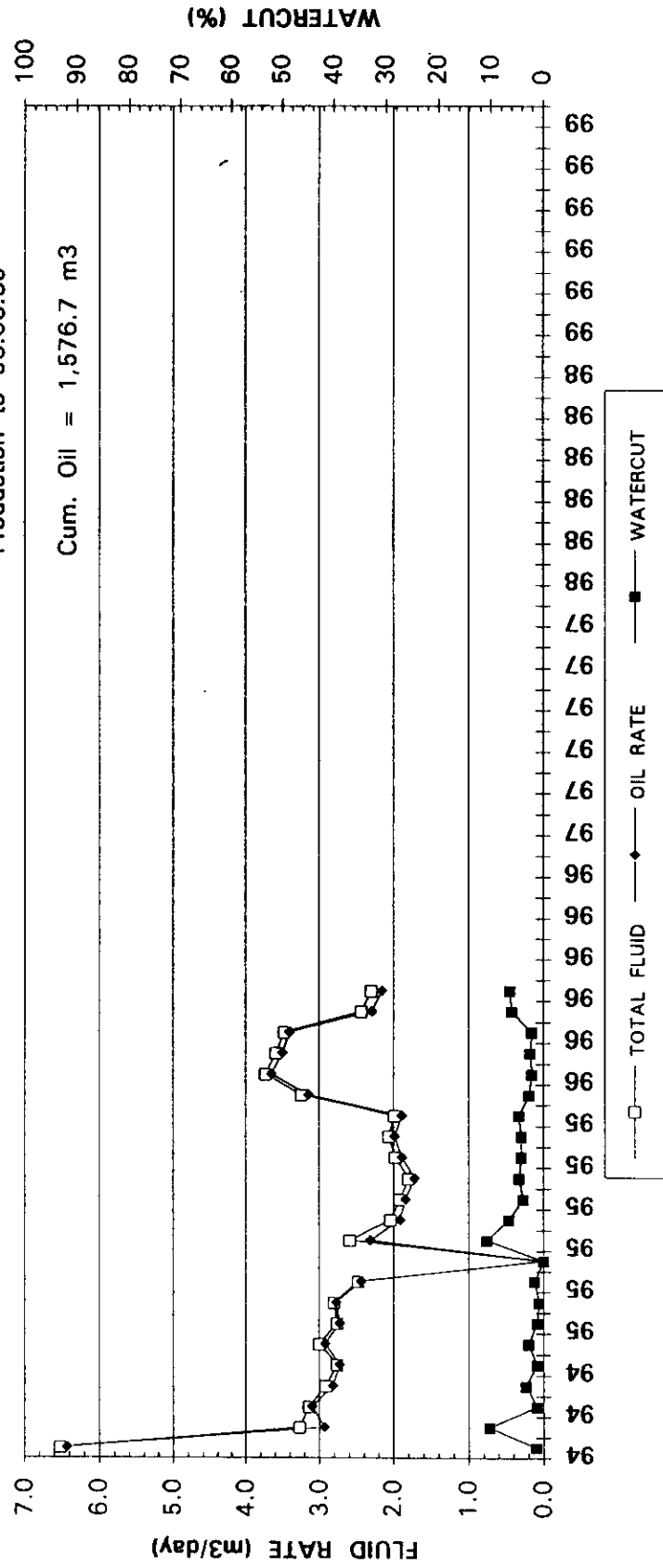
**CUM. OIL = 2,558.3 m3**



# WELL 11-33-10-29 PRODUCTION HISTORY

Production to 96.06.30

Cum. Oil = 1,576.7 m3





## APPENDIX D

### INDIVIDUAL WELL ULTIMATE RECOVERY PREDICTIONS

Data 11/93-06/96

Field: 01

Type: Unkn

॥ श्रीगणेशाय नमः ॥

qi: 3.22668 m3/d, Dec, 1993

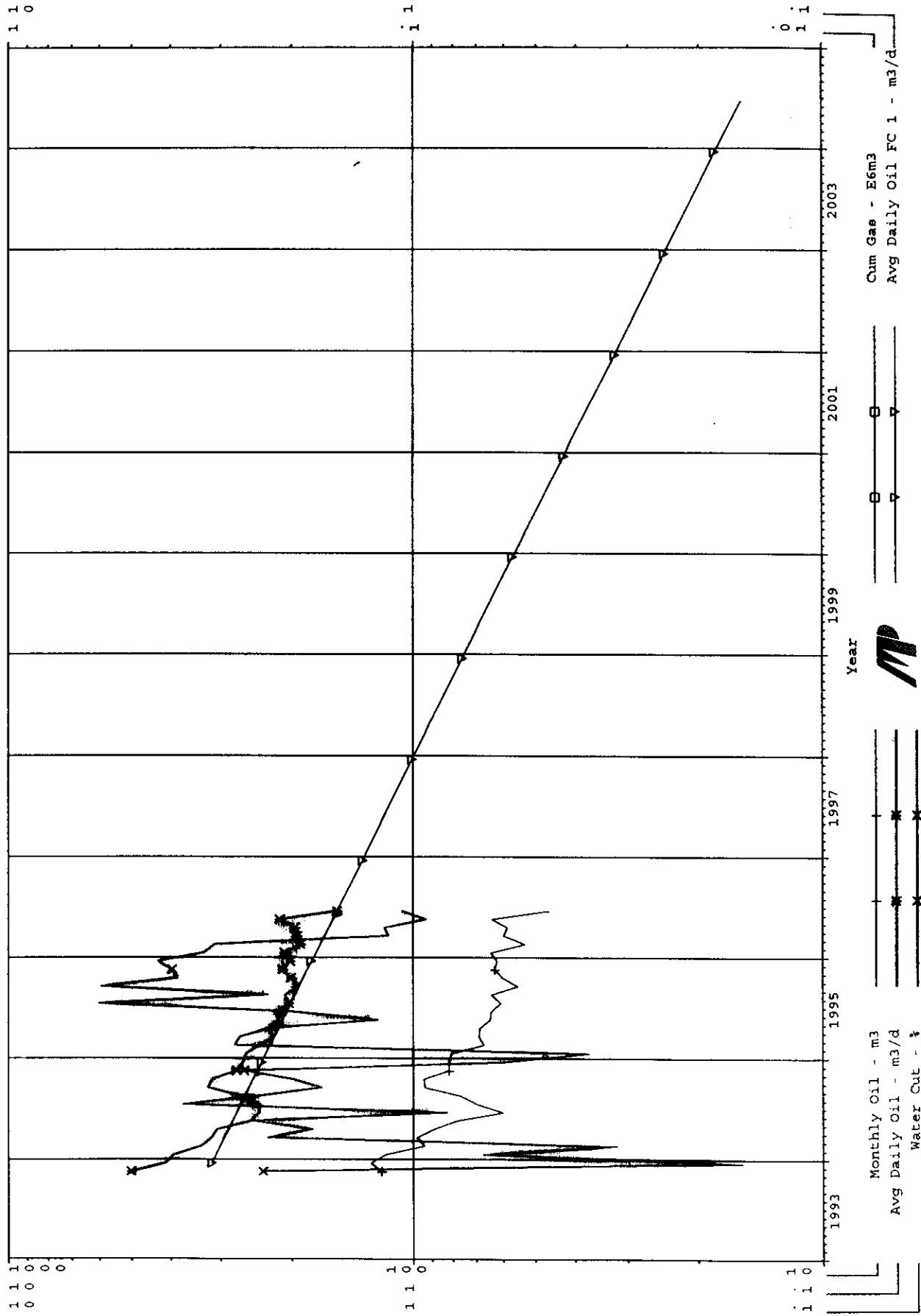
Li(Exp): 24.8094 CTD: 2407.6 m

RR: 1710.96 m3 Tot: 4118.56 m3

il: 2407.6 m3

**Water: 52.3 m3**

Cond: 0 m3



00/16-29-010-29W1/0

(Tundra Daly Prov. R//E16-29-10-29W1)

Data 03/93-06/96

Operator:

Field: 01

Zone: 60A

Type: Unknown

Group: KOLAU2

Avg Daily Oil FC 1 (Rate-Time)

qi: 1.61128 m3/d, Mar, 1993

qf: 0.158788 m3/d, Feb, 2001

di(Exp): 25.1475 CTD: 1261.4 m3

RR: 508.7 m3 Tot: 1770.1 m3

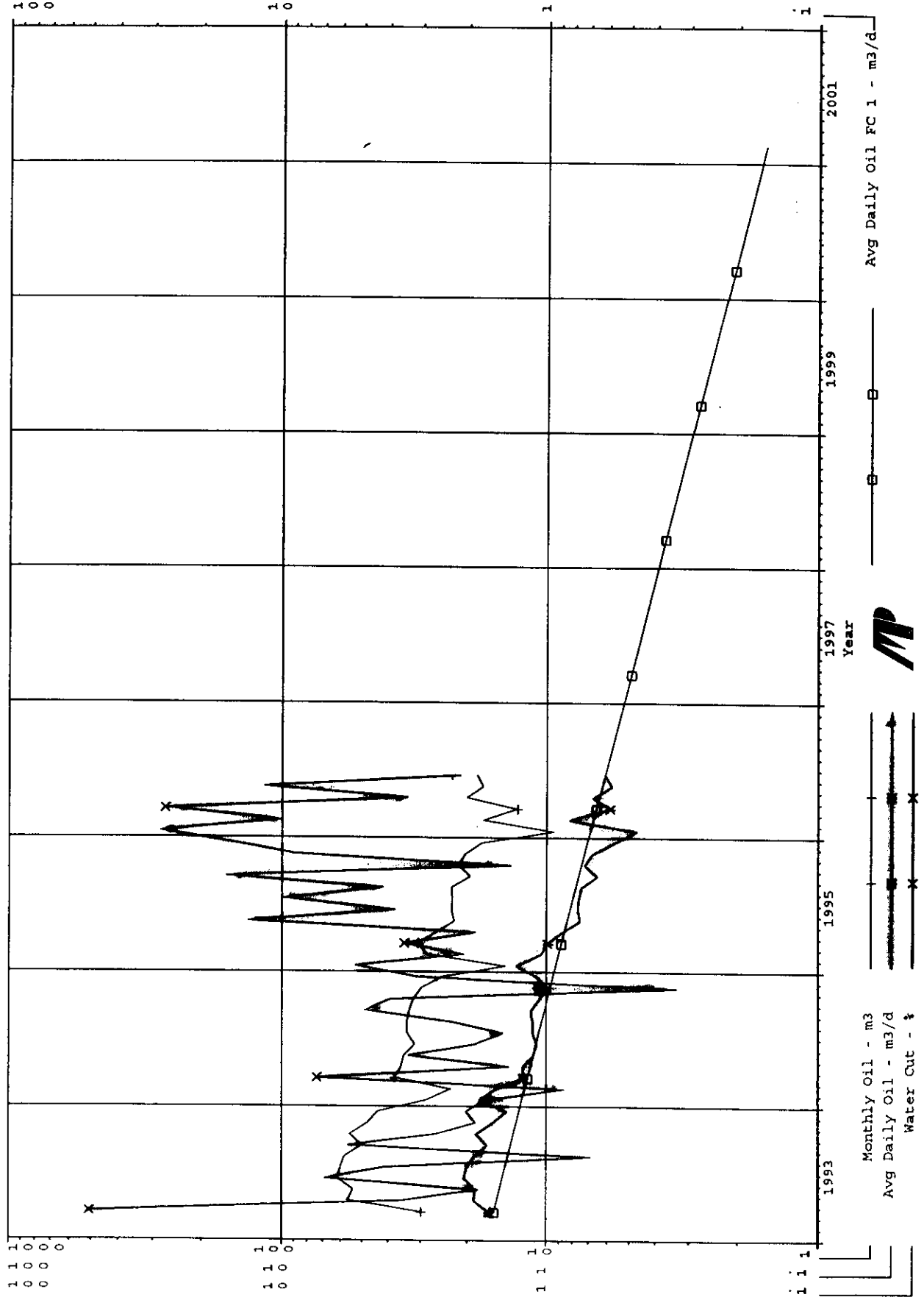
Production Cums

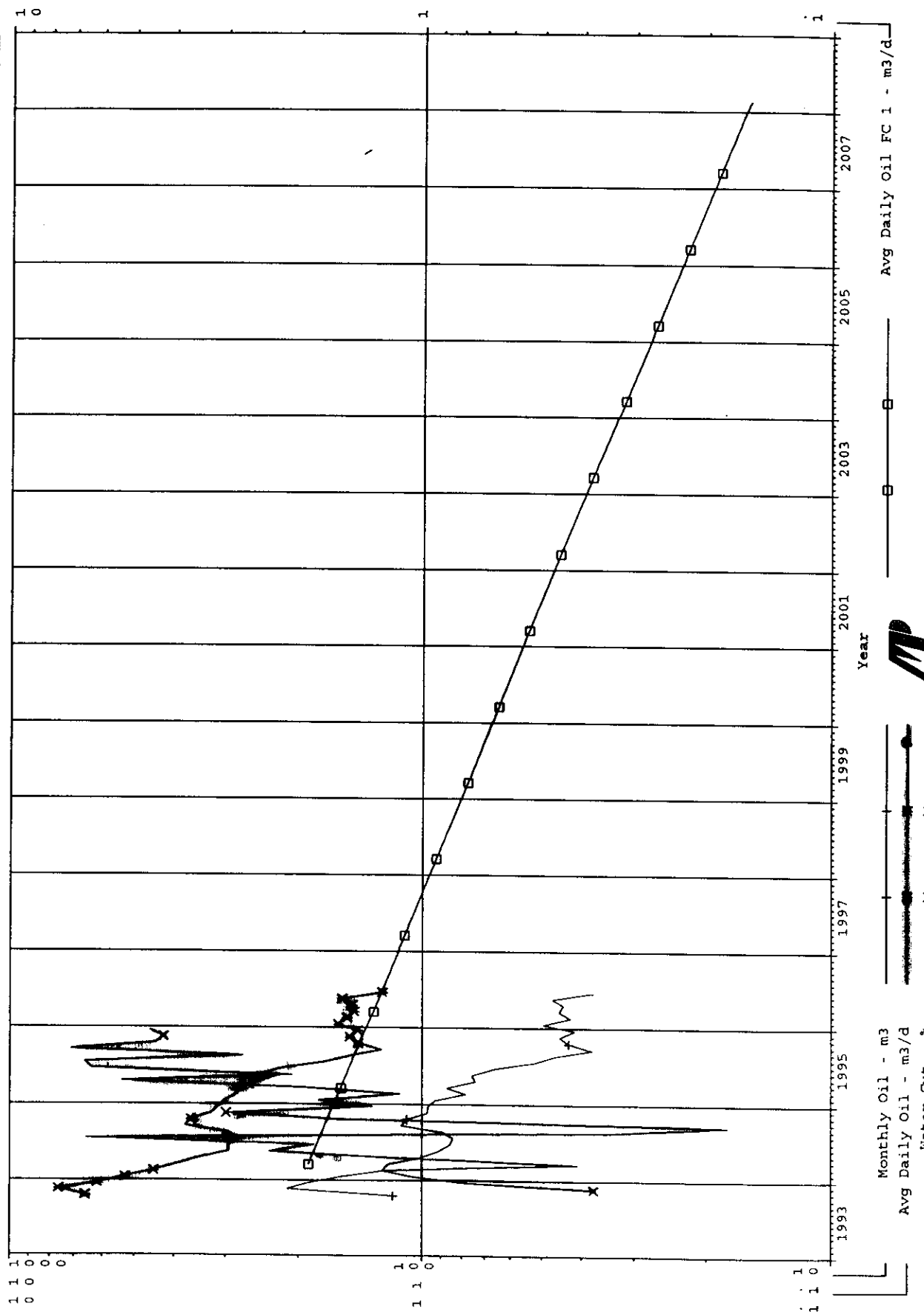
Oil: 1261.4 m3

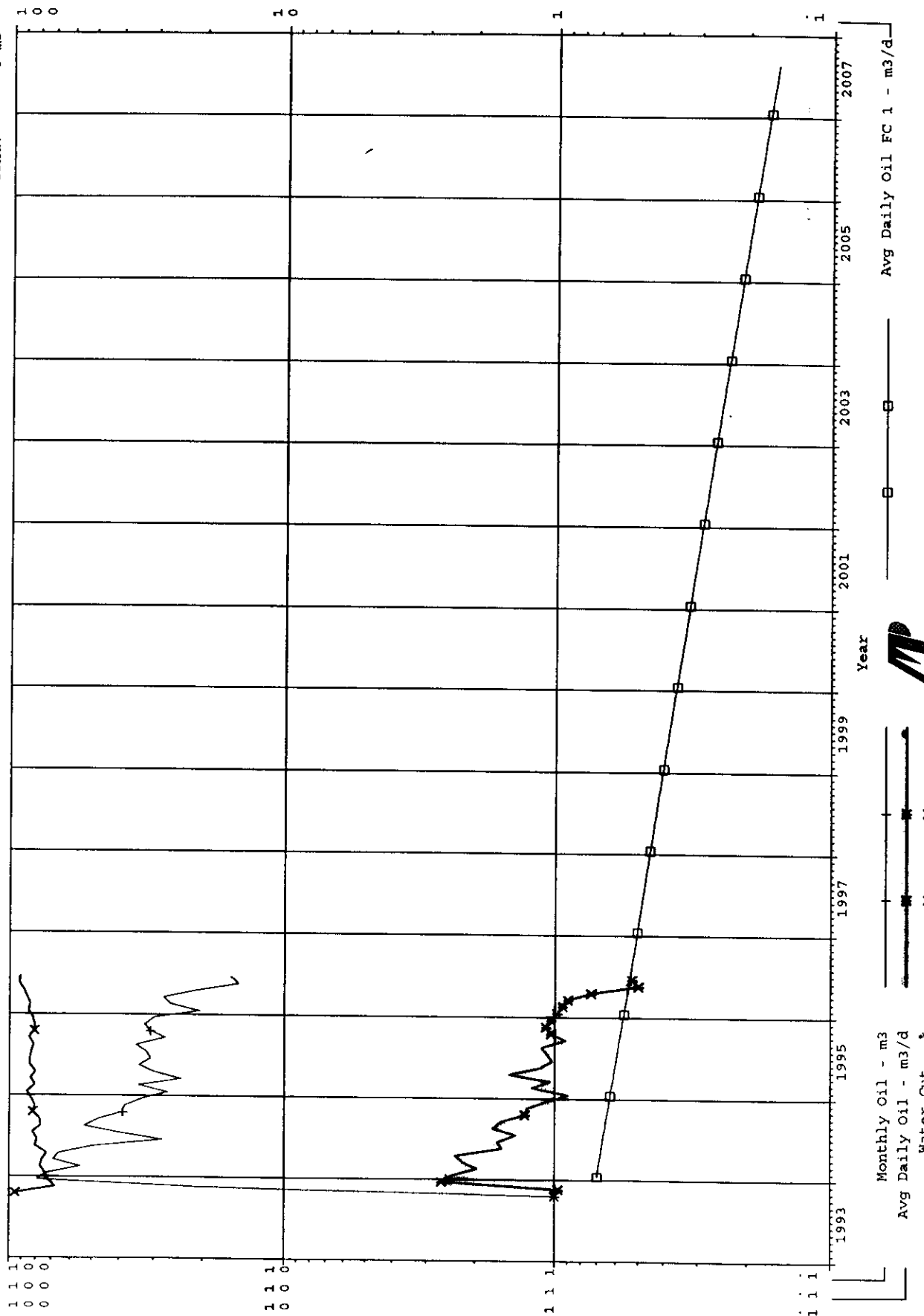
Gas: 0 B6m3

Water: 92.7 m3

Cond: 0 m3





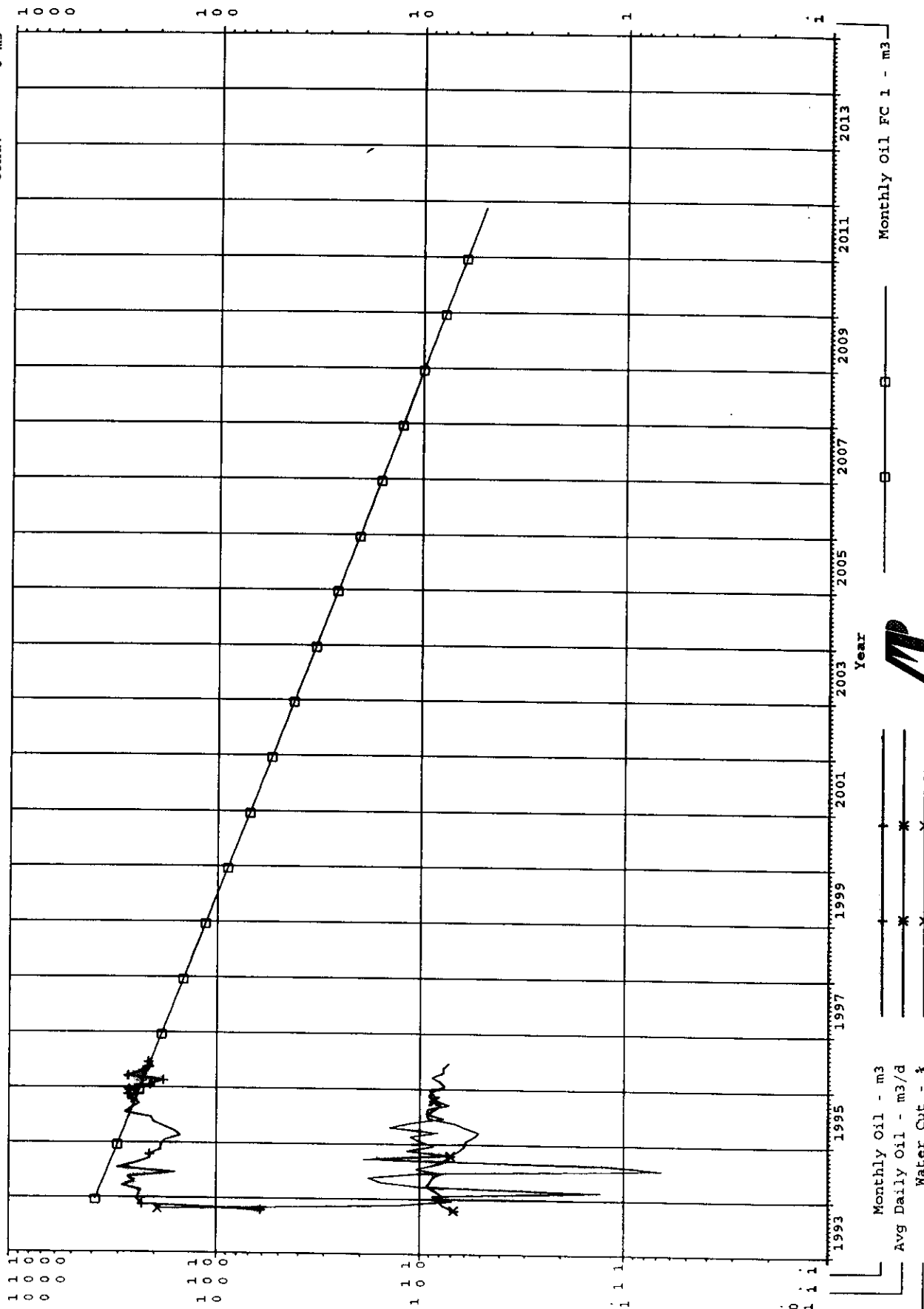


00/08-32-010-29W1/0 (Tundra Daly R//E08-32-10-29W1) Data 10/93-06/96

Operator:  
Field: 01  
Zone: 60A  
Type: Unknown  
Group: KOLAU2

Production Cums  
Oil: 7279.7 m3  
Gas: 0 B6m3  
Water: 70 m3  
Cond: 0 m3

Monthly Oil FC 1 (Rate-Time)  
qi: 393.406 m3, Dec, 1993  
qf: 4.90153 m3, Nov, 2011  
di(Exp): 21.622 CTD: 7279.7 m3  
RR: 10085.2 m3 Tot: 17364.9 m3

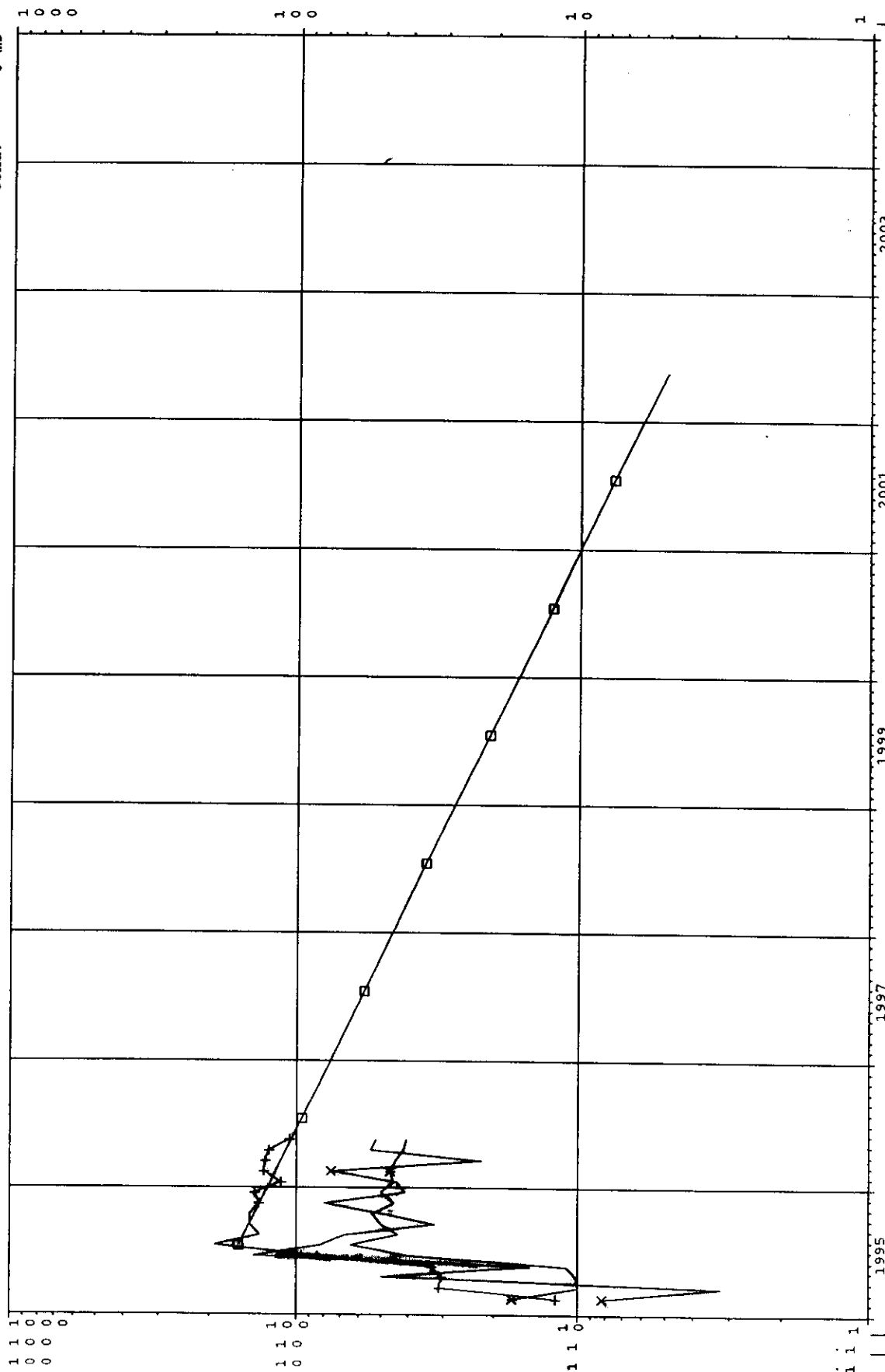


00/01-33-010-29W1/0 (Tundra Daly R//E01-33-10-29W1) Data 02/95-06/96

Operator:  
Field: 01  
Zone: 60A  
Type: Unknown  
Group: KOLAU2

Monthly Oil FC 1 (Rate-Time)  
qi: 165.416 m3, Jul, 1995  
qf: 4.9893 m3, May, 2002  
di(Exp): 39.7214 CTD: 1684.6 m3  
RR: 2245.5 m3 Tot: 3930.1 m3

Production Cums  
Oil: 1684.6 m3  
Gas: 0 E6m3  
Water: 104.7 m3  
Cond: 0 m3



Year

Monthly Oil - m3  
Avg Daily Oil - m3/d  
Water Cut - %



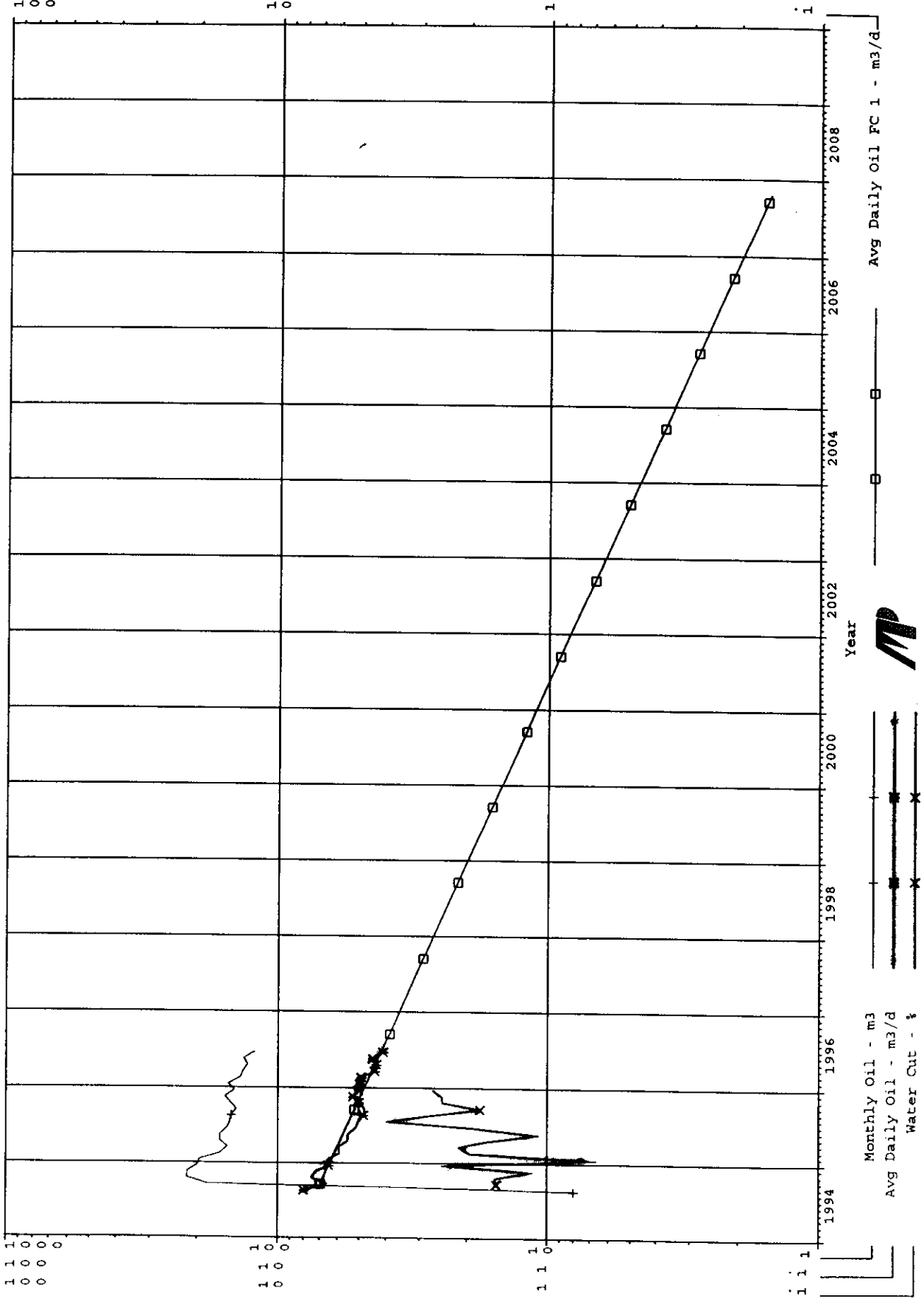
Monthly Oil FC 1 - m3

00/03-33-010-29W1/0 (Tundra Daily R//E03-33-10-29W1) Data 08/94-06/96

Operator:  
Field: 01  
Zone: 60A  
Type: Unknown  
Group: KOLAU2

Avg Daily Oil FC 1 (Rate-Time)  
qi: 7.1218 m3/d, Sep, 1994  
qf: 0.155346 m3/d, Oct, 2007  
di (Exp): 25.2129 CTD: 3536.7 m3  
RR: 4848.54 m3 Tot: 8385.24 m3

Production Cums  
Oil: 3536.7 m3  
Gas: 0 B6m3  
Water: 54.4 m3  
Cond: 0 m3



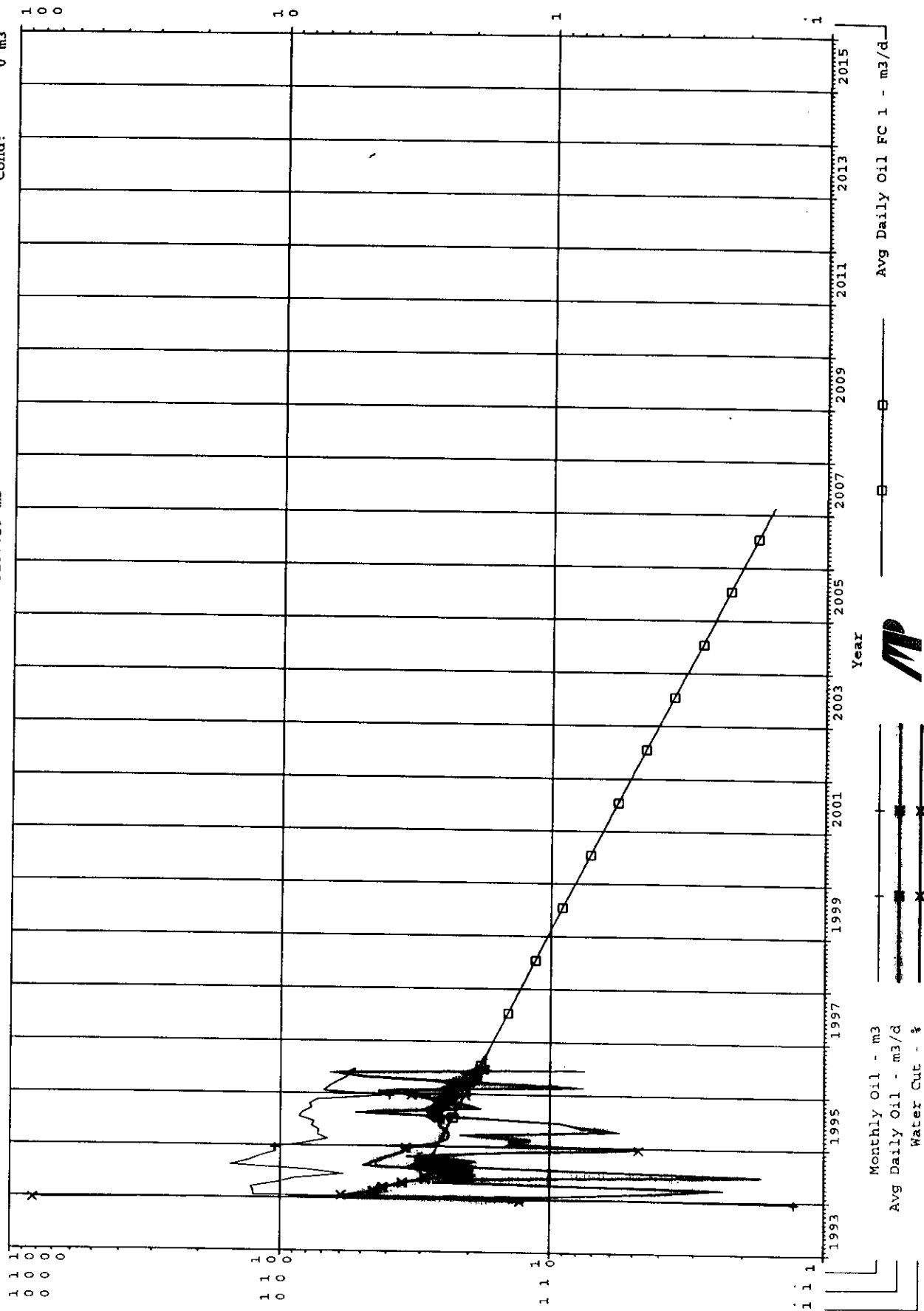


00/07-33-010-29W1/0 (Tundra Daly R//E07-33-10-29W1) Data 01/93-06/96

Operator:  
Field: 01  
Zone: 60A  
Type: Unknown  
Group: KOLAU2

Avg Daily Oil FC 1 (Rate-Time)  
qi: 2.93327 m3/d, Jul, 1994  
qf: 0.15788 m3/d, Feb, 2007  
di(Exp): 20.6012 CTD: 2558.8 m3  
RR: 2628.49 m3 Tot: 5187.29 m3

Production Cums  
Oil: 2558.8 m3  
Gas: 0 E6m3  
Water: 57.2 m3  
Cond: 0 m3



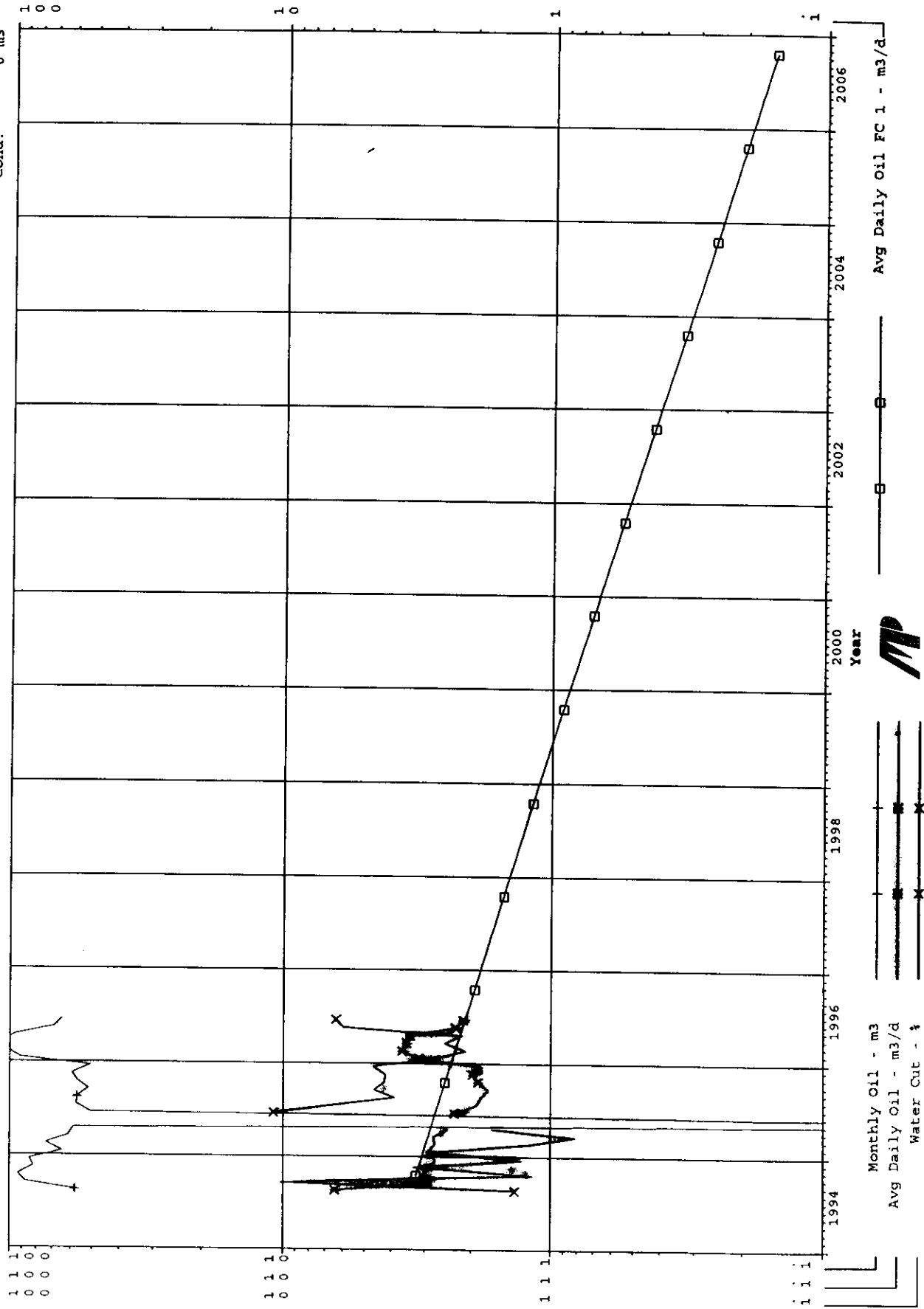
Data 08/94-06/96

(Tundra Daly R//E11-33-10-29W1)

Operator:  
Field: 01  
Zone: 60A  
Type: Unknown  
Group: KOLAU2

Avg Daily Oil FC 1 (Rate-Time)  
qi: 3.29555 m3/d, Oct, 1994  
qf: 0.156631 m3/d, Oct, 2006  
di(Exp): 22.2848 CTD: 1576.7 m  
RR: 2551.06 m3 Tot: 4127.76 m3

Production Cums	
Oil:	1576.7 m3
Gas:	0 E6m3
Water:	61.2 m3
Cond:	0 m3



## APPENDIX E

CORE REPORTS WELLS 1-32-10-29 AND 3-33-10-29

# CORE REPORT ANALYSIS

WELL 1-32-10-29 W1M

# CORE LABORATORIES

Company : TUNDRA OIL AND GAS LTD.  
 Well : TUNDRA ET AL DALY 1-32-10-29

Field : DALY  
 Formation : BAKKEN SAND

File No.: 52131-93-5062  
 Date : 1993 10 02

TABLE I  
 SUMMARY OF CORE DATA

ZONE AND CUTOFF DATA		CHARACTERISTICS REMAINING AFTER CUTOFFS	
ZONE:		ZONE:	
Identification	BAKKEN SAND	Number of Samples	23
Top Depth	861.67 m	Thickness Represented	5.59 m
Bottom Depth	867.26 m		
Number of Samples	23		
DATA TYPE:		POROSITY:	
Porosity	(HELIUM)	Storage Capacity	0.915 $\phi$ -m
Permeability	(MAXIMUM) Kair	Arithmetic Average	0.169 frac
		Minimum	0.115 frac
		Maximum	0.224 frac
		Median	0.174 frac
		Standard Deviation	$\pm 0.030$ frac
CUTOFFS:		GRAIN DENSITY:	
Porosity (Minimum)	0.000 frac	Arithmetic Average	2736. kg/m <sup>3</sup>
Porosity (Maximum)	1.000 frac	Minimum	2680. kg/m <sup>3</sup>
Permeability (Minimum)	0.0000 mD	Maximum	2940. kg/m <sup>3</sup>
Permeability (Maximum)	100000. mD	Median	2730. kg/m <sup>3</sup>
Water Saturation (Maximum)	1.000 frac	Standard Deviation	$\pm 52. \text{ kg/m}^3$
Oil Saturation (Minimum)	0.000 frac		
Grain Density (Minimum)	2000. kg/m <sup>3</sup>		
Grain Density (Maximum)	3000. kg/m <sup>3</sup>		
Lithology Excluded	NONE		
		PERMEABILITY:	
		Flow Capacity	90.77 mD-m
		Arithmetic Average	16.6 mD
		Geometric Average	1.87 mD
		Harmonic Average	0.19 mD
		Minimum	0.02 mD
		Maximum	232. mD
		Median	1.90 mD
		Standard Dev. (Geom)	$K \cdot 10^{\pm 1.001}$ mD
		HETEROGENEITY (Permeability):	
		Dykstra-Parsons Var.	0.901
		Lorenz Coefficient	0.789
		AVERAGE SATURATIONS (Pore Volume):	
		Oil	0.139 frac
		Water	0.659 frac

# CORE LABORATORIES

Company : TUNDRA OIL AND GAS LTD.  
Well : TUNDRA ET AL DALY 1-32-10-29  
Location : LSD XX/01-32-010-29 W1M/X  
Province : MANITOBA, CANADA

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

File No.: 52131-93-5062  
Date : 1993 10 02  
Analysts: RJH/SGP  
Core Dia: 89

## 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/m <sup>3</sup>	GRAIN DENSITY kg/m <sup>3</sup>	SATURATION		DESCRIPTION
				(MAXIMUM) Kair mD	(90 DEG) Kair mD	(VERTICAL) Kair mD						(PORE VOLUME) OIL frac	WATER frac	
-	856.00- 57.50	1.50												ls shbks
-	857.50- 61.12	3.62												sh
NA	861.12- 61.67	0.55												ss vshy
1	861.67- 62.10	0.43	0.18	0.02	0.01	<.01	0.009	0.115	0.052	2450.	2770.	0.000	0.933	ss vf slty shy
2	862.10- 62.18	0.08	-	4.48	-	-	0.358	0.205	0.016	-	2940.	0.140	0.689	ss vf slty dol shy pyr
3	862.18- 62.48	0.30	0.22	0.46	0.16	0.02	0.138	0.156	0.048	2340.	2780.	0.119	0.772	ss vf slty shy foss
4	862.48- 62.69	0.21	0.10	3.94	1.19	0.27	0.827	0.197	0.042	2220.	2760.	0.079	0.711	ss vf slty shy
5	862.69- 63.06	0.37	0.30	2.04	1.67	0.15	0.755	0.147	0.056	2350.	2750.	0.087	0.767	ss vf slty shy
6	863.06- 63.25	0.19	-	-	-	-	-	-	-	-	-	0.222	0.447	41.5 API
AST	863.25- 63.31	0.06	-	0.42	0.39	0.04	0.025	0.160	0.010	2300.	2740.	0.000	0.888	ss vf f slty shy shbks lam
7	863.31- 63.44	0.13	0.09	1.47	1.40	0.04	0.191	0.168	0.022	2270.	2730.	0.113	0.580	ss vf f slty shy shbks
8	863.44- 63.79	0.35	0.20	0.42	0.39	0.04	0.147	0.160	0.056	2300.	2740.	0.000	0.888	ss vf f slty shy shbks lam
9	863.79- 64.09	0.30	0.18	0.18	0.17	0.04	0.054	0.143	0.042	2360.	2750.	0.000	0.916	ss vf f slty shy lam
10	864.09- 64.39	0.30	0.22	0.25	0.25	0.03	0.075	0.140	0.042	2370.	2760.	0.000	0.857	ss vf f slty shy lam
11	864.39- 64.59	0.20	0.14	1.76	1.72	0.40	0.352	0.163	0.032	2280.	2720.	0.238	0.649	ss vf f slty shbks lam
12	864.59- 64.91	0.32	0.20	0.77	0.75	0.65	0.246	0.142	0.045	2330.	2710.	0.263	0.624	ss vf m slty pyr lam 40.5 API
13	864.91- 65.19	0.28	0.12	33.9	32.4	0.56	9.492	0.206	0.059	2160.	2720.	0.210	0.511	ss vf f slty pyr lam
14	865.19- 65.37	0.18	0.11	58.2	53.5	5.91	10.476	0.224	0.040	2120.	2730.	0.214	0.408	ss vf m slty pyr lam
15	865.37- 65.57	0.20	0.13	232.	87.8	0.32	46.400	0.216	0.044	2120.	2700.	0.179	0.431	ss vf m slty pyr lam
16	865.57- 65.89	0.32	0.18	17.0	17.1	0.22	5.440	0.174	0.054	2240.	2710.	0.209	0.486	ss vf f slty shbks lam
17	865.89- 66.09	0.20	0.11	13.9	12.1	0.40	2.780	0.200	0.040	2170.	2710.	0.192	0.507	ss vf f slty pyr lam
18	866.09- 66.39	0.30	0.19	3.29	1.53	0.29	0.987	0.176	0.054	2240.	2720.	0.205	0.619	ss vf f slty pyr lam
19	866.39- 66.67	0.28	0.12	35.5	33.6	0.68	9.940	0.205	0.056	2150.	2700.	0.232	0.486	ss vf f slty pyr lam
20	866.67- 66.83	0.16	0.08	1.48	1.41	0.36	0.237	0.173	0.027	2220.	2880.	0.244	0.544	ss vf f slty shbks pyr lam
21	866.83- 67.12	0.29	0.25	6.29	5.57	0.22	1.824	0.180	0.052	2250.	2740.	0.168	0.559	ss vf f slty pyr lam

CORE NO. 1 856.00 - 873.25m (Core Received 17.10m) (13 Boxes)

# CORE LABORATORIES

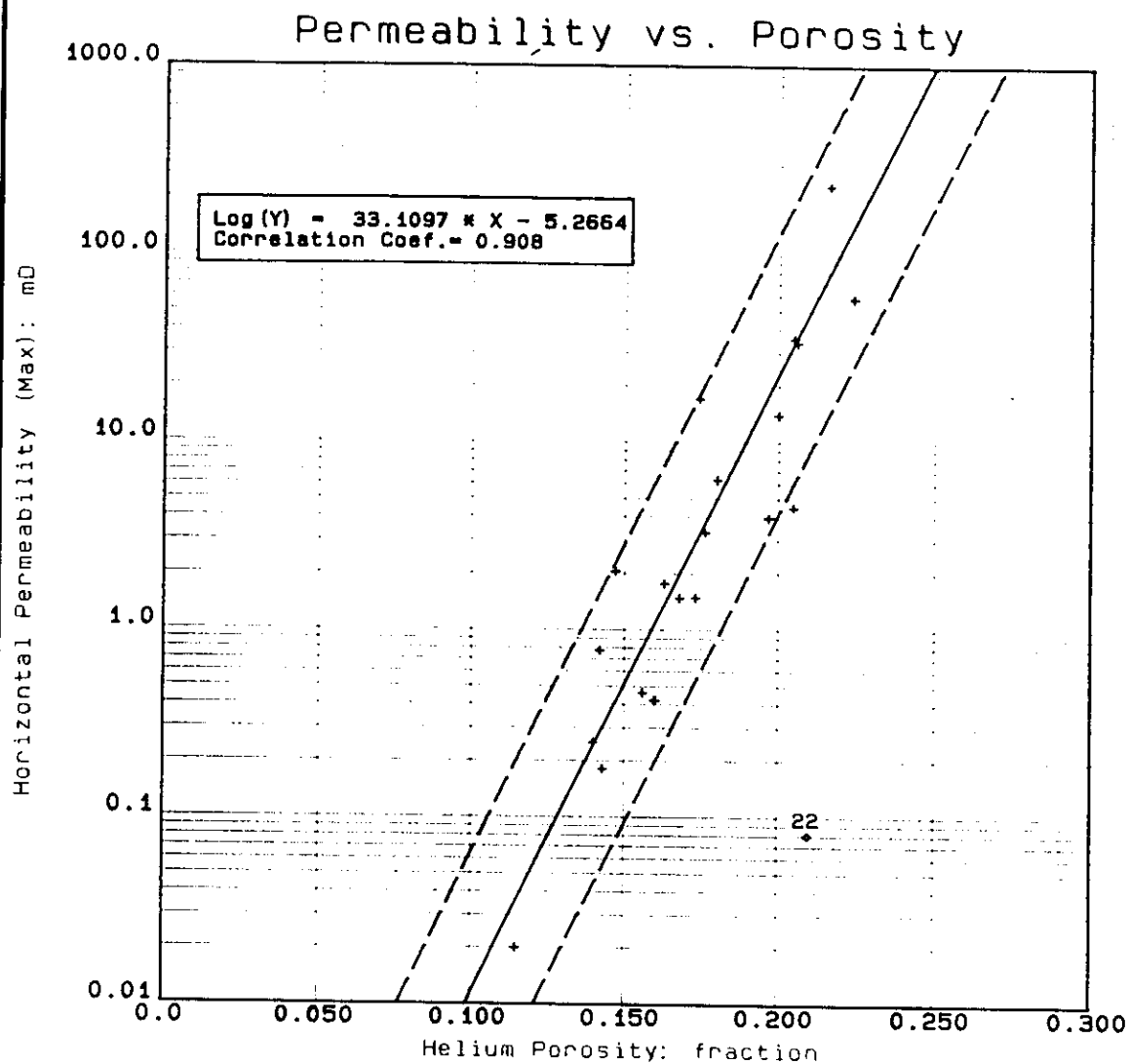
Company : TUNDRA OIL AND GAS LTD.  
Well : TUNDRA ET AL DALY 1-32-10-29

Field : DALY  
Formation : BAKKEN SAND

File No.: 52131-93-5062  
Date : 1993 10 02

## CORE ANALYSIS RESULTS

SAMPLE NUMBER	DEPTH m	INTVL REP m	SAMPLE LENGTH m	PERMEABILITY		CAPACITY (MAXIMUM) Kair mD-m	POROSITY (HELIUM) fraction	CAPACITY (HELIUM) cm	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	
SP 22	867.12- 67.26	0.14	-	0.08	-	-	0.011	0.210	-	2700.	0.045	0.873	ss vf silty vshy pyr anhy



#### TUNDRA OIL AND GAS LTD.

TUNDRA ET AL DALY

1-32-10-29 W1M

DALY, MANITOBA

FILE NO. 52131-93-5062

FORMATION: BAKKEN SAND

(861.67 - 867.26m)

Core Laboratories

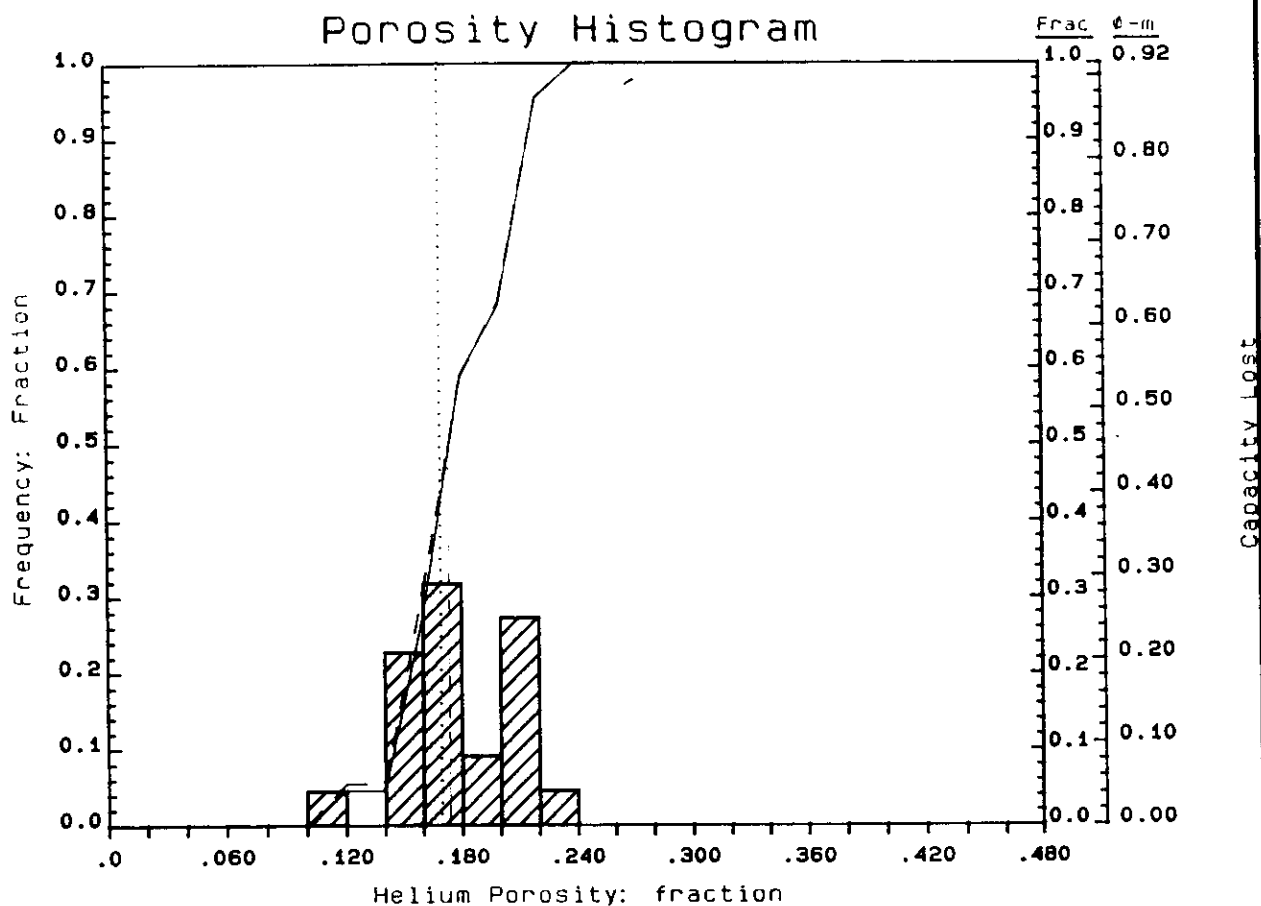
1993 10 02

#### - LEGEND -

BAKKEN SAND

+ Deleted





#### TUNDRA OIL AND GAS LTD.

TUNDRA ET AL DALY

1-32-10-29 W1M

DALY, MANITOBA

FILE NO. 52131-93-5062

FORMATION: BAKKEN SAND

(861.67 - 867.26m)

Core Laboratories

1993 10 02

#### - LEGEND -

Median Value (0.174)

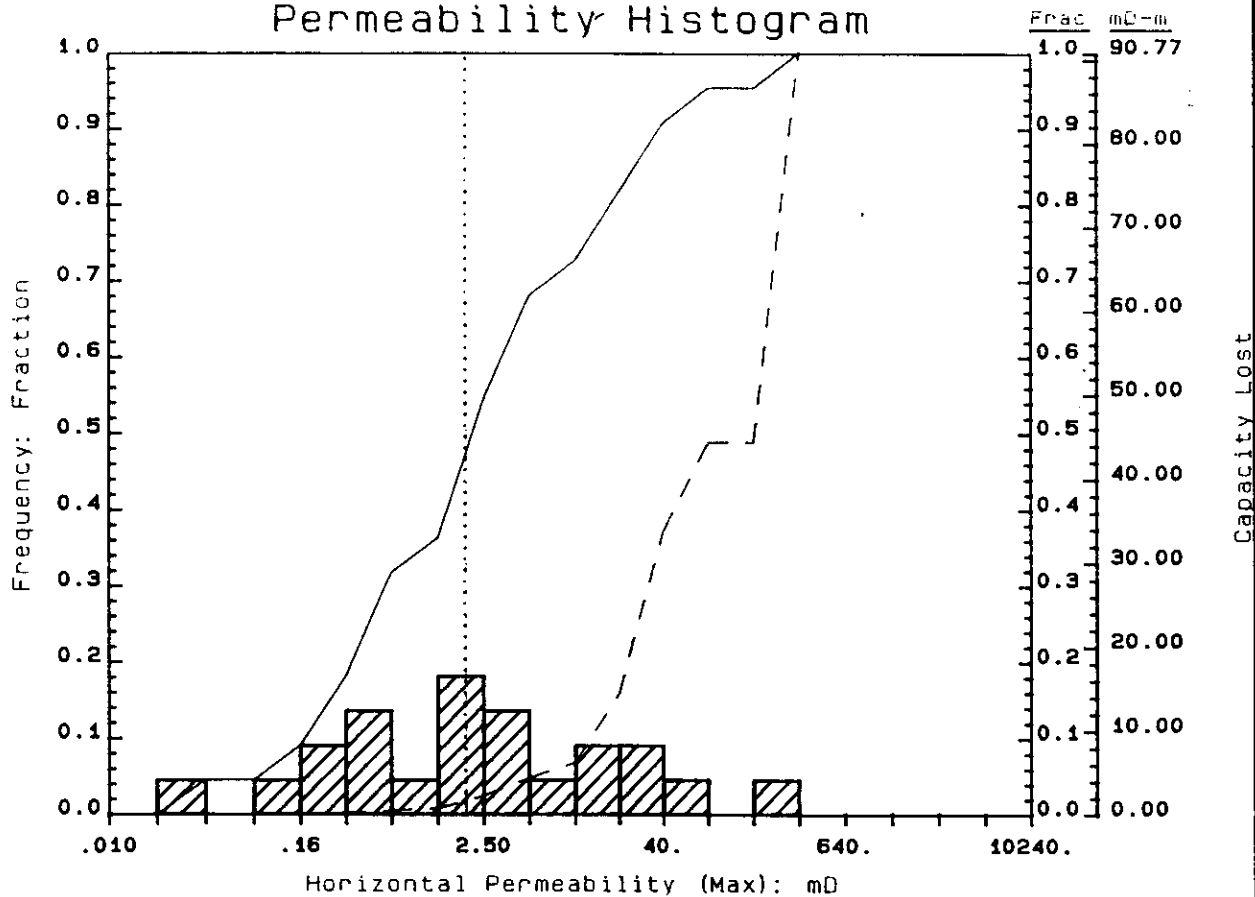
Arith. Average (0.169)

Cumulative Frequency

Cumulative Capacity Lost

22 Samples

# Permeability Histogram



## TUNDRA OIL AND GAS LTD.

TUNDRA ET AL DALY

1-32-10-29 W1M

DALY, MANITOBA

FILE NO. 52131-93-5062

FORMATION: BAKKEN SAND

(861.67 - 867.26m)

Core Laboratories

1993 10 02

## - LEGEND -

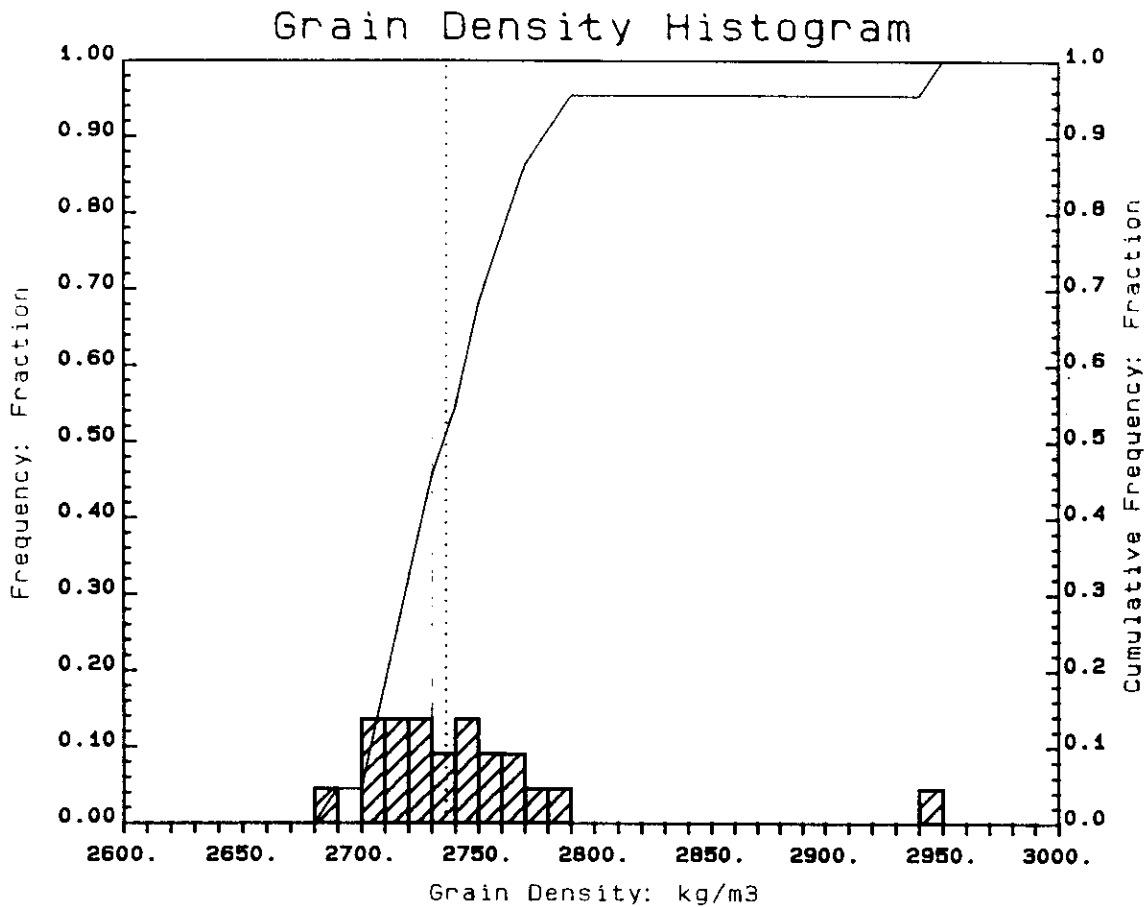
Median Value (1.90)

..... Geom. Average (1.87)

———— Cumulative Frequency

- - - - Cumulative Capacity Lost

22 Samples



#### TUNDRA OIL AND GAS LTD.

TUNDRA ET AL DALY

1-32-10-29 W1M

DALY, MANITOBA

FILE NO. 52131-93-5062

FORMATION: BAKKEN SAND

(861.67 - 867.26m)

Core Laboratories

1993 10 02

#### - LEGEND -

Median Value (2730)

Arith. Average (2736)

Cumulative Frequency

22 Samples

# CORE REPORT ANALYSIS

WELL 3-33-10-29 W1M

# CHEMICAL & GEOLOGICAL LABORATORIES INC.

Company: TUNDRA OIL AND GAS LTD.  
 Well Name: TUNDRA DALY 3-33-10-29 W1  
 Formation: BAKKEN

Lab No: S94-4540  
 Page: 3  
 Date: 1994-09-16

## SUMMARY OF CORE DATA REPORT

Summary Interval: 853.50 - 865.50 ( 12.00 )

Thickness Not Analyzed: Rubble 0.00 Dense 6.05 Lost 0.00 Drilled 0.00 Not Tested 0.00 Total: 6.05

## PERMEABILITY RANGES, MILLIDARCIES

	Total All Samples	Greater Than 99.	10. - 99.	1.0 - 9.9	.30 - .99	.10 - .49	.01 - .09	Less Than .01
Thickness, m	5.950	0.000	1.100	3.150	0.800	0.900	0.000	0.000
Fraction of Analyzed Core	1.000	0.000	0.185	0.529	0.134	0.151	0.000	0.000
Porosity Thickness, porosity-m	1.008	0.000	0.214	0.532	0.129	0.133	0.000	0.000
Permeability Thickness, mD-m	70.252	0.000	57.100	12.305	0.576	0.271	0.000	0.000
Weighted Averages (Arithmetic):								
Porosity	0.169	0.000	0.194	0.169	0.162	0.148	0.000	0.000
KMAX, mD	11.807	0.000	51.909	3.906	0.720	0.301	0.000	0.000
Residual Oil	0.155	0.000	0.157	0.153	0.218	0.100	0.000	0.000
Residual Water	0.543	0.000	0.582	0.589	0.526	0.309	0.000	0.000

Weighted Average (Geometric) KMAX, mD, for all samples = 3.026  
 Weighted Average (Harmonic) KMAX, mD, for all samples = 1.100

# CORE ANALYSIS DATA REPORT

[illegible]

Company: TUNDRA OIL AND GAS LTD.  
Well Name: TUNDRA DALY 3-33-10-29 W1  
Formation: BAKKEN  
Cored Interval: 853.50 - 865.50

Lab No: S94-4540  
Page: 5  
Date: 1994-09-16

# CALCULATED DATA REPORT

Sample Number	Interval, m		Thickness, m		Porosity - Thickness		Weighted Average Porosity (Arith)	Rear - Thickness		Weighted Average Rear (Arith)
	Top	Base	Rep	Cum	Rep	Cum		Rep	Cum	
DE	853.50	856.65	3.15	-	-	-	-	-	-	-
1	856.65	857.15	0.50	0.50	0.071	0.071	0.142	0.175	0.175	0.350
2	857.15	857.55	0.40	0.90	0.062	0.133	0.148	0.096	0.271	0.301
3	857.55	857.90	0.35	1.25	0.060	0.193	0.155	2.415	2.686	2.149
4	857.90	858.20	0.30	1.55	0.045	0.238	0.154	0.540	3.226	2.081
5	858.20	858.60	0.40	1.95	0.065	0.303	0.156	1.200	4.426	2.270
6	858.60	858.90	0.30	2.25	0.040	0.344	0.153	0.360	4.786	2.127
7	858.90	859.25	0.35	2.60	0.050	0.394	0.151	0.263	5.048	1.942
8	859.25	859.50	0.25	2.85	0.041	0.435	0.153	1.775	6.823	2.394
9	859.50	859.75	0.25	3.10	0.044	0.479	0.154	18.750	25.574	8.250
10	859.75	859.95	0.20	3.30	0.035	0.514	0.156	15.200	40.773	12.356
11	859.95	860.15	0.20	3.50	0.041	0.555	0.158	6.400	47.173	13.478
12	860.15	860.35	0.20	3.70	0.041	0.595	0.161	6.000	53.173	14.371
13	860.35	860.65	0.30	4.00	0.051	0.647	0.162	0.630	53.803	13.451
14	860.65	860.90	0.25	4.25	0.046	0.693	0.163	2.125	55.928	13.160
15	860.90	861.05	0.15	4.40	0.027	0.720	0.164	0.540	56.468	12.834
16	861.05	861.30	0.25	4.65	0.048	0.767	0.165	1.400	57.868	12.445
17	861.30	861.55	0.25	4.90	0.045	0.813	0.166	0.550	58.418	11.922
18	861.55	861.80	0.25	5.15	0.053	0.866	0.168	10.750	69.168	13.431
19	861.80	862.00	0.20	5.35	0.031	0.896	0.168	0.156	69.324	12.958
DE	862.00	862.15	0.15	-	-	-	-	-	-	-
20	862.15	862.50	0.35	0.35	0.063	0.063	0.180	0.770	0.770	2.200
DE	862.50	862.75	0.25	-	-	-	-	-	-	-
21	862.75	863.00	0.25	0.25	0.049	0.049	0.195	0.158	0.158	0.630
DE	863.00	865.50	2.50	-	-	-	-	-	-	-

Company: TUNDRA OIL AND GAS LTD.  
 Well Name: TUNDRA DALY 3-33-10-29 W1  
 Formation: BAKKEN  
 Interval : 853.50 - 865.50

Lab No: S94-4540  
 Page: 6  
 Date: 1994-09-16

# STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

## GROUPING BY POROSITY RANGES

Porosity Range	Samples		Thickness		Wt. Avg Porosity	Wt. Avg. BMV		Frequency	
	Number	Cum	#	Cum		Arith	Geom	#	Cum
0.120 - 0.140	1	1	0.30	0.30	0.134	1.200	1.200	5.04	5.04
0.140 - 0.160	5	6	1.75	2.05	0.148	0.703	0.543	29.41	34.45
0.160 - 0.180	6	12	1.75	3.80	0.170	22.840	8.639	29.41	63.87
0.180 - 0.200	6	18	1.50	5.30	0.185	3.695	2.746	25.21	89.08
0.200 - 0.220	3	21	0.65	5.95	0.207	35.615	35.146	10.92	100.00



# CHEMICAL & GEOLOGICAL LABORATORIES INC.

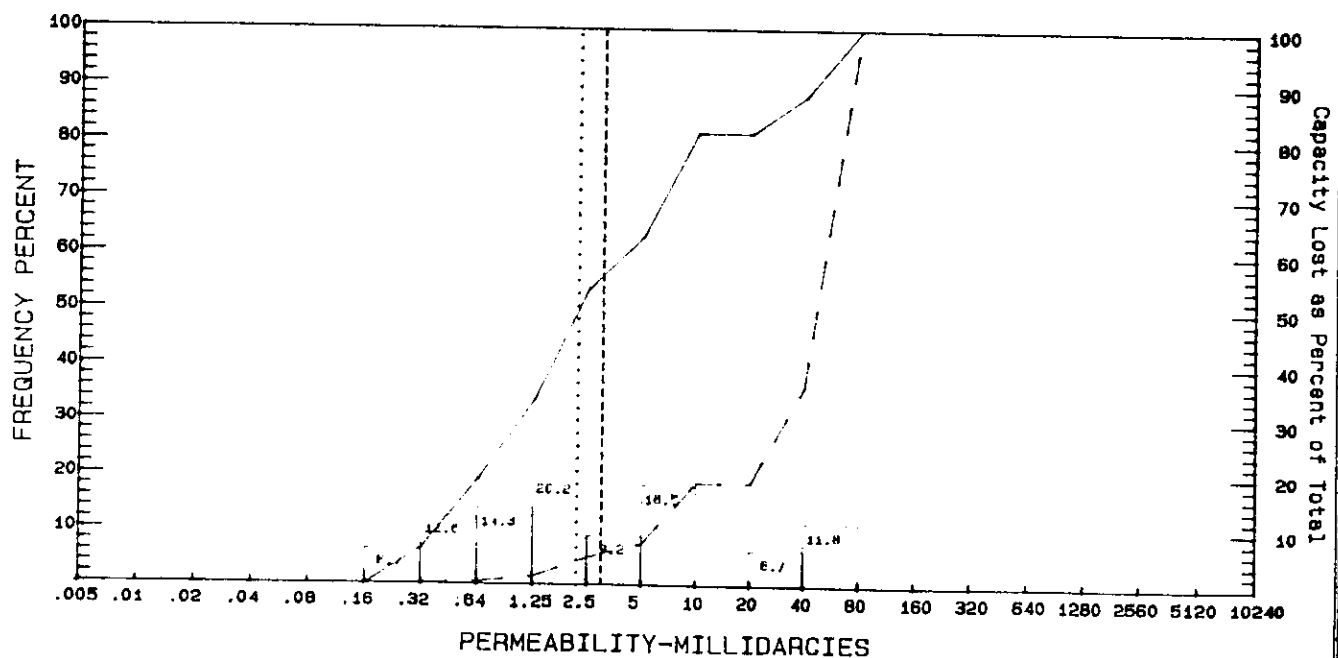
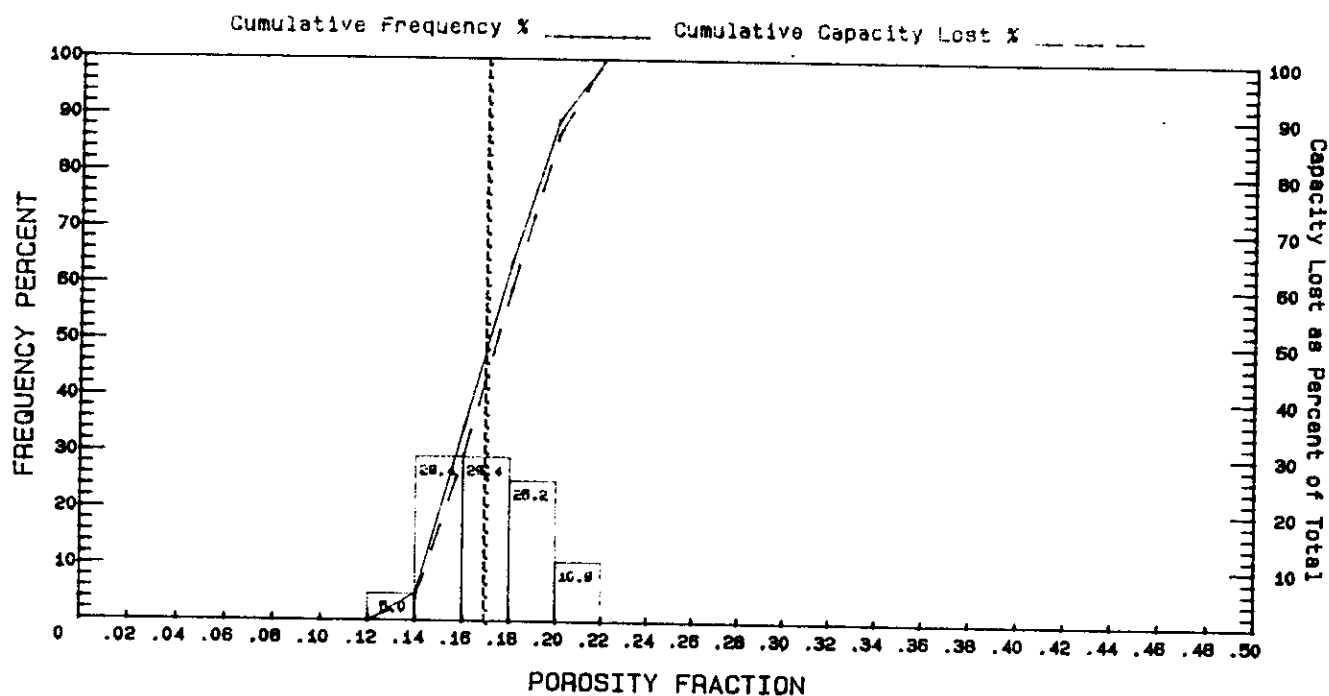
Company : TUNDRA OIL AND GAS LTD.  
Well Name: TUNDRA DALY 3-33-10-29 W1  
Formation: BAKKEN  
Interval : 853.50 - 865.50

Lab No: S94-4540  
Fig No: 1  
Date : 1994-09-16

Arithmetic Mean Porosity: 0.169  
Median Porosity: 0.171

Geometric Mean KMAX: 3.026  
Median KMAX: 2.195

## POROSITY AND PERMEABILITY HISTOGRAMS



# CHEMICAL & GEOLOGICAL LABORATORIES INC.

Company : TUNDRA OIL AND GAS LTD.  
Well Name: TUNDRA DALY 3-33-10-29 W1  
Formation: BAKKEN  
Interval : 853.50 - 865.50

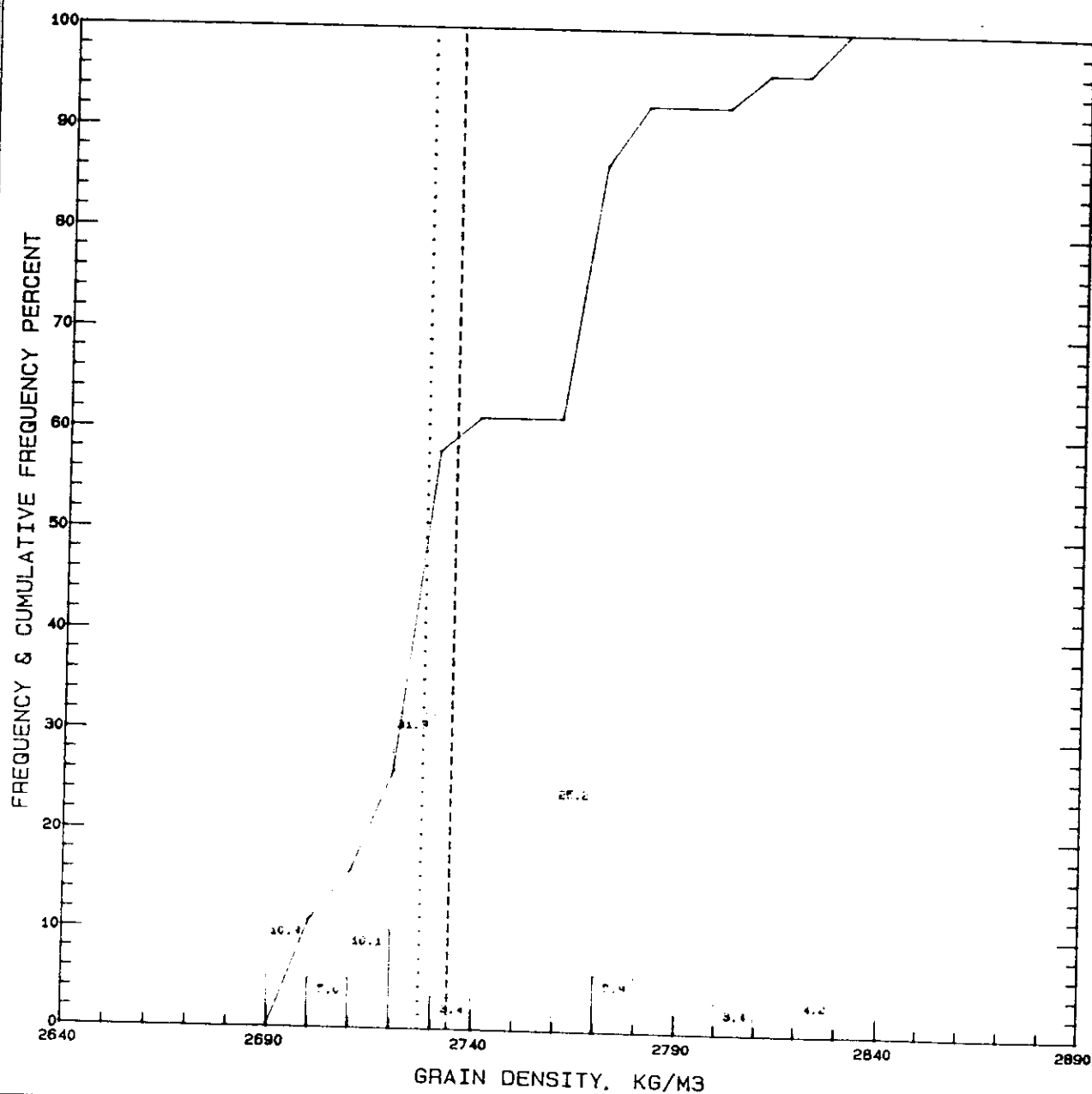
Lab No: S94-4540  
Fig No: 2  
Date : 1994-09-16

Arithmetic Mean Grain Density: 2735.  
-----

Median Grain Density: 2727.  
.....

## GRAIN DENSITY HISTOGRAM

Cumulative Frequency -----

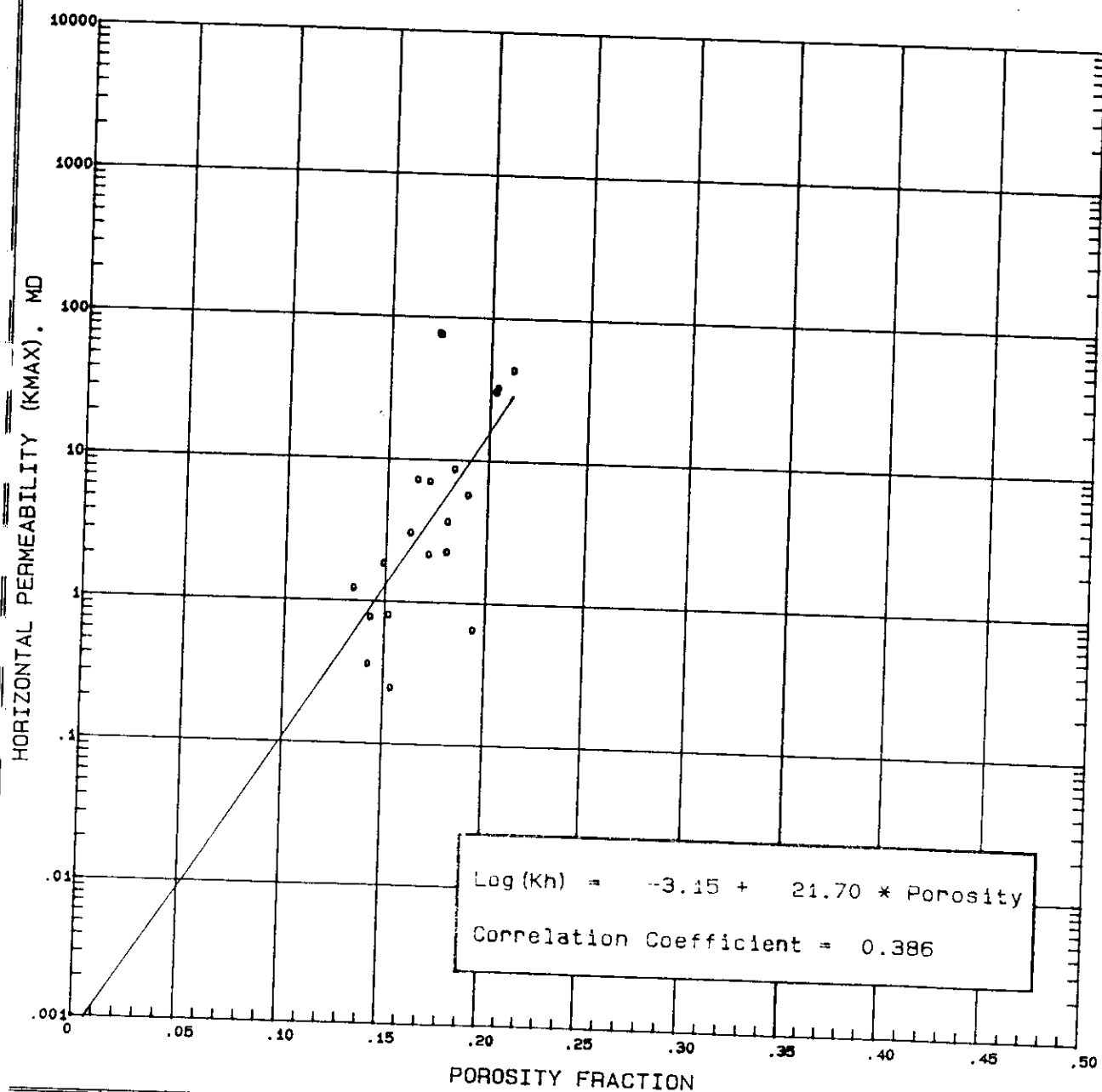


# CHEMICAL & GEOLOGICAL LABORATORIES INC.

Company : TUNDRA OIL AND GAS LTD.  
Well Name: TUNDRA DALY 3-33-10-29 W1  
Formation: BAKKEN  
Interval : 853.50 - 865.50

Lab No: S94-4540  
Fig No: 3  
Date : 1994-09-16

## HORIZONTAL PERMEABILITY (KMAX) VS POROSITY



## **APPENDIX F**

### **PRESSURE SURVEYS**

**WELLS 15-28-10-29, 1-33, 3-33, 5-33, 7-33-10-29**

# DRILL STEM TEST

WELL 15-28-10-29

## TEST REPORT

## Well Data

Well Name: Tundra et al Daly  
 Well Location: 15-28-10-29 w1  
 Customer: Tundra Oil & Gas  
 Customer Rep.: Jed Sanderson  
 Tester: Kevin Moore  
 Test Type: Conventional Straddle

Date: Jan. 25/96  
 Test Number: One  
 Formation: Bakken  
 Interval: 852 - 862  
 Total Depth: 880.1  
 KB Elev. 533.72 Gr. Elev.: 529.52

## Time-Pressure Data

Pre-Flow: 10 mins. ISL: 56 mins. Flow: 59 mins. FSI: 121 mins.

Out In Out

Rec. No. 20750E	Rec. No. 6165	Rec. No. 12592	Rec. No.
Range 41369	Range 28269	Range 28958	Range
Depth 858	Depth 859	Depth 863	Depth

Initial Hydrostatic Pressure-	9767	9875	11252
Initial Shut-in Pressure-	6122	6066	
Initial Flow Pressure-	521	590	
Final Flow Pressure-	806	756	
Final Shut-in Pressure-	6014	5923	
Final Hydrostatic Pressure-	9679	9790	10266
Initial/Final Pre-flow-	321/375	374/374	8318

## Fluid Recovery

Total Recovery: 71 Meters

Recovered: 71 meters of Slightly oil-cut mud.  
 meters of  
 meters of  
 meters of

## Gas Recovery

Measured With				
Flow Time	Reading	Temperature	Orifice Size	Flow Rate
Minutes:	kPa:	Degrees C:	MM:	M3/D:

## Test Data

Net Pay (M):	1	% Porosity:	15.0%
Drill Pipe Size:	114.3	Drill Pipe Wt.:	24.7
Drill Collar ID:	63.5	D.C. Above Tool:	143m
Main Hole Size:	200	Packer Size:	177
Cushion Amount:	n/a	Cushion Type:	n/a
Wt. to Set Pckr:	15,000	Pull Free Wt.:	3,000
Bottom Hole Temp.:	28.33	Bottom Hole Size:	25.4
Tool Open At:	3:00 AM	Sampler:	n/a

Mud Type: Gel Chem Viscosity: 70 F/C: 1.6 W.L.: 9.0 WT: 1130

## Remarks

Preflow: Faint air blow - 1/8 inch into pail.

Valve Open: Faint air blow - 1/8 inch into pail.

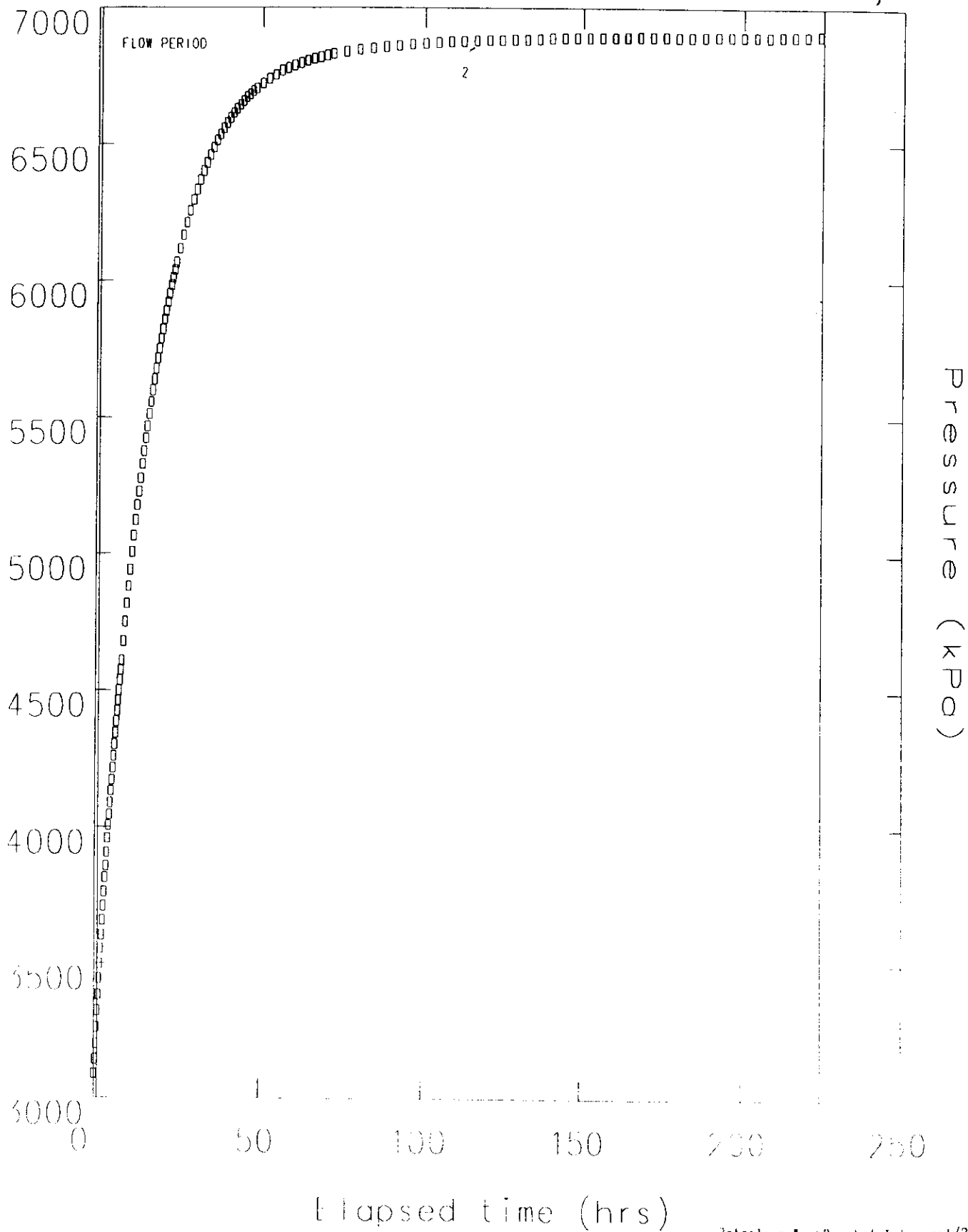
# CONVENTIONAL PRESSURE BUILDUP TEST

WELL 3-33 10-29

Tundra Oil and  
Gas Ltd.

3-33-10-29

Pressure  
History



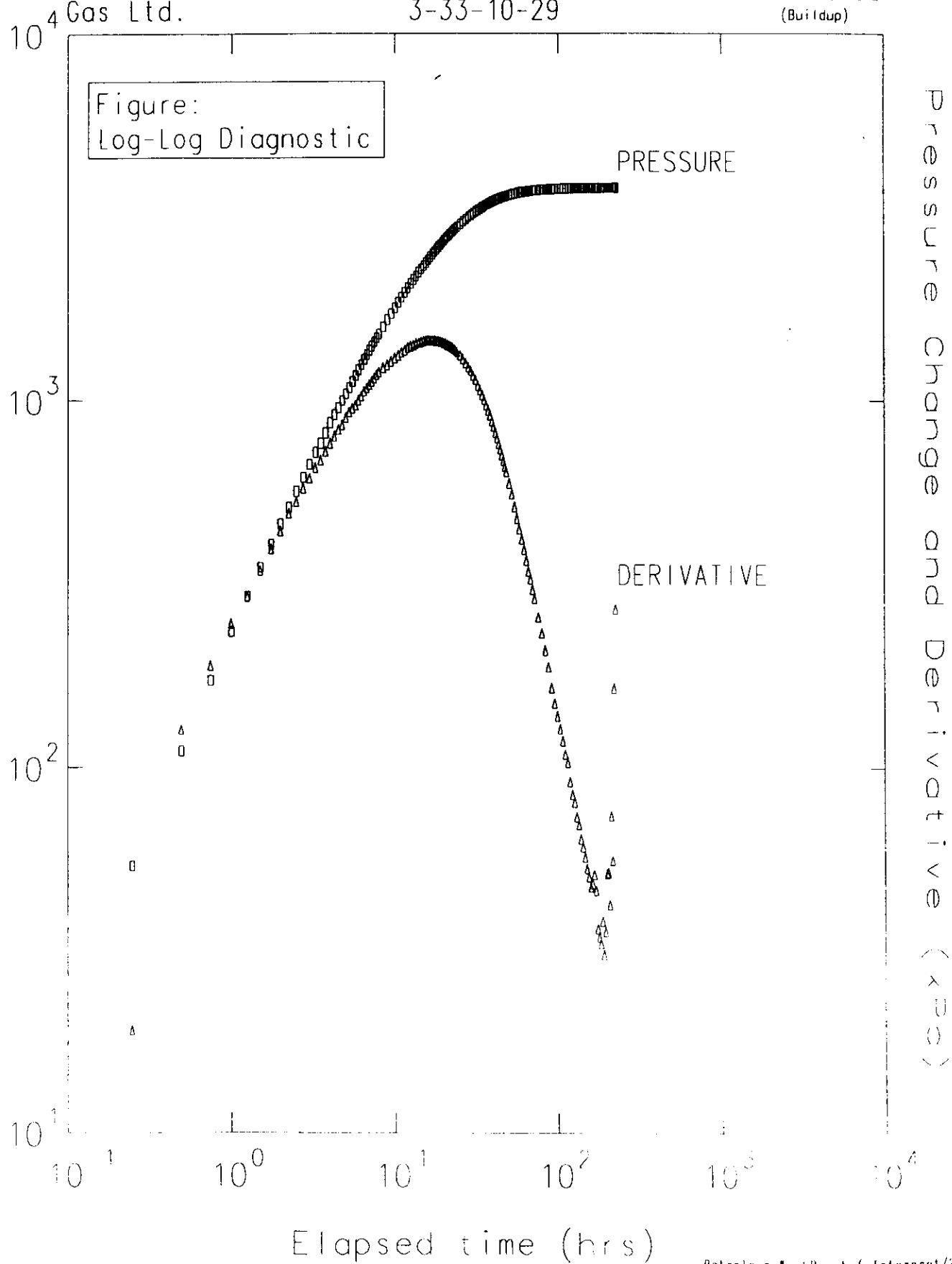


Tundra Oil and  
Gas Ltd.

3-33-10-29

FLOW PERIOD 2  
(Buildup)

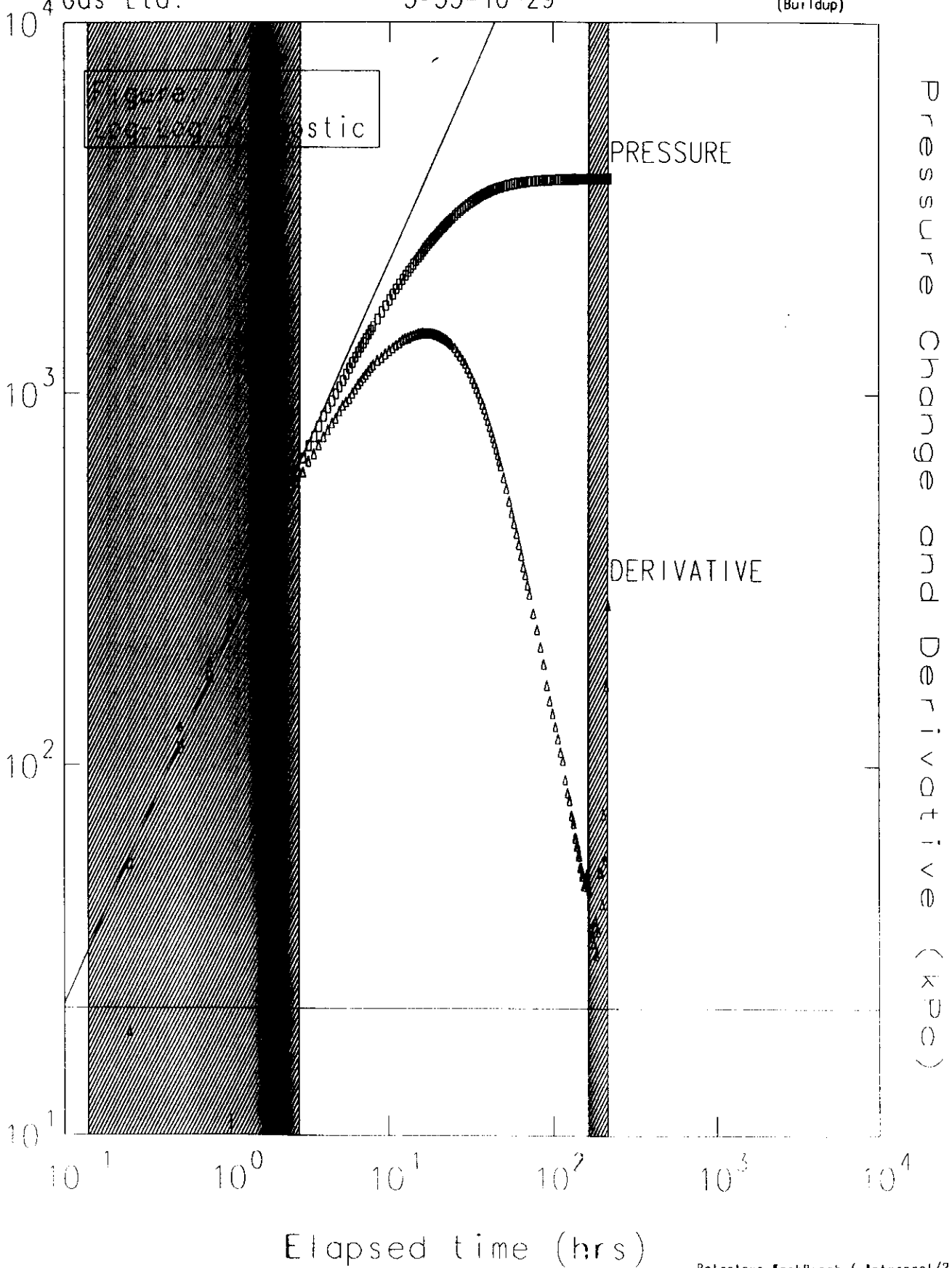
Figure:  
Log-Log Diagnostic



Tundra Oil and  
Gas Ltd.

3-33-10-29

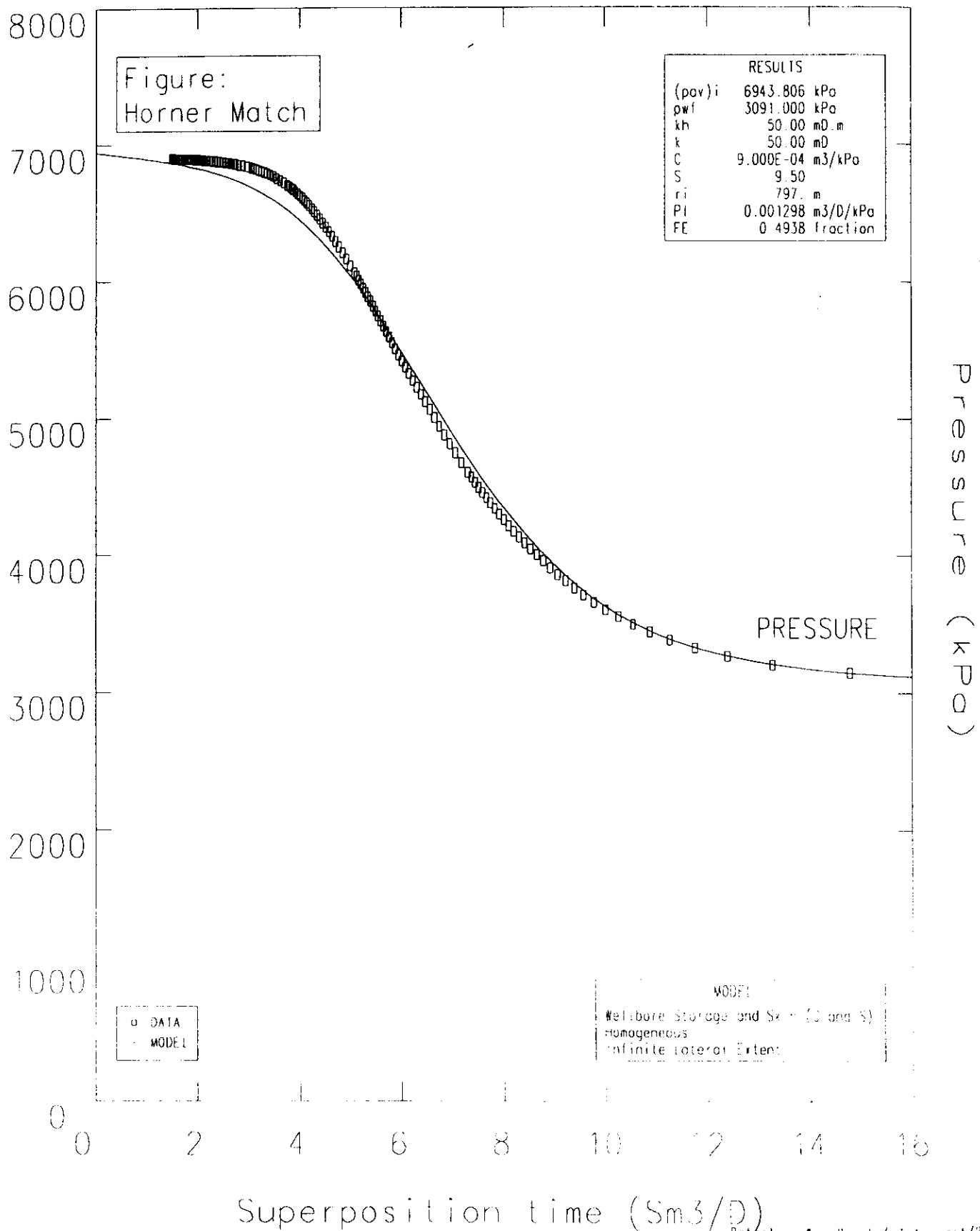
FLOW PERIOD 2  
(Buildup)



Tundra Oil and  
Gas Ltd.

3-33-10-29

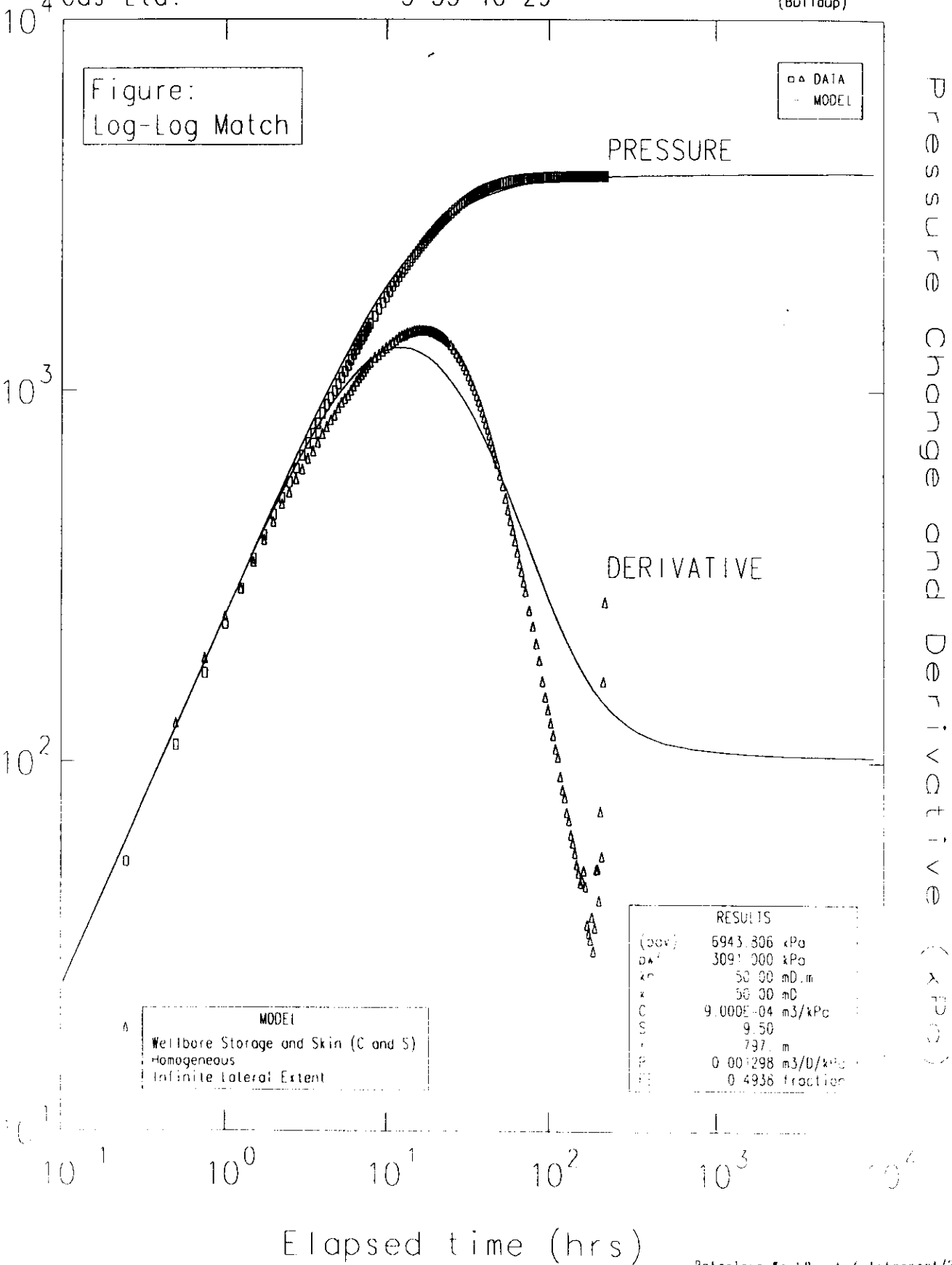
FLOW PERIOD 2  
(Buildup)



Tundra Oil and  
Gas Ltd.

3-33-10-29

FLOW PERIOD 2  
(Buildup)



## TEST REPORT

### Well Data

Well Name: Tundra Daly	Date: Feb. 13/95
Well Location: 1-33-10-29 w1	Test Number: One
Customer: Tundra Oil & Gas Corp	Formation: Bakken
Customer Rep.: Trevor Hadley	Interval: 852 - 862
Tester: Kevin Moore	Total Depth: 880.7
Test Type: Conventional Straddle	KB Elev. 532.5 Gr. Elev. 528.83

### Time Pressure Data

Pre-Flow: 10 mins.	ISI	65 mins.	Flow:	59 mins.	FSI:	130 mins.
	In	Out N	InX	Out	In	OutX
	Rec. No.	2751	Rec. No.	6165	Rec. No. (Electr	Rec. No.
	Range	22063	Range	28269	Range	Rec.)
	Depth	863.51	Depth	859.70	Depth	858.23
Initial Hydrostatic Pressure-	9788		9400			
Initial Shut-in Pressure-			7572			
Initial Flow Pressure-			360			
Final Flow Pressure-			110			
Final Shut-in Pressure-			7410			
Final Hydrostatic Pressure-	9561		9174			
Initial/Final Pre-flow-	8881		223/324			

### Recovery

Total Recovery: 37 Meters

Recovered: 37 of Oil-cut mud  
of  
of  
of

### Gas Recovery

Measured With	Reading	Temperature	Orifice Size	Flow Rate
Flow Time	kPa	Degrees C	MM	M3/D
Minutes:				

### Test Data

Net Pay (M):	% Porosity:
Drill Pipe Size: 101.6	Drill Pipe Wt.: 19.8
Drill Collar ID: 63.5	D.C. Above Tool: 111.16
Main Hole Size: 200	Packer Size: 177
Cushion Amount: n/a	Cushion Type: n/a
Wt. to Set Pckr: 18000	Pull Free Wt.: 2000
Btm Hole Temp: n/a	Btm Choke Size: 25.4
Tool Open At: 0.35	Sampler:

Mud Type: Gel Chem Viscosity: 85 FIC: 1.6 W.L.: 13 WT: 11.40

### Remarks

Preflow: Weak air blow, 1.4 inch in pad

Valve Open: Faint air blow throughout

February 13, 1995

# DOUBLE K OILFIELD TESTING LTD.

## WELL DATA

Well Name Tundra Daly Date Dec. 18/93  
 Well Location 7-33-10-29 w1 Test No. Two  
 Customer Tundra Oil & Gas Corp Formation Bakken  
 Customer Rep Trevor Hadley Interval 857 - 863  
 Tester Kent Fowler Total Depth 924  
 Test Type Conventional Straddle KB Elev 532.6 GR Elev 528.47

## TIME PRESSURE DATA

Prelflow	10 mins.	ISI	61 mins.	Flow	62 mins.	FSI	128 mins.	
	In X	Out	In	Out X	In	Out X	In	Out
	Rec. No.	2751	Rec. No.	22149	Rec. No.	12592	Rec. No.	
	Range	22064	Range	24821	Range	28958	Range	
	Depth	858.87	Depth	860.40	Depth	864.09	Depth	
Initial Hydrostatic Pressure		9729		9864		9894		
Initial Shut-In Pressure		7793		7877				
Initial Flow Pressure		342		515				
Final Flow Pressure		728		806				
Final Shut-In Pressure		7709		7824				
Final Hydrostatic Pressure		9602		9770		9821		
Pre-flow:		182/192		330		8354		

## FLUID RECOVERY

Total Recovery 72 Meters  
 Recovered 36 Meters of Gassy oil-cut mud  
 Recovered 36 Meters of Frothy mud-cut oil  
 Recovered \_\_\_\_\_ Meters of \_\_\_\_\_  
 Recovered \_\_\_\_\_ Meters of \_\_\_\_\_

## GAS RECOVERY

Measured with  
 Flow Time \_\_\_\_\_ Reading \_\_\_\_\_ Temperature \_\_\_\_\_ Orifice Size \_\_\_\_\_ Flow Rate \_\_\_\_\_  
 Minutes \_\_\_\_\_ KPA \_\_\_\_\_ °C \_\_\_\_\_ MM \_\_\_\_\_ M3/D \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## TEST DATA

Meters of Net Pay \_\_\_\_\_ Percentage Porosity \_\_\_\_\_  
 Drill Pipe Size 114.3 FH Drill Pipe Weight 24.7  
 Drill Collar ID 63.5 Meters of Collars Above Tool 126.36  
 Main Hole Size 200 Packer Size 177  
 Cushion Amount --- Cushion Type ---  
 Weight to Set Packer 15,000 Weight to Pull Loose 5,000  
 Bottom Hole Temperature --- Bottom Choke Size 25.4  
 Tool Open at 20:45 Sampler \_\_\_\_\_  
 Mud Type Gel Chem Vis 71 FIC 1.6 W.L. 11.0 WI 1150

## REMARKS

Pre-flow: Steady weak air blow increasing to 2" at 10 minutes.  
 Valve Open: Surging 4-5 inch blow.

Well Name

TUNDRA DALY

Well Location

7-33-10-29 w1

Test No

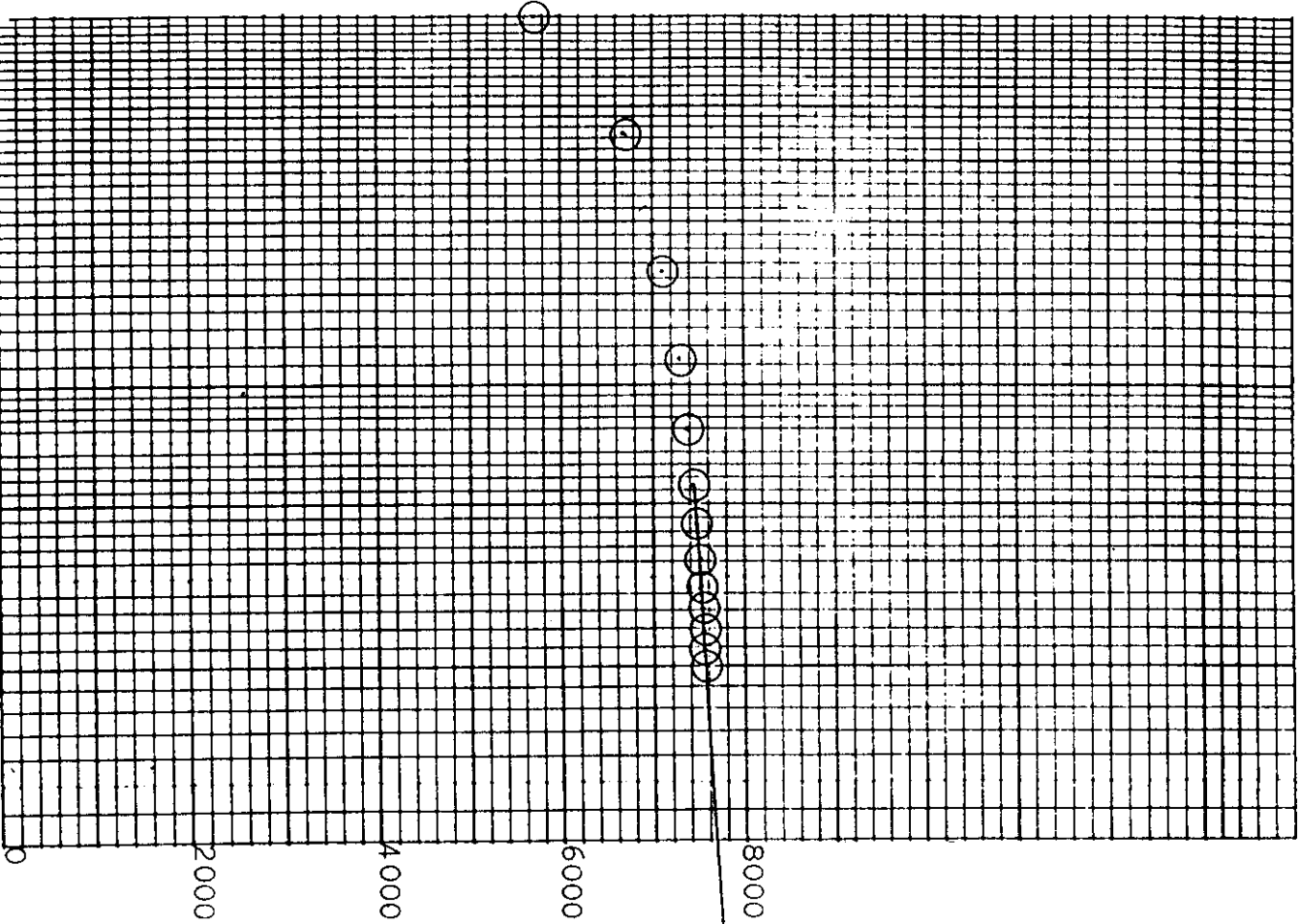
TWO

Date

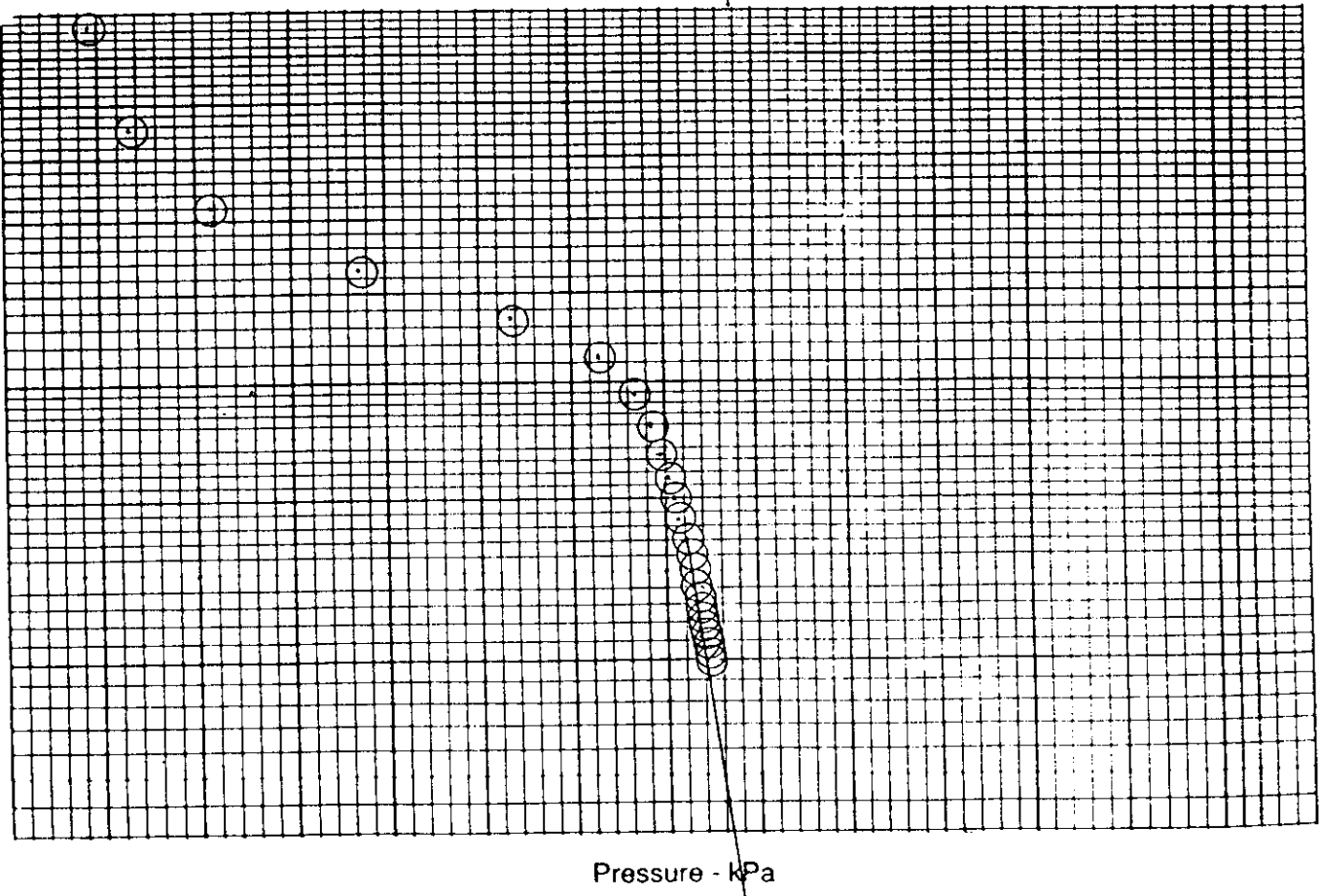
12/18/93

7-33-10-29

Pressure - kPa



Initial Shut-in:  $p^*$  - 7760 kPa  
slope - 560 kPa/cycle

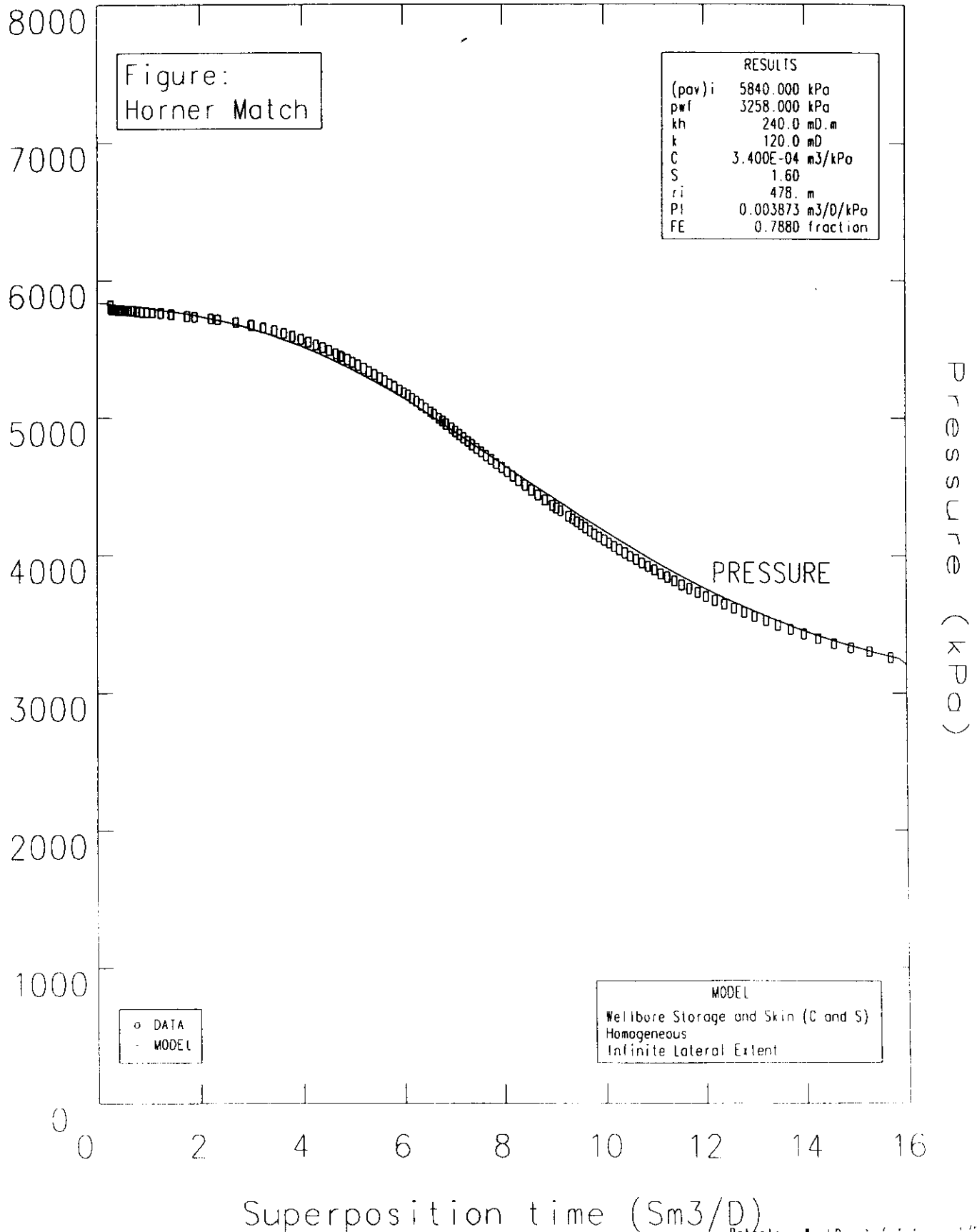


Final Shut-in:  $p^*$  - 7875 kPa  
slope - 1442 kPa/cycle

TUNDRA OIL AND  
GAS

5-33-10-29

FLOW PERIOD 2  
(Buildup)





TUNDRA OIL AND  
GAS

5-33-10-29

FLOW PERIOD 2  
(Buildup)

Figure:  
Log-Log Match

RESULTS	
(pov) <sub>i</sub>	5803.674 kPa
p <sub>wf</sub>	3258.000 kPa
kh	242.2 mD.m
k	121.1 mD
C	5.657E-04 m <sup>3</sup> /kPa
S	0.69
r <sub>i</sub>	480. m
PI	0.003928 m <sup>3</sup> /D/kPa
FE	0.9081 fraction

DERIVATIVE

Pressure Change and Derivative (kPa)

PRESSURE

□ DATA  
— MODEL

MODEL  
Wellbore Storage and Skin (C and S)  
Homogeneous  
Infinite Lateral Extent

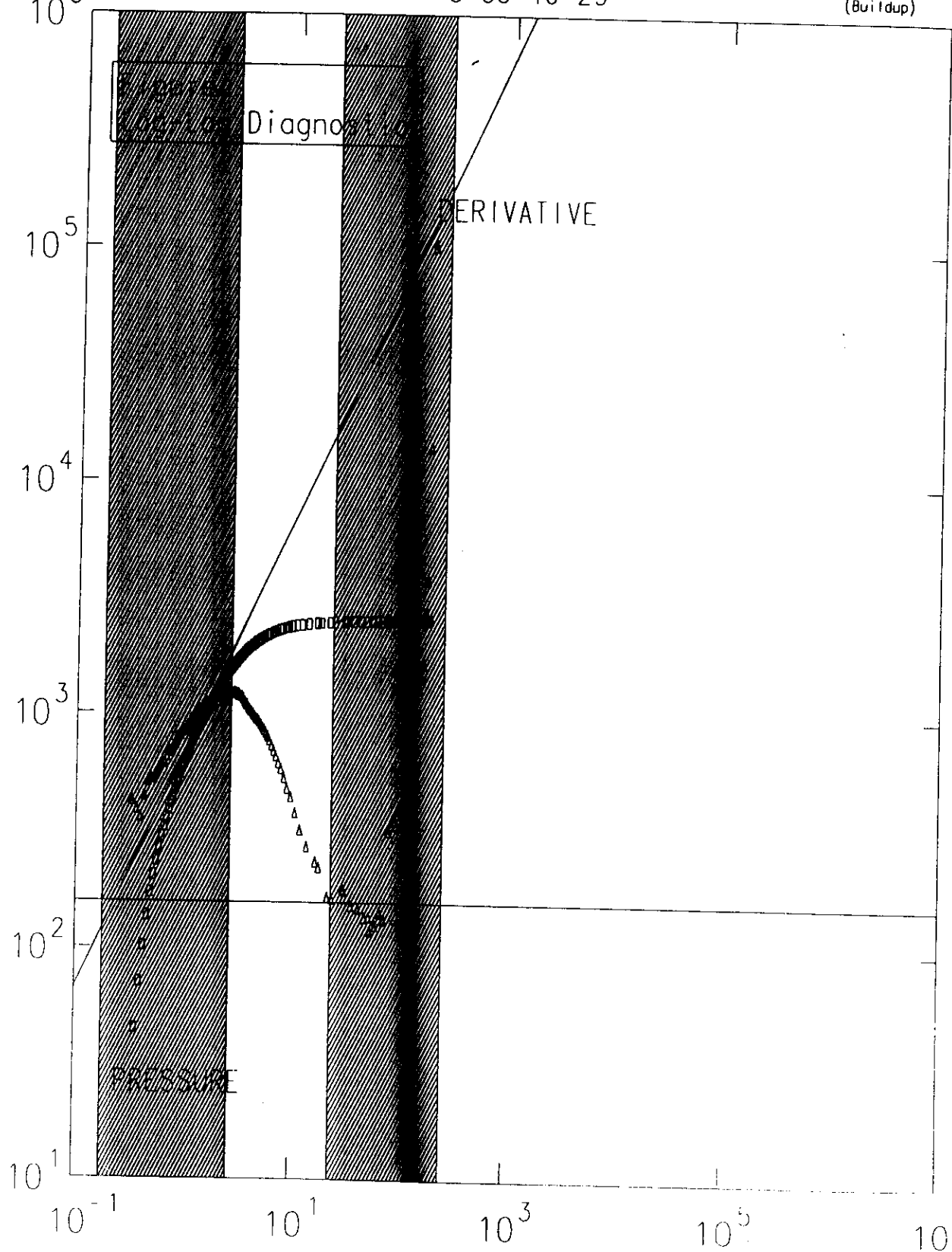
Elapsed time (hrs)

TUNDRA OIL AND  
GAS

5-33-10-29

FLOW PERIOD 2  
(Buildup)

Pressure Change and Derivative ( $\times P_0$ )

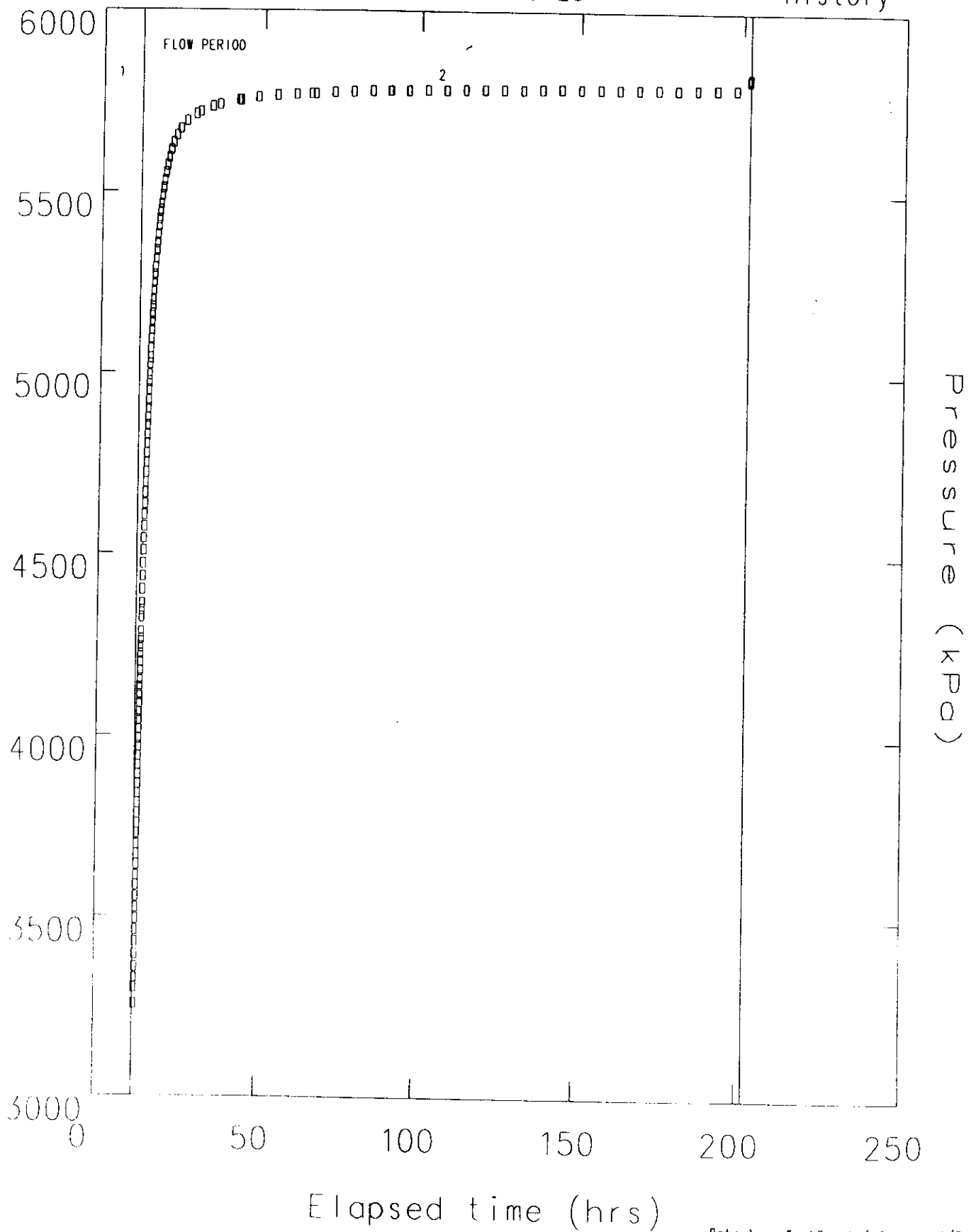


Elapsed time (hrs)

TUNDRA OIL AND  
GAS

5-33-10-29

Pressure  
History



Reporting Date : February 23, 1996

Page 1

Well Name : Tundra Daly 05-33

Formation : Bakken

Location : 05-33-010-29 WPH

Date of Test : February 12-20, 1996

Filter Settings:

FILTER PRESS: 20.0 kPa

FILTER TIME: 360.0 min

UPPER GAUGE							LOWER GAUGE			
Depth: 851.0 m,CF							Depth: 852.0 m,CF			
Serial No: 01114 (Sunada)							Serial No: 01112 (Sunada)			
Sample No	Date (mm-dd)	Time (hh:mm:ss)	Cum Time (hrs)	Pressure (kPaA)	Delta (kPa)	Temperature (Deg C)	Pressure (kPaA)	Delta (kPa)	Temperature (Deg C)	
1	Feb-12	16:25:00	0.000	5.2	0.0	12.80				
6		16:35:00	0.167	75.9	70.6	11.20	0.0	0.0	13.20	
7		16:37:00	0.200	2349.9	2274.0	16.60	77.5	77.5	11.20	
8		16:39:00	0.233	2832.2	482.3	21.30	2361.5	2284.0	13.10	
9		16:41:00	0.267	2702.6	-129.5	24.10	2853.1	491.5	16.30	
10		16:43:00	0.300	3215.5	512.9	25.60	2720.9	-132.1	19.20	
							3230.8	509.9	21.40	
Set recorders @ 852.0 m,CF										
11		16:45:00	0.333	3245.7	30.2	26.80	3258.0	27.2	23.10	
12		16:47:00	0.367	3292.2	46.5	27.50	3302.7	44.7	24.50	
13		16:49:00	0.400	3321.4	29.2	28.00	3329.0	26.3	25.60	
14		16:51:00	0.433	3355.9	34.5	28.40	3359.6	30.6	26.50	
15		16:53:00	0.467	3395.7	39.7	28.80	3395.0	35.4	27.20	
16		16:55:00	0.500	3430.5	34.9	29.00	3429.9	34.9	27.70	
17		16:57:00	0.533	3465.6	35.0	29.20	3461.7	31.8	28.20	
18		16:59:00	0.567	3500.6	35.1	29.30	3493.1	31.4	28.50	
19		17:01:00	0.600	3530.7	30.1	29.50	3524.3	31.1	28.80	
20		17:03:00	0.633	3561.0	30.2	29.50	3555.2	31.0	29.00	
21		17:05:00	0.667	3591.3	30.3	29.60	3586.1	30.8	29.20	
22		17:07:00	0.700	3621.6	30.3	29.70	3614.0	27.9	29.30	
23		17:09:00	0.733	3654.5	32.9	29.70	3644.5	30.5	29.40	
24		17:11:00	0.767	3682.4	27.9	29.70	3672.2	27.8	29.50	
25		17:13:00	0.800	3710.3	27.9	29.70	3699.9	27.7	29.60	
26		17:15:00	0.833	3740.7	30.4	29.80	3730.3	30.3	29.60	
27		17:17:00	0.867	3766.1	25.3	29.80	3757.9	27.6	29.70	
28		17:19:00	0.900	3796.6	30.5	29.80	3785.4	27.5	29.70	
29		17:21:00	0.933	3824.5	27.9	29.80	3812.9	27.5	29.70	
30		17:23:00	0.967	3849.9	25.3	29.80	3840.5	27.5	29.70	
31		17:25:00	1.000	3877.8	27.9	29.80	3865.2	24.8	29.80	
32		17:27:00	1.033	3903.2	25.4	29.80	3892.7	27.5	29.80	
33		17:29:00	1.067	3928.6	25.4	29.80	3917.5	24.8	29.80	
34		17:31:00	1.100	3954.0	25.4	29.80	3942.2	24.7	29.80	
35		17:33:00	1.133	3979.4	25.4	29.80	3969.6	27.5	29.80	
36		17:35:00	1.167	4002.3	22.9	29.80	3991.6	22.0	29.80	
37		17:37:00	1.200	4027.7	25.4	29.80	4016.3	24.7	29.80	
38		17:39:00	1.233	4050.6	22.9	29.80	4041.0	24.7	29.80	
39		17:41:00	1.267	4076.0	25.4	29.80	4062.9	22.0	29.80	
40		17:43:00	1.300	4098.8	22.9	29.80	4087.7	24.7	29.80	
41		17:45:00	1.333	4119.2	20.3	29.80	4109.6	22.0	29.80	
42		17:47:00	1.367	4142.0	22.9	29.80	4131.6	22.0	29.80	
43		17:49:00	1.400	4164.9	22.9	29.80	4153.5	22.0	29.80	
44		17:51:00	1.433	4187.8	22.9	29.80	4175.4	21.9	29.80	
45		17:53:00	1.467	4208.1	20.3	29.80	4200.1	24.7	29.80	
46		17:55:00	1.500	4231.0	22.9	29.80	4222.1	22.0	29.80	
47		17:57:00	1.533	4251.3	20.3	29.80	4241.3	19.2	29.80	
48		17:59:00	1.567	4271.7	20.3	29.80	4263.3	22.0	29.80	
49		18:01:00	1.600	4294.5	22.9	29.80	4282.5	19.2	29.80	
51		18:05:00	1.667	4332.7	38.2	29.80	4323.7	41.2	29.80	
52		18:07:00	1.700	4353.0	20.3	29.80	4342.9	19.2	29.80	
53		18:09:00	1.733	4373.3	20.3	29.80	4362.0	19.1	29.70	
55		18:13:00	1.800	4408.9	35.6	29.80	4400.5	38.4	29.70	
57		18:17:00	1.867	4447.1	38.2	29.70	4436.1	35.7	29.70	
59		18:21:00	1.933	4482.6	35.6	29.70	4471.8	35.7	29.70	
61		18:25:00	2.000	4518.2	35.6	29.70	4507.5	35.7	29.70	
63		18:29:00	2.067	4551.2	33.0	29.70	4540.4	32.9	29.70	
65		18:33:00	2.133	4584.3	33.1	29.70	4573.3	32.9	29.70	
67		18:37:00	2.200	4614.8	30.5	29.70	4606.2	32.9	29.70	
69		18:41:00	2.267	4645.4	30.6	29.70	4636.4	30.2	29.70	
71		18:45:00	2.333	4675.9	30.5	29.70	4666.6	30.2	29.70	

Reporting Date : February 23, 1996

Page 2

Well Name : Tundra Daly 05-33  
Formation : BakkenLocation : 05-33-010-29 WPM  
Date of Test : February 12-20, 1996

Filter Settings:

FILTER PRESS: 20.0 kPa  
FILTER TIME: 360.0 min

## UPPER GAUGE

Depth: 851.0 m, CP

Serial No: 01114 (Sunada)

## LOWER GAUGE

Depth: 852.0 m, CP

Serial No: 01112 (Sunada)

Sample No	Date (mm-dd)	Time (hh:mm:ss)	Cum Time (hrs)	Pressure (kPa)	Delta (kPa)	Temperature (Deg C)	Pressure (kPa)	Delta (kPa)	Temperature (Deg C)
73	Feb-12	18:49:00	2.400	4703.9	28.0	29.70			
75		18:53:00	2.467	4734.4	30.5	29.70	4696.7	30.1	29.70
77		18:57:00	2.533	4762.4	28.0	29.70	4724.2	27.5	29.70
79		19:01:00	2.600	4787.8	25.4	29.70	4751.6	27.4	29.60
81		19:05:00	2.667	4815.7	27.9	29.70	4776.3	24.7	29.60
83		19:09:00	2.733	4838.7	22.9	29.60	4803.7	27.5	29.60
85		19:13:00	2.800	4864.1	25.4	29.60	4828.4	24.6	29.60
87		19:17:00	2.867	4886.9	22.9	29.60	4853.1	24.7	29.60
89		19:21:00	2.933	4912.4	25.5	29.60	4875.0	22.0	29.60
91		19:25:00	3.000	4935.3	22.9	29.60	4899.7	24.7	29.60
94		19:31:00	3.100	4963.3	28.0	29.60	4921.6	21.9	29.60
96		19:35:00	3.167	4983.7	20.4	29.60	4951.8	30.2	29.60
98		19:39:00	3.233	5004.0	20.3	29.60	4973.7	21.9	29.60
101		19:45:00	3.333	5032.0	27.9	29.60	4993.0	19.2	29.60
103		19:49:00	3.400	5052.3	20.3	29.60	5023.2	30.2	29.60
106		19:55:00	3.500	5077.7	25.4	29.60	5039.6	16.5	29.60
109		20:01:00	3.600	5100.5	22.8	29.60	5067.1	27.5	29.60
112		20:07:00	3.700	5128.4	27.9	29.60	5091.8	24.8	29.60
115		20:13:00	3.800	5148.8	20.3	29.60	5116.6	24.7	29.60
118		20:19:00	3.900	5169.1	20.3	29.60	5138.5	22.0	29.60
121		20:25:00	4.000	5192.0	22.9	29.60	5160.4	21.9	29.60
124		20:31:00	4.100	5212.4	20.3	29.60	5179.6	19.2	29.60
128		20:39:00	4.233	5235.3	22.9	29.50	5198.8	19.2	29.60
132		20:47:00	4.367	5258.2	22.9	29.50	5223.5	24.6	29.50
136		20:55:00	4.500	5281.1	22.9	29.50	5245.4	21.9	29.50
140		21:03:00	4.633	5301.4	20.3	29.50	5267.4	22.0	29.50
145		21:13:00	4.800	5324.3	22.9	29.50	5288.5	21.2	29.50
150		21:23:00	4.967	5347.9	23.6	29.50	5312.6	24.1	29.50
155		21:33:00	5.133	5368.9	21.1	29.50	5335.2	22.6	29.50
161		21:45:00	5.333	5392.4	23.4	29.50	5356.0	20.8	29.50
167		21:57:00	5.533	5413.5	21.1	29.50	5379.7	23.8	29.50
173		22:09:00	5.733	5433.6	20.1	29.50	5402.1	22.3	29.50
179		22:21:00	5.933	5454.4	20.9	29.50	5422.9	20.8	29.40
181		22:25:00	6.000	5460.5	6.1	29.50	5441.9	19.0	29.40
187		22:37:00	6.200	5476.0	15.4	29.40	5447.8	5.9	29.40
196		22:55:00	6.500	5497.5	21.5	29.40	5464.7	16.9	29.40
205		23:13:00	6.800	5519.7	22.2	29.40	5487.8	23.1	29.40
215		23:33:00	7.133	5541.3	21.6	29.40	5508.9	21.1	29.40
227		23:57:00	7.533	5561.8	20.4	29.40	5529.3	20.5	29.40
240	Feb-13	00:23:00	7.967	5582.5	20.7	29.40	5550.9	21.6	29.30
256		00:55:00	8.500	5602.5	20.1	29.30	5571.0	20.1	29.30
274		01:31:00	9.100	5622.7	20.2	29.30	5592.8	21.8	29.30
296		02:15:00	9.833	5643.0	20.2	29.30	5613.5	20.7	29.30
325		03:13:00	10.800	5663.5	20.5	29.30	5632.7	19.2	29.30
361		04:25:00	12.000	5682.9	19.4	29.30	5653.8	21.1	29.30
362		04:27:00	12.033	5683.7	0.8	29.30	5671.9	18.0	29.30
418		06:19:00	13.900	5703.7	20.0	29.30	5672.3	0.4	29.30
503		09:09:00	16.733	5723.8	20.1	29.20	5693.0	20.7	29.20
541		10:25:00	18.000	5729.5	5.7	29.20	5712.6	19.6	29.20
654		14:11:00	21.767	5743.9	14.3	29.20	5719.5	6.9	29.20
721		16:25:00	24.000	5750.2	6.3	29.20	5733.6	14.1	29.20
901		22:25:00	30.000	5763.1	12.9	29.20	5738.7	5.1	29.20
916		22:55:00	30.500	5764.0	1.0	29.20	5752.7	13.9	29.20
1081	Feb-14	04:25:00	36.000	5770.5	6.5	29.20	5752.5	-0.2	29.20
1261		10:25:00	42.000	5776.5	6.0	29.20	5760.7	8.3	29.20
1441		16:25:00	48.000	5781.7	5.2	29.20	5766.2	5.4	29.20
1584		21:11:00	52.767	5784.0	2.3	29.20	5768.9	2.7	29.20
1621		22:25:00	54.000	5786.4	2.3	29.20	5771.7	2.8	29.20
1801	Feb-15	04:25:00	60.000	5788.1	1.8	29.20	5771.7	0.0	29.20
1981		10:25:00	66.000	5787.8	-0.4	29.20	5775.1	3.4	29.20
							5777.1	2.0	29.20

Reporting Date : February 23, 1996

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Filter Settings:

FILTER PRESS: 20.0 kPa

FILTER TIME: 360.0 min

Well Name : Tundra Daly 05-33

Location : 05-33-010-29 WPM

Formation : Bakken

Date of Test : February 12-20, 1996

Sample No	Date (mm-dd)	Time (hh:mm:ss)	Cum Time (hrs)	UPPER GAUGE			LOWER GAUGE		
				Depth: 851.0 m,CF	Serial No: 01114 (Sunada)		Depth: 852.0 m,CF	Serial No: 01112 (Sunada)	
				Pressure (kPaA)	Delta (kPa)	Temperature (Deg C)	Pressure (kPaA)	Delta (kPa)	Temperature (Deg C)
2161	Feb-15	16:25:00	72.000	5791.4	3.7	29.20	5779.9	2.7	29.20
2341		22:25:00	78.000	5792.3	0.8	29.10	5780.6	0.7	29.20
2521	Feb-16	04:25:00	84.000	5793.1	0.9	29.10	5781.0	0.4	29.10
2701		10:25:00	90.000	5794.3	1.1	29.10	5782.9	1.9	29.10
2881		16:25:00	96.000	5794.9	0.6	29.10	5783.0	0.1	29.10
3061		22:25:00	102.000	5796.1	1.2	29.10	5784.6	1.6	29.10
3241	Feb-17	04:25:00	108.000	5798.1	2.0	29.10	5785.3	0.7	29.10
3421		10:25:00	114.000	5798.6	0.5	29.10	5785.2	-0.0	29.10
3601		16:25:00	120.000	5797.4	-1.1	29.10	5785.6	0.4	29.10
3781		22:25:00	126.000	5797.8	0.4	29.10	5787.3	1.7	29.10
3961	Feb-18	04:25:00	132.000	5798.0	0.2	29.10	5788.2	1.0	29.10
4141		10:25:00	138.000	5798.6	0.5	29.10	5788.0	-0.2	29.10
4321		16:25:00	144.000	5798.9	0.3	29.10	5788.0	0.0	29.10
4501		22:25:00	150.000	5801.1	2.2	29.10	5787.9	-0.1	29.10
4681	Feb-19	04:25:00	156.000	5800.7	-0.4	29.10	5787.9	0.0	29.10
4861		10:25:00	162.000	5799.4	-1.3	29.10	5788.3	0.4	29.10
5041		16:25:00	168.000	5801.3	1.9	29.10	5787.8	-0.5	29.10
5221		22:25:00	174.000	5800.2	-1.1	29.10	5788.9	1.1	29.10
5401	Feb-20	04:25:00	180.000	5801.7	1.6	29.10	5789.4	0.5	29.10
5581		10:25:00	186.000	5801.0	-0.8	29.10	5790.0	0.7	29.10
5704		14:31:00	190.100	5821.3	20.3	29.10	5815.3	25.3	29.10
5706		14:35:00	190.167	5831.6	10.3	29.00	5820.8	5.4	29.10
Running recorders to 800.0 m,CF									
5707		14:37:00	190.200	5526.6	-305.0	29.10	5798.7	-22.0	29.00
5708		14:39:00	190.233	5263.4	-263.2	28.70	5252.2	-546.6	29.00
Recorders @ 800.0 m,CF									
5710		14:43:00	190.300	5261.9	-1.5	28.40	5251.4	-0.8	28.60
Recorders @ 750.0 m,CF									
5711		14:45:00	190.333	4992.6	-269.3	28.30	5251.0	-0.4	28.50
5712		14:47:00	190.367	4739.1	-253.5	28.10	4726.1	-524.9	28.40
5713		14:49:00	190.400	4737.0	-2.1	27.90	4725.5	-0.5	28.20
Recorders @ 700.0 m,CF									
5714		14:51:00	190.433	4500.8	-236.2	27.80	4725.1	-0.5	28.10
5715		14:53:00	190.467	4214.5	-286.4	27.50	4202.7	-522.4	28.00
5716		14:55:00	190.500	4215.1	0.7	27.30	4201.9	-0.8	27.70
Recorders @ 650.0 m,CF									
5717		14:57:00	190.533	4067.9	-147.2	27.10	4201.3	-0.6	27.50
5718		14:59:00	190.567	3685.0	-383.0	26.70	3675.9	-525.4	27.30
5719		15:01:00	190.600	3685.5	0.5	26.40	3672.0	-3.8	27.00
5720		15:03:00	190.633	3686.1	0.6	26.30	3673.9	1.8	26.70
Recorders @ 600.0 m,CF									
5722		15:07:00	190.700	3160.4	-525.7	25.30	3147.4	-526.5	26.20
5723		15:09:00	190.733	3158.5	-1.9	25.00	3146.0	-1.4	25.80
Recorders @ 400.0 m,CF									
5724		15:11:00	190.767	1659.2	-1499.3	24.50	2690.0	-456.0	25.50
5725		15:13:00	190.800	1586.4	-72.8	22.00	1571.3	-1118.8	24.70

Filter Settings:

Reporting Date : February 23, 1996

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FILTER PRESS: 20.0 kPa  
FILTER TIME: 160.0 min

Well Name : Tundra Daly 05-33

Location : 05-33-010-29 WPH

Formation : Bakken

Date of Test : February 12-20, 1996

Sample No	Date (mm-dd)	Time (hh:mm:ss)	Cum Time (hrs)	UPPER GAUGE			LOWER GAUGE		
				Pressure (kPaA)	Delta (kPa)	Temperature (Deg C)	Pressure (kPaA)	Delta (kPa)	Temperature (Deg C)
5726	Feb-20	15:15:00	190.833	1586.8	0.4	20.80	1570.4	-0.8	23.30
Recorders @ 200.0 m,CF									
5728		15:19:00	190.900	187.6	-1399.1	17.70	167.5	-1402.9	21.40
5729		15:21:00	190.933	185.9	-1.7	15.80	164.9	-2.7	19.50
5730		15:23:00	190.967	184.2	-1.7	15.10	163.0	-1.9	18.00
Recorders @ Surface									
5732		15:27:00	191.033	173.4	-10.7	13.50	150.5	-12.5	16.10
5733		15:29:00	191.067	171.7	-1.7	12.30	155.4	4.9	15.10
5734		15:31:00	191.100	170.1	-1.6	11.30	157.5	2.1	14.00
Recovered recorders from well									
5738		15:39:00	191.233	14.1	-156.0	3.20	0.6	-156.9	8.50

## APPENDIX G

### MINERAL OWNERS AND ADDRESSES



ANRO	Angus, Robert Lyle P.O. Box 400 Elkhorn, MB 845-2149	ROM ONO	CAMI	Canart, Mildred May P.O. Box 154 Elkhorn, MB 845-2455	ROM ONO	DIBE	Dibben, Beth 8531 - 77th Avenue Edmonton, AB	T6C 0L5
ANZA	Anderson, Zarett Marie 26, 9520 - 174th Street Edmonton, AB	T5T 5Z3	CARO	Canart, Robert George 3047 Victoria Heights Crescent Ottawa, ON (613) 738-7555	K1T 3M8	DIXO	Dixon, Sharon, Dava & Douglas P.O. Box 56 Maryfield, SK	
ARCH	Archambault, Marcel & Elizabeth 1115 - 22nd Street Brandon, MB 727-8780	R7B 2P6	CNEL	Canada Northwest Energy Limited 2700, 300 Fifth Avenue S.W. Calgary, AB	T2P 3C4	DRRA	Drinnan, Jim G. 408 Silver Hill Way N.W. Calgary, AB (403) 286-6613	T3B 4L5
BABE	Baughen, Bernice (formerly Northcut)		COCI	Collinge, Cindy Lee P.O. Box 564 Didsbury, AB	TOM OWO	DULL	Duncan, Lloyd Alexander P.O. Box 1502 Taber, AB	TOK 2G0
BIVI	Bird, Vivian Mary 32 Bridge Villa Estates Lethbridge, AB (403) 320-0088	T1K 4Z8	COCL	Collins, Cindy Lorraine 601 - 7275 Salisbury Avenue Burnaby, BC	V5E 4E1	ELAR	Ellingson, Arnold Emil 36 McNabb Park Street Brooks, AB	TOJ 0J0
BOEA	Boomhauer, Earl General Delivery Elkhorn, MB 845-2577	ROM ONO	COIS	Cotton, Isabel 2015 Richmond Avenue Brandon, MB 728-1890	R7B 0T4	EXJE	Exley, Jean 65 Acheson Road West Hill, ON	
BOJE	c/o P.O. Box 63 St. Paul, AB	TOA 3A0	COMI	Collins, Michael Dwayne P.O. Box 1024 Westbank, BC	VOH 2A0	FOCI	Fordyce, Cindy Christine 18 Glenacres Crescent Winnipeg, MB	R3T 5P9
BUMA	Bukaluk, Marlene Fay 1613 - 20th Street Brandon, MB 728-3860	R7B 2P2	COOL	Corvair Oils Ltd. P.O. Box 3827, Station "D" Edmonton, AB	T5L 4J8	GAOC	Gauer Oil Company 202 Riverside Drive Toronto, ON	M6S 4A9
CAJO	Canart, John Lucien (Estate) c/o 3047 Victoria Heights Crescent Ottawa, ON (613) 738-7555	K1T 3M8	DEMU	Desy, Muriel Charlotte 3834 Sixth Avenue North Port Alberni, BC	V9Y 4M2	GATI	Gardiner, Timothy Lawrence P.O. Box 634 Didsbury, AB (403) 337-2866	TOM OWO
CAMA	Cantlon, Marlene Elaine P.O. Box 113 Oak Lake, MB 855-2259	ROM 1P0	DEPT	Department of Energy & Mines 555 - 330 Graham Avenue Winnipeg, MB	R3C 4E3	GIER	Giesbrecht, Ernest A. General Delivery Kola, MB	ROM 1B0

GODO	Gow, Dorothy Arlene General Delivery Miniota, MB	ROM 1M0	KOBA	Koop, Barry Alan P.O. Box 35 Kola, MB 556-2223	ROM 1B0	LUKE	Lund, Kenneth Lloyd P.O. Box 263 Elkhorn, MB 845-2188	ROM ONO
GOHE	Goethe, Helen Rachel General Delivery Elkhorn, MB 845-2074	ROM ONO	KUSI	Kucharavy, Sidney John 23 Leeds Avenue Winnipeg, MB 261-0404	R3T 3X1	LUKM	Lund, Kenneth & Marion P.O. Box 263 Elkhorn, MB 845-2188	ROM ONO
GRAN	Grant, Andrew & Betty P.O. Box 1922 Virden, MB 748-1156	ROM 2C0	LAER	Lamont, Eretta Ilene P.O. Box 23 Manson, MB 722-2324	ROM 1J0	LULY	Lund, Lyle George Berry 105 - 5635 Paterson Avenue Burnaby, BC (604) 435-4227	V5H 2M6
GREV	Green, Eva General Delivery Crystal City, MB 873-2507 (disconnected)	ROK ONO	LEBL	Leis, Blanche Noreen P.O. Box 231 Elkhorn, MB 845-2032	ROM ONO	MACG	MacNeil, Genevieve 9631 Diamond Road Richmond, BC (604) 271-0679	V7E 1P5
HAEL	Hamilton, Elsie General Delivery Elkhorn, MB	ROM ONO	LERL	Leonard Resources Ltd. P.O. Box 245 Elkhorn, MB	ROM ONO	MAMA	Magnon, May P.O. Box 63 St. Paul, AB	TOA 3A0
HUED	Hudzik, Edward R.R. #4 Brandon, MB	R7A 5Y4	LESM	Lennon, Samuel & Myrna 619 - 22nd Street Brandon, MB 728-5482	R7A 1S5	MCMH	McEachen, Mavis Maxine P.O. Box 117 Onanole, MB	ROJ 1N0
HUKE	Hutchison, Kenneth General Delivery Elkhorn, MB 845-2008	ROM ONO	LLCM	Longman, Lloyd & Christmas, Margaret General Delivery Maryfield, SK		MCWI	McMichael, Winthrop Leigh 718 Dukeshire Avenue Kalamazoo, Michigan U.S.A.	
KC&C	Kola Church & Cemetary General Delivery Kola, MB 556-2604	ROM 1B0	LUDA	Lund, Harold Dale 3501 Rosser Avenue Brandon, MB 727-7862	R7B 2Z3	MOHI	Moore, Hillis Gordon P.O. Box 535 Virden, MB 748-1530	ROM 2C0
KIHO	Kitzler, Hope Justine 125 Cedar Avenue Snow Lake, MB 358-2550	ROB 1M0	LUGE	Lund, Gerald Laverne P.O. Box 12 Elkhorn, MB 845-2196	ROM ONO	MOMY	Mooney, Myrtle Revia 2312 Bradford Avenue Sidney, BC	V8L 2B6
KLER	Klassen, Erna 14728 Deer Ridge Drive S.E. Calgary, AB	T2J 6B5	LUGG	Lund, Glen James & Garth Walker P.O. Box 41 Kola, MB 556-2355	ROM 1B0	MOSA	Montgomery, Sarah Bessie General Delivery Virden, MB 748-1703	ROM 2C0

MOTC	Montreal Trust Company 411 Eighth Avenue S. W. Calgary, AB (403) 267-6887 (Kathy J. Smith)	T2P 1E7	OGDO	Ogilvie, Donald C12 Wellbury Drive, R.R. #3 Ganges, BC	VOS 1E0	PEED	Penner, Edgar General Delivery Elkhorn, MB	ROM ONO
MOTR	Montreal Trust Company P.O. Box 369 Winnipeg, MB 943-0451	R3C 2J1	OGEL	Ogilvie Enterprises Ltd. P.O. Box 417 Maryfield, SK	SOG 3K0	PEHE	Pettapiece, Helen Clarinda 119 Bruce Avenue Winnipeg, MB 832-4469	
MURO	Strata Resources Ltd. 1298 Williams Road E. Courtenay, BC	V9N 7J9	OGGE	Ogilvie, Gerald George General Delivery Elkhorn, MB 845-2015	ROM ONO	PENF	Penner Farms Ltd. P.O. Box 42 Kola, MB	ROM 1B0
NAEA	Naylen, Edward Anthony P.O. Box 174 Maryfield, SK 556-2366	SOG 3K0	OGHA	Ogilvie, Harold P.O. Box 65 Elkhorn, MB 845-2071	ROM ONO	PERM	Canada Trust c/o Montreal Trust 411 Eighth Avenue S.W. Calgary, AB (403) 267-6887 (Kathy J. Smith)	T2P 1E7
NARU NAOC	Naylen, Ruth J. (Est)/Naylen Oil Corp. 40 Everett Crescent Regina, SK	S4S 2M7	OVLJ	Overand, Lewis & Jean P.O. Box 313 Elkhorn, MB 845-2324	ROM ONO	POCO	Poco Petroleums Ltd. P.O. Box 4365, Station "C" Calgary, AB	T2T 5N2
NEAR	Neufeld, Arthur Peter P.O. Box 34 Kola, MB 556-2334	ROM 1B0	OVWE	Overand, Wesley & Ellen General Delivery Elkhorn, MB 845-2636	ROM ONO	REFR	Rex, Franz Leo General Delivery Butler, MB	
NEDC	Neufeld, Donald Craig General Delivery Kola, MB 556-2228	ROM 1B0	PAED	Paull, Edward James P.O. Box 189 Elkhorn, MB 845-2418	ROM ONO	REJD	Reddekop, James & Doreen General Delivery Kola, MB	ROM 1B0
NEED	Neufeld, Eric Deane P.O. Box 396 Maryfield, SK (306) 646-4430	SOG 3K0	PAUW	Paull, William Ian Apt. 32, 750 South Edward Street Thunder Bay, ON (807) 577-3693	P7E 2H4	ROKW	Rowan, Kenneth William John P.O. Box 402 Elkhorn, MB 845-2061	ROM ONO
NTCL	Northern Trusts Company c/o 411 Eighth Avenue S.W. Calgary, AB (403) 267-6887 (Kathy J. Smith)	T2P 1E7	PAWI	Paull, William John P.O. Box 128 Elkhorn, MB 845-2127	ROM ONO	ROMA	Rowan, Mary Katherine P.O. Box 402 Elkhorn, MB 845-2061	ROM ONO
OGDA	O'Greysik, Dale Andrew General Delivery Elkhorn, MB 845-2573	ROM ONO	PEAE	Penner, Archie & Elvira P.O. Box 71 Kola, MB	ROM 1B0	ROTU	Rowan, Thelma Minnie General Delivery Elkhorn, MB	ROM ONO

RMWA	R.M. of Wallace P.O. Box 310 Virden, MB 748-1239	ROM 2C0	SHRM	Shepherd, Rosella Mary P.O. Box 411 Virden, MB 748-2607	ROM 2C0	TOGL	Tundra Oil and Gas Ltd. 1111 One Lombard Place Winnipeg, MB 934-5850	R3B OX4
RODA	Rowan, Darwin Lorne General Delivery Elkhorn, MB 845-2389	ROM ONO	SHRO	Shepherd, Rodney Stuart P.O. Box 126 Elkhorn, MB 845-2069	ROM ONO	TWDD	Twigg, Darryl & Donald P.O. Box 248 Elkhorn, MB 845-2306	ROM ONO
ROED	Rowand, Edith Sharon General Delivery Kola, MB 556-2644	ROM 1B0	SOFL	Southern, Florence Mabel Kelowna, BC		TWDL	Twigg, Darryl Lloyd P.O. Box 248 Elkhorn, MB 845-2306	ROM ONO
ROKE	Rowan, Kenneth Lyle General Delivery Elkhorn, MB 845-2345	ROM ONO	SSBC	Soldier Settlement Board of Canada		UOFM	University of Manitoba Room 202, Administration Building Winnipeg, MB	R3T 2N2
ROLA	Rouse, Lawrence Garth 5023 - 1988 Street Langley, BC (604) 530-6580	V3A 7L9	STDR	Stephen, Doris Ruth 360 Evergreen Street Sherwood Park, AB	T8A 1J8	WAIL	Wasy Investments Ltd. 1598 Sixth Avenue Prince George, BC	V2L 5G7
ROWI	Rowan, William Ralph P.O. Box 223 Elkhorn, MB 845-2323	ROM ONO	STNO	Stewart, William Norman P.O. Box 307 Maryfield, SK	SOG 3K0	WAJO	Watson, John Edwin 158 Leslie Street Sault Ste. Marie, ON (705) 256-5835	P6B 5C7
SHCL	Shepherd, Clifford Dale 101 Prairie Crescent Brandon, MB 729-8884	R7B 3S9	STRC	Streeter, Rose Catherine 14923 NE Graham Portland, OREGON	U.S.A	WARO	Watson, Robin P.O. Box 245 Roblin, MB 937-2426	ROL 1P0
SHFR	Shepherd, Francis Malcolm P.O. Box 58 Elkhorn, MB 845-2051	ROM ONO	TAJA	Taylor, James Austin 7 Forest Boulevard Brandon, MB 728-6872	R7B 2N4	WATE	Watson, Thomas & Evelyn P.O. Box 1405 Virden, MB 748-3012	ROM 2C0
SHJM	Shepherd, Joyce Marlene c/o 101 Prairie Crescent Brandon, MB N/A	R7B 3S9	TAMU	Taylor, Murray Archibald P.O. Box 262 Maryfield, SK (306) 646-2201	SOG 3K0	WATH	Watson, Thomas Reginald P.O. Box 1405 Virden, MB 748-3012	ROM 2C0
SHMU	Shepherd, Murray Dwight P.O. Box 693 Virden, MB 748-1028	ROM 2C0	THKA	Thomson, Kathleen Mary P.O. Box 218 Elkhorn, MB 845-2147	ROM ONO	WIBA	Widger, Barbara J. P.O. Box 68 Elkhorn, MB 845-2311	ROM ONO

WIDO	Widger, Donald C. P.O. Box 68 Elkhorn, MB 845-2311	ROM ONO
WODJ	Wood, David John P.O. Box 87 Crossfield, AB	TOM OSO
WODO	Wood, Douglas Harold P.O. Box 99 Kelwood, MB 967-2384	ROJ OYO
WOHL	Woodbrand Holdings Ltd. General Delivery Hargrave, MB	ROM OWO

## **APPENDIX H**

### **CONVERSION PROGRAM 1-32-10-29**

**TUNDRA OIL AND GAS LTD.  
1-32-10-29 WPM KOLA UNIT NO. 2  
CONVERSION PROGRAM**

96-05-29  
WELL DATA

ELEVATIONS

K.B. - 536.5 M  
G.L. - 532.26 M  
P.B.T.D. - 906.5 M  
T.D. - 930.0 M

PERFORATIONS

862.75 - 867.25 M Bakken

CASING

SURFACE - 10 JTS 219.1 MM, 35.72 KG/M, K-55 SET AT 126.2 M. Cemented with 12 tonnes class "A" plus 3 % CaCl<sub>2</sub>.

PRODUCTION - 69 JTS 139.7 MM, 23.07 KG/M, J-55, SET AT 925.0 M. Cemented with 17 tonnes 2:1:8 class A and 7 tonnes 0:1:0 class G.

CORE

856.0 - 873.25 M

D.S.T

863.0 - 872.0 M Bakken - Recovered 149 m GMCO

TUBING

90 JTS, 60.3 MM  
1 - PSN, 0.33 M

LANDING DEPTH - 987.25 M

RODS

20-150-RWAC-12-3+WIPERS, TOG-9312  
78 - 19 MM PLAIN  
35 - 19 MM NYLON SCRAPERED

PROGRAM

1. Inform Dept. of Energy and Mines of impending workover at 748-1557.
2. MIRU service rig c/w pump and tank. Conduct a pre-job meeting reviewing program and safety requirements.

3. Lock out power and remove horsehead. Stroke pump to pressure test tbg to 3500 kPa. If tbg does not pressure test use rig pump for test.

4. POOH with pump and rods. Lay down rods.

5. Install and pressure test B.O.P.'s. Bleed off csg to rig tank. Tag PBTD to check for fill. Circulate well over to clean produced water.

6. With the tubing landed at the base of the perforations, MIRU acidizer c/w 1 m3 15 % HCl containing iron chelator, 5 % mutual solvent etc.. . Conduct a pre-job safety meeting. Personnel shall wear eye protection and fresh water for eye washes etc shall be available.

7. Pressure test surface lines to 20 MPA. Circulate acid to the perforations. Perform a wash and squeeze treatment at 80 l/min.. Do not exceed 14 Mpa. Overflush acid with 1 m3 clean produced water.

8. Rig up to swab. Swab back acid to rig tank. neutralize acid with soda ash.

9. POOH and lay down 60.3 mm tbg.

10. RIH with the following string:

1 - 139.7 mm coated AD-1 tension packer

1 - Impreglon coated PSN

60.3 mm TK-99 lined tbg to surface

Impreglon coated 8 rd to LPT cross-over

14000 kPa Stainless steel ball valve

#### **Land packer at 860 m.**


Follow installation instructions as per manufacturer.

11. Reverse circulate the annulus over to fresh water inhibited with 0.5 % CRW 132. Do not overcirculate fresh water into tbg. Pump 5 gal diesel into annulus to prevent freezing.

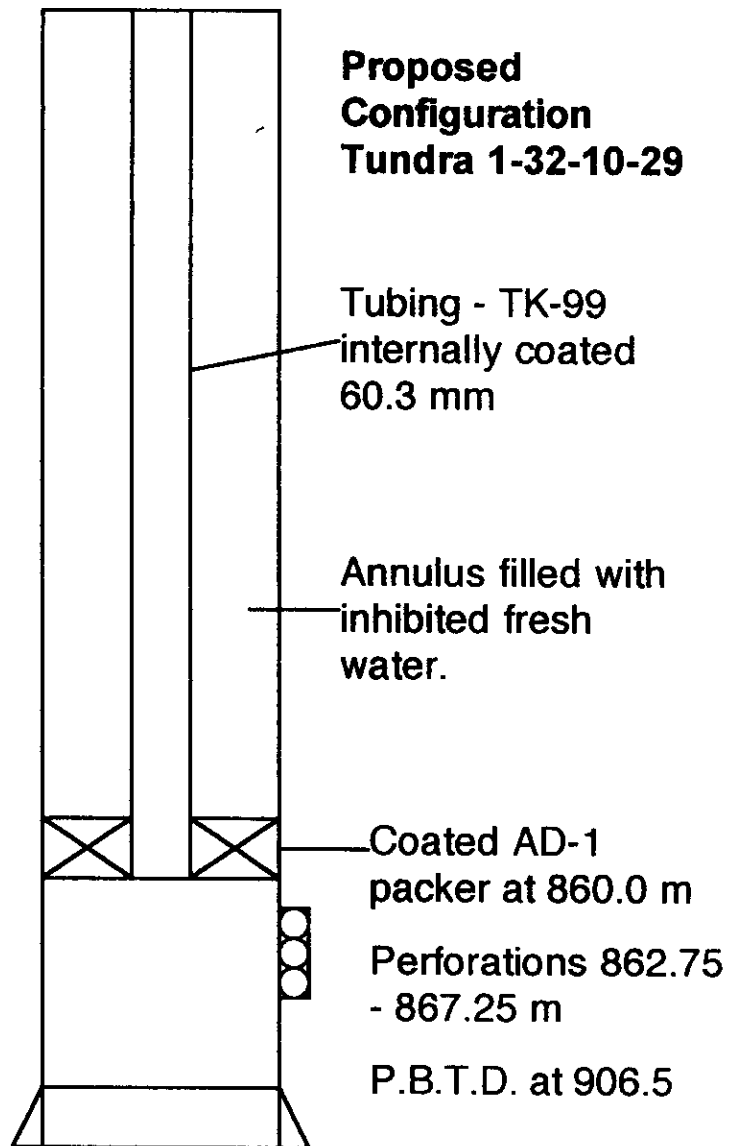
12. Set packer in 8000 daN tension. Exchange dognut for slips. Pressure test annulus to 3500 kPa.

13. Install teflon impregnated nipple on tbg and install a stainless steel ball valve.

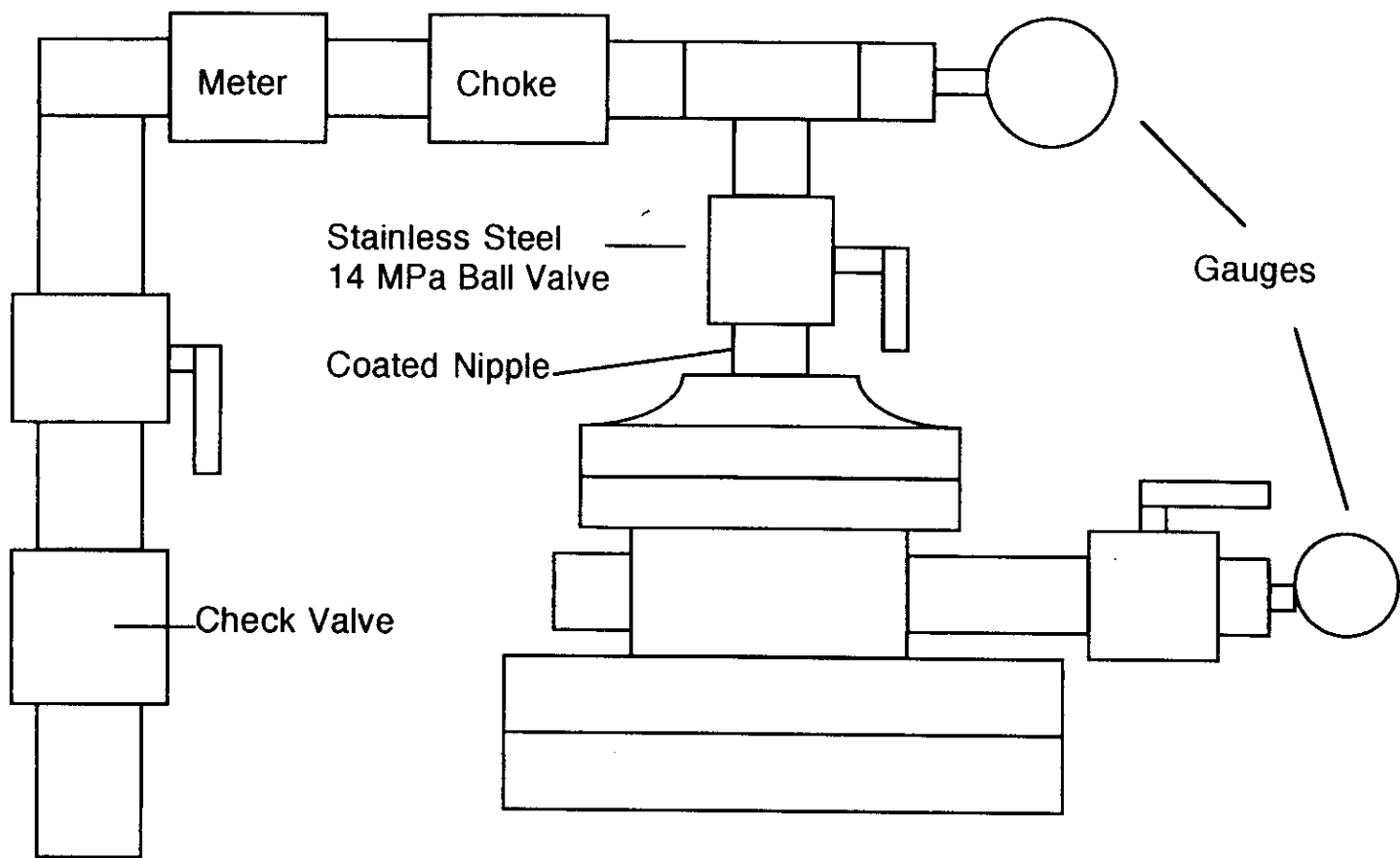
14. T.O.T.P.

PREPARED BY  P. Eng.





**TUNDRA OIL  
AND GAS LTD.**



**TYPICAL  
INJECTION  
WELLHEAD**

## APPENDIX I

### LETTER AGREEMENT (PRE-UNITIZATION TERMS AND CONDITIONS)

August 8, 1996

Corvair Oils Ltd.  
11030 - 127 Street  
Edmonton, Alberta  
T5M 3K7

Attention:      **Mr. Rick Korol**  
                    **V.P. Engineering**

Dear Rick,

**RE: Kola Unit No.2**  
      **Pre - Unitization Letter Agreement**

---

Tundra is planning to unitize the North Kola Bakken "A" Pool lands for the purpose of waterflooding during 1996. In order to have an approved pressure maintenance scheme in place before year end 1996, we will have to negotiate the Unit tract factors and submit a pressure maintenance application to the Crown by late August, 1996. The letter agreement method was used in 1993 to successfully put in place the Kola Unit No.1 waterflood operation. Tundra Oil and Gas Ltd. and Corvair Oils Ltd. will be the only working interest owners in the proposed Unit. The current letter agreement will be the template for the subsequent Unit agreements that will be drafted by Tundra. The terms of the Kola Unit No.2 Letter Agreement are outlined as follows:

**UNIT NAME**

Tundra suggests that the official Unit name of the North Kola lands shall be the Kola Unit No.2.

**OPERATORSHIP**

Tundra Oil and Gas Ltd. will be the operator of record at the proposed Kola Unit No.2.

**UNIT LANDS**

The lands that will be included in the proposed Kola Unit No.2 are outlined as follows (refer also to Figure No.1):

- LSD 13-28-10-29 W1M
- LSD 14-28-10-29 W1M

UNIT LANDS (continued)

- LSD 15-28-10-29 W1M
- LSD 16-28-10-29 W1M
- LSD 16-29-10-29 W1M
- LSD 1-32-10-29 W1M
- LSD 2-32-10-29 W1M
- LSD 8-32-10-29 W1M
- LSD 1-33-10-29 W1M
- LSD 2-33-10-29 W1M
- LSD 3-33-10-29 W1M
- LSD 4-33-10-29 W1M
- LSD 5-33-10-29 W1M
- LSD 6-33-10-29 W1M
- LSD 7-33-10-29 W1M
- LSD 8-33-10-29 W1M
- LSD 11-33-10-29 W1M
- LSD 12-33-10-29 W1M

The total Unit area will consist of 720 acres (291 hectares). The Unit will include both 40 acre and 80 acre developed lands.

UNIT WELLS

The following wells will be included in the proposed Kola Unit No.2:

- Well 13-28-10-29 W1M
- Well 15-28-10-29 W1M
- Well 16-29-10-29 W1M
- Well 1-32-10-29 W1M
- Well 2-32-10-29 W1M
- Well 8-32-10-29 W1M
- Well 1-33-10-29 W1M
- Well 3-33-10-29 W1M
- Well 5-33-10-29 W1M
- Well 7-33-10-29 W1M
- Well 11-33-10-29 W1M

UNITIZED ZONE

The Bakken "A" Pool will be the unitized oil bearing formation in the proposed Kola Unit No.2.

**PRESSURE MAINTENANCE AREA**

Waterflooding in the proposed Unit will include both 40 acre and 80 acre pressure maintenance. Tundra proposes that initially 1-32-10-29 W1M be converted to injection service. The 1-32 conversion will provide pressure maintenance in the 40 acre development area. Pressure maintenance in the 80 acre development area can best be achieved through well 3-33-10-29 W1M. Well 3-33 will be converted to injection service once the oil rate declines below 1 m<sup>3</sup>/day. Figure No.2 outlines the proposed waterflood patterns in the Kola Unit No.2.

**EQUALIZATION**

All existing wellbores, downhole equipment, lease equipment, and flowlines will be equalized at no value.

**CAPITAL EXPENDITURES**

The only immediate capital expenditures that are envisioned in the proposed Kola Unit No.2 is the conversion of 1-32-10-29 W1M to injection service. All high rates wells have previously been flow lined to the 4-28-10-29 central battery facilities. Low rate wells currently produce to lease facilities. An injection line has previously been run to the 1-32 well location. All fluids from the Kola Unit No.2 will continue to be processed at the 4-28-10-29 W1M central battery facilities. Project AFE costs of 33.45 M\$ are estimated to convert 1-32 to injection service (refer to Attachment No.1). A working interest owner not having an equity interest in the 4-28-10-29 W1M central battery facilities will be charged a processing fee. The processing fee will be calculated on the basis of a rate of return formula. All future capital expenditures in the proposed Kola Unit No.2 will be allocated to the working interest owners based on their final equity interests in the proposed Kola Unit No.2

**ENGINEERING COSTS**

Pre-unitization engineering costs incurred by Tundra will be distributed to the working interest owners based on their final equity interests in the proposed Kola Unit No.2. Pre-unitization engineering costs will include but will not be restricted to laboratory services, waterflood evaluation studies, engineering time spent in preparation of capital cost estimates for facilities, and the pressure maintenance application.

**TRACT FACTORS**

Tundra proposes that the tract factors in the proposed Kola Unit No.2 be determined using the same methodology that was used in the Kola Unit No.1. The oil production rate during the last 90 operating days was used to determine tract factors in the Bakken "A" Pool at Kola Unit No.1. It was found that pore volume was not an acceptable parameter to determine tract factors, since completion problems have resulted in under performance in many of the wells with good reservoir pore volume. As a result, current oil productivity was considered to be a more equitable approach in determining Unit working interests. On this basis, since the Kola Unit No.2 is the northern extension of the Kola Bakken "A" Pool, with similar production performance, current oil production should be used to determine Unit tract factors. Production during the last 90 operating days up to June 30 31, 1996 will be used in the calculation of tract factors.

Table No.1 outlines the production during the last 90 operating days. Table No.2 outlines the proposed tract factors for the lands included in the proposed Kola Unit No.2. Based on the aforementioned methodology, the proposed working interests in the Unit will be as follows:

Tundra Oil and Gas Ltd.	98.60700 %
Corvair Oils Ltd.	<u>1.39300 %</u>
TOTAL	100.00000 %

**PRESSURE MAINTENANCE APPLICATION**

In preparation for unitization of the North Kola Bakken "A" Pool lands, Tundra has prepared the pressure maintenance application for the proposed Kola Unit No.2. This document provides a comprehensive overview of the waterflood operations proposed for the Kola Unit No.2. Tundra will file this application with the Manitoba Petroleum Branch if the terms and conditions of the Letter Agreement and Pressure Maintenance Application (previously sent to Corvair, dated 96.06.18) are acceptable to Corvair.

# Tundra

oil and gas ltd.

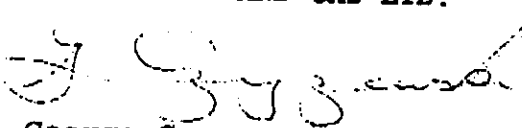
5

## SYNOPSIS

If the terms and conditions outlined in this offer of unitization pertaining to the North Kola Lands are acceptable to Corvair Oils Ltd., please execute both copies of the Letter Agreement, and return one fully executed copy to Tundra Oil and Gas Ltd. Should you have any questions, please contact the undersigned at (204) 934-5853.

Yours truly,

TUNDRA OIL AND GAS LTD.

  
George Czyzewski, P.Eng.  
Senior Reservoir Engineer

## LETTER AGREEMENT

In acceptance of the terms and conditions pertaining to the unitization of the proposed Kola Unit No.2 outlined in this Letter Agreement, CORVAIR OILS LTD. has executed this Letter Agreement between TUNDRA OIL AND GAS LTD. and CORVAIR OILS LTD. on this 28 day of August, 1996 in the City of Edmonton, and Province of Alberta, Canada.

CORVAIR OILS LTD.

Per: 22 Koral

Witness: [Signature]



[illegible]

[illegible]



November 27, 1996

Mr. Brad Thiessen  
Tundra Oil and Gas Ltd.  
1111-One Lombard Place  
Winnipeg MB R3B 0X4

NEW FILE

FIELD/POOL

DAILY SALES AT POOL

KOLA UNIT NO. 2

UNIT AGREEMENT

Dear Brad:

**Re: Kola Unit No. 2 Unit Agreement**

Attached is a copy of the execution page for Kola Unit No. 2 Unit Agreement signed by the Minister of Energy and Mines. The Branch is in receipt of a copy of the signed execution pages for each owner in the unit and has registered the unit agreement. The effective date for Kola Unit No. 2 is December 1, 1996.

The exclusion of the tract containing Lsd's 10 & 15-28-10-29 (WPM) from the unit area has created a potential correlative rights issue with respect to conversion of the 1-33-10-29 and 3-33-10-29 wells to water injection. Prior to approving conversion of these wells the Branch will require the offsetting royalty owners in Lsd's 10, 14 (currently unleased Crown oil & gas rights) and 15-28-10-29 be notified and given an opportunity to comment on the application. Tundra should be prepared to address the merits of unit enlargement at the time of conversion.

If you have any questions in respect of this matter please contact the undersigned at 945-6574.

Yours truly,

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

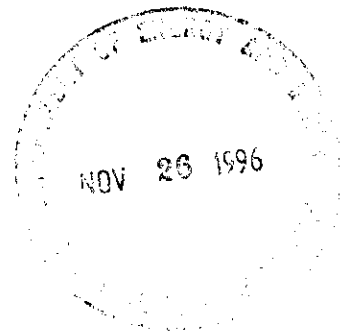
cc. Administration  
P. Seymour



November 26, 1996

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

**Attention: John Fox**  
**Chief Petroleum Engineer**



Dear John:

**RE: Unit Agreement and Operating Procedure**  
**Kola Unit No. 2**

---

Further to our telephone conversation, please find enclosed the following signature pages for Kola Unit No. 2:

Unit Agreement	-Montreal Trust Company
	-Corvair Oils Ltd.
	-Tundra Oil and Gas Ltd.

Unit Operating Agreement	-Corvair Oils Ltd.
	-Tundra Oil and Gas Ltd.

It is my understanding that the Crown's signatory page for the Unit Agreement is with your Minister for signing.

We would ask that you proceed with the registration of the Unit in accordance with The Oil and Gas Act for an effective date of December 1, 1996.

Thank you for your cooperation in these matters.

Sincerely,

TUNDRA OIL AND GAS LTD.

A handwritten signature in cursive script, which appears to read "Brad Thiessen", is written over the typed name.

Brad Thiessen  
Land Manager

BT/kd  
Enclosure



## Memorandum

Date November 14, 1996

To L.R. Dubreuil  
Director  
Petroleum & Energy Branch

From John Fox  
Chief Petroleum Engineer  
Petroleum & Energy Branch

Subject **Proposed Kola Unit No. 2 - Revised Unit Area**

Tundra Oil and Gas was unable to obtain approval of 100% of the royalty owners in the proposed unit area. Two of three royalty owners in the unit tract containing LSD's 10 & 15-28-10-29 did not execute the agreement. Tundra has modified the unit area to exclude the aforementioned unit tract (see Fig. 1) and submitted a revised unit agreement for execution by the Minister.

### Recommendation

It is recommended that the Minister execute the revised unit agreement on behalf of the Crown. Attached is a copy of the proposed memo to the Deputy.

### Discussion

Royalty owners of the unit tract containing LSD's 10 & 15-28-10-29 were not satisfied with the tract participation, 2.23%, based on production from April to June. The well was fracture stimulated in late June and production increased to 104.5 m<sup>3</sup>/mon (Sep/96) from 14.3 m<sup>3</sup>/mon (Jun/96).

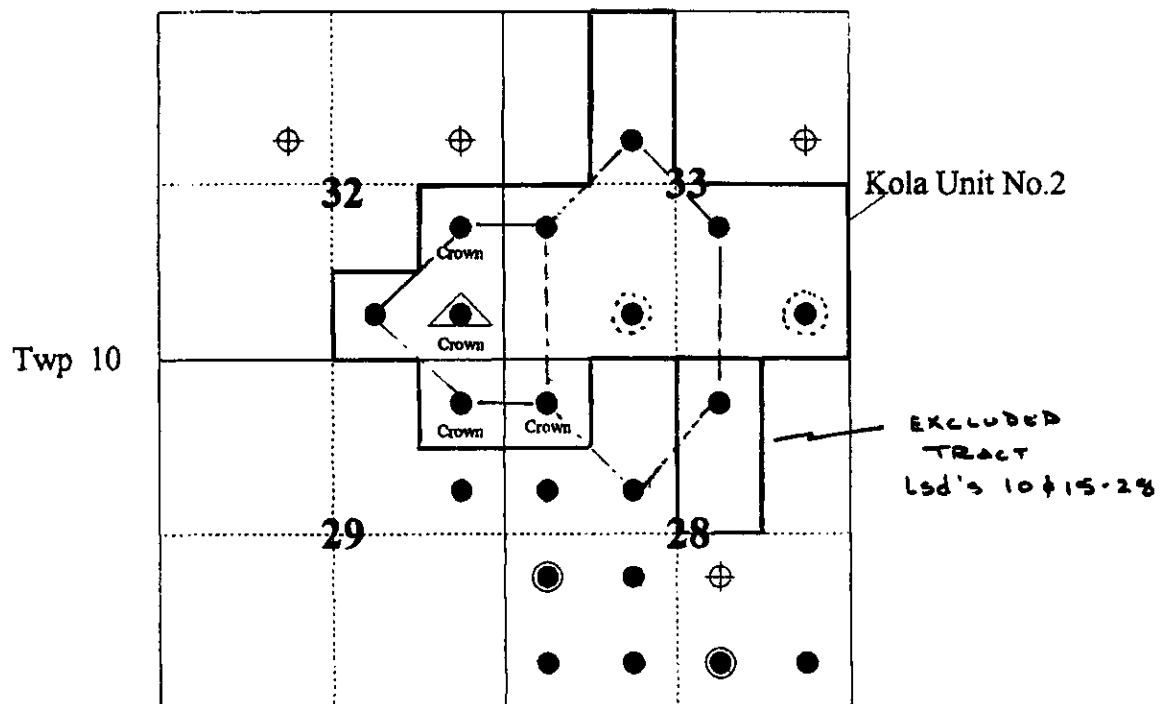
Removal of the subject unit tract will have no impact on waterflood recovery and minimal impact on correlative rights. The 15-28 well is part of the 7-spot injection pattern surrounding the 3-33 well (see Fig. 1). Tundra plans to convert the 7-33 well to injection after waterflood response is observed in the 1-32 injection pattern. Additional injection support at 15-28 may occur when the 1-33 well is converted. Tundra has estimated incremental waterflood recovery at 15-28 of 700 m<sup>3</sup> (5% of tract OOIP). The 15-28 well fractured out of zone into the Lodgepole and has a 77% water-cut. Tundra has observed that Bakken wells with water influx from the Lodgepole have lower oil recovery.

It is understandable why the royalty owners of the subject tract did not enter into the unit agreement. Based on production from July-September the tract participation would have been 8.1% vs 2.23% proposed by Tundra. The only correlative rights issue is recovery of oil mobilized by the waterflood by the 15-28 well outside the unit. The financial impact of oil being swept outside the unit and recovered by the 15-28 well is minimal.





With the unit area modified the Crown's share in the unit increases from 7.2% to 7.4%. Tundra would like to commence injection in December. It is recommended that the Minister execute the revised unit agreement on behalf of the Crown by November 30, 1996.

FIGURE 1

KOLA UNIT NO. 2



LEGEND

-  Well to be converted to water injection
-  Current production well
-  Water injection well (former producer)
-  Dry and abandoned well

# EXHIBIT 'A'

Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2

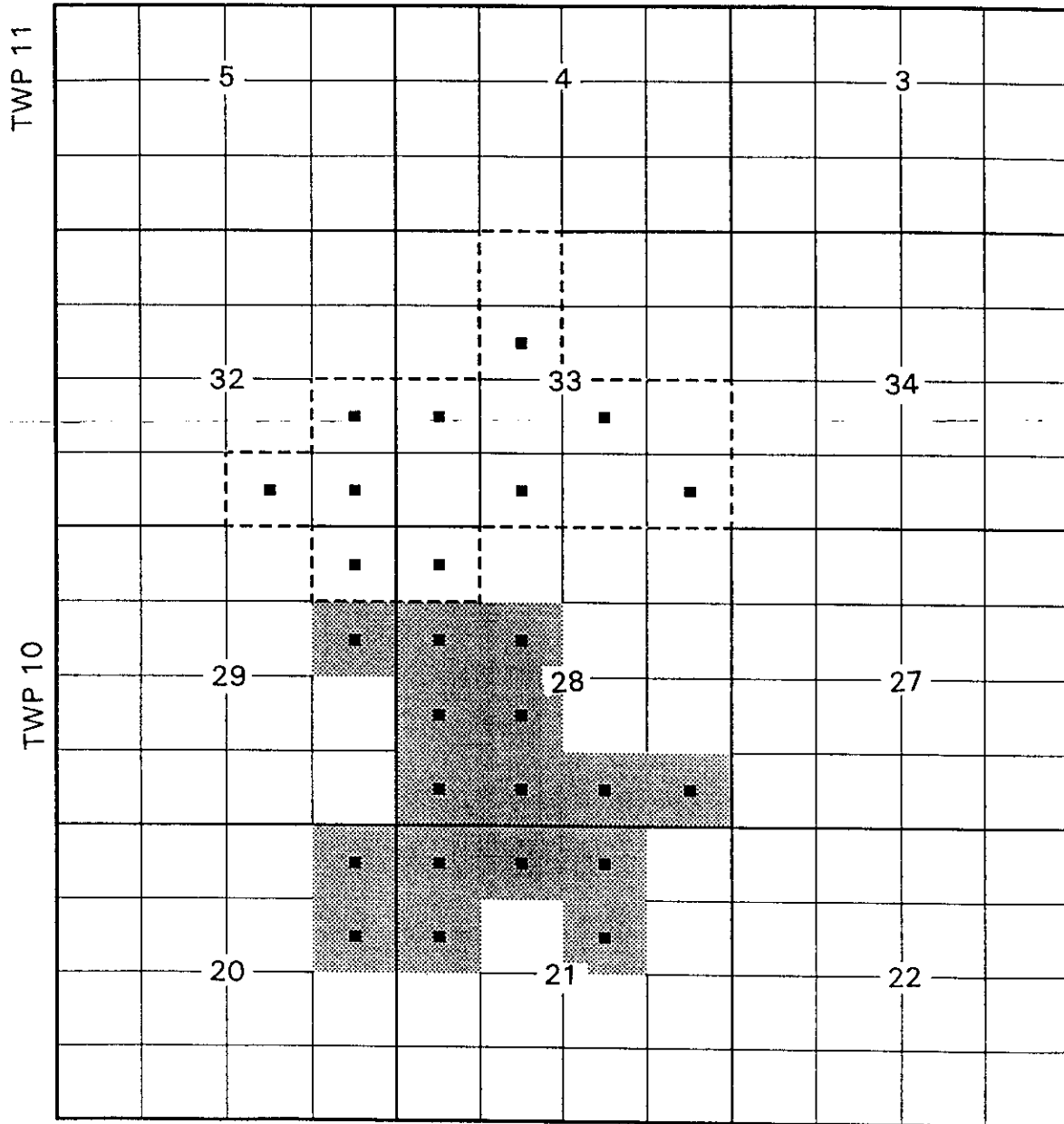
## TRACT PARTICIPATION November 7, 1996

Tract No.	Land Description LSD	Working Interest		Royalty Interest		Tract Participation %
		Owner	Share (%)	Owner	Share (%)	
1	13-28-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	5.10936
2	16-29-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	1.68799
3	1-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	3.91143
4	2-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Tundra Oil and Gas Ltd.	100.0000	1.60026
5	8-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	20.42230
6	1 & 8-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.56790
7	2 & 7-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	5.00650
8	3 & 6-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.70403
9	4 & 5-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	31.86617
10	11 & 14-33-10-29 WPM	Corvair Oils Limited Tundra Oil and Gas Ltd.	20.0000 80.0000	Montreal Trust Company	100.0000	7.12406

# EXHIBIT "B"

Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2  
November 7, 1996

## RGE 29 WPM





# KOLA UNIT NO. 2 - PRODUCTION JUL to SEP

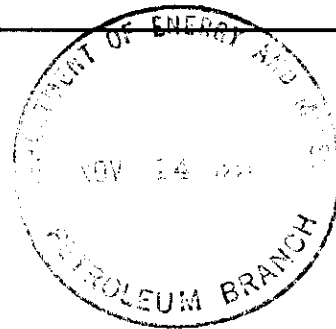
WELL	JUL	AUG	SEP	TOTAL
13-26	45.3	44.3	43.4	133.0
15-28	51.2	101.4	104.5 ( 77.4% WC )	257.1
16-29	15.6	16.1	16.4	48.1
1-32	38.3	31.2	30.3	99.8
2-32	16.2	14.7	6.2	37.1
8-32	211.7	201.8	197.6	611.1
1-33	117.3	109.6	113.2	340.1
3-33	116.6	112.3	105.6	334.5
5-33	348.6	329.1	326.2	1003.9
7-33	46.8	48.7	45.3	140.8
11-33	73.2	47.4	46.5	167.1
TOTAL				<u>3172.6</u> m <sup>3</sup>

TRACT PARTICIPATION  
15-28 8.10 %



November 13, 1996

Manitoba Energy and Mines  
Petroleum Branch  
1395 Ellice Avenue, Suite 360  
Winnipeg, Manitoba  
R3G 0G3



Attention: **Mr. J. Fox, P.Eng.**  
**Chief Petroleum Engineer**

Dear John,

**RE: Kola Unit No.2 Unitization**

In follow-up to your conversation (96.11.13) with Brad Thiessen of Tundra Oil and Gas Ltd. pertaining to the impact of removing tracts 10-28 and 15-28-10-29 from Kola Unit No.2, Tundra offers the following explanation.

Tundra's preference was to retain the aforementioned tracts in the Unit. Due to a reluctance by two of the three mineral owners in these tracts not to participate in the unitization process, Tundra has removed these tracts in order not to hold back the benefits of pressure maintenance in other areas of the Unit.

Tundra considers this action to have minimal impact on the ultimate recovery from the Unit both under primary and secondary operations. The 15-28-10-29 well was hydraulically fractured in late June, 1996 to improve productivity. Although oil production increased, the high water-cut after the job indicates the fracture went into the overlying Lodgepole formation which is water bearing. Historically, Bakken "A" Pool fracture stimulation programs that have broken into the Lodgepole formation have indicated a lower oil recovery due to the high water influx from the Lodgepole. The 15-28 tract has less than 4% of the total assigned recoverable oil in the Unit. As a result, the impact on overall Unit oil recovery by removing the subject tracts will not be significant.

In terms of equity issues relating to waterflood operations, Tundra has observed that Bakken "A" Pool wells fractured out of zone do not respond to incremental oil recovery from pressure maintenance activities. This condition has been observed in several wells in Kola Unit No.1. On this basis, it is unlikely that incremental oil attributable to waterflood operations will be recovered by well 15-28-10-29.

# **Tundra**

**oil and gas ltd.**

Tundra would appreciate that the Crown execute the revised Unit agreement prior to December 1, 1996, in order for waterflood operations to commence this year. I am prepared to further discuss this matter with you should your office have any additional questions.

Yours truly,

**TUNDRA OIL AND GAS LTD.**

A handwritten signature in cursive script, appearing to read 'G. Czyzewski', with a long horizontal stroke extending to the right.

George Czyzewski, P.Eng.  
General Manager

cc: B. Thiessen

November 8, 1996

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

Attention: **John Fox**  
Chief Petroleum Engineer

Dear John:

RE: **Unit Agreement**  
**Kola Unit No.2**

---

Further to our telephone conversation, please be advised that two royalty owners in the 15-28-10-29 WPM well/proposed tract have declined to participate in Kola Unit No.2. We have adjusted the appropriate schedules to the Unit Agreement to remove the tract.


We would ask that you execute the new signatory page and insert the amended schedules in your copy of the agreement.

We have targeted December 1, 1996 as the effective date for Kola Unit No.2. In order to meet this target date, we request that the signatory pages be returned to me no later than November 22, 1996.

Should you have any questions please give me a call.

Sincerely,

TUNDRA OIL AND GAS LTD.

  
Brad Thiessen  
Land Manager

BT/mm

Enclosures

October 22, 1996

Mr. Brad Thiessen  
Tundra Oil and Gas Ltd.  
1111-One Lombard Place  
Winnipeg, MB R3B 0X4

Dear Brad:

**Re: Kola Unit No. 2 Unit Agreement**

Attached is a copy of the execution page for Kola Unit No. 2 Unit Agreement signed by the Minister of Energy and Mines. For the unit to be effective on November 1, 1996, a copy of the signed execution pages for each owner in the unit must be submitted to the Branch by October 31, 1996.

If you have any question please contact the undersigned at 945-6574.

Yours truly,

A handwritten signature in dark ink, consisting of a stylized 'J' and 'F' intertwined, with a horizontal line extending to the right.

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



## Memorandum

Date October 16, 1996

To Michael Fine  
Deputy Minister  
Energy and Mines

from L.R. Dubreuil  
Director  
Petroleum & Energy Branch

Subject Proposed Kola Unit No. 2 Unit Agreement

Telephone

*Bob  
Bohke-you  
signed*

Tundra Oil and Gas Ltd. is proposing to unitize an area in the Daly Field which includes 11 tracts. The proposed Kola Unit No. 2 involves 4 tracts for which the Crown is the royalty owner (i.e. mineral rights owner). Tundra has applied for approval to waterflood the unit area and has also submitted a copy of the proposed Unit Agreement for Kola Unit No. 2 (attached) for execution by the Minister on behalf of the Crown as an affected royalty owner.

Section 133 of The Oil and Gas Act provides for the Minister to enter such agreement on behalf of the Crown as a royalty owner.

### Recommendation:

It is recommended that the Minister enter into the Kola Unit No. 2 Unit Agreement on behalf of the Crown with respect to LSD 13 of Section 28, LSD 16 of Section 29, and LSD's 1 and 8 of Section 32 in Township 10, Range 29 WPM by signing two copies of the attached execution page for the Kola Unit No. 2 Unit Agreement.

### Discussion:

The 4 tracts in the proposed Kola Unit No. 2 that contain Crown-owned mineral rights are highlighted in Attachment No. 1. All Crown leases are held by Tundra Oil and Gas Ltd. Currently the wells on the Crown tracts produce from the Daly Bakken A Pool at a combined rate of approximately 2.3 m<sup>3</sup>/d.

It is anticipated that waterflood operations will significantly increase the amount of oil recovered from the unit area and consequently increase royalty and production tax revenue to the Crown.

The proposed unit area is currently developed on 16 ha and 32 ha well spacing. Proposed tract factors are based on current productivity. Upon review, Branch staff has found the proposed tract factors to be reasonable. On this basis, it is recommended that the Minister enter into the proposed Unit Agreement on behalf of the Crown as a royalty owner.

L.R.Dubreuil

First | Fold

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

MANITOBA DEPARTMENT OF ENERGY AND MINES

Oct. 17, 1996  
(DATE)

1 S. S. S. S. S.

ADDRESS FOR SERVICE:

360 - 1395 Ellice Avenue

Winnipeg, MB R3G 3P2

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

EXHIBIT 'A'

Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2

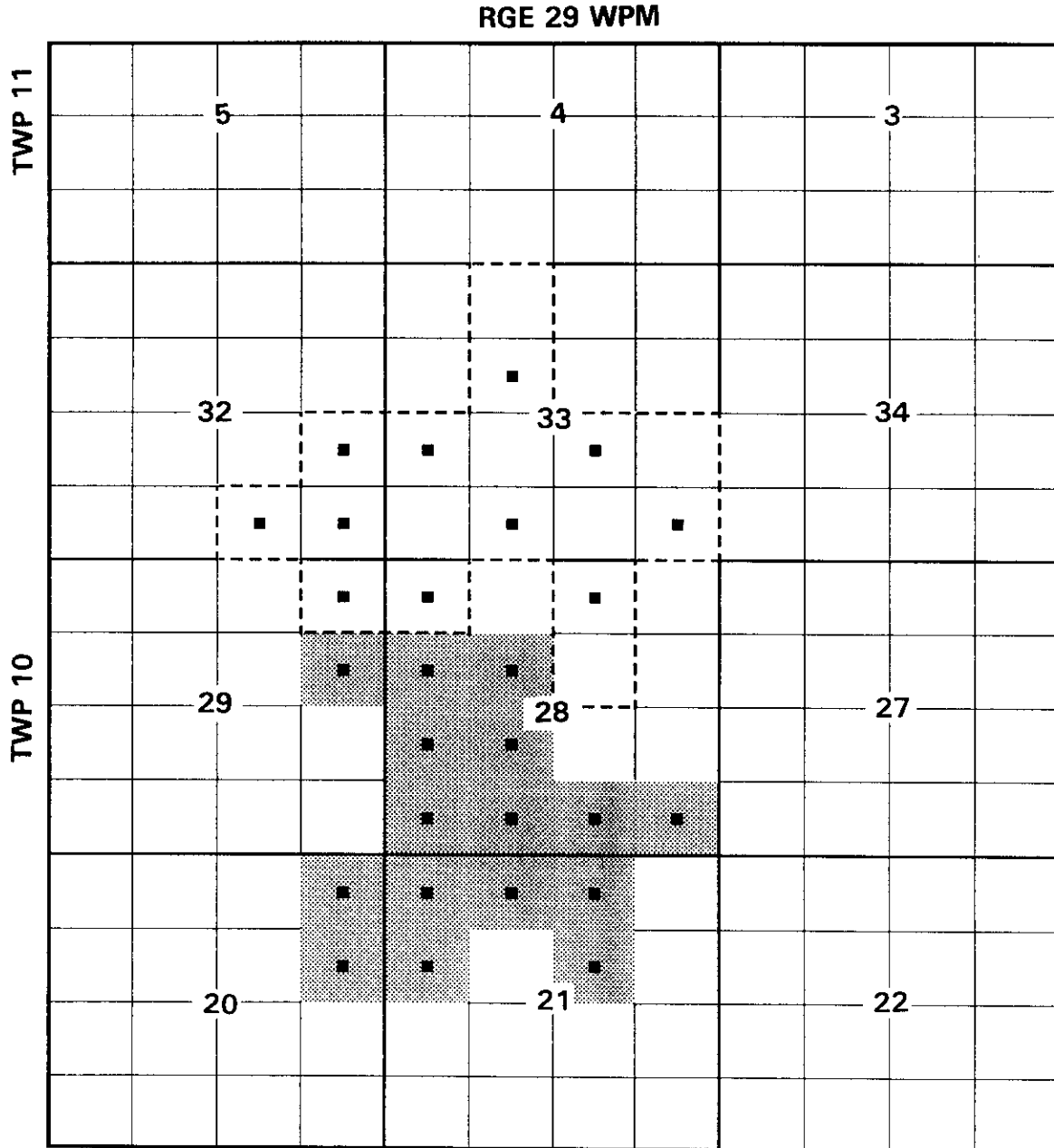
TRACT PARTICIPATION

Tract No.	Land Description LSD	Working Interest		Royalty Interest		Tract Participation %
		Owner	Share (%)	Owner	Share (%)	
1 ✓	10 & 15-28-10-29 WPM	Tundra Oil and Gas Ltd. <i>after penalty</i> Corvair Oils Limited Tundra Oil and Gas Ltd.	100.0000 20.0000 80.0000	Corvair Oils Limited Gauer Oil Company Naylen Oil Corp.	50.0000 25.0000 25.0000	2.23294
2 ✓	13-28-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	4.99527
3 ✓	16-29-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	1.65030
4 ✓	1-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	3.82409
5 ✓	2-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Tundra Oil and Gas Ltd.	100.0000	1.56453
6 ✓	8-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	19.96628
7 ✓	1 & 8-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.30959
8 ✓	2 & 7-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	4.89471
9 ✓	3 & 6-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.44268
10 ✓	4 & 5-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	31.15462
11 ✓	11 & 14-33-10-29 WPM	Corvair Oils Limited Tundra Oil and Gas Ltd.	20.0000 80.0000	Montreal Trust Company	100.0000	6.96499



# EXHIBIT "B"

Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2



# EXHIBIT 'A'

Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2

## TRACT PARTICIPATION

Tract No.	Land Description LSD	Working Interest		Royalty Interest		Tract Participation %
		Owner	Share (%)	Owner	Share (%)	
1	10 & 15-28-10-29 WPM	Tundra Oil and Gas Ltd. <i>after penalty</i> Corvair Oils Limited Tundra Oil and Gas Ltd.	100.0000  20.0000 80.0000	Corvair Oils Ltd. Gauer Oil Company Naylen Oil Corp.	50.0000 25.0000 25.0000	2.23294
2	13-28-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	4.99527
3	16-29-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	1.65030
4	1-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	3.82409
5	2-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Tundra Oil and Gas Ltd.	100.0000	1.56453
6-	8-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	19.96628
7	1 & 8-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.30959
8	2 & 7-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	4.89471
9	3 & 6-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.44268
10	4 & 5-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	31.15462
11	11 & 14-33-10-29 WPM	Corvair Oils Limited Tundra Oil and Gas Ltd.	20.0000 80.0000	Montreal Trust Company	100.0000	6.96499



October 21, 1996

Mr. Donald Gauer  
202 Riverside Drive  
Toronto ON M6S 4A9

Dear Mr. Gauer:

The Branch is in receipt of your letter dated October 8, 1996 outlining your concerns and questions regarding the tract participation formula proposed for Kola Unit No. 2.

Tundra has proposed using the last 90 days production as the method of determining tract participation in the unit. This is the same method as used in Kola Unit No. 1. Production or production combined with some other factor(s) is the most commonly used method of determining participation in a unit. The advantages of using production to determine unit tract participation are two-fold:

- (1) production volumes are not subject to interpretation, as are some other parameters; and
- (2) current production preserves owners revenues at current levels.

It is anticipated that unit owners in Kola Unit No. 2 will benefit from implementation of a waterflood. Based on waterflood performance in Kola Unit No. 1, those benefits include increased production in the short term, a longer production life and an increase in the total volume of oil recovered.

With respect to your concerns regarding the appropriate time frame for determination of the last 90 days production, I offer the following comments. In order to unitize and implement a waterflood a certain amount of lead time is required to complete technical studies, convince partners on the merits of the project and obtain the necessary approvals including having all parties to the unit sign the unit agreement. This process requires a time frame be fixed for determining production.

Without a fixed time frame for determining production, there is a tendency for owners to wait and see if their share in the unit may increase as a result of the operator, in this case Tundra, carrying on production optimization activities. The frac job at 15-28-10-29 has increased production from your well but other production optimization activities completed or proposed on wells in the unit area will also effect your share in the unit. Gauer Oils must decide whether the unit share proposed by Tundra based on production from April, May and June is equitable.

If you have any further questions in respect of this matter, please call John Fox, Chief Petroleum Engineer at (204) 945-6574.

Yours truly,

A handwritten signature in cursive script, appearing to read "L. R. Dubreuil".

L. R. Dubreuil  
Director  
Petroleum and Energy Branch

cc: John N. Fox  
Tundra Oil and Gas Limited



Date: Oct 15/96

## Action / Route Slip

To: John

From: BWZ

Telephone: \_\_\_\_\_

☐ Take Action

☐ Per Your Request

☐ Circulate, Initial  
and Return

☐ For Approval and  
Signature

☐ Make \_\_\_\_\_ Copies

☐ May We Discuss

☐ For Your Information

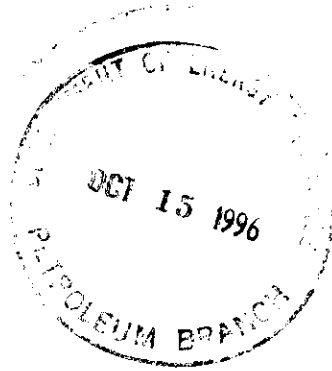
☐ Return With Comments  
or Revisions

☐ Draft Reply for  
Signature

☐ Please File

Comments:

Please review a draft a response for  
my signature. Should advise that all we are  
doing here is approving the WF plan. And as  
a royalty owner, he should be negotiating  
with Tundra on tract participation  
Have we been asked to seek the ~~Green~~  
Minister's approval on the tract factors yet?



202 Riverside Drive  
Toronto, Ontario  
M6S 4A9

October 8, 1996

Mr. Bob Dubreuil  
Director, Petroleum Branch  
Department of Energy and Mines  
1395 Ellice Avenue  
Suite 360  
Winnipeg, Manitoba  
R3G 3P2

Dear Mr. Dubreuil:

This is in response to your recent letter regarding the expansion of the Waterflood in the Daly Bakken "A" Pool which, I believe, Tundra Oil & Gas identified as Kola Unit No. 2.

I have no objection to the expansion of this Waterflood area per se, but I am wondering if I can call upon the Petroleum Branch to offer an opinion regarding the tract participation percentages.

As a participant in Kola Unit No. 1, I am satisfied that the creation of a Waterflood project area is certainly a good move for the participants and will probably be similarly good for the participants of Kola Unit No. 2.

My question is whether the calculation of the tract participation percentages is equitable for the various participants? As you will see, Gauer Oil is one of the smallest participants in the tract with a 25 % share of a 2.23 % participation. I understand, however, from talking to Tundra, that the participation percentage is calculated from a three-month average of production from the individual wells. I wonder whether this is fair as a means of calculating the participating percentages when our well No. 15-28-10-29 has only recently come on stream? Shown below is the volume output of the well since it started producing in February of this year:

<u>Production Month</u>	<u>Production Volume</u>
February	11.0 Units
March	18.7 Units
April	18.5 "
May	14.4 "
June	14.3 "
July	51.2 "
August	101.4 "

.....continued on next page

Page 2

Mr. Bob Dubreuil

October 8, 19960

I was told that the increase in volume was as a result of the well being fraced, and that the volume output would not remain high. Be that as it may, I gather that the tract participation percentage was determined from the average of the months April, May and June, which works out to be 15.7 Units. As you can see, however, any later three-month average would probably have resulted in a much higher tract participation.

It would not surprise me to find that the Petroleum Branch has some guidelines as to how the participation percentages should equitably be calculated when the different wells are in different stages of development. I would appreciate it if you would take a look at this matter and reassure me that Tract No. 1 is being fairly treated.

Sincerely yours,

A handwritten signature in black ink, appearing to read "DL Gauer". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Donald L. Gauer

DLG:LL

Attachment: Exhibit 'A'

c.c. Tundra Oil & Gas Ltd., 1111 One Lombard Place, Winnipeg, Manitoba R3B 0X4

**EXHIBIT 'A'**

Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2

**TRACT PARTICIPATION**

Tract No.	Land Description LSD	Working Interest		Royalty Interest		Tract Participation %
		Owner	Share (%)	Owner	Share (%)	
1	10 & 15-28-10-29 WPM	Tundra Oil and Gas Ltd. <i>after penalty</i> Corvair Oils Limited Tundra Oil and Gas Ltd.	100.0000  20.0000 80.0000	Corvair Oils Limited Gauer Oil Company Naylen Oil Corp.	50.0000 25.0000 25.0000	2.23294
2	13-28-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	4.99527
3	16-29-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	1.65030
4	1-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	3.82409
5	2-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Tundra Oil and Gas Ltd.	100.0000	1.56453
6-	8-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	19.96628
7	1 & 8-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.30959
8	2 & 7-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	4.89471
9	3 & 6-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.44268
10	4 & 5-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	31.15462
11	11 & 14-33-10-29 WPM	Corvair Oils Limited Tundra Oil and Gas Ltd.	20.0000 80.0000	Montreal Trust Company	100.0000	6.96499



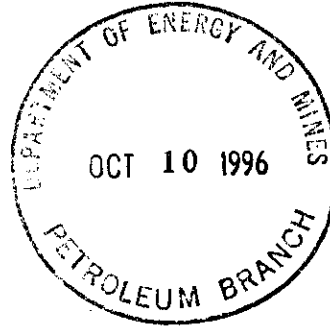
October 9, 1996

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

Attention: John Fox, P.Eng

Dear John:

RE: Unit Agreement  
Kola Unit No. 2



Further to my letter dated September 20, 1996, please find enclosed the final documentation for Kola Unit No. 2.

The only changes from the draft document that was sent to you previously are as follows:

- 1) The references to the Conservation Board have been changed to the Petroleum Branch and rather than approval of the Board, the Unit Agreement is registered with the Petroleum Branch.
- 2) In 201(a), Owners of the Working Interest has been changed to the Working Interest Owners.
- 3) Exhibit "A" Tract 1 - Corvair Oils Limited has been changed to Corvair Oils Ltd.

Tundra Oil and Gas Ltd. has targeted November 1, 1996 as the effective date for Kola Unit No. 2. In order to meet this target date, we request that the extra signatory page that has been enclosed be executed and returned to the undersigned by October 18, 1996. Your prompt consideration in this matter is greatly appreciated.

Should you have any questions or concerns regarding this Unit, please give me a call at (204) 934-5856.

Sincerely,

TUNDRA OIL AND GAS LTD.

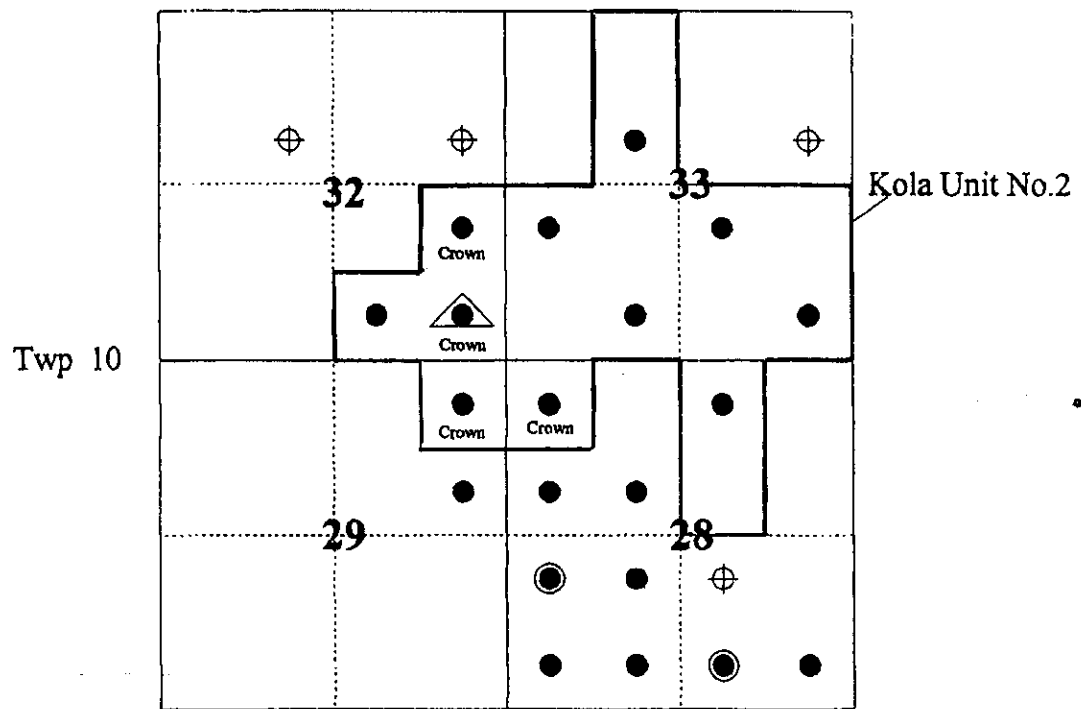


Brad Thiessen  
Land Manager

BT/kd  
Encl.





FIGURE 1

KOLA UNIT NO. 2



Rge 29 WPM

LEGEND

-  Well to be converted to water injection
-  Current production well
-  Water injection well (former producer)
-  Dry and abandoned well

Reference: TUNDRA

Fax No: (204) 945-0586

Date: 23-SEP-96

Total No. of Pages: 416 5  
(including this page)

**FROM:**

John N. Fox, P. Eng.  
Petroleum Branch, Energy & Mines  
Phone: (204) 945-6574

**TO:**

Name: BRAD THIESSEN

Branch: TUNDRA

Fax No: \_\_\_\_\_

**Comments:**

MINOR REVISIONS TO KOLA UNIT NO. 2  
UNIT AGREEMENT. ALL REVISIONS RELATED TO  
CHANGING REFERENCE ~~FR~~ TO "CONSERVATION BOARD"  
TO "PETROLEUM BRANCH" AND EFFECTIVE DATE  
OCCURRING ON 1ST DAY OF MONTH FOLLOWING  
REGISTRATION OF THE UNIT AGREEMENT.

Originals will be:

Mailed to you \_\_\_\_\_ Mailed upon request \_\_\_\_\_ Remain on file \_\_\_\_\_

September 20, 1996

DRAFT UNIT  
AGREEMENT  
INCLUDES P.B.  
COMMENTS.

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

**Attention: John Fox, P.Eng.**  
**Chief Petroleum Engineer**

Dear John:

**RE: Unit Agreement**  
**Kola Unit No. 2**

---

Tundra Oil and Gas Ltd. hereby encloses a copy of Draft #1 of the Unit Agreement for the proposed Kola Unit No. 2. Tundra requests that you review the Agreement and forward any comments by October 7, 1996.

For your information, this draft has been circulated to all working and royalty interests for their comments as well. I would also point out that we have used the same format as Kola Unit No. 1.

Should you have any questions, please give me a call.

Sincerely,

TUNDRA OIL AND GAS LTD.



Brad Thiessen  
Land Manager

BT/kd

Enclosure

DRAFT 20-Sep-96

**DRAFT** #1

KOLA UNIT NO. 2  
**UNIT AGREEMENT**

UNIT AGREEMENT  
KOLA UNIT NO. 2

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## UNIT AGREEMENT

### KOLA UNIT NO. 2

WHEREAS the Parties own Royalty Interests and Working Interests, or either of them, in the Unitized Zone;

AND WHEREAS the Parties desire that the Unitized Zone be developed, produced and operated as a Unit, as hereinafter provided;

NOW THEREFORE in consideration of the covenants herein contained, the Parties agree as follows:

#### ARTICLE I DEFINITIONS

##### 101. Definitions

In this agreement: "Petroleum Branch" means the Department of Energy and Mines, Petroleum ~~and~~ Branch established under The Oil and Gas Act

- (a) "Conservation Board" means ~~The Oil and Gas Conservation Board of the Province of Manitoba;~~
- (b) "Effective Date" means the time and date referred to in Article XIV;
- (c) "Lease" means an instrument granting a Working Interest in any lands in the Unit Area;
- (d) "Outside Substances" means any substances initially obtained from any source other than the Unitized Zone or any Unitized Substances with respect to which royalty has been paid;
- (e) "Party" means a person who is bound by this Agreement;
- (f) "Petroleum Substances" means petroleum, natural gas and related hydrocarbons (except coal) and all substances whether gaseous, liquid or solid, which are produced in association therewith, or any of them;
- (g) "Royalty Interest" means
  - i) an ownership, fee simple, or similar estate in Petroleum Substances in the Unitized Zone, or
  - ii) a right to a share of Petroleum Substances produced from the Unitized Zone, to a share of the proceeds from the sale of such Petroleum Substances, or to a payment based on the quantity or value of such Petroleum Substances, but does not include a Working interest, the interest of a purchaser or such Petroleum Substances after production, or a mortgage, charge or like interest granted as security in a financial transaction;
- (h) "Royalty Owner" means a Party owning a Royalty Interest in or in respect of Unitized Substances;
- (i) "Spacing Unit" means the area allocated to a well by the Conservation Board with respect to the Unitized Zone for the purpose of drilling for or producing Petroleum Substances;
- (j) "Tract" means a parcel of land described and given a Tract number in Exhibit "A" and shown outlined on Exhibit "B";
- (k) "Tract Participation" means the Participation percentage allocated to a Tract pursuant to Article VI and set forth in Exhibit "A";
- (l) "Unit Area" means the lands described in Exhibit "A" and shown outlined on Exhibit "B";
- (m) "Unit Operations" means any operations or activities undertaken in connection with the Unitized Zone, the production or handling of Unitized Substances or the installation, operation, maintenance or removal of equipment or facilities, insofar as such operations or activities have been authorized or provided for under this agreement or the Unit Operating Agreement
- (n) "Unit Operator" means the person who is so designated under the Unit Operating Agreement;
- (o) "Unit Operating Agreement" means the agreement entitled "Unit Operating Agreement - Kola Unit No. 2" entered into by the Working Interest Owners;
- (p) "Unitized Zone" means the Bakken Formation of the Mississippian Age underlying the lands within the Unit Area as same is shown on the compensated neutron litho-density log of the Tundra Daly 4-28-10-

29 WPM well in 4-28-10-29 WPM, in the Province of Manitoba between the intervals of 870.0 metres and 880.0 metres as measured from the kelly bushing at 4-28-10-29 WPM and shown on Exhibit "C";

- (q) "Unitized Substances" means Petroleum Substances in or obtained from the Unitized Zone;
- (r) "Working Interest" means any interest which entitles the owner thereof to produce and dispose of, or to participate in the production and disposition of, Petroleum Substances from the Unitized Zone, and with which is associated a responsibility to bear all or a portion of the costs of recovering such Petroleum Substances;
- (s) "Working Interest Owner" means a party owning a Working Interest in or in respect of Unitized Substances;
- (t) "Minister" means the member of the Executive Council charged by the Lieutenant Governor in Council with the administration of The Oil and Gas Act of Manitoba.

## ARTICLE II

### EXHIBITS

#### 201. Exhibits

The following exhibits are attached to and incorporated in this agreement:

- (a) Exhibit "A" which numbers and describes each Tract and sets forth its Tract Participation, the names of the Owners of the Working Interest and their respective shares of the Working Interest, together with the names of the Royalty Owners and their respective shares of the Royalty Interest;
- (b) Exhibit "B" which is a plan of the Unit Area identifying the Tracts;
- (c) Exhibit "C" which is a reproduction of a portion of the compensated neutron litho-density log referred to in Subclause 101(p) hereof.

#### 202. Exhibits Correct

Each exhibit shall be deemed conclusively to be correct to the effective time of a revision or correction thereof as herein provided.

#### 203. Correction of Exhibits

If any mistake or mechanical error occurs in an exhibit, Unit Operator may, or upon request of the Working Interest Owners shall, prepare a corrected exhibit but the data used in establishing Tract Participation shall not be re-evaluated.

#### 204. Effective Time

Any corrected exhibit prepared on or before the Effective Date or within ninety (90) days thereafter shall be effective on the Effective Date. Any corrected exhibit prepared after the said ninety (90) days shall be effective at 8:00 a.m. on the first day of the calendar month next following its preparation or on such other date as is determined by the Working Interest Owners.

#### 205. Supplying of Exhibits

Each time that an exhibit is revised or corrected pursuant to this agreement, Unit Operator shall supply the ~~Conservation Board and the Department of Energy and Mines, Manitoba~~ with two copies each and shall supply each Working Interest Owner with the number of copies of the exhibit it requests. Each Working Interest Owner shall supply each of its Royalty Owners, excepting the Crown, with a copy thereof.

Petroleum  
Branch

#### 206. Form of Revised or Corrected Exhibits

Exhibits that are revised or corrected shall show the effective time of the revision or correction and shall be numbered consecutively.



### ARTICLE III

#### UNITIZATION AND EFFECT

301. Unitization

On and after the Effective Date the interests of each Royalty Owner and of each Working Interest Owner in the Unitized Substances and in the Unitized Zone are hereby unitized, in accordance with the provisions of this agreement.

302. Personal Property Excepted

All lease and well equipment heretofore or hereafter placed by any of the Working Interest Owners on lands comprised in the Unit Area shall be deemed conclusively to be and shall remain personal property belonging to and may be removed by the Working Interest Owners. The Working Interest Owners' rights and interests therein are set forth in the Unit Operating Agreement.

303. Continuation of Leases

All Unit Operations and all production of Unitized Substances shall, except for the purpose of calculating payments to Royalty Owners, be deemed conclusively to be operations upon or production from all of the Unitized Zone in each Tract, and such operations or production shall continue in force and effect each Lease and any other agreement or instrument relating to the Unitized Zone or Unitized Substances as if such operations had been conducted on, or a well had been drilled and was producing from each Tract or Spacing Unit, or portion thereof, in the Unit Area.

If from time to time during the term of this Agreement the production of Unitized Substances and the conduct of other Unit Operations is temporarily interrupted or suspended:

(a) for any period not exceeding ninety (90) consecutive days or

(b) for any period during which an event of force majeure contemplated by Clause 1305 is in effect,

then, for the purposes of this Clause 303, Unitized Substances shall be deemed to have been produced throughout any such period.

304. Leases Amended

Each Lease and any other agreement or instrument relating to the Unitized Zone or Unitized Substances is hereby amended only to the extent necessary to make it confirm to this agreement.

305. Ratification of Leases

Except for a Lease in respect of which a Royalty Owner is involved in a court action which has been commenced and is pending on the Effective Date, each Royalty Owner hereby ratifies each Lease, as amended by this agreement, to which it is a party, and hereby confirms that no notice of default has been given and remains outstanding with respect to any such Lease, and that each Lease is in effect as of the Effective Date. The provisions of this Clause 305 do not constitute a waiver, and shall not give rise to an estoppel, of any right to pursue the enforcement of any outstanding obligation under any such Lease.

306. Effect of Unitization on Titles

Nothing in this agreement, nor the Unit Operating Agreement shall be construed as a transfer or exchange of any interest in the Leases, Tracts or Unitized Zone, or in the Unitized Substances before production thereof.

307. Name

The name of the Unit hereby constituted is "Kola Unit No. 2".

308. Equipment and Facilities

All equipment and facilities used in connection with the Unit Operations and heretofore or hereafter installed, affixed or constructed by any of the Working Interest Owners on or in lands within the Unit Area are and shall remain the personal property of the Working Interest Owners, or such of them as may from time to time have an interest

Unit Agreement: Kola Unit No. 2

therein, and, except as otherwise provided in Clause 1503, no interest in any such equipment and facilities shall vest in the Royalty Owners by virtue of the provisions of this Agreement.

## ARTICLE IV

### AUTHORITY TO WORKING INTEREST OWNERS

401. Operations

The Working Interest Owners are hereby granted the right to develop and operate the Unitized Zone without regard to the provisions of the Leases or the boundary lines of the Tract or Spacing Units in such manner and by such means and methods as the Working Interest Owners consider appropriate. Without limiting the generality of the foregoing, the Working Interest Owners shall have the right to inject any substance or combination of substances into the Unitized Zone and to convert and use as injection wells any wells now existing or hereafter drilled into the Unitized Zone.

402. Delegation

The Working Interest Owners may delegate to Unit Operator any of the rights and powers herein or otherwise granted to them.

403. Vote of Working Interest Owners

Any matter to be determined under this agreement by the Working Interest Owners may be determined by vote of the parties to the Unit Operating Agreement as prescribed therein.

## ARTICLE V

### INCLUSION AND QUALIFICATION OF TRACTS

501. Tracts Included on Effective Date

The Tracts included in the Unit Area as of the Effective Date are those Tracts which are qualified under Clause 502:

- (a) before the Effective Date; or
- (b) on or within ninety (90) days after the Effective Date.

502. Qualification of Tracts

A Tract is qualified for inclusion in the Unit Area when its title has been approved by the Working Interest Owners under Clause 1102 and when:

- (a) owners of one hundred percent (100%) of the Working Interests therein have become Parties and parties to the Unit Operating Agreement and owners of one hundred percent (100%) of the Royalty Interest therein have become Parties; or
- (b) owners of one hundred percent (100%) of the Working Interests therein have become Parties and parties to the Unit Operating Agreement and owners of less than one hundred percent (100%) of the Royalty Interest therein have become Parties, and such owners of Working Interests agree, if required by the other Working Interest Owners, to indemnify the other Working Interest Owners in a form and manner satisfactory to them for any loss or damages that may be suffered by such other Working Interest Owners in respect of claims and demands that, because of the inclusion of the Tract in the Unit Area, may be made by those owners of Royalty Interests in the Tract who have not become Parties; or
- (c) owners of the Working Interests therein have agreed with the owners of Working Interests then Parties and parties to the Operating Agreement as to the basis on which the Tract shall become qualified, where the Tract cannot be qualified pursuant to Subclause (a) or (b) of this Clause.

503. Revision of Exhibits

Within one hundred twenty (120) days after the Effective Date the exhibits shall be revised, if necessary, to set out only those Tracts included in the Unit Area under this Article. The revised Exhibit "A" shall set forth the Tract Participation of the Tracts recalculated on the same basis and using the same data as that used in the calculation of Tract Participation in the original Exhibit "A" and so that their summation is one hundred percent (100%). The exhibits as so revised shall be effective as of the Effective Date.

**ARTICLE VI**  
**TRACT PARTICIPATION**

601. Tract Participation

Each Tract has the Tract Participation ascribed to it in Exhibit "A".

**ARTICLE VII**  
**ALLOCATION OF UNITIZED SUBSTANCES PRODUCED**

701. Allocation to Tracts

Subject to Clauses 801 and 802 the Unitized Substances when produced shall be allocated to the Tracts in accordance with their Tract Participation. The amount of Unitized Substances allocated to each Tract, and only that amount, regardless of whether it be more or less than the amount of actual production of Unitized Substances from the well or wells, if any, on the Tract, shall be deemed conclusively to have been produced from the Tract.

702. Allocation Among Parties

The Unitized Substances allocated to a Tract shall be further allocated among the Working Interest Owners thereof in accordance with their respective percentage Working Interests in the Tract as set forth in Exhibit "A", and the Working Interest Owners of each Tract shall account to the Royalty Owners of such Tract for any royalty payable or deliverable to such Royalty Owners in respect of the Unitized Substances allocated to such Tract.

703. Calculation of Royalty

The Working Interest Owners of each Tract shall calculate royalty on the Unitized Substances allocated to the Tract at the applicable rate under the Lease, other agreement or instrument relating to the Tract. The Royalty Owners of each Tract agree to accept payment of royalty so calculated in satisfaction of the obligation of a Working Interest Owner to make royalty payments on Unitized Substances under the Lease, agreement or other instrument covering such Tract; but a lessee under a Lease shall not be relieved from making payment of royalty to its lessor if payment is not made by the Working Interest Owner as aforesaid. In calculating royalty on residue gas, sulphur and fluid hydrocarbons, or any of them, obtained by processing Unitized Substances, other than crude oil, by compression, absorption or other plant extraction or stabilization, proper allowances shall be made for costs, expenses and charges, including a reasonable return on investment, incurred in or attributable to gathering and processing the Unitized Substances.

704. Taking Unitized Substances in Kind

The Unitized Substances allocated to a Tract shall be delivered in kind at the time and place of production to the Working Interest Owners entitled thereto who may, if there is no interference with Unit Operations by them, construct, maintain and operate in the Unit Area all necessary facilities for taking delivery in kind.

705. Failure to Take in Kind

To the extent that a Party entitled to take in kind any of the Unitized Substances fails to take or otherwise dispose of them at the time and place of production, then so long as such failure continues, Unit Operator, as agent and for the account and at the expense of such Party may sell, store, inject or otherwise dispose of them. Where there is a sale the "net proceeds" remaining from the sale shall be paid to the Party. Unit Operator may contract for the sale thereof only for the minimum term obtainable which in no event shall exceed one (1) year. When Unit Operator has so contracted, the Party may take its share of the Unitized Substances in kind upon the expiration of the current sales

contract. The "net proceeds" for the purpose of this Clause shall mean the proceeds from the sale of the non-taking Party's share of production, less all direct costs of the sale, including processing and shipping costs.

706. Royalty on Outside Substances

If an Outside Substance is injected into the Unitized Zone, the first like substance contained in the Unitized Substances subsequently produced and sold or used other than for operations hereunder shall be deemed conclusively to be that Outside Substance until a quantity equal to the quantity of the Outside Substance injected into the Unitized Zone is recovered. No royalty shall be payable on any substance which is deemed conclusively to be an Outside Substance.

707. Several Royalty Liability

Without limiting the generality of the provisions of Clauses 702 and 1304, nothing in this Agreement shall be construed as giving rise to any right entitling the Royalty Owners of a Tract to look to any Working Interest Owners other than the Working Interest Owners of such Tract for the satisfaction of royalty obligations in respect of such Tract; provided, however, that in the event that the Working Interest Owners of a Tract are not the same persons as the lessee under a Lease relating to the Tract, the provisions of this Clause 707 shall not be construed as relieving such lessee of any obligation to account for royalty payable or deliverable to the lessor under such Lease if the Working Interest Owners fail to comply with their obligations in that respect.

## ARTICLE VIII

### USE, LOSS AND RE-INJECTION OF UNITIZED SUBSTANCES

801. Use or Loss

The Working Interest Owners may use as much of the Unitized Substances, other than crude oil, as they deem necessary for Unit Operations. Unitized Substances so used or injected and Unitized Substances lost shall be excluded in allocating Unitized Substances to Tracts, and no royalty or other payment shall be payable in respect thereof.

802. Re-Injection

The Working Interest Owners are hereby granted the right to re-inject Unitized Substances into the Unitized Zone for any purpose related to the Unit Operations. Unitized Substances so injected shall be excluded in allocating Unitized Substances to Tracts, and no royalty or other payment shall be payable in respect thereof until they are recovered for sale or for use other than for Unit Operations.

## ARTICLE IX

### ENLARGEMENT OF UNIT AREA

901. Enlargement

After the expiration of ninety (90) days following the Effective Date, if an owner of a Working Interest in lands adjoining the Unit Area makes application to enlarge the Unit Area to include such adjoining lands which appear to be potentially productive of Petroleum Substances from the Unitized Zone the Working Interest Owners may approve the enlargement of the Unit Area to include such adjoining lands on such terms and conditions as the Working Interest Owners may consider appropriate, and, if such adjoining lands qualify for inclusion in the Unit Area under Clause 502, the Unit Area shall be enlarged to include such adjoining lands. Notwithstanding that any owner of a Working Interest or a Royalty Interest in such adjoining lands is already a Party, such owner shall not, for the purposes of the qualification of such adjoining lands under Clause 502, be considered to have executed and delivered this agreement until it executes and delivers to the Unit Operator an additional counterpart of this agreement incorporating exhibits which reflect the proposed enlargement and which are stated to be effective as of the effective date of such enlargement.

902. Adjustment of Tract Participation

The Tract Participation of each Tract added pursuant to Clause 901 shall be determined by the Working Interest Owners. The Tract Participation shall then be adjusted in order that:

- (a) the ratios of the Tract Participation of Tracts shown on Exhibit "A" immediately prior to the enlargement remain the same to each other; and
- (b) the total of the Tract Participation for all Tracts of the enlarged Unit Area and Unitized Zone is one hundred percent (100%).

903. Exhibits

Unit Operator shall revise Exhibits "A" and "B" as required by the enlargement.

904. Effective Time of Enlargement

An enlargement pursuant to Clause 901 and an adjustment of Tract Participation under this Article shall become effective at 8:00 a.m. on the first day of the first calendar month following approval of admission under Clause 901, Tract qualification under Clause 502 and ~~approval of the Conservation Board.~~ *in registration by the*  
~~the date the Unit~~ *Petroleum Branch.*  
*Agreement is registered by the Petroleum Branch.*

905. No Retroactive Adjustment

There shall never be any retroactive adjustment of the allocation of Unitized Substances by reason of an enlargement under this Article.

## ARTICLE X

### DISPUTES

1001. Disputes

If the title or right of a Party to receive in kind all or any portion of the Unitized Substances allocated to a Tract, or any share of the proceeds from the sale thereof, is in dispute, the Party concerned shall forthwith give notice thereof to Unit Operator. If Unit Operator is so notified or if Unit Operator is directed to do so by the Working Interest Owners in the event that it is otherwise informed of the dispute, Unit Operator shall withhold and sell the portion of the Unitized Substances the title or right to which is in dispute, and hold in trust the proceeds from the sale thereof until:

- (a) the Party concerned furnishes security in a form and manner satisfactory to the Working Interest Owners for the proper accounting thereof to the rightful owner or owners if the title or right of the Party shall fail in whole or in part, whereupon the proceeds shall be paid to the party; or
- (b) the title or right thereto is established by a final judgment of a Court or otherwise to the satisfaction of the Working Interest Owners, whereupon such proceeds shall be paid to the person rightfully entitled.

If Unit Operator does not comply with this Clause because it is not notified of a dispute by a Party concerned, that Party hereby agrees to indemnify and save harmless Unit Operator from any loss or damage suffered because of anything done or omitted to be done by Unit Operator because it was not notified.

## ARTICLE XI

### APPROVAL OF TITLES

1101. Titles Committee

The Working Interest Owners shall appoint a Titles Committee which shall investigate the ownership of all Tracts. Each Working Interest Owner shall submit to the Title Committee such title data and information as the titles Committee may reasonably require from time to time. The Titles Committee shall report the result of its investigation to the Working Interest Owners specifying the titles to Tracts which it unanimously recommends for approval.

1102. Approval of Titles by Working Interest Owners

The Working Interest Owners may approve:

- (a) the titles of Working Interest Owners to Tracts which have been unanimously recommended for approval by the Titles Committee; and

- (b) the titles of Working Interest Owners to Tracts which have not been unanimously recommended for approval by the Titles Committee but with respect to which such Working Interest Owners have agreed to indemnify the other Working Interest Owners, in a form and manner satisfactory to them, from loss or damage that may be suffered by them in respect of claims and demands made because of subsequent failure of the Working Interest Owners' title.

Notwithstanding the foregoing, the Working Interest Owners may approve any title that has not been unanimously recommended for approval by the Titles Committee.

1103. Subsequent Failure of Title

If the title of a Working Interest Owner to a Tract fails, the Tract shall be excluded from this agreement and the Unit Operating Agreement as of 8:00 a.m. on the first day of the calendar month in which the failure of title is finally determined unless:

- (a) any other Party is held or declared to own the title in which event that Party shall be bound by this agreement and the Unit Operating Agreement in respect of the Tract; or
- (b) by the last day of the next following calendar month the Tract qualifies for inclusion in the Unit Area pursuant to Clause 502.

1104. Revision of Exhibits

Unit Operator shall revise the exhibits to reflect any change in ownership in or exclusion from this agreement of a Tract pursuant to Clause 1103. Where a Tract is excluded, the Tract Participation of the other Tracts shall each be increased, without changing their ratios to each other, so that their summation is one hundred percent (100%). The revised exhibits shall be effective as of 8:00 a.m. on the first day of the calendar month in which the failure of title referred to in Clause 1103 is finally determined.

## ARTICLE XII TRANSFER OF INTEREST

1201. Disposition

In this Clause "disposition" means a sale, assignment, transfer, lease, sublease, conveyance, parting with possession, or any transaction of a similar nature, whether by trust or otherwise. A disposition of an interest owned by a Party in a Tract shall cover the whole or an undivided interest in the Party's interest in such Tract. A disposition shall not be binding on Unit Operator until the acquiring parties who are not Parties have executed and delivered to Unit Operator counterparts of this agreement, and at least one of the parties thereto has given notice thereof to the Unit Operator. Unit Operator shall revise the exhibits to reflect each disposition of an interest in a Tract and the revised exhibits shall be effective as of 8:00 a.m. on the first day of the calendar month next following the calendar month in which the notice is received by Unit Operator.

1202. Multiple Disposition Not to Increase Costs

If any disposition of an interest by a Party in a Tract should be made to multiple parties so that the expense or duties of Unit Operator are thereby increased, the Unit Operator may require the assignee parties (and Party if it retains and interest) to appoint one of their number as representing all of them for the purpose of this agreement, unless arrangements satisfactory to the Unit Operator are made to compensate the Unit Operator for the increased expenses or duties.

## ARTICLE XIII IN GENERAL

1301. Execution in Counterpart

This agreement may be executed in separate counterparts and all the executed counterparts together shall constitute one agreement. Execution of this agreement by the Minister shall be on behalf of the Crown only as owner of Royalty Interest.

1302. Dual Capacity

If a Party owns a Working Interest and a Royalty Interest, its execution of this agreement shall constitute execution in both capacities.

1303. Subsequent Execution

An owner of an interest in a Tract who has not become a Party as of the date the Tract was included in the Unit Area under Article V or IX, may become a Party with respect to that interest only on such terms and conditions as may be prescribed by the Working Interest Owners.

1304. No Partnership

The duties and obligations of the Parties shall be separate and not joint or collective. Nothing contained in this agreement shall be construed to create a partnership or association.

1305. Force Majeure

Neither Unit Operator nor any Party shall be deemed to be in default with respect to non-performance including delay or failure to partially perform any or all of its obligations hereunder, other than financial, if and so long as its non-performance is due, in whole or in part, to any cause beyond its reasonable control, but lack of funds shall not be a cause beyond a Party's reasonable control. The performance of such obligations shall begin or be resumed within a reasonable time after such cause has been removed. Neither this agreement nor any Lease or any other agreement or instrument relating to the Unitized Zone or Unitized Substances shall terminate by reason of suspension of Unit Operations for the cause set forth in this Clause.

1306. Taxes

Each Party shall be separately liable to the extent of its ownership for all taxes on Unitized Substances and with respect to the production or sale of Unitized Substances. A Working Interest Owner may, at any time and from time to time, pay said taxes on behalf of its Royalty Owner and deduct the amount of the payment from the Royalty Owner's royalty. Those taxes with respect to the production or sale of Unitized Substances shall be adjusted so that they are borne as if the basis of taxation was the allocation of Unitized Substances hereunder.

1307. Right of Redemption

A Working Interest Owner may, at any time and from time to time, with full rights of subrogation, redeem for its Royalty Owner any agreement for sale, mortgage, or other lien or encumbrance of any kind or nature affecting any interest in the Unit Area in the event of default of payment by the Royalty Owner and deduct the amount of any payment made hereunder from the Royalty Owner's royalty.

1308. Interpretation

The Clause Headings in this agreement shall not be considered in interpreting the text.

1309. Number and Gender

In this agreement words importing the singular include the plural and vice versa; words importing the masculine gender include the feminine and vice versa; and words importing persons include firms or corporations and vice versa.

1310. Time

In this agreement all times are "official times" as defined in The Official Time Act of the Province of Manitoba.

1311. Compliance with Legislation

The provisions of The Oil and Gas Act and regulations of Manitoba thereunder, as amended from time to time, take precedence over this agreement.

1312. Governing Law

This Agreement shall be governed by and construed in accordance with the laws of the Province of Manitoba, and each of the Parties submits to the jurisdiction of the courts of the Province of Manitoba for the interpretation and enforcement hereof.

ARTICLE XIV  
EFFECTIVE DATE

1401. Effective Date

The unitization provided for herein shall become effective at 8:00 a.m. on the first day of the first calendar month following:

- (a) the date of the qualification under Clause 502 of Tracts having a combined Tract Participation of one hundred percent (100%) as originally set out in Exhibit "A"; and
- (b) the date of the Unit Operator receiving written approval of this agreement from the Conservation Board.  
*Agreement is registered by the Petroleum Branch.*

1402. Notice of Effective Date

As soon as possible after the Effective Date Unit Operator shall notify all Working Interest Owners, ~~the Conservation Board and the Department of Energy and Mines of Manitoba~~ of the Effective Date and each of the Tracts qualified as of the Effective Date, and each Working Interest Owner shall advise each of its Royalty Owners of the Effective Date.

1403. Release of Parties

This agreement shall cease to bind the Parties if the unitization provided for herein has not become effective on or before the first day of December, 1996.

ARTICLE XV  
TERM

1501. Effect of Execution and Delivery

Subject to Clause 1403 this agreement is binding upon a person who executes and delivers a counterpart thereof to Unit Operator, and that person is bound by this agreement as of the time of such delivery. This agreement inures to the benefit of and is binding upon the heirs, executors, administrators, successors and assigns of the Parties.

1502. Termination

This agreement terminates ninety (90) calendar days after all wells for the production of Unitized Substances in the Unit Area have been abandoned, plugged or disposed of or upon the termination of the Unit Operating Agreement, and thereafter the Parties shall be governed by the terms and provisions of their Leases and other agreements or instruments relating to the Unitized Zone or Unitized Substances.

1503. Salvaging Equipment Upon Termination

The Royalty Owners grant the Working Interest Owners the right for a period of six (6) months after termination of this agreement to salvage, sell, distribute or otherwise dispose of the personal property and facilities used in connection with Unit Operations.

1504. Notice to Royalty Owners

The Working Interest Owners shall give notice in accordance with their Leases to their respective Royalty Owners of the termination of this agreement within thirty (30) calendar days thereafter.  
Unit Agreement: Kola Unit No. 2



IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

CORVAIR OILS LTD.

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
ADDRESS FOR SERVICE:

*P.O. Box 3827, Station "D"*

*Edmonton, AB T5L 4J8*

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

GAUER OIL COMPANY.

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
ADDRESS FOR SERVICE:

*202 Riverside Drive*

*Toronto, ON M6S 4A9*

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

MANITOBA DEPARTMENT OF ENERGY AND MINES

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
\_\_\_\_\_  
  
ADDRESS FOR SERVICE:  
*360 - 1395 Ellice Avenue*  
*Winnipeg, MB R3G 3P2*

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

MONTREAL TRUST COMPANY

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
ADDRESS FOR SERVICE:

*221 Portage Avenue*

*Winnipeg, MB R3B 2A6*

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

NAYLEN OIL CORP.

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
ADDRESS FOR SERVICE:

*40 Everett Crescent*

*Regina, SK S4S 2M7*

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

TUNDRA OIL AND GAS LTD.

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
ADDRESS FOR SERVICE:

*1111 One Lombard Place*

*Winnipeg, MB R3B 0X4*

Execution Page forming part of the Unit Agreement - Kola Unit No. 2



September 10, 1996

Mr. George Czyzewski, P.Eng.  
Sr. Reservoir Engineer  
Tundra Oil and Gas Ltd.  
1111-One Lombard Place  
Winnipeg MB R3B 0X4

Dear George:

**Re: Proposed Kola Unit No. 2**

The Branch is in receipt of your application for expansion of the waterflood in the Daly Bakken A Pool. Proposed Kola Unit No. 2 includes areas of both 16 ha and 32 ha spacing. In order to conform with spacing unit boundaries, the unit area should be modified. Figure 1 shows the revised unit area. The revised unit area includes all developed 16 ha and 32 ha spacing units. The undrilled Crown LSD 14-28 is no longer under lease to Tundra (lease expiry Oct 23/95).

The Branch has done a preliminary review of the proposed tract factors. Based on Tundra's proposed tract participation formula, the last 90 days production, the Crown's share from it's five tracts is 34.2%. A quick review of other factors such as OOIP, remaining recoverable reserves and ultimate recoverable reserves yield a Crown unit share of 42-51%. The Branch will be reviewing the financial impact of Tundra's proposed participation formula on Crown revenues. The Branch will advise you if we believe the tract participation formula should be modified in order for the Crown to receive it's fair share.

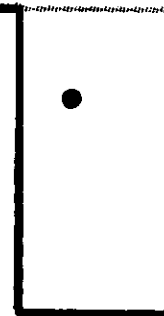
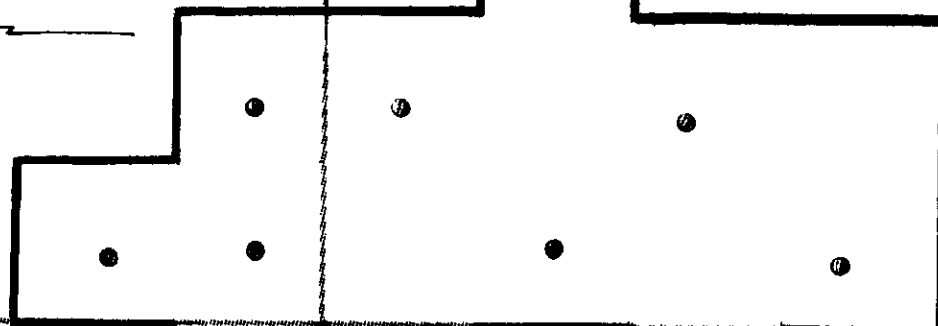
As we discussed the application will be advertised showing the revised unit area. It is anticipated the application can be approved and the unit agreement executed and registered by the Crown with an effective date for the unit of November 1, 1996. If you have any questions please don't hesitate to call me at 945-6574.

Your truly,

A handwritten signature in black ink, appearing to read 'John N. Fox', with a long horizontal flourish extending to the right.

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

REVISED  
KOLA  
UNIT NO. 2



Kola



FIGURE  
1



# KOLA UNIT NO. 2 TRACT PARTICIPATION FORMULA

Comparison of Crown Revenue using Tundra's current production vs remaining rec. reserves (Crown)

WELL	PRODUCTION (M3)	TUNDRA TRACT FACTOR	ALLOCATED PRODUCTION (M3)	ROYALTY (M3)	TAX (M3)	CROWN TRACT FACTOR	ALLOCATED PRODUCTION	ROYALTY	TAX
13-28	57.152	4.995	57.064	6.935		0.04340	49.582	5.102	
15-28	25.536	2.233	25.511		0.000	0.06160	70.374		5.586
16-29	18.848	1.650	18.850	0.737		0.01290	14.737	0.451	
1-32	43.776	3.824	43.687	0.002	0.729	0.05700	65.119	0.005	4.151
2-32	17.936	1.565	17.879		0.000	0.03000	34.273		0.000
8-32	228.000	19.966	228.098	0.057	35.833	0.25460	290.863	0.092	47.476
1-33	129.200	11.310	129.209		17.112	0.05400	61.691		3.750
3-33	130.720	11.443	130.728		17.410	0.12180	139.148		19.059
5-33	355.680	31.154	355.913		61.523	0.23060	263.445		43.409
7-33	55.936	4.895	55.922		2.657	0.06660	76.086		6.705
11-33	79.648	6.965	79.570		7.388	0.06640	75.857		6.660
TOTAL	1142.432	100.000	1142.432	7.731	142.652	0.999	1141.175	5.650	136.797

◇  
ND

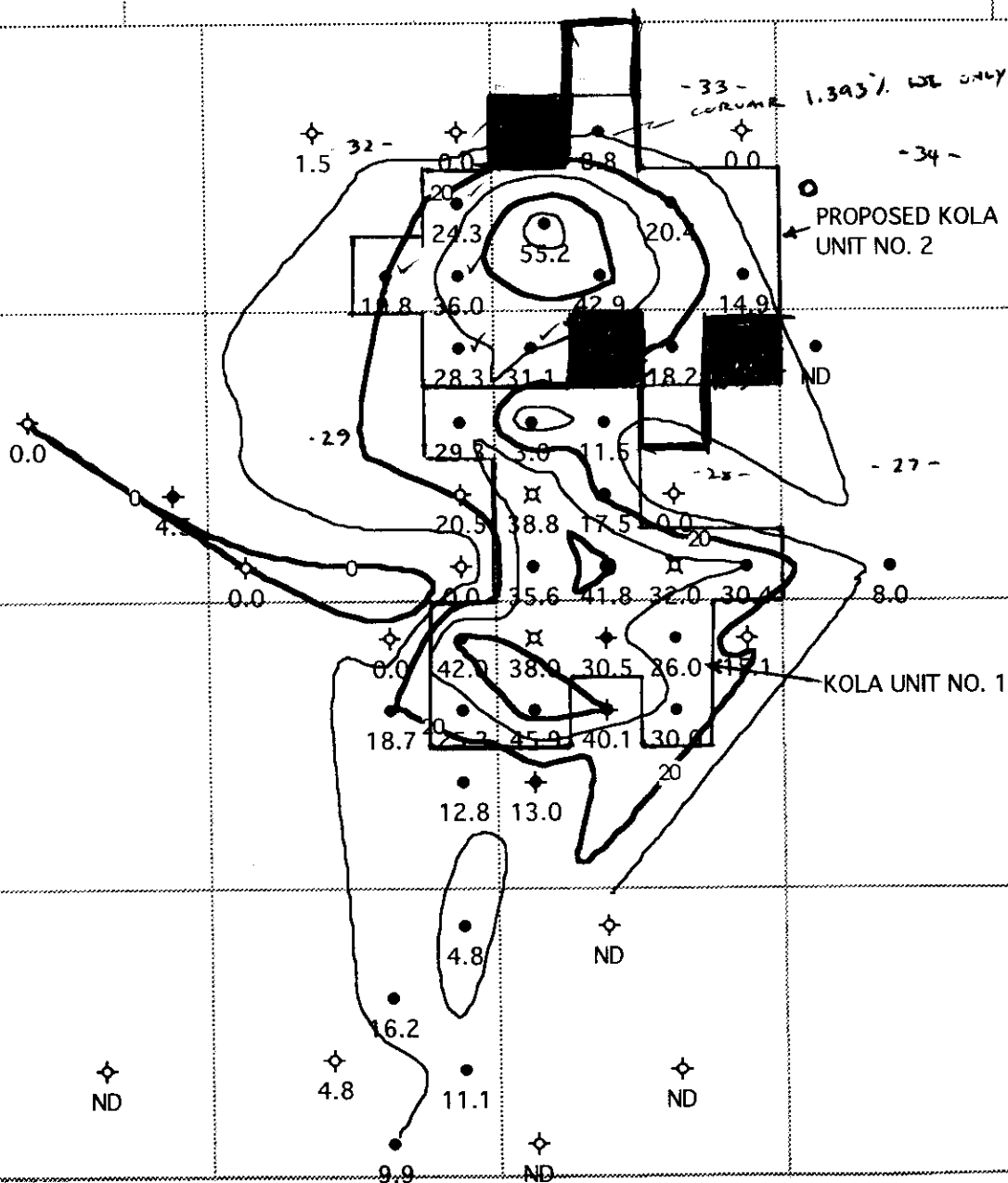
T11

## ATTACHMENT NO.5

◇  
1.5

36 31

34



T10

ND

TUNDRA OIL AND GAS LTD.

KOLA AREA BAKKEN

(PHI-H 15% CUTOFF) at 10.0 Intervals

—————  
(2 km)

M.B. DUPONT

Date: 5/22/96

40000

KOLA UNIT NO. 2

ISSUES

- Nov. 1 effective  
date of unit

## 1/ CROWN'S SHARE

- TUNDRA'S proposal last 90 days  
production Crown share - 34.2%

RESERVES CURRENT CROWN PERCENTAGE

5-33

1-33

6-32

3-33

- Crown share well count 54.5%

- Crown share ultimate recoverable reserves 50.78%

- Crown share OOIIP : 41.91%

- Crown share remaining rec. reserves : 45.96%

## 2/ UNIT AREA

- unit mixes 16 & 32 ha spacing

- unit area does not follow 32 ha  
spacing unit boundaries (NE/4 28 + NW/4 33)

- unit area includes undeveloped  
spacing units 14-28, 16-28 & 12-32

## Unitization Application

1. Engineering sends a letter indicating receipt of the application.
2. Assign application reference Number. 4A96-01.
3. Processing of the application depends on whether the unit includes Crown tracts, i.e. unit tracts where the Crown is the mineral owner

## No Crown Tracts in Unit

4. Two copy of the unit agreement are to be submitted. The unit agreement is to be accompanied by a copy of the execution pages signed by all the working interest and royalty owners in the unit. The unit agreement should be reviewed to ensure the following are satisfactory
  - proposed plan of unit operations
  - schedule for implementation of the unit
  - a description of the unit tracts in the unit area
  - the method of allocating to each unit tract a share of the oil & gas produced from the unit
  - any other administrative matters
5. If all parties to the unit agreement have executed it and the agreement is satisfactory, recommend to the Chief Petroleum Engineer (CPE) that the unit agreement be registered. (Sec 132 OF THE OIL & GAS ACT)
6. Upon approval of the Director advise Administration to register the unit agreement with an effective date of the first day of the following month.
7. Advise the company by letter that the unit agreement has been registered and what the unit's effective date is. The company should also be advised that it cannot start water injection until the effective date of the unit.
8. Provide Administration with a list of unit wells, unit tract factors, working interest owners (specify the unit operator) and the unit's effective date.
9. Provide information to Engineering (Paulette) for updating of the Manitoba Unit Publication.

## Crown Tracts in Unit

10. Review the proposed unit tract participation formula to ensure the Crown is being allocated a fair share of the unit production. Recommend to the CPE whether or not the proposed unit tract participation formula is acceptable. If the proposed unit tract participation formula is not acceptable, recommend a revised formula, complete with technical support, to discuss with the applicant.
11. When agreement is reached on the unit tract participation formula, recommend to the CPE that the Crown enter into the unit agreement. Prepare a cover memo from the Director to the Deputy Minister summarizing the unitization proposal, outlining the Crown's involvement and recommending that the Minister execute the unit agreement on behalf of the Crown. Include two copies of the execution page for the Minister's signature. (Sec. 133 OF THE OIL & GAS ACT)
12. Advise the company by letter that the unit agreement has been executed by the Crown include one copy of the signed execution page.
13. Follow Steps 5 - 9.

KOLA UNIT NO. 2  
**UNIT AGREEMENT**

<b>PETROLEUM DOCUMENT REGISTRY</b>	
Document No.	<u>96-559</u>
Registered:	<u>NOVEMBER 28, 1996</u>
<u>C.D. Martin</u>	
Petroleum Registrar	

UNIT AGREEMENT  
KOLA UNIT NO. 2

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## UNIT AGREEMENT

### KOLA UNIT NO. 2

WHEREAS the Parties own Royalty Interests and Working Interests, or either of them, in the Unitized Zone;

AND WHEREAS the Parties desire that the Unitized Zone be developed, produced and operated as a Unit, as hereinafter provided;

NOW THEREFORE in consideration of the covenants herein contained, the Parties agree as follows:

## ARTICLE I DEFINITIONS

### 101. Definitions

In this agreement:

- (a) "Effective Date" means the time and date referred to in Article XIV;
- (b) "Lease" means an instrument granting a Working Interest in any lands in the Unit Area;
- (c) "Outside Substances" means any substances initially obtained from any source other than the Unitized Zone or any Unitized Substances with respect to which royalty has been paid;
- (d) "Party" means a person who is bound by this Agreement;
- (e) "Petroleum Branch" means the Department of Energy and Mines, Petroleum Branch established under The Oil and Gas Act;
- (f) "Petroleum Substances" means petroleum, natural gas and related hydrocarbons (except coal) and all substances whether gaseous, liquid or solid, which are produced in association therewith, or any of them;
- (g) "Royalty Interest" means
  - i) an ownership, fee simple, or similar estate in Petroleum Substances in the Unitized Zone, or
  - ii) a right to a share of Petroleum Substances produced from the Unitized Zone, to a share of the proceeds from the sale of such Petroleum Substances, or to a payment based on the quantity or value of such Petroleum Substances, but does not include a Working interest, the interest of a purchaser or such Petroleum Substances after production, or a mortgage, charge or like interest granted as security in a financial transaction;
- (h) "Royalty Owner" means a Party owning a Royalty Interest in or in respect of Unitized Substances;
- (i) "Spacing Unit" means the area allocated to a well by the Petroleum Branch with respect to the Unitized Zone for the purpose of drilling for or producing Petroleum Substances;
- (j) "Tract" means a parcel of land described and given a Tract number in Exhibit "A" and shown outlined on Exhibit "B";
- (k) "Tract Participation" means the Participation percentage allocated to a Tract pursuant to Article VI and set forth in Exhibit "A";
- (l) "Unit Area" means the lands described in Exhibit "A" and shown outlined on Exhibit "B";
- (m) "Unit Operations" means any operations or activities undertaken in connection with the Unitized Zone, the production or handling of Unitized Substances or the installation, operation, maintenance or removal of equipment or facilities, insofar as such operations or activities have been authorized or provided for under this agreement or the Unit Operating Agreement
- (n) "Unit Operator" means the person who is so designated under the Unit Operating Agreement;
- (o) "Unit Operating Agreement" means the agreement entitled "Unit Operating Agreement - Kola Unit No. 2" entered into by the Working Interest Owners;
- (p) "Unitized Zone" means the Bakken Formation of the Mississippian Age underlying the lands within the Unit Area as same is shown on the compensated neutron litho-density log of the Tundra Daly 4-28-10-

29 WPM well in 4-28-10-29 WPM, in the Province of Manitoba between the intervals of 870.0 metres and 880.0 metres as measured from the Kelly bushing at 4-28-10-29 WPM and shown on Exhibit "C";

- (q) "Unitized Substances" means Petroleum Substances in or obtained from the Unitized Zone;
- (r) "Working Interest" means any interest which entitles the owner thereof to produce and dispose of, or to participate in the production and disposition of, Petroleum Substances from the Unitized Zone, and with which is associated a responsibility to bear all or a portion of the costs of recovering such Petroleum Substances;
- (s) "Working Interest Owner" means a party owning a Working Interest in or in respect of Unitized Substances;
- (t) "Minister" means the member of the Executive Council charged by the Lieutenant Governor in Council with the administration of The Oil and Gas Act of Manitoba.

## ARTICLE II

### EXHIBITS

#### 201. Exhibits

The following exhibits are attached to and incorporated in this agreement:

- (a) Exhibit "A" which numbers and describes each Tract and sets forth its Tract Participation, the names of the Working Interest Owners and their respective shares of the Working Interest, together with the names of the Royalty Owners and their respective shares of the Royalty Interest;
- (b) Exhibit "B" which is a plan of the Unit Area identifying the Tracts;
- (c) Exhibit "C" which is a reproduction of a portion of the compensated neutron litho-density log referred to in Subclause 101(p) hereof.

#### 202. Exhibits Correct

Each exhibit shall be deemed conclusively to be correct to the effective time of a revision or correction thereof as herein provided.

#### 203. Correction of Exhibits

If any mistake or mechanical error occurs in an exhibit, Unit Operator may, or upon request of the Working Interest Owners shall, prepare a corrected exhibit but the data used in establishing Tract Participation shall not be re-evaluated.

#### 204. Effective Time

Any corrected exhibit prepared on or before the Effective Date or within ninety (90) days thereafter shall be effective on the Effective Date. Any corrected exhibit prepared after the said ninety (90) days shall be effective at 8:00 a.m. on the first day of the calendar month next following its preparation or on such other date as is determined by the Working Interest Owners.

#### 205. Supplying of Exhibits

Each time that an exhibit is revised or corrected pursuant to this agreement, Unit Operator shall supply the Petroleum Branch with two copies and shall supply each Working Interest Owner with the number of copies of the exhibit it requests. Each Working Interest Owner shall supply each of its Royalty Owners, excepting the Crown, with a copy thereof.

#### 206. Form of Revised or Corrected Exhibits

Exhibits that are revised or corrected shall show the effective time of the revision or correction and shall be numbered consecutively.



### ARTICLE III

#### UNITIZATION AND EFFECT

301. Unitization

On and after the Effective Date the interests of each Royalty Owner and of each Working Interest Owner in the Unitized Substances and in the Unitized Zone are hereby unitized, in accordance with the provisions of this agreement.

302. Personal Property Excepted

All lease and well equipment heretofore or hereafter placed by any of the Working Interest Owners on lands comprised in the Unit Area shall be deemed conclusively to be and shall remain personal property belonging to and may be removed by the Working Interest Owners. The Working Interest Owners' rights and interests therein are set forth in the Unit Operating Agreement.

303. Continuation of Leases

All Unit Operations and all production of Unitized Substances shall, except for the purpose of calculating payments to Royalty Owners, be deemed conclusively to be operations upon or production from all of the Unitized Zone in each Tract, and such operations or production shall continue in force and effect each Lease and any other agreement or instrument relating to the Unitized Zone or Unitized Substances as if such operations had been conducted on, or a well had been drilled and was producing from each Tract or Spacing Unit, or portion thereof, in the Unit Area.

If from time to time during the term of this Agreement the production of Unitized Substances and the conduct of other Unit Operations is temporarily interrupted or suspended:

- (a) for any period not exceeding ninety (90) consecutive days or
- (b) for any period during which an event of force majeure contemplated by Clause 1305 is in effect,

then, for the purposes of this Clause 303, Unitized Substances shall be deemed to have been produced throughout any such period.

304. Leases Amended

Each Lease and any other agreement or instrument relating to the Unitized Zone or Unitized Substances is hereby amended only to the extent necessary to make it conform to this agreement.

305. Ratification of Leases

Except for a Lease in respect of which a royalty Owner is involved in a court action which has been commenced and is pending on the Effective Date, each Royalty Owner hereby ratifies each Lease, as amended by this agreement, to which it is a party, and hereby confirms that no notice of default has been given and remains outstanding with respect to any such Lease, and that each Lease is in effect as of the Effective Date. The provisions of this Clause 305 do not constitute a waiver, and shall not give rise to an estoppel, of any right to pursue the enforcement of any outstanding obligation under any such Lease.

306. Effect of Unitization on Titles

Nothing in this agreement, nor the Unit Operating Agreement shall be construed as a transfer or exchange of any interest in the Leases, Tracts or Unitized Zone, or in the Unitized Substances before production thereof.

307. Name

The name of the Unit hereby constituted is "Kola Unit No. 2".

308. Equipment and Facilities

All equipment and facilities used in connection with the Unit Operations and heretofore or hereafter installed, affixed or constructed by any of the Working Interest Owners on or in lands within the Unit Area are and shall remain the personal property of the Working Interest Owners, or such of them as may from time to time have an interest

therein, and, except as otherwise provided in Clause 1503, no interest in any such equipment and facilities shall vest in the royalty Owners by virtue of the provisions of this Agreement.

## ARTICLE IV

### AUTHORITY TO WORKING INTEREST OWNERS

401. Operations

The Working Interest Owners are hereby granted the right to develop and operate the Unitized Zone without regard to the provisions of the Leases or the boundary lines of the Tract or Spacing Units in such manner and by such means and methods as the Working Interest Owners consider appropriate. Without limiting the generality of the foregoing, the Working Interest Owners shall have the right to inject any substance or combination of substances into the Unitized Zone and to convert and use as injection wells any wells now existing or hereafter drilled into the Unitized Zone.

402. Delegation

The Working Interest Owners may delegate to Unit Operator any of the rights and powers herein or otherwise granted to them.

403. Vote of Working Interest Owners

Any matter to be determined under this agreement by the Working Interest Owners may be determined by vote of the parties to the Unit Operating Agreement as prescribed therein.

## ARTICLE V

### INCLUSION AND QUALIFICATION OF TRACTS

501. Tracts Included on Effective Date

The Tracts included in the Unit Area as of the Effective Date are those Tracts which are qualified under Clause 502:

- (a) before the Effective Date; or
- (b) on or within ninety (90) days after the Effective Date.

502. Qualification of Tracts

A Tract is qualified for inclusion in the Unit Area when its title has been approved by the Working Interest Owners under Clause 1102 and when:

- (a) owners of one hundred percent (100%) of the Working Interests therein have become Parties and parties to the Unit Operating Agreement and owners of one hundred percent (100%) of the Royalty Interest therein have become Parties; or
- (b) owners of one hundred percent (100%) of the Working Interests therein have become Parties and parties to the Unit Operating Agreement and owners of less than one hundred percent (100%) of the Royalty Interest therein have become Parties, and such owners of Working Interests agree, if required by the other Working Interest Owners, to indemnify the other Working Interest Owners in a form and manner satisfactory to them for any loss or damages that may be suffered by such other Working Interest Owners in respect of claims and demands that, because of the inclusion of the Tract in the Unit Area, may be made by those owners of Royalty Interests in the Tract who have not become Parties; or
- (c) owners of the Working Interests therein have agreed with the owners of Working Interests then Parties and parties to the Operating Agreement as to the basis on which the Tract shall become qualified, where the Tract cannot be qualified pursuant to Subclause (a) or (b) of this Clause.

503. Revision of Exhibits

Within one hundred twenty (120) days after the Effective Date the exhibits shall be revised, if necessary, to set out only those Tracts included in the Unit Area under this Article. The revised Exhibit "A" shall set forth the Tract Participation of the Tracts recalculated on the same basis and using the same data as that used in the calculation of Tract Participation in the original Exhibit "A" and so that their summation is one hundred percent (100%). The exhibits as so revised shall be effective as of the Effective Date.

**ARTICLE VI**  
**TRACT PARTICIPATION**

601. Tract Participation

Each Tract has the Tract Participation ascribed to it in Exhibit "A".

**ARTICLE VII**  
**ALLOCATION OF UNITIZED SUBSTANCES PRODUCED**

701. Allocation to Tracts

Subject to Clauses 801 and 802 the Unitized Substances when produced shall be allocated to the Tracts in accordance with their Tract Participation. The amount of Unitized Substances allocated to each Tract, and only that amount, regardless of whether it be more or less than the amount of actual production of Unitized Substances from the well or wells, if any, on the Tract, shall be deemed conclusively to have been produced from the Tract.

702. Allocation Among Parties

The Unitized Substances allocated to a Tract shall be further allocated among the Working Interest Owners thereof in accordance with their respective percentage Working Interests in the Tract as set forth in Exhibit "A", and the Working Interest Owners of each Tract shall account to the Royalty Owners of such Tract for any royalty payable or deliverable to such Royalty Owners in respect of the Unitized Substances allocated to such Tract.

703. Calculation of Royalty

The Working Interest Owners of each Tract shall calculate royalty on the Unitized Substances allocated to the Tract at the applicable rate under the Lease, other agreement or instrument relating to the Tract. The Royalty Owners of each Tract agree to accept payment of royalty so calculated in satisfaction of the obligation of a Working Interest Owner to make royalty payments on Unitized Substances under the Lease, agreement or other instrument covering such Tract; but a lessee under a Lease shall not be relieved from making payment of royalty to its lessor if payment is not made by the Working Interest Owner as aforesaid. In calculating royalty on residue gas, sulphur and fluid hydrocarbons, or any of them, obtained by processing Unitized Substances, other than crude oil, by compression, absorption or other plant extraction or stabilization, proper allowances shall be made for costs, expenses and charges, including a reasonable return on investment, incurred in or attributable to gathering and processing the Unitized Substances.

704. Taking Unitized Substances in Kind

The Unitized Substances allocated to a Tract shall be delivered in kind at the time and place of production to the Working Interest Owners entitled thereto who may, if there is no interference with Unit Operations by them, construct, maintain and operate in the Unit Area all necessary facilities for taking delivery in kind.

705. Failure to Take in Kind

To the extent that a Party entitled to take in kind any of the Unitized Substances fails to take or otherwise dispose of them at the time and place of production, then so long as such failure continues, Unit Operator, as agent and for the account and at the expense of such Party may sell, store, inject or otherwise dispose of them. Where there is a sale the "net proceeds" remaining from the sale shall be paid to the Party. Unit Operator may contract for the sale thereof only for the minimum term obtainable which in no event shall exceed one (1) year. When Unit Operator has so contracted, the Party may take its share of the Unitized Substances in kind upon the expiration of the current sales

contract. The "net proceeds" for the purpose of this Clause shall mean the proceeds from the sale of the non-taking Party's share of production, less all direct costs of the sale, including processing and shipping costs.

706. Royalty on Outside Substances

If an Outside Substance is injected into the Unitized Zone, the first like substance contained in the Unitized Substances subsequently produced and sold or used other than for operations hereunder shall be deemed conclusively to be that Outside Substance until a quantity equal to the quantity of the Outside Substance injected into the Unitized Zone is recovered. No royalty shall be payable on any substance which is deemed conclusively to be an Outside Substance.

707. Several Royalty Liability

Without limiting the generality of the provisions of Clauses 702 and 1304, nothing in this Agreement shall be construed as giving rise to any right entitling the Royalty Owners of a Tract to look to any Working Interest Owners other than the Working Interest Owners of such Tract for the satisfaction of royalty obligations in respect of such Tract; provided, however, that in the event that the Working Interest Owners of a Tract are not the same persons as the lessee under a Lease relating to the Tract, the provisions of this Clause 707 shall not be construed as relieving such lessee of any obligation to account for royalty payable or deliverable to the lessor under such Lease if the Working Interest Owners fail to comply with their obligations in that respect.

## ARTICLE VIII

### USE, LOSS AND RE-INJECTION OF UNITIZED SUBSTANCES

801. Use or Loss

The Working Interest Owners may use as much of the Unitized Substances, other than crude oil, as they deem necessary for Unit Operations. Unitized Substances so used or injected and Unitized Substances lost shall be excluded in allocating Unitized Substances to Tracts, and no royalty or other payment shall be payable in respect thereof.

802. Re-Injection

The Working Interest Owners are hereby granted the right to re-inject Unitized Substances into the Unitized Zone for any purpose related to the Unit Operations. Unitized Substances so injected shall be excluded in allocating Unitized Substances to Tracts, and no royalty or other payment shall be payable in respect thereof until they are recovered for sale or for use other than for Unit Operations.

## ARTICLE IX

### ENLARGEMENT OF UNIT AREA

901. Enlargement

After the expiration of ninety (90) days following the Effective Date, if an owner of a Working Interest in lands adjoining the Unit Area makes application to enlarge the Unit Area to include such adjoining lands which appear to be potentially productive of Petroleum Substances from the Unitized Zone the Working Interest Owners may approve the enlargement of the Unit Area to include such adjoining lands on such terms and conditions as the Working Interest Owners may consider appropriate, and, if such adjoining lands qualify for inclusion in the Unit Area under Clause 502, the Unit Area shall be enlarged to include such adjoining lands. Notwithstanding that any owner of a Working Interest or a Royalty Interest in such adjoining lands is already a Party, such owner shall not, for the purposes of the qualification of such adjoining lands under Clause 502, be considered to have executed and delivered this agreement until it executes and delivers to the Unit Operator an additional counterpart of this agreement incorporating exhibits which reflect the proposed enlargement and which are stated to be effective as of the effective date of such enlargement.

902. Adjustment of Tract Participation

The Tract Participation of each Tract added pursuant to Clause 901 shall be determined by the Working Interest Owners. The Tract Participation shall then be adjusted in order that:

- (a) the ratios of the Tract Participation of Tracts shown on Exhibit "A" immediately prior to the enlargement remain the same to each other; and
- (b) the total of the Tract Participation for all Tracts of the enlarged Unit Area and Unitized Zone is one hundred percent (100%).

903. Exhibits

Unit Operator shall revise Exhibits "A" and "B" as required by the enlargement.

904. Effective Time of Enlargement

An enlargement pursuant to Clause 901 and an adjustment of Tract Participation under this Article shall become effective at 8:00 a.m. on the first day of the first calendar month following approval of admission under Clause 901, Tract qualification under Clause 502 and the date the Unit Agreement is registered by the Petroleum Branch.

905. No Retroactive Adjustment

There shall never be any retroactive adjustment of the allocation of Unitized Substances by reason of an enlargement under this Article.

## ARTICLE X

### DISPUTES

1001. Disputes

If the title or right of a Party to receive in kind all or any portion of the Unitized Substances allocated to a Tract, or any share of the proceeds from the sale thereof, is in dispute, the Party concerned shall forthwith give notice thereof to Unit Operator. If Unit Operator is so notified or if Unit Operator is directed to do so by the Working Interest Owners in the event that it is otherwise informed of the dispute, Unit Operator shall withhold and sell the portion of the Unitized Substances the title or right to which is in dispute, and hold in trust the proceeds from the sale thereof until:

- (a) the Party concerned furnishes security in a form and manner satisfactory to the Working Interest Owners for the proper accounting thereof to the rightful owner or owners if the title or right of the Party shall fail in whole or in part, whereupon the proceeds shall be paid to the party; or
- (b) the title or right thereto is established by a final judgment of a Court or otherwise to the satisfaction of the Working Interest Owners, whereupon such proceeds shall be paid to the person rightfully entitled.

If Unit Operator does not comply with this Clause because it is not notified of a dispute by a Party concerned, that Party hereby agrees to indemnify and save harmless Unit Operator from any loss or damage suffered because of anything done or omitted to be done by Unit Operator because it was not notified.

## ARTICLE XI

### APPROVAL OF TITLES

1101. Titles Committee

The Working Interest Owners shall appoint a Titles Committee which shall investigate the ownership of all Tracts. Each Working Interest Owner shall submit to the Title Committee such title data and information as the titles Committee may reasonably require from time to time. The Titles Committee shall report the result of its investigation to the Working Interest Owners specifying the titles to Tracts which it unanimously recommends for approval.

1102. Approval of Titles by Working Interest Owners

The Working Interest Owners may approve:

- (a) the titles of Working Interest Owners to Tracts which have been unanimously recommended for approval by the Titles Committee; and

- (b) the titles of Working Interest Owners to Tracts which have not been unanimously recommended for approval by the Titles Committee but with respect to which such Working Interest Owners have agreed to indemnify the other Working Interest Owners, in a form and manner satisfactory to them, from loss or damage that may be suffered by them in respect of claims and demands made because of subsequent failure of the Working Interest Owners' title.

Notwithstanding the foregoing, the Working Interest Owners may approve any title that has not been unanimously recommended for approval by the Titles Committee.

1103. Subsequent Failure of Title

If the title of a Working Interest Owner to a Tract fails, the Tract shall be excluded from this agreement and the Unit Operating Agreement as of 8:00 a.m. on the first day of the calendar month in which the failure of title is finally determined unless:

- (a) any other Party is held or declared to own the title in which event that Party shall be bound by this agreement and the Unit Operating Agreement in respect of the Tract; or
- (b) by the last day of the next following calendar month the Tract qualifies for inclusion in the Unit Area pursuant to Clause 502.

1104. Revision of Exhibits

Unit Operator shall revise the exhibits to reflect any change in ownership in or exclusion from this agreement of a Tract pursuant to Clause 1103. Where a Tract is excluded, the Tract Participation of the other Tracts shall each be increased, without changing their ratios to each other, so that their summation is one hundred percent (100%). The revised exhibits shall be effective as of 8:00 a.m. on the first day of the calendar month in which the failure of title referred to in Clause 1103 is finally determined.

## ARTICLE XII TRANSFER OF INTEREST

1201. Disposition

In this Clause "disposition" means a sale, assignment, transfer, lease, sublease, conveyance, parting with possession, or any transaction of a similar nature, whether by trust or otherwise. A disposition of an interest owned by a Party in a Tract shall cover the whole or an undivided interest in the Party's interest in such Tract. A disposition shall not be binding on Unit Operator until the acquiring parties who are not Parties have executed and delivered to Unit Operator counterparts of this agreement, and at least one of the parties thereto has given notice thereof to the Unit Operator. Unit Operator shall revise the exhibits to reflect each disposition of an interest in a Tract and the revised exhibits shall be effective as of 8:00 a.m. on the first day of the calendar month next following the calendar month in which the notice is received by Unit Operator.

1202. Multiple Disposition Not to Increase Costs

If any disposition of an interest by a Party in a Tract should be made to multiple parties so that the expense or duties of Unit Operator are thereby increased, the Unit Operator may require the assignee parties (and Party if it retains and interest) to appoint one of their number as representing all of them for the purpose of this agreement, unless arrangements satisfactory to the Unit Operator are made to compensate the Unit Operator for the increased expenses or duties.

## ARTICLE XIII IN GENERAL

1301. Execution in Counterpart

This agreement may be executed in separate counterparts and all the executed counterparts together shall constitute one agreement. Execution of this agreement by the Minister shall be on behalf of the Crown only as owner of Royalty Interest.

1302. Dual Capacity

If a Party owns a Working Interest and a Royalty Interest, its execution of this agreement shall constitute execution in both capacities.

1303. Subsequent Execution

An owner of an interest in a Tract who has not become a Party as of the date the Tract was included in the Unit Area under Article V or IX, may become a Party with respect to that interest only on such terms and conditions as may be prescribed by the Working Interest Owners.

1304. No Partnership

The duties and obligations of the Parties shall be separate and not joint or collective. Nothing contained in this agreement shall be construed to create a partnership or association.

1305. Force Majeure

Neither Unit Operator nor any Party shall be deemed to be in default with respect to non-performance including delay or failure to partially perform any or all of its obligations hereunder, other than financial, if and so long as its non-performance is due, in whole or in part, to any cause beyond its reasonable control, but lack of funds shall not be a cause beyond a Party's reasonable control. The performance of such obligations shall begin or be resumed within a reasonable time after such cause has been removed. Neither this agreement nor any Lease or any other agreement or instrument relating to the Unitized Zone or Unitized Substances shall terminate by reason of suspension of Unit Operations for the cause set forth in this Clause.

1306. Taxes

Each Party shall be separately liable to the extent of its ownership for all taxes on Unitized Substances and with respect to the production or sale of Unitized Substances. A Working Interest Owner may, at any time and from time to time, pay said taxes on behalf of its Royalty Owner and deduct the amount of the payment from the Royalty Owner's royalty. Those taxes with respect to the production or sale of Unitized Substances shall be adjusted so that they are borne as if the basis of taxation was the allocation of Unitized Substances hereunder.

1307. Right of Redemption

A Working Interest Owner may, at any time and from time to time, with full rights of subrogation, redeem for its Royalty Owner any agreement for sale, mortgage, or other lien or encumbrance of any kind or nature affecting any interest in the Unit Area in the event of default of payment by the Royalty Owner and deduct the amount of any payment made hereunder from the Royalty Owner's royalty.

1308. Interpretation

The Clause Headings in this agreement shall not be considered in interpreting the text.

1309. Number and Gender

In this agreement words importing the singular include the plural and vice versa; words importing the masculine gender include the feminine and vice versa; and words importing persons include firms or corporations and vice versa.

1310. Time

In this agreement all times are "official times" as defined in The Official Time Act of the Province of Manitoba.

1311. Compliance with Legislation

The provisions of The Oil and Gas Act and regulations of Manitoba thereunder, as amended from time to time, take precedence over this agreement.

1312. Governing Law

This Agreement shall be governed by and construed in accordance with the laws of the Province of Manitoba, and each of the Parties submits to the jurisdiction of the courts of the Province of Manitoba for the interpretation and enforcement hereof.

## ARTICLE XIV EFFECTIVE DATE

1401. Effective Date

The unitization provided for herein shall become effective at 8:00 a.m. on the first day of the first calendar month following:

- (a) the date of the qualification under Clause 502 of Tracts having a combined Tract Participation of one hundred percent (100%) as originally set out in Exhibit "A"; and
- (b) the date the Unit Agreement is registered by the Petroleum Branch.

1402. Notice of Effective Date

As soon as possible after the Effective Date Unit Operator shall notify all Working Interest Owners of the Effective Date and each of the Tracts qualified as of the Effective Date, and each Working Interest Owner shall advise each of its Royalty Owners of the Effective Date.

1403. Release of Parties

This agreement shall cease to bind the Parties if the unitization provided for herein has not become effective on or before the first day of December, 1996.

## ARTICLE XV TERM

1501. Effect of Execution and Delivery

Subject to Clause 1403 this agreement is binding upon a person who executes and delivers a counterpart thereof to Unit Operator, and that person is bound by this agreement as of the time of such delivery. This agreement inures to the benefit of and is binding upon the heirs, executors, administrators, successors and assigns of the Parties.

1502. Termination

This agreement terminates ninety (90) calendar days after all wells for the production of Unitized Substances in the Unit Area have been abandoned, plugged or disposed of or upon the termination of the Unit Operating Agreement, and thereafter the Parties shall be governed by the terms and provisions of their Leases and other agreements or instruments relating to the Unitized Zone or Unitized Substances.

1503. Salvaging Equipment Upon Termination

The Royalty Owners grant the Working Interest Owners the right for a period of six (6) months after termination of this agreement to salvage, sell, distribute or otherwise dispose of the personal property and facilities used in connection with Unit Operations.

1504. Notice to Royalty Owners

The Working Interest Owners shall give notice in accordance with their Leases to their respective Royalty Owners of the termination of this agreement within thirty (30) calendar days thereafter.



IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

96-11-21  
(DATE)

CORVAIR OILS LTD.

  
R.G. BRECKON - VICE PRESIDENT

  
J.A. MITCHELL  
PRESIDENT

ADDRESS FOR SERVICE:

P.O. Box 3827, Station "D"

Edmonton, AB T5L 4J8

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

MANITOBA DEPARTMENT OF ENERGY AND MINES

NOVEMBER 26, 1996

(DATE)

ADDRESS FOR SERVICE:

360 - 1395 Ellice Avenue

Winnipeg, MB R3G 3P2

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

November 22/96  
(DATE)

MONTREAL TRUST COMPANY

[Signature] T/18  
John W. Platt P.30  
EXECUTION  
APPROVED  
[Signature]

ADDRESS FOR SERVICE:

200 Portage Avenue

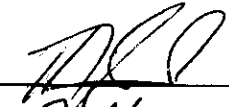
Winnipeg, MB R3B 2A6

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

TUNDRA OIL AND GAS LTD.

November 26, 1996  
(DATE)

  
D. H. Huisen

ADDRESS FOR SERVICE:

1111 One Lombard Place

Winnipeg, MB R3B 0X4

Execution Page forming part of the Unit Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

96-11-21  
(DATE)

CORVAIR OILS LTD.

[Signature]  
R. G. [Signature] - PRESIDENT  
PRESIDENT

ADDRESS FOR SERVICE:


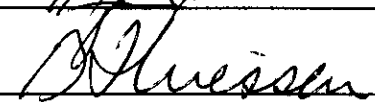
P.O. Box 3827, Station "D"  
Edmonton, AB T5L 4J8

Execution Page forming part of the Unit Operating Agreement - Kola Unit No. 2

IN WITNESS WHEREOF the Parties have executed this agreement each on the date shown below.

TUNDRA OIL AND GAS LTD.

November 26, 1996  
(DATE)

ADDRESS FOR SERVICE:

1111 One Lombard Place

Winnipeg, MB R3B 0X4

Execution Page forming part of the Unit Operating Agreement - Kola Unit No. 2

**EXHIBIT 'A'**

Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2

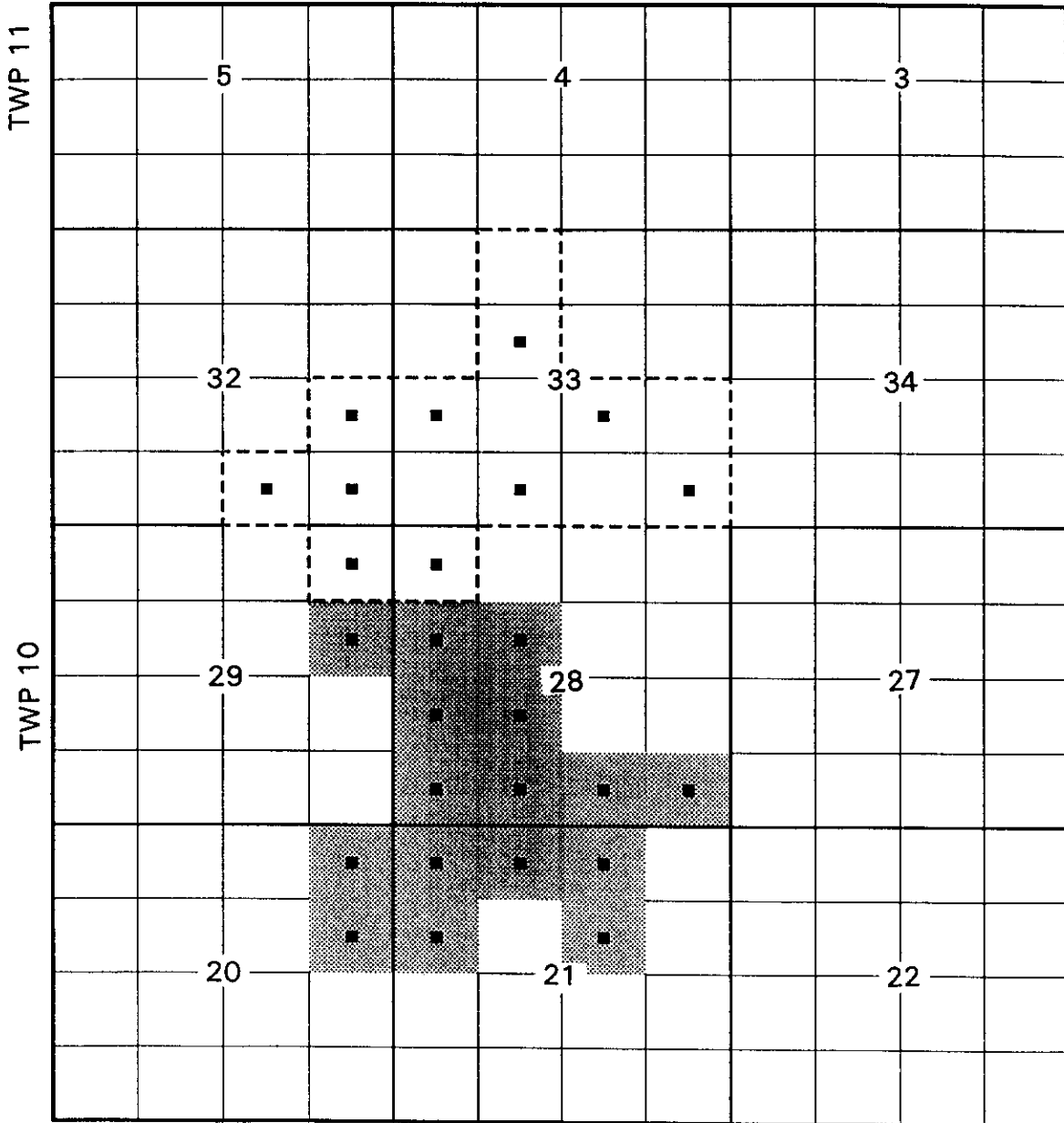
**TRACT PARTICIPATION**  
November 7, 1996

Tract No.	Land Description LSD	Working Interest		Royalty Interest		Tract Participation %
		Owner	Share (%)	Owner	Share (%)	
1	13-28-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	5.10936
2	16-29-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown	100.0000	1.68799
3	1-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	3.91143
4	2-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Tundra Oil and Gas Ltd.	100.0000	1.60026
5	8-32-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Crown Tundra Oil and Gas Ltd.	2.2894 97.7106	20.42230
6	1 & 8-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.56790
7	2 & 7-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	5.00650
8	3 & 6-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	11.70403
9	4 & 5-33-10-29 WPM	Tundra Oil and Gas Ltd.	100.0000	Montreal Trust Company	100.0000	31.86617
10	11 & 14-33-10-29 WPM	Corvair Oils Limited Tundra Oil and Gas Ltd.	20.0000 80.0000	Montreal Trust Company	100.0000	7.12406

# EXHIBIT "B"

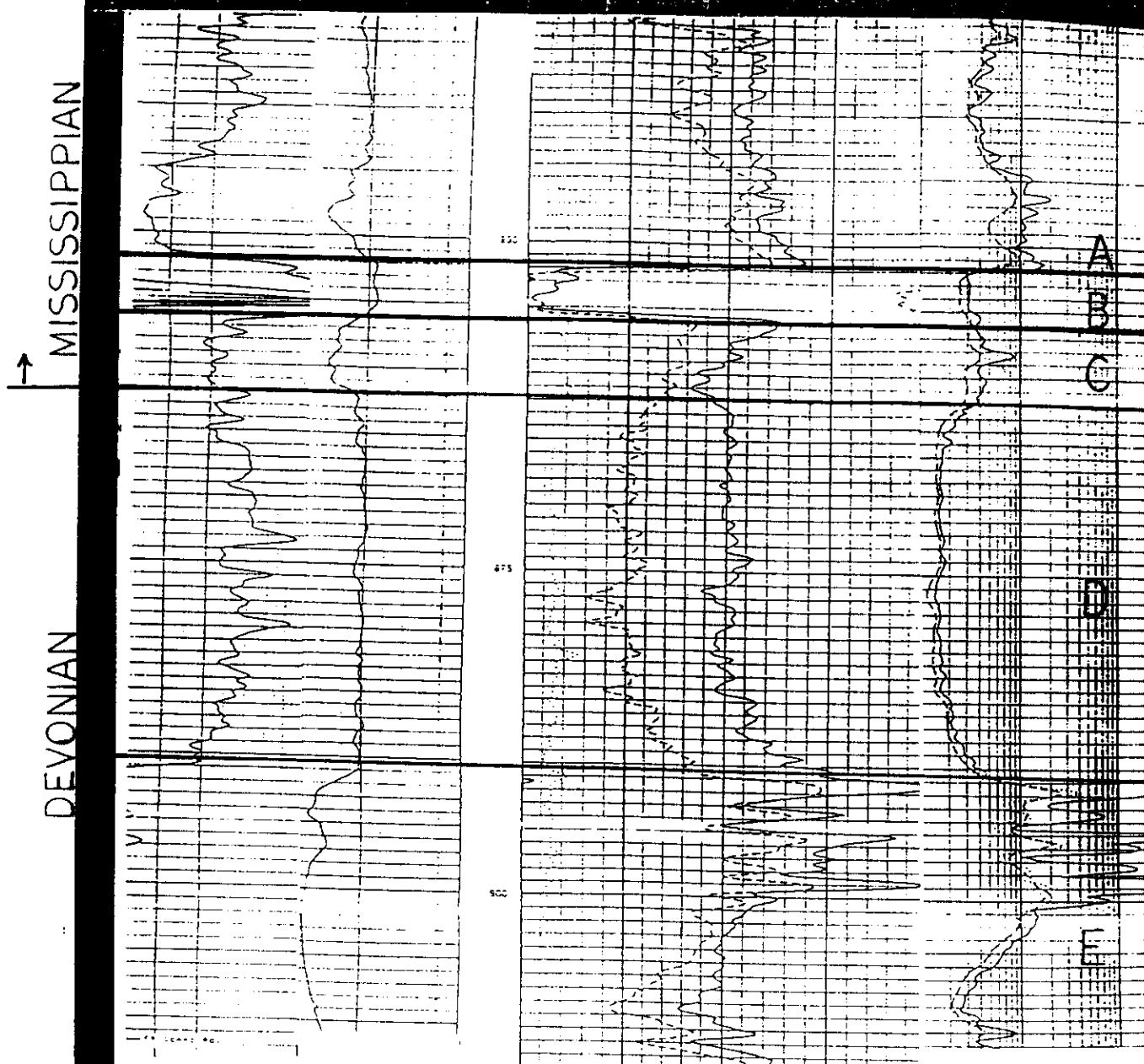
Attached to and made part of an Agreement Entitled  
Unit Agreement - Kola Unit No. 2  
November 7, 1996

## RGE 29 WPM





## BAKKEN FORMATION STRATIGRAPHIC COLUMN



- A. LODGEPOLE FORMATION
- B. UPPER MEMBER BAKKEN FORMATION
- C. MIDDLE MEMBER BAKKEN FORMATION
- D. LYLETON FORMATION
- E. NISKU FORMATION

COMPOSITE LOG

TUNDRA 3-33 10-29

**Tundra** oil and gas ltd.

INDUCTION LOG

CNL DENSITY LOG



October 18, 1996

Mr. George Czyzewski, P.Eng.  
Sr. Reservoir Engineer  
Tundra Oil and Gas Ltd.  
1111 - One Lombard Place  
Winnipeg MB R3B 0X4

Dear George:

**Re: Kola Unit No. 2  
Waterflood Order No. 4**

Your application to expand waterflood operations in the Daly Bakken A Pool has been approved. Attached is Waterflood Order No. 4 outlining conditions for operation of the waterflood in Kola Unit No. 2. Water injection into the unit may not commence until the unit agreement has been executed by all parties and registered by the Petroleum Branch.

If you have any questions please don't hesitate to call the undersigned at 945-6574.

Yours truly,

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

cc. Virden

**THE OIL AND GAS ACT**  
**MINISTERIAL ORDER**  
**WATERFLOOD ORDER NO. 4**

**Pertaining to Waterflood Operations in Kola Unit No. 2**

- 1.0 The Unit Operator shall conduct waterflood operations by injecting water into the Bakken Formation underlying Kola Unit No. 2 ("the Unit") through the wells listed in Schedule A. The Director may approve the conversion of additional wells in the Unit 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 9,500 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 Unit Operator shall conduct an annual survey to determine the level and distribution of reservoir pressure in the Unit. 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 annual surveys will not assist the Unit Operator in monitoring the effectiveness of the waterflood.
- 2.2 The Unit 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 Unit 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 waterflood operations.

- 3.0 The Unit Operator shall file a monthly 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 Unit Operator is to comment in the annual waterflood progress report required under Section 73 of the Drilling and Production Regulation on the observed waterflood performance on 16 ha versus 32 ha spacing and the estimated incremental waterflood recovery from the 16 ha and 32 ha spacing areas in the Unit.

OCT 17, 1996

Date

*L. H. Dubreuil*

Director of Petroleum for  
Minister of Energy and Mines

<b>PETROLEUM DOCUMENT REGISTRY</b>	
Document No.	<u>96-529</u>
Registered:	<u>OCTOBER 18, 1996</u>
<u><i>A. D. Martin</i></u>	
Petroleum Registrar	

**Schedule A**

**Kola Unit No. 2**

**Water Injection Wells**

Tundra Kola Unit No. 2 WIW 01-32-10-29 (WPM)  
Tundra Kola Unit No. 2 WIW 01-33-10-29 (WPM)  
Tundra Kola Unit No. 2 WIW 03-33-10-29 (WPM)



## Memorandum

Date	October 16, 1996		
To	John Fox Chief Petroleum Engineer	From	Ulrich Oosthuizen Petroleum Engineer
Subject	Kola Unit No. 2 Expansion of Waterflood Operations - Daly Bakken A Pool		

Tundra has made application to expand waterflood operations in the Daly Bakken A Pool into a new unit, Kola Unit No. 2. Notice of the application was published in the Virden Empire Advance and sent to royalty and working interest owners in and adjoining the proposed unit area. No objections to the application were received.

### Recommendations

It is recommended that Waterflood Order No. 4 be issued by the Director on behalf of the Minister. A copy of the proposed Waterflood Order is attached. It is also recommended that the Minister enter into the proposed Kola Unit No. 2 Unit Agreement on behalf of the Crown with respect to LSD 13 of Section 28, LSD 16 of Section 29, and LSD's 1 and 8 of Section 32 in Township 10, Range 29 WPM. A copy of the proposed memo to the Deputy is attached.

### Discussion

Tundra has applied to expand waterflood operations in the Daly Bakken A Pool. The proposed waterflood project, Kola Unit No. 2, will include 11 wells north of Kola Unit No. 1 as shown on Figure 1. The Bakken is the intended formation to be waterflooded. Tundra plans to initially convert the well 1-32-10-29 to water injection and flood an inverted 5-spot pattern. Depending on the production response in the initial waterflood area, Tundra plans to convert wells 3-33-10-29 and 1-33-10-29 to injection.

### Kola Unit No. 1 Waterflood Performance

In order to arrest the rapid pressure decline in Kola Unit No. 2, Tundra proposes to conduct a waterflood, which should ultimately lead to improved oil recovery from the Daly Bakken A Pool. To evaluate the performance of this proposed project the Branch has conducted a performance study of Kola Unit No. 1, which is also under waterflood in the Daly Bakken A Pool. The Branch has examined the production performance of wells in Unit No. 1 in the initial waterflood area and in the total unit area. Production results show that the production decline in Unit No. 1 was arrested after 6 months of injection. Production in the initial waterflood area continues to increase from 7m<sup>3</sup>/d (10/93) to 10m<sup>3</sup>/d (12/95). The production decline in Kola Unit No. 1 prior to waterflooding was 40% p.a. (hyperbolic) (Figure 3). Production in Unit No. 1 increased from 14.91 m<sup>3</sup>/d to 23.5 m<sup>3</sup>/d as a result of the waterflood and is currently declining at 16% p.a. (exponential) (Figure 3). Figures 4 to 9 are production plots for wells in the initial waterflood area. The wells show a favourable response to the waterflood and indicate waterflooding has been successful in Kola Unit No. 1. Tundra has estimated an incremental oil recovery of 42,4289 m<sup>3</sup> or 17.3% of the original oil-in-place for Kola Unit No. 1. The incremental oil produced in Kola Unit No. 1 as of May 1996 is 3,709 m<sup>3</sup>.

Tundra has maintained an average injection rate of  $19 \text{ m}^3/\text{d}$  at a maximum wellhead injection pressure of 9,653 kPa in Kola Unit No. 1, although the Crown has approved a maximum wellhead injection pressure of 9,000 kPa. Tundra has had to increase the wellhead injection pressure from 2,750 kPa to 9,653 kPa to maintain a water injection rate of  $19 \text{ m}^3/\text{d}$ . These injection volumes have resulted in an average voidage replacement ratio of 1.57. A pressure transient test conducted on the 13-21-10-29 injector concluded that injection had fractured the formation. However, there is no indication of any channeling or out-of-zone injection due to these fractures.

## **Proposed Kola Unit No. 2 Waterflood Expansion**

### *Primary Production*

The original oil-in-place estimated for Kola Unit No. 2 is  $303,476 \text{ m}^3$  using the volumetric method. The cumulative oil produced as of June 1996 is  $25,848 \text{ m}^3$  or 8.5% of original oil-in-place. Tundra has estimated an ultimate primary recovery of  $65,000 \text{ m}^3$  or 21.4% of original oil-in-place based on the current production decline of wells in Unit No. 2. The Branch's calculated ultimate primary recovery agrees with Tundra's estimate. Results of the Branch's primary recovery calculations are shown in Appendix 1. The current production decline for wells in Unit No. 2 ranges from 17 to 47% p.a. (exponential). The rapid production decline in Unit No. 2 is mainly due to the rapid reservoir pressure depletion as shown in Figure 2. The reservoir pressure has decreased from 7,800 kPa to 5,800 kPa with just over  $19,000 \text{ m}^3$  of oil produced.

### *Waterflood Prediction*

The wells in the initial waterflood area in Kola Unit No. 2 produce 26 m/d of oil. All the wells in the initial waterflood area in Unit No. 2 but 2-32-10-29 have water cuts less than 2%, compared with Kola Unit No. 1 which averaged 50% water cut prior to waterflooding. The average pay in the initial waterflood area is 1.95 m, which is slightly thinner than the initial waterflood area in Kola Unit No. 1. Based on the performance of the waterflood in Kola Unit No. 1 similar results can be expected from waterflood operations in Kola Unit No. 2. The waterflood project in Kola Unit No. 2 may recover more oil because the wells in Unit No. 2 have better primary production performance and reservoir characteristics.

Tundra has applied for a maximum wellhead injection pressure of 9,500 kPa to maintain a proposed injection rate of  $25 \text{ m}^3/\text{d}$  at 01-32-10-29 in the initial waterflood area in Kola Unit No. 2. Tundra's anticipated injection rate of  $25 \text{ m}^3/\text{d}$  will maintain a voidage replacement of greater than 1.0.

The Branch has estimated the formation fracture pressure for the Daly Bakken A Pool to be approximately 19,567 kPa at the sand-face. The proposed maximum wellhead operation pressure of 9,500 kPa results in a sand-face pressure of 17,972 kPa. This indicates the injection pressure should be slightly lower than the formation fracture pressure. However, if fracturing occurs as observed in Unit No. 1, out-of-zone injection should not be a problem.

Depending on the production response in the initial waterflood area, Tundra plans to convert wells, 3-33-10-29 and 1-33-10-29, to injection. By converting these well to injectors Tundra plans to complete an inverted 5-spot pattern in Kola Unit No. 2.

Tundra has estimated that if the waterflood project in Kola Unit No. 2 is successful an incremental 15,174 m<sup>3</sup> or 5% of original oil-in-place will be recovered, which will bring the total recoverable oil in Unit No. 2 to 80,486 m<sup>3</sup> or 26.5% of the original oil-in-place.

The initial waterflood area in Kola Unit No. 2 is developed on 16 ha and 32 ha well spacing. This mixed well spacing may decrease the waterflood efficiency as a result of early water breakthrough in the wells nearest to the injector. If expanded into the remainder of Unit No. 2, waterflooding will be on 32 ha well spacing. The incremental waterflood recovery on 32 ha spacing according to the "Kola Bakken A Reservoir Simulation" study, may be lower than expected on 16 ha spacing. Tundra should be requested to comment in their annual waterflood progress report on the observed waterflood performance on 16 ha versus 32 ha spacing.


### **Proposed Kola Unit No. 2 Unit Agreement and Tract Factors**

The Crown is royalty owner of 4 of 11 tracts in the proposed Kola Unit No. 2. All Crown leases are held by Tundra Oil and Gas Ltd. Tundra has proposed to calculate the tract factors for Kola Unit No. 2 based on oil production during the last 90 days (April 30, 1996 to June 30, 1996). Currently the wells on the Crown tracts produce from the Daly Bakken A Pool at a combined rate of approximately 2.3 m<sup>3</sup>/d. Based on Tundra's proposed tract factor calculation the Crown's royalty share in the unit will be 7.1%.

The Branch has reviewed the proposed tract participation formula. This same formula, current production, was used to determine unit participation for Kola Unit No. 1. The difference between Unit No. 1 and Unit No. 2 is that Unit No. 2 is developed on a mix of 16 ha and 32 ha well spacing, while Kola Unit No. 1 is developed entirely on 16 ha well spacing. The Branch reviewed other tract factors such as OOIP and remaining recoverable reserves. When compared with current production these factors had little impact on total Crown revenue from the unit (royalty + production tax). From the perspective of maintaining Crown revenue, unit tract participation based on the last 90 days production, which maintains all unit owners' current cashflow, appears reasonable. Tundra may encounter some resistance from freehold owners in the 32 ha well spacing area, as productivity from their tracts would be enhanced by infill drilling on 16 ha spacing.

Tundra has submitted two copies of the proposed Unit Agreement for Kola Unit No. 2 for execution by the Minister on behalf of the Crown as an affected royalty owner. Section 133 of The Oil and Gas Act provides for the Minister to enter such agreements on behalf of the Crown as a royalty owner. A copy of the proposed memo to the Deputy recommending that the Minister enter into the unit agreement on behalf of the Crown is attached.



 Ulrich R. Oosthuizen



**THE OIL AND GAS ACT**  
**MINISTERIAL ORDER**  
**WATERFLOOD ORDER NO. 4**

**Pertaining to Waterflood Operations in Kola Unit No. 2**

- 1.0 The Unit Operator shall conduct waterflood operations by injecting water into the Bakken Formation underlying Kola Unit No. 2 ("the Unit") through the wells listed in Schedule A. The Director may approve the conversion of additional wells in the Unit 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 9,500 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 Unit Operator shall conduct an annual survey to determine the level and distribution of reservoir pressure in the Unit. 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 annual surveys will not assist the Unit Operator in monitoring the effectiveness of the waterflood.
- 2.2 The Unit 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 Unit 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 waterflood operations.

- 3.0 The Unit Operator shall file a monthly 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 Unit Operator is to comment in the annual waterflood progress report required under Section 73 of the Drilling and Production Regulation on the observed waterflood performance on 16 ha versus 32 ha spacing and the estimated incremental waterflood recovery from the 16 ha and 32 ha spacing areas in the Unit.

OCT 17, 1996

Date



Director of Petroleum for  
Minister of Energy and Mines

**Schedule A**

**Kola Unit No. 2**

**Water Injection Wells**

Tundra Kola Unit No. 2 WIW 01-32-10-29 (WPM)  
Tundra Kola Unit No. 2 WIW 01-33-10-29 (WPM)  
Tundra Kola Unit No. 2 WIW 03-33-10-29 (WPM)

October 16, 1996

Michael Fine  
Deputy Minister  
Energy and Mines

L.R. Dubreuil  
Director  
Petroleum & Energy Branch

**Proposed Kola Unit No. 2 Unit Agreement**

Tundra Oil and Gas Ltd. is proposing to unitize an area in the Daly Field which includes 11 tracts. The proposed Kola Unit No. 2 involves 4 tracts for which the Crown is the royalty owner (i.e. mineral rights owner). Tundra has applied for approval to waterflood the unit area and has also submitted a copy of the proposed Unit Agreement for Kola Unit No. 2 (attached) for execution by the Minister on behalf of the Crown as an affected royalty owner.

Section 133 of The Oil and Gas Act provides for the Minister to enter such agreement on behalf of the Crown as a royalty owner.

Recommendation:

It is recommended that the Minister enter into the Kola Unit No. 2 Unit Agreement on behalf of the Crown with respect to LSD 13 of Section 28, LSD 16 of Section 29, and LSD's 1 and 8 of Section 32 in Township 10, Range 29 WPM by signing two copies of the attached execution page for the Kola Unit No. 2 Unit Agreement.

Discussion:

The 4 tracts in the proposed Kola Unit No. 2 that contain Crown-owned mineral rights are highlighted in Attachment No. 1. All Crown leases are held by Tundra Oil and Gas Ltd. Currently the wells on the Crown tracts produce from the Daly Bakken A Pool at a combined rate of approximately 2.3 m<sup>3</sup>/d.

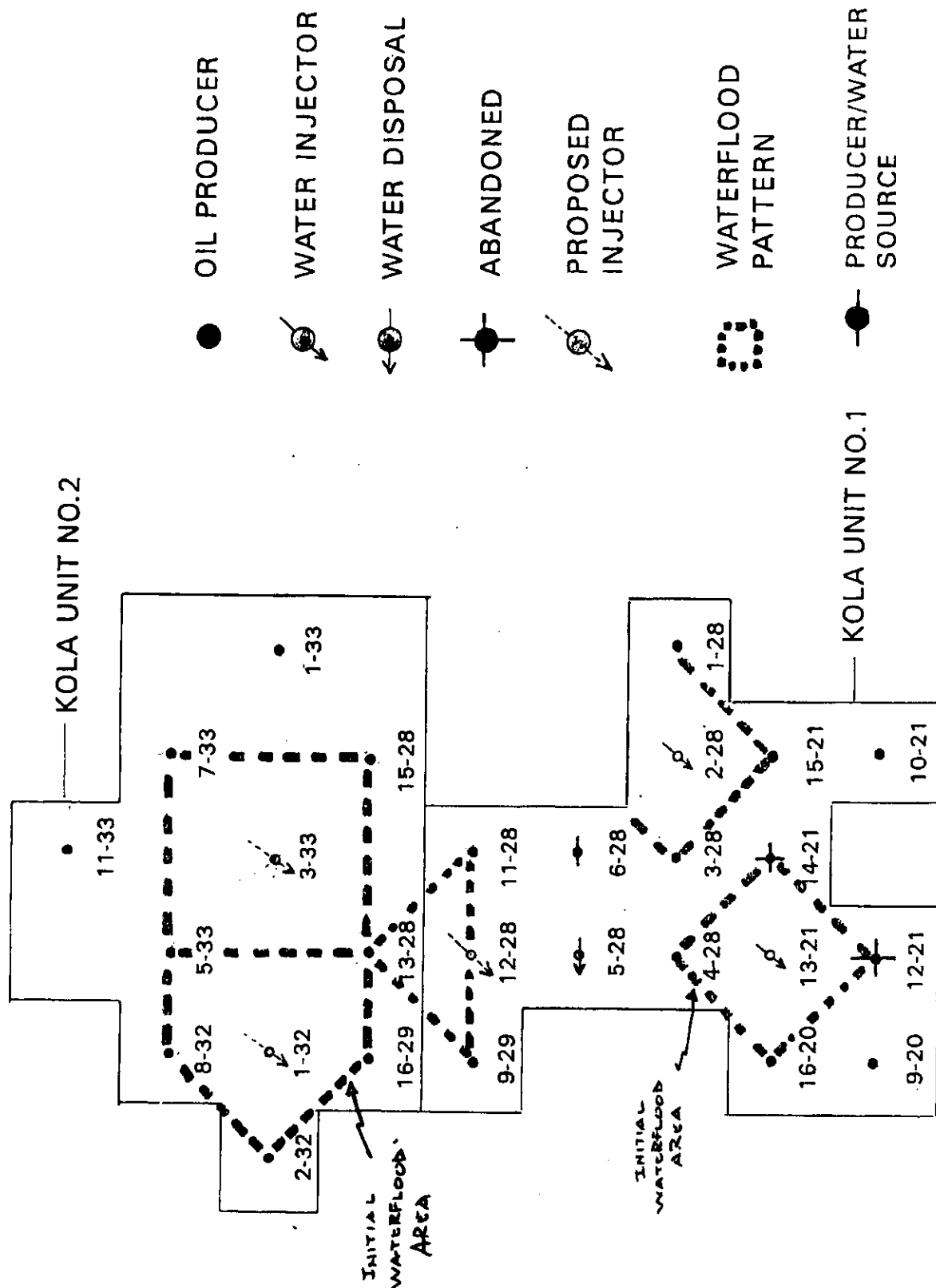
It is anticipated that waterflood operations will significantly increase the amount of oil recovered from the unit area and consequently increase royalty and production tax revenue to the Crown.

The proposed unit area is currently developed on 16 ha and 32 ha well spacing. Proposed tract factors are based on current productivity. Upon review, Branch staff has found the proposed tract factors to be reasonable. On this basis, it is recommended that the Minister enter into the proposed Unit Agreement on behalf of the Crown as a royalty owner.

L.R.Dubreuil

# FIGURE NO. 1

## WATERFLOOD PATTERNS



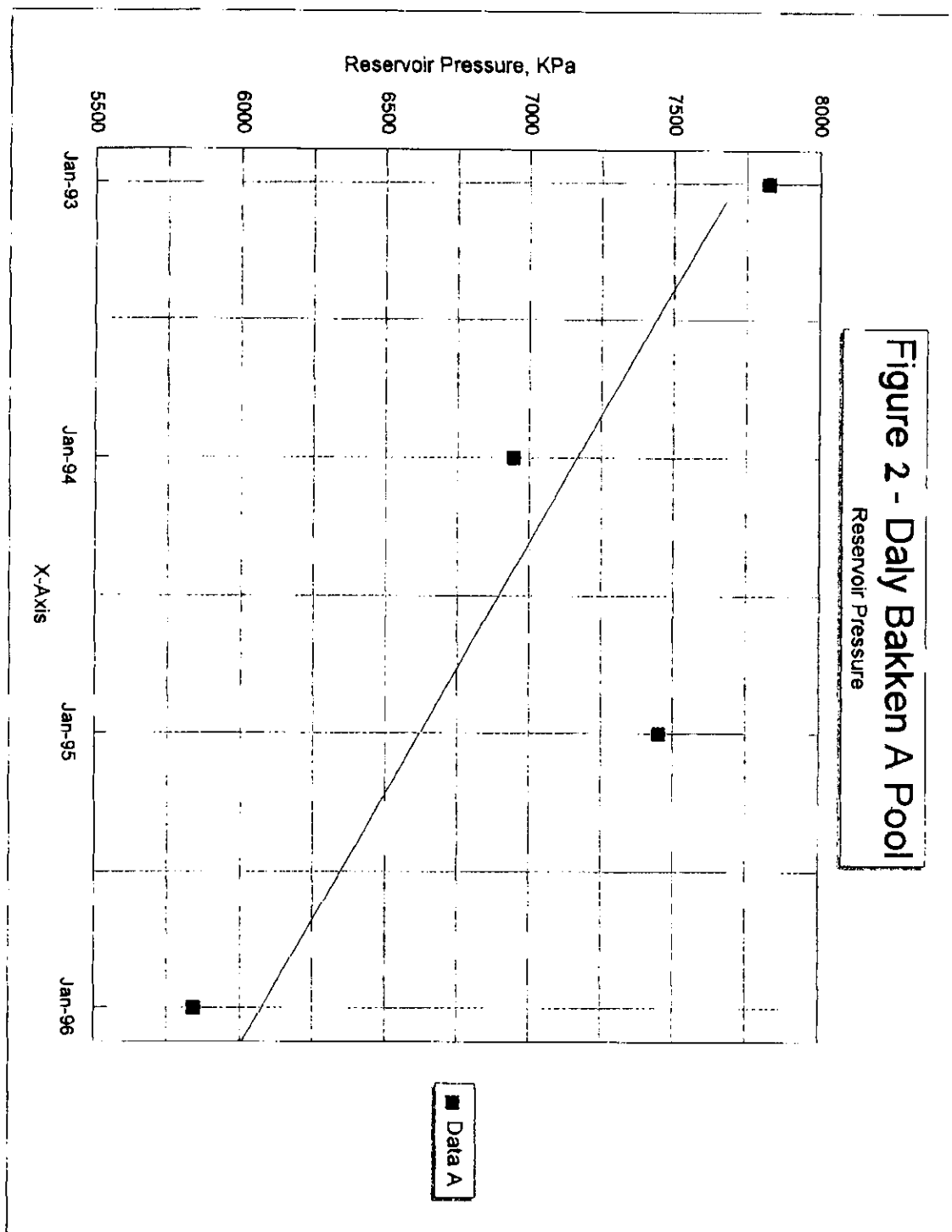


FIGURE 3

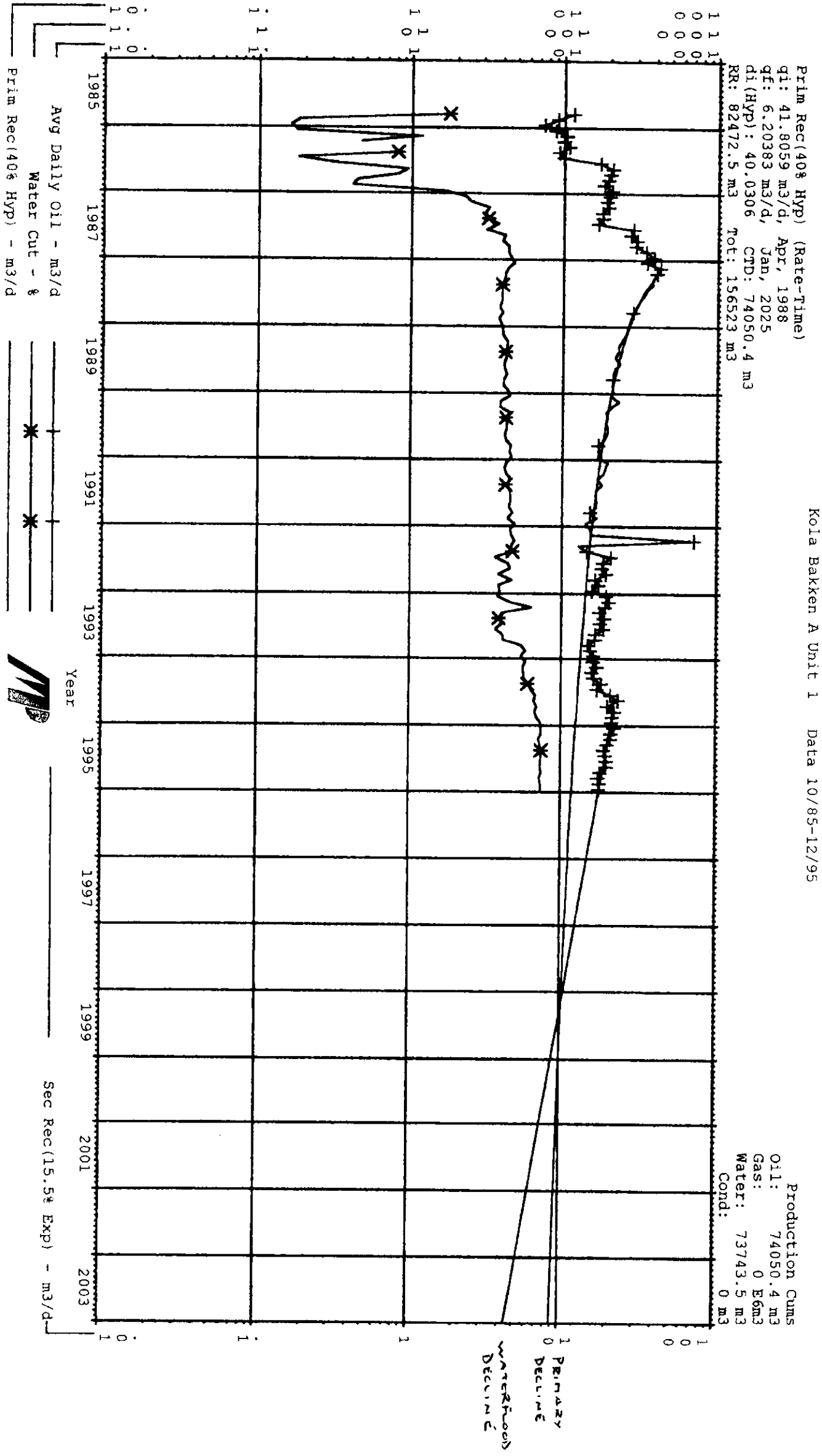






FIGURE 5

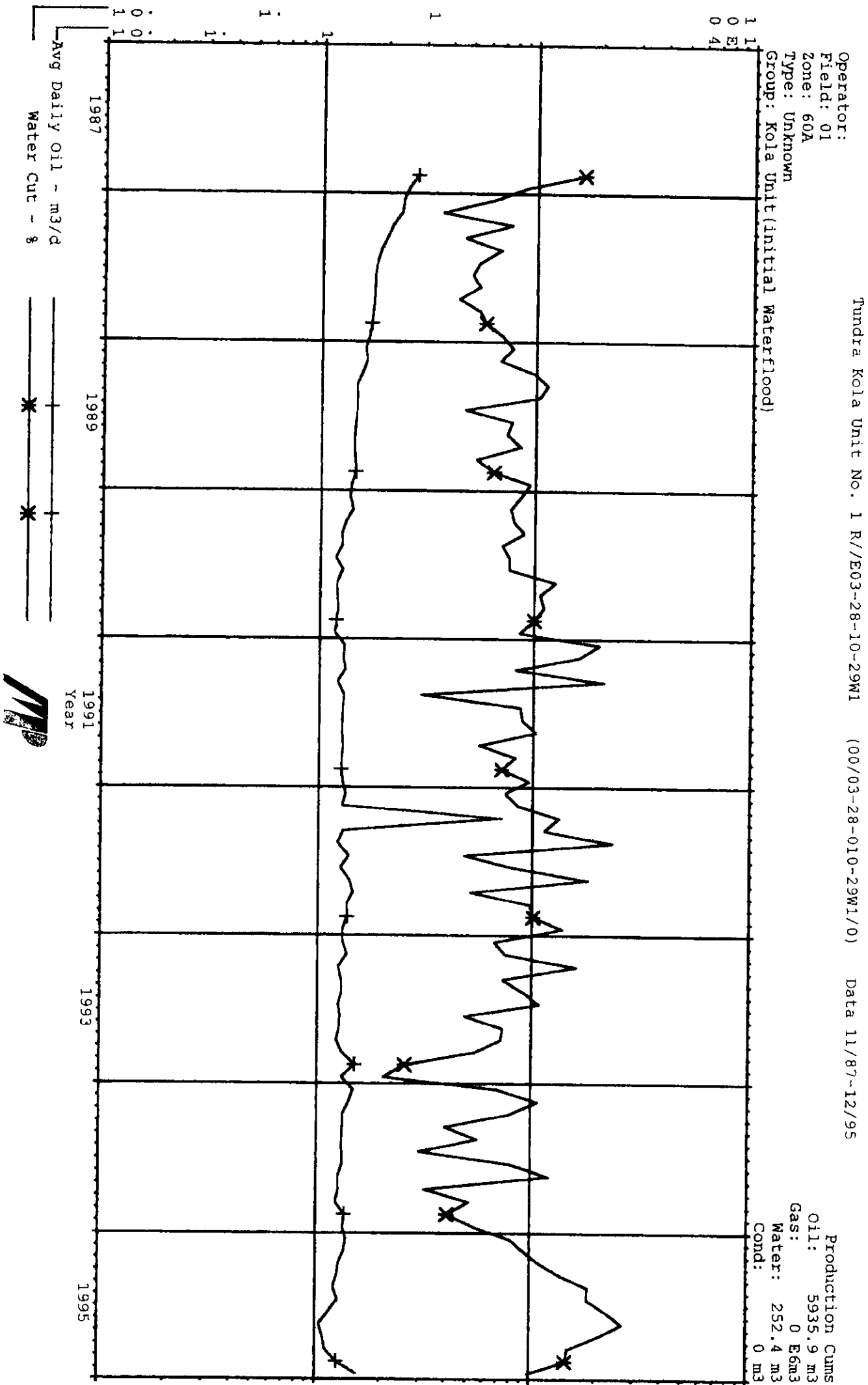


FIGURE 6

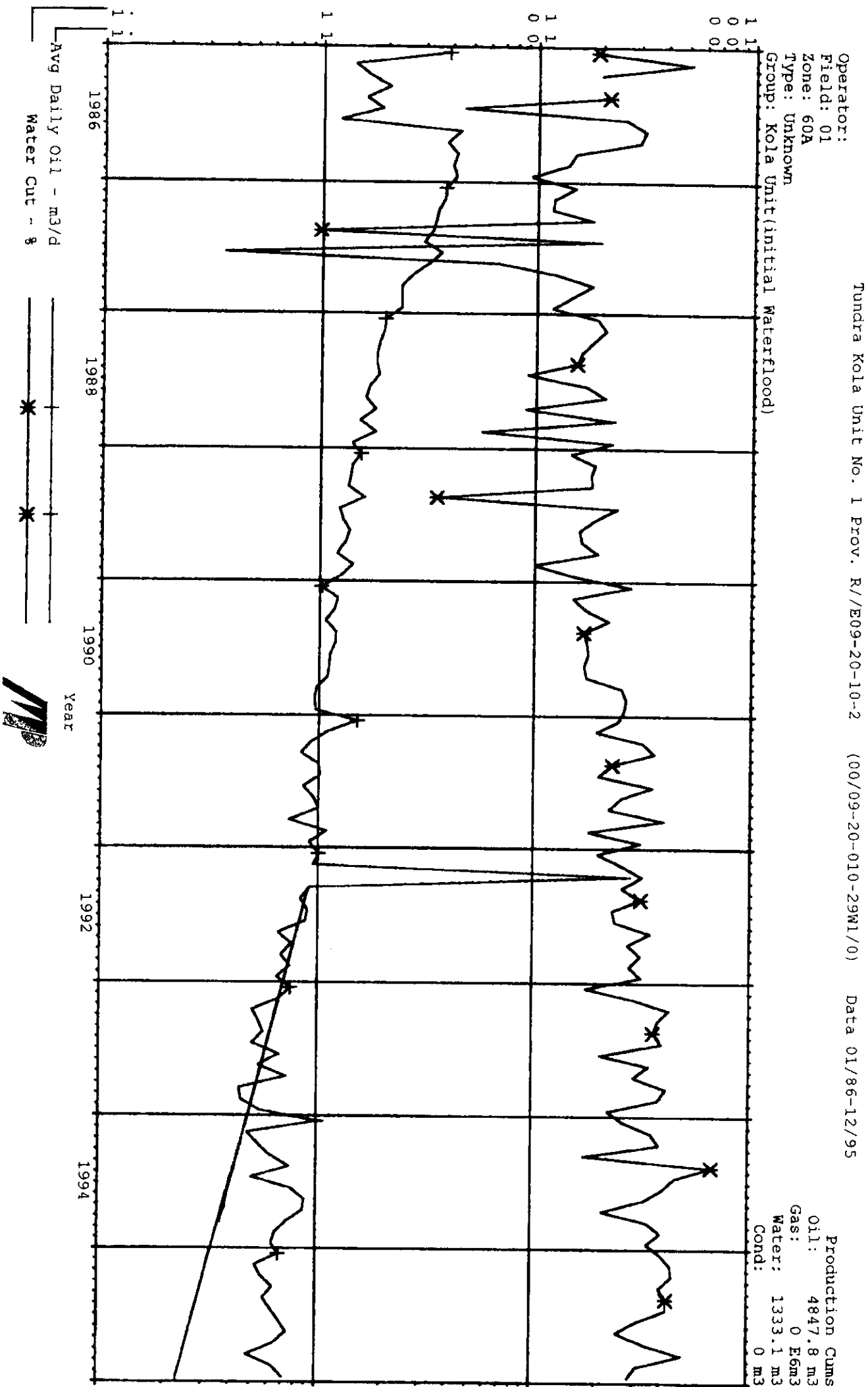


FIGURE 7

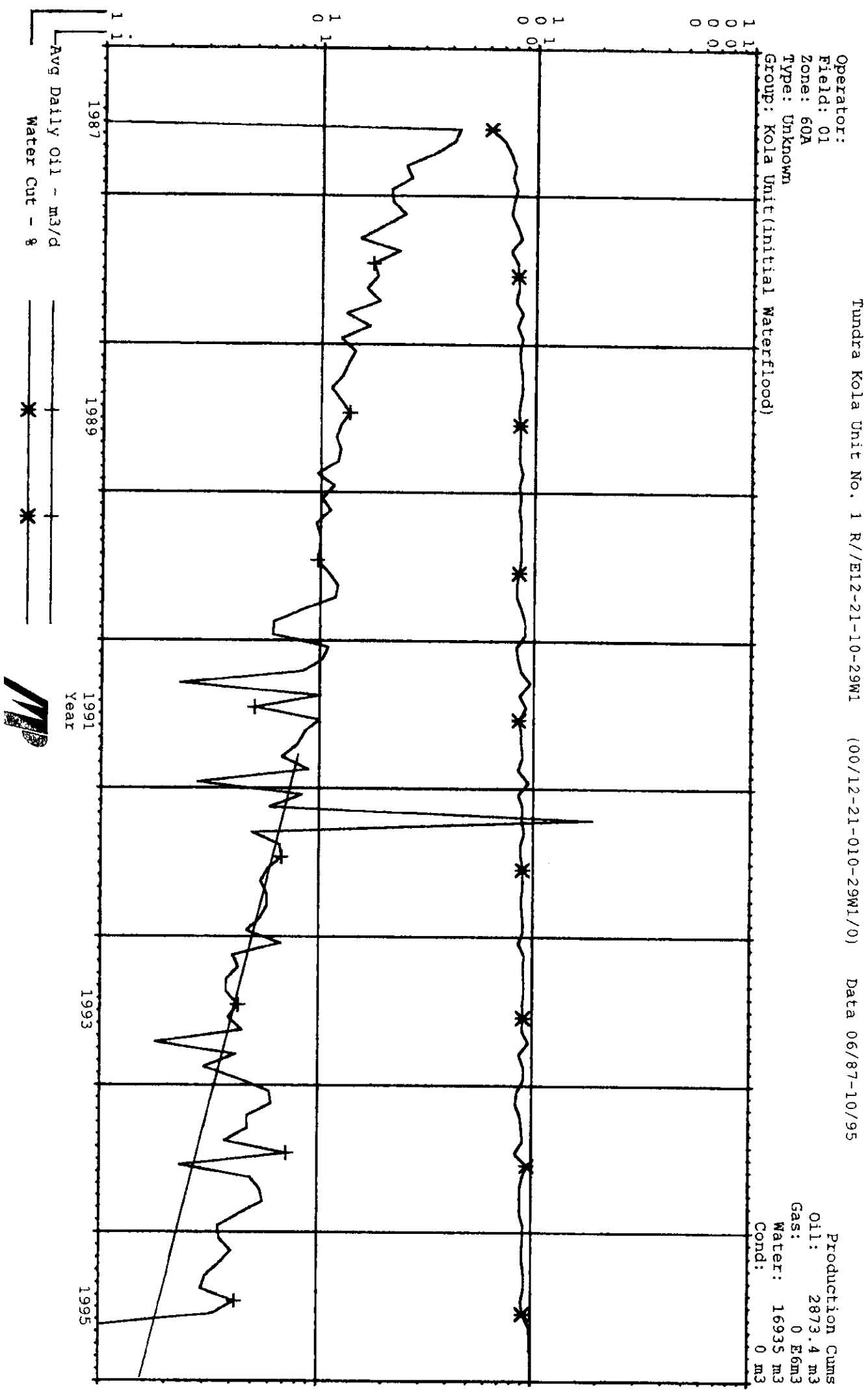


FIGURE 8

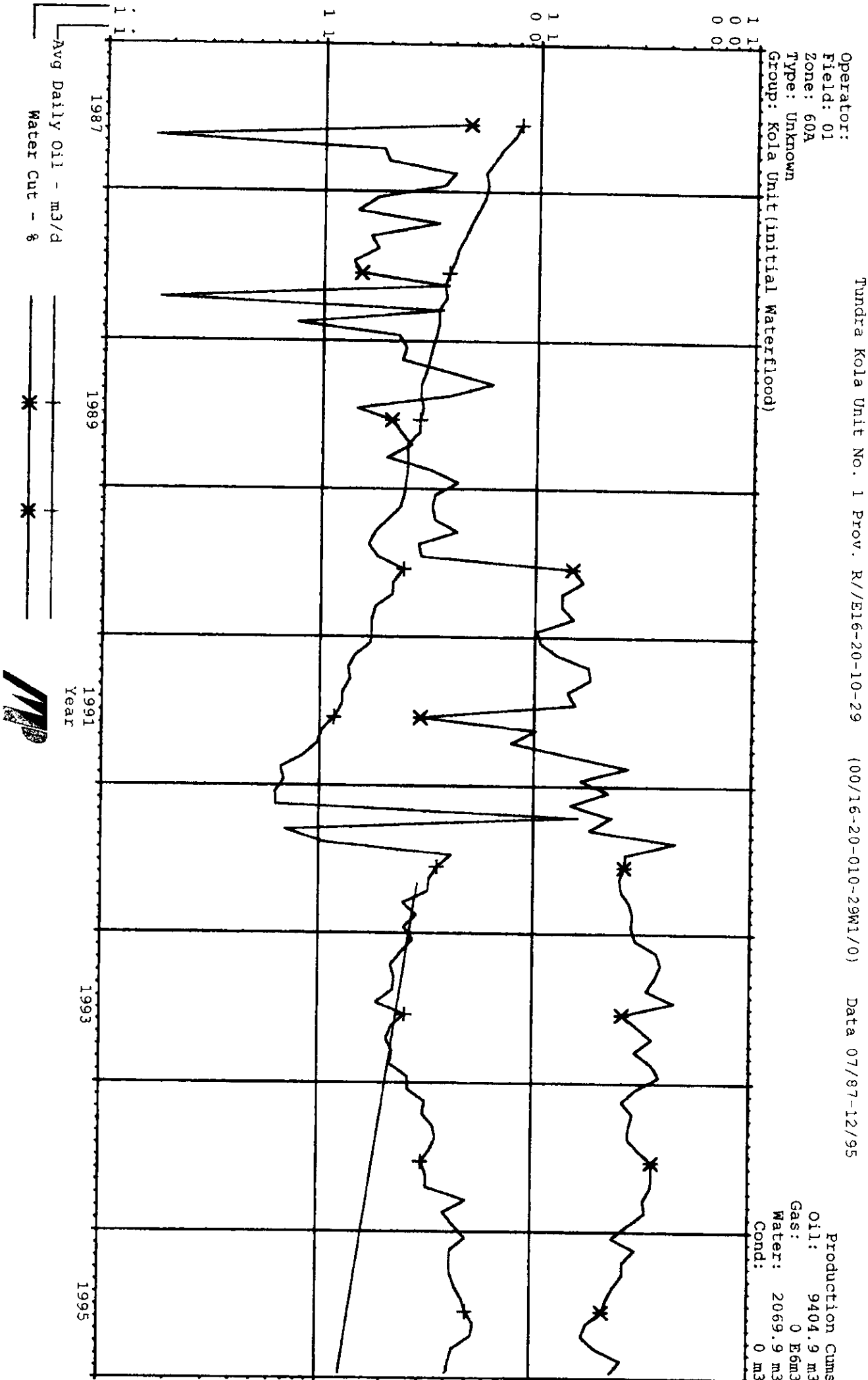
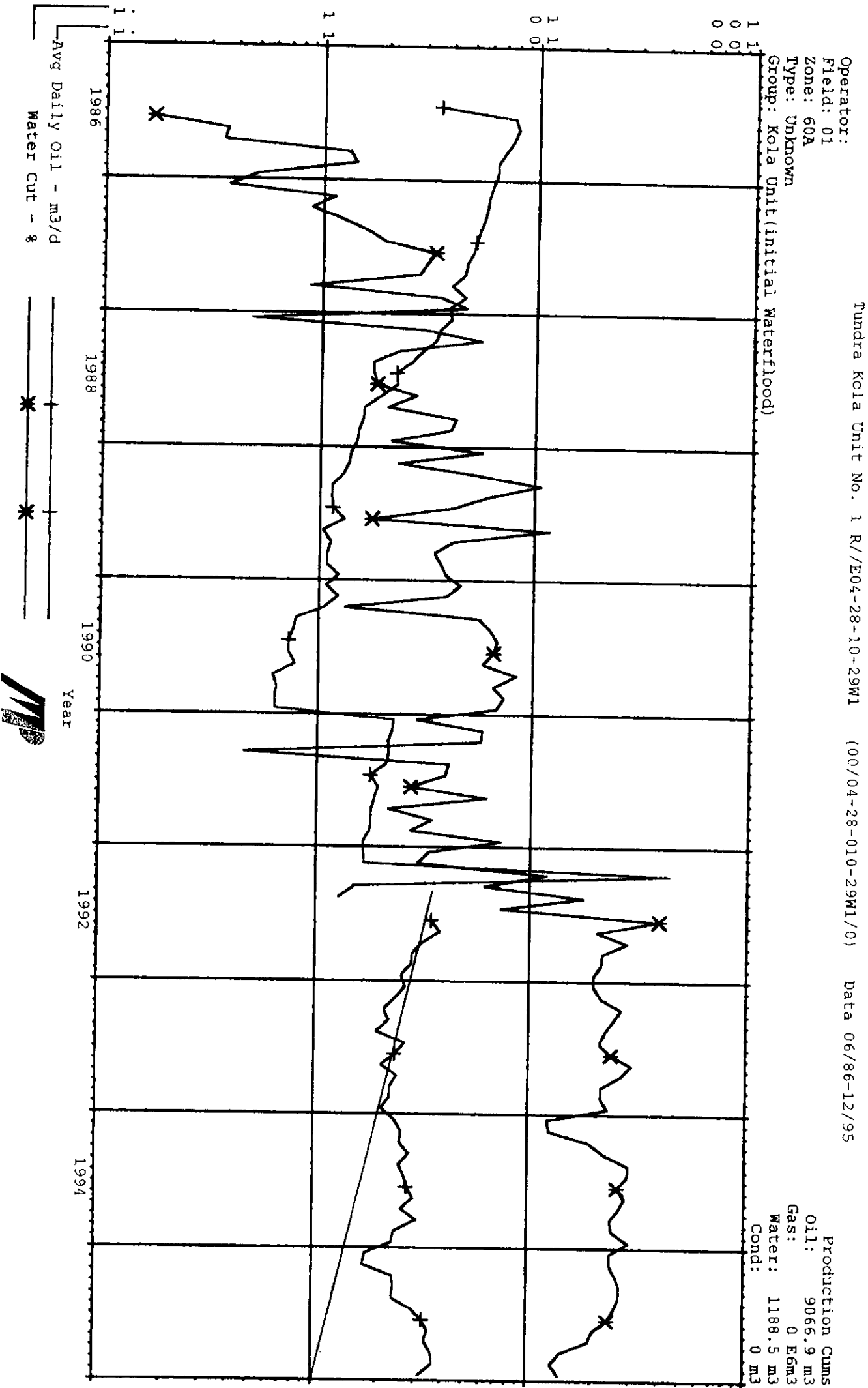


FIGURE 9



APPENDIX 1

Kola Unit no 2

Primary Production

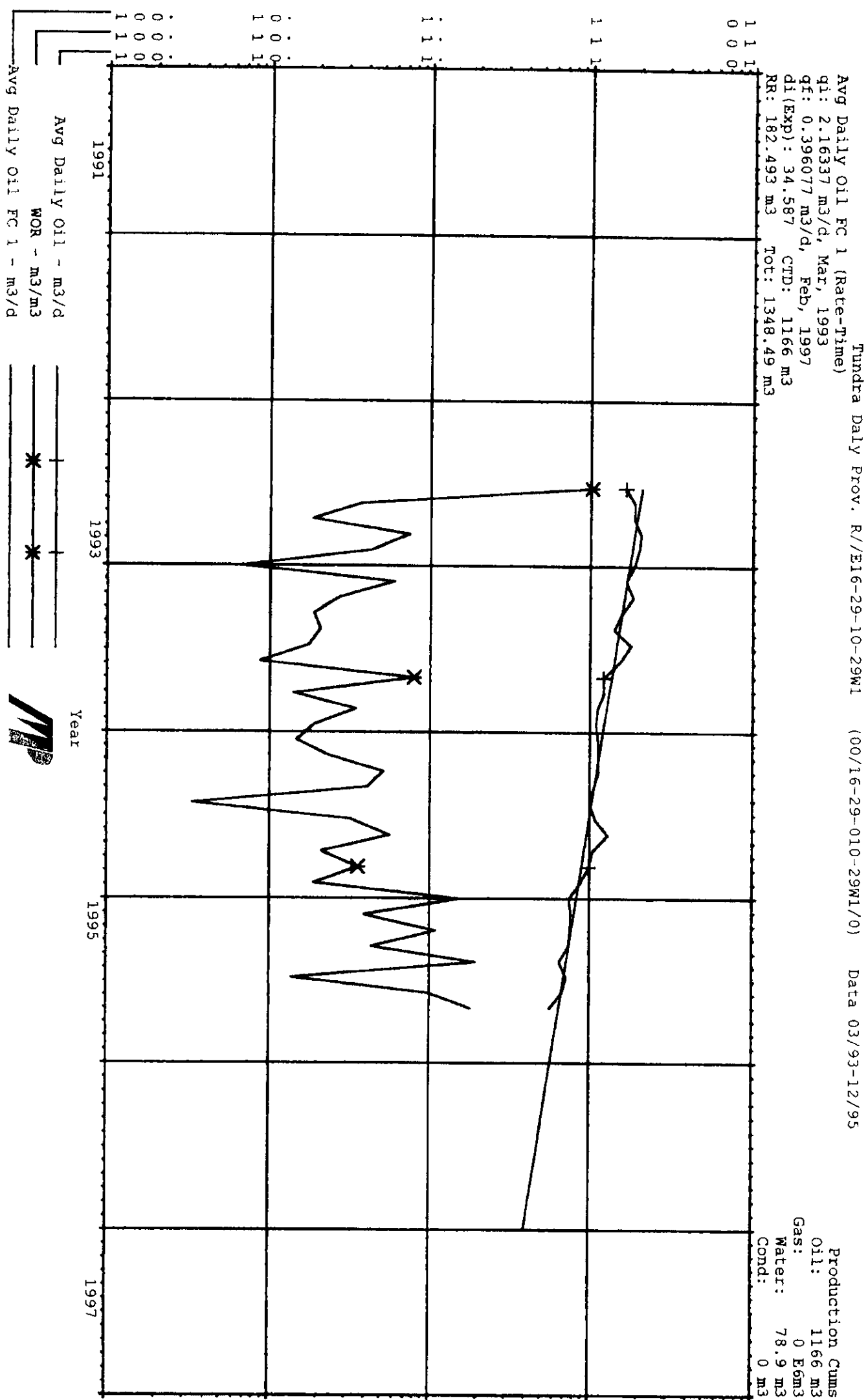
The primary reserves for the Kola Unit no 2 were estimated using the exponential decline method. Figures 1 to 9 show production history of the wells in Kola Unit no 2 with decline analysis. The results of this evaluation are shown in the following table:

Well	Decline Rate (%/year)	Remaining Reserves (m)	Ultimate Recovery (m)
11-33-10-29	46.7	539	1,585
08-32-10-29	31.29	7,079.29	13,039
07-33-10-29	17.7	2,386	4,583
03-33-10-29	29.9	3,936	6,659
02-32-10-29	25.98	626	1,686
01-33-10-29	30.4	3,893	4,976
01-32-10-29	48.9	523	3,060
05-33-10-29	20 (est.)	21,170	22,706
13-28-10-29	29.07	1,465	3,526
16-29-10-29	34.6	182.5	1,348
15-28-10-29	20 (est.)	912.5	982.5
Total		42,712	64,150

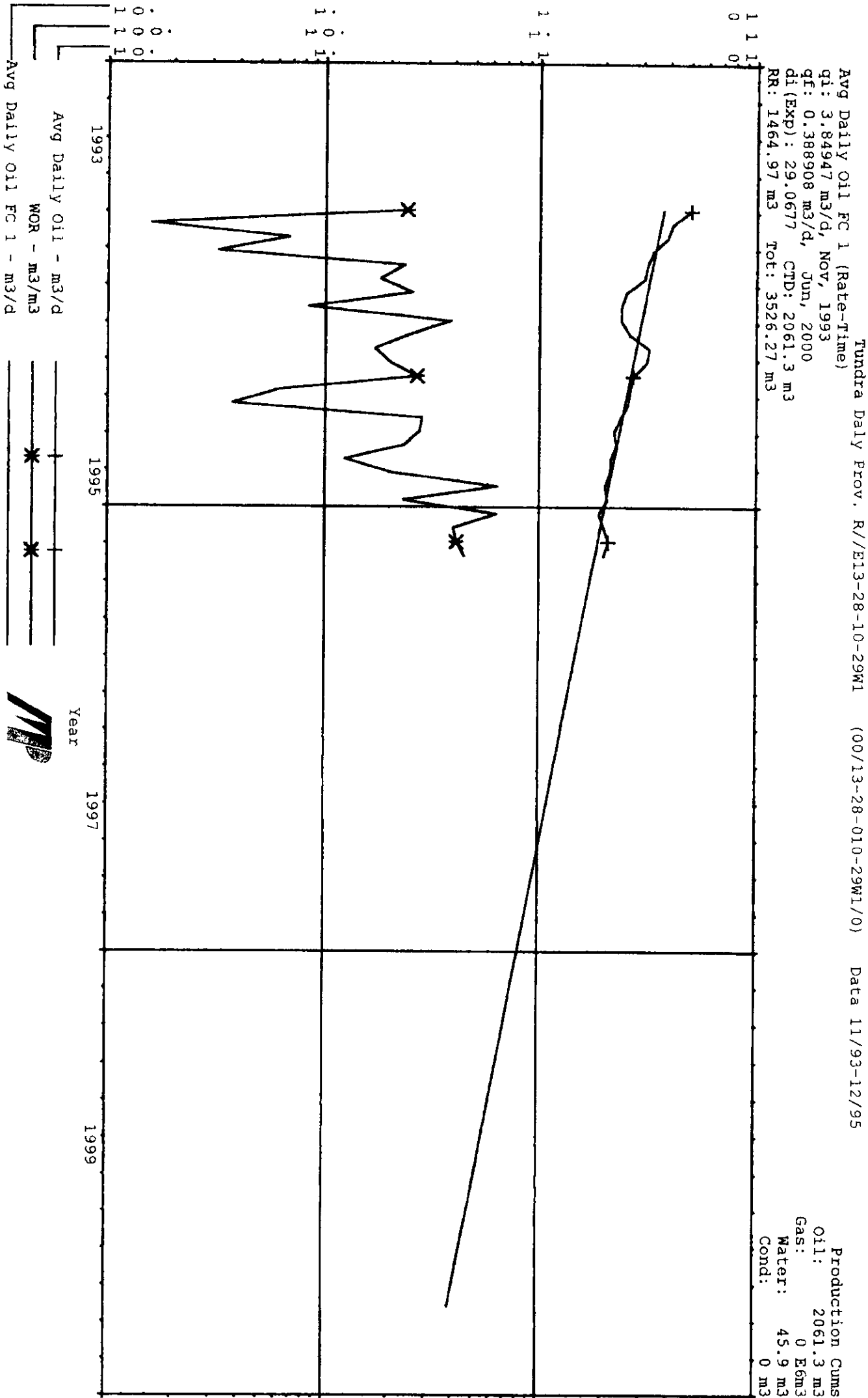
The economic limit used in the production decline analysis is 0.4 m³/d.

The ultimate primary recovery estimated for the Kola Unit no 2 is 64,150 m³ of oil.

APPENDIX 1  
FIGURE 1

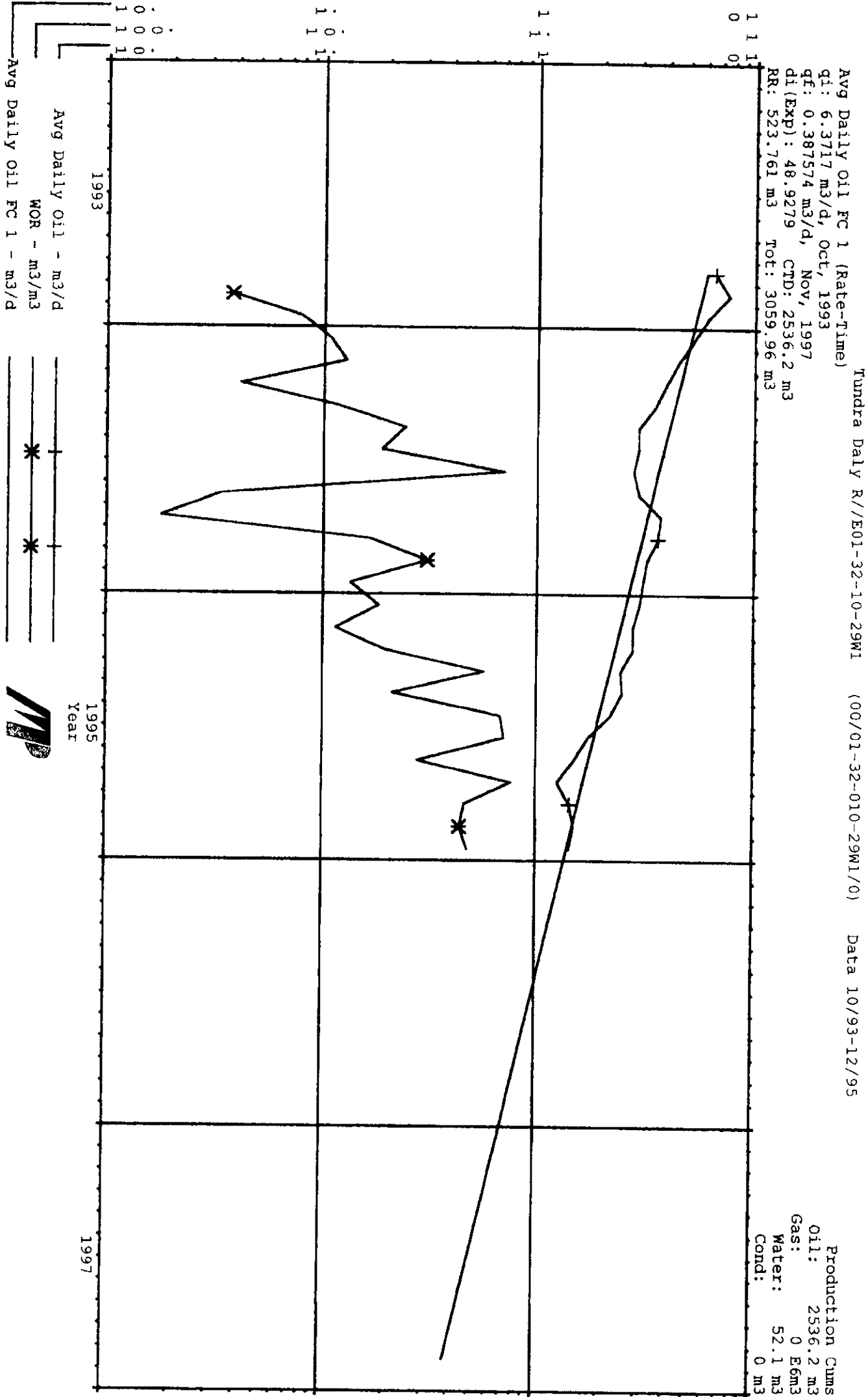


APPENDIX 1  
FIGURE 2

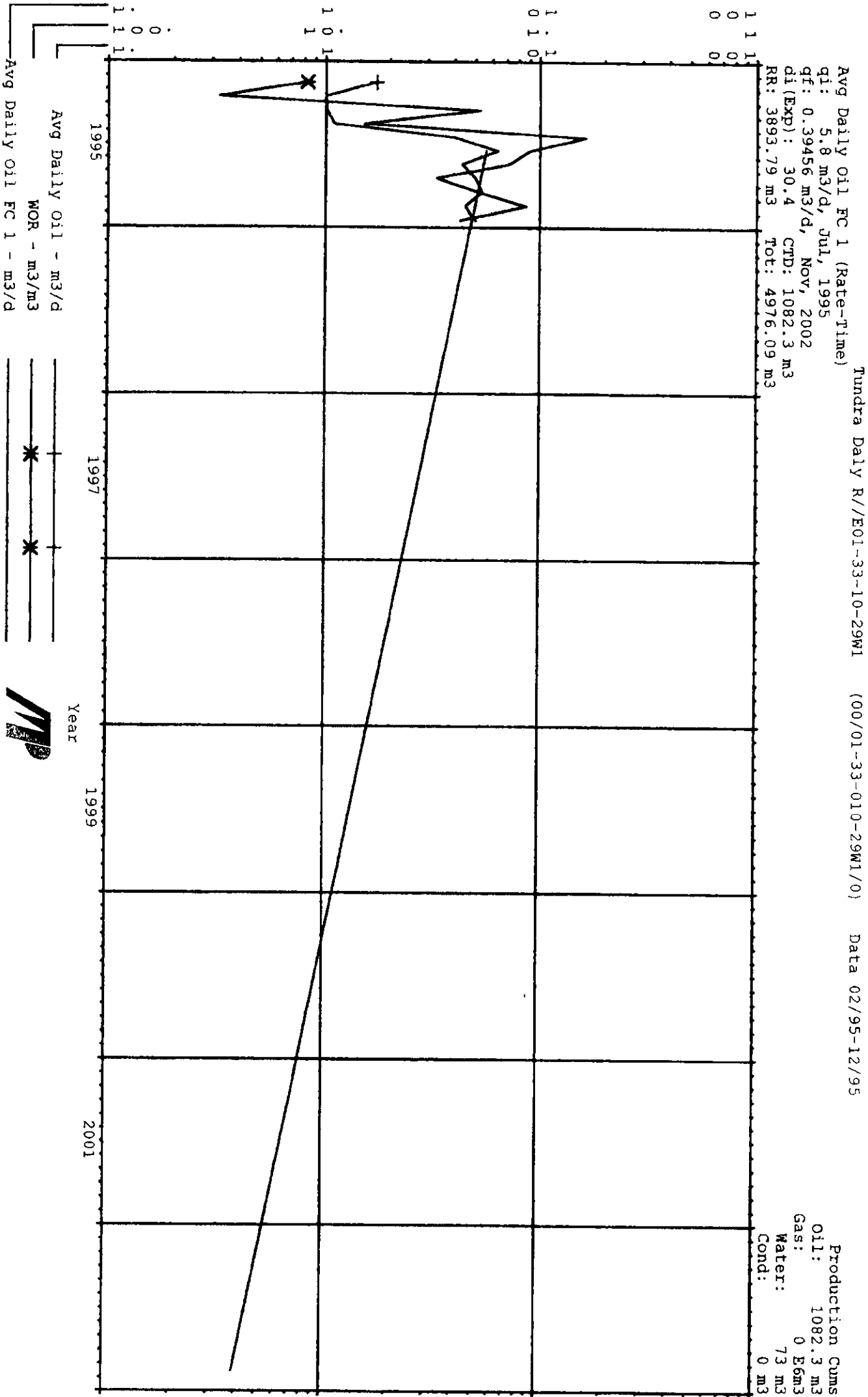




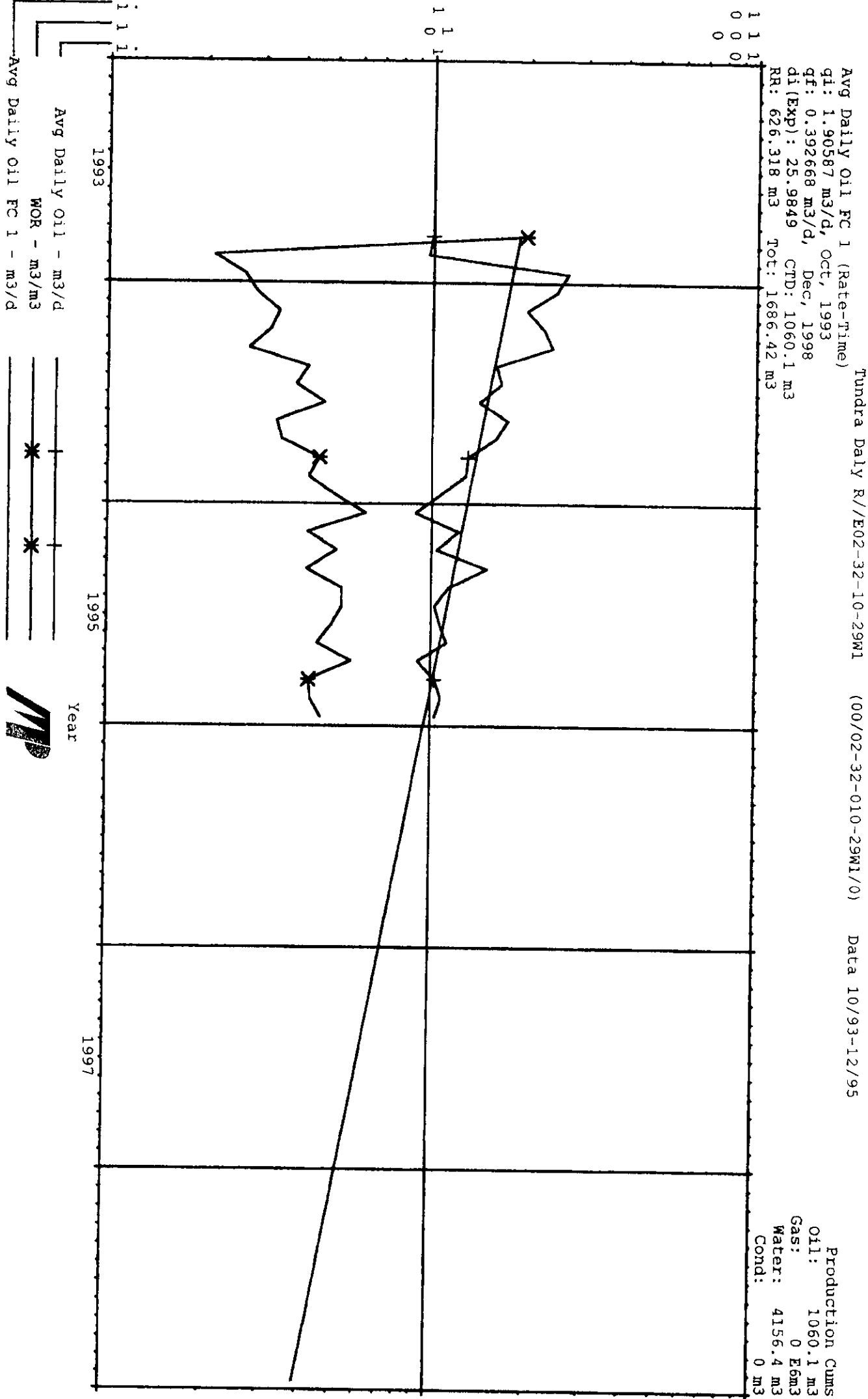
APPENDIX 1  
FIGURE 3



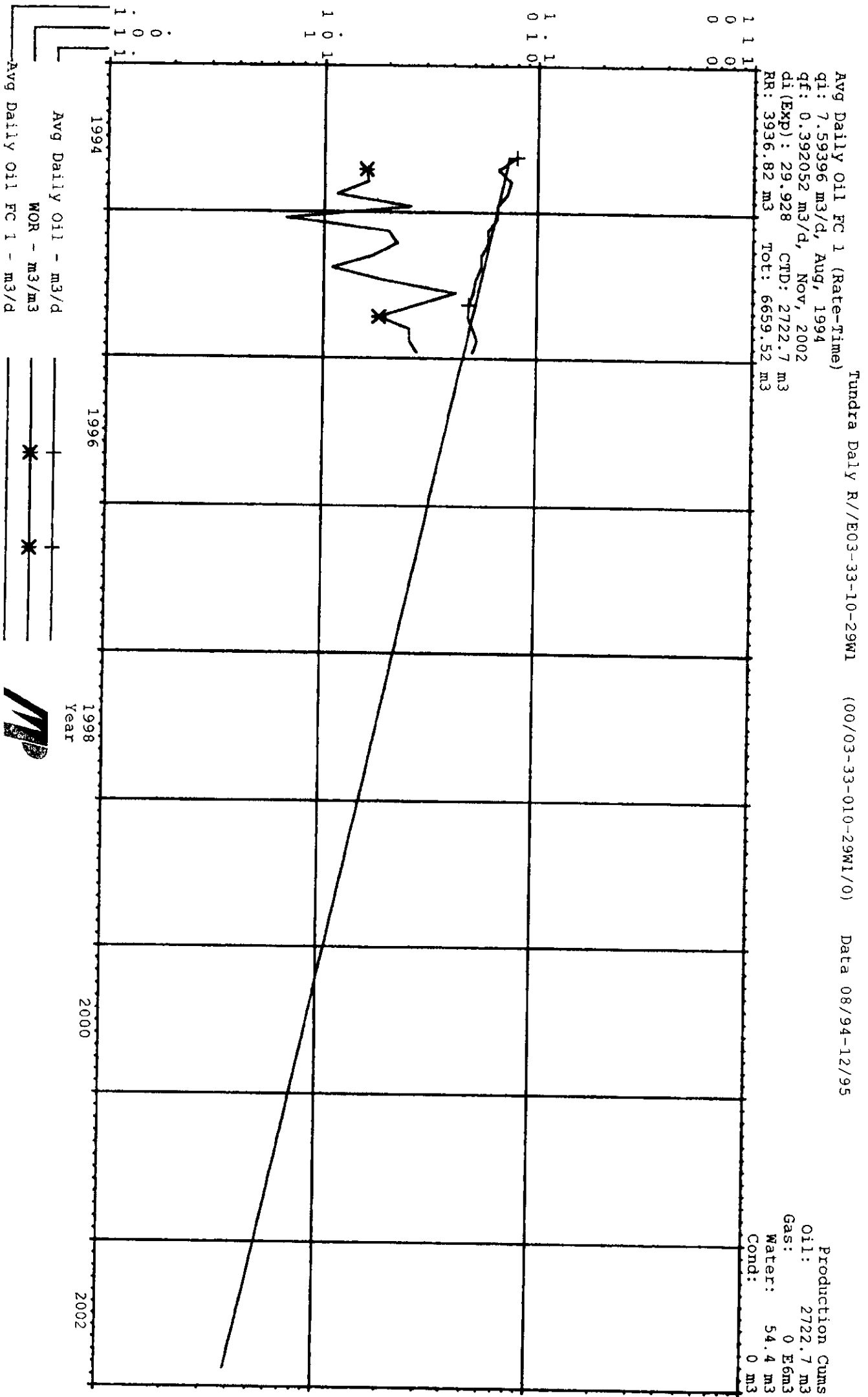
APPENDIX 1  
FIGURE 4



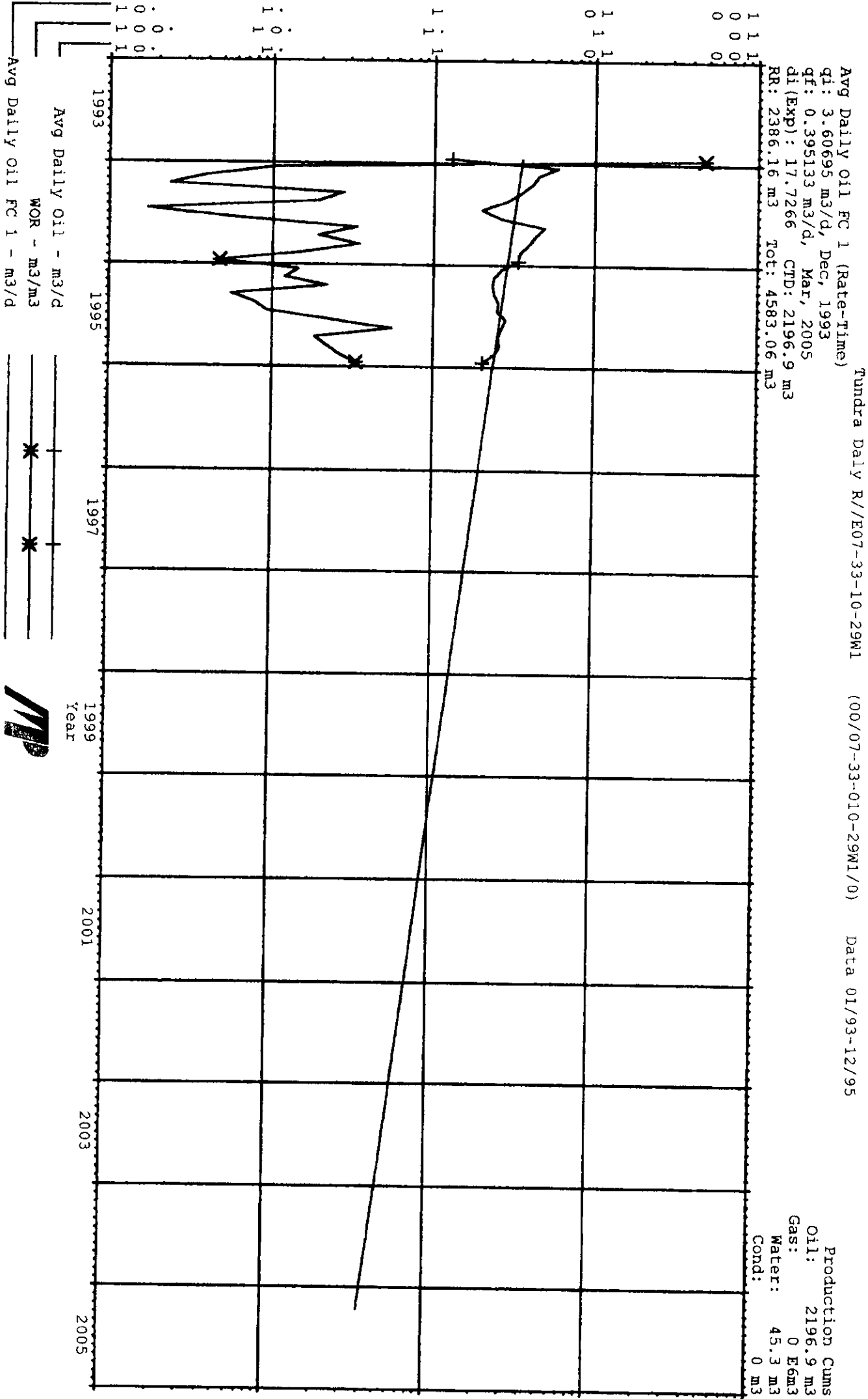
APPENDIX 1  
FIGURE 5



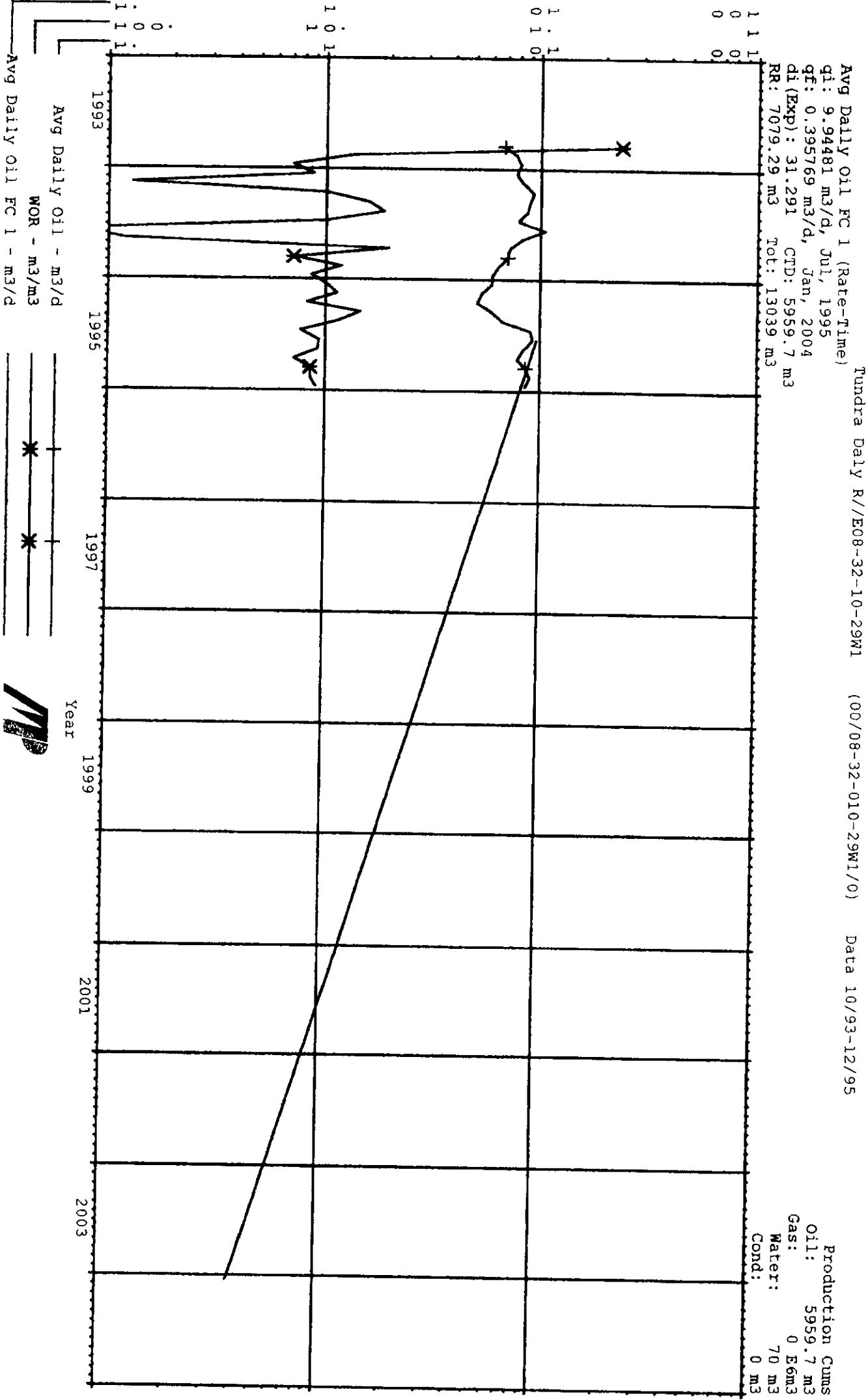
APPENDIX 1  
FIGURE 6



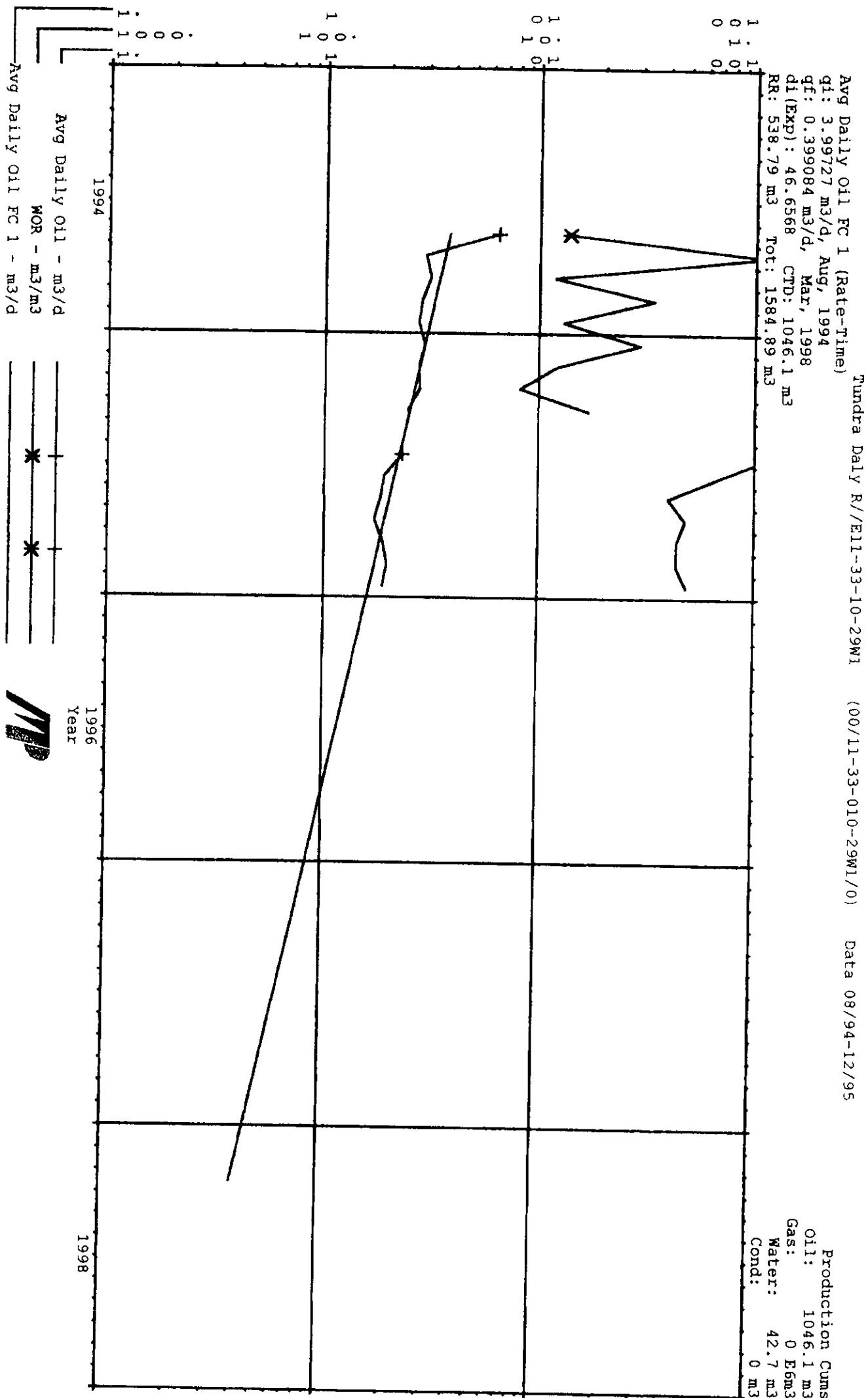
APPENDIX 1  
FIGURE 7



APPENDIX 1  
FIGURE 8



APPENDIX 1  
FIGURE 9



# Manitoba

Date **September 18, 1996**

## Memorandum

To **Bob Dubreuil**  
Director  
Energy & Mines - Petroleum Branch

From **John N. Fox**  
Chief Petroleum Engineer  
Petroleum Branch

Telephone  
Subject **PUBLICATION OF NOTICE UNDER THE OIL AND GAS ACT**  
**APPLICATION FOR PRESSURE MAINTENANCE - DALY BAKKEN A POOL**

Tundra Oil & Gas Ltd. has made application to conduct an expansion of the waterflood in the Daly Bakken A Pool. The waterflood project initially involves conversion of the 1-32-10-29 production well to a water injection well. Tundra estimates the waterflood will improve the recovery of oil from the pool. Tundra hopes to commence waterflood operations on November 1, 1996.

The Branch has completed a preliminary review of the application and there are no deficiencies. It is recommended that notice of the application be published in the Virden Empire Advance and sent directly to lessors and lessees in and adjacent to the proposed waterflood project area. A copy of the standard notice is attached for your signature.

John N. Fox  
Chief Petroleum Engineer

JNF/bj

Attachment (1)

NOTE: The project area has been modified to coincide with spacing unit boundaries. A memo discussing the technical details of the proposed waterflood is being prepared by Ulrich.



Reference: VIRDEN

Fax No: (204) 945-0586

Date: 20-SEP-96

Total No. of Pages: 3  
(including this page)

**FROM:**

John N. Fox, P. Eng.  
Petroleum Branch, Energy & Mines  
Phone: (204) 945-6574

**TO:**

Name: ULRICH

Branch: VIRDEN

Fax No: \_\_\_\_\_

**Comments:**

I WILL ARRANGE FOR PUBLICATION OF  
THE NOTICE IN THE VIRDEN ENQUIRE ADVANCE.  
PLEASE TAKE CARE OF THE MAILING TO  
OFFSETTING WORKING INTEREST & ROYALTY OWNERS. +  
POSTING THE NOTICE IN THE VIRDEN OFFICE.

Originals will be:

Mailed to you \_\_\_\_\_ Mailed upon request \_\_\_\_\_ Remain on file \_\_\_\_\_

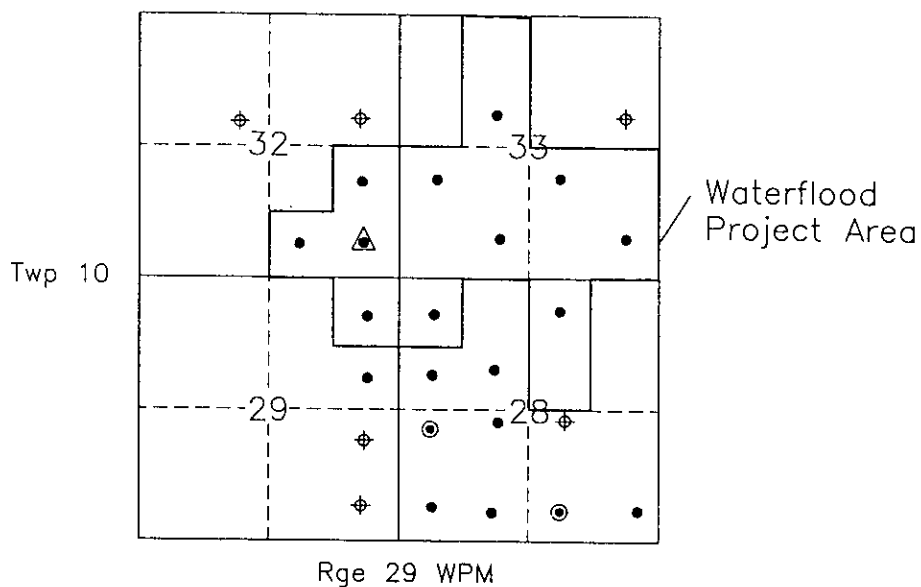


## NOTICE

### UNDER THE OIL AND GAS ACT

#### DALY OIL FIELD

Tundra Oil & Gas Ltd. has made application under The Oil & Gas Act to expand the waterflood in the Daly Bakken A Pool in that portion of the Daly Field referred to as the "waterflood project area" and shown below.



#### LEGEND

- Current production well
- ▲ Well to be converted to water injection
- ⊕ Dry and abandoned well
- ⊙ Water injection well (former producer)

Page 2

It is proposed to convert the well, Tundra Daly 1-32-10-29 (WPM) to water injection.

If no valid objection or intervention in writing is received by the Department of Energy & Mines, Petroleum Branch at Suite 360, 1395 Ellice Avenue, Winnipeg, Manitoba, R3G 3P2 before October 15, 1996, the Director may approve the application.

Copies of the application can be obtained from:

Tundra Oil & Gas Ltd.  
1111 One Lombard Place  
Winnipeg MB R3B 0X4

(204)934-5850

This application may be viewed at the offices of the Petroleum 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 19<sup>th</sup> day of September, 1996



Bob Dubreuil  
Director, Petroleum Branch

# FAX SHEET

PRIORITY:

Urgent: (X)

Normal: (X)

DATE:

Sept 30

TO:

John Fox  
Energy & Mines  
945-0586

FAX #:

FROM:

Laurie Softley

## Manitoba

Culture, Heritage &  
Citizenship  
Information Resources10 - 155 Carlton Street  
Winnipeg, Manitoba  
R3C 3H8Laurie Softley  
Media Specialist(204) 945-8096  
(204) 945-1366 Fax

ORIGINAL: Mailed: ( ) Remain on file: (/)

NUMBER OF PAGES 2  
(INCLUDING THIS PAGE)

### NOTES:

Here is a proof of  
your ad.

The map is not  
too bad although the  
symbols aren't very  
clear on the map

This is a fax of a fax  
so it may be a little  
broken up.

Please fax back approval  
right away so that we  
don't miss the deadline

Thanks.

If you do not receive all pages please call  
(204) 945-3745 (Information Resources)  
945-0516 (Communications Services)  
945-3484 (Production Services)  
945-3765 (Advertising Services)

### NOTICE OF PRIVILEGE AND CONFIDENTIALITY: THIS TRANSMITTAL IS INTENDED ONLY FOR THE ADDRESSEE.

It may contain privileged or confidential information. Any unauthorized distribution, copying, disclosure or dissemination of this transmission or the taking of any action in reliance on the contents of this transmission is strictly prohibited. If you receive this transmission in error, please notify us immediately by telephone and return the original to the above address by mail.

EMPIRE PUB

EMPIRE PUBLI

Manitoba

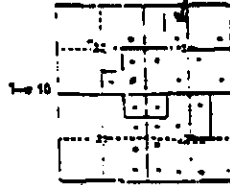
Energy and Mines

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Waterflood Project Area



Page 29 WPM

## LEGEND

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Copies of the application can be obtained from:

Tundra Oil & Gas Ltd.  
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Winnipeg, MB R3B 0X4  
(204) 934-5850

This application may be viewed at the offices of the Petroleum Branch:  
Suite 360 1395 Ellice Avenue  
Winnipeg, MB R3G 3P2  
(204) 945-6677; or  
227 King Street West  
Virden, MB R0M 2C0  
(204)-748-1557.  
Dated at Winnipeg, this 13th day of September, 1996.

Actual size.

Manitoba

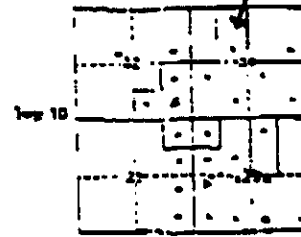
Energy and Mines

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Page 29 WPM

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

Dated at Winnipeg, this 13th day of September, 1996.

Enlarged for proofing

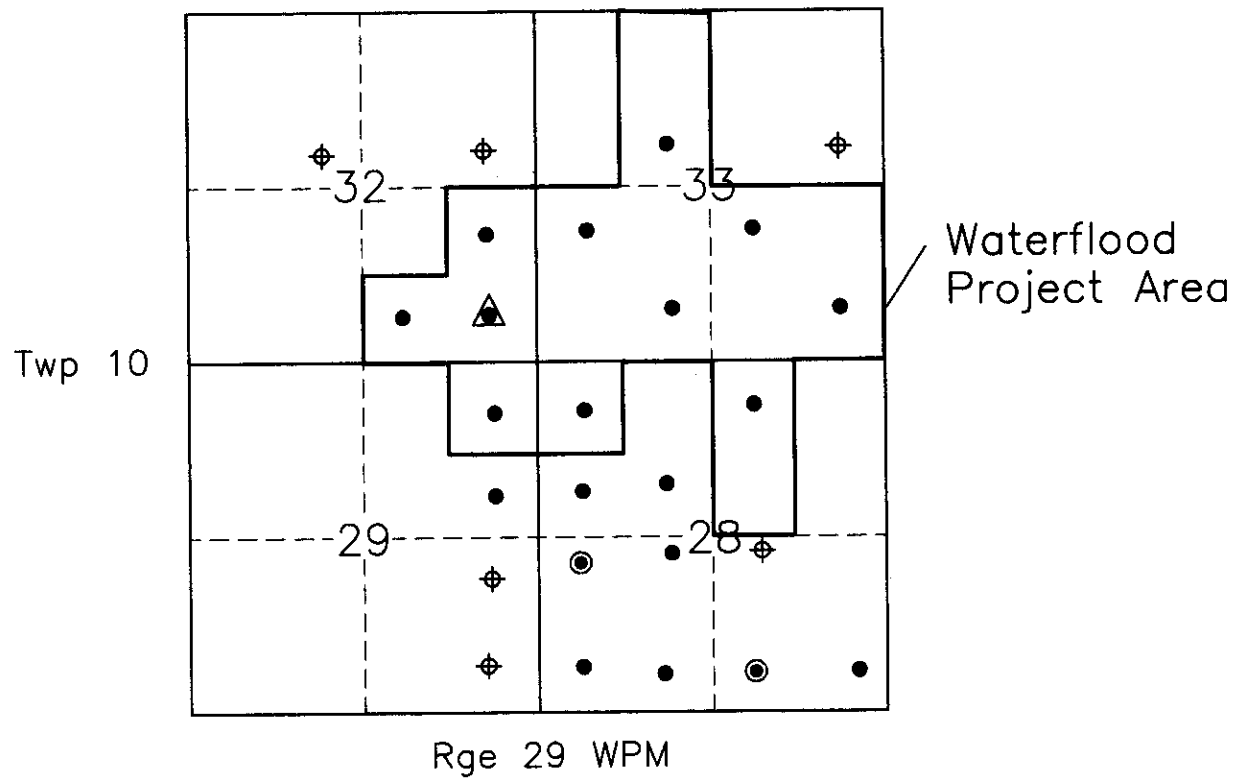
## Waterflood Application

1. Engineering sends a letter indicating receipt of the application
2. Assign application reference number. W-36-11
3. Engineering reviews application for deficiencies in accordance with the requirements outlined in Section 71 of the Drilling and Production Regulation.
3. Engineering prepares a memo to the Chief Petroleum Engineer (CPE) summarizing the application and outlining any deficiencies. A deficiency letter, signed by the CPE, requesting additional information should be sent to the applicant within 15 days of receipt of the application.
4. A notice of the application (see attached example) is to be published in the local newspaper, posted in the district offices and sent to working interest and royalty owners in and adjacent to the project area. Companies must supply the names & addresses of working interest and royalty owners in & within 0.5 km of the project area. The notice should be prepared once all critical technical issues are resolved. In general a notice period of 2-3 weeks is recommended.
5. Engineering prepares a memo to the Chief Petroleum Engineer (CPA) recommending approval of the application and listing the approval conditions. The memo should discuss any objections to or interventions in the application.
6. Attach the proposed Waterflood Order to the memo (see attached example). The Waterflood Order is to be signed by the Director, registered by Administration and forwarded to the company.
7. All material related to the application is filed in Engineering's Field/Pool files and a copy of the Waterflood Order is also filed in the Ministerial Orders file.
8. Individual well conversions to water injection should be approved using the Application for Approval of Well Operations Form.

## Technical Issues

The following are some of the technical issues that should be addressed when reviewing the application;

- (a) Is the project area appropriate? Should additional operated or non-operated wells be included in the project area? Are there any correlative rights issues?
- (b) Inspection should review & comment on the proposed facilities design. Inspection approves any battery modifications.
- (c) Are the company's estimates of OOIP, primary recovery and incremental recoverable reserves reasonable? Are the company's key technical assumptions valid? Comment.
- (d) Is the proposed injection pattern optimum? If key wells are not being converted to injection, why not? Are the injection rates and pressures reasonable? Establish the maximum injection pressure for inclusion in the Waterflood Order.
- (e) Will the project maximize ultimate recovery from the project area? Are there any reservoir or geological concerns that may have a negative impact on project performance?

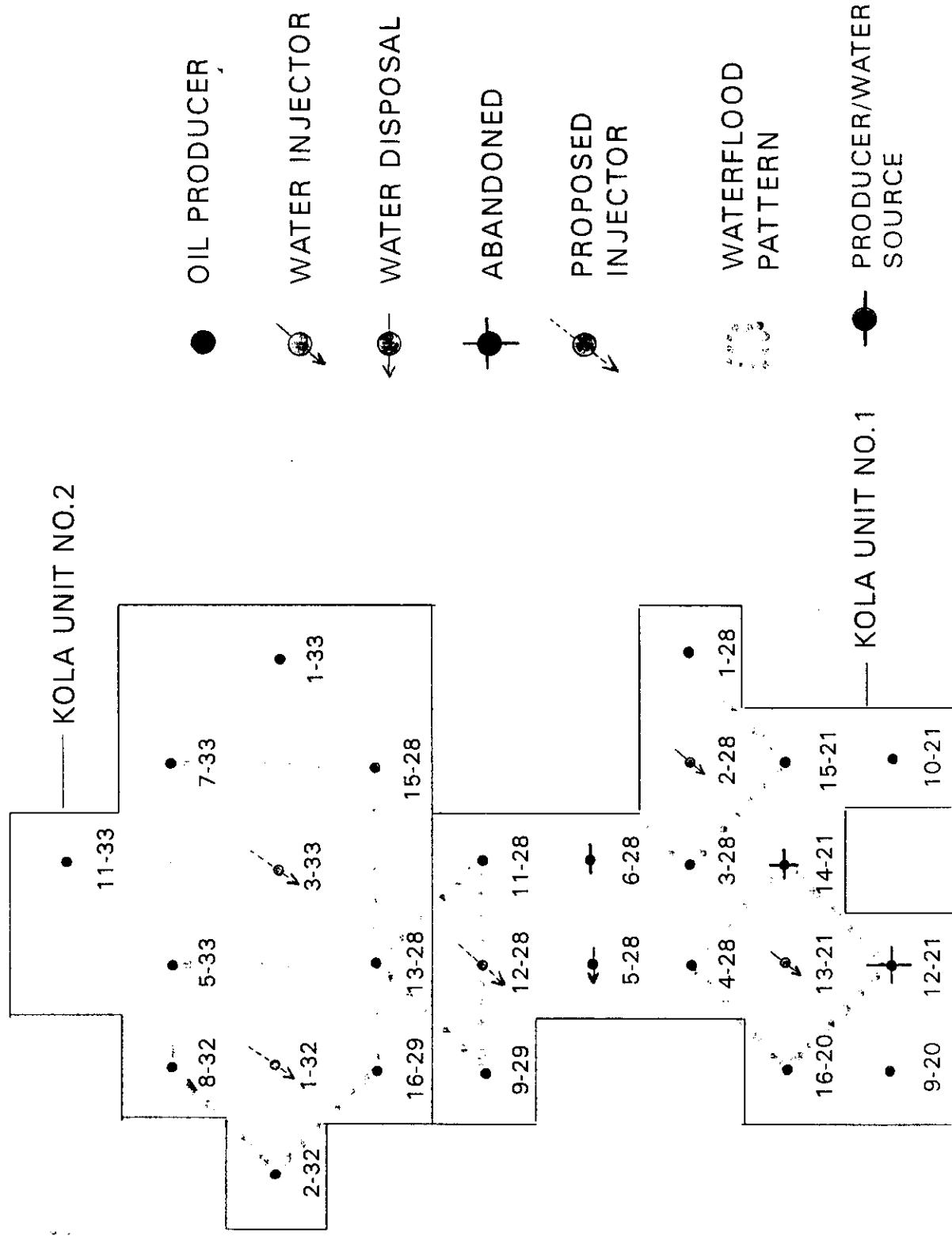


## LEGEND

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- ⊙ Water injection well (former producer)

# FIGURE NO. 3

## WATERFLOOD PATTERNS

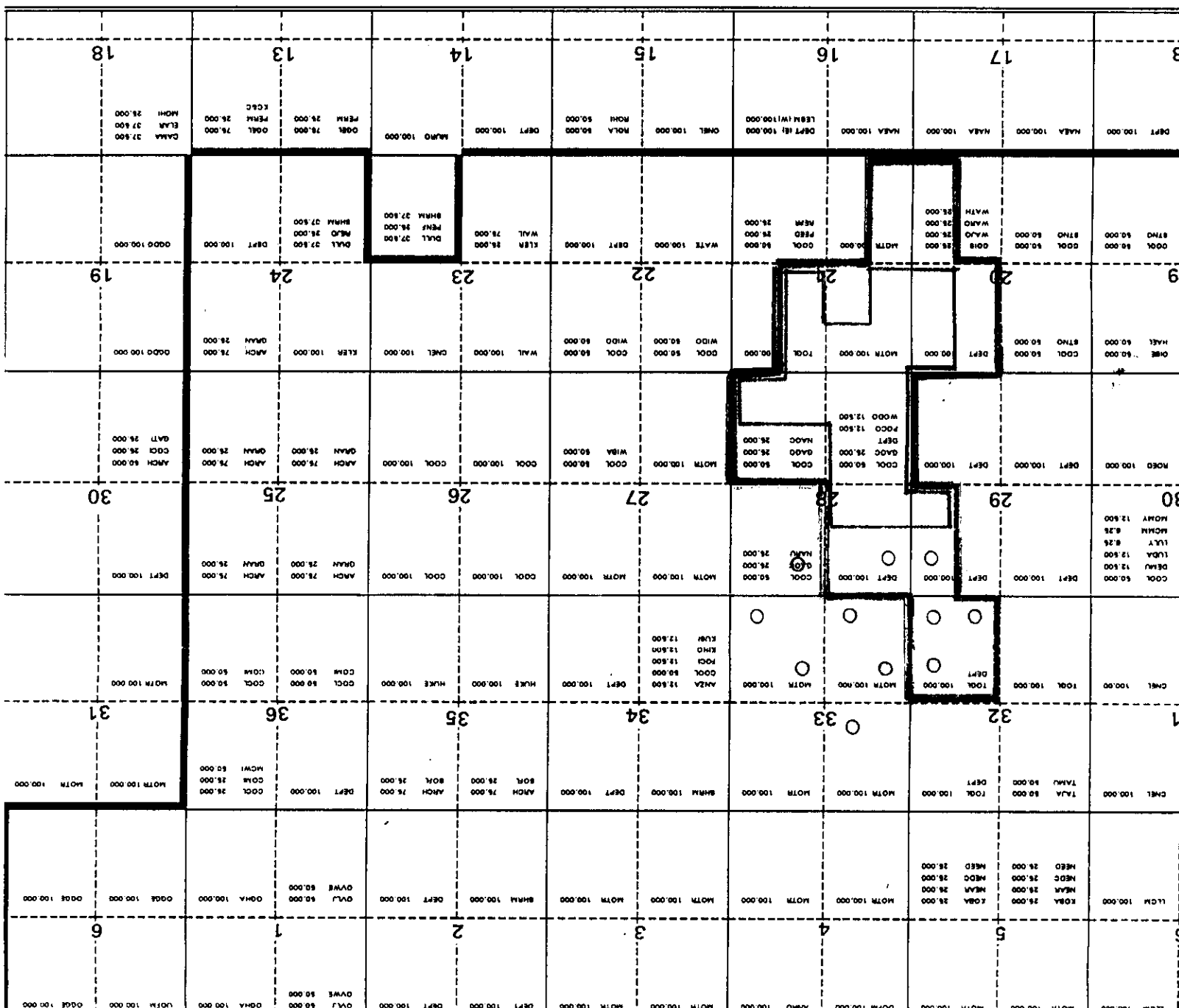




PROPOSED KOLA UNIT NO.2 AREA

16 HECTARE AREA OF EXCLUSION

16 HECTARE AREA OF EXCLUSION



WATERFLOOD QUESTIONS.

1. ANTICIPATED DATE FOR CONVECTION 3-33-10-29

2. ANY ADDITIONAL RECOVERY PROGRAMS  
BY WATERFLOODING USING 32 ha VS  
64 ha INVERTED S-SPOT INJECTION  
PATTERNS.

NORTH KRA UNIT NO. 2

- 11 wells - 36 w/d and prod. (96-06-30) 25848 L<sup>3</sup> current recovery 8.5% oil
- with concentration 1-32, wet + 3-33 <WATER>
- Area 1-32 w/d pattern stop - 3
- fract pack-off - current prod (last 90 days)

Primary recovery - 65300 - 3 21.5% oil  
 $\Delta W F \text{ rec} = 34000 \text{ stb} \text{ (up to 50\% oil)}$   
 $\Delta W F \text{ rec (with 3 w/d)} = 95000 \text{ bbl water}$   
 $\phi_{\text{cut-off}} = 15\% \quad k = 1 \text{ md}$   
 $\Delta W F \text{ rec} = 34000 \text{ stb} \text{ (up to 50\% oil)}$   
 $\Delta W F \text{ rec (with 3 w/d)} = 95000 \text{ bbl water}$   
 $\phi_{\text{cut-off}} = 15\% \quad k = 1 \text{ md}$   
 $\Delta W F \text{ rec} = 34000 \text{ stb} \text{ (up to 50\% oil)}$   
 $\Delta W F \text{ rec (with 3 w/d)} = 95000 \text{ bbl water}$   
 $\phi_{\text{cut-off}} = 15\% \quad k = 1 \text{ md}$

Quantity of prod. for head losses  
 15-28 & 11-33 produce only for - upper layers

\* PNT 1994 study need? + Knd study? 3-28  
 speed core study 4-28

$P_o = 6000 \text{ bar}$

$G_{or-p} = 303476 \text{ m}^3 \quad S_{or} = 58\%$

Kra unit No. 2 291 ha.

inj = 25 w/d @ 1-32 @ 9500 kPa (2-32 out of 2nd prod)

2-3500-4000 m  
 39 cm

Kel Unit No. 2

- proposed unit area in cluster

- undeveloped spacing unit @ 14-28

- 4 parked 80 ac DSA's

- crew 6 of 18 (18 Leds) 11 walls

Unit cell count 6/11

Unit sq 28,254.32

Current U/L Vac = 33167 (50.76%)

Current OUP = 127,191 m<sup>2</sup> (4191%)

Current - current rate =  $\frac{3381.2}{1157.5}$  (34.2%)

- unit cell area of roof spacing unit square

Current Unit Mod = 15030.4 m<sup>2</sup> (58.15%)

Current Row Row = 18137 m<sup>2</sup> (45.96%)