Manitoba

The Oil and Natural Gas Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

NOTICE

UNDER THE MINES ACT

DALY OIL FIELD

Tundra Oil and Gas Ltd. has made application under The Mines Act to conduct a waterflood project in the Bakken Formation in that portion of the Daly Field described as follows: Lsd's 15 and 16 of Section 11, Lsd 13 of Section 12, Lsd's 4 and 5 of Section 13 and Lsd's 1, 7, 8 and 10 of Section 14, all in Township 10, Range 29 (WPM).

It is proposed to convert the well, Tundra Daly 8-14-10-29 (WPM) to water injection.

If no valid objection or intervention in writing is received by The Oil and Natural Gas Conservation Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3C 0V8, before June 24, 1991, the Board may approve the application.

Copies of the application may be obtained from:

Tundra Oil and Gas Ltd.
1313 - One Lombard Place
Winnipeg, Manitoba
R3B 0X3
(204) 934-5850

The application may be viewed at the offices of the Petroleum Branch:

555 - 330 Graham Avenue
Winnipeg, Manitoba
(204) 945-6577

247 Wellington Street West
Virden, Manitoba
(204) 748-1557

Dated at Winnipeg, this 30TH day of May ,1991.

H. Clare Moster
Deputy Chairman

Manitoba

The Oil and Natural Gas
Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

September 13, 1991

NEW FILE
DALY BAKKEN D POOL
NORTH EBOR UNIT NO.2

"PRESSURE
MAINTENANCE
APPLICATION

Mr. Dan Barchyn, P. Eng.
Exploration Manager
Tundra Oil and Gas Ltd.
1313 - One Lombard Place
Winnipeg, Manitoba
R3B 0X3

Dear Mr. Barchyn:

Re: North Ebor Unit No. 2
Pressure Maintenance Appproval

The Board has completed its review of your application to expand waterflood operations in the Daly Bakken D Pool. Attached is a copy of Board Order No. PM 67 authorizing pressure maintenance operations in North Ebor Unit No. 1 and the proposed North Ebor Unit No. 2.

Please note that water injection into North Ebor Unit No. 2 is not authorized until the Board has approved the Unit Agreement as required by Section 74 of The Mines Act.

If you have any questions in respect of this matter, please contact L. R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster
Deputy Chairman

Manitoba

The Oil and Natural Gas
Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

Order No. PM 67

An Order Pertaining to Pressure Maintenance by Water Flooding Daly Bakken D Pool

WHEREAS, subsection(9)(d) of Section 62 of "The Mines Act", Chapter M160, of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

> "62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders
>
> (d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is econonomical so to do, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water, or other substance;"

AND WHEREAS, the Board received an application dated May 16, 1991 from Tundra Oil and Gas Ltd. for approval of a project to inject water into the Daly Bakken D Pool ("the pool") in the proposed North Ebor Unit No. 2.

AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application, which was subsequently withdrawn.

AND WHEREAS, Tundra Oil and Gas Ltd. is the unit operator of North Ebor Unit No. 1 and the proposed unit operator of the proposed North Ebor Unit No. 2 ("the unit areas").

AND WHEREAS, upon due consideration, the Board has found it is reasonable and desirable to approve the application.

NOW THEREFORE, the Board orders that:

1. Board Order No. PM 62 is hereby rescinded.

2. The unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit areas.

3. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1(1) Water shall be injected into the pool through the wells:

North Ebor Unit No. 2 WIW 8-14-10-29 (WPM)
North Ebor Unit No. 1 WIW 16-14-10-29 (WPM)

and such other wells in the unit areas as the Board may order or approve.

1(2) After the commencement of injection, the unit operator shall, subject to any remedial work required to be performed on the wells referred to in subsection (1), endeavour to maintain continuous injection.

1(3) Notwithstanding the provisions of subsection (2), the Board may, upon application by the unit operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the unit areas will not be adversely affected.

1(4) The completion of the wells referred to in subsection (1) will be as prescribed by the Director of Petroleum.

2 The unit operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.

3(1) Before injection of water is commenced, the unit operator shall submit, to the Board, results of a survey conducted to determine the static reservoir pressure in the unit areas.

3(2) The unit operator shall, not less than six months nor more than 12 months after the commencement of injection, and at yearly intervals thereafter, conduct a survey to determine the static reservoir pressure in the unit areas.

3(3) The unit operator shall submit to the Petroleum Branch, the details of the surveys described in subsections (1) and (2), including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of Petroleum before the program is carried out.

3(4) The unit operator shall submit to the Petroleum Branch, within 30 days of the completion date of the surveys described in subsections (1) and (2), a report which shall include:

(a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
(b) an isobaric map of the pool within the unit areas based on the data obtained; and
(c) a discussion of the survey results and pressure distribution within the pool.

3(5) The Board may, at any time, require the unit operator to carry out such additional reservoir pressure surveys as it deems necessary.

4 The unit operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.

5 The maximum wellhead pressure at which water is injected into the wells referred to in subsection 1(1) shall not exceed 7 000 kPa or such other maximum pressure as the Board may prescribe and the Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the unit areas.

6(1) The unit operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in subsection 1(1).

6(2) The unit operator shall, not later than the last day of each month, file with Petroleum Branch a summary report of production and injection operations during the preceding month, which report shall include:

(a) a tabulation of total oil, total water and total gas produced;
(b) a tabulation of the number of producing wells and injection wells which were active;
(c) the results of at least one twenty-four hour production test on each producing well in the unit areas including volumes of oil, gas and water produced during the test; and
(d) a summary of any remedial operations carried out on any well in the unit areas.

7 The unit operator, shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

H. Clare Moster
Deputy Chairman

Ian Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION BOARD ORDER NO. PM 67 APPROVED THIS 12 DAY OF Sept A.D., 1991 AT THE CITY OF WINNIPEG.

APPROVED:

Harold Neufeld
Minister of Energy and Mines

September 5, 1991

The Oil and Natural Gas
Conservation Board
- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

John N. Fox
Chief Petroleum Engineer
Petroleum Branch

RE: Application for Pressure Maintenance
Daly Bakken D Pool - North Ebor Unit No. 2

The objection to the subject application from the mineral owners in the NW/4 of Section 12 and SW/4 of Section 13, in Township 10, Range 29 (WPM) has been withdrawn. A copy of the letter withdrawing the objection is attached.

RECOMMENDATION

It is recommended that the Board approve Tundra's pressure maintenance application. A copy of Board Order No. PM 67 covering pressure maintenance operations in North Ebor Unit No. 1 and proposed North Ebor Unit No. 2 is attached. Board Order No. PM 67 rescinds Board Order No. PM 62. Also attached is a copy of the proposed Board letter of approval to accompany the order.

The Branch's memorandum to the Board dated May 10, 1991 presents the technical discussion supporting the Branch's recommendations.

ORIGINAL SIGNED BY
JOHN N. FOX

John N. Fox

Approved: _____
L.R. Dubreuil, Director

McNEILL POOLE

BARRISTERS, SOLICITORS, NOTARIES

R.M. McNEILL, B.Sc., LL.B.
S.R. POOLE, B.A., B.Ed., LL.B.
GLEN HARASYMCHUK, B.Sc., LL.B.

BUCKINGHAM BUILDING
243 RAGLAN STREET WEST
P.O. BOX 520
VIRDEN, MANITOBA
R0M 2C0

Phone (204) 748-1220
Fax (204) 748-3007

August 29, 1991

Our File M-32711

Department of Energy and Mines
Winnipeg, Manitoba

ATTENTION: John Fox

Dear Sir;

Re: North Ebor Unit No. 2
Proposed Waterflood by Tundra Oil and Gas Limited.

Further to our letter of June 24, 1991 to The Department of Energy and Mines we would confirm that our clients have received sufficient information and have no further objections to the project a this time.

Yours truly,

McNEILL POOLE

PER:

RENE MARK McNEILL

RMM/mb

VIA FAX 945-0586

c.c. Tundra Oil & Gas Ltd.

Via Fax 934-5820

Manitoba

The Oil and Natural Gas
Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

Mr. Dan Barchyn, P. Eng.
Exploration Manager
Tundra Oil and Gas Ltd.
1313 - One Lombard Place
Winnipeg, Manitoba
R3B 0X3

Dear Mr. Barchyn:

Re: North Ebor Unit No. 2
Pressure Maintenance Appproval

The Board has completed its review of your application to expand waterflood operations in the Daly Bakken D Pool. Attached is a copy of Board Order No. PM 67 authorizing pressure maintenance operations in North Ebor Unit No. 1 and the proposed North Ebor Unit No. 2.

Please note that water injection into North Ebor Unit No. 2 is not authorized until the Board has approved the Unit Agreement as required by Section 74 of The Mines Act.

If you have any questions in respect of this matter, please contact L. R. Dubreuil, Director of Petroleum or John N. Fox, Chief Petroleum Engineer at 945-6573 or 945-6574, respectively.

Yours respectfully,

H. Clare Moster
Deputy Chairman

Manitoba

The Oil and Natural Gas
Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

Order No. PM 67

An Order Pertaining to Pressure Maintenance by Water Flooding Daly Bakken D Pool

WHEREAS, subsection(9)(d) of Section 62 of "The Mines Act", Chapter M160, of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

> "62(9) Without restricting the generality of subsection (8) the board, with the approval of the minister, may make orders
>
> (d) requiring the repressuring, recycling, or pressure maintenance, of any pool or portion thereof where it is econonomical so to do, and for that purpose where necessary requiring the introduction or injection into any pool or portion thereof of gas, air, water, or other substance;"

AND WHEREAS, the Board received an application dated May 16, 1991 from Tundra Oil and Gas Ltd. for approval of a project to inject water into the Daly Bakken D Pool ("the pool") in the proposed North Ebor Unit No. 2.

AND WHEREAS, upon publication of notice of the application, the Board received an objection to the application, which was subsequently withdrawn.

AND WHEREAS, Tundra Oil and Gas Ltd. is the unit operator of North Ebor Unit No. 1 and the proposed unit operator of the proposed North Ebor Unit No. 2 ("the unit areas").

AND WHEREAS, upon due consideration, the Board has found it is reasonable and desirable to approve the application.

NOW THEREFORE, the Board orders that:

1. Board Order No. PM 62 is hereby rescinded.

2. The unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit areas.

3. The pressure maintenance operation shall be in accordance with, and subject to, the following rules:

PRESSURE MAINTENANCE RULES

1(1) Water shall be injected into the pool through the wells:

North Ebor Unit No. 2 WIW 8-14-10-29 (WPM)
North Ebor Unit No. 1 WIW 16-14-10-29 (WPM)

and such other wells in the unit areas as the Board may order or approve.

1(2) After the commencement of injection, the unit operator shall, subject to any remedial work required to be performed on the wells referred to in subsection (1), endeavour to maintain continuous injection.

1(3) Notwithstanding the provisions of subsection (2), the Board may, upon application by the unit operator, approve the suspension of water injection into any well or wells, provided that the Board is satisfied that pressure maintenance operations in the unit areas will not be adversely affected.

1(4) The completion of the wells referred to in subsection (1) will be as prescribed by the Director of Petroleum.

2 The unit operator, upon the request of the Board, shall satisfy the Board as to the source, suitability and method of treatment of the water to be injected.

3(1) Before injection of water is commenced, the unit operator shall submit, to the Board, results of a survey conducted to determine the static reservoir pressure in the unit areas.

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3(3) The unit operator shall submit to the Petroleum Branch, the details of the surveys described in subsections (1) and (2), including a list of the wells to be surveyed, the measurement technique to be used, and the intended shut-in periods for each well, and approval shall be obtained from the Director of Petroleum before the program is carried out.

3(4) The unit operator shall submit to the Petroleum Branch, within 30 days of the completion date of the surveys described in subsections (1) and (2), a report which shall include:

(a) the static reservoir pressure data obtained from the survey, corrected to a common datum;
(b) an isobaric map of the pool within the unit areas based on the data obtained; and
(c) a discussion of the survey results and pressure distribution within the pool.

3(5) The Board may, at any time, require the unit operator to carry out such additional reservoir pressure surveys as it deems necessary.

4 . The unit operator shall immediately report to the Board any indication of channelling or break-through of injected water to producing wells or any indication of other detrimental effects that may be attributable to the pressure maintenance operations.

5 The maximum wellhead pressure at which water is injected into the wells referred to in subsection 1(1) shall not exceed 7 000 kPa or such other maximum pressure as the Board may prescribe and the Board may, from time to time, prescribe a maximum or minimum rate at which water shall be injected into any well in the unit areas.

6(1) The unit operator shall, not later than the last day of each month, file with the Petroleum Branch, a report of the quantity, source and pressure of water injected during the preceding month into each well referred to in subsection 1(1).

6(2) The unit operator shall, not later than the last day of each month, file with Petroleum Branch a summary report of production and injection operations during the preceding month, which report shall include:

(a) a tabulation of total oil, total water and total gas produced;
(b) a tabulation of the number of producing wells and injection wells which were active;
(c) the results of at least one twenty-four hour production test on each producing well in the unit areas including volumes of oil, gas and water produced during the test; and
(d) a summary of any remedial operations carried out on any well in the unit areas.

7 The unit operator, shall, within 60 days of the end of each calendar year, file with the Petroleum Branch a report of the pressure maintenance program, setting out graphically such interpretive information necessary to evaluate the efficacy of the waterflood.

H. Clare Moster
Deputy Chairman

Ian Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION BOARD ORDER NO. PM 67 APPROVED THIS DAY OF A.D., 1991 AT THE CITY OF WINNIPEG.

APPROVED:

Harold Neufeld
Minister of Energy and Mines

Manitoba

Memorandum

Date June 26, 1991

To The Oil and Natural Gas Conservation Board
- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

From John N. Fox
Chief Petroleum Engineer
Petroleum Branch

Telephone

Subject

First | Fold

Re: Application for Pressure Maintenance
Daly Bakken D Pool - North Ebor Unit No. 2

An objection to the subject application was received from the mineral owners in the NW/4 of Section 12-10-29 (WPM) and the SW/4 of Section 13-10-29 (WPM). Based on recent discussions with the objectors, the Branch believes the mineral owners are really concerned about their share in the proposed unit. Presently the three wells, 13-12-10-29, 4-13-10-29 and 5-13-10-29 produce 56% of the proposed unit production.

Recommendation:

It is recommended that Tundra be requested by the Board to discuss with the mineral owners the questions and concerns outlined in their letter. A copy of the proposed Board letters to Tundra and the mineral owners is attached.

ORIGINAL SIGNED BY
JOHN N. FOX

John N. Fox
Chief Petroleum Engineer

JNF/sml

Attachment

Recommended for Approval: L. R. Dubreuil
L. R. Dubreuil, Director

Manitoba

The Oil and Natural Gas Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

Mr. Bob Puchniak
President
Tundra Oil and Gas Ltd.
1313 - One Lombard Place
Winnipeg, Manitoba
R3B 0X3

Dear Mr. Puchniak:

Re: Application for Pressure Maintenance
Daly Bakken D Pool - North Ebor Unit No. 2

The Oil and Natural Gas Conservation Board ("the Board") has received an objection to Tundra's application for pressure maintenance in the proposed North Ebor Unit No. 2.

A copy of the letter of objection from the mineral owners in the NW/4 of Section 12-10-29 (WPM) and SW/4 of Section 13-10-29 (WPM) is attached. Also attached is a copy of the Board's reply to the questions outlined in the letter. Tundra is requested to discuss the questions and concerns outlined in the letter with the mineral owners.

Please advise the Board in writing, of the outcome of these discussions. If Tundra is able to satisfy the concerns of the mineral owners, the mineral owners should be asked to withdraw their objection.

The Board will withhold final dispositon of the application until it has been advised by Tundra of the outcome of the discussions.

If you have any questions, please contact L. R. Dubreuil, Director of Petroleum at 945-6573.

Yours respectfully,

ORIGINAL SIGNED BY
H. CLARE MOSTER

H. Clare Moster
Deputy Chairman

Attachment

Manitoba

The Oil and Natural Gas Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

June 28, 1991

McNeill Poole
P.O. Box 520
Virden, Manitoba
ROM 2CO

Dear Mr. McNeill:

Re: Application for Pressure Maintenance
Daly Bakken D Pool - North Ebor Unit No. 2

The Board has received your letter dated June 24, 1991 outlining your client's concerns with the subject application. In response to the questions in your letter, the Board offers the following comments.

1) The Daly Bakken D Pool was discovered in 1986. To April 30, 1991 cumulative production from the pool has totalled 32 290.8 m^3 or an estimated 6.4% of the original oil in place in the pool. The Petroleum Branch estimates that if a waterflood is not implemented in North Ebor Unit No. 2, only 13.8% of the original oil in place will be recovered.

Production from the pool has resulted in a significant decline in reservoir pressure, especially around the high productivity 5-13-10-29 (WPM) well. The addition of new wells in the pool, 13-12-10-29 (WPM), 4-13-10-29 (WPM) and A10-14-10-29 (WPM) will further accelerate the reservoir pressure decline. It is desirable to implement a waterflood or other pressure maintenance scheme before the reservoir pressure is too low, to ensure oil recovery from the pool is maximized. The Petroleum Branch has estimated that implementation of a waterflood may double the amount of oil recovered.

In designing a waterflood project, the operator will generally conduct reservoir studies to determine the optimum location of injection wells. Wells directly offsetting the proposed injection wells are normally included in the project area.

Each well's share of production in the proposed North Ebor Unit No. 2 is a matter for negotiation between the lessors and lessees.

2. If a well's production is restricted because it is capable of producing in excess of the maximum permissible production rate under the Petroleum Drilling and Production Regulation, there are a number of engineering calculations that can be used to determine the well's unrestricted production rate.

The purpose of implementing a waterflood is to increase the oil recovery from a pool. The unit operator may apply to the Board after implementing a waterflood for exemption from maximum permissible production rate restrictions.

3. Production from the older wells in the proposed North Ebor Unit No. 2 is already produced to the same battery as wells from North Ebor Unit No. 1. At the battery, Tundra has a test separator where each well is production tested on a monthly basis. Tundra has also applied to construct a test satellite at 1-14-10-29 to production test the remaining wells, 5-11, 16-11, 13-12, 4-13 and 1-14 all in Township 10, Range 29 (WPM).

This method of production testing is in common use in the oil industry in Canada and has been demonstrated to be an accurate and economic method of determining individual well rates. The accuracy of measurement in a given situation is reflected by the proration factor (the total production rate at the battery divided by the sum of the individual well production test rates). This factor is monitored and if it falls outside acceptable tolerances, the Petroleum Branch will require the operator to review and improve measurement practices.

The Board has sent a copy of your letter to Tundra Oil and Gas and requested the company also discuss with you the questions and concerns you have raised. After your discussions with Tundra, please advise the Board if you wish to either continue or withdraw your intervention. The Board will withhold final dispostion of the application until it has been advised of the outcome of the discussions.

If you have any further questions in respect of this matter, please contact L. R. Dubreuil at 945-6573.

Yours respectfully,

ORIGINAL SIGNED BY
H. CLARE MOSTER

H. Clare Moster
Deputy Chairman

McNEILL POOLE

BARRISTERS, SOLICITORS, NOTARIES

R.M. McNEILL, B.Sc., LL.B.
S.R. POOLE, B.A., B.Ed., LL.B.
GLEN HARASYMCHUK, B.Sc., LL.B.

BUCKINGHAM BUILDING
243 RAGLAN STREET WEST
P.O. BOX 520
VIRDEN, MANITOBA
ROM 2C0

Phone (204) 748-1220
Fax (204) 748-3007

Our File M-32711

June 24th, 1991.

Department of Energy & Mines,
Virden, Manitoba,
ROM 2C0.

Dear Sir:

RE: proposed North Ebor Unit #2 Waterflood by Tundra Oil & Gas Ltd.

We have been regained by some of the mineral owners in the area proposed for this water flood (5-13, 4-13 and 13-12). These mineral owners have some concerns and would ask for your comments and further information:

1. We understand that this field is relatively new. Should a waterflood be put into place when some of the wells have not been on production very long? How does a well qualify for being included in a water flood area?

2. Two of our client's wells are limited in production by time clocks. How do you establish a fair rating for these wells?

Also, is it necessary to have a waterflood when these wells are already limited by daily production limits?

3. We understand that Tundra is proposing that the production be mingled with Unit No. 2. How will the production from this unit be measured and what safeguards will be in place to accurately record production?

In summary, it seems that this proposed waterflood is not necessary at this time. If the objective is just to increase the annual production rate and not to increase the long term recoverability of the oil, then I believe my clients would object to the proposal. However, we would ask you to provide us with further information and answers to assist us in our deliberations. If a meeting would be helpful, please advise.

Yours truly,
McNEILL POOLE

Per:
Rene Mark McNeill
RMM'rc

Manitoba

Memorandum

Date May 30, 1991

To The Oil and Natural Gas Conservation Board
- Ian Haugh, Chairman
- H. Clare Moster, Deputy Chairman
- Wm. McDonald, Member

From John N. Fox
Chief Petroleum Engineer
Petroleum Branch

Telephone

Subject

First | Fold

Re: North Ebor Unit No. 2
Pressure Maintenance Application

Tundra Oil and Gas Ltd. has made application to expand pressure maintenance operations in the Daly Bakken D Pool in the proposed North Ebor Unit No. 2.

Recommendation:

It is recommended that notice of the application be published in the Manitoba Gazette and the Virden Empire Advance. A copy of the proposed notice is attached.

If no objections are received, it is recommended that the Board approve Tundra's application. A copy of Board Order No. PM 67 covering pressure maintenance operations in North Ebor Unit No. 1 and proposed Unit No. 2 is attached. Also attached is a copy of the proposed Board letter of approval to accompany the order.

Discussion:

Tundra has applied to expand waterflood operations in the Daly Bakken D Pool, south of North Ebor Unit No. 1. The project in the proposed North Ebor Unit No. 2 involves the conversion of 8-14-10-29 to water injection to create a second injection pattern in the Bakken D Pool (Figure 1).

North Ebor Unit No. 1 - Waterflood Performance

Water injection commenced at 16-14-10-29 in North Ebor Unit No. 1 in July, 1990 under Board Order No. PM 62. Water injection to March 1, 1991 has totalled 4 890 m^3, resulting in a cumulative voidage-replacement of 0.22.

Primary production in the Daly Bakken D Pool is characterized by a steep production decline in the order of 40-50%/year. Water injection in Unit No. 1 has arrested the production decline and resulted in an increase in production rate from 15.4 m^3/d (July, 1990) to 17.8 m^3/d (March, 1991) (Figure 2).

A pressure fall-off test conducted at 16-14-10-29 in December, 1990 indicates reservoir pressure in Unit No. 1 has increased from 4 480 - 4 960 kPa in June, 1990 to 5 310 kPa.

Tundra's and the Branch's estimates of OOIP and recoverable reserves - primary and secondary for Unit No. 1 are shown in Table 1. Though the values differ, both estimates clearly illustrate the positive effect of waterflooding. Because of limited waterflood history, accurate incremental recovery estimates are not possible. It should be noted that Unit No. 1 is the first Bakken waterflood in Manitoba.

Proposed North Ebor Unit No. 2

Tundra has continued development of the Daly Bakken D Pool, recently drilling the 4-13-10-29, 13-12-10-29, 1-14-10-29 and A10-14-10-29 wells. DST pressure measurements at 4-13 (Feb./91) and 13-12 (Mar./91) were 4 350 kPa and 6 230 kPa, respectively. These pressures demonstrate the reservoir continuity of the D Pool and though well above the bubble point pressure of 2 000 kPa, clearly indicate the need for pressure maintenance in the S/2 of the pool.

Tundra's and the Branch's OOIP estimates and primary and secondary recovery predictions for the proposed North Ebor Unit No. 2 are shown in Table 1.

The Branch's higher OOIP estimate results from the interpretation of a thicker pay section running SE-NW through Unit No. 2 (Figure 3). The Branch's estimate of primary recoverable reserves using decline curve analysis (Figure 4) matches closely with Tundra's. The higher primary recovery factor for Unit No. 2 is a result of the high productivity 5-13-10-29 well. To March 1, 1991, the 5-13 well had produced 5 874 m^3, 19.7% of the cumulative pool production.

The Branch agrees with Tundra's estimate of incremental waterflood recovery and based on the performance of Unit No. 1 recommends that in the absence of legitimate objections to a notice, the application be approved. Proposed Board Order No. PM 67 covering pressure maintenance operations in both Unit No.'s 1 and 2 is attached. Board Order No. PM 67 rescinds Board Order No. PM 62. Injection in Unit No. 2 is not to commence until the Board has approved the Unit Agreement.

John N. Fox
Chief Petroleum Engineer

JNF/sml

Attachment

Recommended for Approval: L. R. Dubreuil

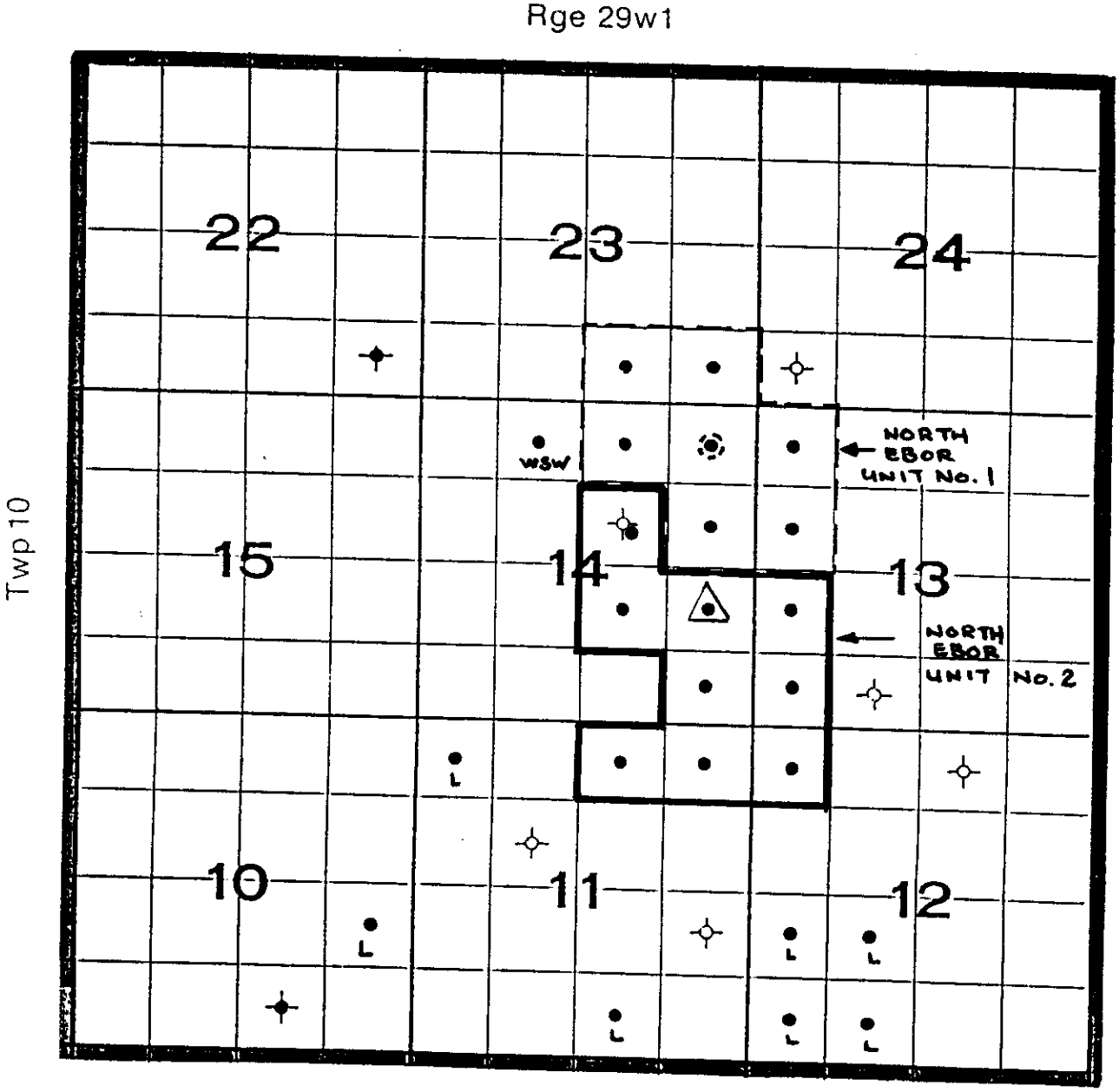
L. R. Dubreuil, Director

TABLE 1

RECOVERABLE RESERVES ESTIMATES

	North Ebor Unit No. 1		North Ebor Unit No. 2	
	Tundra	Petroleum Branch	Tundra	Petroleum Branch
Original Oil in Place (10^3m^3)	151.1	191.2	183.5	269.2
Primary Recovery Factor (%)	27.5	13.1	26	16.5
Primary Recoverable Reserves (10^3m^3)	41.6	25.2	48.6	44.3
Incremental Waterflood Recovery Factor (%)	21	13.8	14	13.8
Incremental Waterflood Recoverable Reserves (10^3m^3)	31.7	26.5	24.8	37.1

FIGURE 1


Rge 29w1
Twp 10
22
23
24
15
14
13
10
11
12
WSW
NORTH EBOR UNIT No. 1
NORTH EBOR UNIT No. 2
L
PROPOSED INJECTOR CONVERSION
LODGEPOLE PRODUCER
L

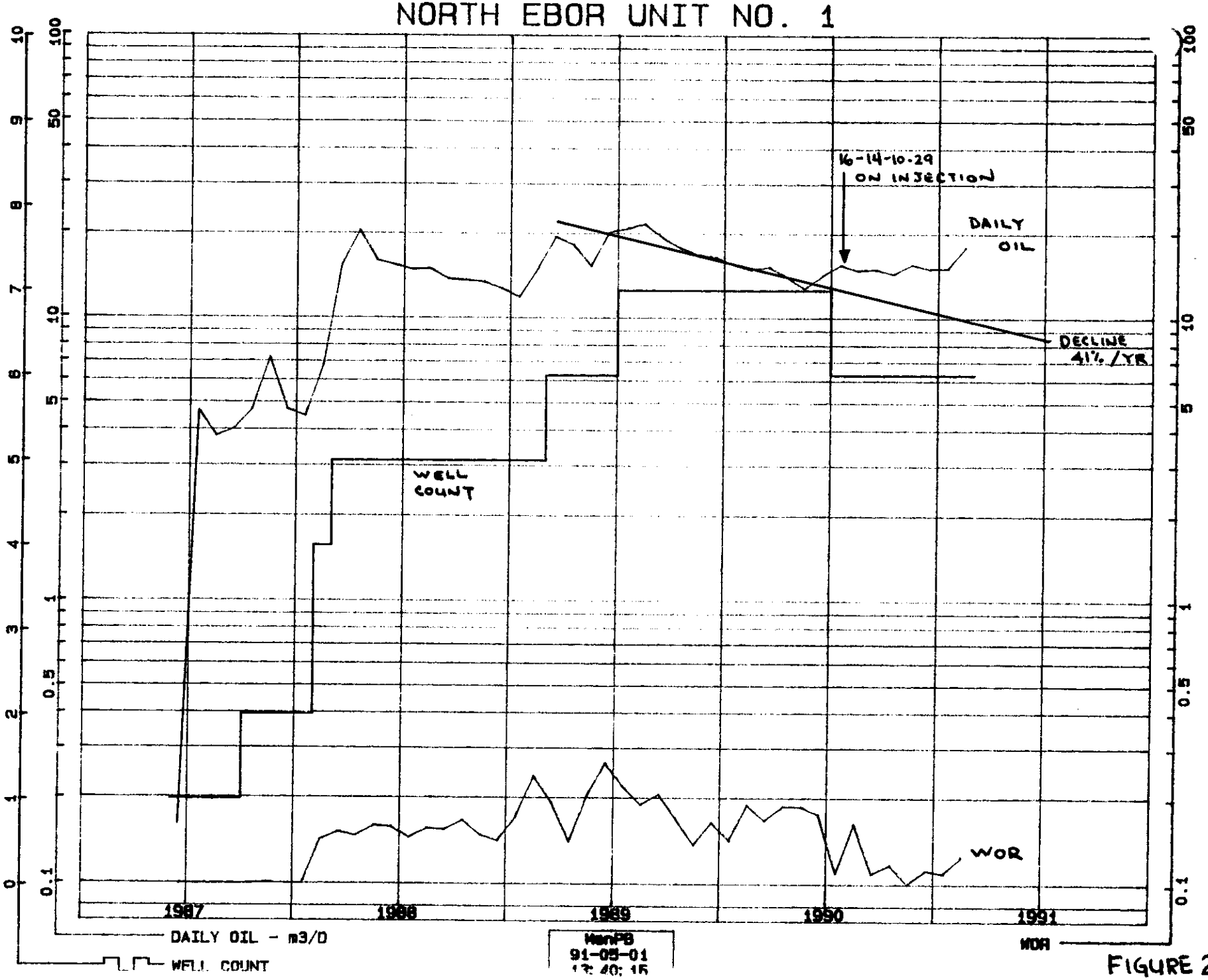
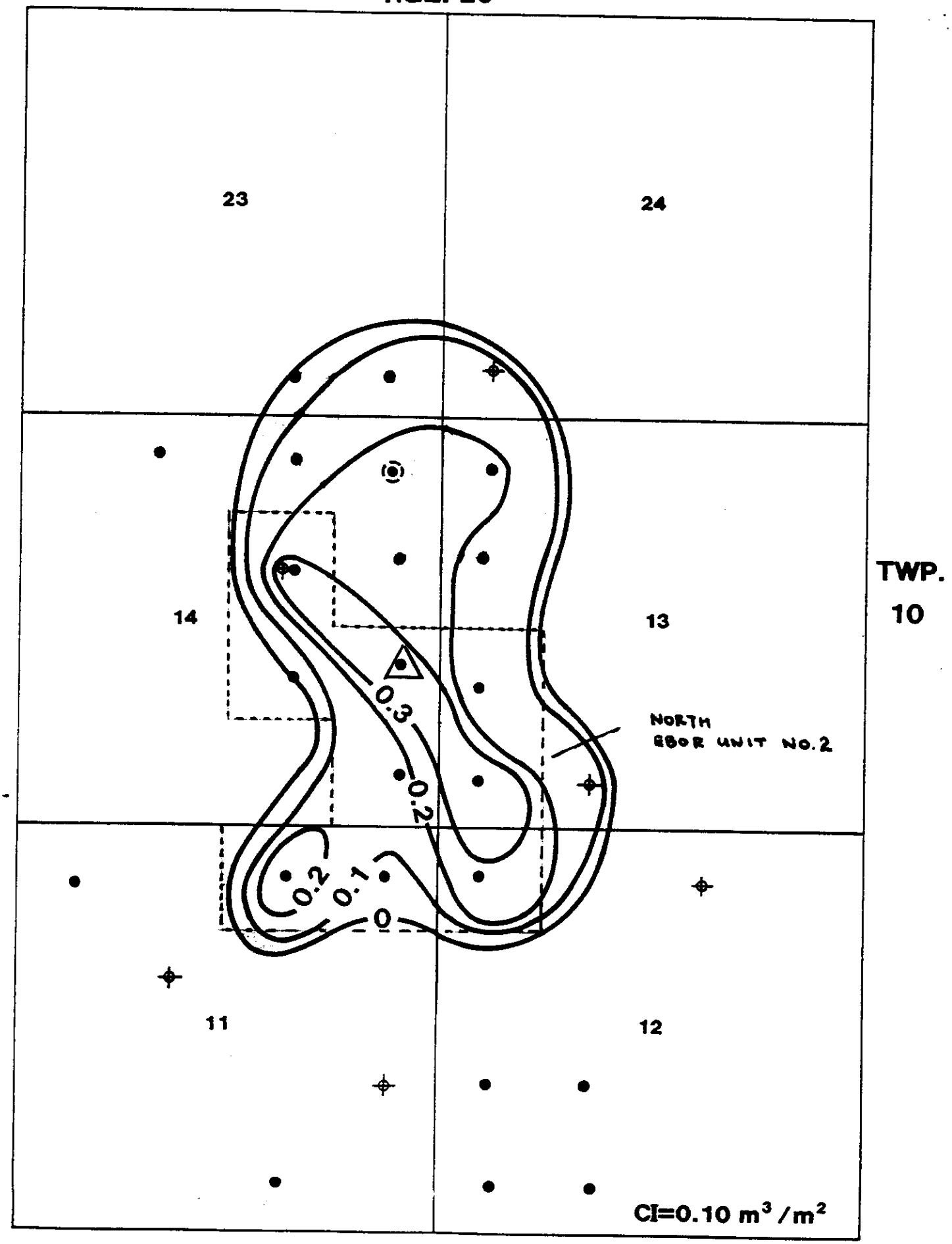

NORTH EBOR UNIT NO. 1
16-14-10-29
ON INJECTION
DAILY
OIL
DECLINE
41%/YR
WELL
COUNT
WOR
1987
1988
1989
1990
1991
DAILY OIL - m3/D
WELL COUNT
MonPB
91-05-01
MDA

FIGURE 2

FIGURE 3

DALY BAKKEN D POOL HYDOCARBON PORE VOLUME



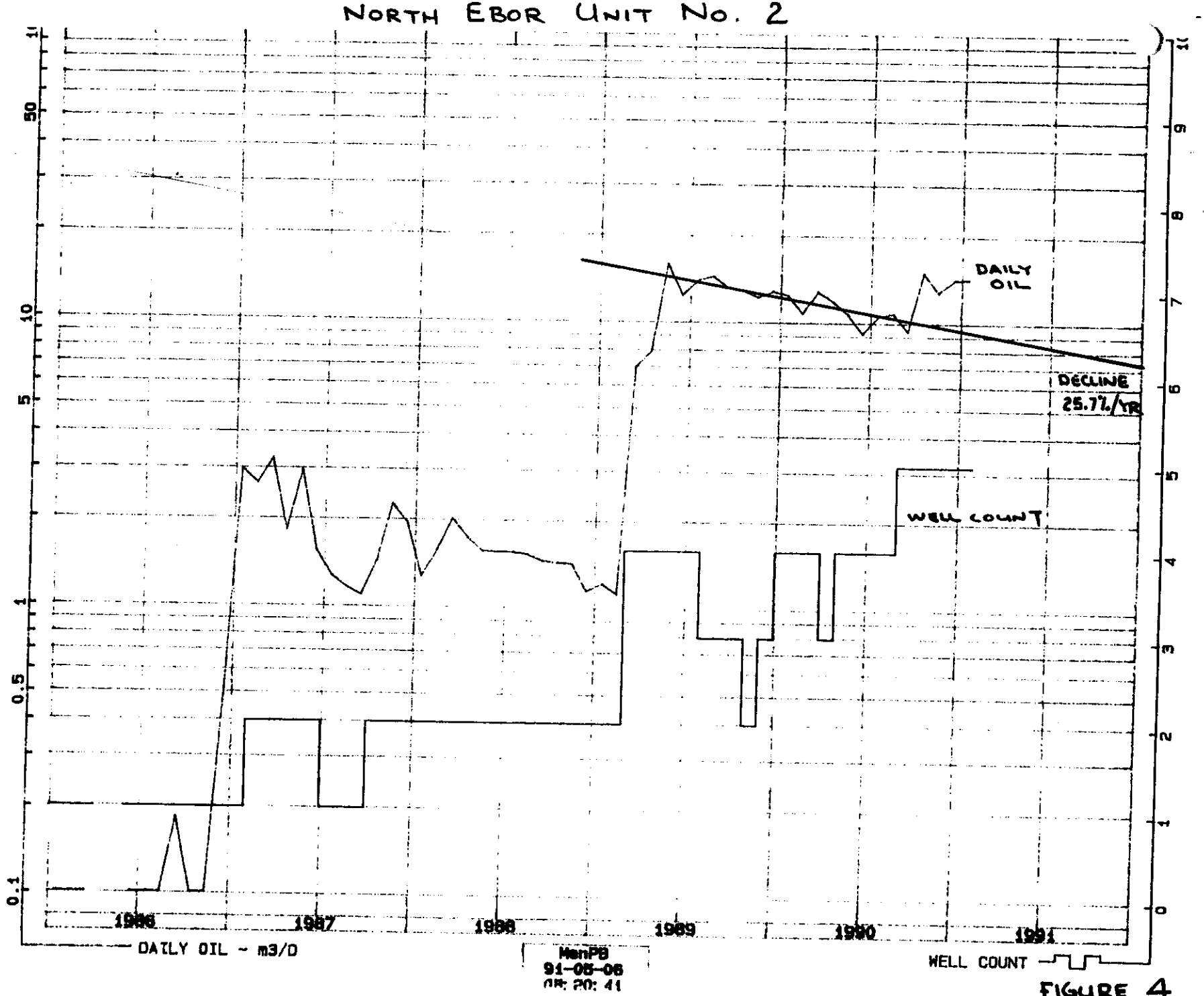

NORTH EBOR UNIT No. 2
DAILY OIL
DECLINE 25.7%/YR
WELL COUNT
50
10
5
1
0.5
0.1
1986
1987
1988
1989
1990
1991
DAILY OIL - m3/D
WELL COUNT
ManPB
91-05-06
08: 20: 41

FIGURE 4

Manitoba

The Oil and Natural Gas Conservation Board

Room 309
Legislative Building
Winnipeg, Manitoba, CANADA
R3C 0V8

(204) 945-3130

NOTICE

UNDER THE MINES ACT

DALY OIL FIELD

Tundra Oil and Gas Ltd. has made application under The Mines Act to conduct a waterflood project in the Bakken Formation in that portion of the Daly Field described as follows: Lsd's 15 and 16 of Section 11, Lsd 13 of Section 12, Lsd's 4 and 5 of Section 13 and Lsd's 1, 7, 8 and 10 of Section 14, all in Township 10, Range 29 (WPM).

It is proposed to convert the well, Tundra Daly 8-14-10-29 (WPM) to water injection.

If no valid objection or intervention in writing is received by The Oil and Natural Gas Conservation Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3C 0V8, before June 24, 1991, the Board may approve the application.

Copies of the application may be obtained from:

Tundra Oil and Gas Ltd.
1313 - One Lombard Place
Winnipeg, Manitoba
R3B 0X3
(204) 934-5850

The application may be viewed at the offices of the Petroleum Branch:

555 - 330 Graham Avenue
Winnipeg, Manitoba
(204) 945-6577

247 Wellington Street West
Virden, Manitoba
(204) 748-1557

Dated at Winnipeg, this 30TH day of MAY ,1991.

H. Clare Moster
Deputy Chairman

12:20 John - please call

CLARE:

I had a call from Isabel (12:55) - the Deputy's office received a call from Jeannie, (604) 564-8242 - she wants information on water flooding, West Second Section 23, Township 10, Range 29.

Please give her a call.

PAT Mineral Owner

June 18/91

TACKED TO CLARE JUN 21/91

SK

John

D. Person

called to register an objection to the Tundra application.

I told her to put it in writing and to include the bases for the objection. I believe you've already talked to her or someone respecting the objection.

BH

Manitoba

Message

To Bob

Person calling Doreen Pearson of

Of Ivy Pearson

☑ Telephoned ☐ Will call again ☐ Came to see you

☑ Please call ☐ Returned your call ☐ Will return

Telephone No. 256-5712 Time (WPG)

Message Tundra wanted to
flush a well +
the objects to it.
(waterflood)
Do you need something
in writing from her?
Deadline is June 24/91. Her lawyer
to a talk about
this.

Date June 21/91 Message taken by

PS-1 86

Manitoba

Message

To John Fjeldsted

Person calling Keith Forester

Of Weldwood

☑ Telephoned ☐ Will call again ☐ Called to see you

☑ Please call ☐ Returned your call ☐ Will return

Telephone No. 748-2125	Time 4:30

Message ~~TORRY BAY — NORTH EBOR~~ ~~UNIT No. 1~~ NORTH EBOR UNIT NO. 2 - concerned WF

→ T.F. → [redacted] current (Interim) Productie - (Final)

→ TURN OVER

Date Message taken by

PS-f-36

→ concerned WF being implemented to soon

→ want to protect cash flow from NW-12 SW/4-13

→ have not seen proposed unit tract features

- call on Jones/Sch to see if an objection -

Wasyl Investments Ltd.
1598 Sixth Avenue
Prince George, B.C.
V2L 5G7

Mrs. E. Klassen
14728 Deer Ridge Drive S.E.
Calgary, Alberta
T2J 6B5

R. (Rosella Mary) Shepherd
P.O. Box 411
Virden, Manitoba
ROM 2CO

L. (Lloyd Alexander) Duncan
P.O. Box 1502
Taber, Alberta
TOK 2GO

Penner Farms Ltd.
P.O. Box 42
Kola, Manitoba
ROM 1BO

Strata Resources Ltd.
c/o Rose Minnie Muir
273 Church Street
Comox, B.C.
V6G 2R8

Ogilvie Enterprises Ltd.
P.O. Box 66
Elkhorn, Manitoba
ROM ONO

Canada Trust
c/o Montreal Trust
411-8th Avenue S.W.
Calgary, Alberta
T2P 1E7
Attention: Oil Royalties

J.D. Koop
P.O. Box 101
Kola, Manitoba
ROM 1BO

K-8 Resources Ltd.
P.O. Box 101
Kola, Manitoba
ROM 1BO

E. (Edith Hannah) Bolam
P.O. Box 754
Virden, Manitoba
ROM 2CO

T. and F. Day
P.O. Box 1683
Virden, Manitoba
ROM 2CO

D. (Doreen) Perron
P.O. Box 754
Virden, Manitoba
ROM 2CO

10 Halliday Bay
Wpg MB R2J 2B2

M. (Mervin) Roach
P.O. Box 754
Virden, Manitoba
ROM 2CO

John Douglas Walker
c/o William Ogilvie
P.O. Box 147
Elkhorn, Manitoba
ROM ONO

S. (Shirley) Kellington
c/o McNeil & Co.
Box 520
Virden, Manitoba
ROM 2CO

G. (Gladys) Powell
c/o McNeil and Co.
Box 520
Virden, Manitoba
ROM 2CO

L. (Lorraine Anna) Solomon
Box 306
Shoal Lake, Manitoba
ROJ 1ZO

L. (Lorna Mae) Williamson
Box 306
Shoal Lake, Manitoba
ROJ 1ZO

W. (William) Ogilvie
P.O. Box 147
Elkhorn, Manitoba
ROM ONO

Burel Norman Brennan
Executive of Last Will of
James Mickel Brennan
General Delivery
Elkhorn, Manitoba
ROM ONO

69763 Manitoba Ltd.
P.O. Box 671
Virden, Manitoba
ROM 2CO

East Plains Resources Ltd.
#1230, 407 - 2nd Street S.W.
Calgary, Alberta
T2P 2Y3

Opinac Exploration Limited
1000, 530-8th Avenue S.W.
Calgary, Alberta
T2P 3S8

Louie Tolaini
486 Henderson Highway
Winnipeg, Manitoba
R2K 2H8

R. Barry Talbot
98 Shier Drive
Winnipeg, Manitoba
R3R 2H8

James D. MacDonald
P.O. Box 278
Winnipeg, Manitoba
R3C 2G9

Morley M. Cohen
1370 Sony Place
Winnipeg, Manitoba
R3C 3C3

Joseph H. Cohen
1370 Sony Place
Winnipeg, Manitoba
R3C 3C3

John C. Cohen
1370 Sony Place
Winnipeg, Manitoba
R3C 3C3

Harry B. Cohen
1370 Sony Place
Winnipeg, Manitoba
R3C 3C3

Albert D. Cohen
1370 Sony Place
Winnipeg, Manitoba
R3C 3C3

UNDER GOOD ET AL

Estate of Harold Good
205 - 1400 East 11th Avenue
Vancouver, B.C.
V5N 1Y5

Ruth Marie Jacobson
226 - 11810 McLeod Trail
Calgary, Alberta
T2J 2V8

Rose Minnie Muir
273 Church Street
Comox, B.C.
V6G 2R8

Phyllis Madeline Dalby
2100 Randless Lane
R.R. 3
Sidney. B.C.
V8L 3X9

Estate of Edith Swann
Attention: Bill Swann
431 Main Street
Penticton, B.C.
V2A 5C4

Lyle Muir
Executor of the Estate of J.A.D. Muir
21976 Lougheed Highway
Maple Ridge, B.C.
V2X 2S5

Estate of J.B. O'Connor
c/o Mrs. Thelma Roy
229-10th Avenue N.E.
Calgary, Alberta
T2E 0X1

Eileen Sarah Scott
Lot 6, Pleasant Road,
Box 5, Group 2, R.R. 1
Anola, Manitoba
R0E 0A0

J.D. and D.D. Reddekop
P.O. Box 3123
Steinbach, Manitoba
ROA 2AO

Docket 1010/91

Applicant	Counsel or Representative
Transall Express Ltd.	**Hugh Gabruch,**
1605 Morgan Avenue,	**1500-2500 Victoria Avenue,**
Saskatoon, Saskatchewan.	**Regina, Saskatchewan.**
S7H 2R9	**S4P 3X2**

Application for Public Service Vehicle Certificate for the transportation of the following:

1. Truckload lots of general merchandise, from all points in Manitoba to the Manitoba/Saskatchewan, Manitoba/Ontario and Manitoba/International boundaries and vice versa.
2. Those commodities which Transall Express Ltd. may lawfully transport through the Province of Manitoba on a corridor operation. No pick ups or drop offs in the Province of Manitoba.

*No Shipper Support Filed.

Docket 1011/91

Applicant	Counsel or Representative
Larry Rister,	**Hugh Gabruch,**
2832-24th Avenue,	**1500-2500 Victoria Avenue,**
Regina, Saskatchewan.	**Regina, Saskatchewan.**
S4S 1J8	**S4P 3X2**

Application for extension of Public Service Vehicle Certificate for the transportation of truckload lots of general merchandise, from all points in Manitoba to the Manitoba/Saskatchewan, Manitoba/Ontario and Manitoba/International boundaries to all points in Manitoba and vice versa.

*No Shipper Support Filed.

Docket 1012/91

Applicant	Counsel or Representative
Atomic Transfer Ltd.,	**N/A**
2070 Logan Avenue,	
Winnipeg, Manitoba.	
R2R 0H9	

Application for extension of Public Service Vehicle Certificate for the transportation of general merchandise, from all points in Manitoba to the Manitoba/Saskatchewan, Manitoba/Ontario and Manitoba/International boundaries and vice versa.

*No Shipper Support Filed.

A Demand for Particulars in Form 8.2 of The Motor Transport Board Rules of Procedure shall also be served on the applicant by the respondent, by July 9, 1991, and proof of service of the Notice of Opposition and the Demand for Particulars shall be filed with the Document Control Officer of the Board within 7 days of service. Where a document is served by mail in accordance with these rules, it must be served by registered or certified mail. Service of the document is deemed to have been effected on the earlier of (a) the day the intended recipient receives it; or (b) three days after the date of the mailing of the document.

L. G. OLIJNEK,
Secretary,
THE MANITOBA MOTOR
TRANSPORT BOARD.

7917—23

UNDER THE MINES ACT

NOTICE

DALY OIL FIELD

Tundra Oil and Gas Ltd. has made application under The Mines Act to conduct a waterflood project in the Bakken Formation in that portion of the Daly Field described as follows: Lsd's 15 and 16 of Section 11, Lsd 13 of Section 12, Lsd's 4 and 5 of Section 13 and Lsd's 1, 7, 8 and 10 of Section 14, all in Township 10, Range 29 (WPM).

It is proposed to convert the well, Tundra Daly 8-14-10-29 (WPM) to water injection.

If no valid objection or intervention in writing is received by The Oil and Natural Gas Conservation Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3C 0V8, before June 24, 1991, the Board may approve the application.

Copies of the application may be obtained from:

Tundra Oil and Gas Ltd.
1313-One Lombard Place
Winnipeg, Manitoba
R3B 0X3
(204) 934-5850

The application may be viewed at the offices of the Petroleum Branch:

555-330 Graham Avenue	247 Wellington Street West
Winnipeg, Manitoba	Virden, Manitoba
(204) 945-6577	(204) 748-1557

Dated at Winnipeg, this 30th day of May, 1991.

H. CLARE MOSTER,
Deputy Chairman.

7934—23

LIFE MEMBERSHIPS—(Left to right) Grand Master Steve Wilson of Kenton presented Life Memberships to Virden Lodge No. 13 I.O.O.F. Brothers Dr. Stan Harris, Bob Cappie and Esmer Hill. One brother also honored, Clarence Lennon, could not attend.

The June 3 meeting of the Virden Lodge was well attended.

The visiting report was given.

Four 45-year life certificates were given to Esmer Hill, Dr. Stan Harris, Bob Cappie, and Clarence

Royal Purple Notes

by D. Smith

Our regular meeting was held on Wednesday, June 5, with 42 members present.

A total of 184 seniors and shut-ins attended our Royal Purple Day tea on June 5. All who attended received a carnation.

September 28 is the date of our annual provincial Elks/Royal Purple walk-a-thon at Ashern.

We were reminded once again that we are invited to attend the various functions for the Elks Provincial Conference this week:

—Thursday, June 13, 8:00 p.m.: Official opening at Virden Alliance Church (full regalia).

—Friday, June 14, 1:00 p.m.: Luncheon for ladies, fashion show to follow. Guests welcome.

—Saturday, June 15, 10:30 a.m.: Meet at the hall (full regalia), march to Cenotaph at 11:00 a.m.

Saturday June 15: Supper and President's Ball.

Sunday, June 16: Farewell breakfast at the hall.

Three members of our executive were officially installed to their positions. They are: Ruth Dunning, Lecturing Lady; Lil Wadham, Loyal Lady; and Diane Ward, Inner Guard.

Committees were assigned for several functions that our Lodge is catering to this month and also in September.

A lovely lunch and social time followed the meeting.

eign Grand Warden Lloyd Shellby of the Sovereign Grand Lodge, and three members from Hartney Lodge No. 25.

Donations were given to the Collegiate scholarship fund and the school patrol fund.

Lodge closed in regular form, and lunch was served, followed by a time of good fellowship.

The next meeting will be on June 17 at 7:30 p.m.

NOTICE
Under The Mines Act
Daly Oil Field

Tundra Oil and Gas Ltd. has made application under the Mines Act to conduct a waterflood project in the Bakken Formation in that portion of the Daly Field described as follows: Lsd's 15 and 16 of Section 11, Lsd 13 of Section 12, Lsd's 4 and 5 of Section 13 and Lsd's 1, 7, 8 and 10 of Section 14, all in Township 10, Range 29 (WPM)

It is proposed to convert the well, Tundra Daly 8-14-10-29 (WPM) to water injection.

If no valid objection or intervention in writing is received by The Oil and Natural Gas Conservation Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3C 0V8, before June 24, 1991, the Board may approve the application.

Copies of the application may be obtained from:

Tundra Oil and Gas Ltd.
1313 - One Lombard Place
Winnipeg, Manitoba R3B 0X3
(204) 934-5050

The application may be viewed at the offices of the Petroleum Branch:

555 - 330 Graham Avenue
Winnipeg, Man. (204) 945-6577
247 Wellington Street West
Virden, Man. (204) 748-1557

Dated at Winnipeg, this 30th day of May, 1991.

H. Clare Moster
Deputy Chairman

Tundra oil and gas ltd.

May 16, 1991

Chairman,
The Oil and Natural Gas Conservation Board
309 Legislative Building
Winnipeg, MB
R3C 0H8

Attention: Dr. Ian Haugh

Dear Sir:

Re: North Ebor Unit #1: Board Order PM 62

Pursuant to Section 64(2) of the Manitoba Oil and Gas Regulations, Tundra Oil and Gas Ltd., as Operator, hereby makes application to expand the above enhanced recovery scheme.

In support of this application, we submit the following:

1. The N. Ebor Unit #1 and the proposed area of expansion is shown in Figure 1. The expanded area includes the following tracts:

   15-11-10-29 WPM
   16-11-10-29 WPM
   13-12-10-29 WPM
    4-13-10-29 WPM
    5-13-10-29 WPM
    1-14-10-29 WPM
    7-14-10-29 WPM
    8-14-10-29 WPM
   10-14-10-29 WPM

2. The mineral rights owners, lessees and surface owners within and adjoining the waterflood scheme are shown on Figure 2.

3. The status and completion zone of each well within and adjoining the scheme area is shown in Figure 3.

4. Pore volume and permeability capacity maps for the Bakken D Pool showing the Pool boundaries are attached as Figures 4 and 5.

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

Tundra oil and gas ltd.

5. The well at 8-14 will be converted to injection. A schematic wellbore cross-section showing the proposed recompletion is shown in Figure 6. Three copies of an application to convert this well to water injection are also enclosed.

6. Copies of letters to the surface owners notifying them of our intentions are included in Appendix A.

7. A tabulation of original oil in place, primary recovery predictions and recovery predictions under waterflood are included in Appendix B.

8. A tabulation of reservoir pressure data is presented in Appendix C.

The initial success of the North Ebor Unit #1, as documented in the Waterflood Progress Report No. 1 dated May 2, 1991, has led us to conclude that the waterflood should be expanded to the southern part of the Daly Bakken D Pool. Recent reservoir pressure measurements (Appendix C) suggest that this expansion should occur as soon as possible.

Our intention is to convert the 8-14 well to an injector and achieve similar voidage replacement rates for the associated pattern as those which have been achieved to date with the 16-14 pattern. Further drilling to delineate the southern edge of the Pool is required to assess the need for and location of any additional injection wells in this part of the pool.

We are currently in the process of obtaining a new unit agreement to cover all tracts in the area of expansion pursuant to this application. A copy will be submitted once it is finalized.

If you have any questions, please call.

Sincerely,

Dan Barchyn, P. Eng.
Exploration Manager

DB/ck

Manitoba
Energy and Mines
Petroleum

APPLICATION TO { ~~SUSPEND PRODUCTION~~ / ~~ABANDON~~ / ~~RECOMPLETE~~ / CONVERT TO SWD, WIW, or _____ / ~~SUSPEND DRILLING~~ / ~~RESUME DRILLING~~ / ~~OTHER~~ } **A WELL**

(Stroke Out Operations Which Do Not Apply)

In compliance with the Petroleum Drilling and Production Regulations, 1984 and amendments thereto, approval is hereby applied for the following operations to be commenced on or about the 1st, day of June 1991, on the well known as Tundra Daly 8-14-10-29

located on Lsd. 8 Sec. 14 Twp. 10 Rge. 29 W of First Meridian,

Well Licence No. 4108 Field or Unit Daly

CASING RECORD

	Size O.D. (mm)	Weight (Kg/m)	Amount (m)	Set (m)	Cement (tonnes)	Method
First String	219.1	35.72	121.5	120.5	12	Plug
Second String	114.3	14.14	87 8	876.75	27	Plug
Third String						

CONDITION OF WELL

Present Status Oilwell

Total Depth of Well 877 Plug Back Total Depth 869.3

Perforations (K.B.): From 860 to 864; From ..... to .....; From ..... to .....

Open Hole (K.B.): ..... To .....

Name of Producing Zone Bakken

Date of Last Production .....

Date of Last Production Test March/91 Daily Production 1.9 m3

W.O.R. .16 W.C.% 14% G.O.R. .....

Reason for Operations Proposed: An injection well is needed to expand the pressure maintenance scheme in the Daly Bakken D. Pool

Program of Operations Proposed:

1) Pull pump, rods and tubing
2) RIH with Baker AD1 tension packer on tubing, set at 855.0m
3) Circulate annulus to fresh inhibited water.
4) Commence injection (subject to final approval from board)

(Note: If adequate injectivity is not achieved, zone will be acidized)

Operations to be carried out by: ..... Address .....

Responsible agent in field: Ed Lowdon Address Virden Phone No. 748-3095

Responsible agent, Co. office: Tim Howell Address Virden Phone No. 748-3095

Signed by [signature] Title Exploration Manager

Company Tundra Oil & Gas at Winnipeg this 15th day of May 19 91

FOR DEPARTMENT USE ONLY

APPROVAL

This application has been examined and program of operations approved, subject to the following conditions:

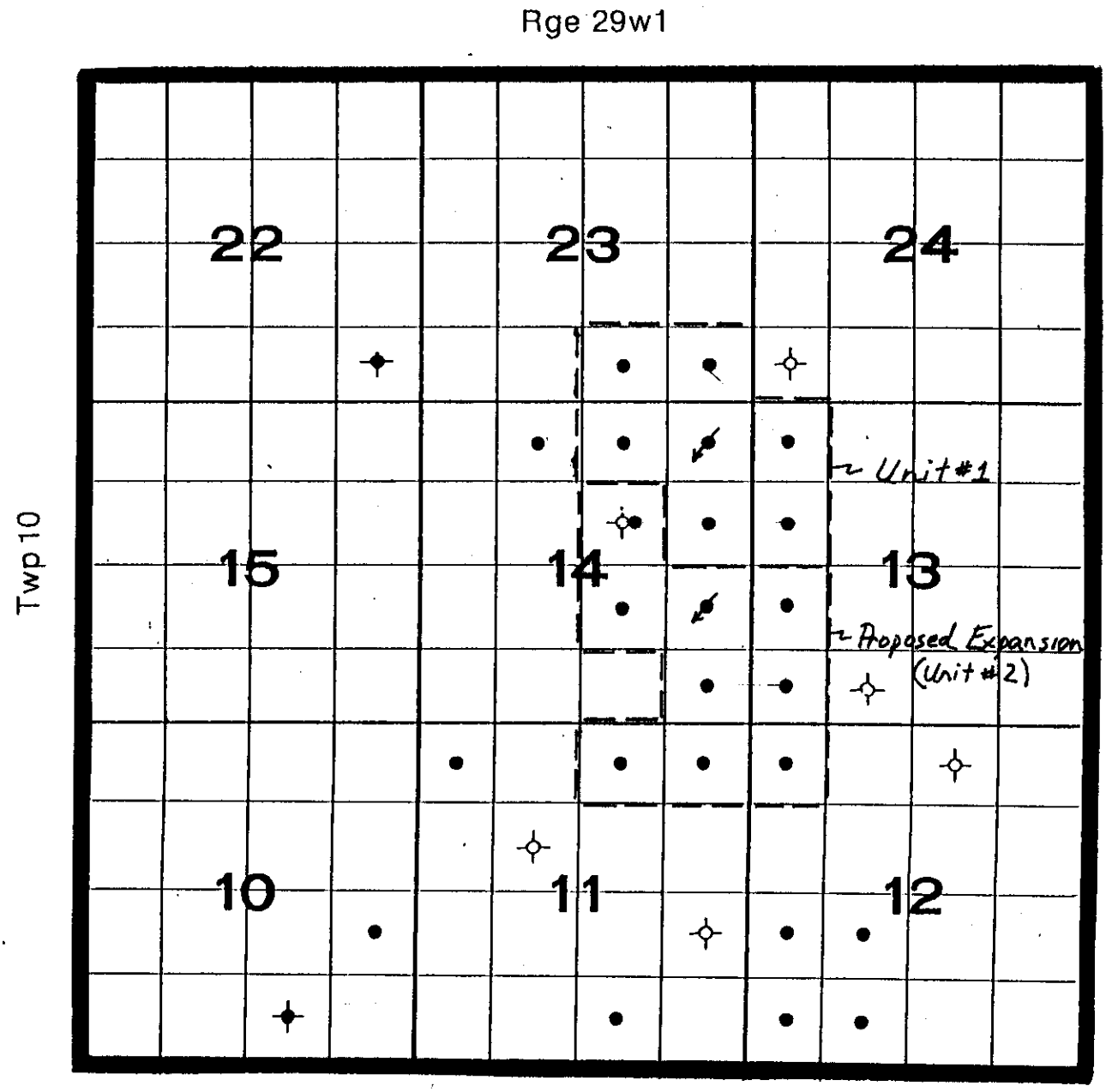
1. Please advise our Virden/Waskada office before approved operations are commenced.
2. .....

Date ..... 19 ..... Approved:

Petroleum Engineering Section

Director, Petroleum Branch

FIGURE 1



N. EBOR UNIT 1

Proposed Expansion of Pressure Maitenance

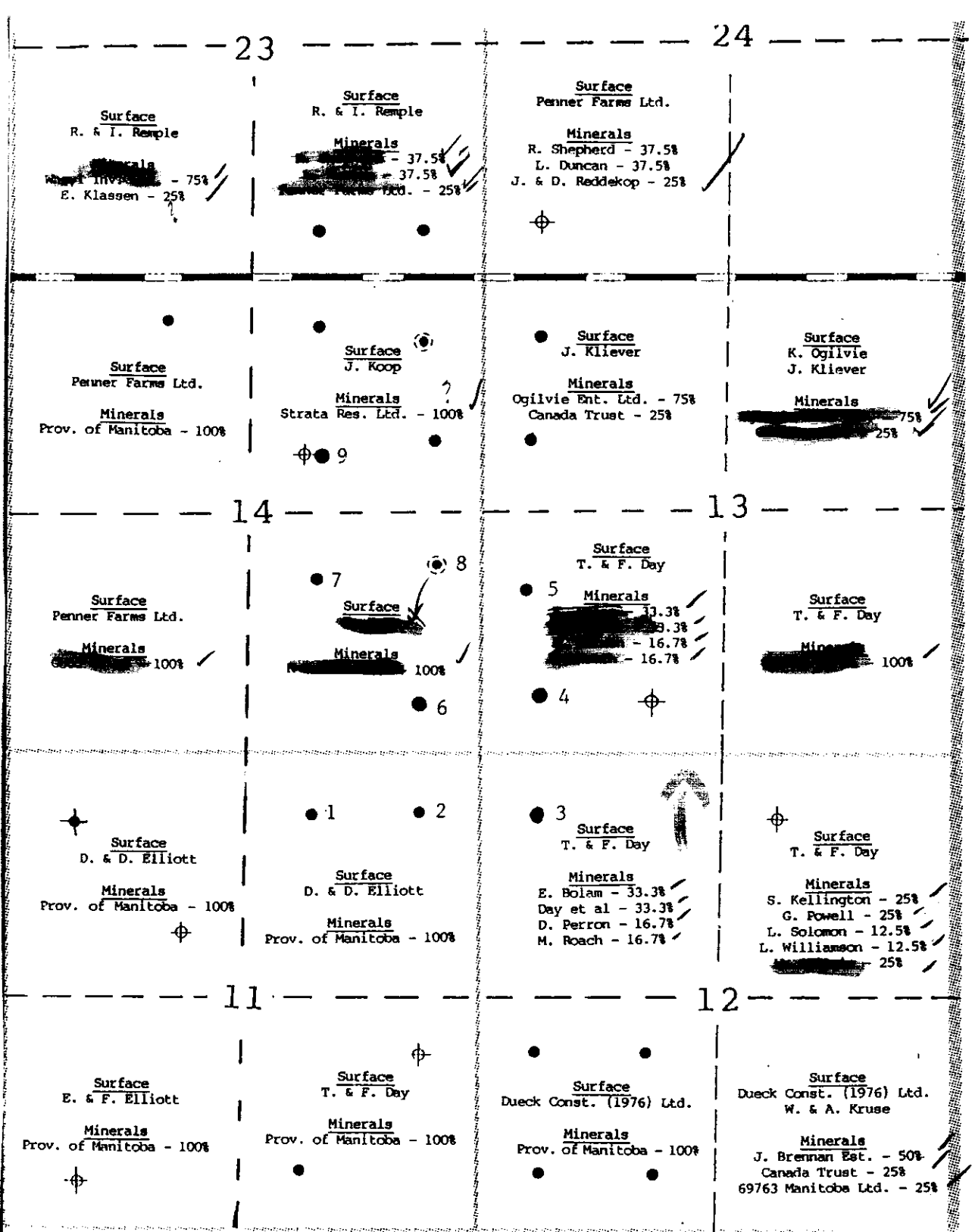
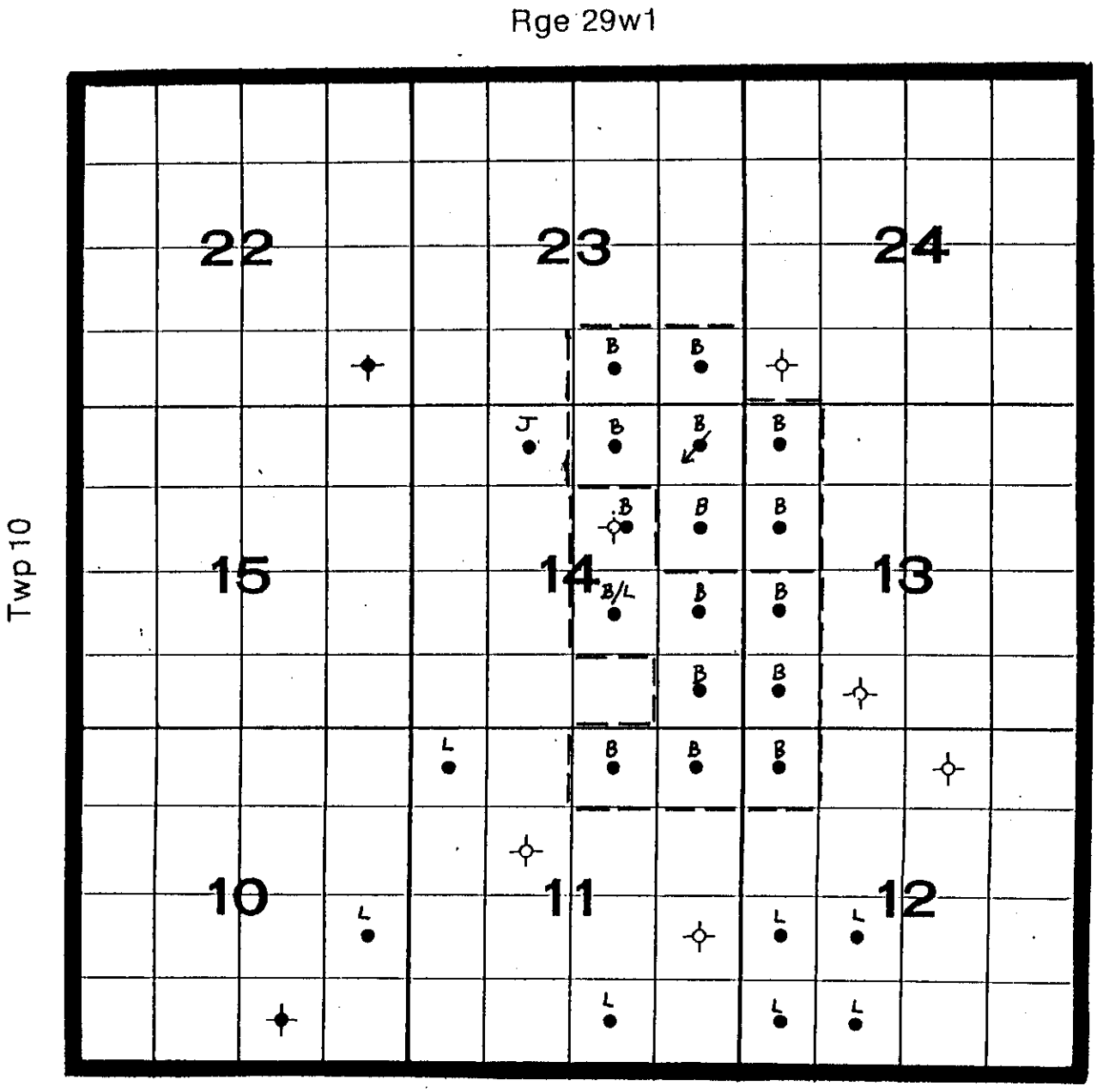


FIGURE 2:

NORTH EBOR UNIT NO.) 2

LANDS	LESSEE	WI %
Tract Nos. 1, 2 & 7	Tundra	100.000000
Tract Nos. 3 - 6 inc. and 8 & 9		2.083334
		2.083333
		2.083333
		2.083333
		2.083333
		2.083334
		4.166667
		4.166667
		4.166666
	Tundra	75.000000
LSDs 9 & 10 & NW 1/4 of 11-10-29 WPM	Tundra	100.000000
SE 1/4 11-10-29 WPM		50.000000
		50.000000
SW 1/4 11-10-29 WPM	Open	
E 1/2 12-10-29 WPM	Open	
SW 1/4 12-10-29 WPM	East Plains Res.	50.000000
	Opinac Exploration	50.000000
NW 1/4 12-10-29 WPM exc. LSD 13	Tundra	100.000000
NE 1/4 13-10-29 WPM	Tundra	100.000000
SE 1/4 13-10-29 WPM	Tundra	100.000000
LSDs 3, 6, 11 & 14 of 13-10-29 WPM	Tundra	100.000000
N 1/2 14-10-29 WPM exc. Lsd 10	Tundra	100.000000
LSD 2-14-10-29 WPM	Tundra	100.000000
SW 1/4 14-10-29 WPM	Open	
LSD's 7 & 8 of 23-10-29 WPM	Tundra	100.000000
SW 1/4 23-10-29 WPM	Tundra	25.000000
	Open	75.000000
SW 1/4 24-10-29 WPM	Open	100.000000

FIGURE 3



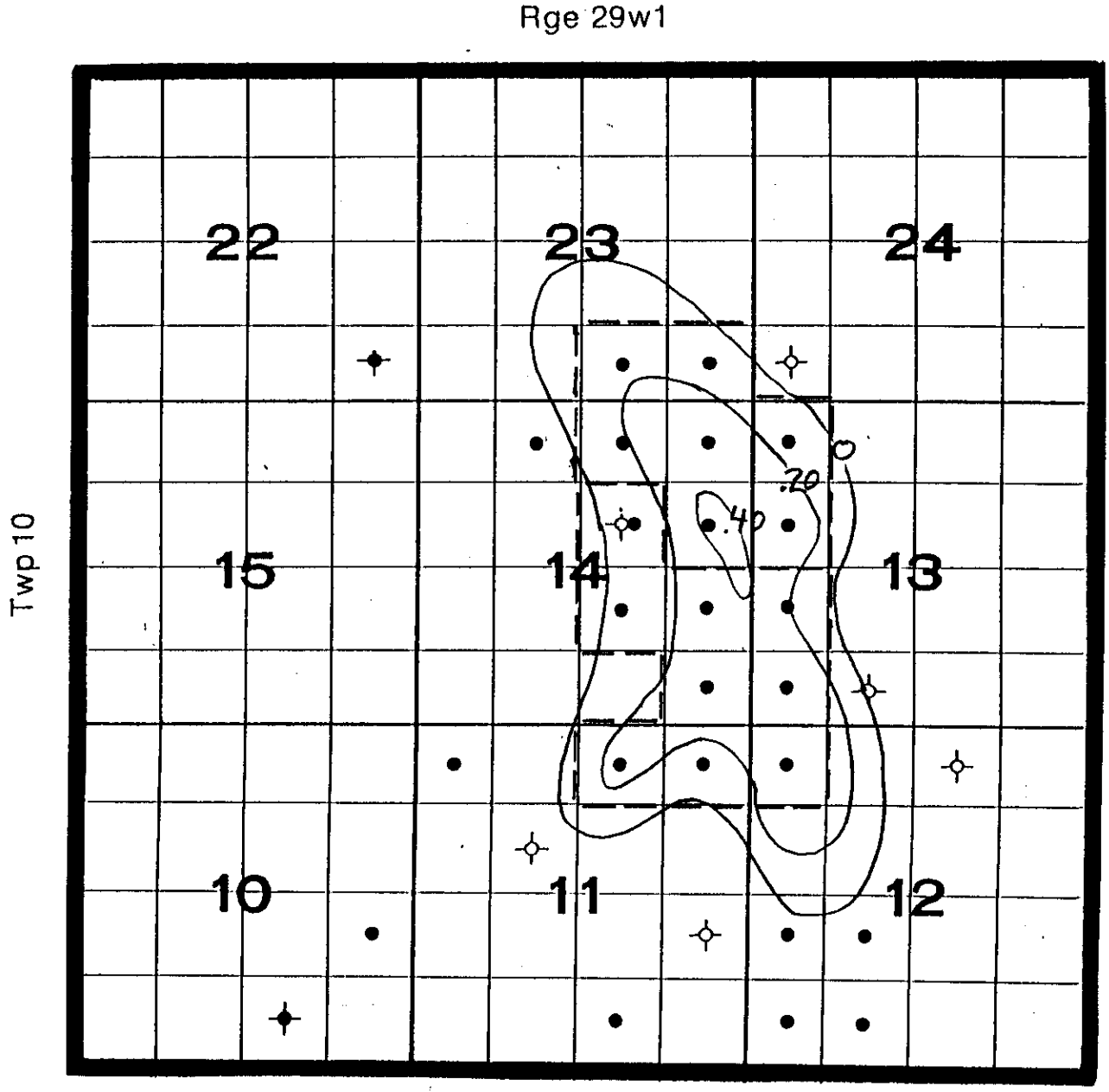
N. EBOR UNIT 1

Completions : B = Bakken

L = Lodgepole

J = Jurassic (WSW)

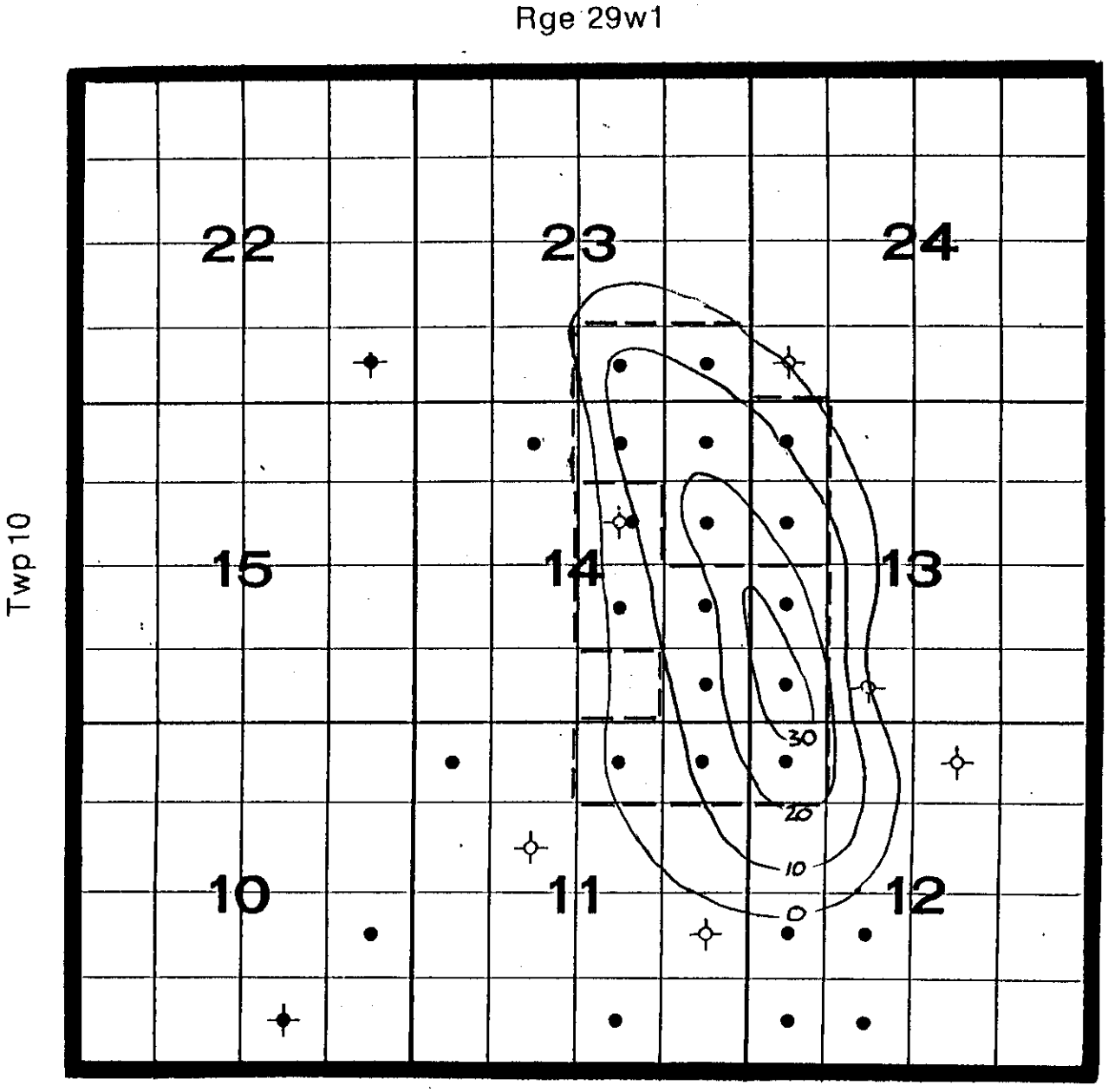
FIGURE 4



N. EBOR UNIT 1

Pore Volume ø·h (ø·m)

FIGURE 5

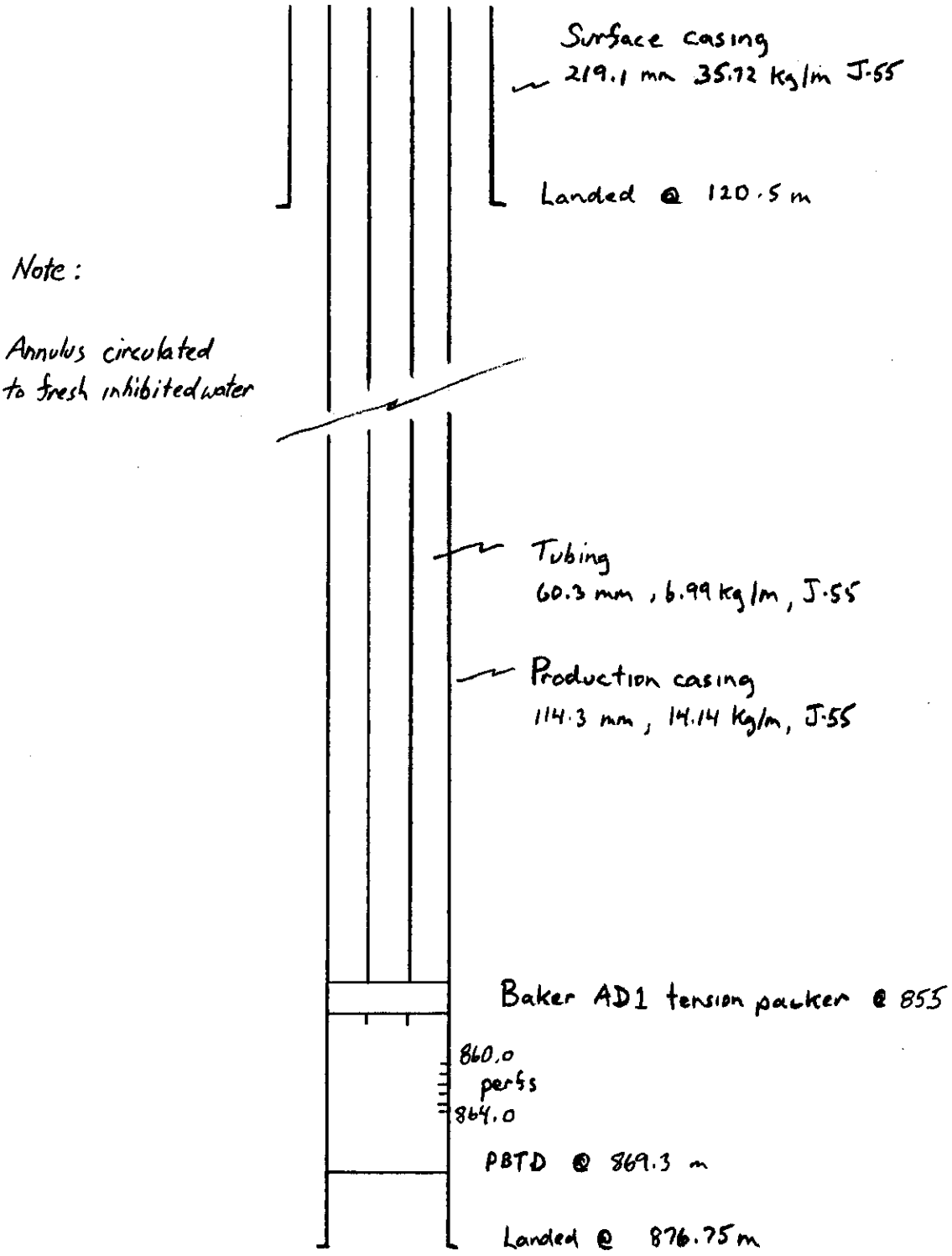


N. EBOR UNIT 1

Permeability Capacity K·h (md-m)

FIGURE 6

TUNDRA DALY B-14-10-29 : WELLBORE SCHEMATIC



Appendix A

Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

Penner Farms Ltd.
Attn: Edgar Penner
P.O. Box 42
Kola, Manitoba
ROM 1B0

Dear Sirs:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

Pursuant to 126(d) of the Petroleum Regulations of the Province of Manitoba, as a Surface owner in the vicinity of the wells involved, you are hereby notified of the proposed unit. The wells included in the plan are as follows:

Tract No.	Well Name	Location
1	Tundra Daly Prov.	15-11-10-29 WPM
2	Tundra Daly Prov.	16-11-10-29 WPM
3	Tundra Daly	13-12-10-29 WPM
4	Tundra Daly	4-13-10-29 WPM
5	Tundra Daly	5-13-10-29 WPM
6	Tundra Daly	1-14-10-29 WPM
7	Tundra Daly	7-14-10-29 WPM
8	Tundra Daly	8-14-10-29 WPM
9	Tundra Daly	A10-14-10-29 WPM

I've enclosed a map outlining the boundary of the proposed unit for your perusal. You will note the well located in LSD 8 of Section 14, Township 10, Range 29 WPM will be converted to an injection well under the plan.

Should you have any questions, please do not hesitate to contact me at 934-5856.

Yours truly,

Cindy V. Marchant

Cindy V. Marchant
Landman

CVM/ck

Enclosure

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

Tundra oil and gas ltd.

May 21, 1991

DOUBLE REGISTERED

Penner Farms Ltd.
Attn: Les Penner
P.O. Box 182
Kola, Manitoba
R0M 1B0

Dear Sirs:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

Pursuant to 126(d) of the Petroleum Regulations of the Province of Manitoba, as a Surface owner in the vicinity of the wells involved, you are hereby notified of the proposed unit. The wells included in the plan are as follows:

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Cindy V. Marchant

Cindy V. Marchant
Landman

CVM/ck

Enclosure

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Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

Mr. J. Kliever
P.O. Box 374
Elkhorn, Manitoba
R0M 0N0

Dear Mr. Kliever

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

Pursuant to 126(d) of the Petroleum Regulations of the Province of Manitoba, as a Surface owner in the vicinity of the wells involved, you are hereby notified of the proposed unit. The wells included in the plan are as follows:

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Yours truly,

Cindy V. Marchant
Landman

CVM/ck

Enclosure

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

R. and I. Remple
P.O. Box 10
Kola, Manitoba
R0M 1B0

Dear Mr. and Mrs. Remple:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

Pursuant to 126(d) of the Petroleum Regulations of the Province of Manitoba, as a Surface owner in the vicinity of the wells involved, you are hereby notified of the proposed unit. The wells included in the plan are as follows:

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Cindy V. Marchant

Cindy V. Marchant
Landman

CVM/ck

Enclosure

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Tundra oil and gas ltd.

May 21, 1991

DOUBLE REGISTERED

Kenneth Ogilvie
P.O. Box 417
Maryfield, Saskatchewan
S0G 3K0

Dear Sir:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

Pursuant to 126(d) of the Petroleum Regulations of the Province of Manitoba, as a Surface owner in the vicinity of the wells involved, you are hereby notified of the proposed unit. The wells included in the plan are as follows:

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Cindy V. Marchant

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Landman

CVM/ck

Enclosure

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

J.D. Koop
P.O. Box 101
Kola, Manitoba
R0M 1B0

Dear Mr. Koop:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

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Cindy V. Marchant
Landman

CVM/ck

Enclosure

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Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

T. and F. Day
P.O. Box 1683
Virden, Manitoba
R0M 2C0

Dear Mr. and Mrs. Day:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

Pursuant to 126(d) of the Petroleum Regulations of the Province of Manitoba, as a Surface owner in the vicinity of the wells involved, you are hereby notified of the proposed unit. The wells included in the plan are as follows:

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Yours truly,

Cindy V. Marchant
Landman

CVM/ck

Enclosure

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

Darrell and Diane Elliott
P.O. Box 37
Cromer, Manitoba
R0M 0J0

Dear Mr. and Mrs. Elliott:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

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Yours truly,

Cindy V. Marchant
Landman

CVM/ck

Enclosure

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Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

Ellis and Florence Elliott
P.O. Box 34
Cromer, Manitoba
R0M 0J0

Dear Mr. and Mrs. Elliott:

Re: North Ebor Unit No. 2

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Landman

CVM/ck

Enclosure

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

Tundra oil and gas ltd.

May 21, 1991 DOUBLE REGISTERED

Walter and Annie Kruse
General Delivery
Kola, Manitoba
R0M 1B0

Dear Mr. and Mrs. Kruse:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

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Cindy V. Marchant
Landman

CVM/ck

Enclosure

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

Tundra oil and gas ltd.

May 21, 1991

DOUBLE REGISTERED

Dueck Construction (1976) Ltd.
P.O. Box 216
Wawota, Saskatchewan
S0G 5A0

c/o Mr. & Mrs Laurence Dueck
2733 Paula Road
Kelowna
V1Z 2K5

Dear Sirs:

Re: North Ebor Unit No. 2

Tundra Oil and Gas Ltd. intends to implement a new waterflood and unitization scheme in the North Ebor area during the third quarter of 1991.

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Landman

CVM/ck

Enclosure

1313-One Lombard Place, Winnipeg, Manitoba, Canada R3B 0X3 Telephone: (204) 934-5850 Fax (204) 934-5820

APPENDIX B: DALY BAKKEN D POOL - RESERVES

Tract	Oil in Place (m3)	Primary Recovery (m3)	%	Recovery Under Waterflood[2] (m3)	%
15-11	23,849	1,566	7		
16-11	11,357	5,106	45		
13-12	29,906	5,000	17		
4-13	30,663	10,000	33		
5-13	18,833	10,405	55		
1-14	25,553	6,510	25		
7-14	6,814	2,188	32		
8-14	25,931	4,791	18		
10-14	10,600	3,000	28		
TOTAL	183,506	48,566	26	73,402	40

1) Reserves calculated by extrapolating current production decline to economic limit. Wells 13-12, 4-13, and 10-14 have limited production history and primary recovery was estimated by analogy to wells with similar initial production characteristics.

2) Reserves estimated by assuming a similar response as that of N. Ebor Unit #1.

APPENDIX C: DALY BAKKEN D POOL - RESERVOIR PRESSURES

Well	Date	Type of Test	Pressure (Kpa)
7-14-10-29	Feb./87	DST	8,591
9-14-10-29	Jan./88	DST	7,763
15-14-10-29	Feb./88	DST	7,537
12-13-10-29	Mar./88	DST	7,914
13-13-10-29	Feb./89	DST	6,719
5-13-10-29	Feb./89	DST	7,426
9-14-10-29	May/89	Fluid Level	5,392
2-23-10-29	June/89	DST	5,353
2-23-10-29	June/90	Fluid Level	4,480 - 4,960
4-13-10-29	Feb./91	DST	4,355
A10-14-10-29	Mar./91	DST	5,710
13-12-10-29	Mar./91	DST	6,230

N. EBOR UNIT No. 1

10-29

- Water injection in the pilot waterflood in N. Ebar Unit No. 1 in the Daly Basal D Pool commenced in July 1, 1990 (Board Order No. PD 62)

The pilot WF is a single seven-spot injection pattern with injection at 16-14-10-29. Since injection commenced a total of m^3 has been injected for a cumulative voidage-replacement of

Primary production in the Daly Basal D Pool is characterized by a steep decline in the order of 40-50 %/year. Water injection in the Unit No. 1 has already arrested the production decline as shown in the production plot. Since July/90 production has increased from 475 l/d to 15.4 m³/d to 17.9 m³/d (March, 1991) ~15% increase

B_{oi} = 1.05 m³/m³

- 16-14 pressure fall-off conducted in December/90 $P^* = 5310$ kPa which compares favourably with the DST pressure of 4480-4960 kPa, measured at 2-23 in June/90

Tundra estimated primary recoverable reserves for N. Ekwan Unit No. 1 of 41.6×10^3 m^3 based on OOIP of 151.1×10^3 m^3 and a primary recovery factor of 27.5% oil. Tundra assumed a waterflood recovery of 48.5% but provided no technical support for this estimate.

The Branch's estimates of OOIP and primary and secondary recovery factors differ dramatically from Tundra's but still indicate the

Branch estimates OOIP $191.2 \times 10^3 m^3$

Primary recovery $\Delta = 13.1\%$

Prim. Rec. Reserves $25.2 \times 10^3 m^3$

Secondary recovery $\Delta = 13.8\%$

Second. Rec. Reserves $26.5 \times 10^3 m^3$

N. EBOR UNIT No. 1 - WF PERFORMANCE

- BOARD ORDER NO. PR 62
  GOIP - 192200 m^3
  Primary recovery - 25204 L^3 (13.1% OOIP
  decline rate 41% /yr.
  - pilot WF
  injection commenced in 16-14 July 1/90
  single 7 spot injection
  - difficult to accurately predict incremental WF recovery but the impact of water injection is already apparent
  - estimated incremental WF recovery 13.8%
  or 26519 $-^3$

- waterflood response observed July /90 production ; Mar/91 production - , a % increase

N. EBOR UNIT NO. 2

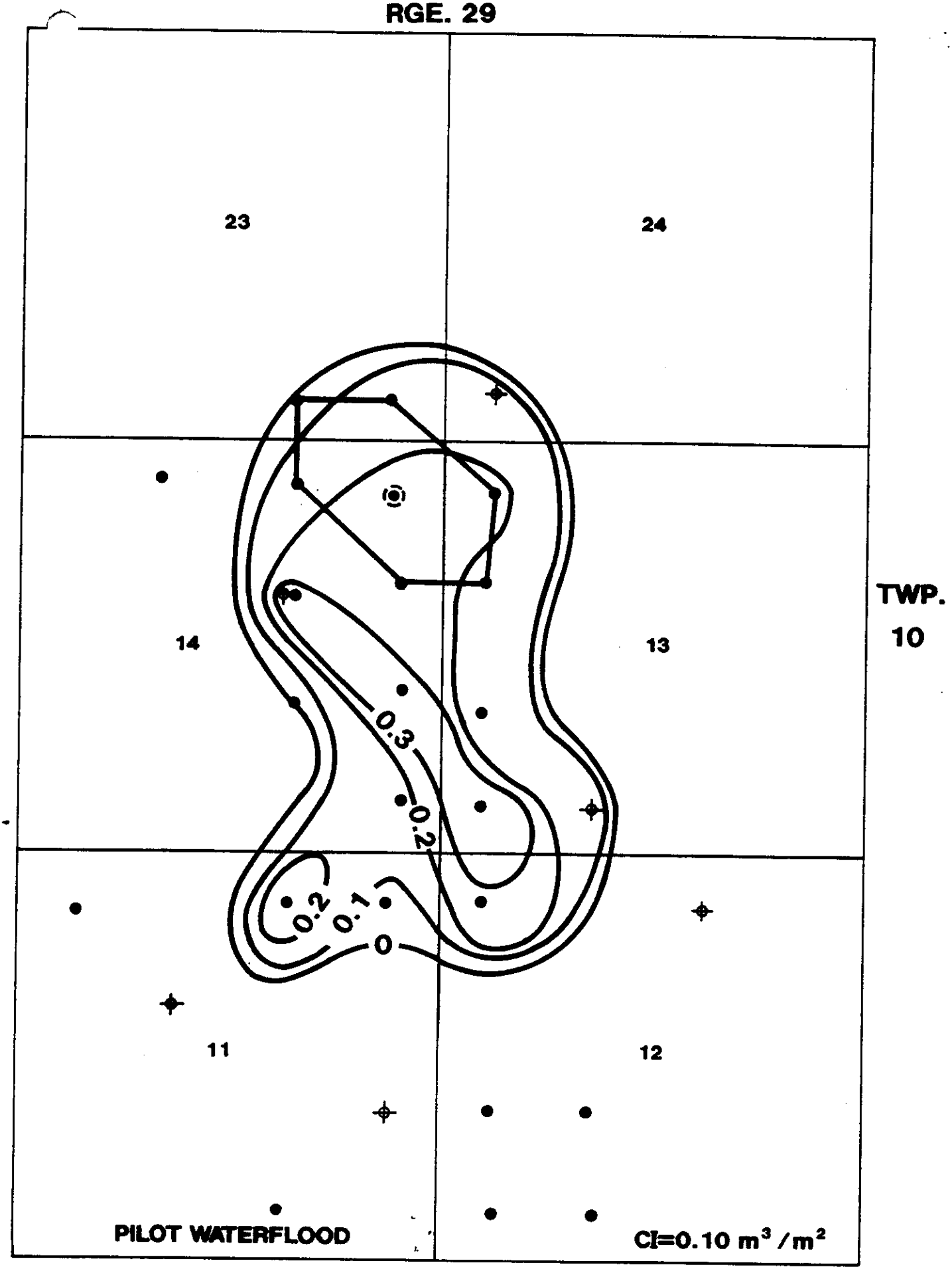
- primary recovery 44298 m^3 (14.2 % OOIP)
OOIP : 311500

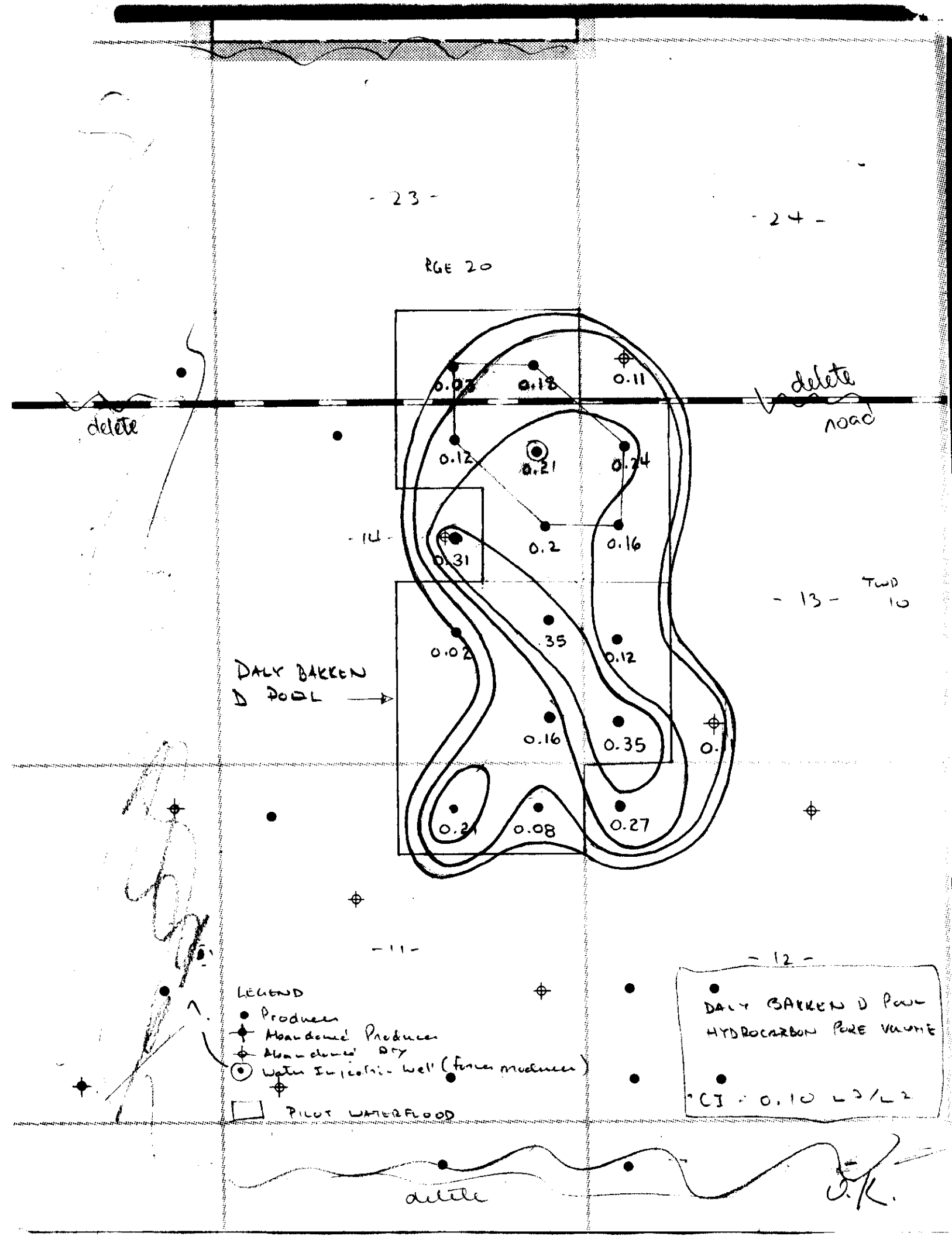
- DST pressures measured at the recently drilled 4-13 (Feb/91) and 13-12 (mar/91) were 4350 kPa and 6230 kPa < note: bubble point pressure is estimated to be 2000 kPa > clearly indicating a reservoir discontinuity in the pool and the need for pressure maintenance in the S/2 of the pool

- Tundra proposes to convert the 8-14 well to water injection essentially creating two 9 spot injection patterns

Tundra's mapping indicates the D Pool may extend further South

DALY BAKKEN D POOL HYDOCARBON PORE VOLUME




- 23 -
- 24 -
RGE 20
delete
delete
road
0.07
0.18
0.11
0.12
0.21
0.24
0.2
0.16
0.31
- 14 -
- 13 -
TWP 10
0.02
.35
0.12
DALY BAKKEN D POOL
0.16
0.35
0.27
0.21
0.08
- 11 -
- 12 -
LEGEND
Producer
Abandoned Producer
Abandoned D&A
Water Injection Well (formerly producer)
PILOT WATERFLOOD
DALY BAKKEN D POOL HYDROCARBON PORE VOLUME
*CI = 0.10 L3/L2
delete
O.K.

OIL / WATER	Cum. Prod. Dec. 31/90 m^3	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	FEB. Daily m^3	1991 Y.T.D. m^3	Cum. Total m^3
BAKKEN B POOL 01 60B																
TUNDRA OIL AND GAS LTD.																
07 -29-10-28	1 158.1	23.0	21.2											0.79	44.2	1 202.3
Prov.c	620.2	2.9	3.4												6.3	626.5
10 -29-10-28	1 532.0	27.6	24.6											0.91	52.2	1 584.2
Prov.	967.9	8.0	7.3												15.3	983.2
11 -29-10-28	447.5	14.4	12.8											0.47	27.2	474.7
Prov.c	302.4	0.8	0.7												1.5	303.9
12 -29-10-28	2 359.2	58.3	51.9											1.92	110.2	2 469.4
Prov.c	554.9	–	–												–	554.9
13 -29-10-28	502.6	44.5	39.6											1.47	84.1	586.7
Prov.c	295.6	21.5	19.4												40.9	336.5
11 -30-10-28	760.3	15.5	0.2											0.01	15.7	776.0
Prov.	255.8	8.8	21.8												30.6	286.4
09 -25-10-29	1 453.1	25.5	12.9											0.48	38.4	1 491.5
	1 092.2	35.8	63.6												99.4	1 191.6
	8 212.8		163.2													8 584.8
	4 089.0		116.2													4 283.0
TOTAL OIL		208.8													372.0	
TOTAL WATER		77.8													194.0	
NON-UNIT																
PREVIOUS	106.6															106.6
PRODUCERS	88.3															88.3
BAKKEN B	8 319.4		163.2													8 691.4
POOL :	4 177.3		116.2													4 371.3
TOTAL OIL		208.8													372.0	
TOTAL WATER		77.8													194.0	
BAKKEN C POOL 01 60C																
NON-UNIT																
PREVIOUS	515.3															515.3
PRODUCERS	373.5															373.5
BAKKEN C	515.3		–													515.3
POOL :	373.5		–													373.5
TOTAL OIL		–													–	
TOTAL WATER		–													–	

CUMUL. INJ 1991 - 1364.4
16-14 Total - 4889.6
15-11 Inj. ?

BAKKEN D POOL 01 60D

NORTH EBOR UNIT #01 (Effective July 1, 1990)

TUNDRA OIL AND GAS LTD.

12 -13-10-29	2 637.5	38.1	36.8			1.36	74.9	2 712.4
	226.9	2.9	3.2				6.1	233.0
13 -13-10-29	1 474.5	54.5	54.0			2.00	108.5	1 583.0
	311.1	5.9	6.5				12.4	323.5
09 -14-10-29	3 450.4	115.9	125.0			4.63	240.9	3 691.3
	581.7	15.1	15.9				31.0	612.7
15 -14-10-29	3 169.6	76.2	67.9			2.51	144.1	3 313.7
	1 051.8	17.8	15.8				33.6	1 085.4

* - COMMINGLED

NORTH EBOR UNIT #01 (Cont.)

BAKKEN D POOL
01 60D

DALY FIELD

Bo: = 1.05

OIL / WATER	Cum.Prod. Dec.31/90 m^3	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	FEB. Daily m^3	1991 Y.T.D. m^3	Cum. Total m^3
TUNDRA OIL AND GAS LTD. (Cont.)																
16 -14-10-29	2888.1	–	–												–	2888.1
	318.2	–	–												–	318.2
01 -23-10-29	2125.9	53.5	91.3											3.97	144.8	2270.7
	206.9	5.6	13.4												19.0	225.9
02 -23-10-29	1779.6	123.3	122.6											4.54	245.9	2025.5
	83.5	2.9	7.3												10.2	93.7
PREVIOUS PRODUCERS	–															–
	–															–
NORTH EBOR UNIT #01	17525.6		497.6													18484.7
	2780.1		62.1													2892.4
TOTAL OIL		461.5													959.1	
TOTAL WATER		50.2													112.3	

VOIDAGE - 22301.2m³

replacement - 4990 m³

VRR: .22

TUNDRA OIL AND GAS LTD.																
15 -11-10-29	1157.3	25.2	19.4											0.72	44.6	1201.9
Fr.Prov.	1538.0	73.6	68.2												141.8	1679.8
16 -11-10-29	885.8	140.8	89.1											3.30	229.9	1115.7
Prov.	1787.5	269.1	243.3												512.4	2299.9
05 -13-10-29	5454.9	209.4	209.8											7.77	419.2	5874.1
	555.0	11.8	15.8												27.6	582.6
01 -14-10-29	445.6	137.7	113.9											4.22	251.6	697.2
	108.0	17.5	8.8												26.3	134.3
07 -14-10-29	713.1	8.6	12.3											0.59	20.9	734.0
c	317.4	5.6	9.6												15.2	332.6
08 -14-10-29	1612.8	58.4	54.2											2.01	112.6	1725.4
	284.1	9.0	9.7												18.7	302.8
	10269.5		498.7													11348.3
	4590.0		355.4													5332.0
TOTAL OIL		580.1													1078.8	
TOTAL WATER		386.6													742.0	
NON-UNIT PREVIOUS PRODUCERS	–															–
	–															–
BAKKEN D POOL :	27795.1		996.3													29833.0
	7370.1		417.5													8224.4
TOTAL OIL		1041.6													2037.9	
TOTAL WATER		436.8													854.3	

BAKKEN E POOL
01 60E

NON-UNIT PREVIOUS PRODUCERS	55.5															55.5
	105.0															105.0
BAKKEN E POOL :	55.5		–													55.5
	105.0		–													105.0
TOTAL OIL		–													–	
TOTAL WATER		–													–	

Manitoba

The Oil and Natural Gas
Conservation Board

555 — 330 Graham Avenue
Winnipeg MB R3C 4E3
CANADA

(204) 945-1111
FAX: (204) 945-0586

January 27, 1994

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

Dear Mr. Czyzewski:

Re: Application to Convert to Water Injection
Tundra N. Ebor Unit No. 2 WIW 1-14-10-29 (WPM)

Your application to convert the subject well to water injection in North Ebor Unit No. 2 is hereby approved. Water injection at 1-14-10-29 is subject to the terms and conditions of Board Order No. PM 67. The maximum wellhead injection pressure is not to exceed 9000 kPa. Attached is a copy of the well operations form approved by the Petroleum Branch.

The EOR incentive for new or enlarged EOR projects was in place from January 1, 1987 to January 1, 1992. To qualify for the incentive, the EOR scheme had to be fully implemented by January 1, 1992. Therefore the 15-11, 16-11, and 13-12 wells are not eligible for an EOR incentive.

If you have any questions please contact John N. Fox, Chief Petroleum Engineer at 945-6574.

Yours respectfully,

H. Clare Moster
Deputy Chairman

cc. Well File
Virden District Office

Manitoba

Memorandum

Date January 21, 1994

To The Oil and Gas Conservation Board
David Tomasson, Chairman
H. Clare Moster, Deputy Chairman

From John N. Fox
Chief Petroleum Engineer

Telephone

Subject **North Ebor Unit No. 2**
Application to Convert 1-14-10-29 (WPM) to Water Injection

Tundra Oil and Gas Ltd. has made application to convert the well, Tundra North Ebor Unit No. 2 1-14-10-29 (WPM) to water injection.

Recommendations:

It is recommended that Tundra's application to convert the subject well be approved under Section 1 of Board Order No. PM 67. A copy of the proposed letter of approval is attached.

Discussion:

In December 1993 the Board approved the conversion of 9-14-10-29 in N. Ebor Unit No. 1 to water injection. Tundra's application to convert 1-14-10-29 to water injection in N. Ebor Unit No. 2 will create a line drive injection pattern down the centre of the Daly Bakken D Pool (see Fig. 1).

The 1-14 well has not experienced water breakthrough nor adequate pressure support from injection at 8-14-10-29 as evidenced by the low water-cut (Oct/93 - 1.1 m^3OPD at a 11% water-cut) and low reservoir pressure (3533 kPa). Tundra believes conversion of 1-14 will improve waterflood sweep efficiency in the southern portion of the unit which is not adequately supported by injection at 8-14.

The current recovery in N. Ebor Unit No. 2 is 21.1% OOIP and with the present waterflood configuration ultimate recovery of 38.9% OOIP is predicted. Tundra estimates the conversion of 1-14 to injection will result in an incremental recovery of 4580 m^3 or 3.1% OOIP primarily from the 15-11, 16-11, 13-12 and 4-13 wells. Tundra has based its incremental recovery estimate on a relative permeability study in the Daly Bakken A Pool and detailed waterflood performance of the unit.

There is no need to advertise the application as all royalty and working interest owners within 0.5 km of 1-14 are participants in the unit.

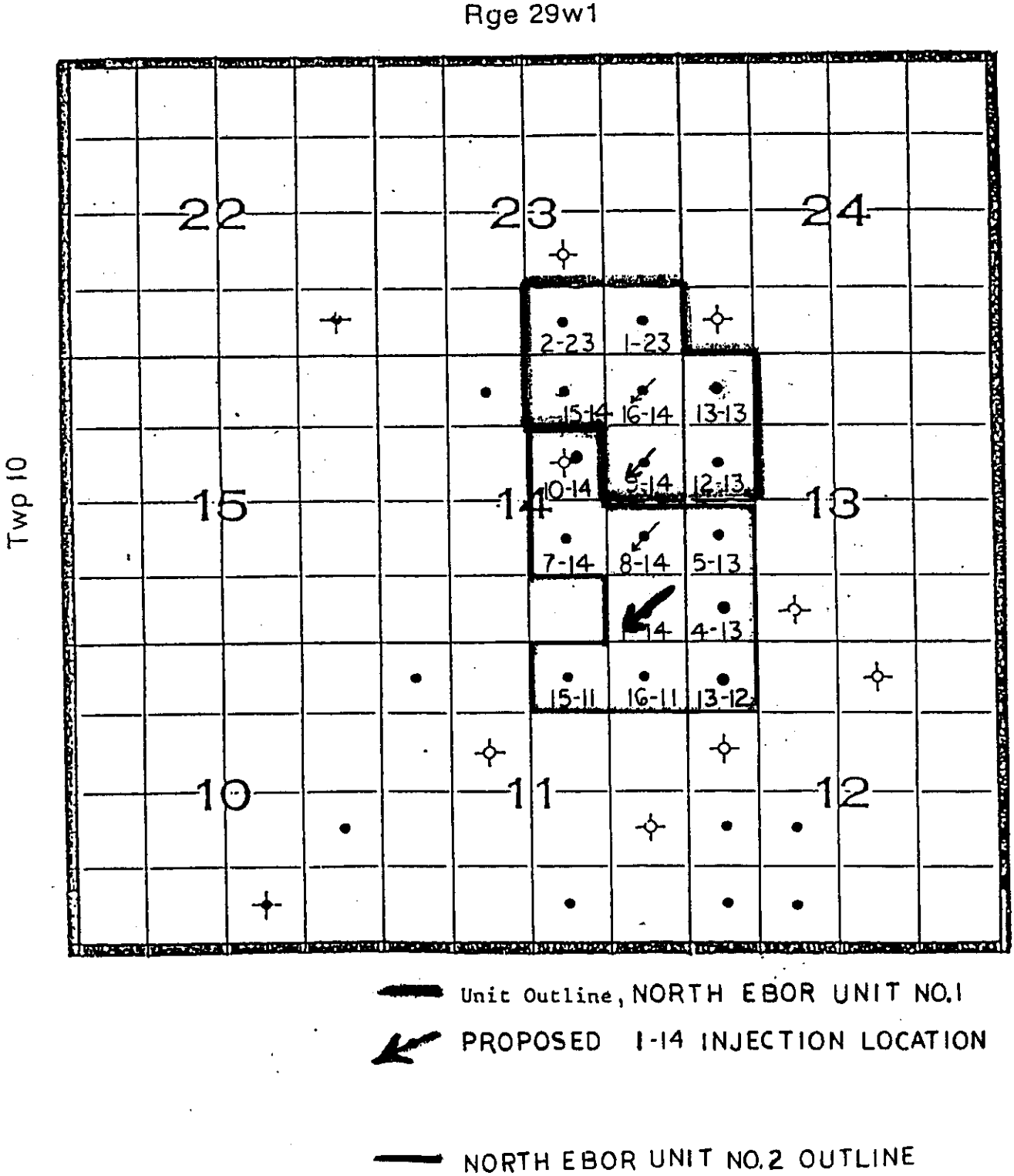
John N. Fox

Recommended for Approval: _____
L.R. Dubreuil, Director

First | Fold

PS-1-25 894-01-00930

FIGURE NO. 1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5-13
4-13
15-11
16-11
13-12
Unit Outline, NORTH EBOR UNIT NO.1
PROPOSED 1-14 INJECTION LOCATION
NORTH EBOR UNIT NO.2 OUTLINE

Manitoba

Memorandum

Date January 21, 1994

To The Oil and Gas Conservation Board
David Tomasson, Chairman
H. Clare Moster, Deputy Chairman

From John N. Fox
Chief Petroleum Engineer

Telephone

Subject **North Ebor Unit No. 2**
Application to Convert 1-14-10-29 (WPM) to Water Injection

Tundra Oil and Gas Ltd. has made application to convert the well, Tundra North Ebor Unit No. 2 1-14-10-29 (WPM) to water injection.

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There is no need to advertise the application as all royalty and working interest owners within 0.5 km of 1-14 are participants in the unit.

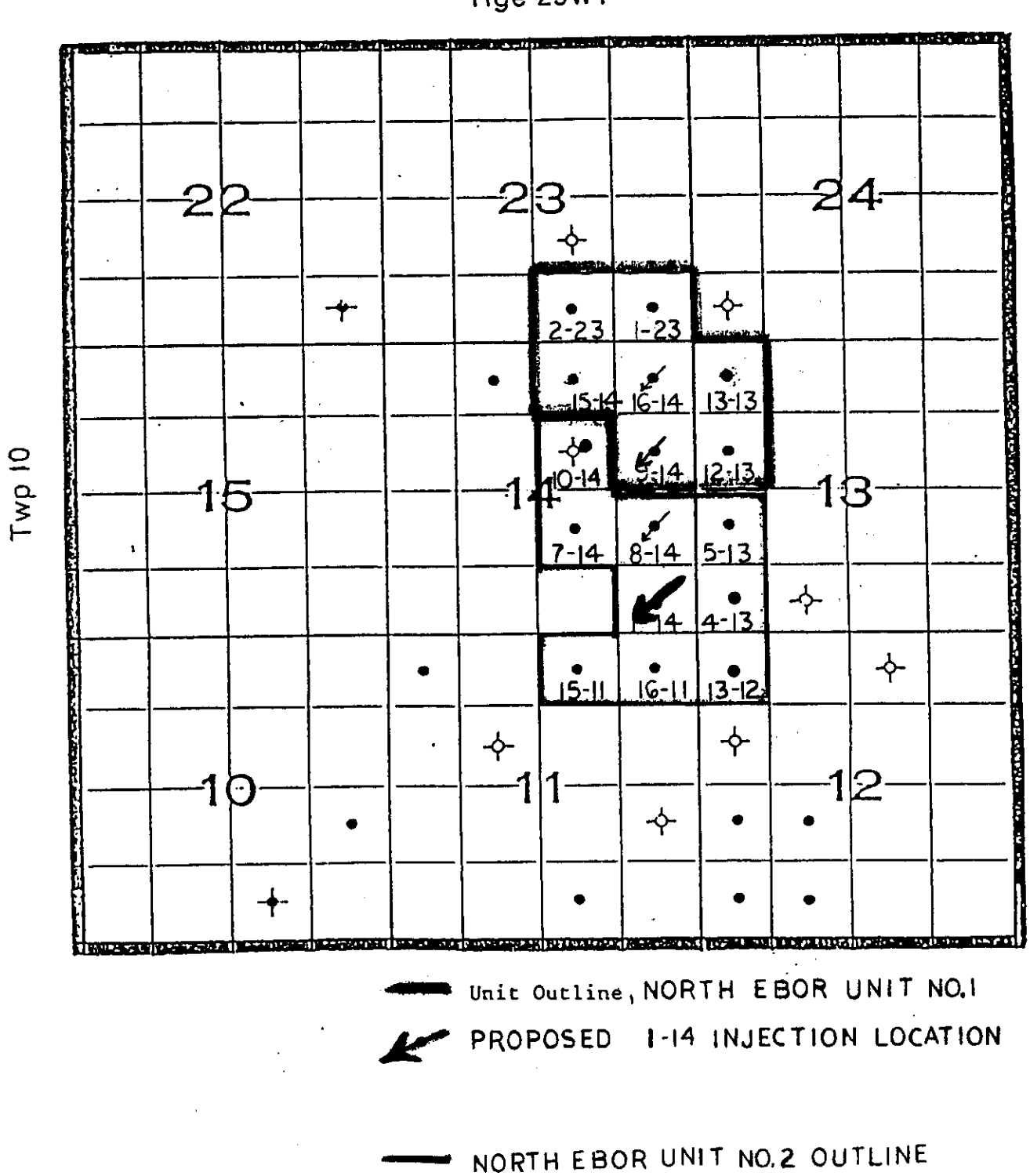
John N. Fox

Recommended for Approval: _____
L.R. Dubreuil, Director

First | Fold

PS-1-25 894-01-00930

FIGURE NO. 1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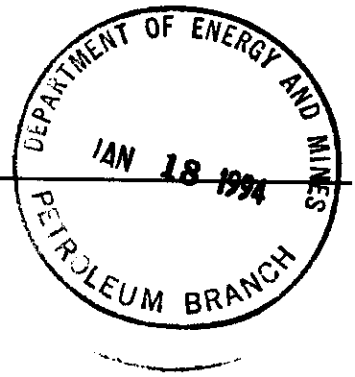
16-11
13-12
Unit Outline, NORTH EBOR UNIT NO.1
PROPOSED 1-14 INJECTION LOCATION
NORTH EBOR UNIT NO.2 OUTLINE

Tundra oil and gas ltd.



January 17, 1994

Manitoba Energy and Mines
Petroleum Branch
555 - 330 Graham Avenue
Winnipeg, Manitoba
R3C 4E3

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

Dear Mr. Fox,

RE: North Ebor Unit No.2
Application to Convert 1-14-10-29 W1M to Injection Service

INTRODUCTION

The referenced application represents Tundra's continuing efforts to maximize oil recovery from our waterflood operation in the Bakken 'D' Pool. Waterflood operations were initiated in the North Ebor Unit No.2 in October, 1991. Oil recovery to November 30, 1993 is estimated at 21.1 % of the total original oil-in-place. The total average daily oil production in the Unit during November, 1993 was 13 m3/day at a watercut of 72.5% (refer to Figure No.1). Currently, only well 10-14-10-29 has indicated water breakthrough, quite likely from non-Unit injection well 16-14-10-29.

Tundra's objectives to convert 1-14-10-29 to injection service parallels the scope of our recently approved program at well 9-14-10-29 (new injector in North Ebor Unit No.1), and are as follows:

1. Improve recovery of bypassed oil in LSD 1-14-10-29 and in the surrounding LSD's.

2. Improve pressure maintenance in the LSD's along the southern boundary of the North Ebor Unit No.2., which in our opinion are not currently receiving pressure support from injection well 8-14-10-29.

3. Improve cumulative voidage replacement in the entire Unit.

4. Reduce the injection pressure load on the existing injection well at 8-14-10-29.

Tundra has notified in writing the surface owner in LSD

1111 - One Lombard Place, Winnipeg, Manitoba R3B 0X4 Telephone: (204) 934-5850 Fax: (204) 934-5820

1-14-10-29, and the mineral owner in 2-14-10-29 (waiver of objection) of our intentions to convert well 1-14-10-29 to injection service.

LAND

Figure No.2 outlines the North Ebor Unit No.2 land area and the location of the new injection well.

GEOLOGY

A reservoir fence diagram was prepared to determine the connectivity between wells in the Bakken 'D' Pool. Tundra's analysis indicates that proposed injection well 1-14-10-29 is the most attractive to further improve recovery in the North Ebor Unit No.2. The 1-14-10-29 location has greater reservoir sweep exposure than any of the other locations in the southern sector of the Unit. Well 1-14-10-29 will also provide injection support to the producers on the southern boundary of the Unit, which are presently not being affected by injection well 8-14-10-29. Appendix A outlines the reservoir fence diagram for the Bakken 'D' Pool.

PRODUCTION PERFORMANCE

The production history for the Unit is outlined in Figure No.1. Peak oil production of 26.5 m3/day occurred in the Unit during mid 1991. Oil production capability has declined since then about 22% / year.

Waterflood operations arrested the production decline during the period between late, 1991 and early, 1993. Production capability began to decline more significantly after the first quarter of 1993. This sharp oil production decline is attributable to the beginning of water breakthrough at well 5-13, and an increase in the watercut at well 13-12 during the month of November, 1993. Oil production capability has declined about 36% during the period between April to November, 1993.

A review of waterflood performance in the Unit indicates that incremental oil recovery has primarily been achieved in Unit wells 4-13, 5-13, and 9-14 (North Ebor Unit No.1). There has been minimal to no waterflood support provided to the other Unit wells by injection well 8-14-10-29.

Appendix B outlines the production histories of the individual wells in the North Ebor Unit No.2.

PRESSURE HISTORY

A review of the pressure history in the Unit was undertaken to further predict waterflood sweep trends in the Unit. A review of the DST at well 4-13 indicates that there had been significant drainage from well 5-13 to the north, prior to the drilling of well 4-13. The static extrapolated reservoir pressure at 4-13 from the DST was 4255 kPa (refer to Appendix C). This represents a significant decline from the original reservoir pressure of about 8600 kPa (refer to DST for well 15-11 in Appendix C). This suggests that there is a preferential flow path between wells 5-13 and 4-13. More recently, a pressure buildup done at well 1-14 in 1992 suggests that there has been minimal pressure support directed towards this location from injection well 8-14. After a shut-in period of 3 months, the 1-14 shut-in static pressure was only 3533 kPa (refer to Appendix C). A pressure fall-off test completed in 1993 at injection well 8-14 indicates that there has primarily been re-pressurization within the 8-14 LSD. The pressure fall-off test at 8-14 indicates that the average static pressure is about 6200 kPa (refer to Appendix C).

In summary, the available pressure history suggests that a strategy for waterflooding and pressure maintenance is required for the southern sector of the Unit. Waterflooding and pressure maintenance to date has been realized primarily at wells 4-13 and 5-13. On this basis, conversion of either 4-13 or 5-13 to injection service would provide minimal incremental recovery or pressure maintenance in the southern sector of the Unit, since there is a preferential flow path between these two locations. As a result, well 1-14 is a better candidate well to improve waterflood recovery at wells 15-11, 16-11, and 13-12.

RESERVES

Tables No.1 and No.2 outline the volumetric reserve estimates for the Bakken 'D' Pool lower and upper zones in the Unit, respectively. Total original oil-in-place is estimated at 149,651 m3 (941,300 STB) in the North Ebor Unit No.2.

RECOVERY PROFILES

Table No.3 outlines the current recovery profiles for the Unit to 93.11.30. Current total Unit recovery is estimated at 21.1% of the total original oil-in-place. Total remaining proved producing oil is estimated at 167,700 STB without further optimization.

The methodology that was used to determine the current and ultimate recovery profiles in the Unit commenced with first a volumetric estimate of the original oil-in-place in each LSD in the Unit. Log and core data was used to estimate porosity and net pay at each well location. An initial formation water saturation of 57.8% (from relative permeability study) was assigned to the lower Bakken zone, and an initial formation water saturation of 60% (from open-hole logs) to the upper Bakken zone. An adjustment was also made in the previously mentioned initial water saturations in wells indicating high ultimate recovery factors. As is outlined in Tables No.1 and No.2, the total original oil-in-place in the lower and upper zones is estimated at 101,980 m3 and 47,671 m3, respectively.

The next step in the process was to estimate the ultimate recovery for each well based on decline analysis. A plot of the ultimate recovery estimated from each well is presented in Appendix D. As a final check, all the production data was aggregated to obtain an ultimate recovery using decline analysis and compared to the sum of the individual well ultimate recovery estimates. Figure No.3 outlines the ultimate recoverable oil with current waterflood performance. There was a good correspondence between the two aforementioned methods in estimating ultimate recoverable oil from the Bakken formation in the North Ebor Unit No.2.

Current recovery factors (to 93.11.30) were then calculated for both the lower zone, and for the total oil-in-place. The two current recovery scenarios are presented in Table No.3. The first scenario considered that only oil from the lower Bakken zone was recoverable in the Unit. The second scenario included recovery from both the upper and lower Bakken zones. Oil recovery was considered possible from the upper Bakken zone, since well 15-11-10-29 has only upper Bakken horizon and has recovered 1828.9 m3 to 93.11.30. Although it is speculative to assign significant recovery from the upper Bakken zone, there is some contribution being provided by this layer, especially since the majority of the Bakken wells have been hydraulically fractured. If oil recovery is only occurring from the lower Bakken zone, the current recovery from this layer is estimated at 31.0 % of the oil-in-place. Oil contribution from both the upper and lower Bakken zones results in a lower current recovery factor of 21.1 % of the oil-in-place.

A note is also in order as to what the ultimate theoretical recovery should be for the Bakken reservoir with waterflooding. A relative permeability study was completed for the Bakken formation in the Kola Unit No.1 during 1993. An ultimate recovery of 53% of the original oil-in-place was obtained with the core flooding method. The majority of the core sample that was used in the study was representative of

the lower Bakken zone. However, as previously outlined, a certain percentage of the upper Bakken horizon may have recoverable oil with waterflooding, especially if primary recovery has already been demonstrated in the North Ebor Unit No.2 from the upper zone. On this basis, an ultimate recovery factor of up to 53 % of the oil-in-place was considered possible from the lower Bakken reservoir with waterfloding, and a nominal incremental recovery of up to 5% of the oil-in-place from the upper Bakken zone may be possible with waterflooding. If a well indicated a significantly higher recovery than 53 % of the oil-in-place from the lower Bakken zone with waterflooding, this was attributed to drainage of oil reserves from offset LSD's. This is especially evident at well 5-13 which indicates a current recovery factor from the lower zone in excess of 100%, and an ultimate recovery factor of 84% of the total oil-in-place. The pressure history in LSD 4-13-10-29 further supports that well 5-13 has drained a greater proportion of the oil reserves from LSD 4-13. In addition, the remaining reserves in LSD 8-14 have also been primarily swept towards LSD's 4-13 and 5-13. This preferential sweep direction would also account for the high recovery at well 5-13.

INCREMENTAL RECOVERY

The incremental oil recovery expected by converting well 1-14 to injection service will be primarily captured at wells 15-11, 16-11, 13-12, and 4-13-10-29. LSD 1-14 currently has only primary recovery based on recent pressure surveys and the ultimate recovery expected at this location (refer to Table No.3). Incremental reserves of 17,000 STB (2,730 m3) are estimated to be recovered from LSD 1-14 by the offset wells with the conversion of 1-14 to injection service. This estimate was determined by assigning a maximun recovery of 53 % of the oil-in-place from the lower Bakken zone with waterflooding. Ultimate primary reserves were deducted to obtain the incremental oil recoverable from LSD 1-14 with waterflooding. A further adjustment was made to account for sweep efficiency (maximum 75% of reservoir area in LSD 1-14). In addition, proposed injector 1-14 will provide waterflood recovery to the north half of LSD's 15-11, 16-11, and 13-12-10-29. Incremental recovery from LSD 15-11 (based on incremental recovery factor of 5 % of oil-in-place with waterflooding upper Bakken zone) is estimated at 2,400 STB (380 m3). The waterflood recovery estimate in LSD 15-11 recognizes only that the north half of this LSD will be impacted by injection well 1-14. Similarly, using the aforementioned methodology in LSD 16-11, incremental oil recovery of 9,400 STB (1500 m3) is estimated with waterflooding. Although LSD 13-12 will benefit in terms of recovery and pressure maintenance from injector 1-14, incremental waterflood recovery has not been estimated due

to the high primary recovery already expected from well 13-12. The high primary recovery may be attributable to drainage of primary reserves from offsetting spacing units, and possibly contribution of oil recovery from the upper Bakken zone. The 13-12 well has a thick upper Bakken section, and incremental waterflood reserves will be estimated after waterflood response becomes evident at this location from injector 1-14.

Total incremental oil recovery of 28,800 STB (4,580 m3) is estimated by converting 1-14-10-29 to injection service.

INJECTOR SELECTION PROCESS

The following criteria (ranked in decending order of importance) were used to screen existing producing wells as injector candidates:

1. Good reservoir connectivity with offset producers (refer to Appendix A).

2. Bypassed oil remaining in spacing units or minimal waterflood support currently being provided by existing injection well.

3. Minimization of oil migration out of the Unit where there are no producers to capture the incremental oil with further waterflood optimization. This criteria also addressed whether there was further opportunity to drill additional wells outside the current Unit boundaries.

The current waterflood pattern in the North Ebor Unit No.2 is an inverted 9-spot. The next logical step is to consider installing an inverted 5-spot in the Unit. An inverted 5-spot grid was developed for the entire Bakken 'D' Pool as is outlined in Figure No.4. The only wells in the North Ebor Unit No.2 that would satisfy the inverted 5-spot configuration are 16-11, 4-13, and 10-14-10-29. Since all the potential candidate locations were edge wells, this was not considered a viable option at this time due to the possibilty of sweeping reserves out of the Unit with no further identifiable development drilling locations. Well 1-14-10-29 was the only location that satisfied Tundra's aforementioned criteria for providing further waterflood recovery in the Unit. The reservoir fence diagram in Appendix A, and the ultimate recovery profiles presented in Table No.3 support our decision.

The conversion of 1-14-10-29 to injection service will result in a line drive centrally located in the Bakken 'D' Pool. This waterflood scheme will essentially sweep oil to

the wells located on the eastern and western boundaries of the North Ebor Units No.1 and No.2.

ROYALTY INCENTIVE STATUS

The Crown in 1991 did not recognize Tundra's application for royalty incentive status to be extended to all wells in the North Ebor Unit No.2, since the wells in LSD's 15-11, 16-11, and 13-12 were not part of a formal waterflood pattern. Tundra's current waterflood optimization program will provide incremental recovery and pressure maintenance in wells 15-11, 16-11, and 13-12, and on this basis, the royalty status of these wells should be reviewed.

In accordance with your letter dated December 16, 1991 pertaining to EOR incentives (refer to Appendix E), Tundra requests that with the conversion of the 1-14-10-29 well to injection service, a royalty incentive be granted to wells 15-11, 16-11, and 13-12 as was previously provided to the other Unit wells. The 15-11, 16-11, and 13-12 wells will now be part of a formal injection pattern, and one LSD from an injection well (1-14-10-29).

WATER INJECTION SERVICE COMPLETION

Figure No.5 outlines the proposed down-hole configuration for placing 1-14-10-29 into injection service.

Tundra Oil and Gas Ltd. would prefer to begin converting 1-14-10-29 to injection service by mid - February, 1994, and any further assistance that Tundra can provide to expedite approval of this application will be made available from our office. Should you have any questions, I can be reached at 934-5853.

Respectfully submitted,

TUNDRA OIL AND GAS LTD

George Czyzewski, P.Eng.
Senior Reservoir Engineer

FIGURE NO.1

NORTH EBOR UNIT NO.2 PRODUCTION HISTORY

PRODUCTION TO 93.11.30

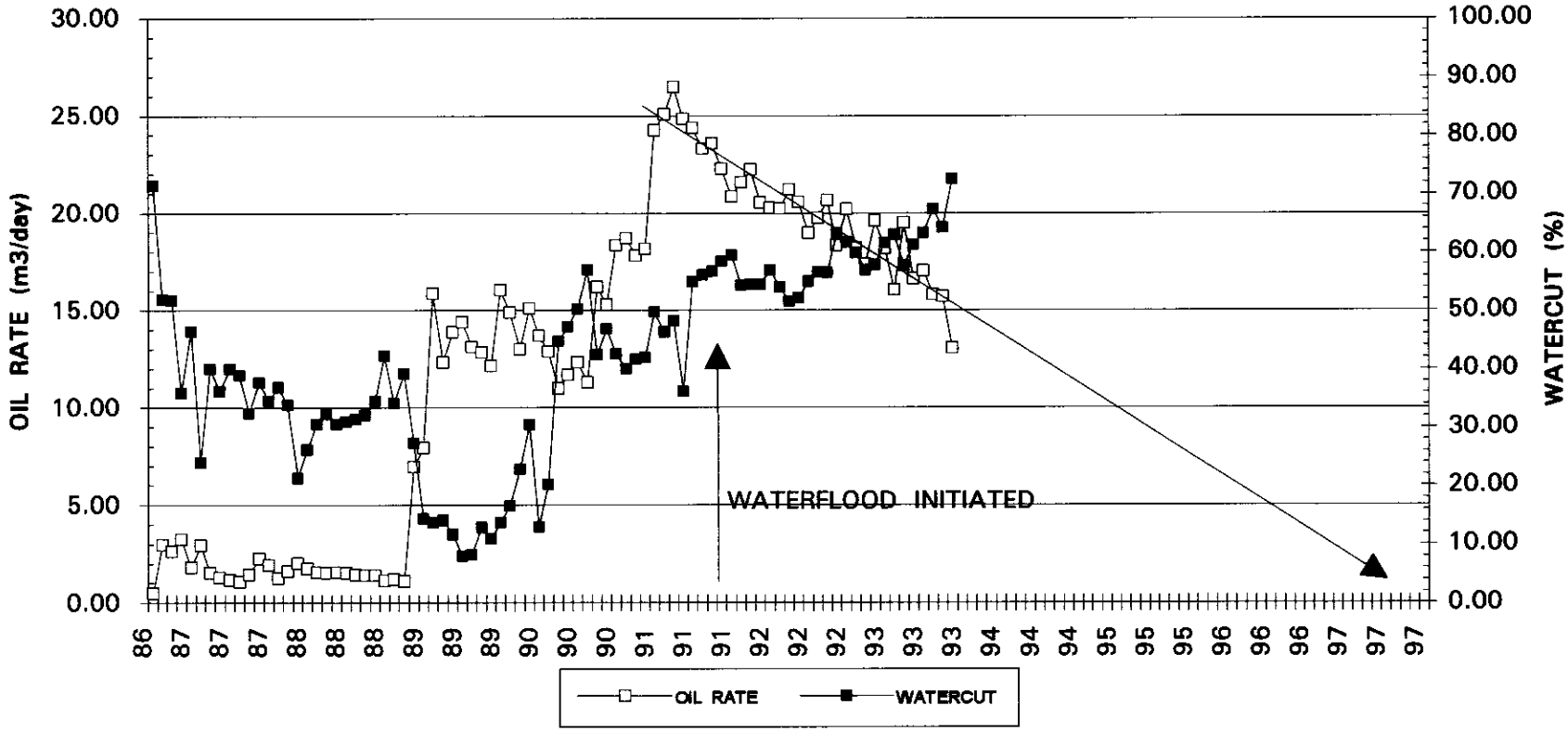
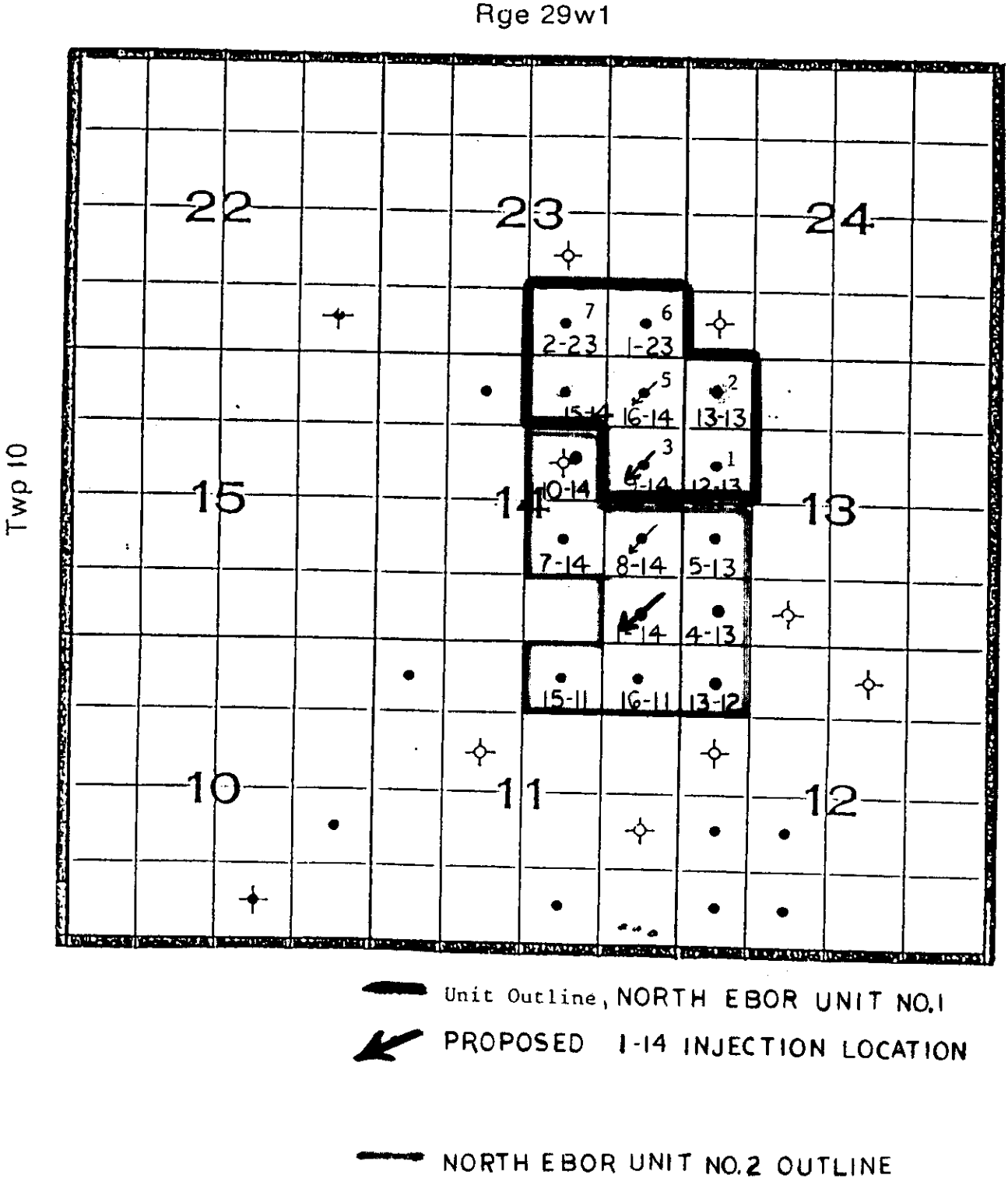


FIGURE NO. 2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4-13
15-11
16-11
13-12
Unit Outline, NORTH EBOR UNIT NO.1
PROPOSED 1-14 INJECTION LOCATION
NORTH EBOR UNIT NO.2 OUTLINE

FIGURE NO.3

NORTH EBOR UNIT NO.2 REMAINING PROVED PRODUCING RESERVES

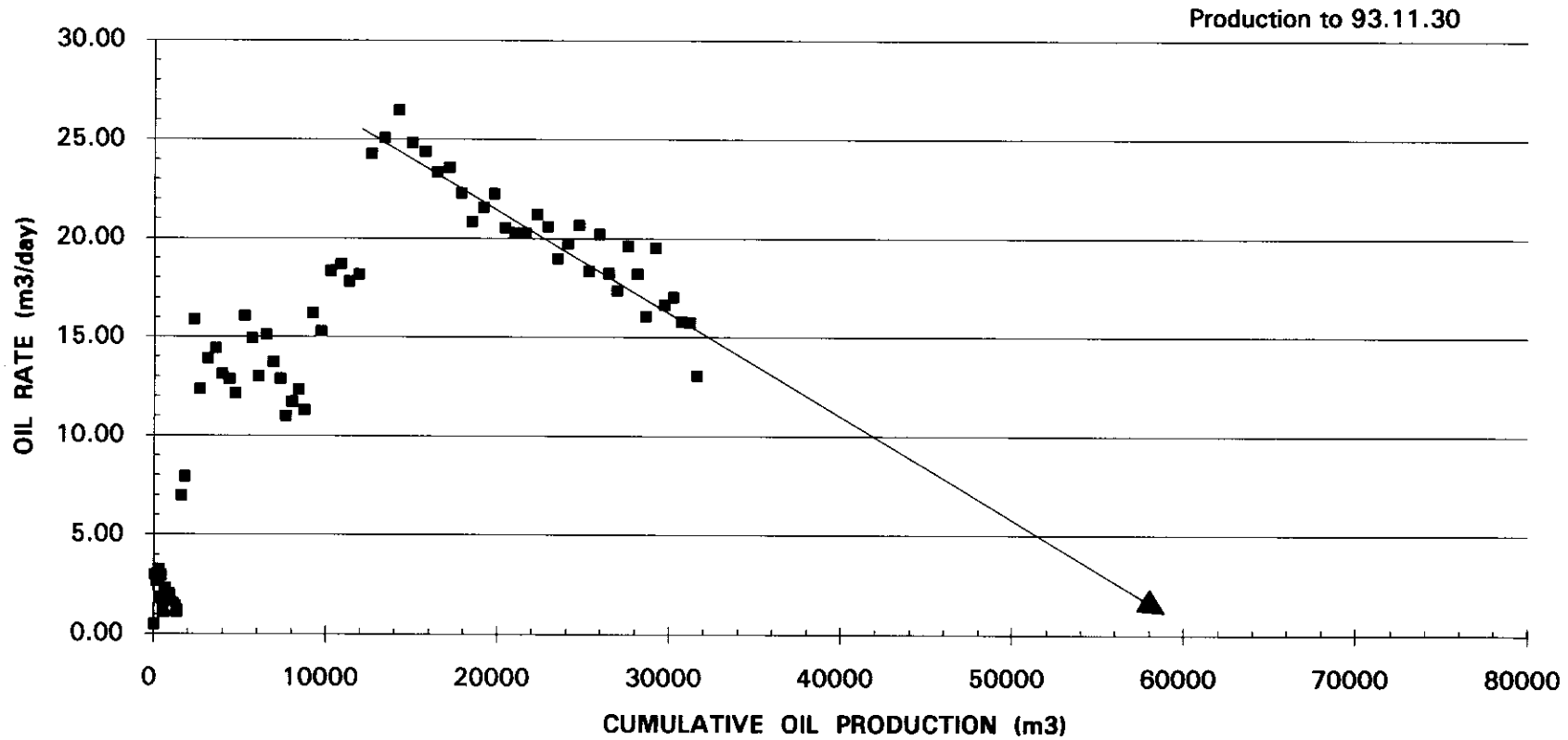
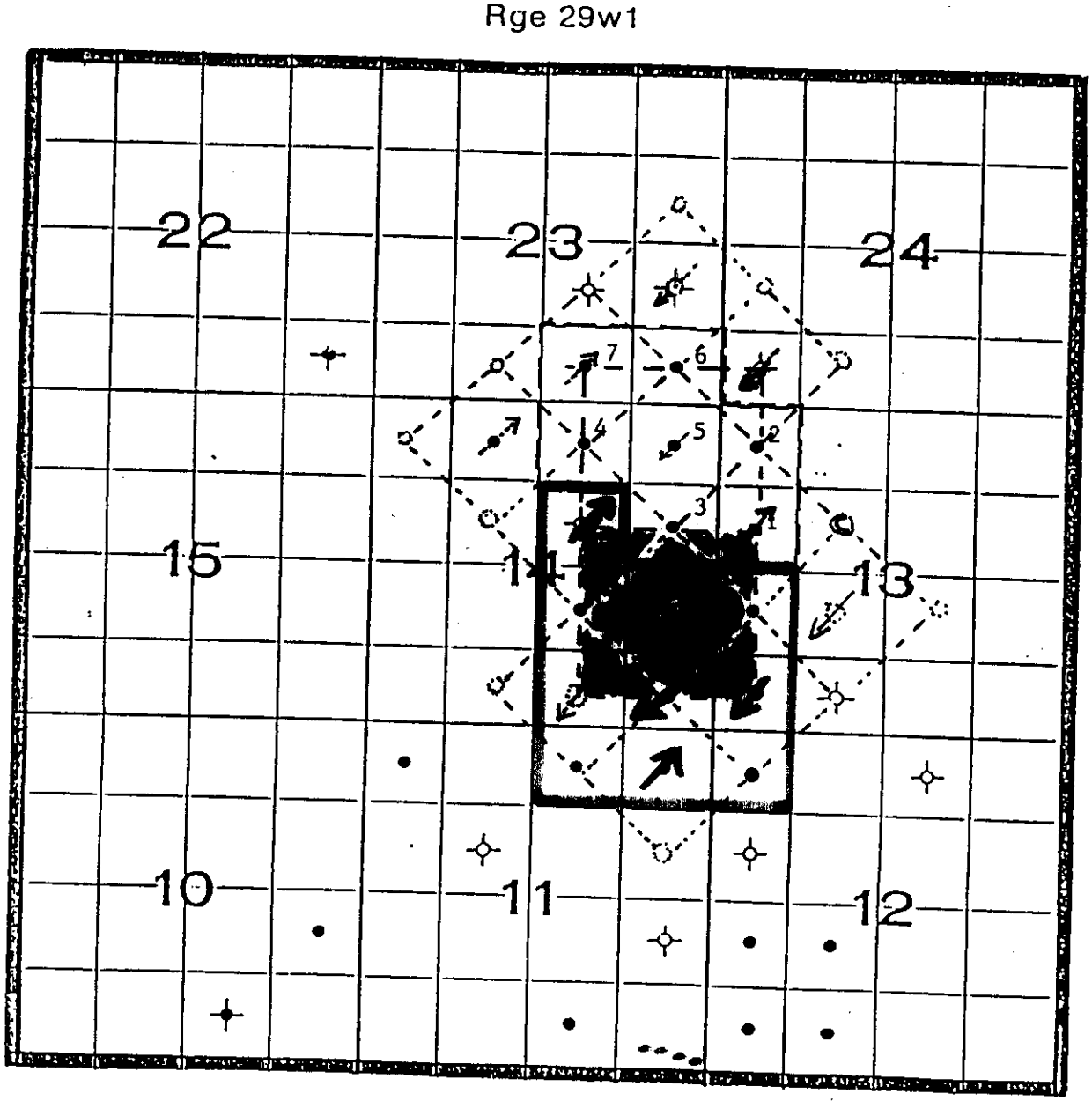


FIGURE NO. 4

INVERTED 5-SPOT FLOOD PATTERN



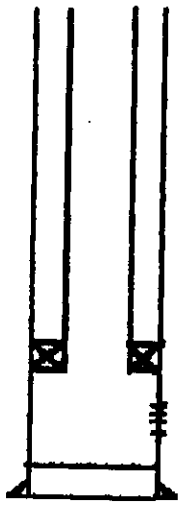
NORTH EBOR UNIT NO.2

PROPOSED 1-14 INJECTOR

POTENTIAL INJECTORS FOR 5-SPOT FLOOD PATTERN

FIGURE NO.5

PROPOSED CONVERSION TO WATER INJECTION
TUNDRA DALY 1-14-10-29 W1M



ANNULUS FILLED WITH INHIBITED FRESH WATER

INTERNALLY COATED 60.3 MM TBG

114.3 MM CASING

COATED AD-1 TENSION PACKER SET AT 845 M

BAKKEN PERFORATIONS 857.0-869.5 M

P.B.T.D. 864.8 M

TABLE NO.1

NORTH EBOR UNIT NO.2

ORIGINAL OIL-IN-PLACE ESTIMATES

Lower Zone

Well	Constant	Area (hectares)	Net Pay (m)	Porosity (%)	Sw (fraction)	(1-Sw) (fraction)	Boi (Rm3/m3)	OOIP (m3)	OOIP (STB)
15-11-10-29	10,000.00	16.19	0.00	0.00	0.578	0.422	1.06	0	0
16-11-10-29	10,000.00	16.19	0.80	0.15	0.350	0.650	1.06	11,880	74,724
13-12-10-29	10,000.00	16.19	1.00	0.16	0.350	0.650	1.06	15,840	99,632
4-13-10-29	10,000.00	16.19	1.20	0.27	0.350	0.650	1.06	32,075	201,754
5-13-10-29	10,000.00	16.19	0.80	0.14	0.350	0.650	1.06	10,692	67,251
1-14-10-29	10,000.00	16.19	1.20	0.16	0.578	0.422	1.06	12,340	77,621
7-14-10-29	10,000.00	16.19	0.20	0.12	0.578	0.422	1.06	1,543	9,703
8-14-10-29	10,000.00	16.19	0.90	0.18	0.578	0.422	1.06	10,412	65,493
10-14-10-29	10,000.00	16.19	0.80	0.14	0.578	0.422	1.06	7,199	45,279
Totals								101,980	641,456

TABLE NO.2

NORTH EBOR UNIT NO.2

ORIGINAL OIL-IN-PLACE ESTIMATES

Upper Zone

Well	Constant	Area (hectares)	Net Pay (m)	Porosity (%)	Sw (fraction)	(1-Sw) (fraction)	Boi (Rm3/m3)	OOIP (m3)	OOIP (STB)
15-11-10-29	10,000.00	16.19	1.80	0.14	0.600	0.400	1.06	15,352	96,566
16-11-10-29	10,000.00	16.19	0.00	0.00	0.000	1.000	1.06	0	0
13-12-10-29	10,000.00	16.19	1.20	0.13	0.600	0.400	1.06	9,504	59,779
4-13-10-29	10,000.00	16.19	0.00	0.00	0.600	0.400	1.06	0	0
5-13-10-29	10,000.00	16.19	0.70	0.13	0.400	0.600	1.06	8,316	52,307
1-14-10-29	10,000.00	16.19	0.60	0.13	0.600	0.400	1.06	4,752	29,890
7-14-10-29	10,000.00	16.19	0.40	0.12	0.600	0.400	1.06	2,924	18,394
8-14-10-29	10,000.00	16.19	0.80	0.14	0.600	0.400	1.06	6,823	42,918
10-14-10-29	10,000.00	16.19	0.00	0.00	0.600	0.400	1.06	0	0
Totals								47,671	299,853

TABLE NO.3

North Ebor Unit No.2

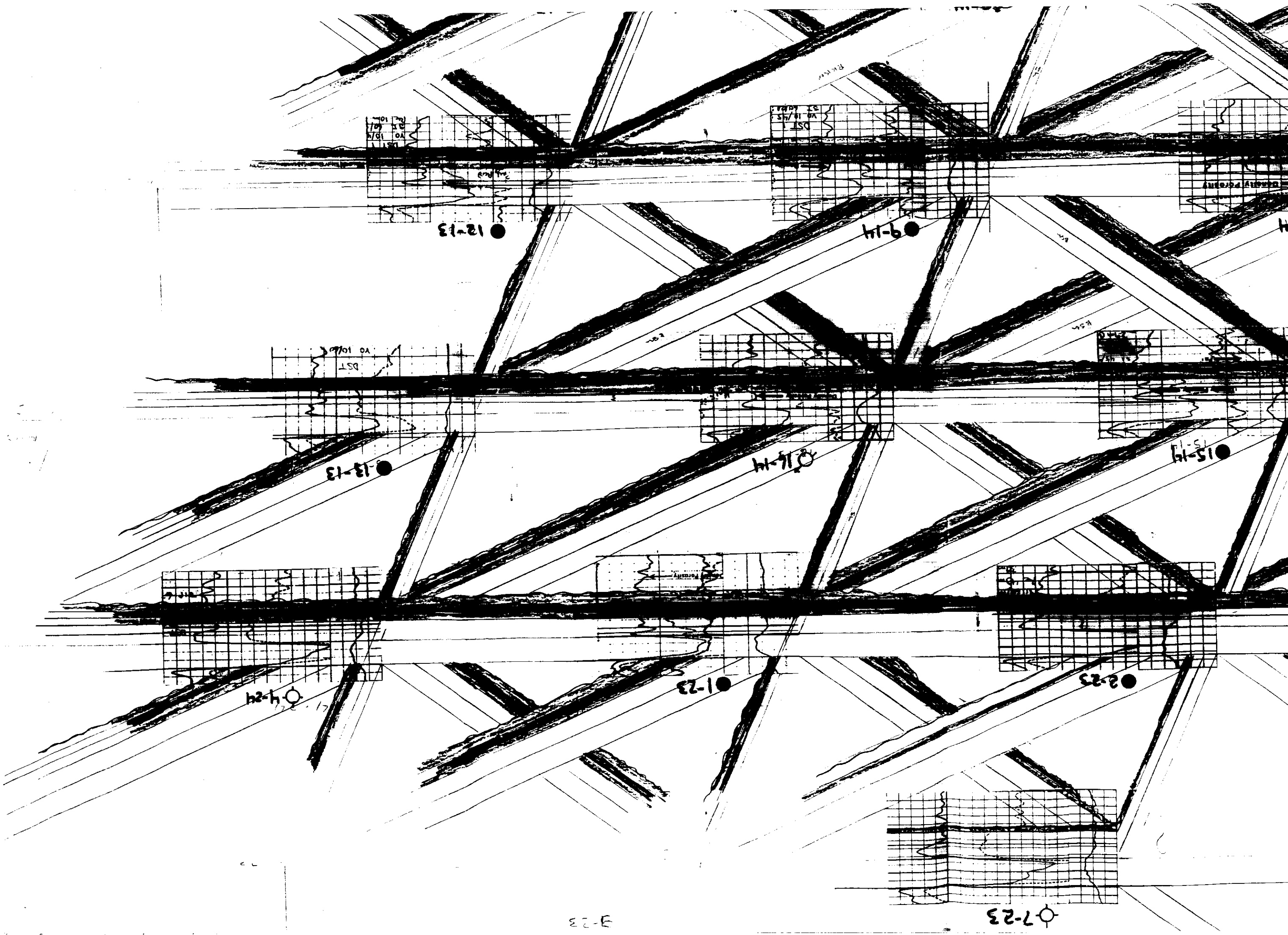
Recovery Profiles

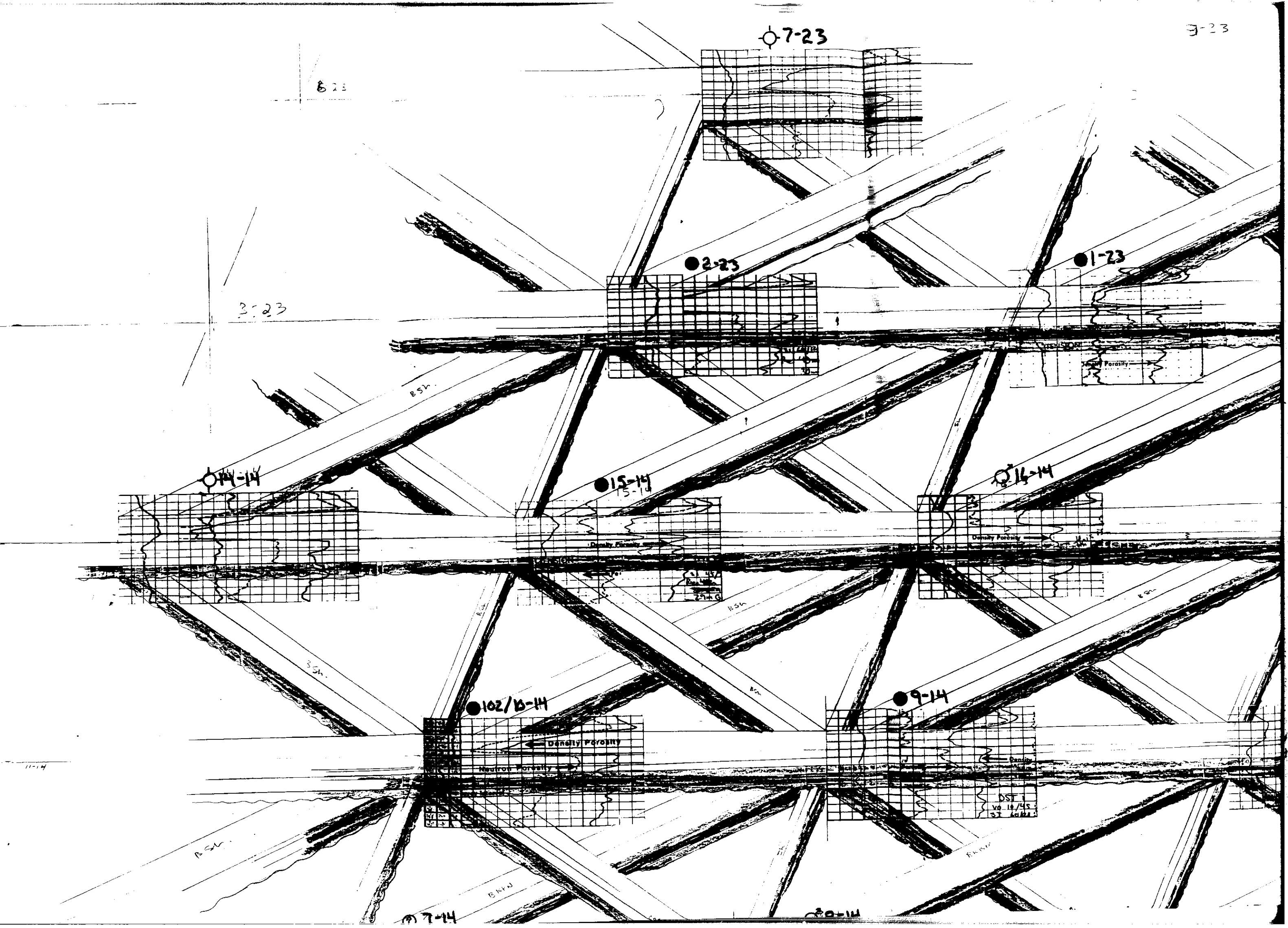
Well	Cum. Prod. to Nov.30/93 (m3)	Cum. Prod. to Nov.30/93 (STB)	Lower Zone OOIP (STB)	Upper Zone OOIP (STB)	Total OOIP (STB)	Ultimate Recoverable Oil (STB)	Remaining Recoverable Oil (STB)	Current Recovery Factor Lower Zone Only (%)	Current Rec. Fac. Lower & Upper Zone (%)	Ultimate Rec. Fac. Lower & Upper Zone (%)
15-11-10-29	1,828.90	11,503.78	0	96,566	96,566	24,530	13,026	-	11.91	25.40
16-11-10-29	2,811.90	17,686.85	74,724	0	74,724	20,760	3,073	23.67	23.67	27.78
13-12-10-29	4,158.00	26,153.82	99,632	59,779	159,411	88,060	61,906	26.25	16.41	55.24
4-13-10-29	4,341.20	27,306.15	201,754	0	201,754	54,100	26,794	13.53	13.53	26.81
5-13-10-29	11,542.10	72,599.81	67,251	52,307	119,558	100,640	28,040	107.95	60.72	84.18
1-14-10-29	2,341.00	14,724.89	77,621	29,890	107,510	18,240	3,515	18.97	13.70	16.97
7-14-10-29	1,032.90	6,496.94	9,703	18,394	28,096	8,200	1,703	66.96	23.12	29.19
8-14-10-29	2,080.20	13,084.46	65,493	42,918	108,411	42,436	29,352	19.98	12.07	12.07
10-14-10-29	1,457.70	9,168.93	45,279	0	45,279	9,435	266	20.25	20.25	20.84
Totals	31,593.90	198,725.63	641,456	299,853	941,309	366,401	167,676	30.98	21.11	38.92

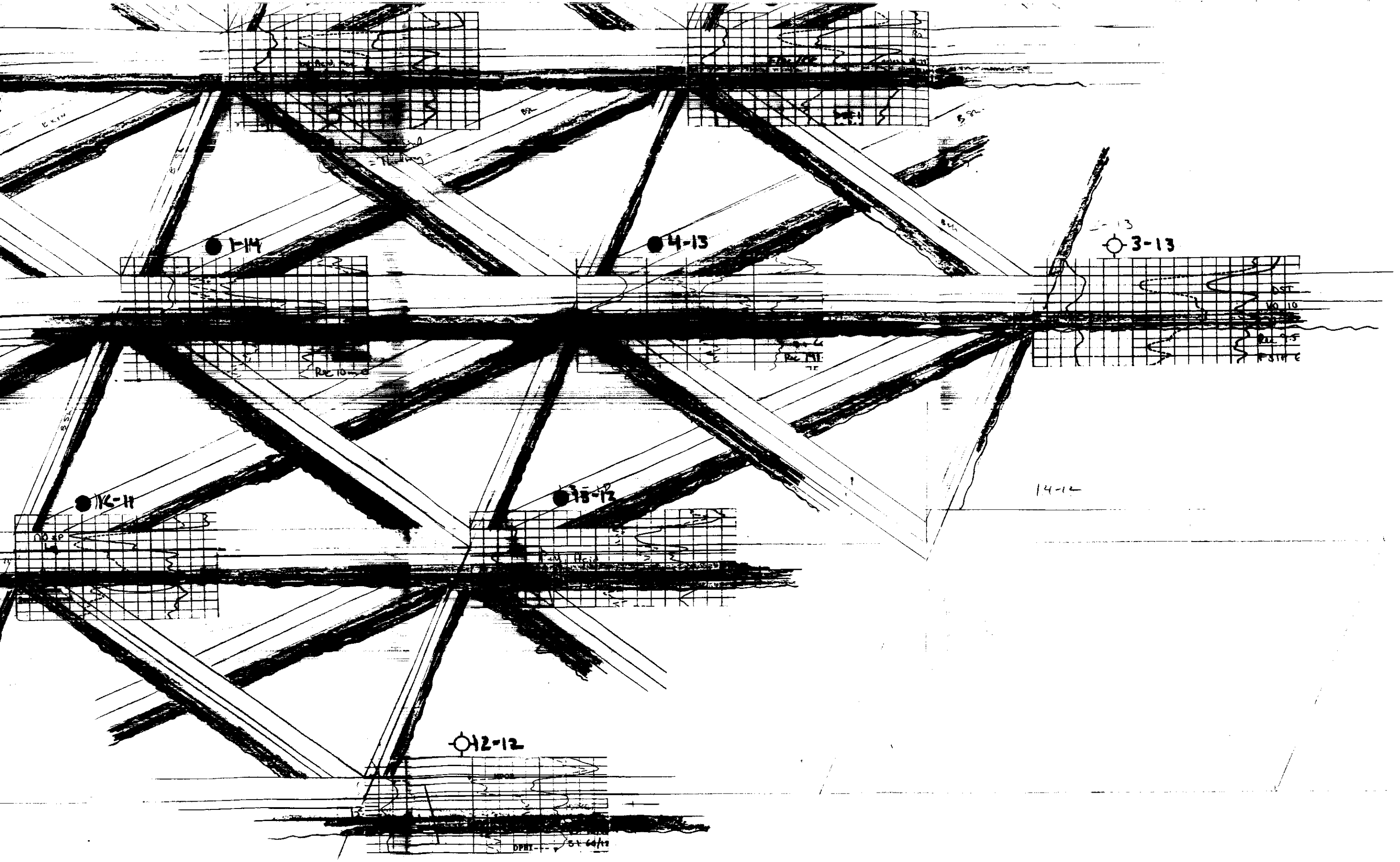
NOTE: RECOVERY PROFILES DO NOT INCLUDE INCREMENTAL RESERVES WITH INSTALLATION OF 1-14-10-29 AS AN INJECTOR

APPENDIX A

BAKKEN 'D' POOL RESERVOIR FENCE DIAGRAM


12-13
9-14
13-13
14-14
15-14
1-23
2-23
4-24
7-23

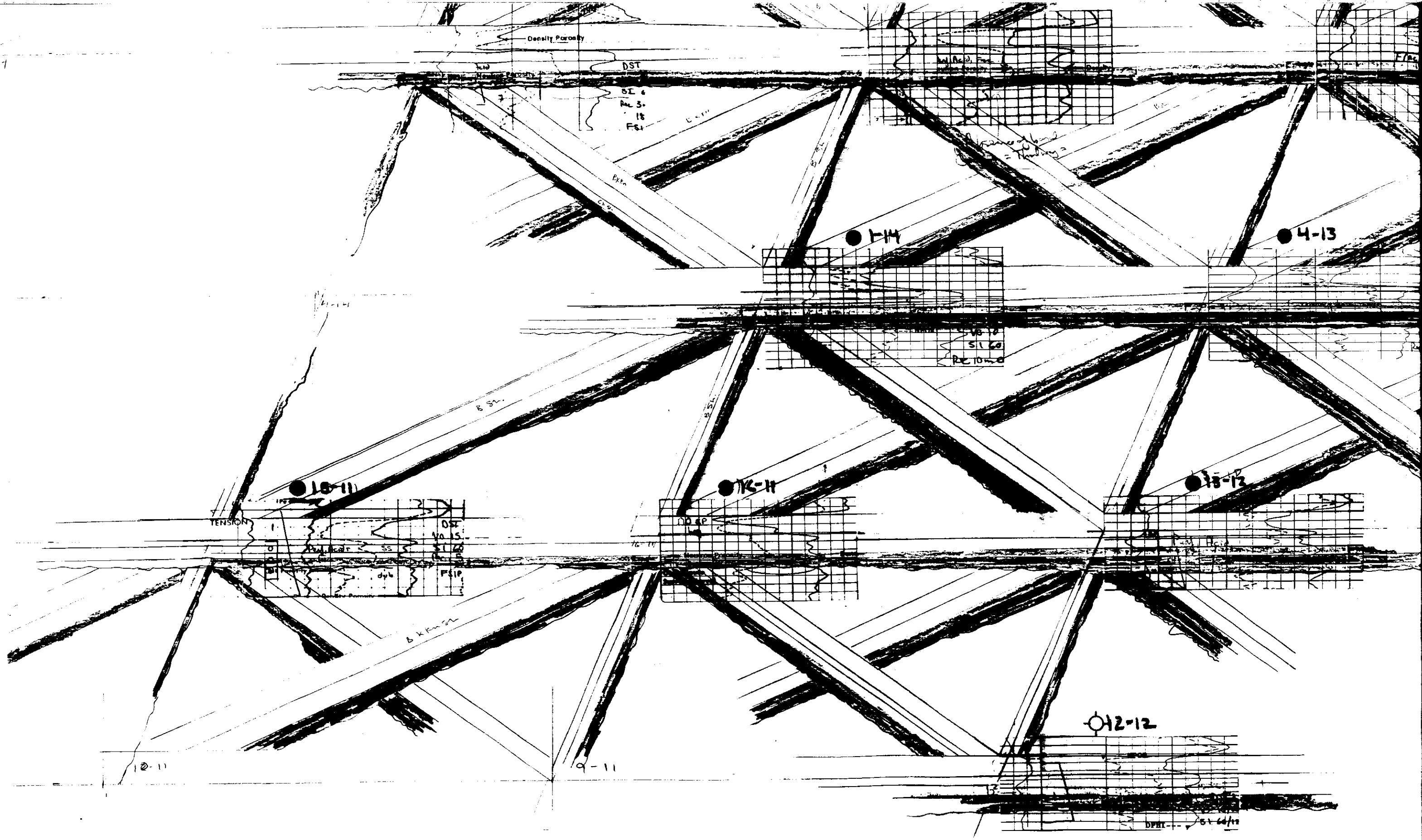

7-23
2-23
1-23
14-14
15-14
16-14
102/15-14
9-14
7-14
Density Porosity
Neutron Porosity
DST



IR FENCE DIAGRAM

LOWER ZONE

UPPER ZONE



BAKKEN 'D' POOL RESERVOIR FENCE DIAGRAM

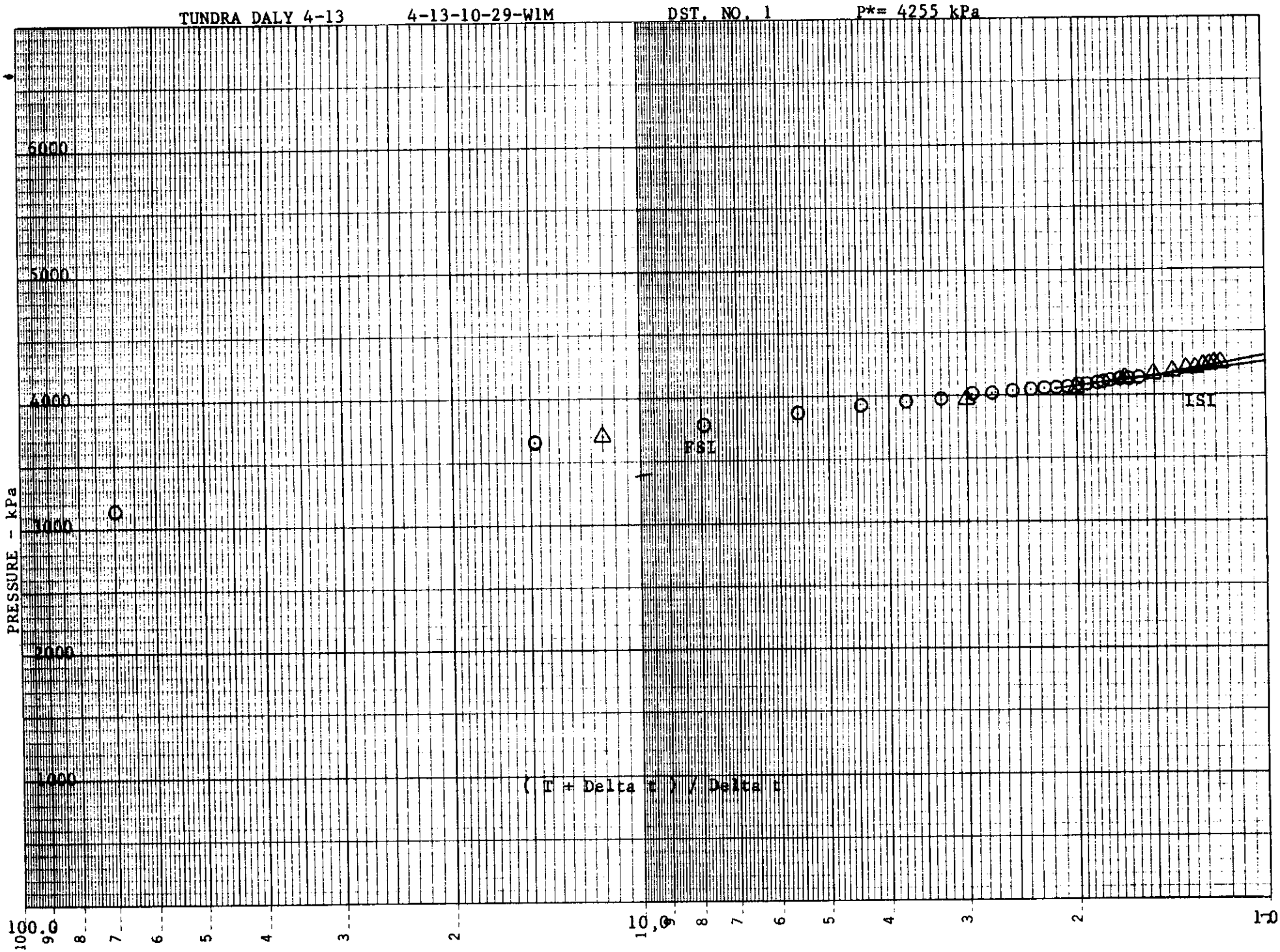
LOWER ZONE

UPPER ZONE

APPENDIX B

NORTH EBOR UNIT NO.2

INDIVIDUAL WELL PRODUCTION HISTORIES



PRESSURE BUILDUP TEST

WELL 1-14-10-29

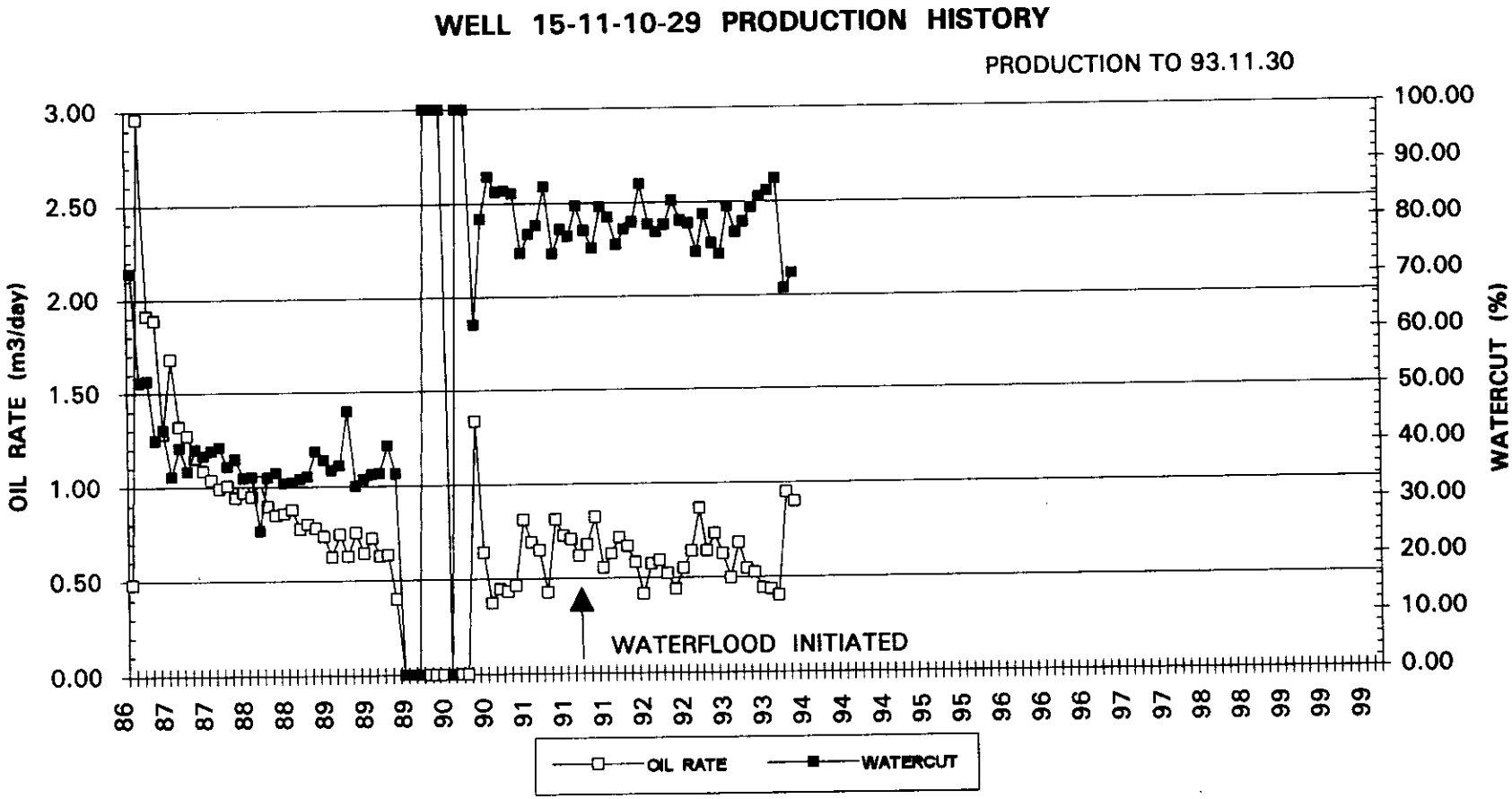
AVERAGE JOINT LENGTH = 9.5 m

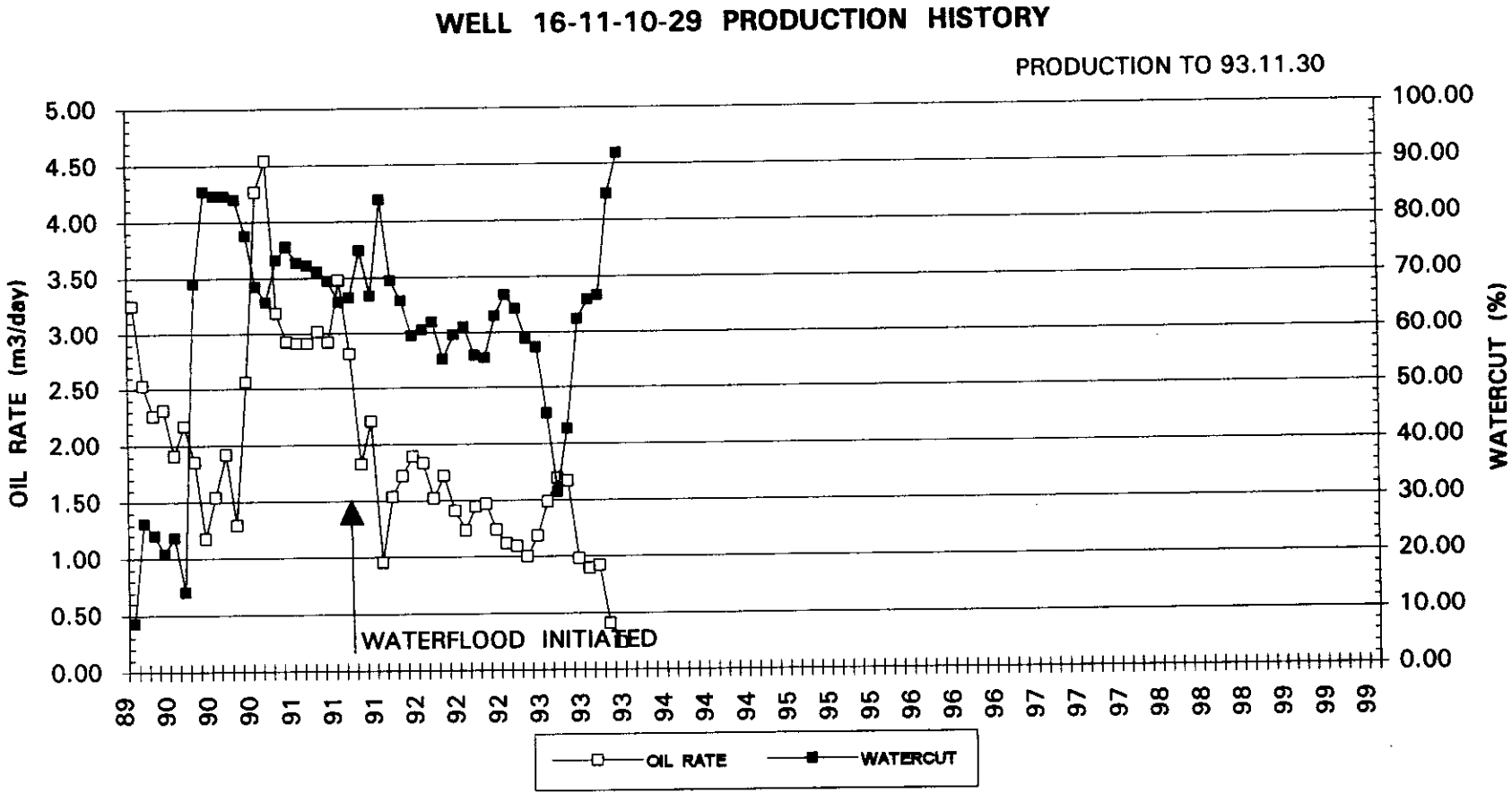
PERFORATIONS @ 859.0 metres

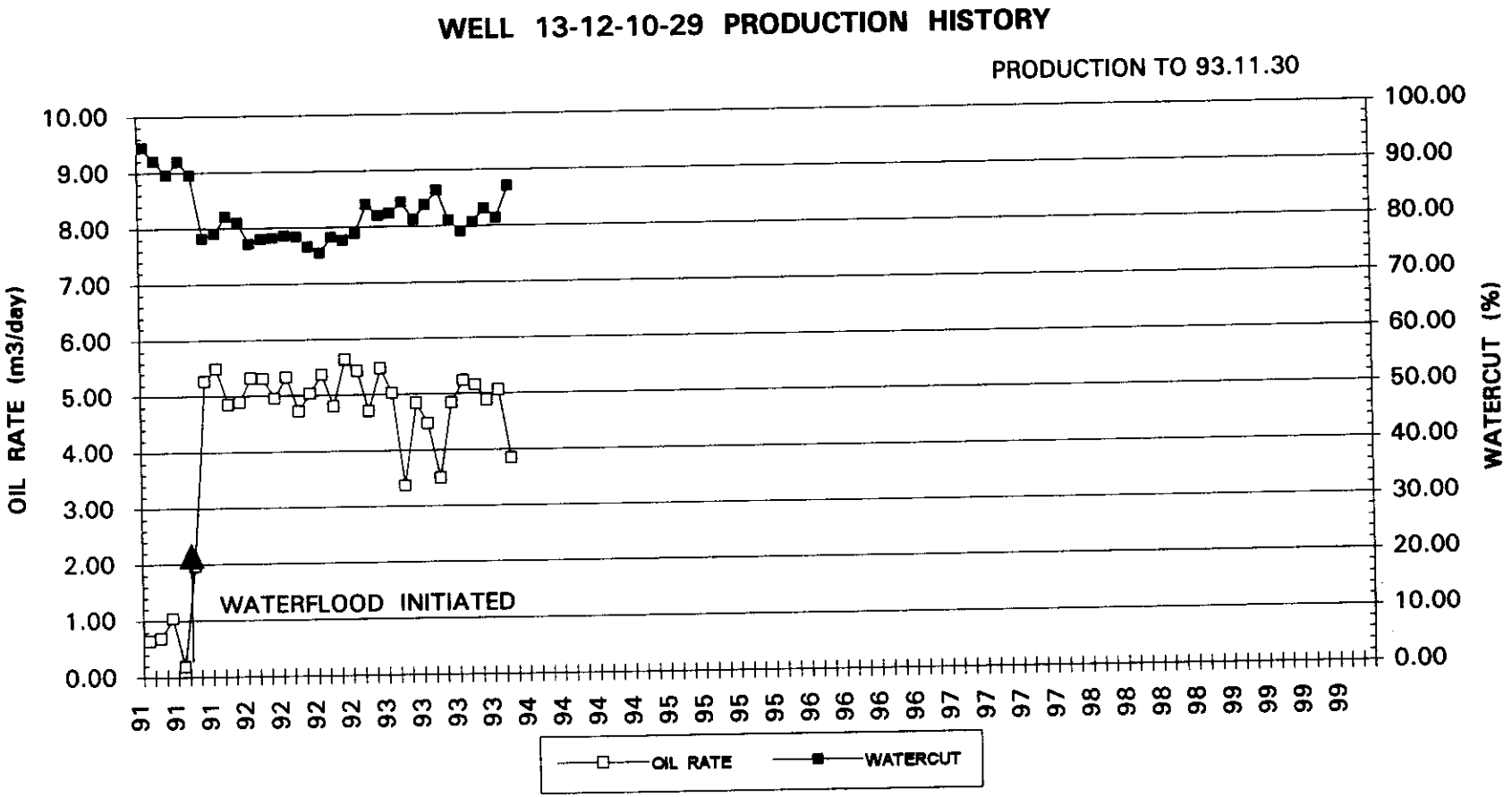
FLUID GRADIENT = 8.24 kPA / m

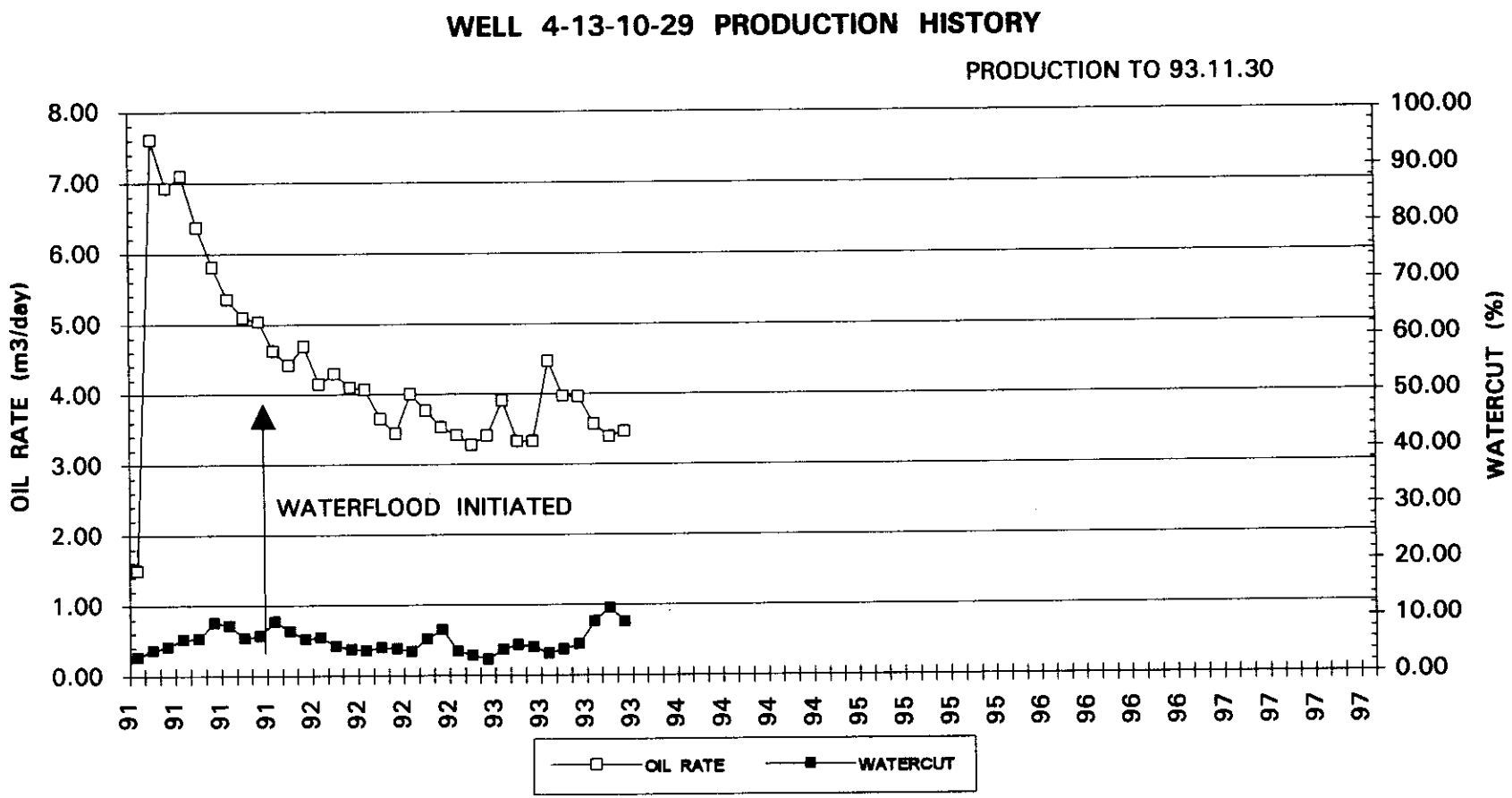
CORRECTED FLOW TIME = 30311 hours

DATE	FLUID LEVEL (Jts)	FLUID LEVEL (m)	CASING PRESSURE (kPa)	Change T (hours)	T + chge T / chge T	Pws (kPa)
Aug. 25 / 92	89.5	850	207	0	-	279
Aug. 26	88.5	841	248	24	1263.96	398
Aug. 27	87	827	255	48	632.48	523
Aug. 28	86	817	283	72	421.99	629
Aug. 31	84	798	303	144	211.49	806
Sept. 1	83.5	793	310	168	181.42	852
Sept.2	82.5	784	324	192	158.87	944
Sept. 9	78	741	359	360	85.20	1331
Sept. 14	75	713	379	480	64.15	1586
Sept. 16	75	713	379	528	58.41	1586
Sept. 21	72	684	400	648	47.78	1842
Sept. 24	71.5	679	400	720	43.10	1881
Sept. 28	68.5	651	414	816	38.15	2130
Oct. 2	67.5	642	428	912	34.24	2222
Oct. 6	65	618	441	1008	31.07	2431
Oct. 14	62	589	462	1200	26.26	2687
Oct. 16	62	589	462	1248	25.29	2687
Oct. 26	59.5	565	490	1488	21.37	2911
Oct. 30	58.5	556	503	1584	20.14	3002
Nov. 6	56	532	517	1752	18.30	3211
Nov. 16	54.5	518	545	1992	16.22	3357
Nov. 26	52.5	499	565	2232	14.58	3533

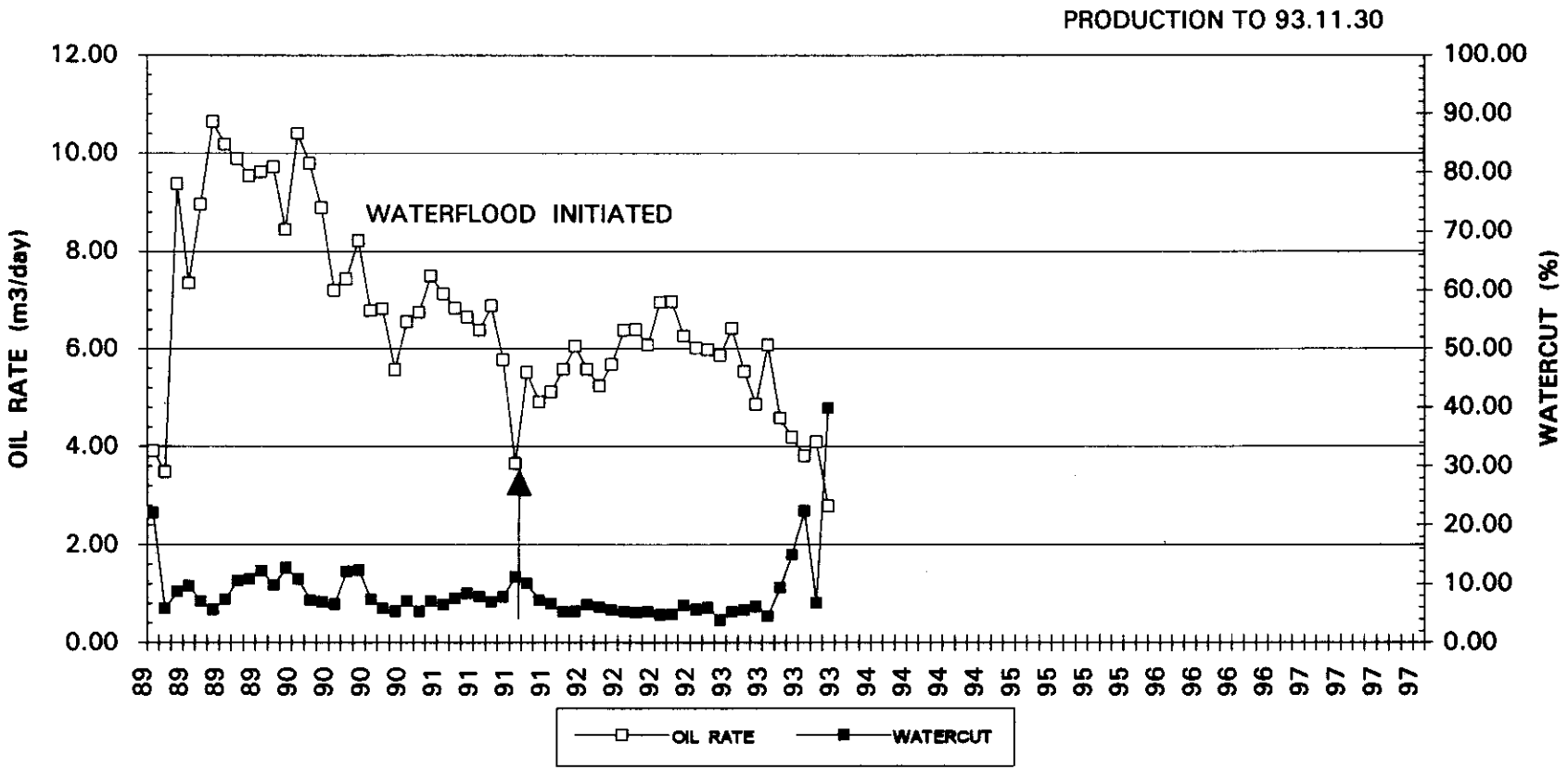

WELL 15-11-10-29 PRODUCTION HISTORY
PRODUCTION TO 93.11.30
OIL RATE (m3/day)
WATERCUT (%)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
WATERFLOOD INITIATED
86 87 87 88 88 89 89 89 90 90 91 91 91 92 92 93 93 94 94 94 95 95 96 96 96 97 97 98 98 99 99 99
OIL RATE
WATERCUT

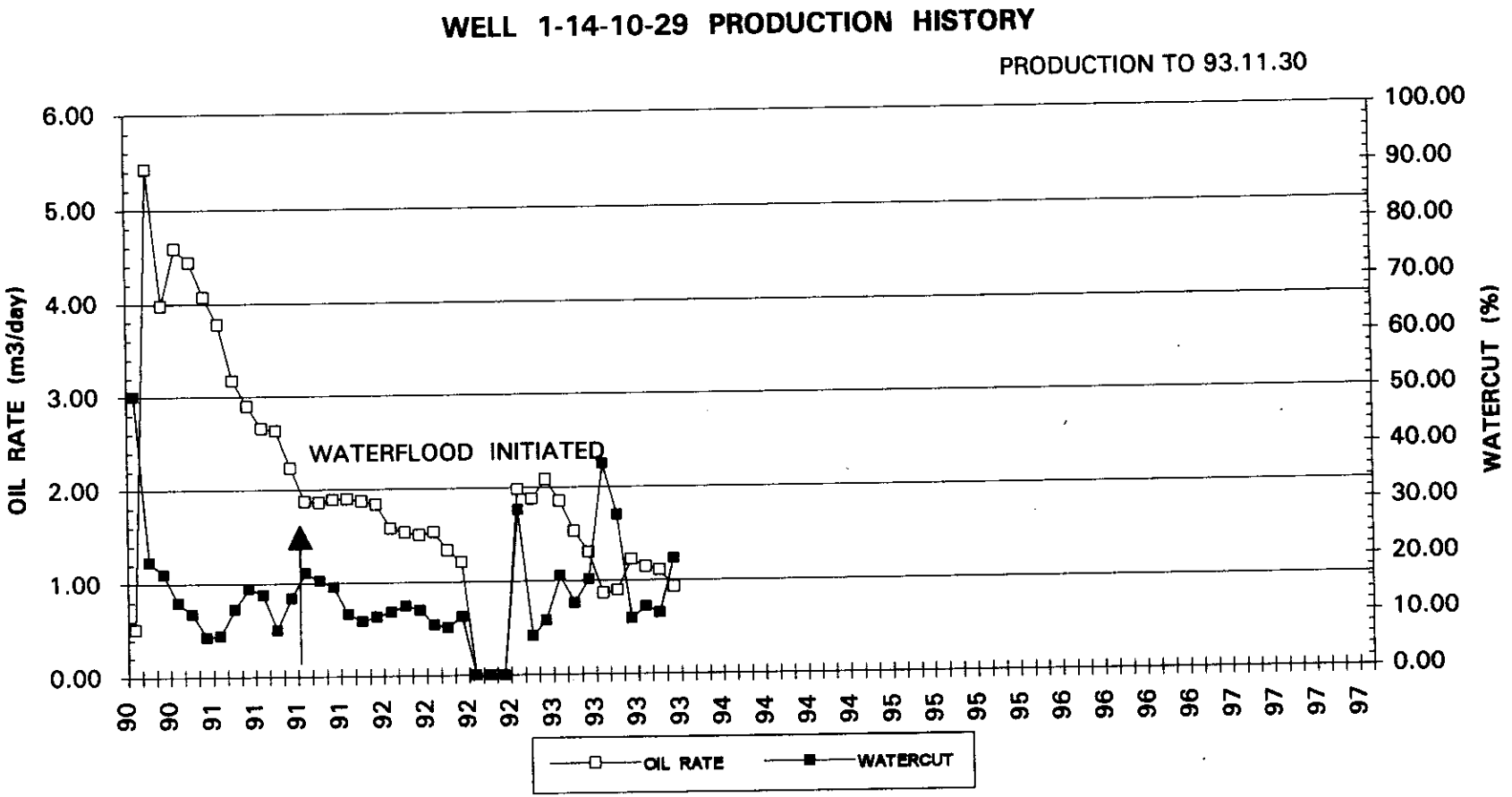

WELL 16-11-10-29 PRODUCTION HISTORY
PRODUCTION TO 93.11.30
OIL RATE (m3/day)
WATERCUT (%)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
WATERFLOOD INITIATED
89 90 90 90 91 91 91 92 92 92 93 93 93 94 94 94 95 95 95 96 96 96 97 97 97 98 98 98 99 99 99
OIL RATE
WATERCUT

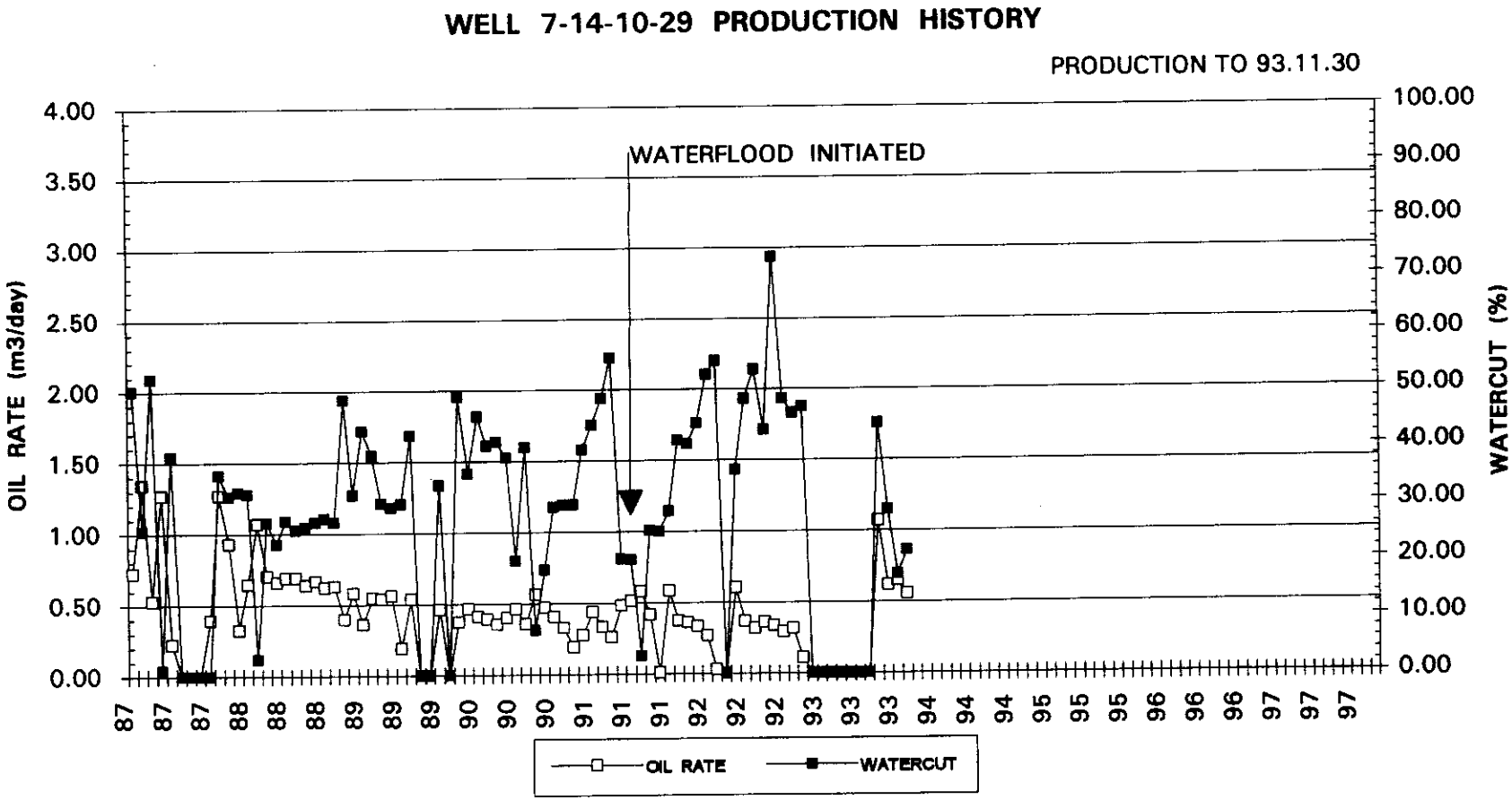

WELL 13-12-10-29 PRODUCTION HISTORY
PRODUCTION TO 93.11.30
OIL RATE (m3/day)
WATERCUT (%)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
WATERFLOOD INITIATED
91 91 91 92 92 92 92 93 93 93 93 94 94 94 94 95 95 95 95 96 96 96 96 97 97 97 97 98 98 98 98 99 99 99 99
OIL RATE
WATERCUT


WELL 4-13-10-29 PRODUCTION HISTORY
PRODUCTION TO 93.11.30
OIL RATE (m3/day)
WATERCUT (%)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
WATERFLOOD INITIATED
91 91 91 91 92 92 92 92 93 93 93 93 94 94 94 94 95 95 95 95 96 96 96 96 97 97 97 97
OIL RATE
WATERCUT

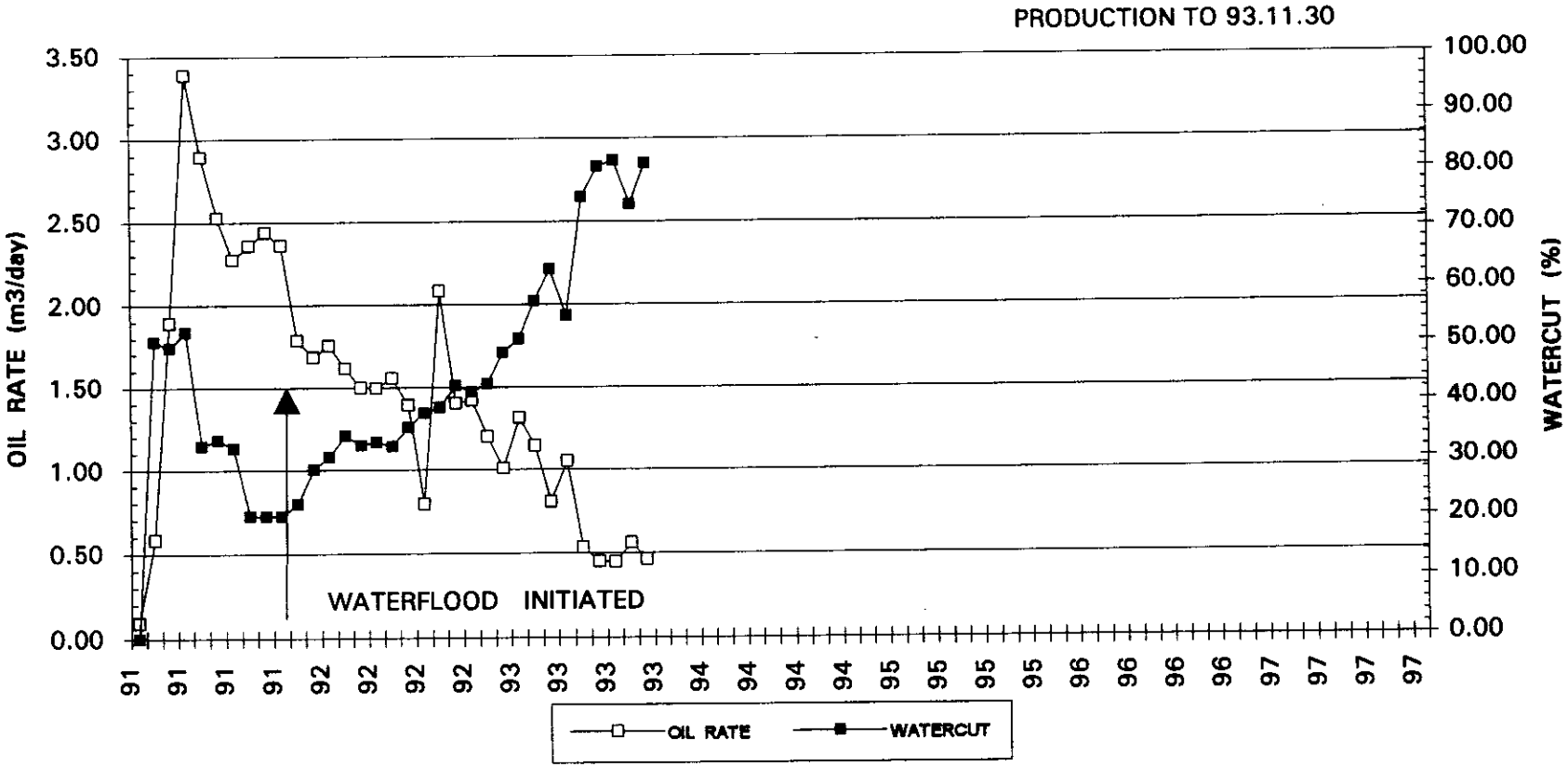
WELL 5-13-10-29 PRODUCTION HISTORY




WELL 1-14-10-29 PRODUCTION HISTORY
PRODUCTION TO 93.11.30
OIL RATE (m3/day)
WATERCUT (%)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
WATERFLOOD INITIATED
90 90 91 91 91 91 92 92 92 92 93 93 93 93 94 94 94 94 95 95 95 95 96 96 96 96 97 97 97 97
OIL RATE
WATERCUT


WELL 7-14-10-29 PRODUCTION HISTORY
PRODUCTION TO 93.11.30
WATERFLOOD INITIATED
OIL RATE (m3/day)
WATERCUT (%)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
87 87 87 88 88 88 89 89 89 90 90 90 91 91 91 92 92 92 93 93 93 94 94 94 95 95 95 96 96 96 97 97 97
OIL RATE
WATERCUT

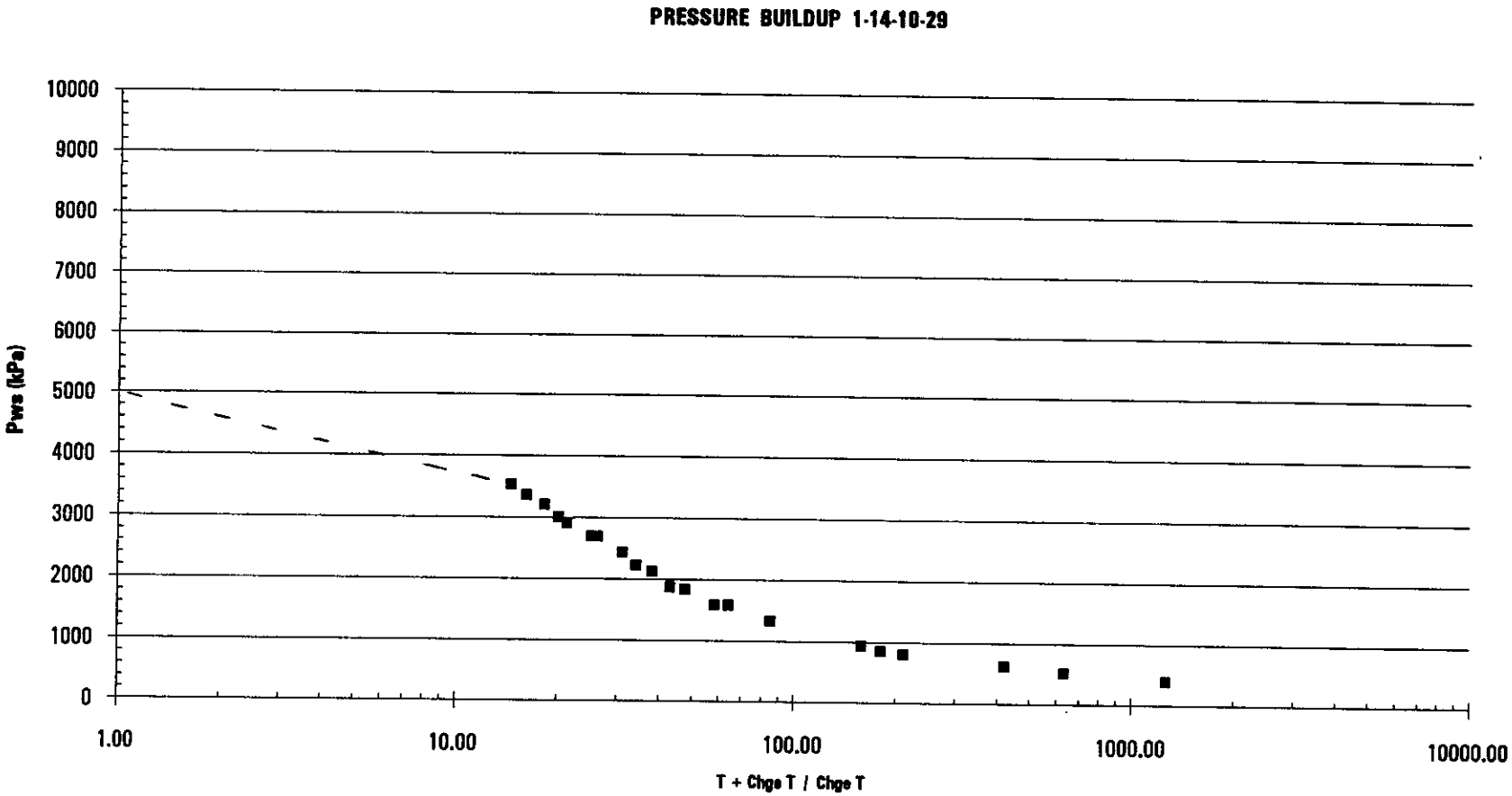
WELL 10-14-10-29 PRODUCTION HISTORY



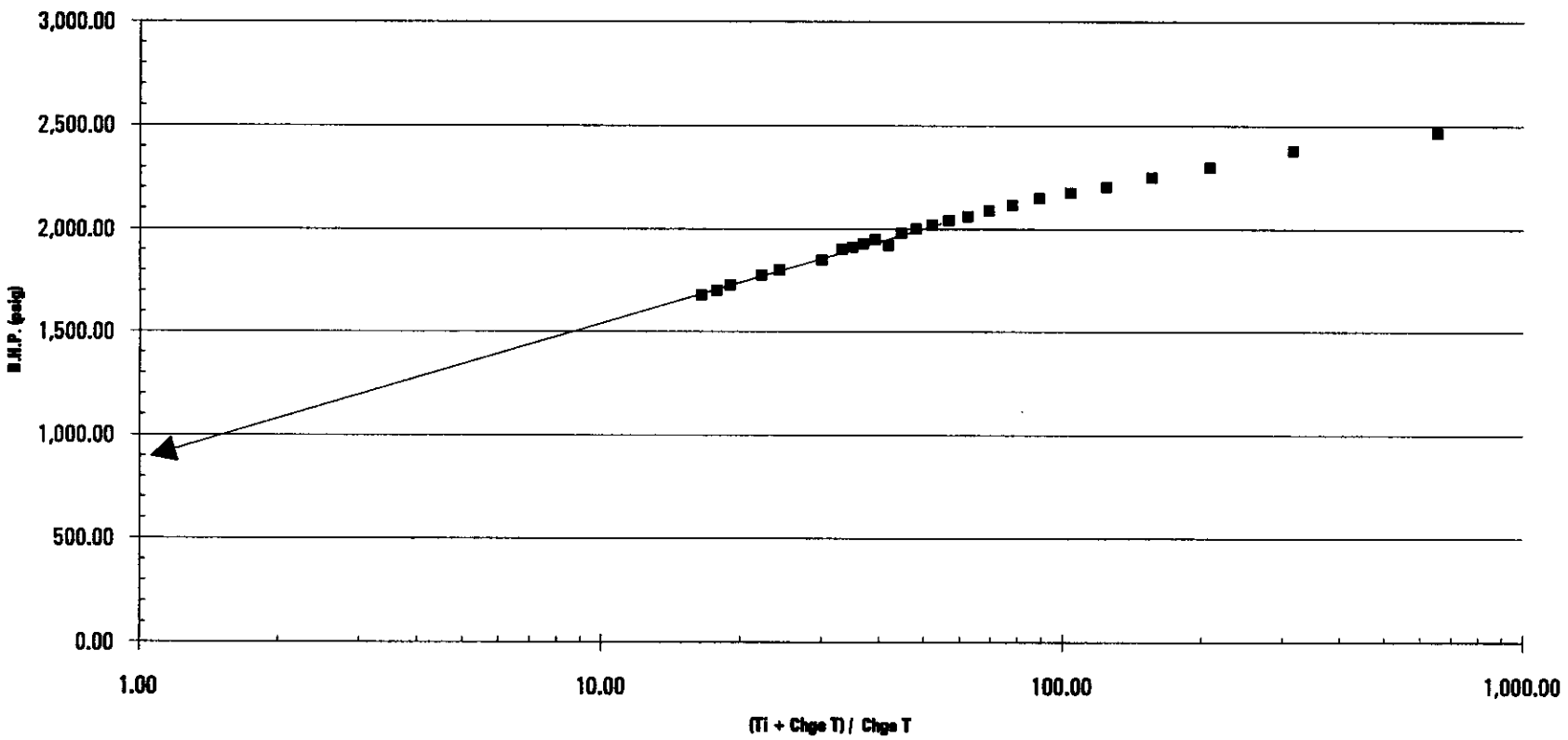
APPENDIX C

NORTH EBOR UNIT NO.2

BAKKEN 'D' POOL PRESSURE HISTORY


PRESSURE BUILDUP 1-14-10-29
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Pws (kPa)
1.00
10.00
100.00
1000.00
10000.00
T + Chge T / Chge T

Pressure Fall-off Test Injection Well 8-14-10-29 Horner Plot



NORTH EBOR UNIT NO.2

Ti = 14640 hrs

INJECTION WELL 8-14-10-29

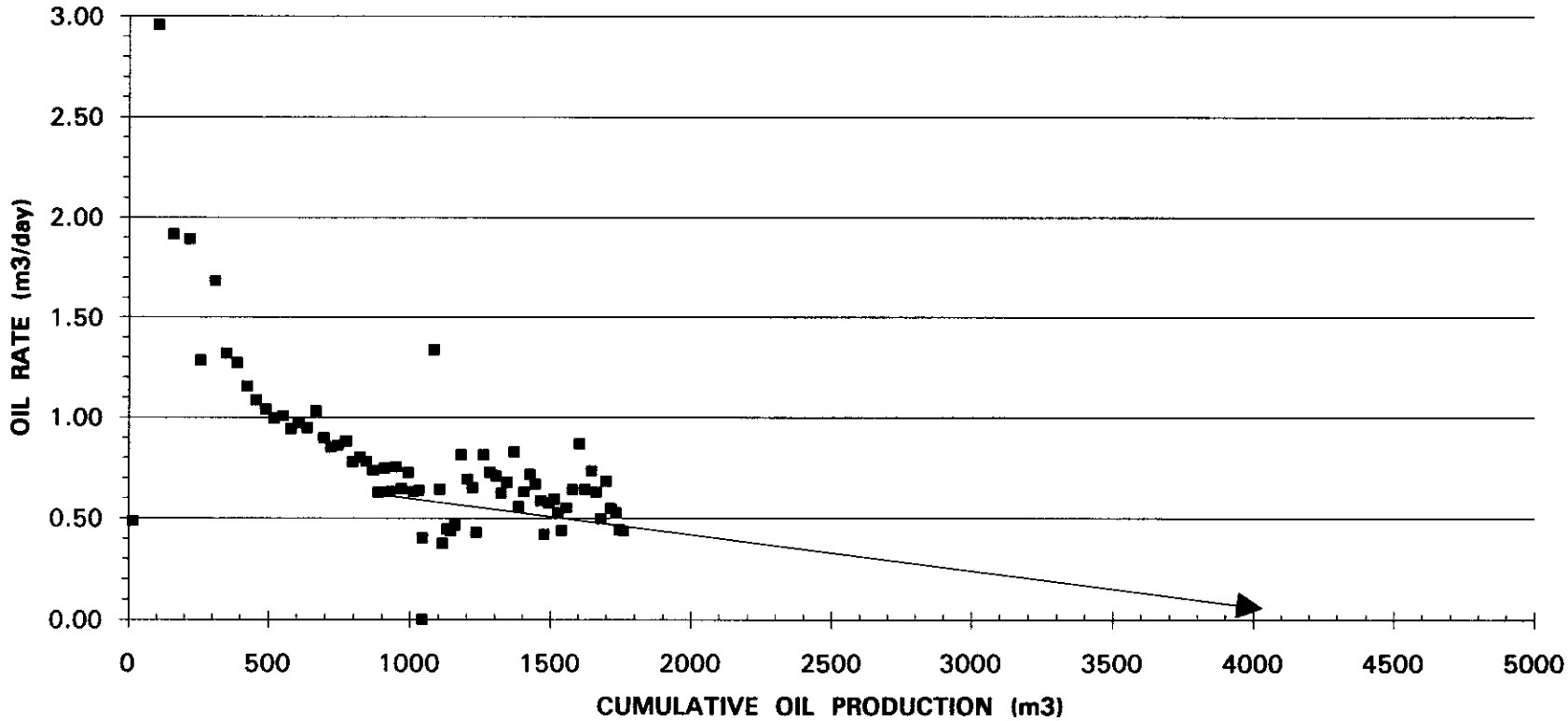
FALL-OFF TEST

Date	Time	Chge T	(Ti + Chge T)/Chge T	Jts to Fluid	Fluid Level	Fluid Pressure	Fluid Pressure	Tubing Pressure	Tubing Pressure	Total Pressure	Total Pressure
		(hrs)			(m)	(kPa)	(psig)	(kPa)	(psig)	(kPa)	(psig)
May. 6 / 93	13:50 hrs	0.00	-	0	0	8,964.80	1,300.19	8,791.00	1,274.98	17,755.80	2,575.17
May. 7 / 93	12:00 hrs	22.50	651.67	0	0	8,964.80	1,300.19	8,033.00	1,165.05	16,997.80	2,465.24
May. 8 / 93	12:00 hrs	46.50	315.84	0	0	8,964.80	1,300.19	7,447.00	1,080.06	16,411.80	2,380.25
May. 9 / 93	12:00 hrs	70.50	208.66	0	0	8,964.80	1,300.19	6,895.00	1,000.00	15,859.80	2,300.19
May. 10 / 93	12:00 hrs	94.50	155.92	0	0	8,964.80	1,300.19	6,550.00	949.96	15,514.80	2,250.15
May. 11 / 93	12:00 hrs	118.50	124.54	0	0	8,964.80	1,300.19	6,234.00	904.13	15,198.80	2,204.32
May. 12 / 93	12:00 hrs	142.50	103.74	0	0	8,964.80	1,300.19	6,033.13	875.00	14,997.93	2,175.19
May. 13 / 93	12:00 hrs	166.50	88.93	0	0	8,964.80	1,300.19	5,860.75	850.00	14,825.55	2,150.19
May. 14 / 93	12:00 hrs	190.50	77.85	0	0	8,964.80	1,300.19	5,619.43	815.00	14,584.23	2,115.19
May. 15 / 93	12:00 hrs	214.50	69.25	0	0	8,964.80	1,300.19	5,447.05	790.00	14,411.85	2,090.19
May. 16 / 93	12:00 hrs	238.50	62.38	0	0	8,964.80	1,300.19	5,240.20	760.00	14,205.00	2,060.19
May. 17 / 93	12:00 hrs	262.50	56.77	0	0	8,964.80	1,300.19	5,102.30	740.00	14,067.10	2,040.19
May. 18 / 93	12:00 hrs	286.50	52.10	0	0	8,964.80	1,300.19	4,964.40	720.00	13,929.20	2,020.19
May. 19 / 93	12:00 hrs	310.50	48.15	0	0	8,964.80	1,300.19	4,826.50	700.00	13,791.30	2,000.19
May. 20 / 93	12:00 hrs	334.50	44.77	0	0	8,964.80	1,300.19	4,688.60	680.00	13,653.40	1,980.19
May. 21 / 93	12:00 hrs	358.50	41.84	0	0	8,964.80	1,300.19	4,274.90	620.00	13,239.70	1,920.19
May. 22 / 93	12:00 hrs	382.50	39.27	0	0	8,964.80	1,300.19	4,481.75	650.00	13,446.55	1,950.19
May. 23 / 93	12:00 hrs	406.50	37.01	0	0	8,964.80	1,300.19	4,343.85	630.00	13,308.65	1,930.19
May. 24 / 93	12:00 hrs	430.50	35.01	0	0	8,964.80	1,300.19	4,205.95	610.00	13,170.75	1,910.19
May. 25 / 93	12:00 hrs	454.50	33.21	0	0	8,964.80	1,300.19	4,137.00	600.00	13,101.80	1,900.19
May. 27 / 93	14:00 hrs	504.50	30.02	0	0	8,964.80	1,300.19	3,792.25	550.00	12,757.05	1,850.19
June. 1 / 93	16:00 hrs	626.50	24.37	0	0	8,964.80	1,300.19	3,447.50	500.00	12,412.30	1,800.19
June. 4 / 93	5:00 hrs	688.50	22.26	0	0	8,964.80	1,300.19	3,275.13	475.00	12,239.93	1,775.19
June. 9 / 93	9:00 hrs	812.50	19.02	0	0	8,964.80	1,300.19	2,930.38	425.00	11,895.18	1,725.19
June. 11 / 93	18:00 hrs	869.50	17.84	0	0	8,964.80	1,300.19	2,758.00	400.00	11,722.80	1,700.19
June. 15 / 93	3:00 hrs	944.50	16.50	0	0	8,964.80	1,300.19	2,585.63	375.00	11,550.43	1,675.19

APPENDIX D

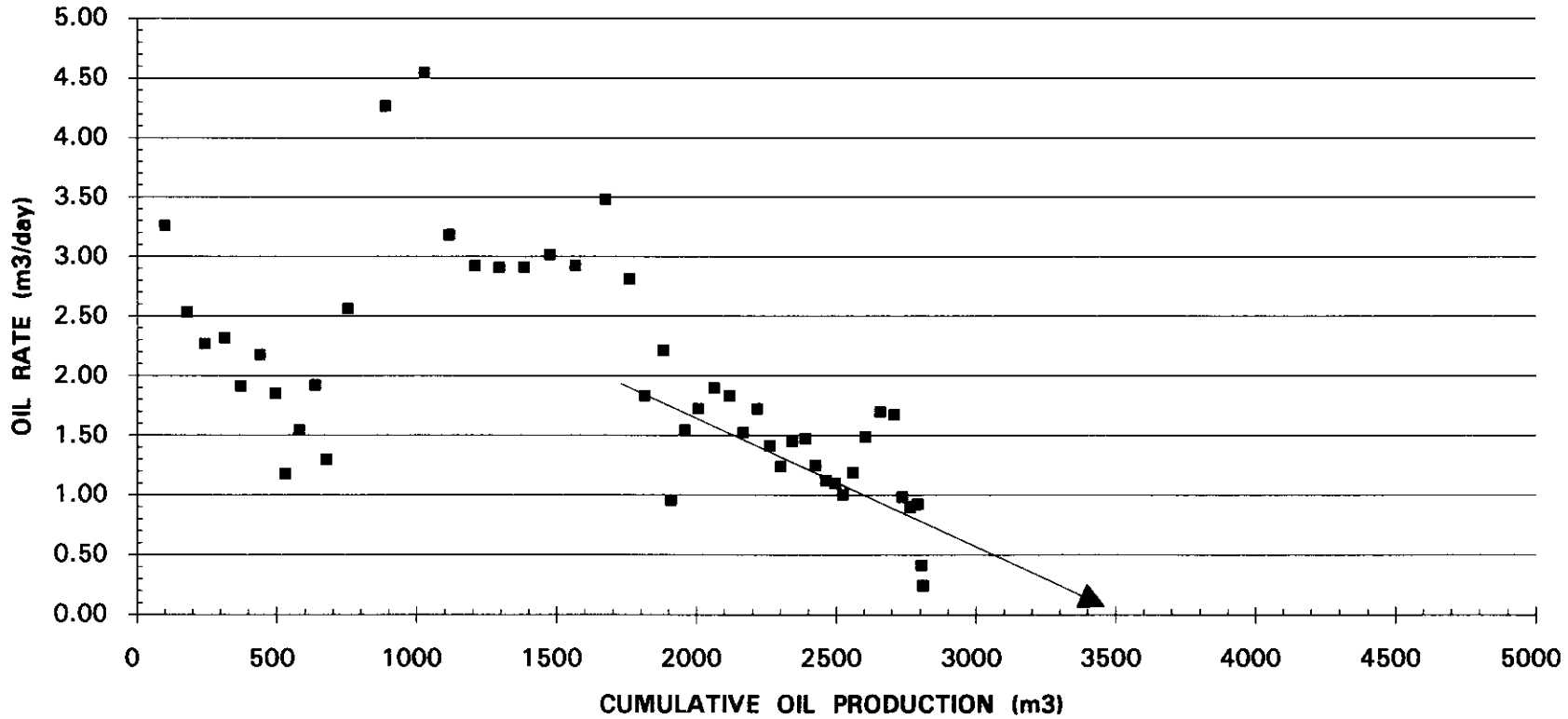
INDIVIDUAL WELL ULTIMATE RECOVERY PLOTS

WELL 15-11-10-29 REMAINING PROVED PRODUCING RESERVES

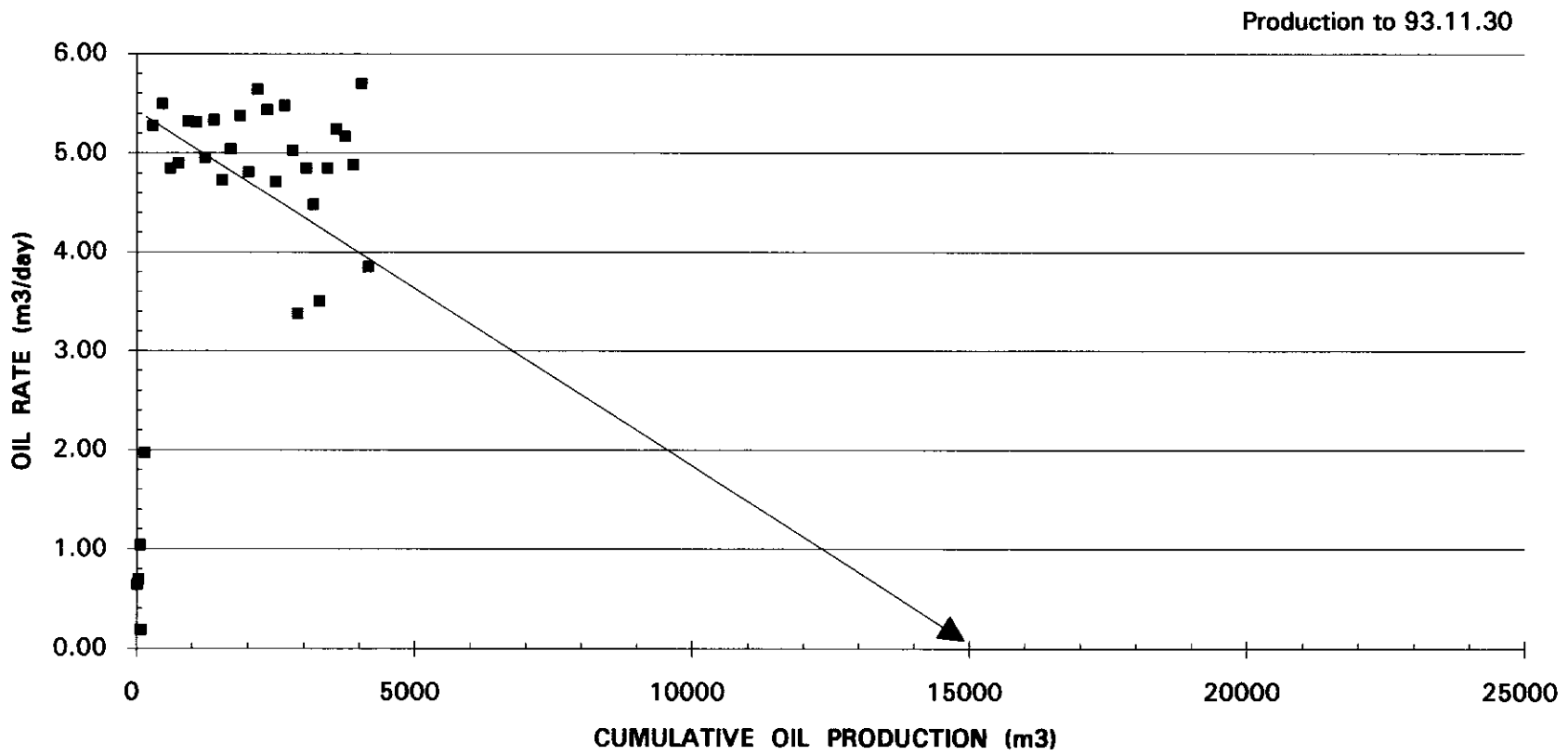


WELL 16-11-10-29 REMAINING PROVED PRODUCING RESERVES

Production to 93.11.30

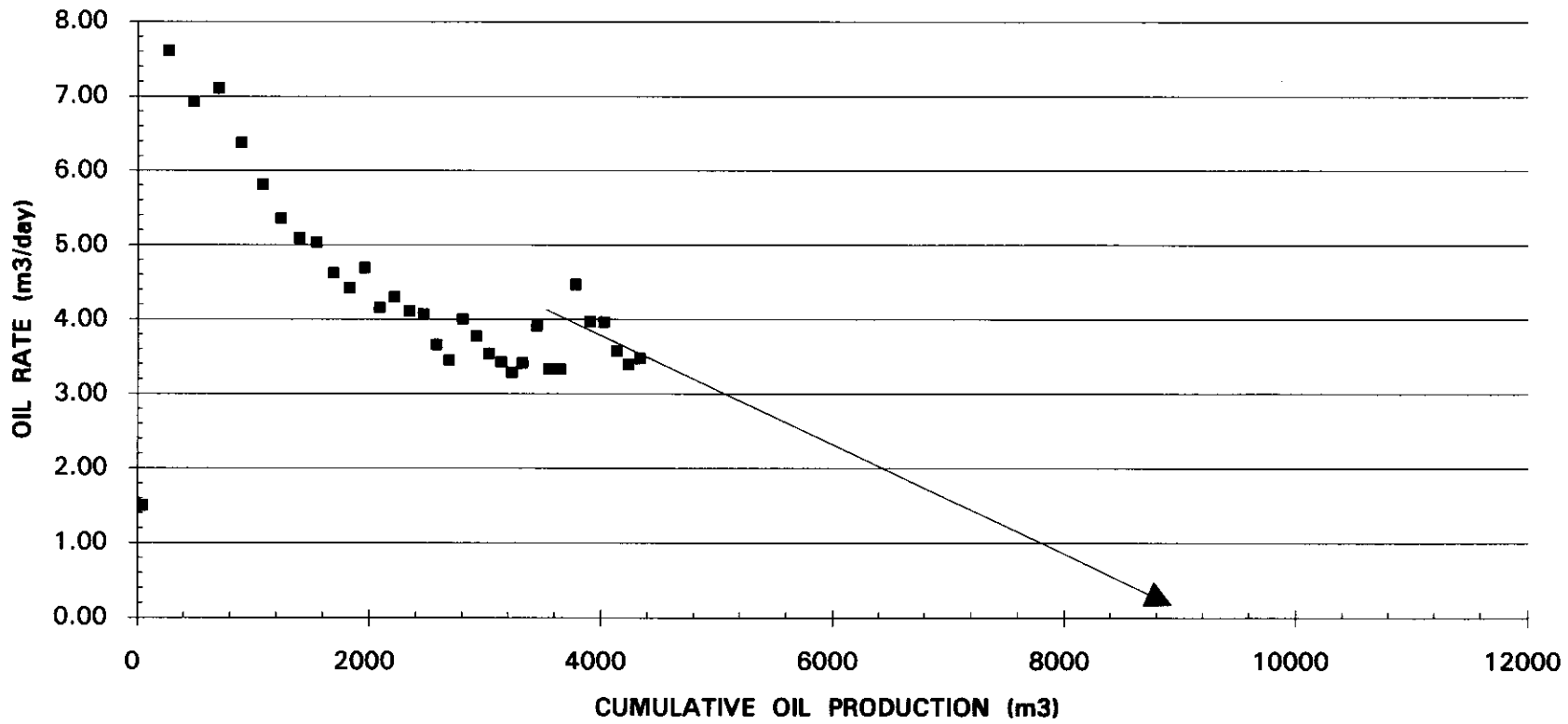


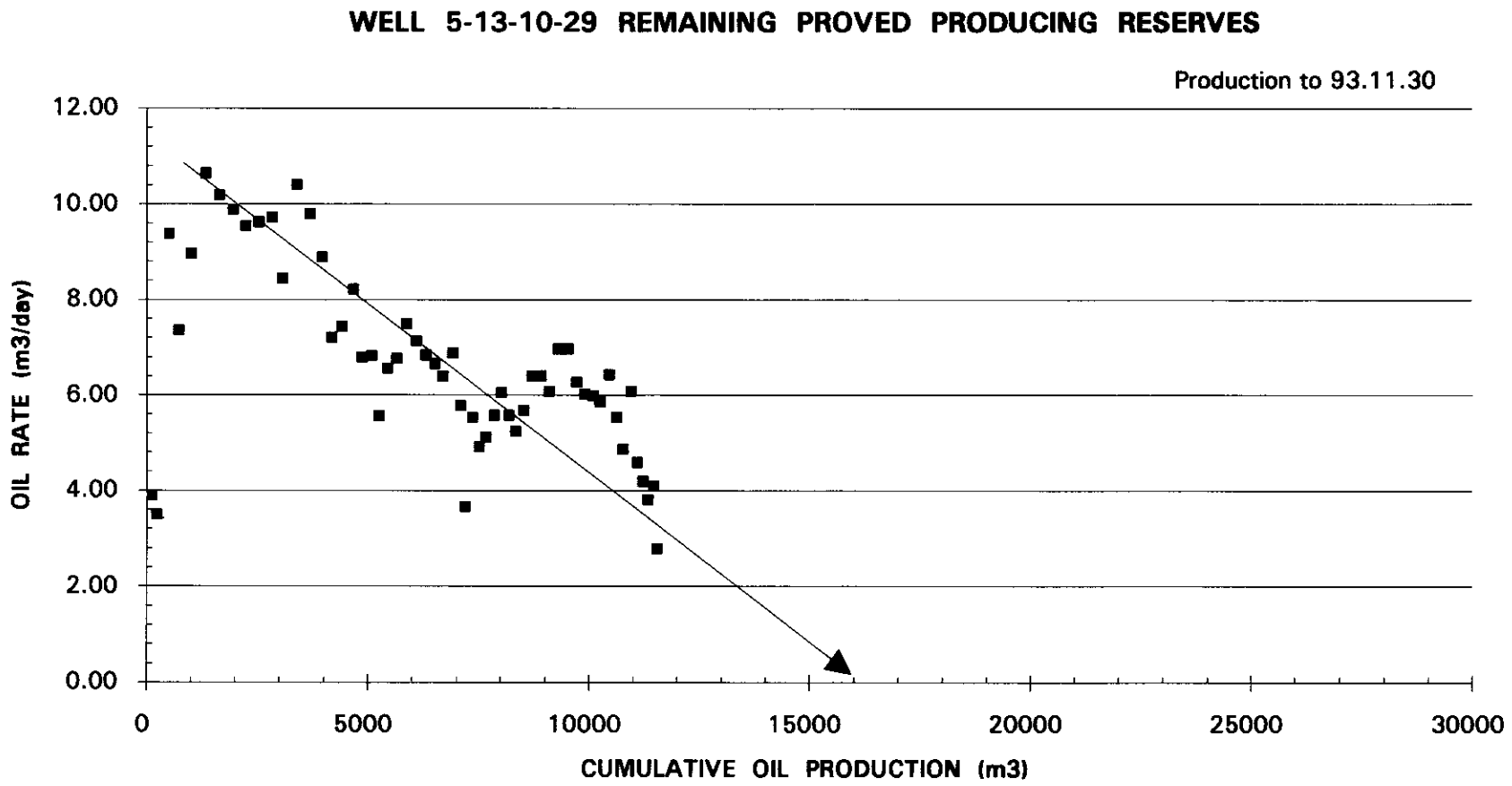
WELL 13-12-10-29 REMAINING PROVED PRODUCING RESERVES



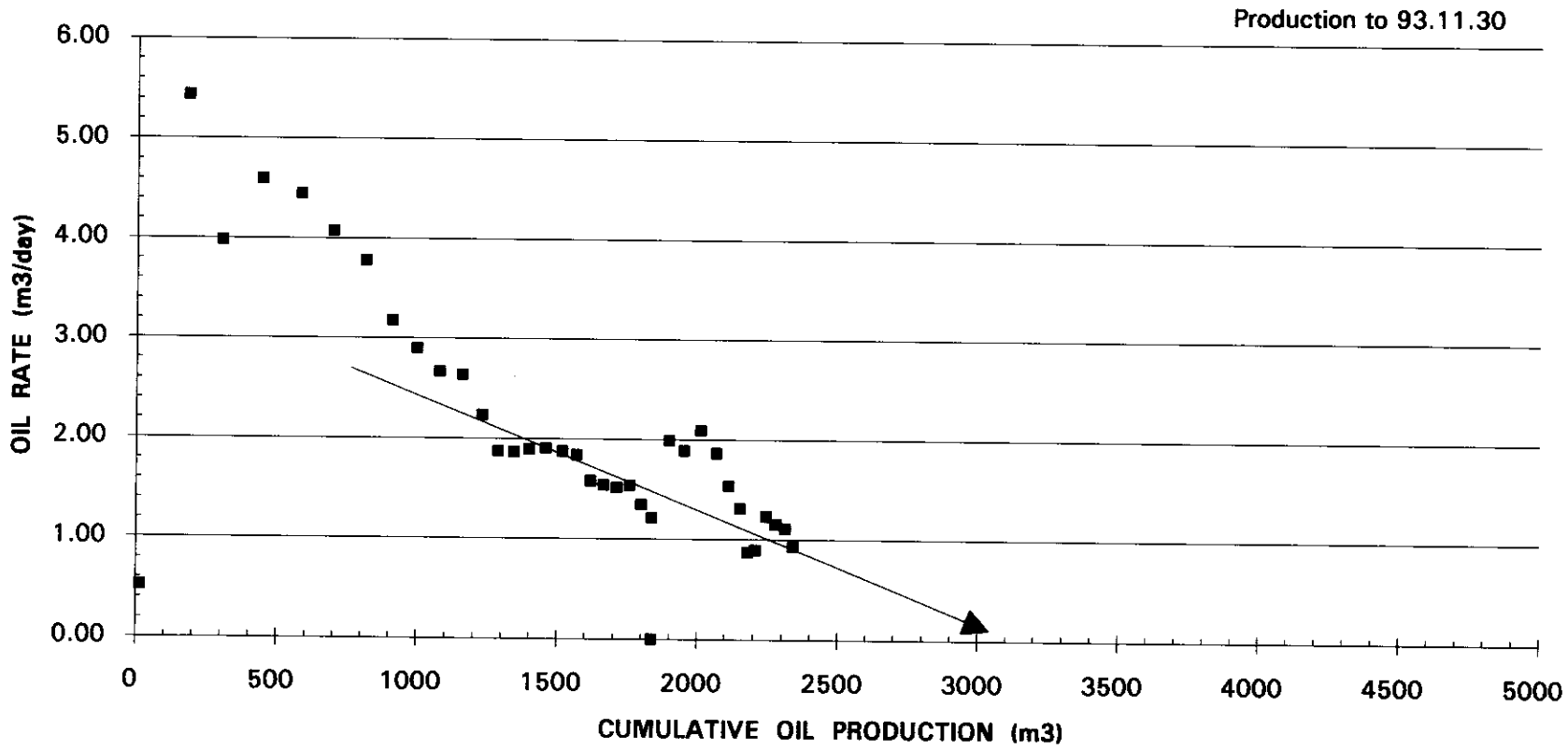
WELL 4-13-10-29 REMAINING PROVED PRODUCING RESERVES

Production to 93.11.30

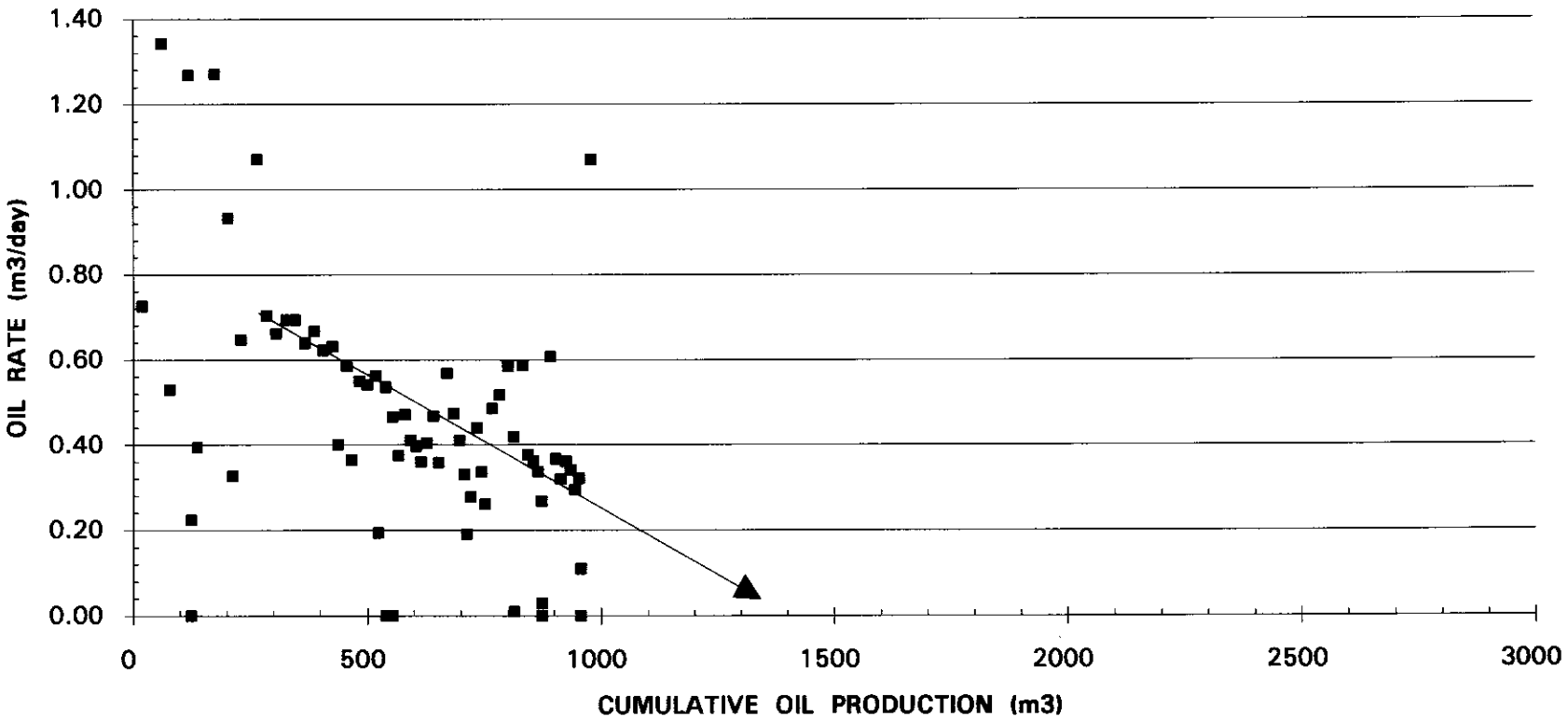


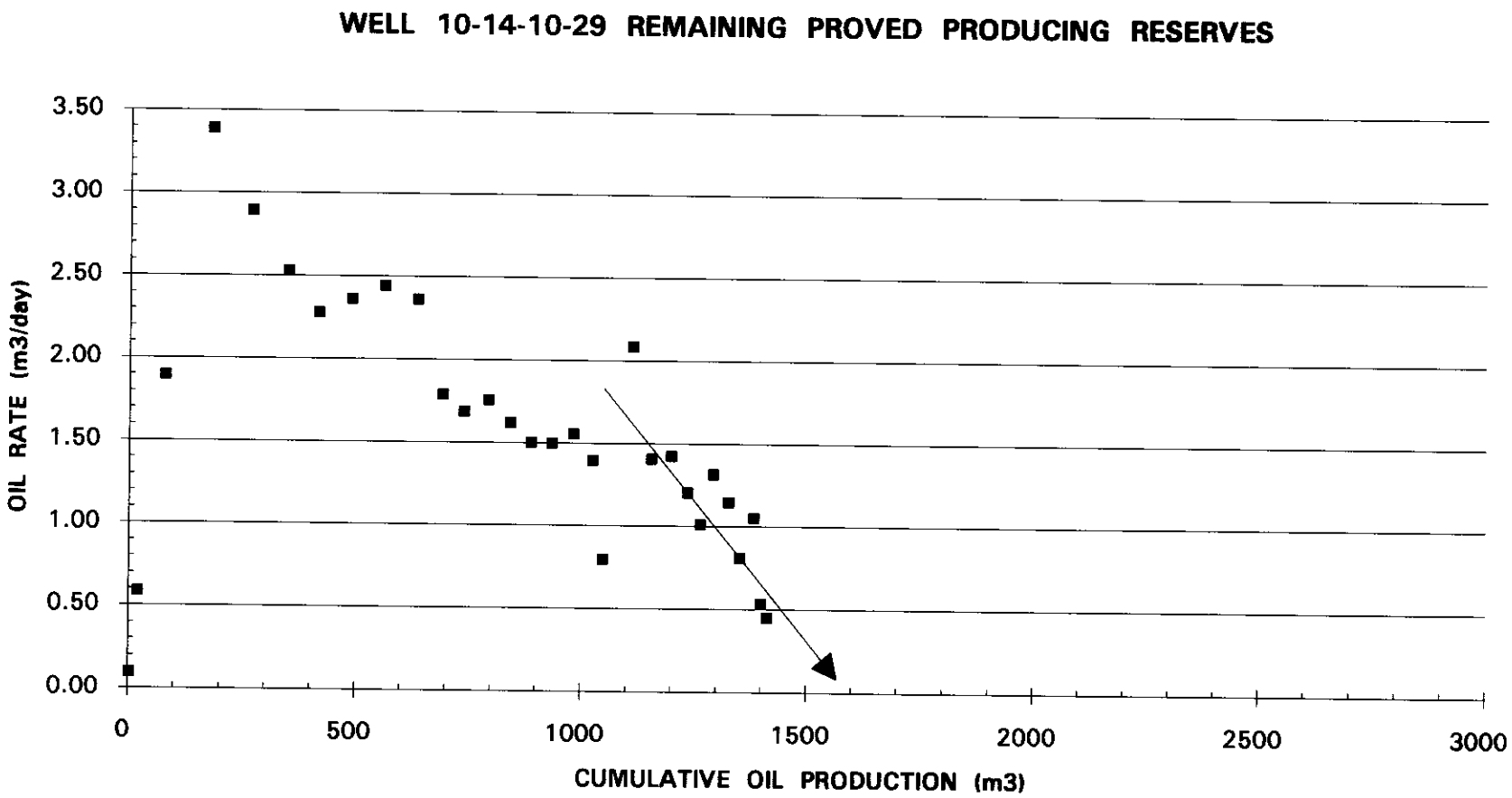

WELL 5-13-10-29 REMAINING PROVED PRODUCING RESERVES
Production to 93.11.30
12.00
10.00
8.00
6.00
4.00
2.00
0.00
OIL RATE (m3/day)
0
5000
10000
15000
20000
25000
30000
CUMULATIVE OIL PRODUCTION (m3)

WELL 1-14-10-29 REMAINING PROVED PRODUCING RESERVES



WELL 7-14-10-29 REMAINING PROVED PRODUCING RESERVES




WELL 10-14-10-29 REMAINING PROVED PRODUCING RESERVES
OIL RATE (m3/day)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
500
1000
1500
2000
2500
3000
CUMULATIVE OIL PRODUCTION (m3)

APPENDIX E

CROWN LETTER OUTLINING EOR INCENTIVES FOR NORTH EBOR UNIT NO.2

Manitoba

RECEIVED DEC 1 9 1991

Energy and Mines | Petroleum

555 — 330 Graham Avenue
Winnipeg, Manitoba, CANADA
R3C 4E3

(204) 945-6577
FAX: (204) 945-0586

December 16, 1991

Tundra Oil and Gas Ltd.
1313-One Lombard Place
Winnipeg, Manitoba
R3B 0X3

Attn: Bob Puchniak

Dear Sir:

Re. EOR Incentive Period - North Ebor Unit No. 2

In accordance with Schedule D of the Petroleum Crown Royalty and Incentives Regulation (MR 63/87), as amended by (MR 264/87), some of the tracts in the subject Unit have qualified for an EOR Incentive Period of 29 months beginning November 1, 1991.

The attached package shows the calculation and the incentive period for the eligible tracts.

Please note that if any tracts are in an existing "incentive period" or have a "holiday volume" yet to be produced, the EOR Incentive Period for that tract will commence:

a) at the expiration of the current incentive period,
or
b) with the first non-holiday volume produced.

Should you have any questions regarding the calculation of eligible tracts please contact Mr. John Fox at (204) 945-6574. Any other questions may be directed to the undersigned at (204) 945-6571.

Yours sincerely,

Brad Thiessen
Manager
Petroleum Administration

BT/ps

Encls

cc: C. Isfeld
P. Seymour

1209P

NORTH EBOR UNIT NO. 2

EOR INCENTIVE CALCULATION

OIL RATE$_{(q)}$ = (2 621.6/11 304)*24 = 5.57 m^3/d

WATER CUT$_{(wc)}$ = $\frac{569.3 \ *100}{(569.3+2\ 621.6)}$ = 17.84%

$I_o = 72 - 9_q = 72 - 9(5.57)$ = 21.87 months

$I_{wc} = \frac{wc}{2.5} = \frac{17.84}{2.5}$ = 7.14 months

TOTAL INCENTIVE ($I_o + I_w$) = 29 months

Date Fully Implemented October 1, 1991

Effective Date of Incentive November 1, 1991

1209P

NORTH EBOR UNIT NO. 2

EOR INCENTIVE DATA

(First Four Producing Months)

WELL	HOURS	OIL	WATER	MONTHS INCENTIVE
15-11-10-29* Prov.				0
16-11-10-29* Prov.				0
13-12-10-29*				0
4-13-10-29	2,112	702.1	39.2	29
5-13-10-29	1,824	736.8	91.8	29
1-14-10-29	2,208	445.6	108.0	29
7-14-10-29 Commingled	2,112	117.1	52.4	29
8-14-10-29	1,776	439.3	89.3	29
A10-14-10-29	1,272	180.7	188.6	29
TOTALS	11,304	2 621.6	569.3	

*Not in an Injection Pattern - No Incentive at this time

1209P