

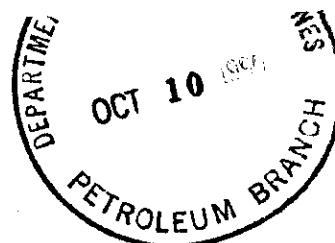


Chevron Canada Resources

P.O. Box 100, Virden, Manitoba R0M 2C0
Phone (204) 748-1334 Fax (204) 748-6762

NVSCU # 1
8 hr Spacing
Correspondence

934-2755



October 5, 1990

Department of Energy and Mines
Petroleum Branch
555-330 Graham Avenue
Winnipeg, MB.
R3C 4E3

Attention: Mr. John Fox
Chief Petroleum Engineer

Subject: Net Oil Computer Status

On 1990-04-25 Chevron submitted its request for approval to use the Net Oil Computer for well testing to the branch. As of 1990-10-05 we have yet to receive your reply.

Chevron requested that the Net Oil Computer be approved for well testing. In addition Chevron asked that during cold ambient temperatures (-10° Celsius or lower) the requirement for 24 hour tests be reduced to six hours to avoid leaving the instrument outside overnight.

If you have any questions, please contact the undersigned at the letterhead address or at 748-1334. Your early response to this request would be appreciated.

Yours Truly

For L.A. Martinson
Area Superintendent Virden

cc: R. Fallwell- Chevron, Calgary



Chevron Canada R

P.O. Box 100, Virden, Manitoba I
Phone (204) 748-1334 Fax (204) 748-67

- will Chevron be using NOC outside the infill area - electrify headers - result erroneous reading due gas breakout
- if you - quantify testing objectives
- if no - testing monthly

Manitoba Oil and Gas
Room 309
Legislative Building
Winnipeg, Manitoba
R3C 0V8

Attention: H. Clare Moster
Deputy Chairman

Dear Sir:

Chevron has completed it's evaluation of the Net Oil Computer (NOC) in well production test measurement. As per your letter of 1989-06-23, enclosed are the results of this evaluation along with other technical information in support of our request to have the Net Oil Computer approved for well production test measurement.

The method that is currently used for well production testing is by producing the well to a test tank for 24 hours and determining the volume and water content of the produced fluid. This method can only be done in the summer months in order to avoid freezing the produced water. This means that other methods must be used if the Petroleum Branch's quarterly well test requirement is to be met. This is the reason why Chevron sought to change our well testing procedure for the North Virden Scallion Unit 1 (NVSU1) Infill Project.

In 1988-06, Chevron Oil Field Research Company (COFRC) released a report recommending the mass-meter-based Net Oil Computer for well production test measurement. The report was based on a NOC that was installed on the oil leg of a two or three-phase separator. COFRC cautioned that care must be taken to avoid gas breakout upstream or within the meter as it caused extreme measurement errors. Chevron Canada had to carefully consider these factors because we not only wanted to make the Virden NOC portable but also install it directly at the wellhead without the benefit of a separator. It was decided that the low gas content of the NVSU1 oil anticipated from the infill project would make the purchase of a NOC justifiable.

A Net Oil Computer System was purchased for the NVSU1 Infill Project in 1989-03. This system includes a mass meter as well as a computer/electronics unit (see attached pictures). A portable generator was also purchased. Due to the corrosion-resistant material (Hastelloy C) required by the

- with 6 hr tests → see individual wells initially tested for two days back to back & results compared
- frequency for recalibration of density rig → depending on experience



meter, its delivery took 23 weeks, arriving on-site during 1989-08. Chevron started its evaluation in late 1989-08, continuing until early 1989-12. This project experienced a few start-up problems that caused delays in the evaluation. The only problem still unsolved is caused by an unstable power supply from the portable generator. This is solved by using line power at lease locations or installing a power conditioner on the generator. Presently, we are using the NOC on locations with 110 V power on the lease.

During the evaluation, Chevron found the NOC to be an accurate and reliable method of determining well production rates. The previously mentioned problem of gas breakout did not materialize as long as the meter was installed at the wellhead and the test done at line pressure.


In order to evaluate the Net Oil Computer, Chevron tested several wells and compared the NOC results against the most recent well test. Table #1 shows this comparison. The differences between these results can generally be attributed to the changes in well production rates and characteristics between the time of the NOC test and the previous production test. The differences between the test procedures also affects this comparison. Table 2 compares these two methods insofar as their actual procedures are concerned.

The principle of operation and initial calibration procedures for the NOC are given in Appendices A and B respectively.

Chevron requests that the NOC method of well testing be approved. In addition, Chevron requests that during periods of cold ambient air temperatures (below -10 degrees Celsius), the requirement for 24-hour well tests be reduced to six hours. Even though the meter and electronics are insulated and electrically heat traced, Chevron is concerned about the effects of leaving the NOC over night in extremely cold weather.

If you have any questions, please contact the undersigned at 748-1334 in our Virden office.

Yours truly,


for L. A. Martinson
Area Superintendent

cc L. R. Dubreuil - Petroleum Branch
R. Fallwell - Chevron Calgary

TABLE # 1
VIRDEN'S NET OIL COMPUTER EVALUATION
NOC vs Test Tank Comparisons

DATE (1989)	WELL	LSD	TEST TIME (hrs)	NOC RESULTS			PREVIOUS TEST			% DIFFERENCE			COMMENTS
				Water Rate (m3/d)	Oil Rate (m3/d)	Water Cut (%)	Water Rate (m3/d)	Oil Rate (m3/d)	Water Cut (%)	Water Rate	Oil Rate	Water Cut	
09-26	7-26-11-26		17	11.0	7.3	60.2%	10.2-0.8	6.8-0.5	60%	-8.0%	-7.1%	-0.3%	
09-20	7-26-11-26		24	10.8	7.0	60.8%	10.2-0.6	6.8-0.2	60%	-6.0%	-2.7%	-1.3%	
11-13	10D-23-11-26		24	11.3	10.1	52.8%	10.2-1.1	8.3-1.0	55%	-10.9%	-21.1%	4.0%	(Note 1)
11-25	11D-23-11-26		21	14.2	1.3	91.4%	10.9-3.3	0.6-0.7	95%	-30.4%	-133.0%	3.8%	(Note 1)
11-26	15D-23-11-26		20	13.6	0.6	96.1%	14.1-0.5	0.9-0.3	94%	3.3%	37.7%	-2.2%	
11-27	15D-23-11-26		25	14.0	0.6	96.0%	14.1-0.1	0.9-0.3	94%	0.5%	35.1%	-2.1%	
11-30	9D-23-11-26		20	13.5	3.6	79.2%	7.5-6.0	2.9-0.7	72%	-80.8%	-22.2%	-10.0%	(Notes 1,2)
12-01	9D-23-11-26		24	13.9	3.1	81.6%	7.5-6.4	2.9-0.2	72%	-85.3%	-7.3%	-13.4%	(Notes 1,2)
12-03	1D-26-11-26		23	6.9	0.9	88.3%	6.8-0.1	1.2-0.3	85%	-1.3%	24.2%	-3.9%	
12-04	2D-26-11-26		22	9.5	0.2	97.5%	9.4-0.1	0.8-0.6	92%	-0.6%	70.2%	-6.0%	
12-05	2D-26-11-26		23	9.0	0.4	96.2%	9.4-0.4	0.8-0.4	92%	3.8%	56.1%	-4.5%	
12-06	14D-23-11-26		23	11.2	0.3	97.2%	11.3-0.1	0.7-0.4	94%	0.9%	55.6%	-3.4%	
12-07	3D-26-11-26		24	0.7	5.2	11.1%	1.0-0.3	4.0-1.2	20%	34.5%	-31.1%	44.5%	(Notes 1,2)
12-08	3D-26-11-26		23	0.9	5.5	13.6%	1.0-0.1	4.0-1.5	20%	13.0%	-38.2%	32.0%	(Notes 1,2)
12-09	3D-26-11-26		22	0.6	5.8	9.7%	1.0-0.4	4.0-1.8	20%	37.9%	-44.5%	51.5%	(Notes 1,2)

-0.42

+0.20 (without wells with net rate)

NOTES:

1. Pumping rate was increased since last well test.
2. Consistent NOC results between consecutive tests.

TABLE # 1

Net Oil Computer vs. Test Tank Method

ITEM	Net Oil Computer	Test Tank Method
Total Volume Determination	<ul style="list-style-type: none">- uses mass of fluid divided by the fluid density- accuracy is better than 1.0%	<ul style="list-style-type: none">- uses test tank level gaugesGauges are divided into 10 cm increments with the operator estimating the last cm.- accuracy could be as high as 2% per cm of level error with low flowing wells
Water Cut Determination	<ul style="list-style-type: none">- continously measures fluid density which is related to water cut.- density measurement is within 0.0005% accurate- overall accuracy depends on oil and water densities manually entered into the computer which generally do not change	<ul style="list-style-type: none">- normally only one wellhead water cut is done per test- the water cut is determined by the operator at the field office- accuracy depends on how representative the sample is and what methods are used by the operator
Actual Test Conditions	<ul style="list-style-type: none">- well test is carried out at actual line pressure	<ul style="list-style-type: none">- well is flowed into a vented test tank- the difference in back pressure affects pump performance and therefore test accuracy
Temperature Compensation	<ul style="list-style-type: none">- all fluid volumes are given corrected to 15 ° C	<ul style="list-style-type: none">- fluid volumes are not corrected- this normally causes only minor errors but could be significant during extremely hot or cold ambient air temperatures

APPENDIX 1

PRINCIPLE OF OPERATION - NET OIL COMPUTER

(refer to attached diagram for more details)

The mass flow rate of the oil/water emulsion is measured directly by the Coriolis-effect mass meter (see the attached "How the Micro Motion Mass Meter Works.").

The density of the emulsion is also continuously measured by the mass meter using the natural frequency of the vibrating tubes. The principle here is that these tubes will vibrate with a different natural frequency depending on the density of the fluid within the tubes.

The temperature is measured by a 100 ohm platinum RTD mounted on the wall of the tube.

The NOC microprocessor receives the density, temperature and mass flow signals from the meter's electronics unit and calculates the net oil and net water volume flow rates using the following:

- 1.) The emulsion's density is corrected to 15° C using the measured temperature and standard API equations.
- 2.) The net total volume flow rate is calculated by dividing the corrected emulsion density from 1.) into the measured mass flow rate.
- 3.) Using the oil and water densities input by the operator and the corrected emulsion density from 1.) the computer calculates the % Water Cut. The equation used is as follows:
$$\% \text{ Water Cut} = \frac{\text{emulsion density} - \text{oil density}}{\text{water density} - \text{oil density}}$$
- 4.) The net oil and water flow rates are then calculated using the % Water Cut from 3.) and the net total volume flow rate from 2.).

The computer can either provide a total test figures or rates averaged over the test period.

How the Micro Motion Mass Flowmeter Works



Newton and the Micro Motion Flowmeter

The Micro Motion Mass Flowmeter measures fluid in motion. Each mass flowmeter consists of one or two flow tubes enclosed in a sensor housing. The principle of operation is the same for all Micro Motion meters.

The flowmeter operates by application of Newton's Second Law of Motion: Force = mass \times acceleration ($F = ma$). The meter uses this law to determine the precise amount of mass flowing through the tubes.

Inside the sensor housing, the flow tube is vibrated at its natural frequency (Figure 1) by a magnetic drive coil located at the center of the bend in the tube. The vibration is similar to that of a tuning fork, covering less than a tenth of an inch and completing a full cycle about 80 times each second.

As the fluid flows through the tube, it is forced to take on the vertical momentum of the vibrating tube. When the tube is moving upward during half of its vibration cycle (Figure 2), the fluid flowing into the meter resists being forced upward by pushing down on the tube. Having been forced upward, the fluid flowing out of the meter resists having its vertical motion decreased by pushing up on the tube (Figure 2). This causes the flow tube to twist (Figure 3). When the tube is moving downward during the second half of its vibration cycle, it twists in the opposite direction. This combination of forces which causes the flow tubes to twist is called the Coriolis effect.

Due to the tube's elasticity, the amount of twist is directly proportional to the mass flow rate of the fluid flowing through the tube. Magnetic sensors located on each side of the flow tube measure the velocity of the vibrating flow tube. The sensors send this information to an electronics unit where the information is processed and converted to an output signal proportional to the mass flow rate.

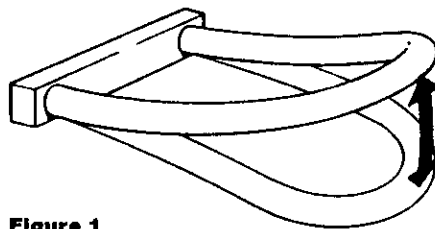


Figure 1
Vibrating flow tube.

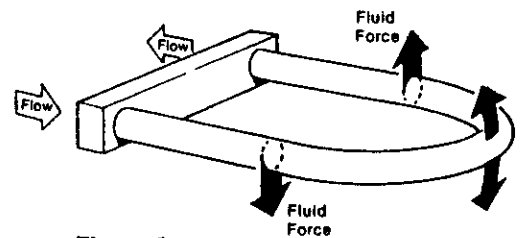


Figure 2
Fluid forces reacting to vibration of flow tube.

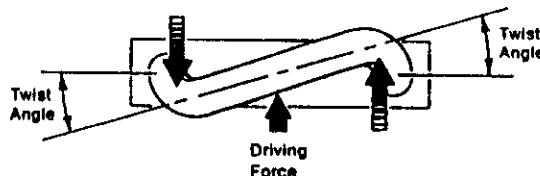
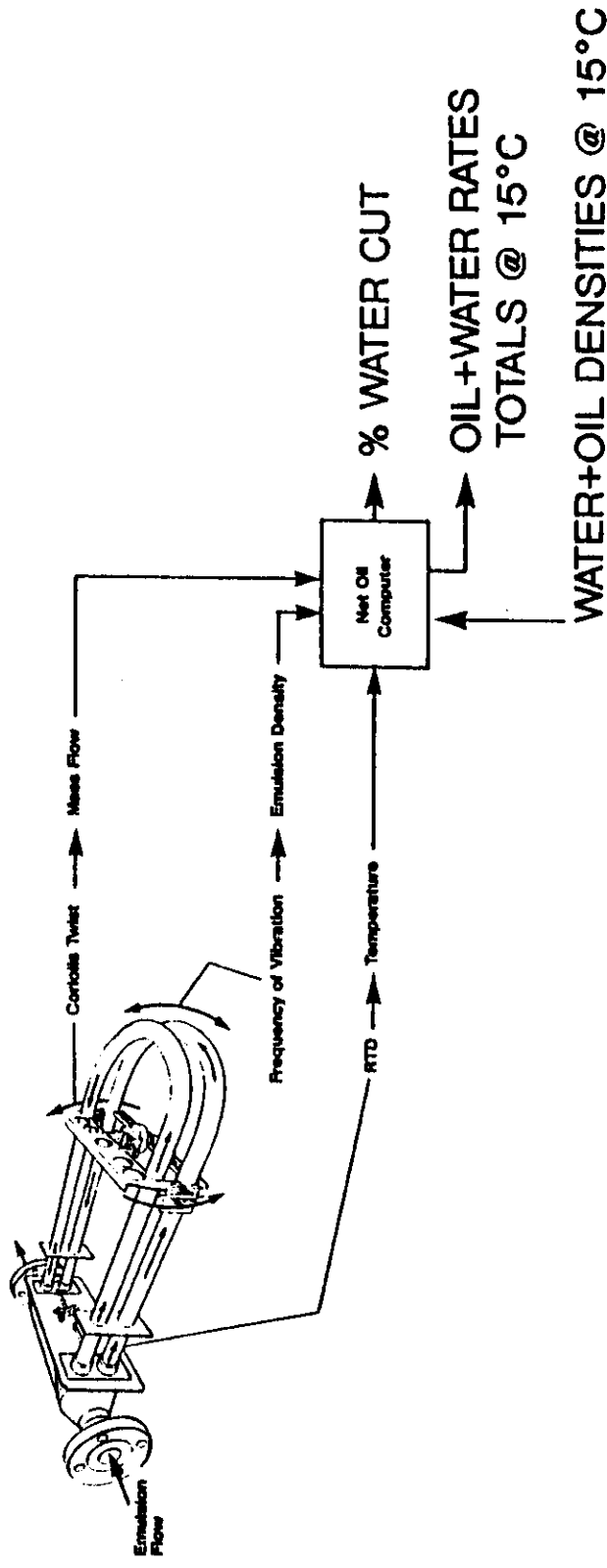


Figure 3
End view of flow tube showing twist.

NET OIL COMPUTER – PRINCIPLE OF OPERATION

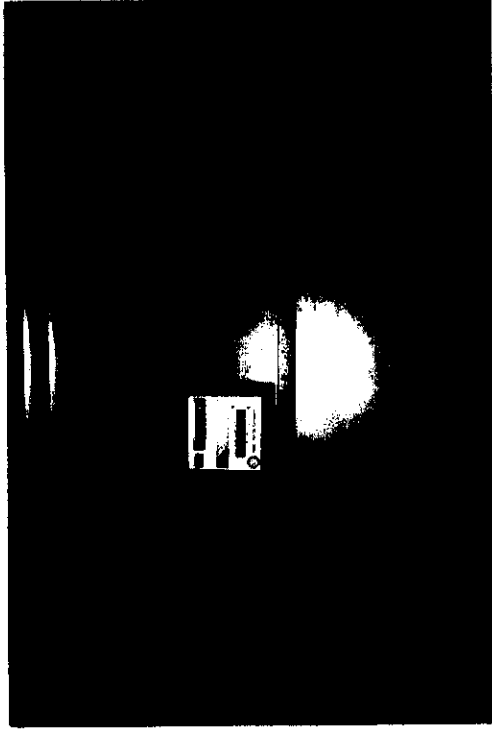


NET OIL COMPUTER EQUATIONS

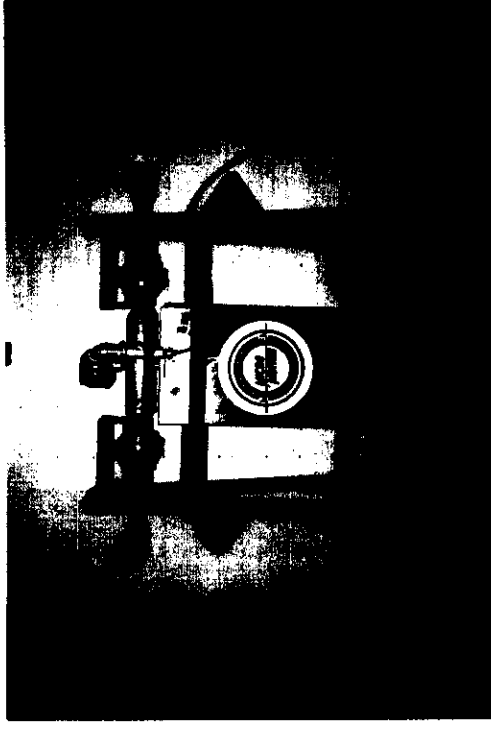
$$\% \text{ WATER CUT} = \frac{\text{EMULSION DENSITY} - \text{OIL DENSITY}}{\text{WATER DENSITY} - \text{OIL DENSITY}}$$

$$\text{EMULSION VOLUME FLOW RATE} = \frac{\text{MASS FLOW}}{\text{EMULSION DENSITY}}$$

CHEVRON CANADA RESOURCES NET OIL COMPUTER AT VIRDEN



Net Oil Computer



Mass Meter



Meter Connected
Directly to Wellhead



Meter Insulated and
Electrically Heat Traced

APPENDIX 2

INITIAL CALIBRATION PROCEDURES - NET OIL COMPUTER

The Net Oil Computer has three signals that require calibration: mass flow, temperature, and density. What follows is a description of the procedures used to calibrate these signals.

- 1.) Mass Flow - The calibration factor for the mass flow signal is dependent on the geometry and material of the tubes and the pick-up coils used to measure tube vibration. Because the tubes and coils are hermetically sealed within a protective metal case, they do not change and therefore do not require field recalibration. The calibration factor is determined at the factory.
- 2.) Temperature - The 100 ohm platinum RTD is also factory calibrated and protected by the metal case. Its factory calibration remains valid as long as the distance between the RTD and the electronics unit is less than 500 feet (actual distance for this NOC is 100 feet).
- 3.) Density - This signal is also calibrated at the factory but field tuning is required because it is affected by the meter's installation and the amount and type of coatings (ie. paraffins, asphaltenes) that may build up on the tube surface from time to time. A two step procedure is followed:
 - a.) The tubes are completely purged with air. Using the attached table, the air density is manually entered into the computer. At the same time the computer also notes the tube vibration frequency.
 - b.) Distilled water is used in a similar fashion (water density table is also attached). The computer now calculates the relationship between tube vibrating frequency and fluid density specific to the application.

Air Density (g/cc)

[illegible]

Density of Distilled Water

Temp (F)	Density (g/cc)
60.0-60.5	0.9990
60.7-61.7	0.9989
61.8-62.8	0.9988
62.9-63.8	0.9987
63.9-64.8	0.9986
64.9-65.7	0.9985
65.8-66.6	0.9984
66.7-67.5	0.9983
67.6-68.4	0.9982
68.5-69.3	0.9981
69.4-70.1	0.9980
70.2-70.9	0.9979
71.0-71.7	0.9978
71.8-72.5	0.9977
72.6-73.2	0.9976
73.3-74.0	0.9975
74.1-74.7	0.9974
74.8-75.5	0.9973
75.6-76.2	0.9972
76.3-76.9	0.9971
77.0-77.6	0.9970
77.7-78.3	0.9969
78.4-79.0	0.9968
79.1-79.6	0.9967
79.7-80.3	0.9966
80.4-80.9	0.9965
81.0-81.6	0.9964
81.7-82.2	0.9963
82.3-82.9	0.9962
83.0-83.5	0.9961
83.6-84.1	0.9960
84.2-84.7	0.9959
84.8-85.3	0.9958
85.4-85.9	0.9957
86.0-86.5	0.9956
86.6-87.1	0.9955
87.2-87.7	0.9954
87.8-88.3	0.9953
88.4-88.8	0.9952
88.9-89.4	0.9951
89.5-90.0	0.9950
90.1-90.5	0.9949
90.6-91.1	0.9948
91.2-91.6	0.9947
91.7-92.2	0.9946

October 24, 1990

AF - Nov 30
File - NV'su#1
3 ha spacing
concentrations

Chevron Canada Resources
Box 100
Virden, Manitoba
ROM OXO

Attention: Mr. L.A. Martinson
Area Superintendent

Dear Sir:

RE: North Virden Scallion Unit No. 1
Net Oil Computer

Your letter regarding the use of the net oil computer for well production test measurement is hereby acknowledged.

The Board is satisfied that the testing procedures used with the net oil computer are more representative of actual production conditions than the present test tank method. The accuracy and repeatability of the net oil computer measurements is also satisfactory.

It is the Board's understanding that the net oil computer will be used within the reduced spacing project area to test the producing wells at least quarterly in accordance with Subsection 56 (1) of the Petroleum Drilling and Production Regulation. Will Chevron be using the net oil computer to test wells outside the project area?

The Board is prepared to approve a production test duration of six (6) hours during the winter months provided each well is tested for six hours a day for two consecutive days and the test results are comparable.

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

Yours respectfully,

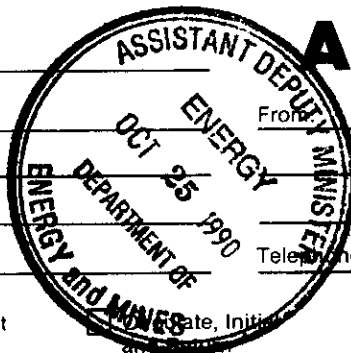
H. Clare Moster
Deputy Chairman

cc: Mr. Robert Fallwell,
Chevron Canada Resources, Calgary



Date: October 24, 1990

To: H. Clare Moster
Deputy Chairman



Action / Route Slip

From: John N. Fox

Telephone: 6574

- | | | | | |
|---|--|--|---|--|
| <input type="checkbox"/> Take Action | <input type="checkbox"/> Per Your Request | <input type="checkbox"/> Date, Initials and Signature | <input type="checkbox"/> For Approval and Signature | <input type="checkbox"/> Make _____ Copies |
| <input type="checkbox"/> May We Discuss | <input checked="" type="checkbox"/> For Your Information | <input type="checkbox"/> Return With Comments or Revisions | <input type="checkbox"/> Draft Reply for Signature | <input type="checkbox"/> Please File |

Comments: As part of its NVSU #1 reduced spacing application, Chevron proposed to use a portable mass flow meter - "Net Oil Computer" to production test the infill wells. Attached is a letter from the Board approving Chevron's request. If you require any additional background information, please call me.

JNF

BRANDON SUN, Friday, April 6, 1990 LOCAL/AGRI BUSINESS 3

Virden drilling project bit disappointing, Chevron says

by BUD ROBERTSON
Sun Staff

A drilling project in the Virden oil-patch hasn't gone over as well as originally hoped, says Chevron Canada's area superintendent.

Last March, the company announced a \$3.6-million project to drill nine new wells and convert 11 others to a water injection process in the Scallion field about nine kilometres north of Virden.

So far, the wells haven't been produc-

ing "as well as we'd anticipated," said Lyle Martinson, adding the company still hopes to see some better results.

Instead of the anticipated seven cubic metres of oil per well per day, only about about half was actually produced.

Government approval for the project was given last July. The wells started producing in late October.

While all nine wells were drilled, only about half of the 11 other wells in the project were converted to water injection, said Martinson.

The process forces oil through the rockbed and into the wells by way of water pressure from another well.

"Because of the discouraging results of some of the initial ones, we never went through with all of the conversions to water injection," he said.

Still, most of the \$3.6 million originally set aside for the project was spent, since the conversions were not as expensive as the drilling itself.

As to the overall success of the project, "the jury's still out," said Martinson.

"Our plan... was to give it about eight months from the time we put the wells on production, then we would go back and review our economics and see how we stood," he said, adding: "We don't anticipate any expansion this year, any way."

Last fall, Chevron drilled six other wells in different parts of the province.

In total, more than 50 oil wells were dug in Manitoba last year.

According to figures released by the

province's petroleum branch, drilling activity is quite high this year, said Martinson. "Unfortunately, I must say it's not us. We haven't drilled any."

While Virden is still a viable oil resource, he said, "we have to be very cautious about operating expenses, but we're still in business and we plan on being in business for a few years yet."

Chevron Canada employs 23 people in its Virden operation and contracts out work to a number of local trades.



Newfield

NC - LORP

8 hr
Spacing
project

NVSU



Energy and Mines

Petroleum

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

(204) 945-6577

July 27, 1989

Chevron Canada Resources Limited
500 - 5th Avenue S.W.
CALGARY, Alberta T2P 0L7

File

NVS-1

Padma Spacing
Project

Attention: K.J. Rossi
Land Assistant

Re: Lic. No. 4123 - Chevron Virden 9D-23-11-26 (WPM)
Lic. No. 4124 - Chevron Virden 10D-23-11-26 (WPM)
Lic. No. 4125 - Chevron Virden 11D-23-11-26 (WPM)
Lic. No. 4126 - Chevron Virden 15D-23-11-26 (WPM)
Lic. No. 4127 - Chevron Virden 1D-24-11-26 (WPM)
Lic. No. 4128 - Chevron Virden 2D-24-11-26 (WPM)
Lic. No. 4129 - Chevron Virden 14D-23-11-26 (WPM)
Lic. No. 4130 - Chevron Virden 3D-24-11-26 (WPM)
Lic. No. 4131 - Chevron Virden Prov

Dear Sir:

Enclosed are Drilling Licence No.'s 4123 through 4131.

The wells have been classified as non-confidential development wells.

You are hereby reminded that in accordance with Informational Notice No. 88-7 dated February 25, 1988, as of May 31, 1989 all drillers, toolpushers and wellsite supervisors must hold a valid First Line Supervisor's Blowout Prevention Certificate.

You are requested to conduct a leak-off test after drilling out the surface casing on the first of the 9 infill wells drilled. Please notify the Virden District Office 24 hours before the leak-off test is to commence.

Attached is a copy of our approval waiving the running of openhole logs to surface on 6 of the 9 infill wells. As indicated in the approval, a cased hole Gamma Ray Neutron log is required to be run to surface on every well on which openhole logs are not run to surface.

A directional survey is not required to be run on any of the wells.

Please ensure that all necessary precautions are taken to prevent the flow of drilling or produced fluids into surface waters from the Chevron Virden Prov. 13C-24-11-26 (WPM) well. To ensure the above mentioned requirements are met, prior to spudding the well the Virden Petroleum Inspector may require additional lease preparation.

It is our understanding that though Chevron will be drilling the main hole to the intermediate casing point with water, you will have weighting material on site as part of your contingency plans. Please forward a copy of Chevron's contingency plan in the event of a well kick, blowout or other loss of well control situation.

Please forward a copy of a fully executed (i.e. signed by Chevron) surface lease for each location and a copy of the approved Crown Land Permit for the location, 13C-24-11-26 (WPM).

Also enclosed is a package outlining data submission requirements.

Yours sincerely,

John N. Fox
Chief Petroleum Engineer
Petroleum Branch

JNF:dah

encl

cc: Virden Office



Energy and Mines

Petroleum

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

(204) 945-6577

July 25, 1989

Chevron Canada Resources
500 — 5th Avenue S.W.
Calgary, Alberta
T2P 0L7

Attention: Mr. Alan Lishman

Re: North Virden Scallion Unit No. 1 — Reduced Spacing Project
Modification of Logging Requirements

Your application for a waiver of the requirement that openhole logs be run from total depth to surface on 6 of the 9 infill locations proposed for the North Virden Scallion Unit No. 1 reduced spacing project is hereby acknowledged.

The application is approved subject to the following conditions:

- (1) a minimum of (3) three infill wells be logged from TD to the surface casing shoe in accordance with the requirements of Section 91(1) of the Petroleum Drilling and Production Regulations; and
- (2) openhole logs as set out in Chevron's reduced spacing application (89-02-24) be run from TD to the intermediate casing shoe and a cased hole Gamma Ray Neutron log be run from the intermediate casing shoe to the surface casing shoe on all remaining infill wells.

Yours sincerely,

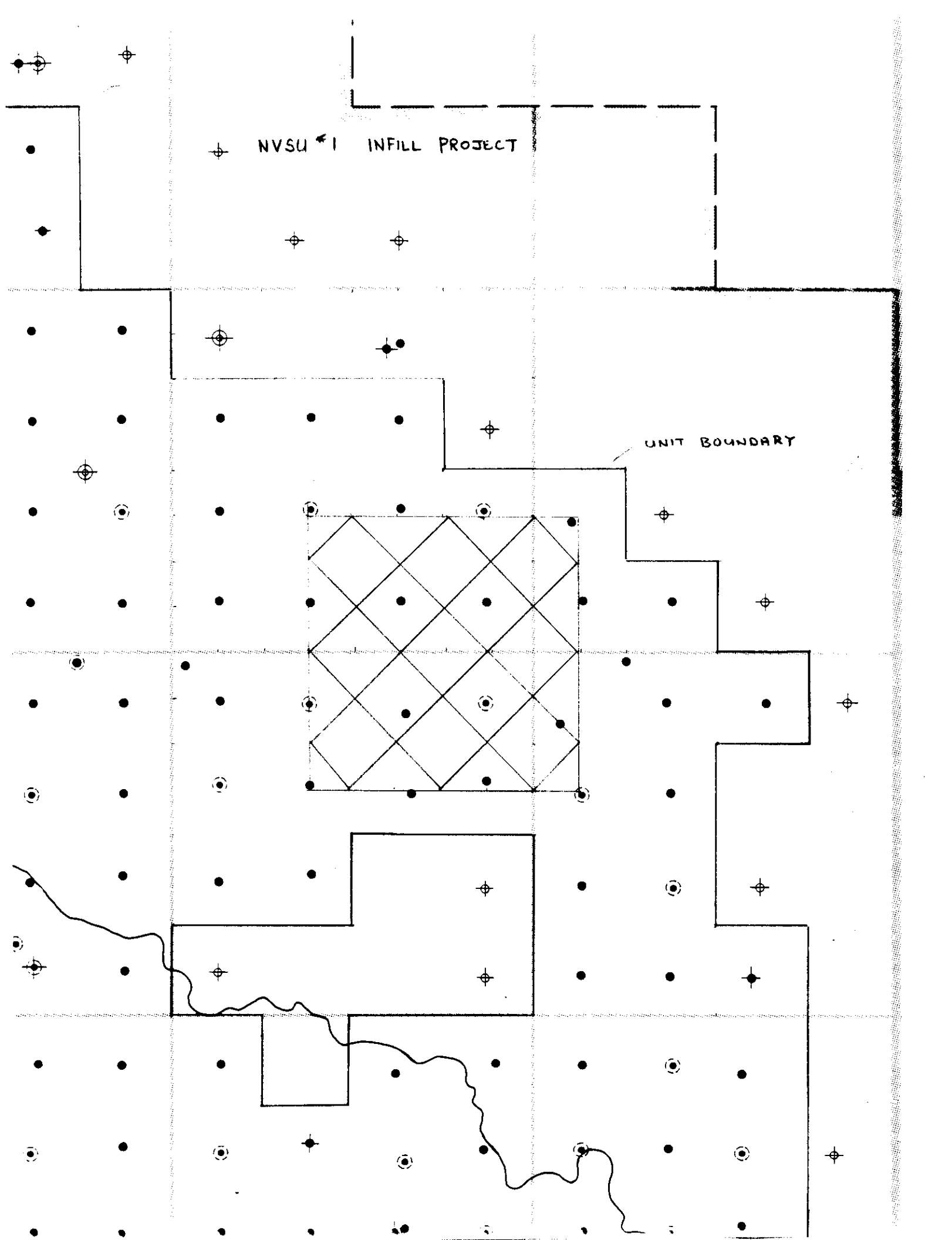
Original Signed By
L. R. DUBREUIL

L. R. Dubreuil
Director of Petroleum

LRD:jtb

NVSU #1 INFILL PROJECT

UNIT BOUNDARY





Chevron Canada Resources

500 - Fifth Avenue S.W., Calgary, Alberta T2P 0L7
Phone (403) 234-5000 Fax (403) 234-5947

W.H. Garman
Manager
Drilling Division

1989-07-31

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

Attention: Mr. John H. Fox

Gentlemen:

RE: CONTINGENCY PLAN FOR WELL CONTROL AT CHEVRON NVSU No. 1

Chevron Canada Resources will be incorporating a "hard" shut-in procedure to minimize the size of the influx and thereby reduce the initial shut-in casing pressure. This method will lower the casing shoe pressures at all points during the circulation and reduces the chance of formation breakdown and an underground blowout.

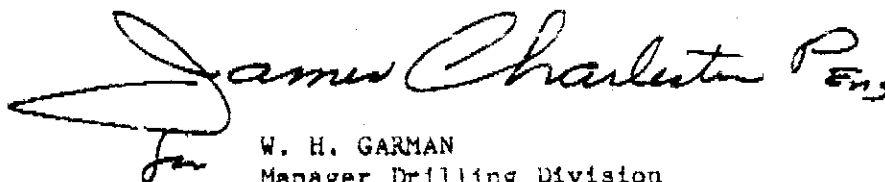
Prior to drilling out surface casing of any of the Chevron Virden wells, we shall rig up a 23 m³ pre-mix tank filled with 1 770 kg/m³ (kill) drilling fluids and two 400 barrel storage tanks. In the event a well kicks prior to setting intermediate casing, the well would be shut-in and the kill drilling fluids circulated to restore well control. Should shut-in pressures exceed the maximum allowable shut-in pressure (MACP), as ^{max. allowable} determined by the leak-off test at Chevron Virden Prov. 13C-24-11-26 WPM, ^{eq. pres.} then the well would be opened to the MACP and allowed to flow into the storage tanks until the well could be safely shut-in. Excessive water would be trucked from location and reinjected as required. The MACP will be posted in the doghouse immediately following the leak-off test.

) check this!

Our policy requires all of the contractor's drillers and Toolpushers to hold a valid First Line Supervisor's Blowout Prevention Certificate. In addition, all Chevron (Onsite) Drilling Representatives have valid Second Line Supervisor's Blowout Prevention Certificates.

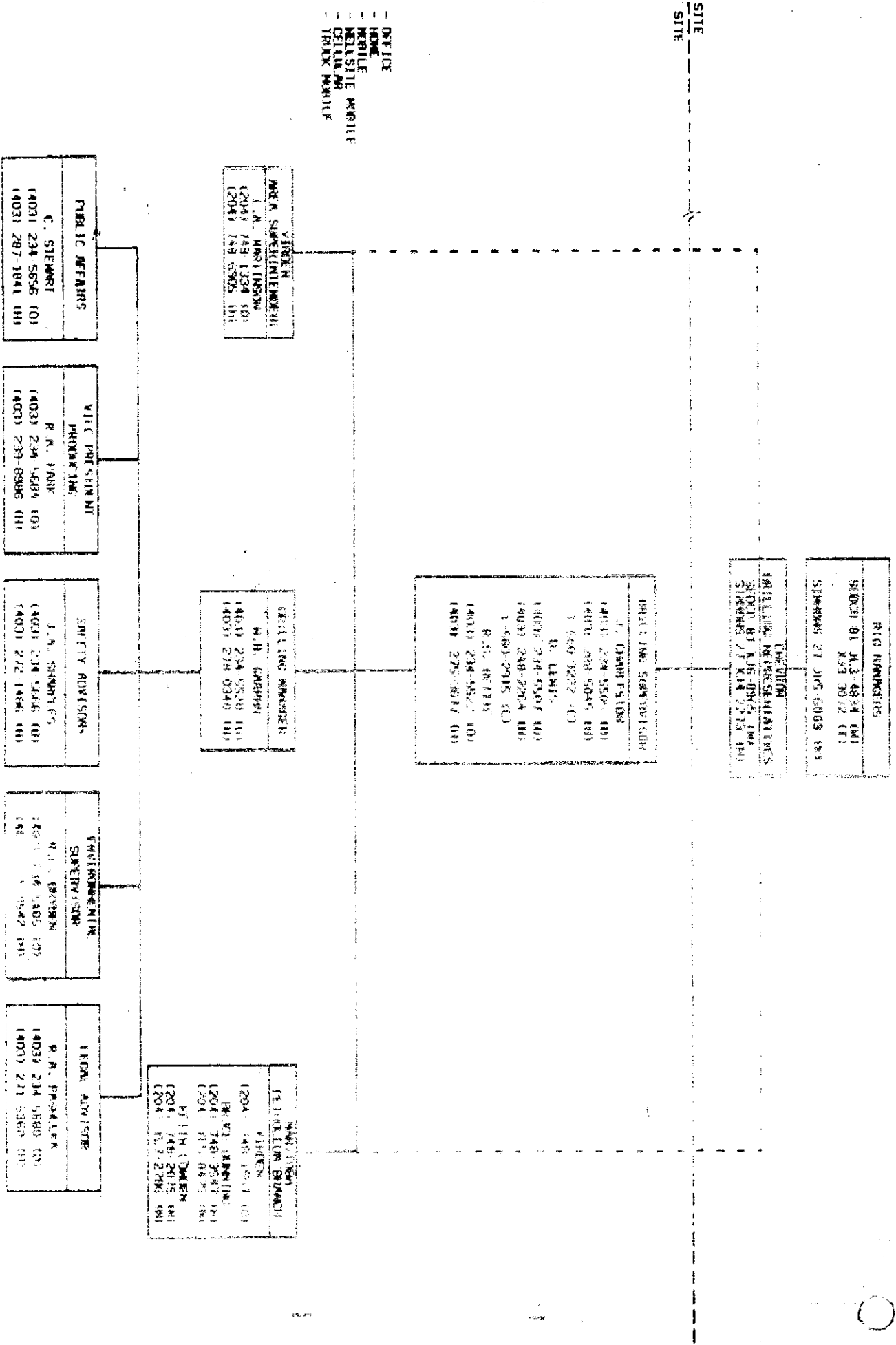
We anticipate spudding the first well on or about 1989-08-03, subject to government approvals and site preparation. Should you have any further questions contact Mr. Roy S. Rattie at (403) 234-5522.

Yours very truly,


W. H. GARMAN
Manager Drilling Division

BD/76:im

FIGURE 1
CHEVRON CANADA RESOURCES
NORTH VIRGEN SCALLION UNIT NO. 1 DRILLING PROGRAM
EMERGENCY NOTIFICATION STRUCTURE



NOTE: DRILLING DIVISION RESPONSIBLE FOR DRILLING OPERATIONS. CONTACTS SHOULD BE MADE WITH DRILLING DIVISION PERSONNEL.

- OFFICE
- HOME
- MOBILE
- CELLULAR
- TRUCK MOBILE



Chevron Canada Resources

500 - Fifth Avenue S.W., Calgary, Alberta T2P 0L7
Phone (403) 234-5500 Fax (403) 234-5547

W.H. Garman
Manager
Drilling Division

1977-18-01

Manitoba Energy Industries
Petroleum Branch
535 - 100 Graham Avenue
Winnipeg, Manitoba
R3C 4S1

Re: Manitoba Energy Industries

Dear Sir:

Enclosed for your information are 10 copies of a letterhead memorandum (LHM) dated 11/23/77, which was prepared by the Drilling Division of Chevron Canada Resources. The LHM is titled "Manitoba Energy Industries - Drilling Operations - 1977-18-01". The LHM is a summary of the drilling operations of the Manitoba Energy Industries for the year 1977. The LHM is a confidential document and should be handled accordingly.

U.S. No. 4127	-	Chevron Virden	90-23-11-26 WPM
U.S. No. 4128	-	Chevron Virden	100-23-11-26 WPM
U.S. No. 4129	-	Chevron Virden	110-23-11-26 WPM
U.S. No. 4130	-	Chevron Virden	120-23-11-26 WPM
U.S. No. 4131	-	Chevron Virden	130-23-11-26 WPM
U.S. No. 4132	-	Chevron Virden	140-23-11-26 WPM
U.S. No. 4133	-	Chevron Virden	150-23-11-26 WPM
U.S. No. 4134	-	Chevron Virden	160-23-11-26 WPM
U.S. No. 4135	-	Chevron Virden	170-23-11-26 WPM
U.S. No. 4136	-	Chevron Virden	180-23-11-26 WPM

Should you require any further information, please contact Mr. Roy A. Burtie at (403) 234-5500.

Yours very truly,

W. H. GARMAN
Manager Drilling Division

BD/77:im

cc: L. A. Martinson
R. L. Dryden
A. R. Young
J. Charleston
D. G. Lewis
On-Site Drilling Reps

CHEVRON SHUT-IN PROCEDURES FOR SURFACE STACK

Chevron requires the use of a hard shut-in procedure, which is designed to reduce the size of the influx. Although some concern may be directed to the possibility of a hydrostatic shock, it should be minimal due to the closing time of the bag preventer.

Note that the BOP and hydraulic choke are always closed during normal operations.

Shut-In Procedure While Drilling

The initial action to be taken after an influx has been detected is:

1. Sound alarm
2. Pull Kelly out of preventer, when stop gauge, ensure tool joints are clear of all BOPs.
3. Close bag-order preventer
4. Open BOP to closed choke
5. Read and record the following:
 - a) S.I.O.P. every minute
 - b) S.I.O.P. every minute
 - c) Volume of mud gained
6. If pipe is to be stopped or repositioned, adjust regulator valve to reduce pressure on bag.

Shut-In Procedure While Tripping

The initial action to be taken after an influx has been detected is:

1. Sound alarm
2. Position tool joint below the slips and under elevators
3. Insert full open safety valve and catch elevators
4. Close safety valve and when closed preventer
5. Open BOP to closed choke
6. Read and record the following:
 - a) S.I.O.P. every minute
 - b) S.I.O.P. every minute
 - c) Volume of mud gained
7. If pipe is to be stopped or repositioned, adjust regulator valve to reduce pressure on bag.

1. BOP Equipment Function Tests

*All function tests are to be recorded in the Tour Book.

- (a) Annular preventer and pipe rams are to be function tested daily and blind rams every time pipe is out of hole. Record closing and opening times
- (b) Remote BOP controls are to be function tested at least once a week.
- (c) Motor air shut-offs are to be function tested at least once a week.

(d) All bolts on BOP flanges must completely fill the nuts and are to be checked for tightness weekly, after pressure tests, and prior to penetrating potential producing zones.

(e) The HCR valve(s) must be function tested weekly.

Note: The above function test is to be conducted by one of the following methods:

- 1) Visual Check (for those where the valve stem movement can be visually witnessed).
- 2) During the wellbore pressure test and/or surface pressure test.
- 3) By use of a pressure gauge which would be used into the manifold allowing fluid to backflow into the manifold and pressure to be applied when in the closed position and maintain pressure for a period of time in the open position.

¹Pressure tests are to be conducted weekly and recorded in the logbook.

2. Accumulator Valve

(a) Accumulator valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system.

(b) The accumulator valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system.

(c) The accumulator valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system.

(d) The accumulator valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system. The valve is to be checked for proper operation and pressure of the system.

3. Drill String

(a) During each trip, a full drill prior to entering the wellbore is to be made. A full drill prior to entering the wellbore is to be made. A full drill prior to entering the wellbore is to be made.

(b) The drill string is to be checked for proper operation and pressure of the system. The drill string is to be checked for proper operation and pressure of the system. The drill string is to be checked for proper operation and pressure of the system.

(c) All kellys are to be equipped with upper and lower kelly covers.

(d) A full opening standing valve in the open position is to be placed in the well and a hydro check valve inside BOP must be available on the rig in a ready and usable location. This valve is not to be used as the lower kelly cover.

(e) The hole is to be kept full at all times while tripping and a bottom gauge is to be kept for each trip. Drilling representatives are to observe the hole and bottom gauge is to be kept for each trip. Drilling representatives are to observe the hole and bottom gauge is to be kept for each trip.

(f) When seasonal weather conditions are below 40°F the BOP, manifold and all lines upstream and downstream of the manifold (from HCR to separator) will be filled with Arctic-grade diesel; steam traced and insulated; the control panel for the 3/8" type choke will be located in the doghouse or an enclosed heated area in the rig area.

(g) Procedures, calculations, formulas and current data required to control a well are to be posted in the doghouse and at the choke controls.

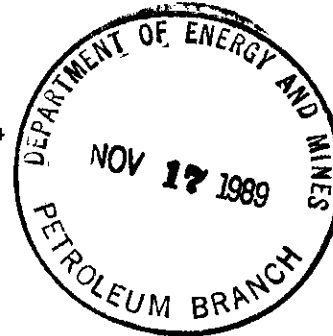
(h) A drill string float topped with a 5 mm hole is to be run directly above the bit on all wells.



Chevron Canada Resources

P.O. Box 100, Virden, Manitoba R0M 2C0
Phone (204) 748-1334 Fax (204) 748-6762

1989-11-14



Department of Energy and Mines
Petroleum Branch
555 - 330 Graham Avenue
WINNIPEG, Manitoba
R3C 4E3

ATTENTION: Mr. L. R. Dubreuil

Dear Sir:

Enclosed is a list of the preliminary production test results for the nine infill wells drilled in North Virden Scallion Unit #1. It should be noted these are early results and some optimization potential still exists.

If you require additional information or future updates please feel free to call me at 748-1334.

Yours truly,

L. A. Martinson, P. Eng.
Area Superintendent
Virden

LAM/tjs
Enclosure

Recent Production Data

Scallion Infill

<u>Well</u>	<u>OPD(m³)</u>	<u>WPD(m³)</u>	<u>Water Cut</u>
13C-24-11-26	1.2	2.5	68%
2D-26-11-26	0.5	9.5	95%
15D-23-11-26	0.8	14.2	95%
10D-23-11-26	8.0	10.0	55%
9D-23-11-26	3.2	7.3	70%
3D-26-11-26	4.7	1.3	21%
11D-23-11-26	1.0	10.0	91%
1D-26-11-26	2.2	7.8	78%
14D-23-11-26 (est.)	4.0	4.0	50%
Totals	25.6m ³ OPD	66.6m ³ WPD	Avg. 72% water cut



Date: October 17, 1989

To: Ian Haugh

Chairman

Oil and Natural Gas Conservation Board

Action / Route Slip

From: H. Clare Moster

Telephone: 1111

- | | | | | |
|---|---|--|---|--|
| <input type="checkbox"/> Take Action | <input type="checkbox"/> Per Your Request | <input type="checkbox"/> Circulate, Initial and Return | <input type="checkbox"/> For Approval and Signature | <input type="checkbox"/> Make _____ Copies |
| <input type="checkbox"/> May We Discuss | <input type="checkbox"/> For Your Information | <input type="checkbox"/> Return With Comments or Revisions | <input type="checkbox"/> Draft Reply for Signature | <input type="checkbox"/> Please File |

Comments: RE: APPROVAL OF OVERHEAD POWER LINES (CHEVRON - NVS REDUCED SPACING)
I have approved the subject request by letter (dated October 13th) sent to Chevron
on October 17th.

Atts. _____

HCM:p _____

*Shelly -
I mailed
the letter to
Chevron.*



The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

October 13, 1989

Chevron Canada Resources
Box 100
VIRDEN, Manitoba ROM 2C0

Attention: Mr. L.A. Martinson, P. Eng.
Area Superintendent

Re: North Virden Scallion Unit No. 1 Reduced Spacing Project
Installation of Overhead Power Lines

Your application to install overhead power lines to the wells, Chevron Virden 1D-26-11-26 (WPM), Chevron Virden 2D-26-11-26 (WPM), and Chevron Virden 3D-26-11-26 (WPM) in the reduced spacing project in North Virden Scallion Unit No. 1 is hereby acknowledged.

The Board agrees with Chevron that due to the rocky soil conditions in Section 26-11-26 (WPM) and use of the lands for pasture, installation of overhead power lines will not have an adverse effect on agricultural operations.

The Board therefore approves Chevron's application for installation of overhead power lines to the aforementioned wells using the routing outlined in the application.

Yours respectfully,

ORIGINAL SIGNED BY
H. CLARE MOSTER

H. Clare Moster
Deputy Chairman

cc: L.R. Dubreuil



Date October 11, 1989

Memorandum

To The Oil and Natural Gas
Conservation Board

From John N. Fox
Chief Petroleum Engineer
Petroleum Branch

Ian Haugh - Chairman
H. Clare Moster - Deputy Chairman
Wm. McDonald - Member

Subject

Telephone

Re: North Virden Scallion Unit No. 1 Reduced Spacing Project
Installation of Overhead Power Lines

Chevron Canada Resources has applied to install overhead power lines to the three infill wells drilled in Section 26-11-26 (WPM) as part of the North Virden Scallion Unit No. 1 reduced spacing project.

Recommendations

It is recommended that the Board approve Chevron's application for the installation of overhead power lines. The proposed letter of approval is attached.

Discussion

The Board, as a condition of its approval of reduced 8 ha spacing in a portion of North Virden Scallion Unit No. 1, Board Order No. SU 4, required Chevron to install electrical power underground. The reason for this condition was to minimize the impact of infill drilling and associated facilities on agricultural operations.

Chevron has applied to install overhead power lines to the three infill wells in Section 26-11-26 (WPM). The S/2 of Section 26 is very rocky pastureland and trenching to install underground electrical services will result in unnecessary disturbance and damage of the pastureland.

Chevron proposes routing the overhead power lines as shown in Figure 1 and have obtained the written approval of the landowner and the municipality (Attachment 1 & 2).

Installation of overhead power lines to the three infill wells in Section 26-11-16 (WPM) will not have any adverse effect on agricultural operations and therefore is not inconsistent with the conditions of the Board's reduced spacing approval.

ORIGINAL SIGNED BY
JOHN N. FOX

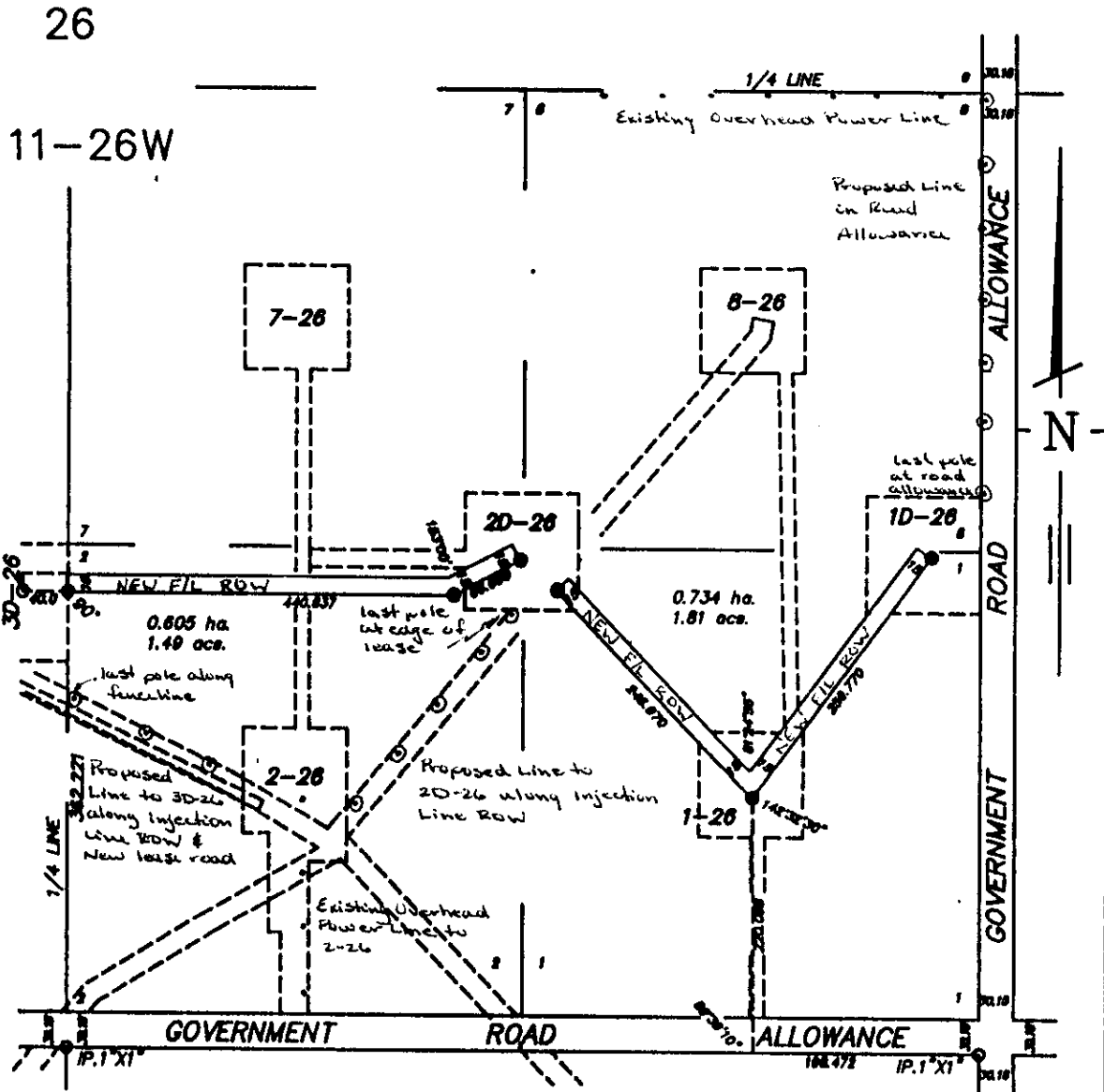
John N. Fox

JNF:dah

Approved by: _____
L.R. Dubreuil, Director

PLAN OF RIGHT OF WAY FOR FLOW LINES
CHEVRON CANADA RESOURCES LTD.
S.E.1/4 SEC.26 TWP.11 RGE.26 W.P.M.
MANITOBA

Scale 1: 8000



NOTES

All distances are in metres or decimal of a metre and may be converted to feet by multiplying by 3.28084
Area required is shown outlined thus -----
Survey monuments found are shown thus ----- o
Iron posts planted are shown thus ----- •

LEASE AREAS

	0.805 ha. 1.49 acs.
	0.734 ha. 1.81 acs.
TOTAL	1.339 ha. 3.30 acs.

Plan and Survey
certified correct
this 23rd day of Aug., 1989

Richard C. Lemoine
Manitoba Land Surveyor

M. J. Van
Witness

LENNON SURVEYS
P.O. Box 1346, 1640 Rosser Avenue
Brandon, Manitoba R7A6N2
(204) 727-0651
FAX (204) 727-6247

John Cooke for
L.A. Martinson, P. Eng.

ATTACHMENT 1

Overhead Powerline Consent
SE 1/4 26-11-26 WPM

I, WILLIAM CLIFFORD LYLE HEAMAN JR., the registered owner of the SE 1/4 26-11-26 WPM, hereby consent to the construction of overhead powerlines on the aforementioned lands for the production of oil wells as more particularly described, outlined in red, on the attached sketch.

Tonia Sparks
Witness

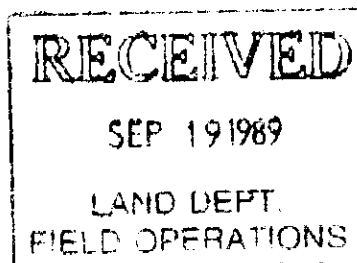
W. L. Lyle Heaman Jr.
WILLIAM CLIFFORD LYLE HEAMAN JR.

Rural Municipality of Wallace

D. H. STEPHENSON
SECRETARY-TREASURER

Phone 748-1739
P.O. Box 2200
Virden, Manitoba
Canada
R0M 1A0

ATTACHMENT 2



Chevron Canada Resources
500 - Fifth Ave. S.W.
CALGARY, Alberta
T2P 0L7

Our File No.

Your File No.

September 14, 1989

Attention: Ian C. Foss, Land Representative

Dear Sir:

Re: Proposed overhead power line SE 26-11-26WPM

Further to your letter of Sept. 11, 1989 please be advised that the R.M. of Wallace has given permission for Chevron to construct the power line as requested. Council would require, however, that the line be located as close to the edge of the road allowance as possible.

Trusting this to be satisfactory.

Yours Truly,

R.M. of Wallace

Don Stephenson
Secretary-Treasurer

DHS/crd

84.09.19
02.19 - K. Lezzer
cc - L. Martinson
cc - J. Corbett
CHH

NVSU #1 REDUCED SPACING PROJECT

- in applⁿ Chevron indicated they would adopt the Board's "Condition of Reduced Spacing Approval" in Daly Unit #3 which indicate the Placement Criteria set out in an impact minimization study by R.A. Benner Associates

10-26, 10-24 on uncultivated land

- COND. No. 2
- (a) electric power will be installed underground
 - (b) Whenever practical in conjunction with new facilities, existing power lines will be installed underground

REQUEST CHEVRON 89-09-11

- ① map of existing hydro lines + proposed routing to infill wells
- ② feasibility from a safety & cost standpoint in laying hydro in Flowline/^{injection-line} ditch/trench
- ③ landowner consent to above ground hydro - remind landowner that the company originally committed



Chevron Canada Resources

P.O. Box 100, Virden, Manitoba R0M 2C0

Phone (204) 748-1334 Fax (204) 748-6762



1989-09-11

North Virden Scallion Unit #1
Reduced Spacing Project

Oil and Natural Gas
Conservation Board
Room 309
Legislative Building
WINNIPEG, Manitoba
R3C 0V8

ATTENTION: Mr. H. C. Moster
Deputy Chairman

Dear Sir:

RE: Installation of Electrical Service on Section 26-11-26 WPM

Further to our letter of 1989-08-25, Chevron would like to provide the following information in support of our request.

Only Section 26 will be affected by this request to install overhead powerlines to 1D, 2D and 3D-26. The line to 1D-26 will be placed in the Municipal Road Allowance subsequent to Chevron receiving approval from the R.M. of Wallace. The line from 2-26 to 2D-26 will be placed on an existing injection line right-of-way as will the line from 2-26 to 3D-26.

Chevron is currently seeking permission from the landowner and the R.M. of Wallace and expects no difficulty in obtaining permission, based on past dealings with both parties.

Chevron's proposed routing for the new oil flowlines from the subject wells and the proposed routing for the electrical service do not match and therefore they cannot be placed in a common trench. Even if the routings were to be changed it would not be in keeping with safe and accepted practice to lay both the flowline and the powerline in the same trench.

Chevron has included with this letter a map of the subject area showing the existing and proposed overhead power lines for your review.

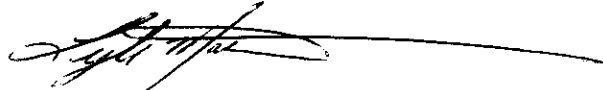
Subsequent review has shown that all power on Section 24 can and will be installed underground.

. . . /Page two

Oil and Natural Gas
Conservation Board
Attn: Mr. H. C. Moster
1989-09-11
Page two

Your attention to this matter would be greatly appreciated. Should you require further information please feel free to contact Lyle Martinson or John Cooke at 1-748-1334 or at the letterhead address.

Your truly,

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

L. A. Martinson, P. Eng.
Area Superintendent
Virden

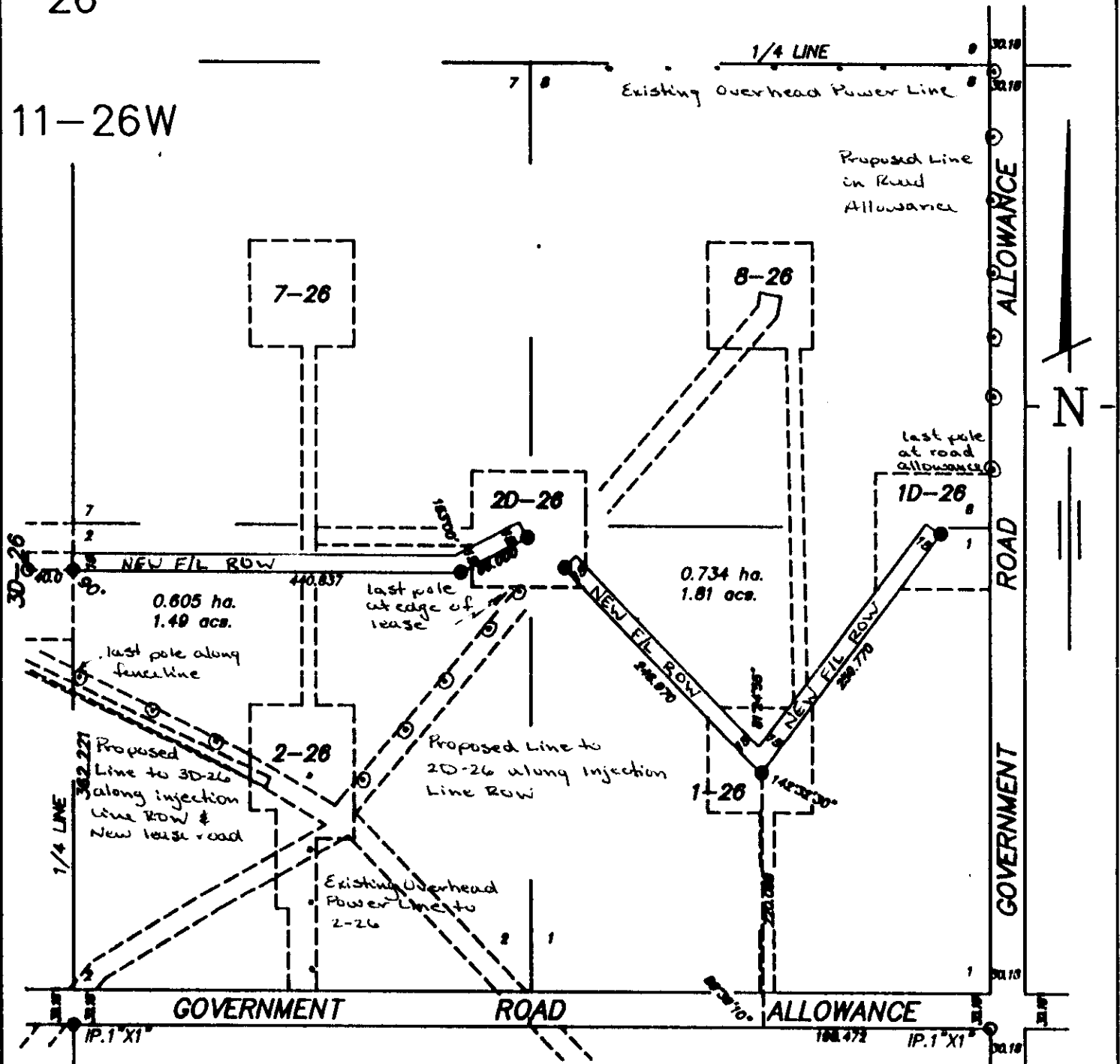
LAM/tjs
Enclosure

PLAN OF RIGHT OF WAY FOR FLOW LINES
CHEVRON CANADA RESOURCES LTD.
S.E.1/4 SEC.26 TWP.11 RGE.26 W.P.M.
MANITOBA

Scale 1: 5000

26

11-26W



NOTES

All distances are in metres or decimals of a metre and may be converted to feet by multiplying by 3.28084
Area required is shown outlined thus -----
Survey monuments found are shown thus ----- o
Iron posts planted are shown thus ----- •

LEASE AREAS

	0.605 ha. 1.49 acs.
	0.734 ha. 1.81 acs.
TOTAL	1.339 ha. 3.30 acs.

Plan and Survey
certified correct
this 23rd day of Aug., 1969

Richard C. Lennon
Manitoba Land Surveyor

M. Van
Witness

LENNON SURVEYS
P.O. Box 1346, 1640 Rossier Avenue
Brandon, Manitoba R7A6N2
(204) 727-0651
FAX (204) 727-5247

John Cooke for
L.A. Martinson, P. Eng



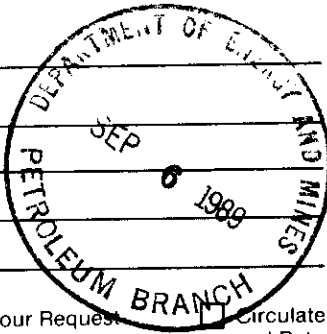
Date: SEPTEMBER 6, 1989

To: L.R. DUBREUIL

Action / Route Slip

From: H. CLARE MOSTER

Telephone: 1111



☒ Take Action

☐ Per Your Request

☐ Circulate, Initial
and Return

☐ For Approval and
Signature

☐ Make _____ Copies

☐ May We Discuss

☐ For Your Information

☒ Return With Comments
or Revisions

☐ Draft Reply for
Signature

☐ Please File

Comments: RE: NVS REDUCED SPACING - ELECTRICAL SERVICE:

Please investigate this request and provide me with your recommendation.

(Have inspectors check sites, consent (written?) from landowners)

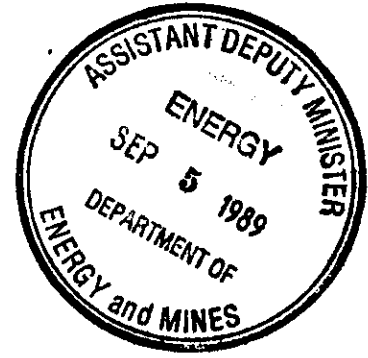
Attachment

HCM:pat



Chevron Canada Resources

P.O. Box 100, Virden, Manitoba R0M 2C0
Phone (204) 748-1334 Fax (204) 748-6762



1989-08-25

Oil and Natural Gas
Conservation Board
Room 309
Legislative Building
WINNIPEG, Manitoba
R3C 0V8

North Virden Scallion Unit #1
Reduced Spacing Project

ATTENTION: Mr. H. C. Moster
Deputy Chairman

Dear Sir:

RE: Installation of Electrical Service on Sections 24 and 26-11-26WPM

In order to minimize the impact of the Infill Project on the agricultural activity in the area, Chevron agreed to install underground cable for all new electrical service in the project area. This was set out as a condition of the Daly Unit #3 Reduced Spacing Approval and included by Chevron in the North Virden Scallion Submission in Appendix 11.

Sections 24 and 26 are pastureland which is very rocky in nature and, upon further investigation, Chevron determined that the installation of the underground service on these sections may result in unnecessary disturbance of the vegetation and soil. It would not be possible to install underground lines with a trencher on these sections, and the installation of overhead powerlines would result in less inconvenience and damage to the pastureland than using a large backhoe to dig a suitable trench through the rocky clay.

As a result of the above, Chevron would like to request permission to deviate from the initial application for the Reduced Spacing Project and install above ground electrical service to the infill wells on Sections 24 and 26.

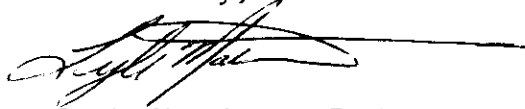
As originally set out in the application, all new electrical service on Section 23 will be underground and, where practical, existing service will be converted to underground service where the existing service is an inconvenience to agricultural activity.

. . . ./Page two

Oil and Natural Gas
Conservation Board
Attn: Mr. H. C. Moster
August 25, 1989
Page two

Your attention to this matter would be greatly appreciated. Should you require further information please feel free to contact Lyle Martinson or John Cooke at 1-748-1334 or at the letterhead address.

Yours truly,

A handwritten signature in dark ink, appearing to read 'L. A. Martinson', with a long horizontal flourish extending to the right.

L. A. Martinson, P. Eng.
Area Superintendent
Virden

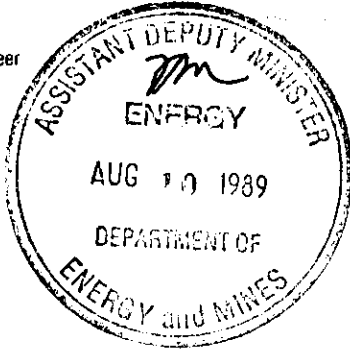
LAM/tjs



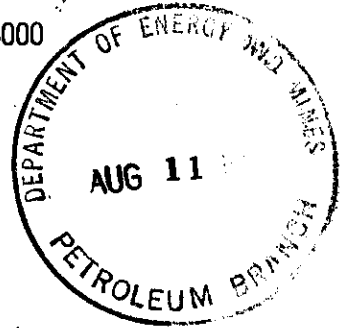
Chevron Canada Resources

500 - Fifth Avenue S.W., Calgary, Alberta T2P 0L7 • Phone (403) 234-5000
Fax 234-5947

K.E. Godard
Chief Engineer



1989-08-03



North Virden Scallion Unit No. 1
Reduced Spacing Project
Proposed Schedule

Oil and Natural Gas Conservation Board
Room 309, Legislative Building
Winnipeg, Manitoba
R3C 0V8

Attention: Mr. H. C. Moster, Deputy Chairman

Gentlemen:

Chevron Canada Resources submits a proposed schedule of North Virden Scallion Unit No. 1 infill drilling project activities. The schedule was requested in the Board's approval of the project dated 1989-06-23. The subject work includes the following:

1. Drilling 9 Wells

- 1 week per well
- early August to early September
- two drilling rigs

2. Completion of 9 Wells

- 3 to 4 days per well
- mid August to mid September
- two service rigs

3. Well Conversions

- 3 to 4 days per well
- mid September to end of October

4. Facilities, Flowlines and Well Tie-ins

- 12 to 14 weeks
- mid August to end of October

Chevron plans to begin drilling with one rig. A preserved core will be taken from the first well at 13C-24-11-26 W1M and will be sent to Core Labs in Calgary for capillary pressure, relative permeability, and wettability work. An additional rig will be moved in for the drilling of the remaining eight wells.

The Board also requested Chevron obtain approval from the Petroleum Branch to convert each of the 11 conversions to water injection prior to performing the work. Chevron will submit to the Petroleum Branch the appropriate Form MG 416 to obtain such approval.

Please contact Scott Robinson at (403) 234-5388 if you have any additional questions.

Yours very truly,

A handwritten signature in cursive script, appearing to read "Scott Robinson".

for C. G. FOLDEN, P.Eng.
Manager
Reservoir Engineering

DSR/jr



Energy and Mines

Petroleum

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

(204) 945-6577

July 25, 1989

Chevron Canada Resources
500 - 5th Avenue S.W.
Calgary, Alberta
T2P 0L7

Attention: Mr. Alan Lishman

Re: North Virden Scallion Unit No. 1 - Reduced Spacing Project
Modification of Logging Requirements

Your application for a waiver of the requirement that openhole logs be run from total depth to surface on 6 of the 9 infill locations proposed for the North Virden Scallion Unit No. 1 reduced spacing project is hereby acknowledged.

The application is approved subject to the following conditions:

- (1) a minimum of (3) three infill wells be logged from TD to the surface casing shoe in accordance with the requirements of Section 91(1) of the Petroleum Drilling and Production Regulations; and
- (2) openhole logs as set out in Chevron's reduced spacing application (89-02-24) be run from TD to the intermediate casing shoe and a cased hole Gamma Ray Neutron log be run from the intermediate casing shoe to the surface casing shoe on all remaining infill wells.

Yours sincerely,


L. R. DUBREUIL

L. R. Dubreuil
Director of Petroleum

LRD:jtb



Chevron Canada Resources

500 - Fifth Avenue S.W., Calgary, Alberta T2P 0L7
Phone (403) 234-5000 Fax (403) 234-5947



Calgary, Alberta
1989-07-06

Manitoba Department of Energy and Mines
555, 330 Graham Avenue
WINNIPEG, Manitoba
R3C 4E3

Attention: Mr. John Fox

Gentlemen:

As per our telephone conversation of 1989-07-06, Chevron wishes to obtain written approval to waive open hole logging over the intermediate hole at the Virden-Scallion infill pilot project. We will run induction-sonic at three of the nine wells to obtain some new representative uphole data. These wells will be:

11D-23-11-26 WPM
15D-23-11-26 WPM
1D-26-11-26 WPM

The remaining six wells will be logged through casing with Gamma Ray-Neutron tool at the completion of each well.

Yours very truly,

ALAN LISHMAN (403) 234-5511

AL/l:jaw



Memorandum

Date July 18, 1989

To

Keith Lowdon

From

John N. Fox

Subject NVSU #1 - Reduced Spacing

Telephone

As we discussed, attached is a copy of the Board's conditions of approval for reduced spacing in Daly Unit No. 3 which the Board has also applied to the NVSU #1 reduced spacing project.

In accordance with Conditions No. 4 & 5, wellsites and flowline R.O.W.'s must be inspected jointly by the landowner and an inspector and the landowner's consent obtained.

I suggest you write a brief letter of agreement for the landowner's signature which indicates that:

- 1) the location of the facilities has been discussed with the landowner,
- 2) he is aware that there is some flexibility with respect to moving the well location (preferably within the target area), and
- 3) the landowner agrees to the location of the facilities.

The landowner should also be made aware of the other conditions of approval such as the use of trails as opposed to built up roads, underground electrical, etc.

If you have any questions about this matter, give me a call.

ORIGINAL SIGNED BY
JOHN N. FOX

John N. Fox

JNF:dah

encl

Attached proposed letter of
consent for Inspector's comments.

REVIEW OF PROPOSED WELL LOCATION

The Oil and Natural Gas Conservation Board has approved an application by Chevron Canada Resources for establishment of smaller 8 hectare drilling spacing units in a portion of North Virden Scallion Unit No. 1. Chevron plans to drill nine (9) wells on the 8 hectare spacing units and one or more of the proposed locations is on lands which you are the landowner or occupant.

A condition of the Board's approval is that wherever practical, wellsites, lease roads and other facilities should be located to minimize impact on agricultural operations.

The Board also requires that the proposed location of wellsites, lease roads and other facilities be jointly inspected by the landowner and an authorized representative of the Petroleum Branch and that the landowner indicate whether he or she is in agreement with the proposed location(s).

Please indicate your general agreement or disagreement with the location of any wellsites, lease roads and other facilities proposed to be constructed on your lands. If you are not interested in a joint inspection of the proposed location(s), please indicate that below.

I agree with the proposed location of the wellsite, lease road and other facilities.

(Landowner/Occupant)

Date

I am not interested in participating in a joint inspection of the proposed location of the wellsite, lease road and other facilities.

(Landowner/Occupant)

Date

I disagree with the proposed location of the wellsite, lease road and other facilities.

(Landowner/Occupant)

Date

Please feel free to add any comments below with regard to the location of proposed facilities on your land.

Comments:



The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

June 23, 1989

Chevron Canada Resources
500 - 5th Avenue S.W.
CALGARY, Alberta
T2P 0L7

Attention: Mr. C. G. Folden, P. Eng.
Manager, Reservoir Engineering

Dear Sir:

Re: North Virden Scallion Unit No. 1
Reduced Spacing Project Approval

The Board has considered your application for reduced 8 ha spacing and conversion of eleven wells to water injection in a portion of North Virden Scallion Unit No. 1 and has issued two orders, Board Order No. SU 4 and Board Order No. PM 61 approving the application. A copy of the Board Orders are attached.

Board Order No. SU 4 establishes 8 ha drilling spacing units for the project area. The location of all new wells in the project area shall conform to the conditions of this order, the criteria set out by Chevron in the application and the requirements of Section 17 of the Petroleum Drilling and Production Regulation.

Manitoba Agriculture has expressed a concern with the proposed location of the well, 14D-23-11-26 (WPM). Consideration should be given to moving the location of this well as far north and east within the target area as is practical.

Any well site located in low-lying areas or sloughs shall be designed and constructed to prevent the contamination of surface waters.

Chevron has proposed to use a mass flow meter and net oil computer for production testing individual wells within and adjacent to the project area. Please provide the Petroleum Branch with the results of calibration tests of the mass flow meter and the procedures to be used for testing wells.

Board Order No. PM 61 covers pressure maintenance operations in the unit and approves conversion of eleven wells in the project area to water injection wells. Board Order No. PM 61 supercedes Board Order No. PM 51.

Prior to converting a well to water injection, Chevron shall obtain the approval of the Petroleum Branch.

Plans for the following activities, as outlined by Chevron in the application, are acceptable:

- (1) drilling program,
- (2) spill mitigation,
- (3) housekeeping,
- (4) facility inspection, and
- (5) well and reservoir data acquisition.

Chevron's proposal to complete the infill wells openhole and perforate all the pay zones in the injection wells may make it difficult to evaluate waterflood conformance. Consideration should be given to conducting a production and injection profile logging program to help evaluate waterflood conformance within the project area. The Board also encourages Chevron to collect and analyze any additional data which may aid in understanding and evaluating the reduced spacing project.

Chevron is requested to provide the Petroleum Branch with a proposed schedule of drilling, conversion and facility construction activities.

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

Yours respectfully,

ORIGINAL SIGNED BY
H. CLARE MOSTER

H. Clare Moster
Deputy Chairman

cc: Ian Haugh, Chairman
Wm. McDonald, Member
L. R. Dubreuil (Petroleum Branch)
S. Scrafield (Municipal Affairs)
D. Partridge (Agriculture)
D. Wotton (Environment)



The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

Order No. PM 61

An Order Pertaining to Pressure Maintenance by Water Flooding Virden Lodgepole A Pool

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being 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 economical 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, Board Order No. PM 51 provides for pressure maintenance by water flooding in the North Virden Scallion Unit No. 1 ("the unit area").

AND WHEREAS, Chevron Canada Resources is the unit operator of the North Virden Scallion Unit No. 1.

AND WHEREAS, the Board received an application dated February 24, 1989 from Chevron Canada Resources for approval to convert eleven additional wells in the unit area to water injection.

AND WHEREAS, upon publication of notice of the application the Board received no objections to or interventions in the application.

AND WHEREAS, upon due consideration of the said application, the Board has found it is reasonable and desirable to convert the said wells to water injection.

NOW THEREFORE, the Board orders that:

1. Board Order No. PM 51 is hereby rescinded.
2. The unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit area.

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:

Chevron Scallion WIW 2-10-11-26 (WPM)
Chevron Scallion WIW 10-10-11-26 (WPM)
Chevron Scallion WIW 12-10-11-26 (WPM)
Chevron Scallion Prov. WIW 2-11-11-26 (WPM)
Chevron Scallion Prov. WIW 4-11-11-26 (WPM)
Chevron Scallion Prov. WIW 6-11-11-26 (WPM)
Chevron Scallion Prov. WIW 12-11-11-26 (WPM)
Chevron Scallion WIW 6-13-11-26 (WPM)
Chevron Scallion WIW 10-13-11-26 (WPM)
Chevron Scallion WIW 12-13-11-26 (WPM)
Chevron Scallion WIW 14-13-11-26 (WPM)
Dome Cdn. Sup. Scallion WIW 8-14-11-26 (WPM)
Cdn. Res. et al Scallion WIW 10-14-11-26 (WPM)
Sun G. Braybrook Scallion WIW 12-14-11-26 (WPM)
Chevron Scallion WIW 2-15-11-26 (WPM)
Chevron Scallion WIW 10-15-11-26 (WPM)
Cdn.-Sup. Veldhouse Scallion WIW 7-16-11-26 (WPM)
Shell Moir South Scallion WIW 10-21-11-26 (WPM)
Chevron Virden WIW A2-22-11-26 (WPM)
Chevron Scallion WIW 4-22-11-26 (WPM)
Sun T. L. Tapp Scallion WIW 10-22-11-26 (WPM)
Chevron Scallion WIW 12-22-11-26 (WPM)
Chevron Virden WIW 16C-22-11-26 (WPM)
Chevron Virden WIW 9-23-11-26 (WPM)
Chevron Virden WIW 10-23-11-26 (WPM)
Chevron Virden WIW 11-23-11-26 (WPM)
Chevron Scallion WIW 12-23-11-26 (WPM)
Chevron Scallion WIW 14-23-11-26 (WPM)
Chevron Virden WIW 15-23-11-26 (WPM)
Chevron Scallion WIW 16-23-11-26 (WPM)
Dome Cdn. Sup. Scallion WIW 6-24-11-26 (WPM)
Chevron Scallion Prov. WIW 12-24-11-26 (WPM)
Chevron Virden Prov. WIW 13-24-11-26 (WPM)
Chevron Virden WIW 4-25-11-26 (WPM)
Chevron Virden WIW 5-25-11-26 (WPM)
Fargo Virden WIW 1-26-11-26 (WPM)
Fargo Virden WIW 2-26-11-26 (WPM)
Sun W.C. Tapp Virden WIW 3-26-11-26 (WPM)
Sun P. J. Tapp Scallion WIW 6-26-11-26 (WPM)
Fargo Virden WIW 7-26-11-26 (WPM)
Cdn. Res. et al Scallion WIW 8-26-11-26 (WPM)
Chevron Scallion WIW 6-27-11-26 (WPM)
Sun W. C. Tapp Scallion WIW 8-27-11-26 (WPM)
Chevron Scallion WIW 14-27-11-26 (WPM)

Gulf Union Tapp Scallion WIW 6-28-11-26 (WPM)
Cdn.-Sup. Whiteford Scallion WIW 8-28-11-26 (WPM)
Gulf Union Tapp Scallion WIW 14-28-11-26 (WPM)
Cdn.-Sup. Whiteford Scallion WIW 16-28-11-26 (WPM)
Shell Moir North Scallion WIW 6-33-11-26 (WPM)
Chevron Scallion WIW 8-33-11-26 (WPM)
Shell Moir North Scallion WIW 14-33-11-26 (WPM)
Vallat et al Scallion WIW 16-33-11-26 (WPM)
Cdn. Res. et al Scallion WIW 6-34-11-26 (WPM)
Dome Scallion WIW 4-3-12-26 (WPM)
Dome Cdn. Sup. Scallion WIW 2-4-12-26 (WPM)
Chevron North Scallion WIW 4-4-12-26 (WPM)
Chevron North Scallion WIW 6-4-12-26 (WPM)
Chevron North Scallion WIW 10-4-12-26 (WPM)
Chevron Virden WIW A12-4-12-26 (WPM)

and such other wells in the unit area as the Board may 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 area 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) At least once every three years commencing in 1981, unless otherwise directed by the Board, the unit operator shall conduct a survey to determine the static reservoir pressure in the unit area.

3(2) Notwithstanding the provisions of subsection (1), the unit operator shall, at yearly intervals, conduct a survey to determine the static reservoir pressure in Sections 23, 24, 25 and 26 in Township 11, Range 26 (WPM).

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 area 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 8 000 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 area.

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 the 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; and
- (c) a summary of any remedial operations carried out on any well in the unit area.

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.



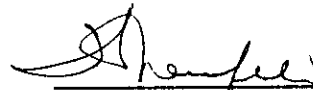
H. Clare Moster
Deputy Chairman



Ian Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION
BOARD ORDER NO. PM 61 APPROVED THIS
20 DAY OF JUNE A.D. 1989
AT THE CITY OF WINNIPEG.

APPROVED:



Harold Neufeld
Minister of Energy and Mines



The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

Order No. SU 4

An Order Pertaining to Drilling Spacing Units Virden Lodgepole A Pool

WHEREAS, subsection (9)(b) of Section 62 of "The Mines Act", being 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

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, subsection (1)(f) of section 63 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders, not inconsistent with any other provision of this Part of Part III,

(f) prescribing spacing units and the size and shape of spacing units;"

AND WHEREAS, subsection (1) of Section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of Section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated February 24, 1989 from Chevron Canada Resources as unit operator of North Virden Scallion Unit No. 1 ("the unit area") for approval to reduce the size of drilling spacing units in a portion of the unit area outlined in Schedule A ("the project area").

AND WHEREAS, upon publication of notice of the application, the Board received no objections to or interventions in the application.

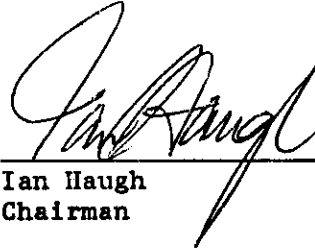
AND WHEREAS, the Board considers that establishment of smaller drilling spacing units within the project area will result in a substantial increase in recovery of crude oil from the project area.

NOW THEREFORE, the Board orders that:

1. Subject to clause 2 herein, the spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from or injecting salt water into the Mississippian Lodgepole Formation within the project area is a square, 8 hectares in area, with corners located at the midpoints of the boundaries of each legal subdivision. The resultant pattern of drilling spacing units, as of the effective date of this Order, is illustrated in Schedule B of this Order.
2. No well shall be drilled nearer to any boundary of the unit area than 200 metres or nearer to any other well than 130 metres.
3. The target area of each drilling spacing unit shall be a square area having sides sixty-five metres from the sides of the drilling spacing unit and parallel to them.
4. The location of any new wells in the project area shall conform to the conditions set out by Chevron Canada Resources in its application and the requirements of Section 17 of the Petroleum Drilling and Production Regulation.
5. The unit operator shall conduct a 24 hour production test on each producing well in the project area and on all other wells which produce to the battery Chevron Virden 4-22-11-26 (WPM), at least once every three months. The results of such production tests shall be submitted to the Petroleum Branch as part of the monthly production report.



H. Clare Moster
Deputy Chairman



Ian Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION
BOARD ORDER NO. SU 4 APPROVED THIS
20 DAY OF JUNE A.D., 1989
AT THE CITY OF WINNIPEG.

APPROVED:

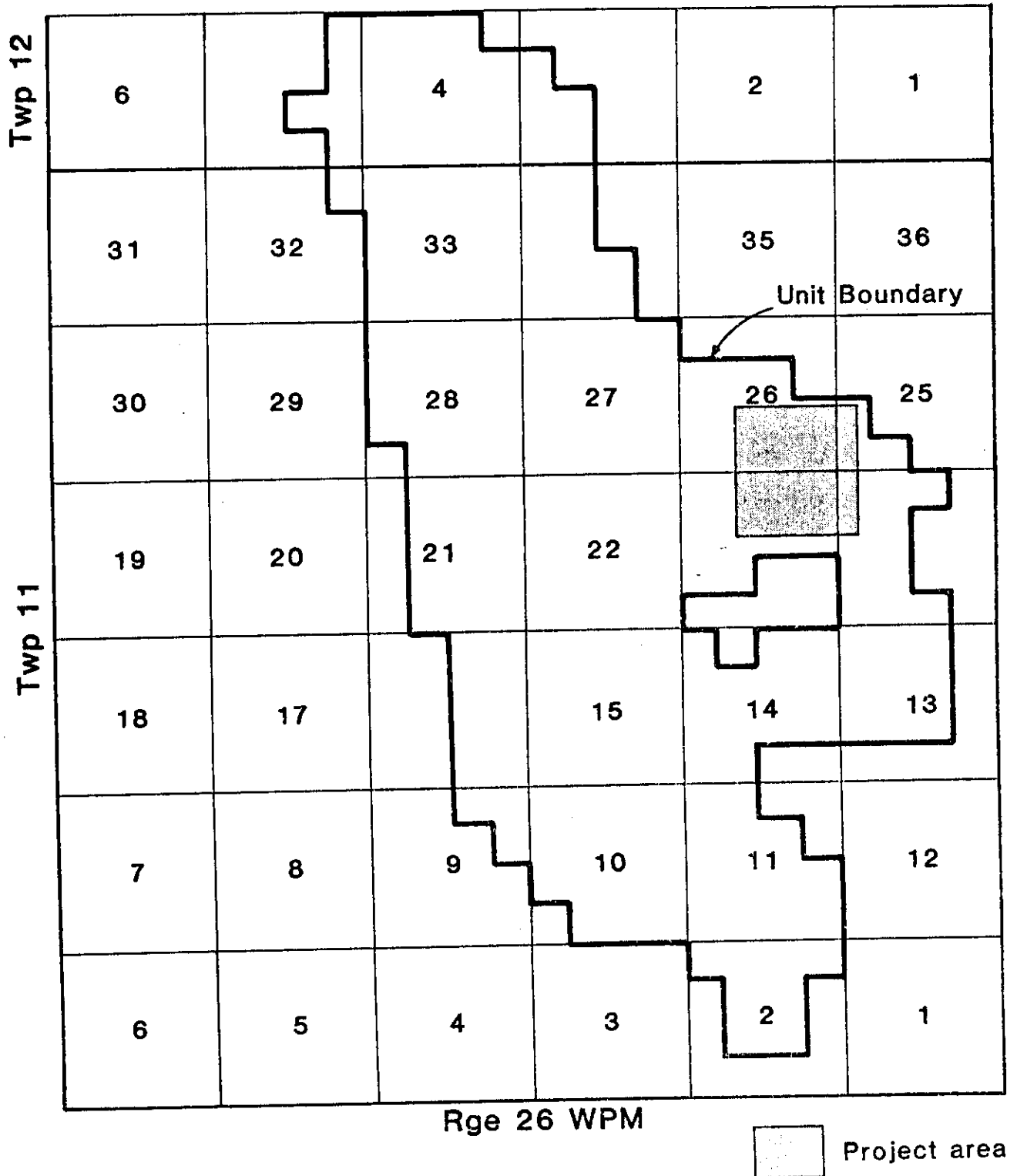


Harold Neufeld
Minister of Energy and Mines

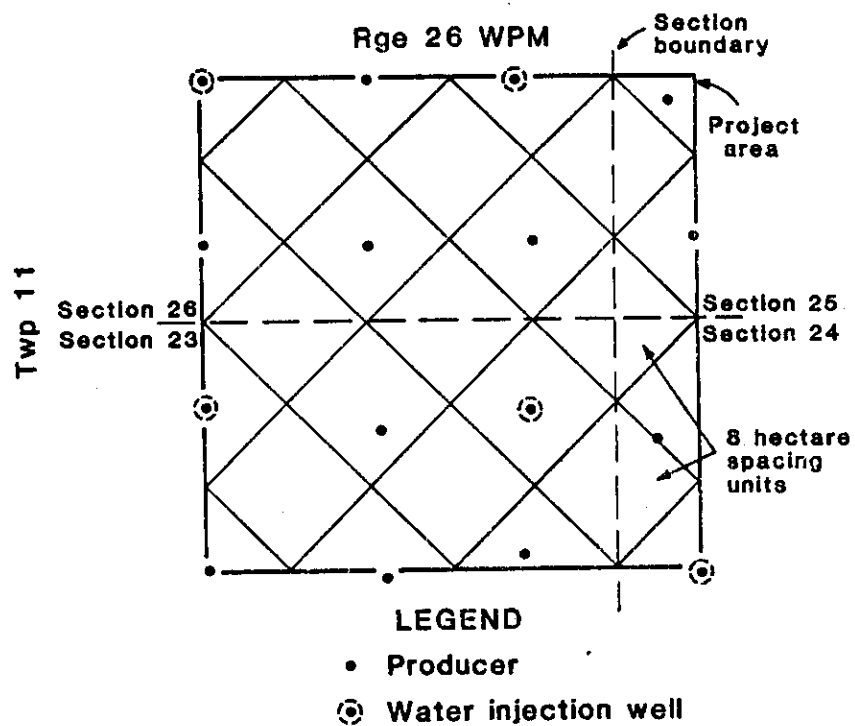
SCHEDULE A

NORTH VIRDEN SCALLION UNIT No. 1

PROJECT AREA



SCHEDULE B
NORTH VIRDEN SCALLION UNIT NO. 1
PROJECT AREA
8 Hectare Drilling Spacing Units





Memorandum

C May 11, 1989

To The Oil and Natural Gas
Conservation Board

Dr. I. Haugh - Chairman
H. Clare Moster - Deputy Chairman
Subject Wm. McDonald - Member

From John N. Fox
Chief Petroleum Engineer
Petroleum Branch

Telephone

Re: North Virden Scallion Unit No. 1
Reduced Spacing Project

Chevron Canada Resources as operator of the North Virden Scallion Unit No. 1 ("the unit area") has made application for:

- (1) approval to reduce the size of drilling spacing units in a portion of the unit area ("the project area"),
- (2) approval to convert 11 existing producers to water injection, and
- (3) modification of the current definition of a "new oil well" in the regulations, to allow wells drilled on the new reduced size spacing units to be classified as new oil wells.

Notice of the application was published in the Manitoba Gazette (April 8, 1989) and the Virden Empire Advance (April 5, 1989) and sent to all affected and interested parties. No objections to or interventions in the application were received.

Chevron has responded in a satisfactory manner to the Board's letter (March 17, 1989) requesting further clarification of certain aspects of the application and additional information.

RECOMMENDATIONS

It is recommended that the application be approved and the Board issue the following orders:

- (1) Board Order No. SU 4 - approving 8 hectare drilling spacing units for the project area, and
- (2) Board Order No. PM 61 - approving the conversion of 11 producers in the project area to water injection wells.

Copies of the proposed Board Orders are attached.

BACKGROUND

1. Reduced Well Spacing and Additional Water Injection

Chevron proposes to develop a small portion of the unit area (see Figure 1) on 8 hectare spacing by drilling 9 new wells and converting 11 existing producers to water injection. Figure 2 shows the project area, the proposed 8 hectare drilling spacing units, the new wells and the wells to be converted to injection.

The combination of reduced well spacing and the conversion of producers to injection wells will result in improved reservoir continuity and waterflood conformance in the project area. Chevron has estimated the incremental recovery from the reservoir, within and adjacent to the project area, will be 99,900 m³. Chevron's estimates are technically supported and appear reasonable.

2. Crown and Freehold Benefits

Under the proposed amendments to the Petroleum Crown Royalty and Incentive Regulation and the Oil and Gas Production Tax Regulation, production from the new wells on reduced spacing would be classified as new oil, while production from the remainder of the unit would continue to be classified as old oil.

The combination of old and new production complicates the calculation of Crown royalties and oil and gas production tax payable from the unit.

The Petroleum Branch is satisfied that Chevron's proposed method of calculating Crown royalties and the production tax for the unit is correct. However, in order to assist the Branch in its administration of royalties and taxes, Chevron has agreed to supply the Branch with a diskette showing their calculations.

The estimated increase in Crown revenue over the 30 year life of the project is 7 240 m³ with the majority of benefits occurring over the next 5 years. Freehold mineral owners will also gain an estimated 11 500 m³ in incremental royalties over the life of the project.

3. Environmental and Land Use Concerns

In order to minimize the possibility of oil and salt water spills, Chevron has indicated it will clean the flow lines and test high pressure shutdown switches at least once monthly, inspect wells and battery facilities at least once a day and continue its twice weekly aerial surveillance of the unit.

Chevron has attempted to reduce any adverse land use impacts in the project area, by locating the proposed new wells on non-cropped land where possible. Though, 5 of the 9 new wells are still proposed to be located on cropped land, Manitoba Agriculture is only concerned with one proposed location, Well #4 as shown on Figure 3. It has asked that the company be requested to consider moving the well to the north and east.

4. Well Data and Production Monitoring Program

Chevron plans to run an extensive suite of well logs, cut two 18 metre cores and possibly run a drill stem test on each new well. The company is also considering conducting a special reservoir study. Comprehensive reservoir data of this nature will greatly enhance understanding of the reservoir and aid in evaluating the success of this project.

Royalty and production tax calculations depend on a determination of the portion of unit production assigned to the new wells in the project area. Therefore, there is a need to accurately determine individual well production rates for all wells, new and existing, producing to the Chevron Virden 4-22-11-26 (WPM) battery. Chevron proposes to use a mass flow meter and net oil computer which should result in an overall improvement in the accuracy and frequency of production tests on the new wells.

5. Board Orders

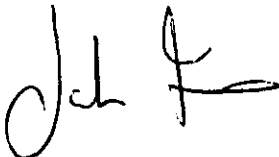
The main conditions of the proposed Board Orders are listed below.

A. Board Order No. SU 4

- (1) Establishes the orientation of the 8 hectare drilling spacing units and the size of the target area within the spacing units.
- (2) Outlines the conditions for locating new wells in the project area which are identical to the conditions set by the Board for reduced spacing in Daly Unit No. 3.
- (3) Requires that all new wells in the project area and existing wells producing to the same battery be production tested at least quarterly.

B. Board Order No. PM 61

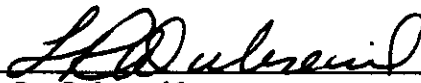
- (1) Grants approval to convert 11 existing producing wells to water injection.
- (2) Sets out the rules for pressure maintenance within both the unit and the project area and includes provisions regarding pressure surveys, maximum injection pressure, monthly production and injection reporting and the submission of annual progress reports.



John Fox
Chief Petroleum Engineer

JF:jtb

Recommended for Approval:


L. R. Dubreuil

SCHEDULE A
NORTH VIRDEN SCALLION UNIT No. 1
PROJECT AREA

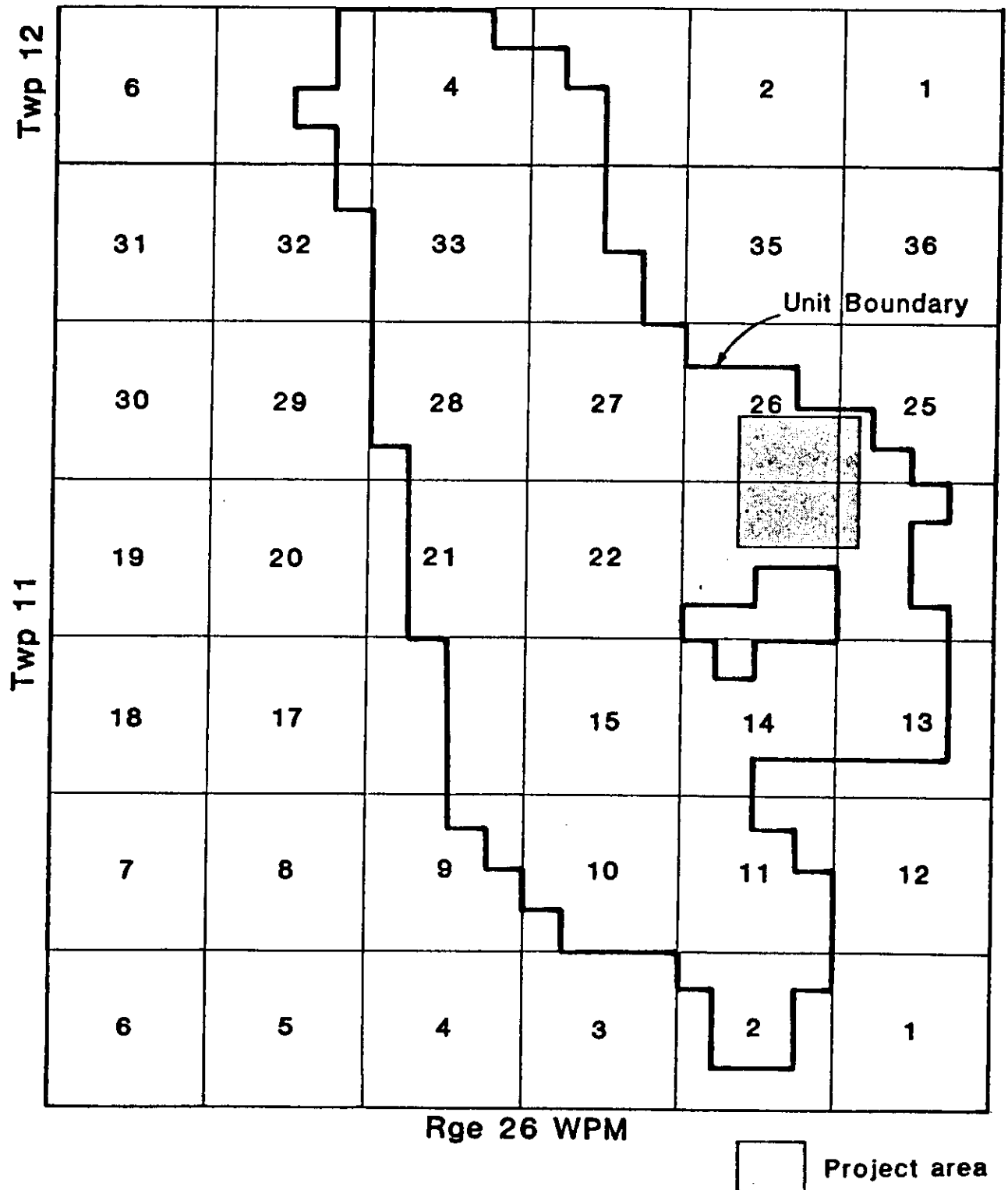


FIGURE 2

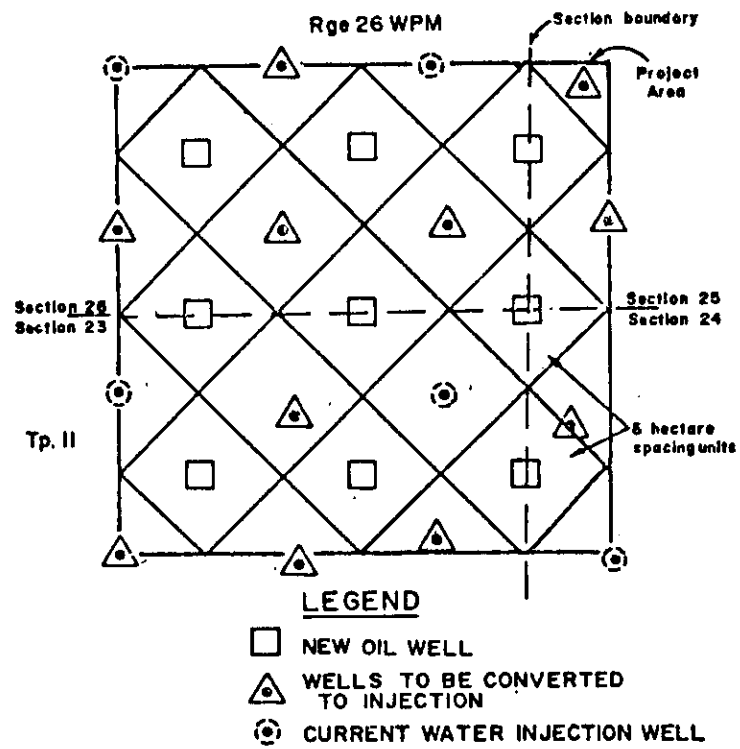


FIGURE 3

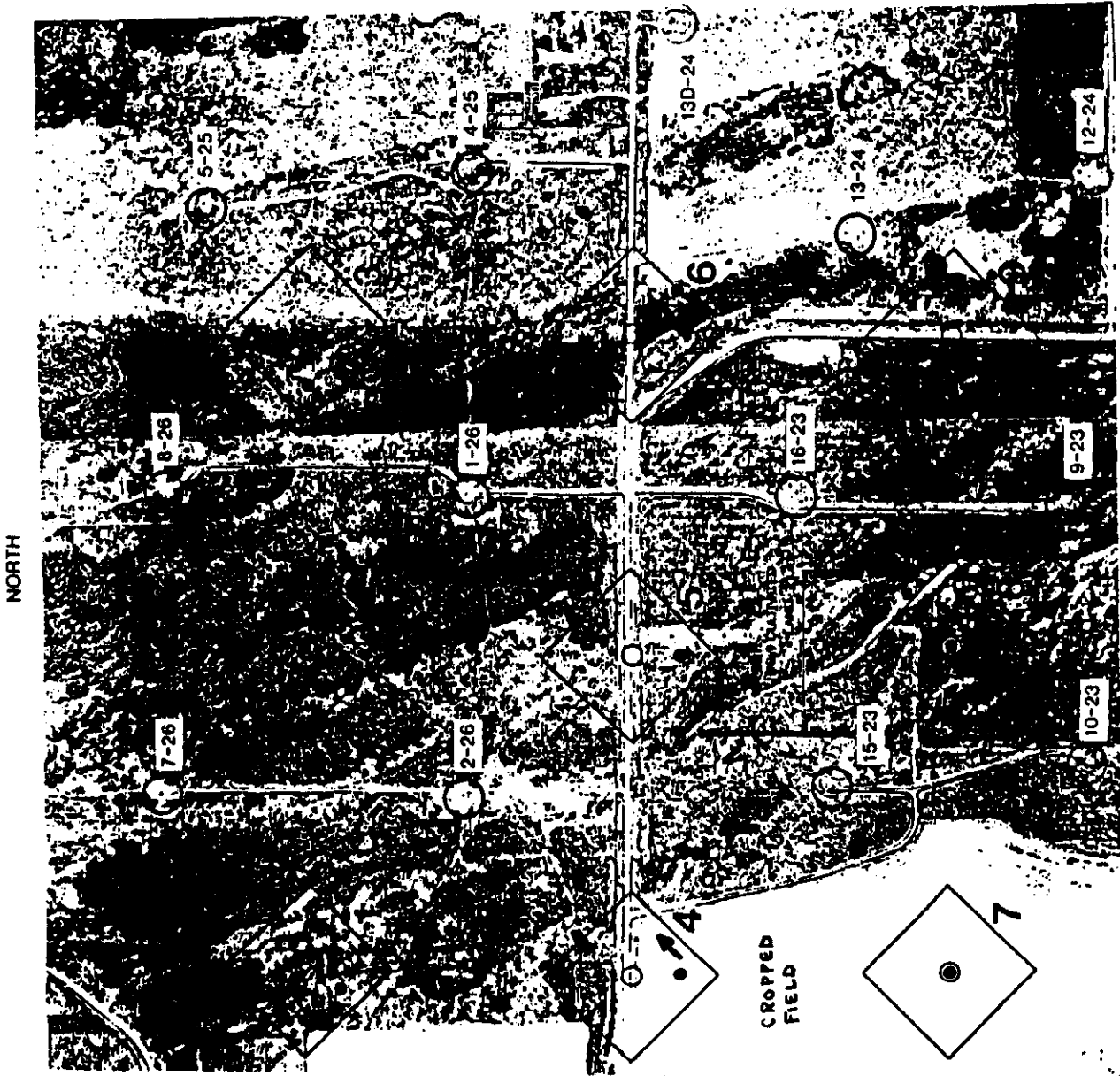
AERIAL PHOTOGRAPH
OF
REDUCED SPACING
PROJECT AREA
(REVISED 88-04)

- KEY:
- EXISTING WELLS
 - PROPOSED WELLS
 - IDEAL LOCATIONS
 - ◇ 8 ha TARGET AREAS
 - 3 WELL NUMBER

SCALE:
0 100 200 300
METRES



↑ PREFERRED LOCATION
MANITOBA AGRICULTURE





The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

Order No. PM 61

An Order Pertaining to Pressure Maintenance by Water Flooding Virden Lodgepole A Pool

WHEREAS, subsection (9)(d) of Section 62 of "The Mines Act", being 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 economical 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, Board Order No. PM 51 provides for pressure maintenance by water flooding in the North Virden Scallion Unit No. 1 ("the unit area").

AND WHEREAS, Chevron Canada Resources is the unit operator of the North Virden Scallion Unit No. 1.

AND WHEREAS, the Board received an application dated February 24, 1989 from Chevron Canada Resources for approval to convert eleven additional wells in the unit area to water injection.

AND WHEREAS, upon publication of notice of the application the Board received no objections to or interventions in the application.

AND WHEREAS, upon due consideration of the said application, the Board has found it is reasonable and desirable to convert the said wells to water injection.

NOW THEREFORE, the Board orders that:

1. Board Order No. PM 51 is hereby rescinded.
2. The unit operator shall conduct pressure maintenance operations by the injection of water into the pool underlying the unit area.

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:

Chevron Scallion WIW 2-10-11-26 (WPM)
Chevron Scallion WIW 10-10-11-26 (WPM)
Chevron Scallion WIW 12-10-11-26 (WPM)
Chevron Scallion Prov. WIW 2-11-11-26 (WPM)
Chevron Scallion Prov. WIW 4-11-11-26 (WPM)
Chevron Scallion Prov. WIW 6-11-11-26 (WPM)
Chevron Scallion Prov. WIW 12-11-11-26 (WPM)
Chevron Scallion WIW 6-13-11-26 (WPM)
Chevron Scallion WIW 10-13-11-26 (WPM)
Chevron Scallion WIW 12-13-11-26 (WPM)
Chevron Scallion WIW 14-13-11-26 (WPM)
Dome Cdn. Sup. Scallion WIW 8-14-11-26 (WPM)
Cdn. Res. et al Scallion WIW 10-14-11-26 (WPM)
Sun G. Braybrook Scallion WIW 12-14-11-26 (WPM)
Chevron Scallion WIW 2-15-11-26 (WPM)
Chevron Scallion WIW 10-15-11-26 (WPM)
Cdn.-Sup. Veldhouse Scallion WIW 7-16-11-26 (WPM)
Shell Moir South Scallion WIW 10-21-11-26 (WPM)
Chevron Virden WIW A2-22-11-26 (WPM)
Chevron Scallion WIW 4-22-11-26 (WPM)
Sun T. L. Tapp Scallion WIW 10-22-11-26 (WPM)
Chevron Scallion WIW 12-22-11-26 (WPM)
Chevron Virden WIW 16C-22-11-26 (WPM)
Chevron Virden WIW 9-23-11-26 (WPM)
Chevron Virden WIW 10-23-11-26 (WPM)
Chevron Virden WIW 11-23-11-26 (WPM)
Chevron Scallion WIW 12-23-11-26 (WPM)
Chevron Scallion WIW 14-23-11-26 (WPM)
Chevron Virden WIW 15-23-11-26 (WPM)
Chevron Scallion WIW 16-23-11-26 (WPM)
Dome Cdn. Sup. Scallion WIW 6-24-11-26 (WPM)
Chevron Scallion Prov. WIW 12-24-11-26 (WPM)
Chevron Virden Prov. WIW 13-24-11-26 (WPM)
Chevron Virden WIW 4-25-11-26 (WPM)
Chevron Virden WIW 5-25-11-26 (WPM)
Fargo Virden WIW 1-26-11-26 (WPM)
Fargo Virden WIW 2-26-11-26 (WPM)
Sun W.C. Tapp Virden WIW 3-26-11-26 (WPM)
Sun P. J. Tapp Scallion WIW 6-26-11-26 (WPM)
Fargo Virden WIW 7-26-11-26 (WPM)
Cdn. Res. et al Scallion WIW 8-26-11-26 (WPM)
Chevron Scallion WIW 6-27-11-26 (WPM)
Sun W. C. Tapp Scallion WIW 8-27-11-26 (WPM)
Chevron Scallion WIW 14-27-11-26 (WPM)

Gulf Union Tapp Scallion WIW 6-28-11-26 (WPM)
Cdn.-Sup. Whiteford Scallion WIW 8-28-11-26 (WPM)
Gulf Union Tapp Scallion WIW 14-28-11-26 (WPM)
Cdn.-Sup. Whiteford Scallion WIW 16-28-11-26 (WPM)
Shell Moir North Scallion WIW 6-33-11-26 (WPM)
Chevron Scallion WIW 8-33-11-26 (WPM)
Shell Moir North Scallion WIW 14-33-11-26 (WPM)
Vallat et al Scallion WIW 16-33-11-26 (WPM)
Cdn. Res. et al Scallion WIW 6-34-11-26 (WPM)
Dome Scallion WIW 4-3-12-26 (WPM)
Dome Cdn. Sup. Scallion WIW 2-4-12-26 (WPM)
Chevron North Scallion WIW 4-4-12-26 (WPM)
Chevron North Scallion WIW 6-4-12-26 (WPM)
Chevron North Scallion WIW 10-4-12-26 (WPM)
Chevron Virden WIW A12-4-12-26 (WPM)

and such other wells in the unit area as the Board may 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 area 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) At least once every three years commencing in 1981, unless otherwise directed by the Board, the unit operator shall conduct a survey to determine the static reservoir pressure in the unit area.

3(2) Notwithstanding the provisions of subsection (1), the unit operator shall, at yearly intervals, conduct a survey to determine the static reservoir pressure in Sections 23, 24, 25 and 26 in Township 11, Range 26 (WPM).

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 area 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 8 000 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 area.

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 the 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; and
- (c) a summary of any remedial operations carried out on any well in the unit area.

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

Dr. I. Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION
BOARD ORDER NO. PM 61 APPROVED THIS
DAY OF A.D. 1989
AT THE CITY OF WINNIPEG.

APPROVED:

Harold Neufeld
Minister of Energy and Mines



The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

Order No. SU 4

An Order Pertaining to Drilling Spacing Units Virden Lodgepole A Pool

WHEREAS, subsection (9)(b) of Section 62 of "The Mines Act", being 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

(b) respecting the designation of the area that shall be allocated to a well in connection with fixing allowable production;"

AND WHEREAS, subsection (1)(f) of section 63 of "The Mines Act" being Chapter M160 of the Continuing Consolidation of the Statutes of Manitoba, provides as follows:

"63(1) For the purpose of carrying out the provisions of this Part and Part III according to their intent, the Lieutenant Governor in Council may make such regulations and orders as are ancillary thereto, and are not inconsistent therewith; and every such regulation or order made under, and in accordance with the authority granted by, this section has the force of law; and, without restricting the generality of the foregoing, the Lieutenant Governor in Council may make regulations and orders, not inconsistent with any other provision of this Part of Part III,

(f) prescribing spacing units and the size and shape of spacing units;"

AND WHEREAS, subsection (1) of Section 20 of Manitoba Regulation 430/87R under The Mines Act ("the Petroleum Drilling and Production Regulation") provides as follows:

"20(1) Notwithstanding section 19, the board may, after a public hearing or after publication of notice, prescribe by order special drilling spacing units which may differ from normal drilling spacing units in size, shape or target area."

AND WHEREAS, subsection (3) of Section 21 of the Petroleum Drilling and Production Regulation provides as follows:

"21(3) Where a special drilling spacing unit is prescribed under section 20, the board may prescribe the target area within which a well shall be completed in order to qualify for a maximum permissible production rate based on the area of the special drilling spacing unit."

AND WHEREAS, the Board received an application dated February 24, 1989 from Chevron Canada Resources as unit operator of North Virden Scallion Unit No. 1 ("the unit area") for approval to reduce the size of drilling spacing units in a portion of the unit area outlined in Schedule A ("the project area").

AND WHEREAS, upon publication of notice of the application, the Board received no objections to or interventions in the application.

AND WHEREAS, the Board considers that establishment of smaller drilling spacing units within the project area will result in a substantial increase in recovery of crude oil from the project area.

NOW THEREFORE, the Board orders that:

1. Subject to clause 2 herein, the spacing unit for each well drilled, or to be drilled, for the purpose of obtaining oil from or injecting salt water into the Mississippian Lodgepole Formation within the project area is a square, 8 hectares in area, with corners located at the midpoints of the boundaries of each legal subdivision. The resultant pattern of drilling spacing units, as of the effective date of this Order, is illustrated in Schedule B of this Order.
2. No well shall be drilled nearer to any boundary of the unit area than 200 metres or nearer to any other well than 130 metres.
3. The target area of each drilling spacing unit shall be a square area having sides sixty-five metres from the sides of the drilling spacing unit and parallel to them.
4. The location of any new wells in the project area shall conform to the conditions set out by Chevron Canada Resources in its application and the requirements of Section 17 of the Petroleum Drilling and Production Regulation.
5. The unit operator shall conduct a 24 hour production test on each producing well in the project area and on all other wells which produce to the battery Chevron Virden 4-22-11-26 (WPM), at least once every three months. The results of such production tests shall be submitted to the Petroleum Branch as part of the monthly production report.

H. Clare Moster
Deputy Chairman

Dr. I. Haugh
Chairman

OIL AND NATURAL GAS CONSERVATION
BOARD ORDER NO. SU 4 APPROVED THIS
DAY OF A.D., 1989
AT THE CITY OF WINNIPEG.

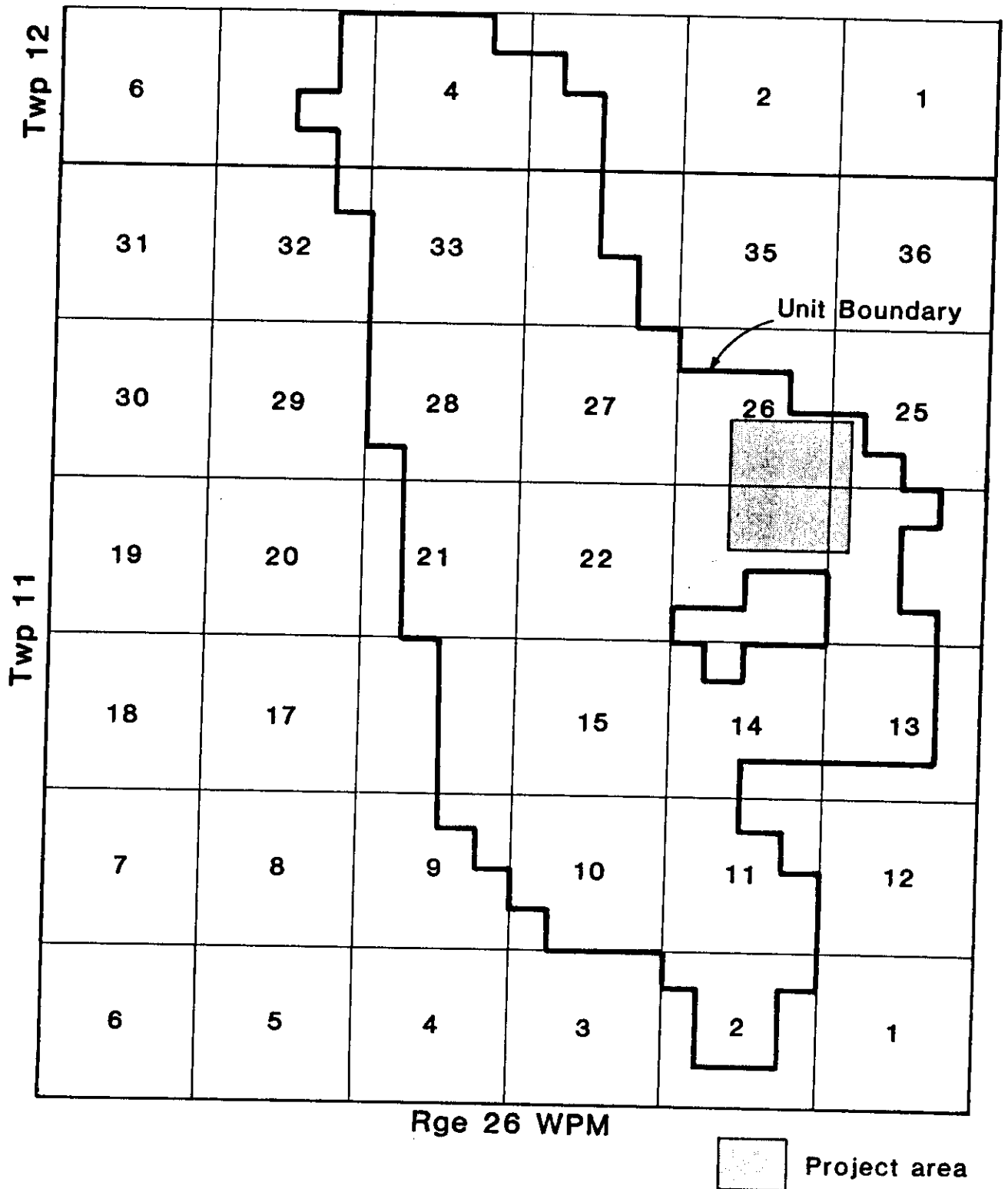
APPROVED:

Harold Neufeld
Minister of Energy and Mines

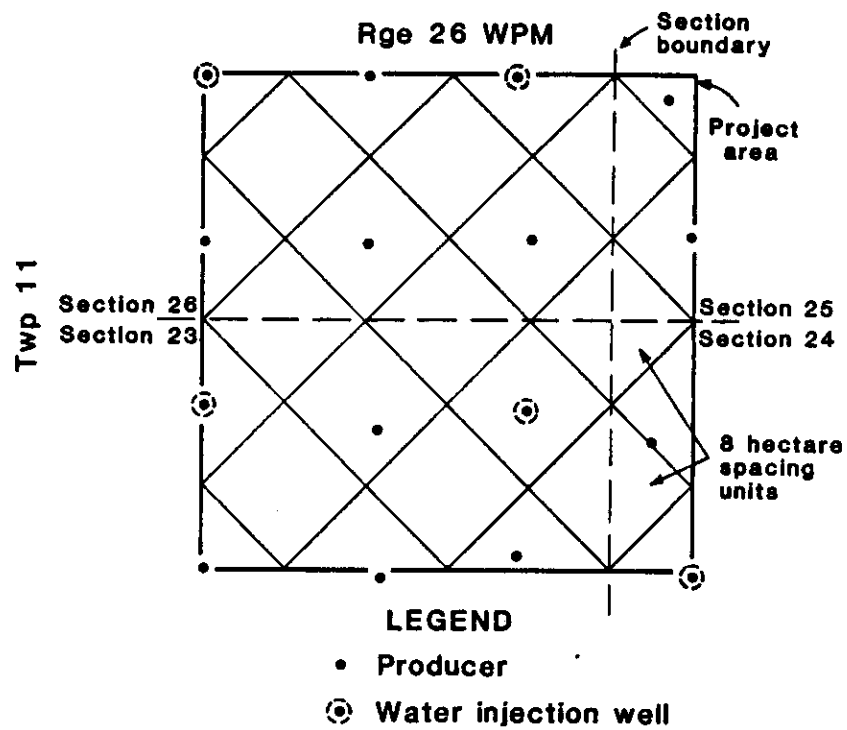
SCHEDULE A

NORTH VIRDEN SCALLION UNIT No. 1

PROJECT AREA

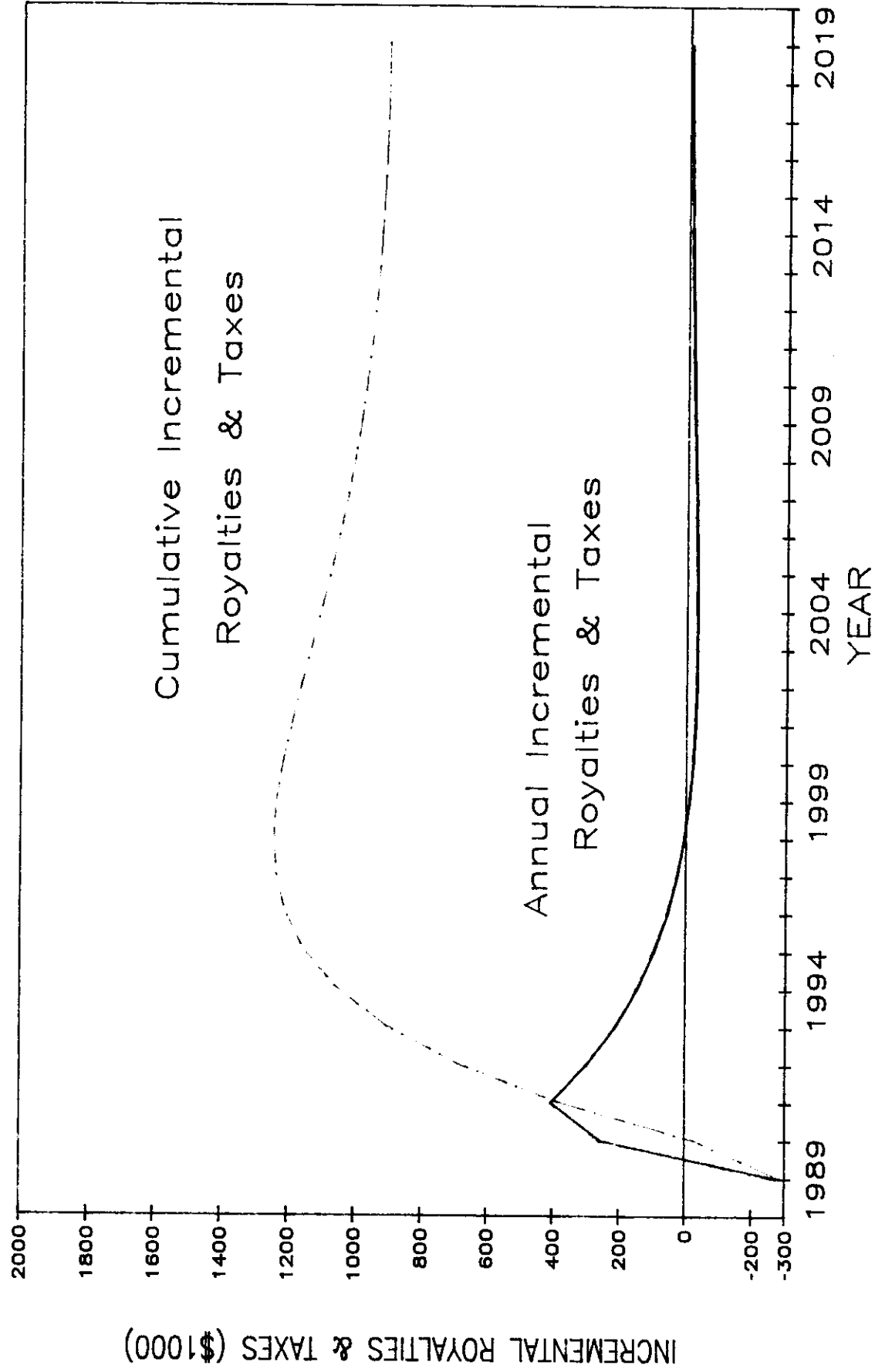


SCHEDULE B
NORTH VIRDEN SCALLION UNIT NO. 1
PROJECT AREA
8 Hectare Drilling Spacing Units

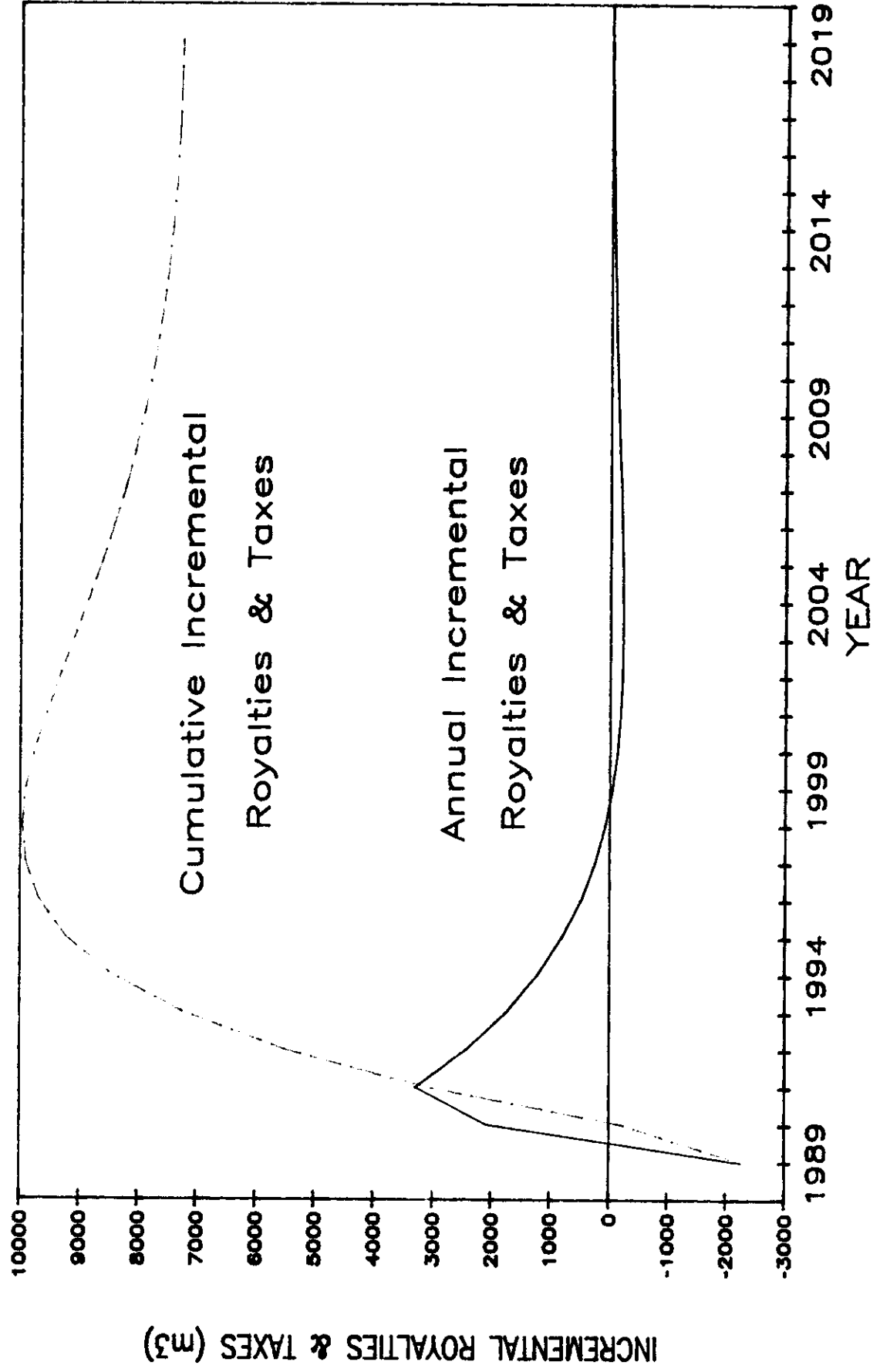


@ \$125/m³
constant

North Viriden Scallion Unit No. 1 Reduced Spacing Project Crown Benefits



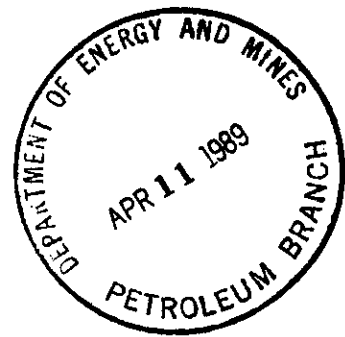
North Viriden Scallion Unit No. 1 Reduced Spacing Project Crown Benefits





Chevron Canada Resources

295 - 3rd Avenue S., P.O. Box 100, Virden, Manitoba R0M 2C0
Phone (204) 748-1334



NOTICE

Chevron Canada Resources will be holding an OPEN HOUSE to answer questions regarding the proposed North Virden Scallion Unit #1 infill drilling project. You are invited to attend this open house which has been scheduled as follows:

April 20, 1989

2:00 p.m. - 4:00 p.m.

7:00 p.m. - 9:00 p.m.

Virden Legion Upstairs Boardroom

If you would like further information please contact Lyle Martinson at 748-1334.

EVERYONE WELCOME!



Memorandum

Date April 13, 1989

To S.J. Puchniak
Executive Director
Mining & Use Taxes Branch

From E. Zegarac
Tax Audit Supervisor

Telephone

Subject CHEVRON PROPOSAL - NORTH SCALLION UNIT #1

As requested, we have reviewed the Chevron proposal for the purpose of determining the tax impact on future mineral taxation on the production from North Scallion Unit #1. We have discussed and confirmed our calculations with Mr. B. Thiessen and Mr. A. Galernyk of the Department of Energy and Mines.

It appears that if Chevron was allowed to claim new well status as a result of the infill drilling, tax revenues would increase \$5,765.18 annually when compared to present tax structure and on present production.

If, Chevron did proceed with the infill drilling without the special tax status, the Province would lose \$40,142.57 annually when comparing what tax revenues would be realized under the present tax legislation on the enhanced production. However, Chevron would likely not proceed with the infill drilling without the special tax status. (See schedule attached for gross tax revenue projections).

E. Zegarac

EZ/hk
Attachment

CHEVRON - NORTH SCALLION UNIT #1

Comparison of Tax Revenues - 1990

Present Tax (Existing Production)	\$223,450.82
Chevron Proposal (Infill - Enhanced Production)	\$229,216.00
Present Tax (Infill - Enhanced Production)	\$269,358.57

Manitoba



Memorandum

Date : April 3, 1989

To : Mr. R.L. Dubreuil
Director of
Petroleum Branch
555 - 330 Graham Avenue

From : Mike Teillet
Senior Policy Planner
Provincial Planning Branch
405 - 800 Portage Avenue

Subject : REDUCED SPACING - NORTH VIRDEN SCALLION UNIT #1

Telephone :

At this time our office has no substantive concerns with the reduced spacing for the pilot project in Sec. 23-11-26W.

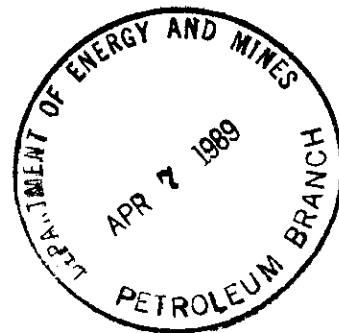
However, as was stated at the meeting of February 16, 1989, by Mr. Serge Scrafield, it is our opinion that the local municipality should be consulted with. It might also be advisable to hold a public information meeting or "open house" on this matter.

We would also concur with the department of Agriculture's position that as much as possible, wells should be kept off of cultivated lands.

We would appreciate being kept appraised of this matter as it develops, and while we will not voice major objections to this pilot project as proposed, we would want to further review this matter if this reduced well spacing pattern were to become more widespread.

Mike Teillet

cc: G.D. Forrest
C. Hanley
D. Partridge
D.L. Wotton



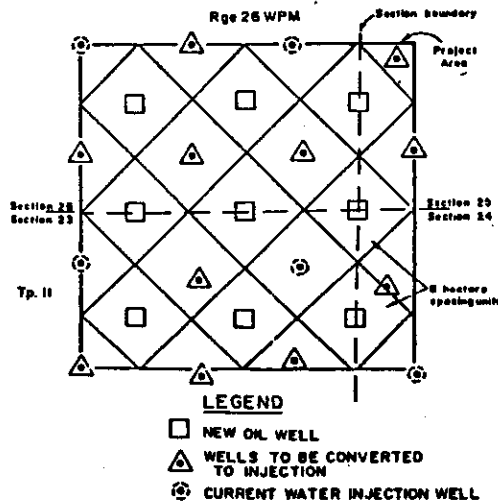
First Fold

NOTICE

Under The Mines Act

Chevron Canada Resources, Operator of North Virden Scallion Unit No. 1 ("the unit area") has made application:

1. Under section 20 of the Petroleum Drilling and Production Regulation for approval of special drilling spacing units in a portion of the unit area. It is proposed that drilling spacing units would be reduced from 16 hectares (40 acres) to eight hectares (20 acres) in the project area outlined below. If the application is approved and the area is fully developed on eight hectare spacing, nine additional oil wells, located as indicated would be drilled.



2. Under Section 64 of the Petroleum Drilling and Production Regulation for approval to convert the following wells to water injection:

Chevron Scallion 9-23-11-26 (WPM)
 Chevron Scallion 10-23-11-26 (WPM)
 Chevron Scallion 11-23-11-26 (WPM)
 Chevron Scallion 15-23-11-26 (WPM)
 Chevron Scallion Prov. 13-24-11-26 (WPM)
 Chevron Scallion 4-25-11-26
 Chevron Scallion 5-25-11-26
 Cdn. Res et al Scallion 1-26-11-26
 Cdn. Res et al Scallion 2-26-11-26
 Sun W.C. Tapp Scallion 3-26-11-26
 Cdn. Res et al Scallion 7-26-11-26

If no intervention in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba R3C 0V8 on or before April 25, 1989, the Board may approve the application.

Copies of the application may be obtained from Chevron Canada Resources, Information Centre, 500 - 5th Avenue S.W., Calgary, Alberta, T2P 0L7 (phone [403] 234-5000) or can be viewed at the offices of the Petroleum Branch, 555 - 330 Graham Avenue, Winnipeg, Manitoba (phone [204] 945-6577) or 247 Wellington Street West, Virden, Manitoba (phone [204] 748-1557).

Dated at Winnipeg, the 29th day of March, 1989.

VIRIDEN EMPIRE ADVANCE Wm. McDonald
 APRIL 5 1989 Member

March 22 / 89

BURNING THE STREET?—No, the Town of Virden Waterworks Department was thawing the ground in order to dig up and repair a broken water line at King Street and Eighth Avenue. For a couple of days last week, railroad ties were being burned at the scene, before coal was used. There were some citizens who were concerned about the "open fire", which contravenes a local by-law. The fire was left burning during the night, unattended.

Elkhorn Library celebrates 30 years of service to area

by Doug Braybrook

Agnes Smith, the Librarian at the Public Library in Elkhorn, hosted a celebration of the 30th year of service, the 300,000th book circulated, and the 3,000th new member on Saturday, March 18, 1989.

Chevron announces '89 drilling program

Chevron Canada Resources announced Monday plans for an infill drilling program in the Scallion area located six miles north of the Town of Virden. The \$3.6 million project involves drilling nine new wells and converting 11 existing wells to water injection. Water injection is a process designed to improve oil recovery from producing reservoirs.

The project has received partner approval but must still be approved by the Manitoba Oil and Natural Gas Conservation Board. Included as part of the Board's review process is an application to reduce the regular 40-acre drilling spacing unit to 20 acres. Chevron is hopeful that this project will be approved by the Board in the near future.

Lyle Martinson, Chevron's Area Superintendent in Virden, said, "The current plans affect only a small area of the Scallion field and has been designed to minimize effects on agriculture and the en-

Mrs. Smith presented a comprehensive history of libraries, including her own experiences growing up in Saskatchewan, attending Normal School in Regina, and the events leading up to the formation of Virden-Elkhorn Regional Library 30 years ago.

environment. The program should be a welcome stimulus to the local economy and to the Manitoba oil well service industry after the past few years of depressed oil industry activity."

Chevron will conduct its program in a safe and environmentally responsible manner, utilizing preventative measures and contingency planning to minimize surface impacts, it was pointed out. Chevron also plans to host an information "open house" for local residents. Landowners whose lands are directly affected have been personally contacted by Chevron representatives during the past several months.

Chevron estimates an additional 100,000 cubic metres (630,000 barrels) of oil will be recovered by the proposal. This additional recovery will provide economic benefits to the Crown and freehold royalty owners, and the increased activity will improve the outlook of Manitoba's oil and gas industry.

Speakers and guests of honor included Mrs. Katherine Webster, a founding member of the Virden-Elkhorn Regional Library Board. She described her experiences in bringing about the first library in Elkhorn in early 1958, and expressed the importance of books in her life. Her closing remarks were, "My generation leaves you a very unsettled world which above all requires peace and a genuine consideration of those who do not live in such a peaceful country as we are blessed with. My sincerest wish is for you to improve it."

Mrs. Irene Moore, a former Chairman of the Virden-Elkhorn Regional Library Board, related her experiences of going through 21 meetings and succeeding in purchasing the McLeod Building that the Library at Elkhorn now occupies. Her closing remarks emphatically stated to the people of Elkhorn and area, "It is your library; use it! Books are everyone's friends, and we are so fortunate to have this library here."

Agnes Bickerton, a former Librarian at Elkhorn, wrote a speech which was presented by Mrs. Irene Moore. Her greatest thrill was in 1973, when she helped her husband, Ab, move into the new bright, sunny Library with Len Collier's truck, for free, since they didn't have the money to pay anyone to help them move. Len Collier's son, and Irene and Lindy Moore helped them move everything from the Masonic Building into the new Elkhorn Library.

See ELKHORN on Page 6

The Division's annual budget, this year split into a six-month budget to end June 30, 1989 and a 12-month one ending June 30, 1990, was approved by the Board of Trustees at its March 13 meeting.

Although the province's educational funding formula was revised in 1988, and the per-pupil grant was increased, Superintendent Harry Chornoboy stated that the loss of 55.3 students in the division last year meant Fort La Bosse did not benefit from the revisions.

"Our increase would have been greater had we not lost so many pupils," Mr. Chornoboy said. Fort La Bosse received a 6.2 per cent increase in funding from the province. The provincial average was 6.1 per cent.

Mr. Chornoboy explained that considerable cutting had to be done to keep the mill rate to a minimum. "Our preliminary budget had to be cut considerably to meet what the Board thought was a fair increase, down to five mills. We initially started with more than twice that."

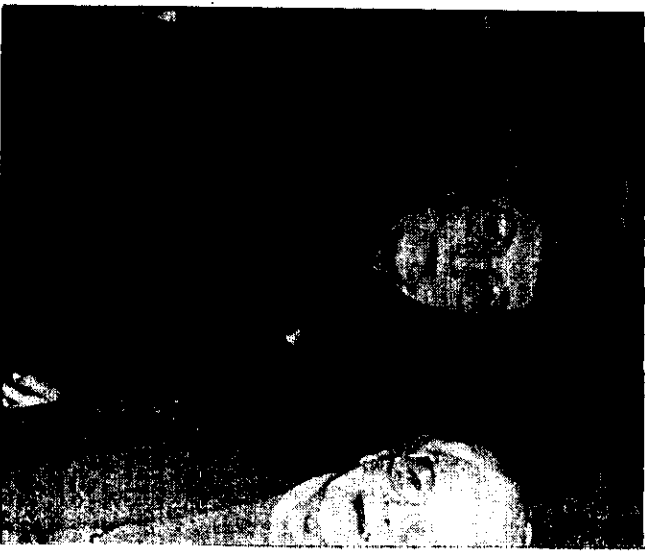
Didluck stated being considered

"All 13 schools are being looking cuts," said ever, Mr. Chornoboy

Virden Empir cuts would be "We're not bers faced by Mr. Chornoboy School Division layout of five Trail and Tur Divisions also in 1989.

"This is pro budget Fort La with, in all Didluck.

Reaction f Plaisier, whose own budget de was one of dis crease. "It's hamper what with the town, The Town of is expected to the next few v



ELKHORN LIBRARY CELEBRATES—Mrs. Irene Moore, Katherine Webster took part in the celebration of the library's 30th anniversary.



Memorandum

Date March 21st, 1989

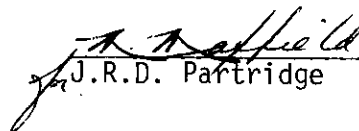
To Mr. Bob Dubreuil, Director
Petroleum Branch
555 - 330 Graham Avenue
Winnipeg, Manitoba

From J.R.D. Partridge, Chief
Land Utilization & Soil Survey Sec.
Soils & Crops Branch, Agriculture
908 - 401 York Avenue
Winnipeg, Manitoba
Telephone 945-3837

Subject REDUCED SPACING - NORTH VIRDEN SCALLION UNIT #1

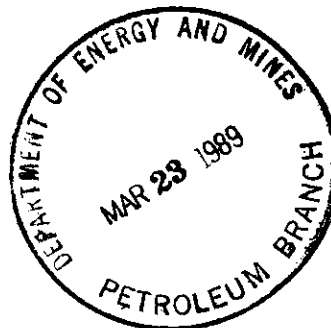
We have reviewed the report on the above application submitted by Chevron February 24, 1989. As relayed to Messrs. Butchko and Martinson in our meeting of February 16, 1989, we have concerns regarding new wells being located in cultivated fields on a reduced spacing (20 acre) basis. We note proposed well #8 (10D-23-11-26W) has been relocated off the cultivated field into the bush and pasture area. This move will help the farmer. We would also recommend well #4 (14D-23-11-26W) could be beneficially moved approximately 35 meters east to be immediately adjacent to the access road to 15-23-11-26W. This move would put the new well on the edge of the cultivated field and still away from the municipal road. We note that trails, not graded roads, are planned to the wells and that topsoil will be stripped, saved and replaced on wellsites and flowlines.

Given that this reduced spacing proposal is being treated as a pilot project, Manitoba Agriculture will not object to the proposal on the basis of the remaining wells that will be on cultivated farmland (#5, #7, and #9). However, should this pilot project prove feasible, we would have serious concerns if the reduced spacing pattern were to be extended over the entire field without utilizing directional drilling to keep new wellsites off cultivated lands.


J.R.D. Partridge

JRDP/mmm

c.c. S. Scrafield
D. Wotton



DEAF
 BOB
 THE
 DRAFT
 ANY
 GET
 NEXT

FOR IMMEDIATE RELEASE

MANITOBA INFILL DRILLING PROGRAM

VIRDEN, March 21, 1989. . . . Chevron Canada Resources announced today plans for an infill drilling program in the Scallion area located six miles north of the Town of Virden, Manitoba. The \$3.6 million project, involves drilling nine new wells and converting eleven existing wells to water injection. Water injection is a process designed to improve oil ~~and gas~~ recovery from producing reservoirs.

The project has received partner approval but must still be approved by the Manitoba Oil and Natural Gas Conservation Board. Included as part of the Board's review process is an application to reduce the regular 40 acre drilling spacing unit to 20 acres. Chevron is hopeful that this project will be approved by the Board in the near future.

Lyle Martinson, Chevron's Area Superintendent in Virden said, "THE CURRENT PLANS" "This project affects only a small area of the Scallion field and has been designed to minimize effects on agriculture and the environment." Martinson also commented, "The program should be a welcome stimulus to the local economy and to the Manitoba oilwell service industry after the past few years of depressed oil industry activity."

Chevron will conduct its program in a safe and environmentally responsible manner utilizing preventative measures and contingency planning to minimize surface impacts. Chevron also plans to host an information "open house" for local residents. Landowners whose lands are directly affected have been personally contacted by Chevron representatives during the past several months.

Chevron estimates an additional 100 000m3 (630,000 bbls) of oil will be recovered by the proposal. This additional recovery will provide economic benefits to the Crown and freehold royalty owners and the increased activity will improve the outlook of Manitoba's oil and gas industry.

###

89/03/21

Chevron Contact: Lyle Martinson
Area Superintendent
Virden, Manitoba
(204) 748-1334

O

MAR 16 '89 16:43

Fax 234 5947

J. S. Pansey
Manager
Regulations and Environment Division

1988-12-08

1135 PAGE 003

Oil Prices May Dip Then Maybe Rebound In Second Half

LONDON (Reuter) - World oil prices are likely to fall from current 15-month highs in the second quarter of this year but the decline should be temporary and markets could rebound in the second half of 1989, analysts say.

"I don't see much more on the upside for the moment...but in the second half prices could be near OPEC's \$18 target," said MIKE UNSWORTH, analyst at SMITH NEW COURT.

"Prices are a little overheated now but the market is showing no signs of major setbacks," said JEREMY HUDSON, oil analyst at SHEARSON LEHMAN HUTTON SECURITIES.

Prompt delivery Brent crude rose to a 15-month high of \$19.05 on Wednesday. Gains were based on AMERICAN PETROLEUM INSTITUTE (API) figures showing further falls in U.S. stocks of crude oil and products and that U.S. demand for oil products is running 1.8% higher than a year earlier.

Reports that Saudi Arabia will cut April oil shipments to U.S. and European customers as well as those in Japan also helped the rally.

The expected correction emerged Thursday and prices fell a few cents — "at present levels people have got a little overexcited," said GEOFF PYNE, analyst at PHILLIPS AND DREW.

Unsworth said he estimated an oil stock build of some 1.5 million bbls a day in the second quarter, "about 500,000 bbls a day more than normal, but the market should be able to tolerate that in the second half of 1989."

Hudson expects a second quarter stock build of some one million bbls a day, while Pyne estimated that stocks will be "flat to down slightly if the draw continues at February levels." But all agreed that the low for Brent will be around \$16 in the April/June period.

Much depends on continued strong demand in consuming countries and on OPEC output remaining at current levels.

"We see the market looking good through to the end of the first half of the year but the question is whether OPEC can maintain the constant rate of excess production seen since the beginning of this year," Hudson said.

OPEC production is estimated by several industry sources to have been running somewhat above its first half 1989 output ceiling of 18.5 million bbls per day.

The United Arab Emirates (UAE), Kuwait and Ecuador were reported to have exceeded their quotas.

Venezuelan Energy and Mines Minister CELESTINO ARMAS said that if OPEC members maintain output discipline the group should reach its target price of \$18 per bbl before its June conference.

Armas said he is pleased that technical experts from an OPEC meeting in Vienna had found member states were complying with production agreements in February.

He said this compliance, unexpectedly higher demand and the withdrawal of some 300,000 bbls a day of North Sea oil output due to accidents helped cause the current upswing in prices.

Armas left Friday for Ecuador to sign an agreement for technical assistance between the two nations' state oil firms.

On Monday, Armas went to Mexico for talks with energy secretary FERNANDO IRIART on coordination of the oil market.

Chevron Canada Planning Manitoba Infill Drilling Program

CHEVRON CANADA RESOURCES announced Monday plans for an \$3.6 million infill drilling program in the Scallion area located six miles north of Virden, Manitoba.

The \$3.6 million project, involves drilling nine new wells and converting 11 existing wells to water injection.

The project has received partner approval but must still be approved by the MANITOBA OIL AND NATURAL GAS CONSERVATION BOARD.

Included as part of the board's review process is an application to reduce the regular 40 acre drilling spacing unit to 20 acres. Chevron said it is hopeful that this project will be approved by the board in the near future.

LYLE MARTINSON, Chevron's area superintendent in Virden said the current plans affect "only a small area of the Scallion field and have been designed to minimize effects on agriculture and the environment."

"The program should be a welcome stimulus to the local economy and to the Manitoba oilwell service industry after the past few years of depressed oil industry activity," he added.

Chevron also plans to host an information "open house" for local residents. Landowners whose lands are directly affected have been personally contacted by Chevron representatives during the past several months.

The company estimates an additional 100,000 cubic metres of oil will be recovered by the project.

Despite Higher Prices, Oil Companies Still Cautious

FORT MCMURRAY, Alta. (CP) - The oil industry is receiving healthier profits than expected this year, but the industry still isn't convinced the hard times are over.

But industry analysts say there still isn't a sense of stability in the industry, and the heads of oil companies have come to expect the unexpected.

GERRY ANGEVINE, executive director of the CANADIAN ENERGY RESEARCH INSTITUTE, said the last three years have taught the industry that anything can and usually does happen.

"Last year was much below everybody's expectations," he said. "The industry planned on \$17 (US) oil in 1988 because 1987 was a pretty good year. But the price of oil in 1988 was \$15 US."

Angevine said a stronger Canadian dollar in 1988 made last year's oil prices almost as bad as in 1986, because it gained almost 10% on the U.S. dollar.

WILF GOBERT, an analyst with PETERS & Co. Limited, said most companies planned on oil prices between \$15 and \$16 a bbl this year, "I think a lot of people are re-examining their budgets in light of the better prices," he said. "But I'd think we'd only see a minimum increase of activity in the second half of the year."



The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

March 17, 1989

Chevron Canada Resources
500 - 5th Ave S.W.
Calgary, Alberta
T2P 0L7

Attention: C. G. Folden, P. Eng.
Manager, Reservoir Engineering

Re: North Virden Scallion Unit No. 1
Reduced Spacing and Additional Pressure Maintenance

Dear Mr. Folden:

Your application dated February 24, 1989, for approval of modifications to well spacing, pressure maintenance and new oil status in a part of North Virden Scallion Unit No. 1 is acknowledged.

The application has been reviewed in detail. Generally, the application is well laid out and complete. There are, however, a number of areas which require further clarification, information or comment. These are outlined below.

The Board feels the application includes sufficient detail to allow proceeding with publication of notice at this time. Final disposition of the application is pending your complete and satisfactory response to this letter. The comments in this letter are presented in the order each subject appears in the application.

1. New Oil Status

We concur that the definition of a "new oil well" requires modification to correct the inequity that exists between unitized and non-unitized production with reduced spacing. However, Chevron's proposal would result in a second well drilled in a spacing unit solely for the purpose of accelerated production to be classified as a "new oil well."

We have initiated action to amend both the Petroleum Crown Royalty and Incentives Regulation and the Oil and Gas Production Tax Regulation. The proposed amendment is included for your information as Attachment No. 1.

Section 3 - Geological Information

- a) Please provide a list of current and proposed completion intervals for all existing wells in the project area.
- b) Please provide net pay (or net Ø h) maps for the Lower Virden (Oolites) and Scallion (Cherty) in and adjacent to the project area.

Section 4 - Technical Justification

- a) (Page 1, Paragraph 3) The application states "pool" recovery is 27% OOIP. Should this not be "unit" recovery?
- b) (Table 1) In determination of Unit and project area ultimate recovery by decline analysis, what abandonment conditions were assumed and on what are they based?
- c) (Page 3, Paragraph 1) You state that "reduced well spacing and conversion of existing producers to injectors will increase both vertical and areal sweep efficiency." Please elaborate on the positive effects of this project on vertical sweep efficiency.
- d) (Page 6, Paragraph 5) You state that approximately 55% of the base case production forecast is from inside the project and the remaining 45% is from outside the project area. How is this determined? How is this estimate used in development of the production predictions?
- e) (Page 8, Table 4) What area is included in the oil in place number outside the project boundary (1 758 900m³)? What average reservoir parameters were assumed in this area?
- f) (Page 8, last line) Figure reference should be 10, not 11.
- g) We request that you provide a copy of Reference No. 1 - Coteman et al - "Laboratory Comparison of Oil Recovery in Five-Spot and Nine-Spot Waterflood Patterns."

Section 7 - Royalty and Tax Calculations

- a) Crown royalty calculations have been done correctly. For consistency and to avoid confusion, we suggest the following descriptive wording be used:

Total Royalty Payable = Old Oil Royalty + New Oil Royalty

Old Oil Royalty = Old Oil Royalty on Old Oil Production

$$\text{New Oil Royalty} = 0.55 \times \left[\left\{ \begin{array}{l} \text{Old Oil Royalty} \\ \text{on Total Production} \end{array} \right\} - \left\{ \begin{array}{l} \text{Old Oil Royalty} \\ \text{on Old Production} \end{array} \right\} \right]$$

- b) Oil and Gas Production Tax. Because the formulae for new and old oil are not proportional, the tax calculated will vary slightly depending on the point that the calculation is converted from a percent to a volume.

The method of determination of tax reflected in Table 2 is considered acceptable. The following verbal description of the calculation is proposed for clarification.

$$\text{Old Oil Tax} = A = \left\{ \begin{array}{l} \text{Old Oil Tax determined on} \\ \text{the Old Oil Production} \end{array} \right\} m^3$$

$$\text{New Oil Tax} = B = \left\{ \begin{array}{l} \text{New Oil Tax on} \\ \text{Total Production} \end{array} \right\} m^3 - \left\{ \begin{array}{l} \text{New Oil Tax} \\ \text{on Old Oil Production} \end{array} \right\} m^3$$

$$\text{Total Tax Payable} = A + B$$

The tax should then be converted from a volume basis to percent of total production.

To facilitate administration of this calculation Chevron is requested to provide to the Petroleum Branch a diskette with a copy of the calculation that will be used for monthly production tax determination.

Please contact Brad Thiessen at (204) 945-6571 if you have any questions or comments.

Section 8 - Incremental Crown Revenue

- a) Please provide a table showing annual benefits to the Crown. The table should include the following headings:

<u>Year</u>	<u>Total Production</u>	<u>Base Production</u>	<u>Royalty/Tax Revenue</u>	
			<u>Total Prod</u>	<u>Base Prod</u>

- b) Please provide an estimate of the projected benefits of this project to freehold mineral holders.

Section 9 - Areal Photograph

- a) Wells in Lsd 4 and 5 of Section 25-11-26 (WPM) are incorrectly labelled "5-25" and "6-25" respectively.
- b) Please provide an areal photograph showing the "ideal location" of each well and the degree of flexibility in locating the well in its target area.

Section 10 - Environmental Impact Assessment

- a) What is the planned frequency of:
- (i) cleaning flow lines,
 - (ii) testing high pressure shut down switches
 - (iii) monitoring wells in the project area. Of what will the monitoring consist?

- b) Manitoba Environment has indicated that the impact of new wells on surface waters has not been addressed adequately. Specifically, the siting of wells in depressional lands or sloughs "is not appropriate, ground water accesses is direct, surface runoff enhances flooding, wildlife habitat is impacted." For further discussion of this concern, please contact Dave Wotton, Head, Terrestrial Standards and Studies, Manitoba Environment (phone (204) 945-7081).
- c) (Page 3, Paragraph 4) Please provide a summary of the elements of Chevron's weed control program.

Section 11 - Surface Land Use Impact Assessment

(Page 2, Paragraph 3) Relaxation of the minimum distance requirement of 50 metres between a well and a road allowance (Schedule C - the Petroleum Drilling and Production Regulation) can be provided upon request supported by evidence that the R.M of Wallace has concurred. If the 38 metre minimum distance restriction required by the R.M of Wallace is in the form of a by-law, a copy of this by-law would be sufficient supporting evidence to relax the restriction from 50 metres to 38 metres.

Section 16 - Landowner Notifications

- a) You have included a copy of a letter sent to the R.M. of Wallace with respect to conversion of the well Chevron Scallion 5-25-11-26 (WPM). The land ownership map (Section 14) however indicates this well is on land owned by the Crown. What is the interest of the R.M of Wallace in this well site?
- b) In the letter of notification to Mr. Heaman, the well in Lsd 2 of Section 26-11-26 (WPM) is incorrectly excluded and the well in Lsd 3 is included.

Section 18 - Water Injection Details

Is the proposed maximum injection pressure of 8 000 kPa below the reservoir fracture pressure? What is the estimated fracture pressure and how was it determined.

Section 21 - Monitoring Program

- a) Please provide a summary of well data that will be obtained during drilling of the new wells (e.g. types of logs, cores, tests etc.). Are there any plans for special core work to better define reservoir parameters (connate water saturation, relative permeability etc.)?
- b) Due to royalty and tax consideration, it will be necessary to accurately determine individual well production rates both inside and outside the pilot area. Will quarterly testing be incorporated for all wells in the Unit (or at least in the battery to which the new wells will produce)? Has or will the net oil computer be callibrated against existing testing methods for Manitoba producing characteristics.
- c) What is your proposed program of monitoring reservoir pressure in the pilot area.

Yours respectively,

ORIGINAL SIGNED BY
H. CLARE MOSTER

H. Clare Moster
Deputy Chairman

cc: C. S. Kang, Chairman
Wm. McDonald, Member
S. Scrafield (Municipal Affairs)
D. Partridge (Agriculture)
D. Wotton (Environment)
L. R. Dubreuil (Petroleum Branch)

THE MINES ACT
(R.S.M. c. M160)

Petroleum Crown Royalty and Incentives Regulation, amendment

Regulation /89
Filed 1989

Subsection 1 (1) amended

1 Regulation 63/87 (as amended by MR 264/87) is amended by repealing the definition of "new oil well" in subsection 1 (1) and substituting the following:

"new oil well" means

(a) a well drilled and completed on or after April 1, 1974 that is the only well in the spacing unit in which the well is located that is producing or capable of producing from the pool in which the well is completed, or

(b) a well abandoned prior to April 1, 1974 that is re-entered on or after April 1, 1974 and that is the only well in the spacing unit in which the well is located that is producing or capable of producing from the pool in which the well is completed,

but does not include an infill or additional well drilled in a spacing unit in which, when such well was drilled, there was already a well completed for production or injection purposes in the pool in which the well is completed.

Note: The Oil and Gas Production Tax Regulation is also being amended to include this definition.



March 16, 1989

Memorandum

To : The Oil and Natural Gas
Conservation Board

From : L. R. Dubreuil
Director
Petroleum Branch

Subject : Charles S. Kang - Chairman
H. Clare. Moster - Deputy Chairman
Wm. McDonald - Member

Telephone

Re: North Virden Scallion Unit No. 1
Reduced Spacing Project

Chevron Canada Resources as operator of North Virden Scallion Unit No. 1 ("the unit area") has made application for:

- a) approval of reduced size drilling spacing units in a portion of the unit area,
- b) approval to convert 11 current producing wells to water injection, and
- c) modifications to the current definition of a "new oil well" in the Petroleum Crown Royalty and Incentives Regulation to permit classification of wells drilled on the new reduced size spacing units as new oil wells.

Recommendation:

It is recommended that:

- 1) The attached letter, acknowledging the application and requesting clarification and additional information be sent to Chevron.
- 2) Notice of the application be published in the Manitoba Gazette and the Virden Empire Advance and sent to the affected or interested parties listed on Table No. 1.

Discussion:

A) Background

The North Virden Scallion Unit No. 1, located in the Virden Oil Field (see Fig No. 1), was established on August 1, 1962. Subsequent to formation of the Unit, a project of pressure maintenance by water injection was initiated. The water flood project has been successful in increasing production rate and enhancing oil recovery (see Fig. No. 2). Production response became apparent within a few months of initiation of injection. Production peaked several years later in 1969/70 at a rate approximately 20% higher than the primary production peak. Production from the Unit is now declining at the rate of 6.5 percent per year. Current cumulative production from the unit area is 8.98 million m³ or 27.2% of the original oil in place (OOIP). The unit currently has a production rate of approximately 365m³/day.

By extrapolation of current production trends to abandonment conditions, Chevron has estimated ultimate recovery of some 32% OOIP. This calculation has been reviewed and appears to be reasonable.

B) Well Spacing and Additional Waterflood

The unit area is developed on 16 hectare (40 acre) spacing in the Virden Lodgepole A Pool. The Lodgepole is a low permeability carbonate formation which exhibits significant areal variations. This reservoir heterogeneity hampers efficient reservoir drainage and sweep efficiency. In reservoirs of this nature, it is well accepted that recovery efficiency increases as well spacing decreases. In evaluating a reduced spacing project, an operator must weigh the potential incremental recovery benefits against the additional costs associated with the project (wells, facilities etc.).

Chevron has proposed a small reduced spacing project in the unit area (see Fig. No. 3). The project area is in a part of the Unit where cumulative recovery to date and predicted ultimate recovery are comparatively low and reservoir quality is somewhat better than average. This area is thought to have good potential for establishing incremental reserves through reduced spacing. Chevron has indicated that if this project is both technically and economically successful, it may apply for reduced spacing in other parts of the Unit.

The project involves the drilling of nine new wells and the conversion of eleven currently producing wells to water injection. This will result in a five spot injection pattern with 8 hectare (20 acre) well spacing. Fig. No. 3 shows the project area, the proposed new wells, wells to be converted to injection and the proposed drilling spacing units.

In developing projected production performance for the project, Chevron reviewed the effects of similar or related projects in Manitoba including:

- a) Daly Unit No. 1 (8 hectare water injection project)
- b) NVS #1 corridor area infill wells (see Fig No. 1)
- c) Eight hectare injection pattern [(16C-22-11-26 WPM)]
- d) NVS #1 16 hectare water flood performance.

Based on assumptions derived from a review of these projects, Chevron has estimated incremental reserves of 88 000m³ within the project area and 11 900m³ in the area adjoining the project boundaries. This equates to an incremental recovery of 7.6% OOIP in the project area and 0.7% OOIP adjacent to the project.

Chevron's methodology for estimating incremental recovery has been examined in detail. While there are some minor areas that require clarification, the production predication (Fig. No. 4) appears to be reasonable.

C) Royalty Production Tax Status

Current provisions of the Petroleum Crown Royalty and Incentives Regulation and the Oil and Gas Production Tax Regulation do not allow production from reduced size spacing units in this project to be classified as new oil for royalty and tax purposes. However, if a reduced spacing project were implemented on non unitized lands the current Regulations would provide new oil status for reduced spacing wells.

This anomaly has been discussed in more detail in a previous memo, (see Attachment No. 1) and action has been initiated in the form of an amending regulations to correct the inequity.

D) Royalty Tax Calculations

Chevron has proposed and illustrated a method of determining royalty and tax liabilities for the project. The method assumes that production from the new reduced spacing wells is classified as new oil. Remaining Unit production is considered old oil.

The proposed method has been reviewed in detail. With respect to calculation of Crown royalties, the method used is correct, however, some of the terminology used must be clarified.

Several methods of calculating oil and gas production tax could be used. This stems from the fact that formulae used to calculate old and new oil tax rates are not proportional (as is the case for the Crown Royalty formulae). The method used by Chevron is acceptable.

The method of calculation with proper terminology is illustrated on Attachment No. 2.

To assist in implementation of the system, Chevron is being asked to provide a diskette with the calculations included.

E) Effect on Crown and Freehold Royalties

If the application is approved and the proposal is implemented, Crown revenues from the Unit will be affected in two ways:

- (i) Conversion of current producers to injection will reduce old oil royalties and taxes.
- (ii) Royalties and taxes from new oil production (after incentive holiday period) will be added.

Assuming the validity of the production forecast (Figure No. 4) the net effect of these factors is to increase Crown revenues by a total of 7 240m³ over the life of the project. Chevron has expressed the net benefit to the Crown as a volume rather than a dollar volume to enable factoring out of oil prices.

Chevron has not commented on the effect of the project on freehold royalties. However, because of the absence of differing oil classifications and holiday volume incentives in a normal freehold mineral lease, the effects are expected to be positive for the mineral owner. Chevron has been asked to quantify this increase.

F) Environmental Impacts

At the request of Manitoba Environment, Chevron has provided an environmental impact assessment. The assessment refers on numerous occasions to provisions of the Petroleum Drilling and Production Regulation designed to mitigate environmental impacts.

Other than possible cumulative effect, the drilling of additional wells and installation of new facilities should have no more severe impacts on the environment than oil field development on wider spacing. Because the project involves the installation of new facilities, oil and salt water spill occurrences should be reduced.

It is suggested that the existing Regulations adequately address anticipated environmental impacts of the project.

G) Land Use Impacts

Additional surface facilities associated with the project will impact on land use. This impact will translate into additional costs of operation to the landowner. These costs would be recognized and mitigated in individual surface lease agreements between the landowner and Chevron, or failing that by reference to the Surface Rights Board.

Potential land use impacts and their mitigation in a project of this type in the Daly Field were considered at great length at a public hearing held by the Board in Virden on August 7, 1986. As a result of this hearing, the Board recognized that all efforts should be taken to minimize land use impacts. In its decision, the Board outlined a process to be used to minimize these impacts. Chevron has stated that it will formally adopt the procedure established by the Board. The procedure is included in Section 11 of the application.

In the project area, four wells are in non-cropped land and should have minimal impact. The remaining five wells are in cropped land, with three being adjacent to road allowances.

The Regulations require a minimum spacing between a road allowance and a well of 50 metres. The Rural Municipality of Wallace requires a minimum spacing of 38 metres. Drilling equipment requires a minimum spacing of 40 to 50 metres from the road allowance. As the provision in the Regulations is intended to reflect concerns of the R.M. of Wallace (snow clearing) and equipment spacing, there may be some latitude to reduce this minimum requirement. It is recognized, however, that moving the well head closer to the road allowances could result in a negative impact if it increases the difficulty in manoeuvring farm equipment around the well head.

Due to the pilot nature of this project, Chevron has indicated it would not be prepared to drill directional wells. It has stated, however, that should the project be expanded, that this option would be evaluated.

In summary, it appears that surface land use impacts in the project can be minimized by careful placement of wells and lease roads. The procedure established by the Board can be used to ensure impacts are minimized.

H) Landowner Notifications

Chevron has provided evidence of notification of all affected landowners. In addition, Chevron has provided a copy of the application to each of the landowners as well as to the R.M. of Wallace. Chevron has also indicated it plans to hold an open house to discuss the project with local area residents. These measures should insure that all landowner concerns are addressed before the project proceeds.

I) Drilling Program

When a reduced spacing project was initiated in 1987 in Daly Unit No. 3, a high pressure zone was encountered in the first well drilled. This resulted in a severe salt water spill and in loss of the well. The current application (section 17) includes a number of modifications and additions to a standard drilling program designed to prevent recurrence of this type of incident. The modified program has been developed in conjunction with the Petroleum Branch. Implementation of this program should prevent recurrence of an incident similar to the "Daly blowout."

J) Water Injection Details

Chevron has indicated that injection pressures would not exceed 8 000kPa. Chevron is being asked to provide calculations demonstrating that injection at this pressure will not result in reservoir fracturing.

K) Well Data and Monitoring Program

One of the difficulties in analysing the Virden Lodgepole A Pool is a lack of modern well data. Further, the surface facilities are configured in a manner such that valid production testing is difficult. The project provides an opportunity to obtain modern well data and through this to better understand this complex pool.

Chevron is being asked to indicate its specific plans for formation evaluation.

With respect to well testing, Chevron has acquired a Coriolis mass flow meter with a net oil computer. This is a relatively new meter which has been tested extensively in the U.S. It is well suited to applications where water cuts are high and gas oil ratios are low (i.e. NVS # 1 conditions). Use of this meter holds promise to greatly improve individual well measurement both within and outside the project area.

Royalty and tax calculations depend on a determination of the portion of total unit production which originates from new wells. As production is prorated, it is also important to know what volumes the remaining wells in the battery are producing. Therefore any test program must include all wells (new or old) tied into the battery in Lsd 4 of Section 22-11-26 (WPM).

L) Publication of Notice

A copy of a proposed notice is attached. It is recommended that the notice be published in the Manitoba Gazette and the Virden Empire Advance and sent to the affected landowners, the Manitoba Surface Rights Association and the R.M. of Wallace.

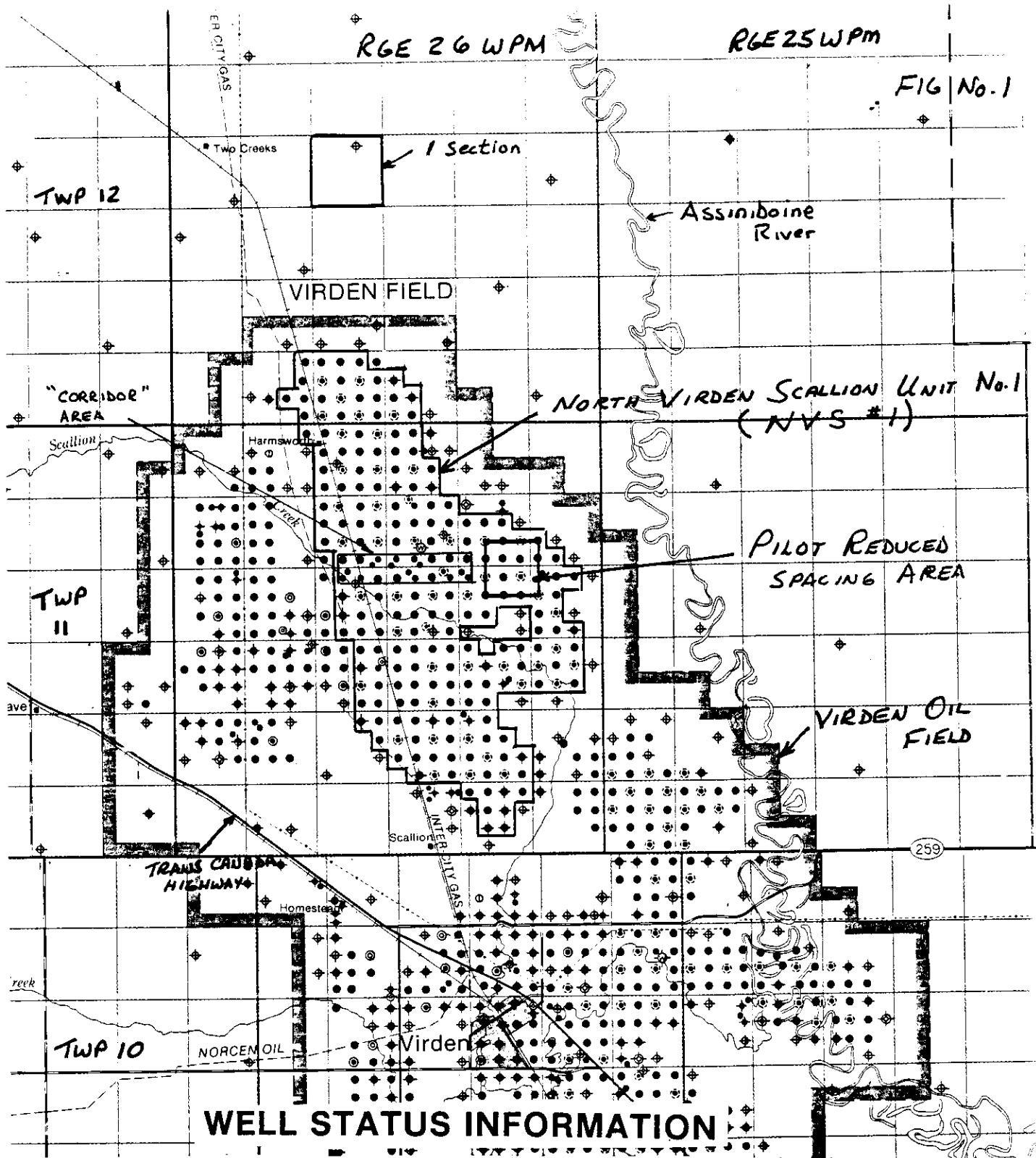


L. R. Dubreuil

LRD:jtb

Table No. 1
North Virden Scallion Unit No. 1
Notice of Application
Interested Parties

<u>Party</u>	<u>Address</u>	<u>Affiliation</u>
Phillip W. Tapp	Box 496 Virden, Man ROM 2C0	Landowner
W. & E. Peters	Box 308 Virden, Man ROM 2C0	Landowner
Lyle Heaman	Box 291 Virden, Man ROM 2C0	Landowner
Department of Natural Resources Crown Lands Branch Leases and Permits	1495 St James St Winnipeg, Man R3H 0W9	Landowner
Rural Municipality of Wallace	Box 2200 Virden, Man ROM 2C0	Landowner
The Manitoba Surface Rights Association	Box 967 Virden, Man ROM 2C0	Landowner's association
Serge Scrafield Senior Planner Provincial Planning Branch Dept of Municipal Affairs	800 Portage Ave Winnipeg, Man R3G 0N5	
Dale Partridge Chief, Land Utilization and Soil Survey Section Department of Agriculture	908 Norquay Bldg Winnipeg, Man	
Dave Wotton Head, Terrestrial Standards and Studies Manitoba Environment	139 Tuxedo Blvd Winnipeg, Man	



- | | |
|----------------------|--|
| ○ Location | ⊗ Water injection well |
| ◐ Standing | ⊗ Water injection well (former producer) |
| ● Producer | ⊕ Abandoned water injection well |
| ◆ Abandoned producer | ⊕ Abandoned water injection well (former producer) |
| ⊖ Dry and abandoned | ⊙ Salt water disposal |
| | ⊙ Salt water disposal (former producer) |
| | ⊕ Abandoned salt water disposal |
| | ⊕ Abandoned salt water disposal (former producer) |

FIG. No. 2

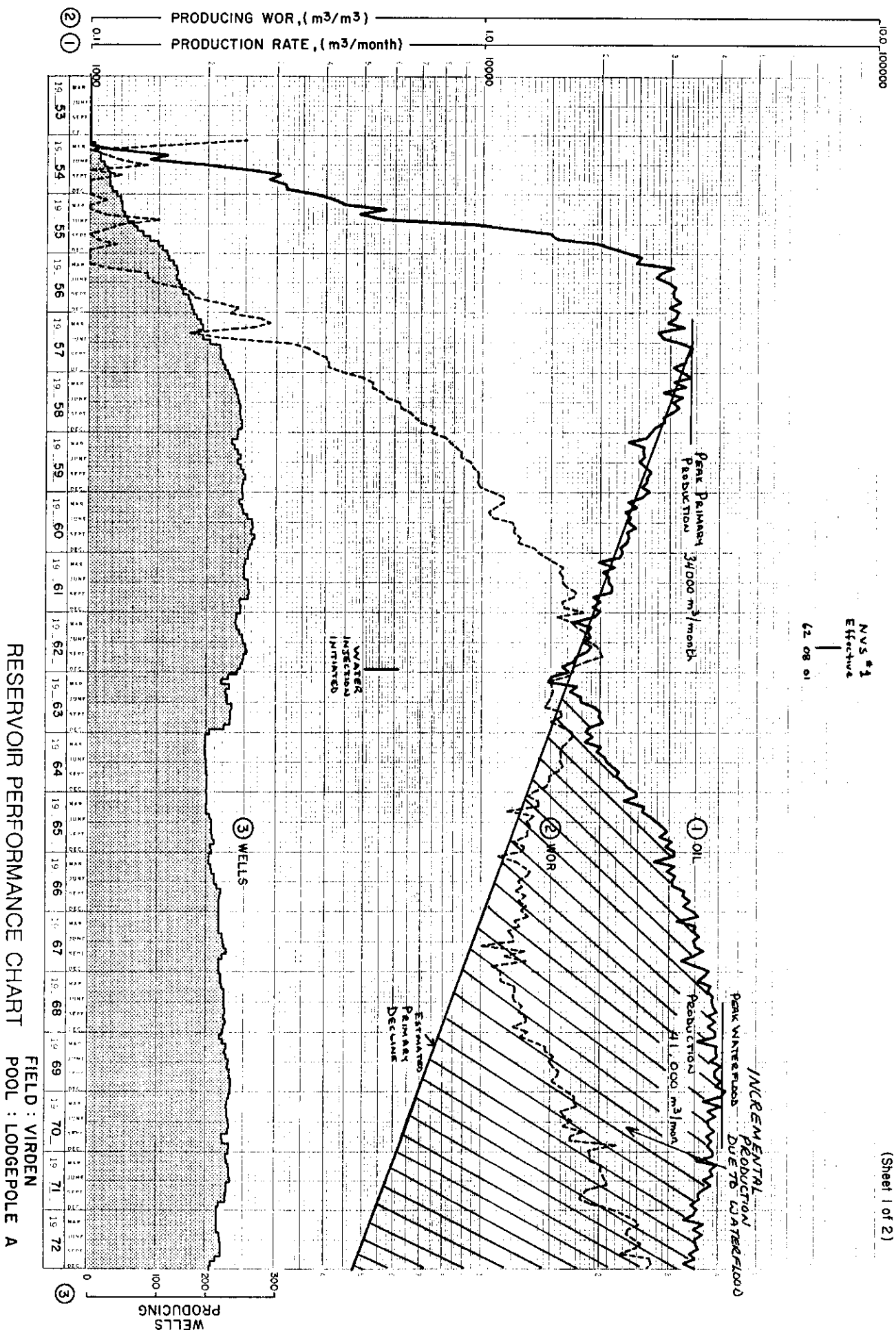
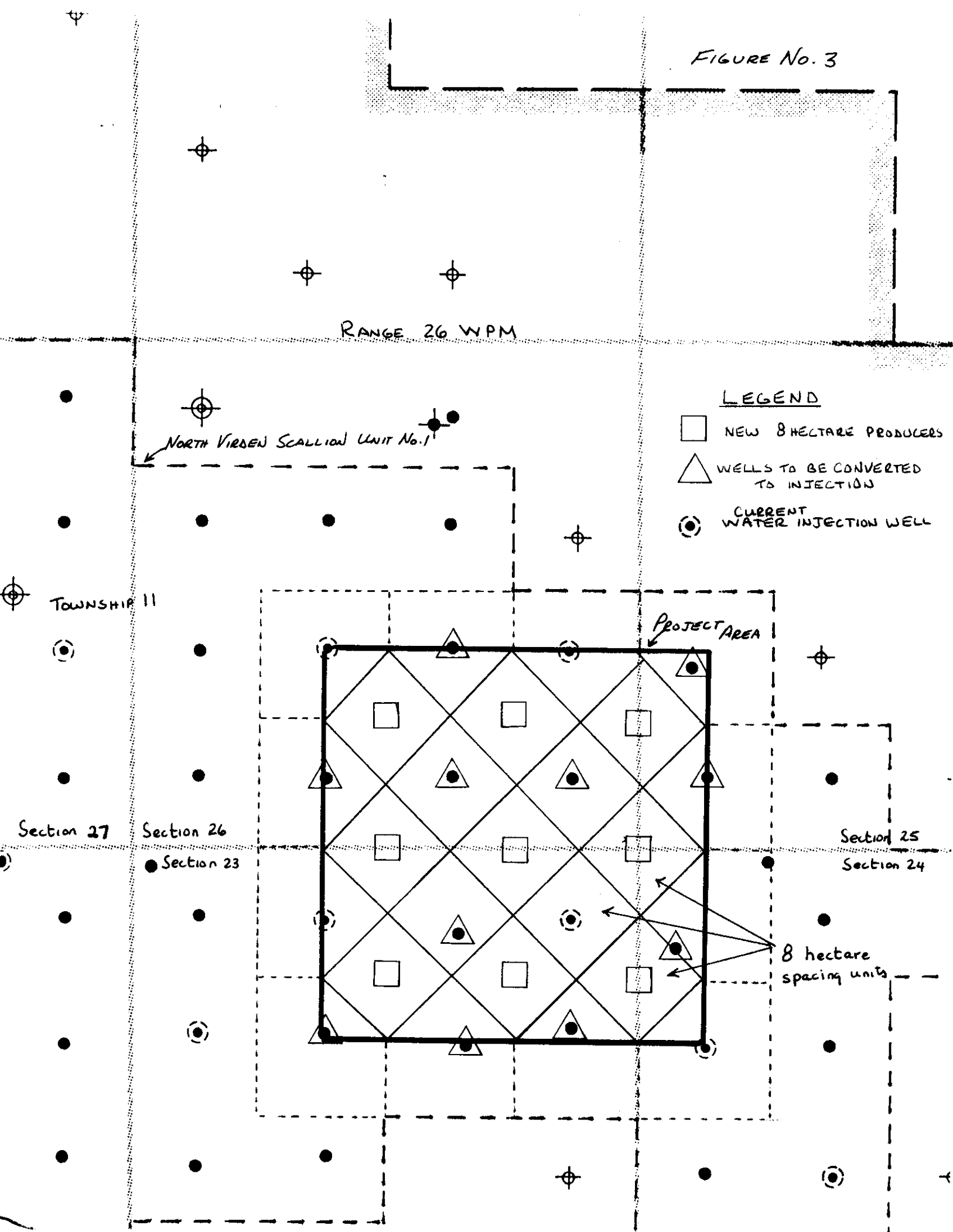
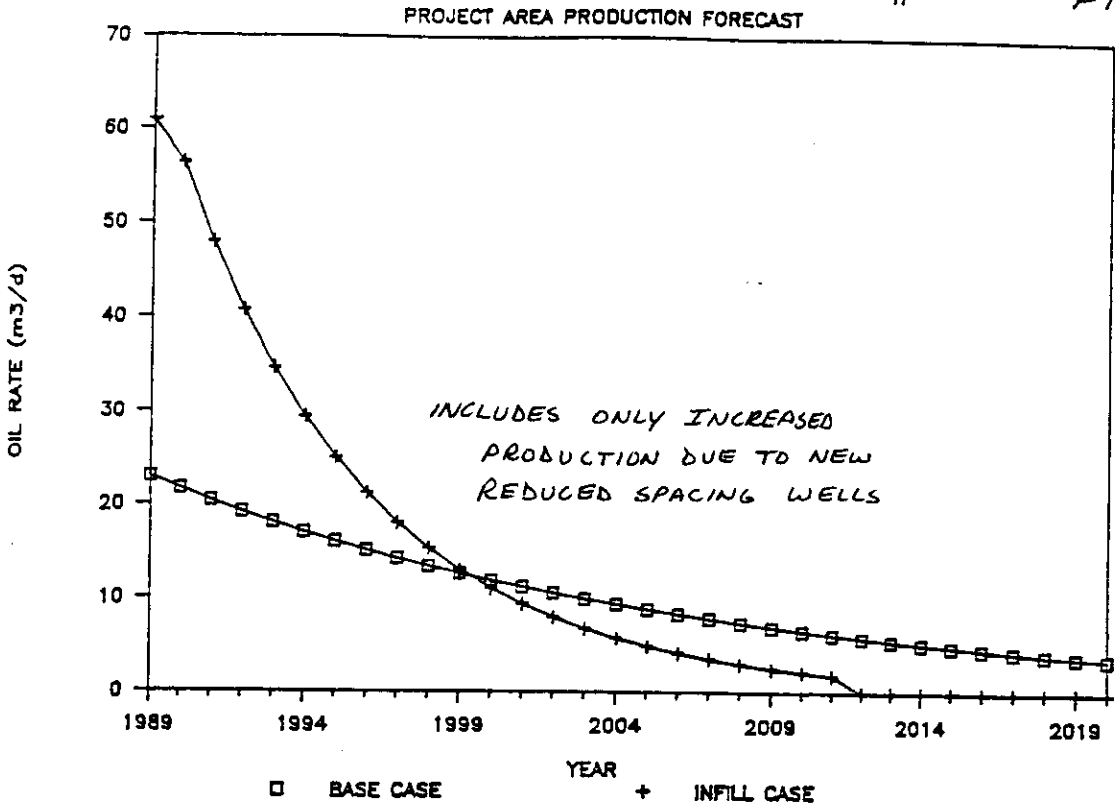


FIGURE No. 3



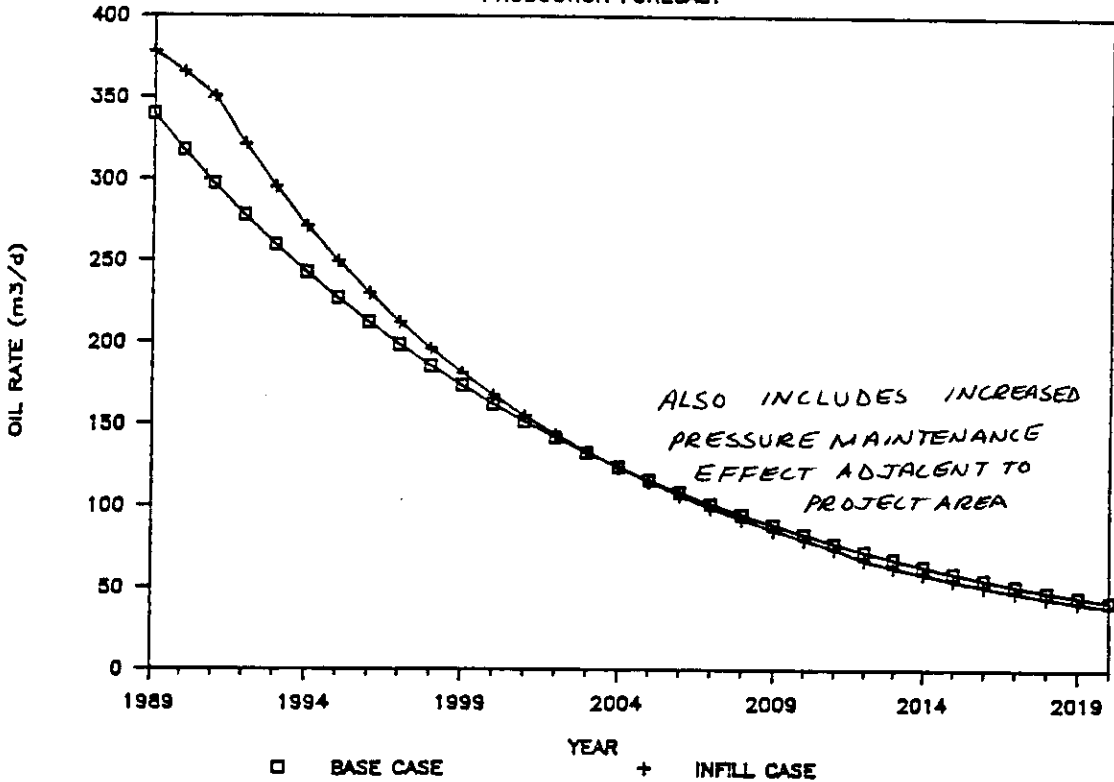
NORTH VIRDEN SCALLION UNIT #1

FIG NO.4



NORTH VIRDEN SCALLION UNIT #1

PRODUCTION FORECAST





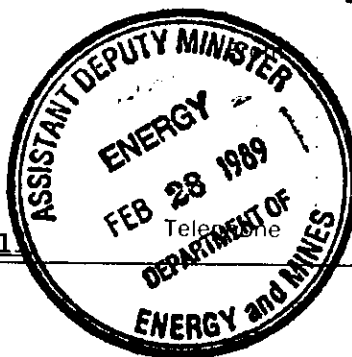
Date February 20, 1989

Memorandum

To H. Clare Moster
Assistant Deputy Minister
Energy Division

L. R. Dubreuil
Director
Petroleum Branch

Subject Re: Definition of New Oil Well



The Petroleum Drilling and Production Regulation provides for normal oil well spacing of 16 ha (40 acres). The Regulation also provides for special drilling spacing units which can be larger or smaller.

Spacing unit size should reflect the well density required to optimize resource recovery. A pool on 16 ha spacing is not fully developed until each 16 ha spacing unit in the pool area has been drilled. Similarly a pool with 8 ha spacing requires a well for each 8 ha spacing unit to be fully developed.

The Petroleum Crown Royalty and Incentive Regulation and The Oil and Gas Production Tax Regulation include a definition of a "new oil well." A new oil well produces "new oil" which is subject to Crown royalty or Oil and Gas Production Tax at a reduced rate.

The definition of a "new oil well" includes "a well drilled and completed on or after April 1, 1974 and that, in the opinion of the director is the only well in the spacing unit in which the well is located that is producing, or capable of producing from the pool in which the well is completed,"

Based on the above provision, a well drilled on an undeveloped spacing unit be it 8 ha, 16 ha etc is a new oil well and should be subject to new oil royalty and tax rates.

The definition of a "new oil well" goes on to say "but does not include an infill or additional well drilled in a spacing unit in which when such well was drilled, there was already a well producing or capable of producing from the zone in which the well is completed or where the spacing unit was deemed to be producing from that pool under an existing pooling or unitization agreement."

This part of the definition of a new oil well is designed to discourage drilling of a second well in a spacing unit for the purpose of accelerating recovery.

A problem arises in a unitized situation where each tract is allocated deemed production for royalty and tax purposes. Typically the tract size is the same as the spacing unit size at the time of unitization. If, subsequent to unitization it is determined that well spacing must be reduced to achieve optimum recovery, the above excerpt from the definition precludes classification of wells drilled on new spacing units as new wells. In this regards the definition is inconsistent; in the non unitized situation a well on a reduced spacing unit would be classified as new, whereas in a unitized situation it would be classified as old.

A second problem could arise in a unit where a tract is coincident with a spacing unit and where there is no well completed in the unitized zone on the tract. Such a tract may be included in the unit and given allocated or deemed production on the basis of wells in adjacent spacing units or on the basis of well data (a well completed in a non unit zone). If the operator then wished to drill or recomplete a well to properly develop the unitized zone, such well, under the current definition, would not qualify as a new oil well.

The main consideration in the present definition of a "new oil well" relating to deemed production was probably to avoid new oil status for a second well in a spacing unit where the other well is a water injection well.

It is proposed to modify the definition of a "new oil well" in both the Petroleum Crown Royalty and Incentive Regulation and the Oil and Gas Production Tax Regulation to the following:

"but does not include an infill or additional well drilled in a spacing unit in which, when such well was drilled, there was already a well completed for production or injection purposes in the pool in which the well is completed."

The proposed modification to the definition will result in consistency between unitized and non unitized situations with respect to new oil and old oil status.



L. R. Dubreuil

LRD:jtb

Attachment No. 2
Calculation of Crown Royalties and
Oil and Gas Production Taxes

A. Crown Royalties

Total Royalty Payable = Old Oil Royalty + New Oil Royalty

Old Oil Royalty = Old Oil Royalty on Old Production

$$\text{New Oil Royalty} = 0.55 \times \left[\left(\frac{\text{Old Oil Royalty}}{\text{on total Production}} \right) - \left(\frac{\text{Old Oil Royalty on}}{\text{Old Production}} \right) \right]$$

Example A-1:

Total Unit Rate = 11 122.2 m³

Percent New Oil = 15.43%

Tract 3-11 allocation factor = 0.0025109

Old Oil Production = 11 122.2 X (1- 0.1543) = 9 406 m³

Old Oil Production allocated to 3-11 = 0.0025109 X 9 406.0 = 23.6 m³

Total Oil Production allocated to 3-11 tract = 0.0025109 X 11 122.2 = 27.9 m³

$$\text{Old Oil Royalty on Old Production} = \frac{P^2}{265} = \frac{(23.6)^2}{265} = 2.10 \text{ m}^3$$

$$\text{Old Oil Royalty on Total Production} = \frac{(27.9)^2}{265} = 2.94 \text{ m}^3$$

$$\text{Total Royalty Payable} = 2.10 \text{ m}^3 * 0.55 (2.94 - 2.10) = 2.56 \text{ m}^3$$



Memorandum

March 14, 1989

To: R. L. Dubreuil
Director
Petroleum Branch
Department of Energy and Mines
555 - 330 Graham Avenue

D. L. Wotton
Head, Terrestrial
Standards & Studies
Manitoba Environment
Bldg. 2, 139 Tuxedo Ave.

Telephone

REDUCED SPACING PILOT PROJECT - NORTH VIRDEN SCALLION UNIT NO. 1

Chevron's application for a reduced spacing pilot project in the North Scallion Unit No. 1 has been reviewed by representatives of the Department of Environment and Workplace Safety and Health.

My initial comments on the proposal as found in my memo of February 16, 1989, Wotton to Scrafield, have largely been addressed. However, there is still reservation regarding item #2, "Siting criteria to be cognizant of environmental protection". In particular, the issue of surface water is still of concern.

Groundwater appears to be addressed satisfactorily in the proposal, surface water receives little attention except for Sec. 10, pg. 3, #5; "Risks to Water Supplies". This reference proposed actions after the fact. In Sec. 11, pg. 7, #vi) a recommendation to site proposed infill wells in depressional lands, or sloughs is made. This is not appropriate, groundwater accesses is direct, surface run-off enhances flooding, wildlife habitat is impacted.

In reviewing attachment #3, it is noted that wells are currently located on the bed of Scallion Creek in the southwest corner of the unit. A subsequent review of the Manitoba Petroleum Regulations appears to indicate that surface waters were not considered in Drilling or Production Regulations or in Crown Leasing.

Environment would recommend that a review and possibly a redraft of present regulations and guidelines take place prior to expansion of the pilot project. This action would be to ensure that surface waters are adequately protected and that wells are not drilled in or on the banks of creeks and other watercourses.

Farther to our meeting of February 16, 1989, Environment does not have a concern for relocation of well #6 to the edge of the field and adjacent to the ditch. I have also been in contact with the Clean Environment Commission and reaffirmed our previous assumption that their involvement would not normally be required unless we found ourselves at an impasse and our Minister requests their involvement.

D. L. Wotton
D. L. Wotton

DLW:lp
c.c. D. Partridge
S. Scrafield

Agriculture
Municipal Affairs

MEMORANDUM

TO BOB

DATE 01-17-89

FROM CLIF

PAGE 1 OF 1

VIRGINIA - 1/17/89

REDUCED SPACING LOCATIONS

THE ATTACHED COPY SHOULD ALLOW YOU TO
SPOT THE PROPOSED WELL LOCATIONS ON YOUR
PHOTO. I HAVE NUMBERED THEM FOR CONVENIENCE.
THE EVENTUAL TRAILS TO THE WELLSITES ARE ALSO
INDICATED. THE PROPOSED LOCATIONS REFLECT OUR
BEST GUESS AT PRESENT. THESE LOCATIONS WILL REQUIRE
SOME CORRESPONDING WITH THE RM AND YOUR OFFICE ON
ROAD ALLOWANCES AND FINAL SURVEYING WRT TOPOGRAPHY.
IN PARTICULAR.

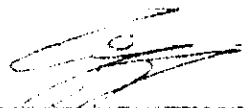
WELL #4 - LOCATED IN WET AREA? EITHER MOVE OR BUILD UP LEASE
- AFFECTED BY "OLD" ROAD ALLOWANCE?

WELL #7 - LOCATED ON ROAD ALLOWANCE.

OBTAIN APPROVAL ASSUMING RM CONCUR.

NOTE: WE HAVE TALKED TO THE LANDOWNERS AND HAVE
OBTAINED "RIGHT TO SURVEY" FOR ALL WELLS. THEY
DID NOT EXPRESS ANY CONCERNS AT THAT TIME.

LET ME KNOW HOW YOU WARE OUT WITH
MUNICIPAL AFFAIRS.





The Oil and Natural Gas
Conservation Board

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

(204) 945-3130

Attached is a revised notice of an application by Chevron Canada Resources. The notice is amended to allow for a one week extension of the deadline for receipt of objections to or interventions in the application (from April 17, 1989 to April 25, 1989). The extension was necessitated by a delay in publication of the notice by the Manitoba Gazette.

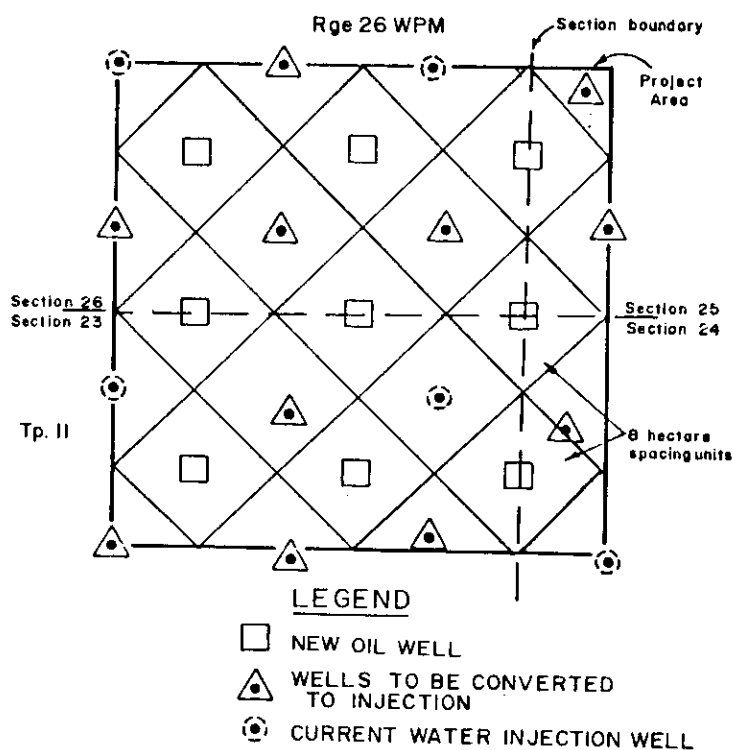


NOTICE

UNDER THE MINES ACT

Chevron Canada Resources, Operator of North Virden Scallion Unit No. 1 ("the unit area") has made application:

1. Under section 20 of the Petroleum Drilling and Production Regulation for approval of special drilling spacing units in a portion of the unit area. It is proposed that drilling spacing units would be reduced from 16 hectares (40 acres) to eight hectares (20 acres) in the project area outlined below. If the application is approved and the area is fully developed on eight hectare spacing, nine additional oil wells, located as indicated would be drilled.



2. Under Section 64 of the Petroleum Drilling and Production Regulation for approval to convert the following wells to water injection:

Chevron Scallion 9-23-11-26 (WPM)
Chevron Scallion 10-23-11-26 (WPM)
Chevron Scallion 11-23-11-26 (WPM)
Chevron Scallion 15-23-11-26 (WPM)
Chevron Scallion Prov 13-24-11-26 (WPM)
Chevron Scallion 4-25-11-26
Chevron Scallion 5-25-11-26
Cdn. Res et al Scallion 1-26-11-26
Cdn. Res et al Scallion 2-26-11-26
Sun W.C. Tapp Scallion 3-26-11-26
Cdn. Res et al Scallion 7-26-11-26

If no intervention in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3C 0V8 on or before April 25, 1988, the Board may approve the application.

Copies of the application may be obtained from Chevron Canada Resources, Information Centre, 500 - 5th Avenue S.W., Calgary, Alberta, T2P 0L7 (phone (403) 234-5000) or can be viewed at the offices of the Petroleum Branch, 555 - 330 Graham Avenue, Winnipeg, Manitoba (phone (204) 945-6577) or 247 Wellington Street West, Virden, Manitoba (phone (204) 748-1557).

Dated at Winnipeg 29th day of March, 1989

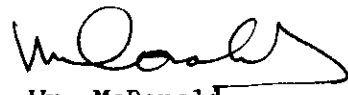

Wm. McDonald
Member

Table No. 1
North Virden Scallion Unit No. 1
Notice of Application
Interested Parties

<u>Party</u>	<u>Address</u>	<u>Affiliation</u>	<u>FIRST</u>	<u>SECOND</u>
Phillip W. Tapp	Box 496 Virden, Man ROM 2C0	Landowner	✓	✓
W. & E. Peters	Box 308 Virden, Man ROM 2C0	Landowner	✓	✓
Lyle Heaman	Box 291 Virden, Man ROM 2C0	Landowner	✓	✓
Department of Natural Resources Crown Lands Branch Leases and Permits	1495 St James St Winnipeg, Man R3H 0W9	Landowner	✓	✓
Rural Municipality of Wallace	Box 2200 Virden, Man ROM 2C0	Landowner	✓	✓
The Manitoba Surface Rights Association	Box 967 Virden, Man ROM 2C0	Landowner's association	✓	✓
Serge Scrafield Senior Planner Provincial Planning Branch Dept of Municipal Affairs	800 Portage Ave Winnipeg, Man R3G 0N5			
Dale Partridge Chief, Land Utilization and Soil Survey Section Department of Agriculture	908 Norquay Bldg Winnipeg, Man			
Dave Wotton Head, Terrestrial Standards and Studies Manitoba Environment	139 Tuxedo Blvd Winnipeg, Man			

UNDER THE OFF-ROAD VEHICLES ACT

THE HIGHWAY TRAFFIC BOARD

Notice is hereby given that a hearing of the Highway Traffic Board will be held on Thursday, April 27, 1989 at 13:00 hours in the Matlock Recreational Hall, Matlock Road, Matlock, Manitoba.

Bylaws — Sections 33(4) and 46 O.R.V.A.

2-ORV — Village of Dunnottar

Consideration to be given to the approval of the Village of Dunnottar bylaw No. 646 respecting the operation of off-road vehicles within the Village of Dunnottar boundaries.

The Highway Traffic Board will be prepared to consider all submissions written or oral on the above application by contacting the Secretary prior to or at the hearing.

206-301 Weston Street

Winnipeg, Manitoba

R3E 3H4

Phone: 945-8912

A. POLTARUK, MMM CD

Secretary,

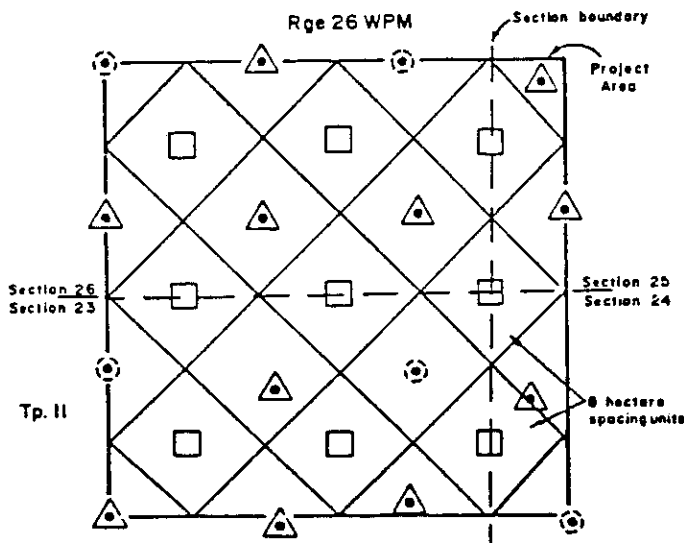
The Highway Traffic Board.

4544—14

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LEGEND

- New oil well
- △ Wells to be converted to injection
- ⊙ Current water injection well

2. Under Section 64 of the Petroleum Drilling and Production Regulation for approval to convert the following wells to water injection:

- Chevron Scallion 9-23-11-26 (WPM)
- Chevron Scallion 10-23-11-26 (WPM)
- Chevron Scallion 11-23-11-26 (WPM)
- Chevron Scallion 15-23-11-26 (WPM)
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- Chevron Scallion 4-25-11-26
- Chevron Scallion 5-25-11-26
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- Cdn. Res et al Scallion 2-26-11-26
- Sun W.C. Tapp Scallion 3-26-11-26
- Cdn. Res et al Scallion 7-26-11-26

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Dated at Winnipeg, 29th day of March, 1989.

Wm. McDONALD,
Member.

4796—14

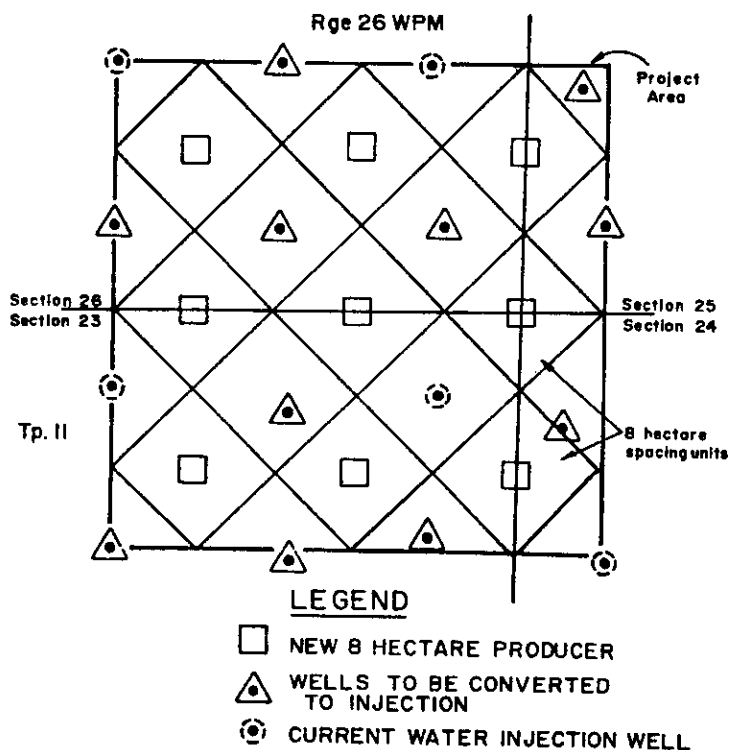


NOTICE

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Sun W.C. Tapp Scallion 3-26-11-26
Cdn. Res et al Scallion 7-26-11-26

If no intervention in writing is received by the Board at Room 309, Legislative Building, Winnipeg, Manitoba, R3C 0V8 on or before April 17, 1988, the Board may approve the application.

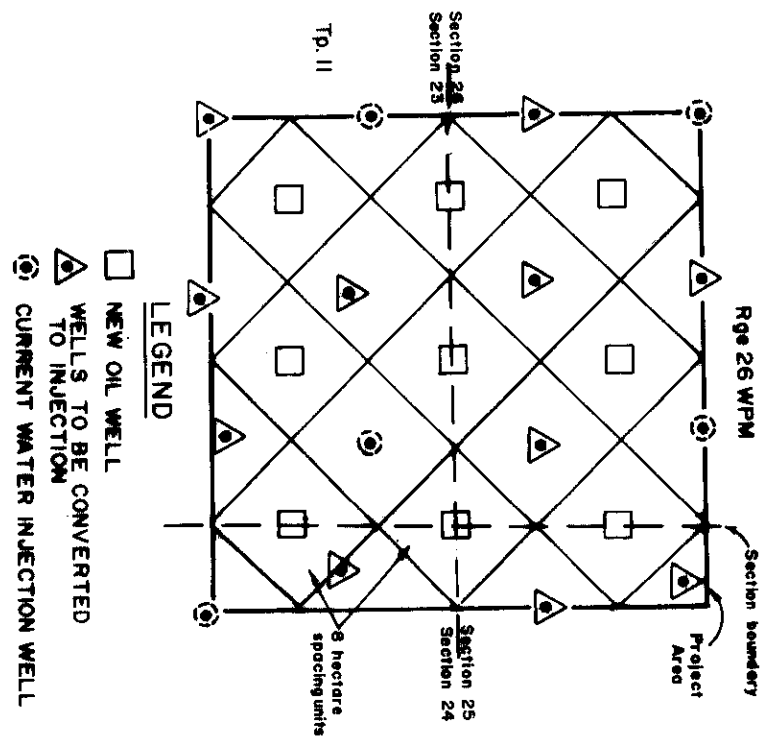
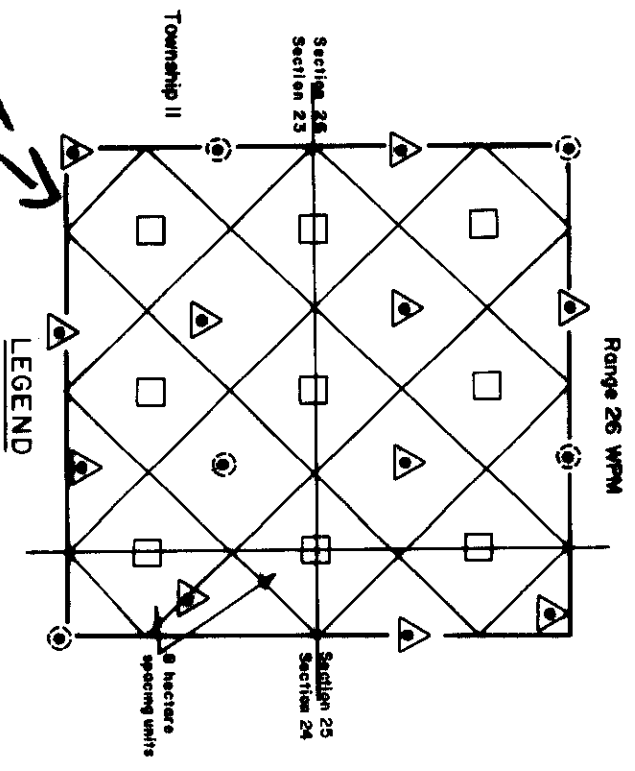
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Dated at Winnipeg 22nd day of MARCH, 1989



H. Clare Moster
Deputy Chairman

OMIT





Memorandum

Date February 16, 1989

To Serge Scrafield
Senior Planner
Provincial Planning Branch
Municipal Affairs
405 - 800 Portage Avenue

Subject

From D.L. Wotton
Head, Terrestrial
Standards & Studies
Manitoba Environment
Bldg. 2 - 139 Tuxedo

Telephone

RE: Reduced Spacing Pilot Project - Chevron

The Department of Environment and Workplace Safety and Health have reviewed the proposal for a Reduced Spacing Pilot Project on North Virden Scallion Unit No. 1 by Chevron Canada Resources.

The Ministerial Agreement with the Department of Energy and Mines is in effect in this case and the requirement for applicants to submit information on the potential environmental impacts of proposed developments such as this pilot project is clearly defined in Section 1(b).

A proposal to reduce drill site spacing from 40 to 20 acre size should include information on the following:

1. Siting criteria to ensure placement in the least sensitive area (i.e. near existing roadways, minimize siting in cultivated areas etc.).
2. Siting criteria to be cognizant of environmental protection and future reclamation requirements: (i.e. sites not subject to flooding, avoid low areas, minimize grading, restrict topsoil removal).
3. Drilling criteria for clean-up and restoration immediately after rig removal.
4. Describe the site in more detail so reviewers have a clearer picture of land use, topography, location of residences etc.
5. Describe the surficial geology of the site relevant to assessing the impact on groundwater.
6. Describe any plans for conservation and replacement of topsoil and reclamation of site following pilot project.
7. Describe alternate drilling options (i.e. directional or slant-hole drilling as a means of reducing numbers of well sites, access roads and flow lines).
8. Describe potential impact on reducing oil reserve by increased extraction rate (i.e. reduced lifespan of field).

D.L. Wotton

First Fold



Action / Route Slip

Date: Feb. 9, 1989

To: Bill Bardswich
Director of Mines

From: Bob Dubreuil
Director of Petroleum

Telephone:

- | | | | | |
|---|--|--|---|--|
| <input type="checkbox"/> Take Action | <input type="checkbox"/> Per Your Request | <input type="checkbox"/> Circulate, Initial and Return | <input type="checkbox"/> For Approval and Signature | <input type="checkbox"/> Make _____ Copies |
| <input type="checkbox"/> May We Discuss | <input checked="" type="checkbox"/> For Your Information | <input type="checkbox"/> Return With Comments or Revisions | <input type="checkbox"/> Draft Reply for Signature | <input type="checkbox"/> Please File |

Comments: Re: Feb. 10 IPB Meeting

Municipal Affairs will have an item under Other Business relating to a proposal by Chevron Canada Resources to reduce well spacing in a portion of the Virden Field.

I am aware of this and will be coordinating a meeting between Chevron and interested Departments.



Memorandum

Date February 8th, 1989

To Serge Scrafield, Senior Planner
Provincial Planning Branch
Municipal Affairs
405 - 800 Portage Avenue
Winnipeg, Manitoba

Subject REDUCED OIL WELL SPACING - VIRDEN

From J.R.D. Partridge, Chief
Land Utilization & Soil Survey Sec.
Soils & Crops Branch
Manitoba Agriculture
Telephone 908 - 401 York Avenue, Winnipeg
945-3837

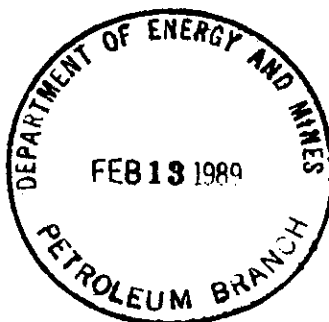
Manitoba Agriculture have reviewed the Chevron proposal for 9 reduced-spacing pilot oil wells on Sections 23 and 26-11-26W in the North Virden Scallion Unit No. 1. Our first concern or question would be whether there has been a report by Chevron on the previous reduced-spacing pilot project in the Daly Field. We understand there were some salt spill problems with that project and would ask what are the risks of similar problems in the Scallion proposal?

Additionally, Chevron have said in the past that they have numerous scattered reduced-spacing wells in the Scallion and Daly fields. Have there been reports and impact studies done on the increased recovery and effect on the agricultural operations from those endeavors?

Manitoba Agriculture is of the firm opinion that any move by Chevron and the Petroleum Branch toward 20 acre spacing of oil wells in Manitoba should be done only under the following conditions:

- 1) new well locations be moved however far off-centre to locate the new well in uncultivated land,
- 2) where the above is not possible, then new wells should be sited in-line with and adjacent to roadways to existing wells, utilizing directional (deviated) drilling,
- 3) wells adjacent to roadways be sited immediately adjacent to the property line, not 125 to 200 feet into cultivated fields,
- 4) graded, built-up roadways not be constructed, so as to allow free passage of farm machinery.

Specifically, the Scallion pilot proposal as submitted will have significant negative agricultural impact if the new wells proposed for L.S.'s 9, 10, 11, 14, and 15 of 23-11-26W are not moved to the extreme edges of the cultivated fields. Proposed wells on L.S. 16 of 23-11-26W and L.S.'s 1, 2, and 3 of 26-11-26W pose no problem as they are on uncultivated lands.



JRDP/mm

c.c. L. R. Dubreuil
T. L. Pringle
J. N. Ewanek
Dave Wotton

J.R.D. Partridge

Manitoba



Memorandum

Date January 5, 1989

To Serge Scrafield
Senior Planner
Provincial Planning Br.
Municipal Affairs
800 Portage Ave.

From L. R. Dubreuil
Director
Petroleum
Energy & Mines
555 - 330 Graham Ave.

Subject

Telephone

Re: North Virden Scallion Unit No. 1
Reduced Spacing Pilot Project

Chevron Canada Resources is preparing a proposal to reduce well spacing in a portion of the North Virden Scallion Unit No. 1. The area of interest is outlined on Figures 1 and 2.

The proposal involves drilling of nine wells on 20 acre spacing and the conversion of 11 existing wells from production to water injection.

The proposal, which requires The Oil and Natural Gas Conservation Board approval, is a pilot project designed to confirm Chevron's estimate of incremental reserves which can be realized by reducing well spacing to 20 acres from 40 acres. Chevron anticipates incremental recovery of 100 000 m³ of oil in the pilot area. At current prices, this incremental recovery would have a total value of over \$12 million. If technically and economically successful, Chevron has indicated the possibility of applying for reduced spacing for other parts of the Unit. Such further proposals would also be subject to review and approval by The Oil and Natural Gas Conservation Board.

Attached is a copy of aerial photographs of the pilot area. It is noted that of the nine new wells proposed, five are located adjacent to municipal road allowances, two are in pasture land and two are in cropped land. The impact of these additional wells on land use and agricultural activities would appear to be limited. Conversion of existing producers to water injection may reduce surface impact slightly owing to reduced size surface facilities. Chevron has committed to a location selection process which involves input from the landowner and the Petroleum Branch in selecting the well site and access road in a manner designed to minimize surface impact. Chevron has discussed its plans with landowners in the proposed project area and has indicated that no specific concerns have been raised.

First Fold

Prior to making formal application, Chevron has asked the Petroleum Branch to review this proposal with you to determine the likelihood of your involvement. I request that you review the attached material and contact me for further discussions.

If I have not heard from you by February 1, 1989, I will assume that you have no concerns.

Original Signed By
L. R. DUBREUIL

L. R. Dubreuil

LRD:dah

attach

cc: Dale Partridge, Chief
Land Utilization and Soil Survey Section
Manitoba Agriculture
908 - 401 York Avenue

bc: H.C. Moster

FIG No. 2

VIRDEN
FIELD
BOUNDARY

LEGEND

NEW REDUCED SPACING
PRODUCERS

EXISTING PRODUCERS
CONVERTED TO WATER
INJECTORS

Section 34-11-26

Section 35-11-26

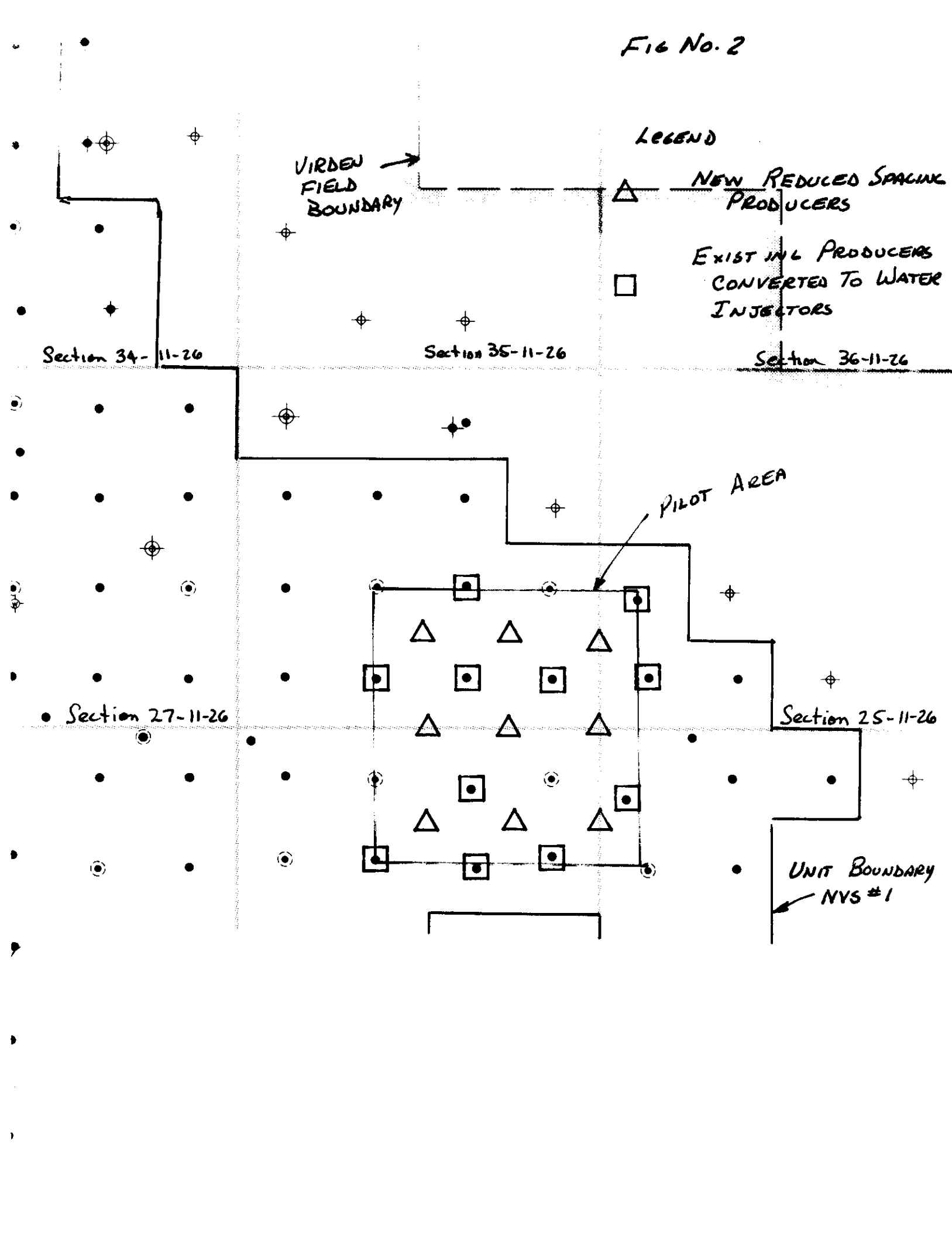
Section 36-11-26

PILOT AREA

Section 27-11-26

Section 25-11-26

UNIT BOUNDARY
NVS #1



MEETING AGENDA

Manitoba Department
of Energy and Mines Petroleum Division
and Chevron Canada Resources

1988-12-15

Introduction

- ° Agenda Summary
- ° Goals of Meeting

North Virden Scallion Unit No. 1

- ° Technical Evaluations
 - Pilot versus Expansion
 - Geological and Reservoir Characteristics
 - Locations, Size and pattern Orientation
 - Production Forecast
- ° Royalties
 - Calculation Method (PC Program)
 - New Oil Calculation
 - Royalty Holiday
 - Benefits to Crown
 - Effect on Project Economics
 - "Tie" New Oil to Spacing Approval - Input From Petroleum Division
 - Administration
- ° Economics
 - Petroleum Division
 - Chevron
- ° Application/Approval Process
 - Comingled Application
 - Information Requirements
 - Approval Process re. Royalties and Hearing
- ° Hearing
 - Daly Comparison
 - Field Work
 - Timing of Application
 - Public Awareness
 - Anticipated Problems
 - Avoid Hearing

Daly Unit No. 3

- ° Summary of Events
- ° Current Status
- ° Future Plans

Other Business

- ° West Routledge
 - 8-18 Exploratory Well
 - Battery Installation
 - WDW Application
 - 7-8 Increase MPPR
- ° Routledge
 - 1989 Infills
 - Low Recovery Areas
- ° Daly
 - 11-9 Performance
 - Possible Unit No. 5
 - Evaluate 20 Acre Waterflood
- ° Daly Unit No. 4
 - 15D-27 Injection
 - Expand Waterflood
- ° Roselea
 - 9-14 Well
- ° NVSU No. 1
 - Waterflood Realignment
 - 5 Spot Patterns
- ° Operational Items

Manitoba



Memorandum

Date December 9, 1988

To H. Clare Moster
Deputy Chairman
Oil and Natural Gas
Conservation Board

From L. R. Dubreuil
Director
Petroleum Branch

Subject Re: Reduced Spacing
North Virden Scallion Unit No. 1

Telephone

Chevron Canada Resources as operator of North Virden Scallion Unit No. 1 has indicated its plans to apply for approval of a pilot reduced spacing project in the subject Unit. I suggested to Chevron that we meet before the application is prepared to define our concerns and what supporting justification and studies would be required. Hopefully, this approach may facilitate the processing of the application and avoid lengthy studies and negotiations as occurred in the Daly Unit No. 3 application.

Chevron's proposal (as I understand it) involves drilling of nine new wells on new spacing Units. Subsequent to this a number of existing wells would be converted to injection. Chevron has raised several questions relating to the royalty/tax implications of this proposal:

- a. If reduced spacing were approved, would production from new wells (in new spacing units) be classified as new oil?
- b. With conversion of existing wells to injection, would the project qualify for an EOR incentive?
- c. If reduced spacing were approved, would the new wells qualify for drilling incentive holiday volumes?

New Oil Status

The present definition of "new oil" in the Crown Royalty Regulation would appear to preclude new oil status for wells drilled on reduced spacing in a unit (new spacing units would have "deemed" production from one or more tracts). It is curious to note that in a non unitized situation, wells drilled on reduced size spacing units would clearly receive new oil classification.

First | Fold

Spacing unit size should reflect the well density required to optimally develop a pool. Therefore, if a pool has 40 acre spacing units it is not fully developed until each DSU is drilled. Similarly if a pool with 20 acre spacing units would require a well on each DSU to be fully developed. This being the case, a well drilled on a previously undeveloped 20 acre DSU should be a "new oil well" just as a new 40 acre well would be.

Stated in summary, if reduced spacing were approved, new oil status for the new wells should also be approved.

In considering reduced spacing for approval, a number of factors need to be considered:

- a) Technical considerations. Maximization of ultimate recovery.
- b) Environmental (surface use) considerations
- c) Provincial revenue implications.

Specifically how will provincial revenues (royalties and taxes) be affected by approval of the project.

I feel that the application should be approved only if all of these factors can be satisfactorily justified. As stated above, if reduced spacing is approved on this basis, new oil status should be part of the approval process.

EOR Incentive

Schedule D of the Petroleum Royalty Regulation provides for an incentive for "new or enlarged" enhanced oil recovery projects. The proposed project is not new nor does it involve an enlarged area. Consequently, the project would not qualify for this incentive.

Drilling Incentives

Following similar reasoning detailed above under "New Oil Status" wells drilled in new drilling spacing units, if approved would qualify for drilling incentive holiday volumes.

Administrative Concerns

In the past, incentives or royalty/tax reductions granted have resulted in administrative complexities. In that the proposed royalty treatment will require specific approval, I would propose that the form of the incentive granted be designed for ease of administration.

Summary

I am prepared to present the above to Chevron as the Branch's proposed method of considering an application for reduced spacing in the subject Unit. As Chevron plans to visit next week (Dec. 12 - 16), I request any comments on the above as soon as possible.

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

L. R. Dubreuil

LRD/sml

cc: Charles S. Kang, Chairman
Wm. McDonald, Member

bc: Brad
Andy

12/08/88

16:08

403 234 6212

CHEVRON MKSG CGY

2001



Chevron Canada Resources

500 - Fifth Avenue S.W., Calgary, Alberta T2P 0L7 • Phone (403) 234-5000

Fax 234-5947

A. R. Bamsey
Manager
Regulations and Environment Division

1988-12-08

Manitoba Energy and Mines/
Chevron Meeting - 1988-12-14

Province of Manitoba
Department of Energy and Mines
555 - 330 Graham Avenue
Winnipeg, Manitoba
R3C 4E3

Attention: L. R. Dubreuil, Executive Director
Petroleum Division

Gentlemen:

As discussed in our 1988-12-09 conversation the meeting is set for 1988-12-15 at your offices. Chevron's intentions are to discuss all aspects of the proposed Scallion reduced spacing infill pilot in addition to some other minor business. Chevron hopes to get a clear understanding of the expected Royalty Treatment for the Scallion pilot and believes that this meeting will help smooth the application/approval process. Attached as a preview to this meeting is the proposed agenda, pilot/project area map, production forecasts and summary curves of benefits to crown.

Please direct any questions or comments to Mr. C. B. Butchko (phone: 403-234-5156).

Yours very truly,

for A. R. BAMSEY, P.Eng.

CPB/je

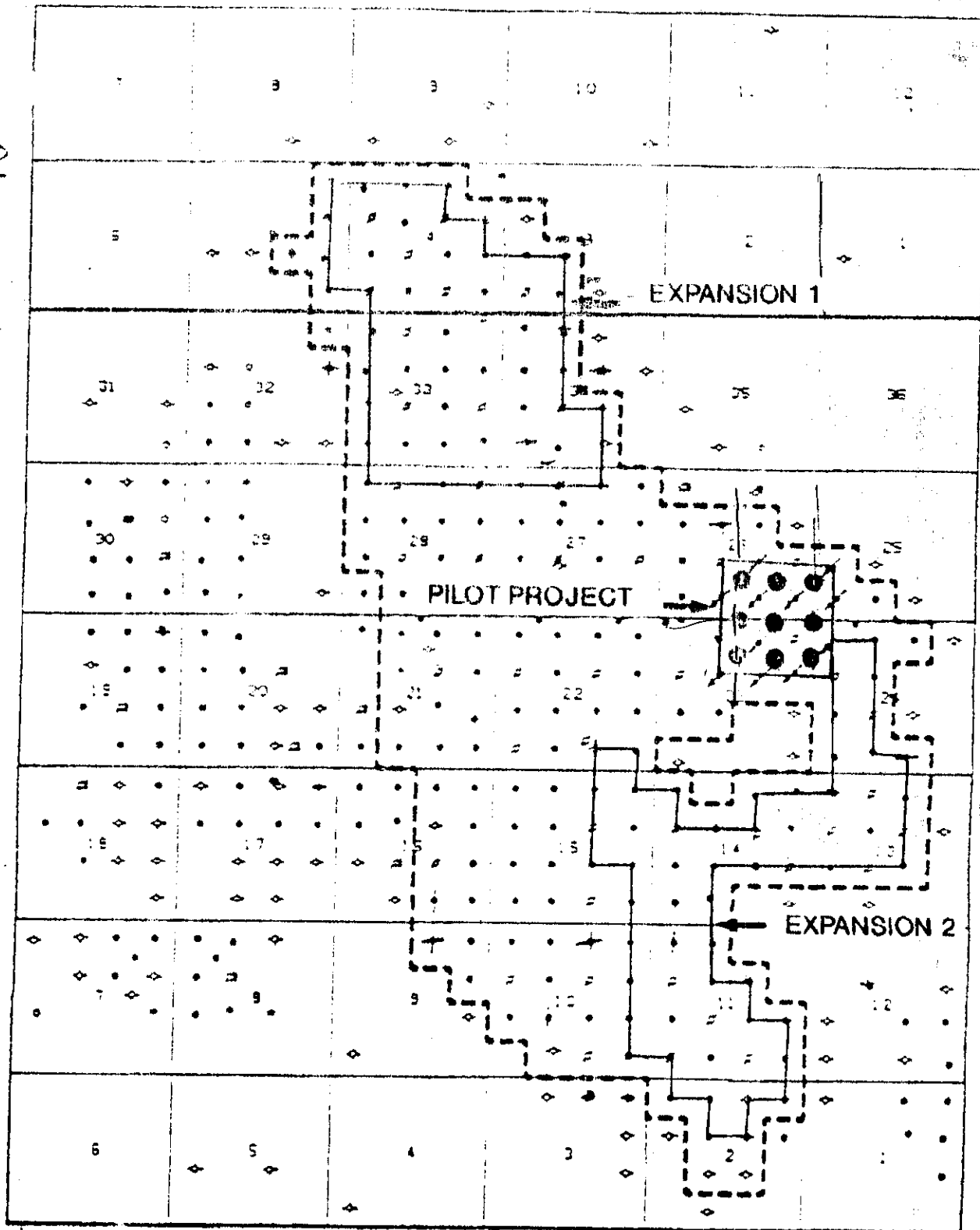
NVSU #1 INFILL PILOT PROJECT

T.12

T.12

R.11

T.11



R.26W1M

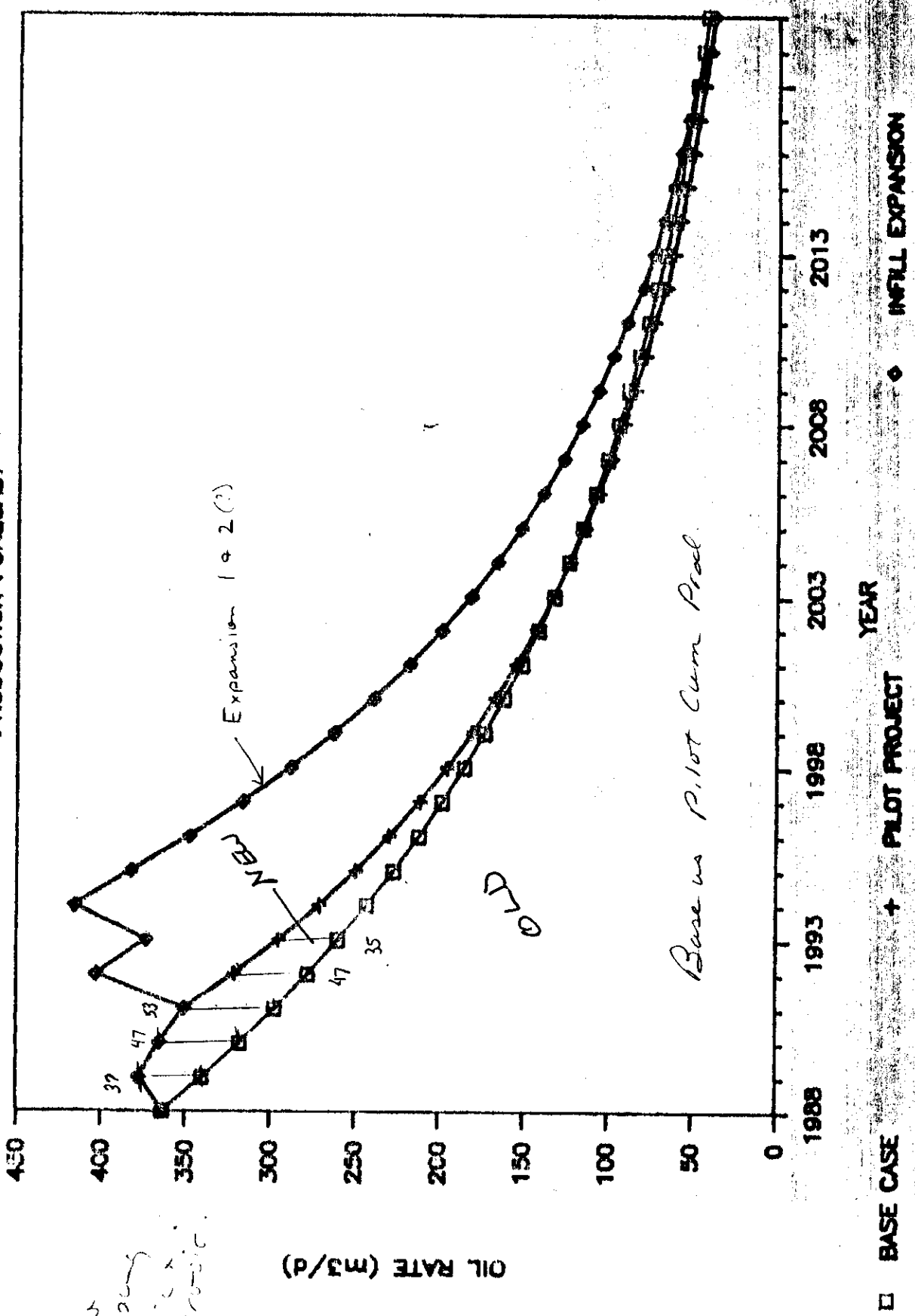
NORTH VIRDEN SCALLION UNIT NO.1

AS OF 1987-12-31

SCALE 1" = 1 MILE

- PILOT PROJECT BOUNDARY
- PROPOSED INFILL WELLS
- ◇ PROPOSED CONVERSIONS

FIGURE 2
NORTH VIRDEN SCALLION UNIT #1
PRODUCTION FORECAST



0.58 = 50 m³/d

Flow
measuring
station
(2000)

FIGURE 3

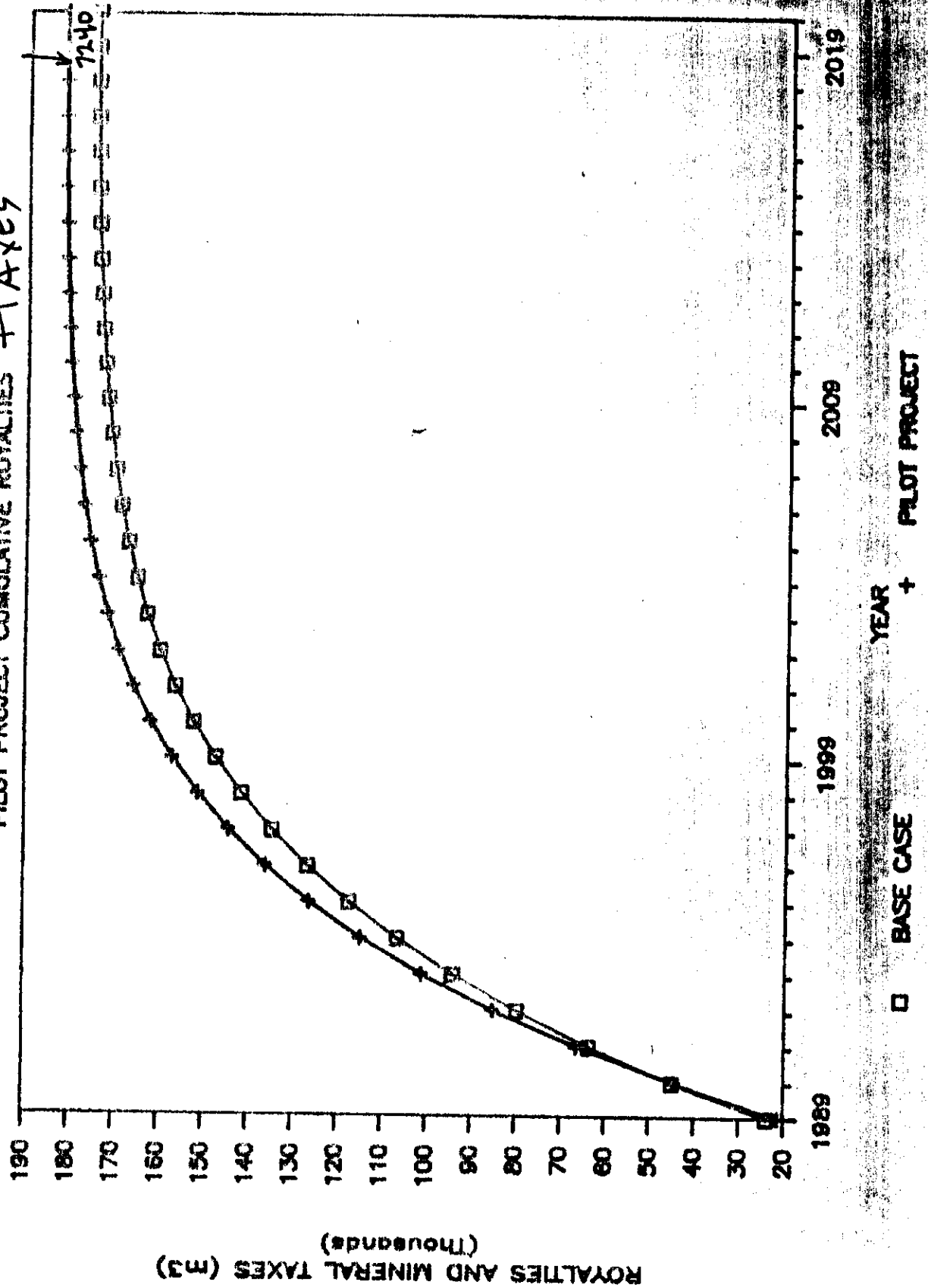
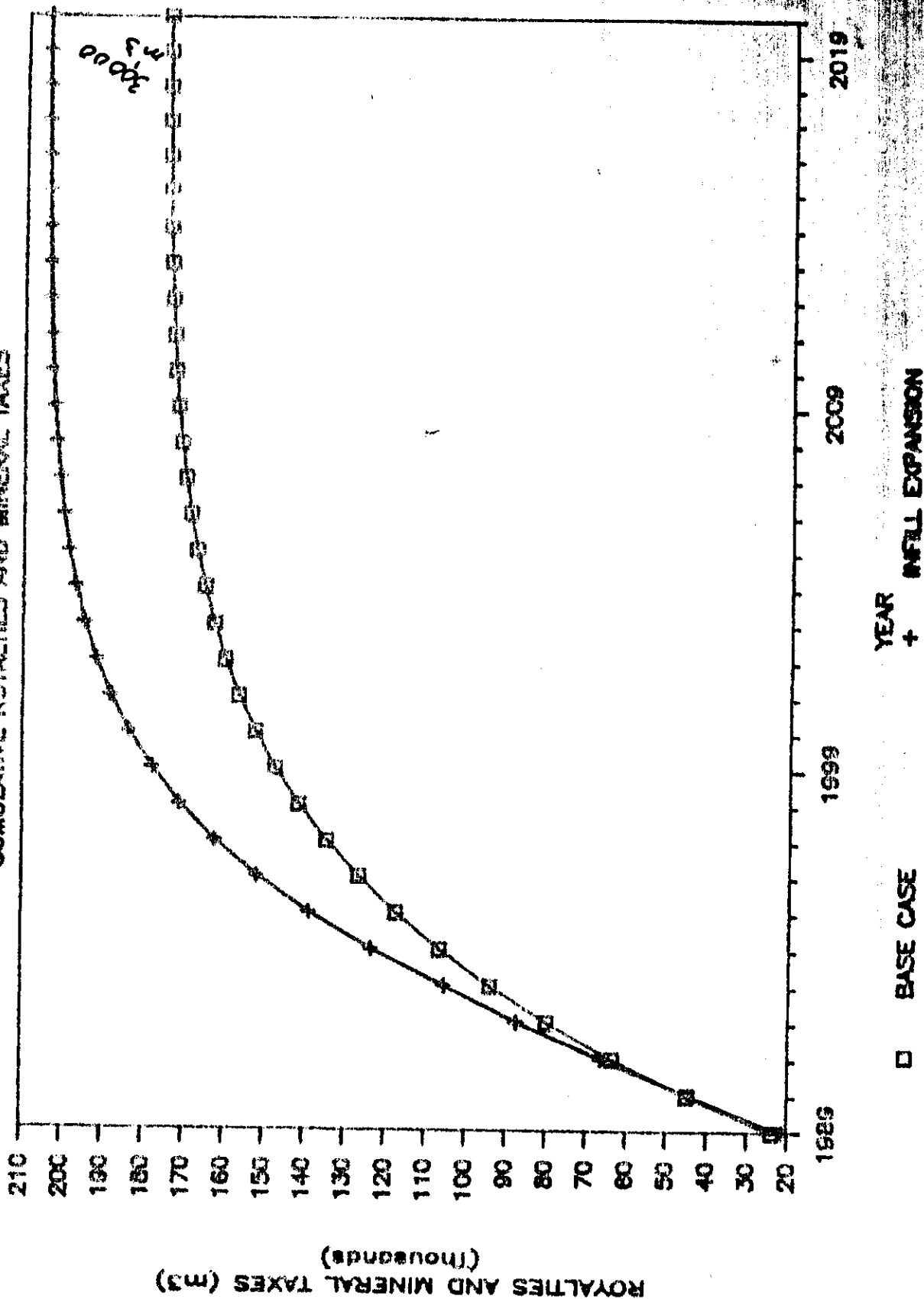
NORTH VIRDEN SCALLION UNIT #1
PILOT PROJECT CUMULATIVE ROYALTIES + TAXES

FIGURE 4
NORTH VIRDEN SCALLION UNIT #1
CUMULATIVE ROYALTIES AND MINERAL TAXES



- Please review and provide me with any comments.

pre-application meeting yet.

reduced spacing project they are proposing. No date has been set for a

- Attached are preliminary notes for discussion with Chevron regarding the

Comments: Re: Proposed NWS #1 Reduced Spacing

☐ May We Discuss

☐ For Your Information

☐ Return With Comments
or Revisions

☐ Draft Reply for
Signature

☐ Please File

☐ Take Action

☐ Per Your Request

☐ Circulate, Initial
and Return

☐ For Approval and
Signature

☐ Make _____ Copies

Telephone:

ENERGY ECONOMICS BRANCH

Andy

Brad

NOV 18 1988

Clare

To:

Date: November 14, 1988
DEPARTMENT OF ENERGY
AND MINES

From:

Bob

Action / Route Slip

Manitoba



NORTH VIRDEN SCALLION UNIT NO. 1
PROPOSED REDUCED SPACING PILOT

The following are initial comments regarding Chevron's reduced spacing proposals for NVS #1.

1. Application should include a detailed schedule of proposed activities.
2. Application should include a detailed Unit production prediction for at least three cases:
 - a) continuation of current operations (base)
 - b) implementation of the "pilot" project
 - c) implementation of Unit wide reduced spacing.
3. Technical support and justification for all three scenario's should be included.
4. Current proposal would be viewed solely as a "pilot" and would not necessarily represent a precedent. We are not prepared to consider Unit wide reduced spacing at this time.
5. The following royalty taxation considerations would apply:

a) if reduced spacing were approved, ~~production from new infill wells would be new and holiday oil would be granted for new wells.~~ *classified as "new oil wells" and production from them would qualify for "holiday" and "new oil" rates.*

b) if approved as additions to ~~pressure maintenance~~ *a new enhanced recovery scheme*, incremental production over a ~~predetermined~~ *forecast* base line would be new oil. No holiday volume for newly drilled wells. *certain new oil* Additional PM incentives *would* may apply. *If approved as a new EOR scheme.*

c) if wells are drilled as infill, (i.e. not reduced spacing) they would be subject to old oil royalties/taxes unless specifically given ~~new oil~~ *some type of* status under an OIC.

6. The application should include economic analysis of revenues to the Province under the proposed "pilot" project. *Also* Optionally, a similar analysis assuming Unit wide reduced spacing may be provided. The results of these economic analyses will be a factor in the application review and disposition process.

Would be considered either red-sp or social PM - not left.

7. If administrative complexity warrants, consideration could be given to mutually acceptable equivalent incentives.
8. The application should include a detailed review of all planning and actions proposed to minimize the impact of additional wells on the surface land use and the environment.
9. A detailed proposal to monitor the performance of the pilot project should be included.

The authors. . .



Sanford

Kirchen

Emerson C. Sanford is section head of the fundamental studies section in Syncrude Canada Ltd.'s research department. He has experience with nonaqueous solvent-catalysts systems. Sanford was previously with Raylo Chemicals Co. and spent a year with Polysar Ltd.'s research department. He is a graduate of Mount Allison University, and he received a PhD from McMaster University.

Sanford spent 2 years as an NRC post-doctoral fellow at California Institute of Technology. Sanford is a member of the Chemical Institute of Canada where he currently serves on the executive board of the catalyst division.

Roger P. Kirchen is a senior research scientist in the fundamental studies section of Syncrude Canada Ltd.'s research department. Prior to joining Syncrude Canada, he spent 2 years with the Alberta Research Council, where he was responsible for projects on catalyst development and coal liquids upgrading. Kirchen was a post-doctoral fellow at the University of Calgary, carrying out research on stable carbocations, after which he spent several years in research on catalysis and heavy-oil upgrading.

Kirchen is a graduate of the Swiss Federal Institute of Technology (ETH) in Zurich, where he also received a PhD in chemistry. He is a member of the Chemical Institute of Canada, the American Chemical Society, and Sigma Xi.

to implement the first solution of altering the catalyst-loading strategy similar to that shown in Fig. 2. The loading was accomplished during a complete turnaround. At the time of this writing, the guard reactor has run for 12 months with no appreciable increase in pressure drop.

Acknowledgments

The authors acknowledge the aid of E. Mastracci in preparing the run histories and obtaining samples, of A. Al-Saigh, V. Nowlan, and J. Tyerman with the fouling studies, and S. Yui for the pressure drop calculations. The authors thank Syncrude Canada Ltd. for permission to publish this article.

References

1. Oulman, C.S., and Baumann, E.R., What the Filter Man Needs to Know About Filtration, W. Shoemaker, Editor, AIChE Symposium Series, Vol. 73, No. 171, 1977, p. 76.
2. Ergun, S., "Fluid Flow Through Packed Columns," Chemical Engineering Progress, Vol. 48, 1952, p. 89.
3. Movse, B.M., "Raschig ring HDS catalysts reduce pressure drop," OGI, Dec. 31, 1984.

Net-oil computer improves water-cut determination

K.T. Liu

David E. Revus

Chevron Oil Field Research Co.
La Habra, Calif.

Both laboratory and field studies have demonstrated that a net-oil computer on a Coriolis mass-flow meter can provide accurate net-oil and water measurements for many well-test situations.

These meters are relatively new, but sufficient operating experience has been gained to indicate that they are sufficiently reliable in the oil field environment. The combination of the new type of net-oil computer and the Coriolis meter offers the following features: Accuracy in measuring production over a range of 0-100% water cut, a single flow line instrument for determining both total flow rate and water cut, feasibility of using the system with either two phase or three-phase separators, high reliability that reduces maintenance and operating costs, high turn-down ratio for mass flow determination, and net-oil correction to a desired temperature.

Background

Measurements of each well's net oil and water production are important for operations monitoring, allocation

measurement, and reservoir management. However, the inaccuracy of these data is a prevalent problem in the oil industry. An overall uncertainty of 20-50% is common, and the uncertainty can range as high as 100-200% in extreme cases. Some of this error is because of the nonrepresentative nature of periodic well tests, but much of the error can be attributed to measurement inaccuracies.

Test facilities. Typical production-test facilities consist of a test separator and a net-oil instrumentation system as shown in Fig. 1. A group of flow lines from individual wells is tied into a manifold at a gathering station. Production from only one well flows through the test separator while the flow from the other wells is diverted around the test facility. The duration of a typical well test is 24 hr.

Fig. 1 illustrates a three-phase test separator where the production stream is separated into gas, free water, and oil/water emulsion. Flow is metered for each stream, and the water content of the emulsion is measured with an on-line water cut analyzer.

A two-phase test separator is similar in configuration but without the free-water line.

Signals from the measurement de-

Well test facility

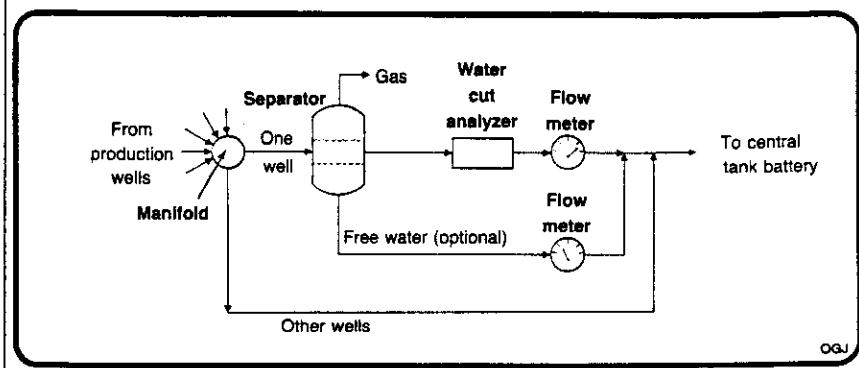
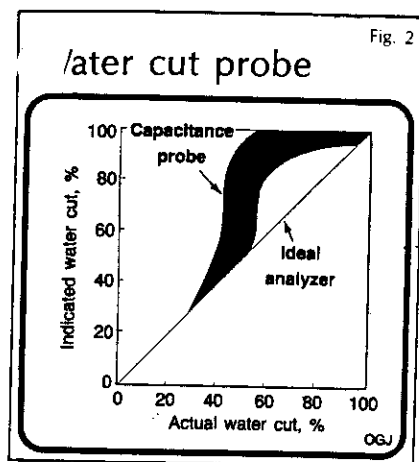


Fig. 1



ices are processed by a net-oil computer (NOC) that calculates and displays the net oil and water production.

Water cut. Measuring water cut is a major source of error in testing producing wells. Conventional water cut analyzers produce erroneous measurements in high water cut streams as observed in both laboratory and field performance evaluations. Those analyzers based on the principle of capacitance measurement at kilohertz or megahertz frequencies do provide reasonable accuracy in the oil-continuous emulsion range at low water cuts. However, since these analyzers are dependent on the electrochemical properties of the emulsion, large discrepancies occur at high water cuts where the oil/water emulsion has a water-continuous phase. This error leads to overestimating water cut as illustrated in Fig. 2.

Another method for measuring water cut is by determining the oil/water emulsion density from differential-head pressure measurements. Water cut is then calculated knowing individual oil and water densities. This method should theoretically be applicable for 0-100% water cut range. However, the performance has been unsatisfactory because of inaccuracies of differential-pressure transducers, and difficulty in properly correcting frictional-pressure loss between the two measurement points.

As part of a comprehensive program for net-oil measurement research, Chevron worked with a Coriolis-meter manufacturer to develop a new net-oil computer system that provides accurate data from 0 to 100% water cut. This NOC system uses a Coriolis meter to simultaneously measure the total flow rate and water cut of an oil/water emulsion stream. This contrasts to the conventional NOC systems that use a separate on-line water cut analyzer and flow meter. The Coriolis meter serves as a single instrument for both functions.

Fig. 2

Net-oil computer field trial

Table 1

Field location	Oil gravity, °API at 60° F.	Water density, g/cc at 60° F.	Fluid temperature, °F.
West Texas	37-39	1.025-1.033	Ambient
Utah	27-31	1.000-1.006	150-170
California	13-15	0.999-1.000	150-210

The net-oil computer system based on this technology had been licensed by Chevron to several Coriolis-meter manufacturers.

The concept of using a Coriolis meter for net-oil computation arose during the successful application of 89 Coriolis meters for mass flow measurement at Chevron's Little Knife field in North Dakota.^{1,2} This project demonstrated the accuracy of the flow meter for production allocation, and its operating reliability with only 0.08 repairs/meter/year over 3 years of service.

Net-oil computer

Total flow rate and water cut of an oil/water production stream are determined by the NOC from signals obtained by the Coriolis meter that consists of flow tubes that vibrate because of an electromagnetic drive-coil mechanism. Most tubes vibrate at their natural frequency (80-100 Hz), while others are designed to operate at a harmonic frequency.

Fluid flowing through the vibrating meter tubes induces a twisting motion, driven by the Coriolis effect, that is monitored by two magnetic position detectors. The magnitude of the twisting motion is proportional to the mass-flow rate of the fluid.

The density of the flowing fluid mixture is obtained by measuring the vibrating frequency of the fluid-filled tubes. Fig. 3 illustrates two different designs of the Coriolis meter offered by two manufacturers.

The net-oil computer calculates total volume of the oil/water mixture from the total mass-flow rate and mixture-density measured from the Coriolis meter. Instantaneous water cut (X_w) is determined from the measured mixture density (D_m) using the following equation:

$$X_w = \frac{D_m - D_o}{D_w - D_o} \quad (1)$$

where: D_w and D_o are the densities of produced water and crude oil for the individual well being tested.

The oil and water density parameters for each well must be entered into the NOC. Net oil and water volumes are computed from total mass flow, and mixture density. The operating temperature for the produc-

tion stream is continuously measured by resistance-thermometer probe mounted on the meter tubes. Temperature measurement is used for:

- Temperature compensation of the spring constant to accurately determine mixture density (D_m)
- Temperature correction of input densities (D_w and D_o), originally entered at some temperature base.
- Input of metered temperature for Equation 1 calculations
- Correction of computed net oil to the desired temperature base.

Accuracy

The Coriolis meter has a very high turn-down ratio and is constructed in various sizes to accommodate a wide range of production rates. The mass-flow accuracy of a typical meter is 0.2% of indicated reading at a 20:1 turn-down ratio, and 0.5% indicated reading at a 50:1 turn-down ratio. This accuracy is quite sufficient for NOC application.

Water-cut measurement accuracy over a wide crude-gravity range is made possible by the high accuracy of the emulsion-density measurement. While the emulsion-density accuracy specified by a manufacturer is 0.0005 g/cc, or 5 parts in 10,000, Chevron's comprehensive performance evaluation showed that a density accuracy of 0.0002 g/cc can be achieved. The latter accuracy is comparable to high-precision laboratory, density-measurement devices.

The uncertainties of water-cut measurement for a wide range of API gravity crudes are illustrated in Fig. 4. These uncertainties were derived from the emulsion-density accuracy of 0.0002 g/cc and a produced-water density close to fresh water. Uncertainty is defined, here, as the variation in measured values divided by the actual values times 100%, and excludes errors in determining oil and water densities.

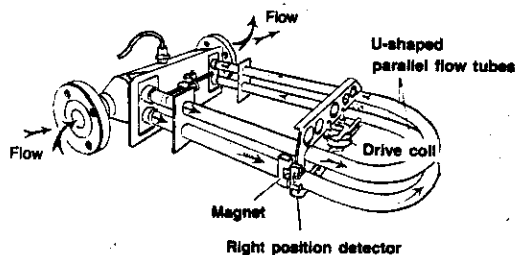
For example, a 28° API crude would have a water cut uncertainty of 0.2%.

For a 14° API gravity crude, the water cut uncertainty increases to 0.5%.

Higher water salinity reduces water cut uncertainty by increasing the density differential between the crude oil and produced water. Obviously this NOC is not recommended with heavy crude oil near 10° API gravity if the

cross section of mass-flow meters

Fig. 3



Courtesy of Micro Motion Inc.

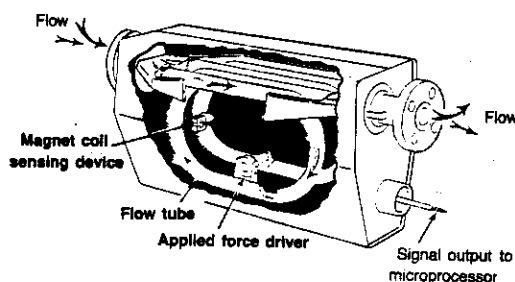


Fig. 4

Uncertainty of measurements

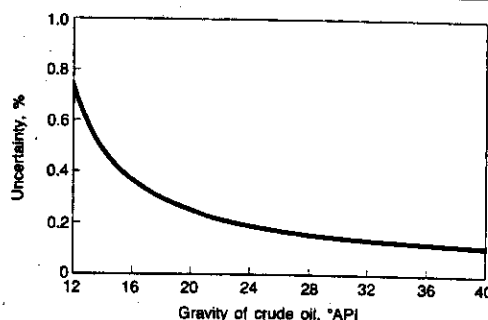


Fig. 5

Uncertainty of net-oil volume

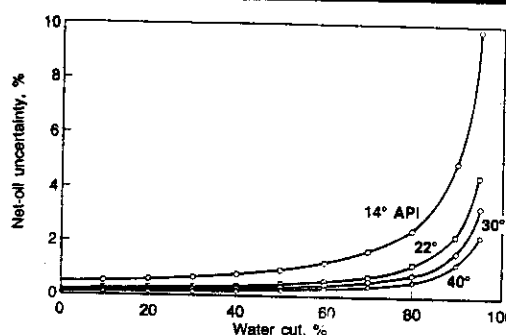
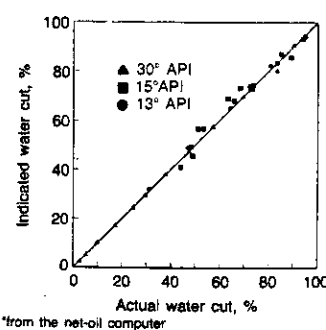


Fig. 6

Instant water cut*



density differential is extremely small and the measurement uncertainty is very high.

Net-oil uncertainty is inversely proportional to water cut level as illustrated in Fig. 5 for four oil gravities (14, 22, 30, 40° API). This again uses an emulsion-density accuracy of 0.0002 g/cc.

As an example, the net-oil uncertainty from the system at 80% average water cut is 1.1% for a 22° API gravity crude.

In contrast, the net-oil uncertainty at 20% average water cut is 0.3% for the same crude.

Field tests

Field trials have been conducted in several Chevron operations to verify the accuracy of the NOC system under field operating conditions. The test sites included light-oil fields in West Texas and Utah, and a heavy-oil field in California. A summary of oil densities, water densities, and fluid temperatures for these field tests is listed in Table 1.

The Coriolis meter was installed on the oil/water emulsion line downstream of an existing test separator and in series with existing conventional water cut analyzers and flow meters.

Piping modifications were made

downstream of the measurement equipment to divert the emulsion stream to a test tank for comparison purposes.

Instantaneous readings from the Coriolis-meter and NOC compared favorably with actual water cut from 0 to 100% (Fig. 6). The actual water cut was determined by analyzing a grab sample from the flow line using standard centrifuge and distillation procedures.

Minor deviation between indicated and actual values were within the uncertainty level of the grab sampling and analysis techniques.

Low water cuts were obtained by operating the test separator in a three-phase mode, and the high water-cut conditions were achieved by blocking flow through the free-water line, thus operating in a two-phase mode.

Gross fluid volume, net-oil volume, and average water cut determined by the NOC system compared very closely with results from gauging the test tank.

Two representative test cases for a 29° API light oil and a 13° API heavy oil are shown in Fig. 7.

The instantaneous water cut varied from 50 to 100% during the well-test period. For a series of test cases, the test-tank measurements generally agreed to within ± 1 -2% for water cut

and ± 2 -3% for net-oil volume.

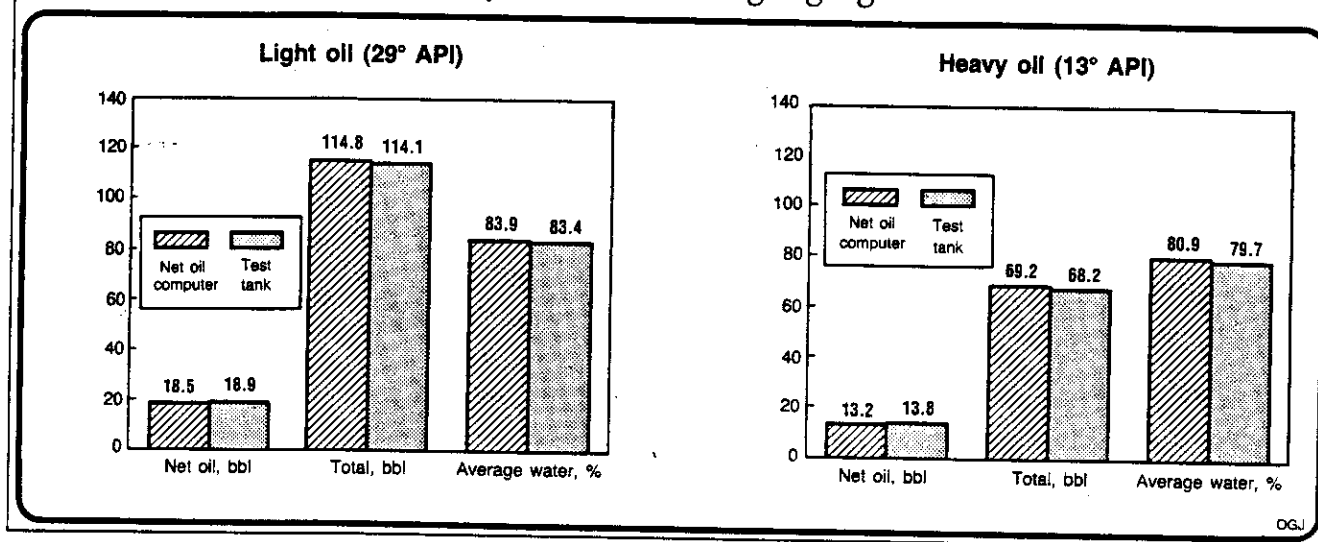
Again, these percentages denote the variation of measured values divided by the actual values times 100%. The results were within the uncertainty level of gauging the test tank.

Operating guidelines

For the most accurate measurement, the oil and water densities for an individual well must be measured and entered into the NOC as input parameters before testing a well. Depending on the particular operating situation (e.g., number of wells, manpower, and time), determining oil and water densities for each well individually may not be feasible.

Comparison of net-oil computer and tank-gauging

Fig. 7



Alternative approaches may be considered if increased measurement uncertainty can be tolerated. One alternative approach is to use the water density of individual wells, and an average oil density for a group of wells. Water density is quicker and easier to measure than oil density. For many light oils, only a moderate net-oil error would result with this approach. If a high measurement uncertainty is acceptable or if the density variations among producing wells are minor, using both average oil and water densities for a group of wells may be considered as another approach.

Changes in oil and water densities for a well or group of wells over time are field-specific. Oil and water densities must be determined at initial installation of the NOC system. A re-determination of densities is necessary if any operational factors cause changes in fluid densities. Density changes can be caused by: Recompleting the well into new zones; changing the production from multiple zones; initiating a new or realigning an existing recovery process such as steamflood, miscible flood, waterflood; and breakthrough of injected fluids.

Chevron has monitored fluid densities in a West Texas light-oil field under waterflood, and a California heavy-oil field under steamflood to obtain some idea of what density variations can occur. As an example, minor deviations in oil densities of approximately ± 0.0005 g/cc or $\pm 0.08^\circ$ API for a light-oil well (38° API) and $\pm 0.07^\circ$ API for a heavy-oil well (13° API) were found over a period of 15 and 12 months, respectively.

For applying Equation 1, the Coriolis meter and NOC system assume that

only two phases, oil and water, are present.

Entrained gas or the breakout of free gas due to pressure drop across the meter and/or the metering-pipe run would reduce the measured emulsion density and result in underestimating water cut.

Separator design and operation should be configured to eliminate entrained gas.

To avoid gas breakout, the meter needs to be installed as close as possible to the emulsion outlet of the test separator, and sized to minimize pressure losses.

The criteria for sizing the meter are that the size will be sufficient for measuring the anticipated maximum instantaneous flow rate (total fluids), and will keep the pressure drop across the meter below 5 psi.

The latter criterion may result in selecting a larger meter than is normally required.

Mass-flow measurement accuracy is retained because of the high turn-down ratio characteristic of these meters.

Operating experience indicates that the Coriolis meter should be installed in a horizontal-pipe run with the meter tubes oriented down and below the level of the pipe run. A correct installation is illustrated in Fig. 8. Mounting of the meters in a vertical or "flag" position can cause erroneous flow indications because the oil and water phases within the vibrating tubes can segregate during the standing period of a separator dump cycle, and the tubes can become unbalanced.

As illustrated in Fig. 5, the net-oil measurement uncertainty of any NOC system is inversely proportional to the instantaneous water cut and sharply

increases above a water cut level of 90%.

To attain the greatest accuracy, a three-phase separator is recommended for wells producing high-average water cut (e.g., 90% or higher). Free water separation occurs in the three-phase separator, thereby reducing the instantaneous water cut level in the emulsion stream monitored by the NOC system.

If a two-phase separator must be used for testing wells with high-average water cut, the recommended guideline is to incorporate a "snap-acting" dump-control mechanism rather than a modulating-flow or continuous-throttling control mechanism for the separator.

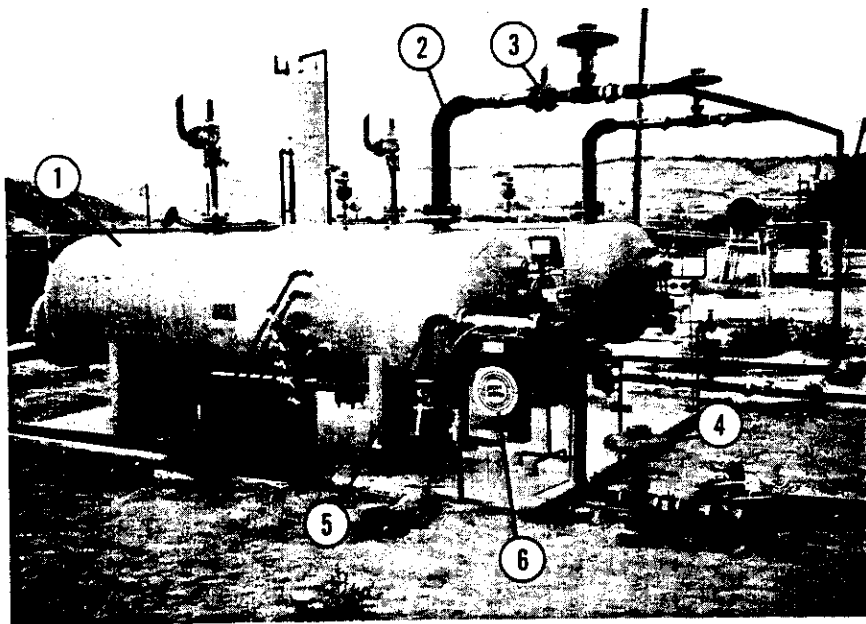
The net-oil uncertainty is improved with a snap-acting control because a wider range of instantaneous water cut can be discharged through the metering line during the dump cycle.

In contrast, the net-oil uncertainty would be worse for the modulating-flow control because this mechanism causes a narrow band of high-instantaneous water cut to discharge through the NOC.

Two concerns associated with sand production through the Coriolis meter are the NOC accuracy and erosion effects.

High sand loading in the flow stream also acts as an unexpected third phase and causes errors in the calculated water cut. Depending on the magnitude of the sand loading, most sand drops out in the test separator, thereby reducing sand passing through the metering system that is installed downstream.

Minor effects on accuracy were experienced in the NOC system operating at a heavy-oil steamflood that had sand production.



Well test facilities in Bakersfield, Calif., illustrate compact size of Coriolis mass-flow meter. Components are: (1) two-phase test separator, (2) gas metering line, (3) gas turbine meter, (4) dump valve, (5) oil/water-emulsion metering line, and (6) Coriolis mass-flow meter (Fig. 8).

Limiting sand erosion in a Coriolis meter follows the same approach as other piping components in the petroleum industry.

The approach uses field experience and the critical erosion velocity computed from Equation 2.8 in the American Petroleum Institute (API) RP-14E booklet.

The general guideline for reducing erosion is to limit flow velocities through the meter below the critical erosion velocity.

As an example, sand production with a 22° API gravity, 80% water cut stream at 150° F. results in a critical velocity of 10 fps according to API RP-14E. For a production flow rate of 750 bbl of fluid/day, the fluid velocity through a 1.5-in. meter at 4 fps is below the critical erosion velocity, and the pressure drop across the meter is below 1 psi.

For high-temperature applications, such as heavy-oil steamflood operations, temperature transient effects of the metered flow stream occur during the start-up of a separator dump cycle and after a lengthy standing period. There is an inherent response lag for the resistance-thermometer probe within the meter.

Great changes in temperature over a short time period could cause erroneous density and water cut measurements because temperature is part of the computed values.

The recommended solution, based on operating experience, is to reduce the temperature transient effect by thermally insulating and installing the Coriolis meter as close as possible to the separator.

Because the Coriolis meter consists

of vibrating tubes, a common concern in offshore applications is whether structural platform vibrations cause interference with the NOC performance.

Structural vibrations do interfere with mass flow and density measurements if the external vibration is near the vibrating tube's natural frequency or a harmonic, and has significant amplitude.

From a practical standpoint, the meter can be installed in such a way as to dampen or eliminate the effects of structural vibration. No vibration problems have been experienced with Coriolis meters in Chevron's offshore applications.

Construction

Coriolis meters are typically made of 316L stainless steel with some manufacturers offering more exotic metallurgy.

Vibrating tubes in these meters are designed to operate at stress levels below the endurance limit and thus have an "infinite" fatigue life. However, corrosion fatigue occurs when 316L stainless steel undergoes cyclic stress in the presence of chlorides.

Not enough is known about this phenomena to predict its effect on fatigue life; however, no 316L stainless steel tubes in production well test service are known to have experienced failure from corrosion fatigue.

Chevron's experience with Coriolis meters helps illustrate the bounds of the problem. No tube failures have occurred during 6 years of operating 89 such meters at the Little Knife field, North Dakota.

In that application, the tubes are

The authors...



Liu



Revus

K.T. Liu is a senior research engineer and leader of the fluid measurement group at Chevron Oil Field Research Co. He is currently involved in R&D in crude oil custody transfer and production allocation measurement technologies. He is a member of several API petroleum measurement working groups.

Liu holds a BS from Taiwan Cheng Kung University and an MS and PhD from the University of Wisconsin, all in chemical engineering.

David E. Revus is a research engineer in the fluid measurement group at Chevron Oil Field Research Co. He has held various research assignments in reservoir engineering, oil recovery, and operations technology; and also served as Aramco coordinator.

Before joining Chevron, Revus worked in seismic processing geophysics for Professional Geophysics Inc. Revus obtained a BS in chemistry from Oklahoma City University, an MS in petroleum engineering from the University of Oklahoma, and is currently a graduate student in systems management at the University of Southern California.

contacting the oil because the emulsion contains less than 3% brine. In contrast, in a CO₂ water-alternating-gas (WAG) application, many of the 316L stainless steel meters supplied by one manufacturer failed over a period of 8 months because of corrosion fatigue caused by injection water with chloride levels of approximately 100,000 ppm.

More exotic corrosion-resistant materials should be carefully considered. If 316L stainless steel had proven suitable in other equipment used at the site, the meter body and flanges could be made of 316L stainless steel. However, the requirements for preventing corrosion fatigue of the thin-wall vibrating tubes are more stringent. Should exotic materials prove necessary, possibly only the vibrating tube material needs to be upgraded.

References

1. Aslesen, K.S., Bocek, R., Canfield, D.R., and Liu, K.T., "Method and Apparatus for Testing the Outflow from Hydrocarbon Wells on Site," U.S. Patent 4,689,989, Sept. 1, 1987.
2. Liu, K.T., Canfield, D.R., and Conley, J.T., "Application of a Mass Flowmeter for Allocation Measurement of Crude Oil Production," SPE Paper 15394, SPE 61st Annual Technical Conference and Exhibition, New Orleans, Oct. 5-6, 1986.

July 5, 1980

July 5, 1980

THE MANITOBA GAZETTE

Vol. 109, No. 27

October 18

Manitoba Regulation 104/80

December 20

Being

December 1

THE OIL AND NATURAL GAS CONSERVATION BOARD

for game hunting

ORDER NO. PM 37

regulation.

An Order Pertaining to Pressure Maintenance by Water Flooding

Made and Passed Pursuant to "The Mines Act", Cap. M160 of the
Continuing Consolidation of the Statutes of Manitoba, and
Amendments Thereto, by The Oil and Natural Gas
Conservation Board of Manitoba

one black bear

(Filed June 20, 1980)

1. Sections 2, 8 and 9 of Manitoba Revised Regulation M160—R8P are repealed.

2. Subsection 1(1) of Schedule A of the regulation is repealed and the following subsection is substituted therefor:

November 1

may hunt or kill
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1(1) Water shall be injected to the Lodgepole Formation of the Mississippian Age in
the wells

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one black bear
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existing moose
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80/81 bear

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Chevron Scallion WIW 2-10-11-26
Chevron Scallion WIW 10-10-11-26
Chevron Scallion WIW 12-10-11-26
Chevron Scallion Prov. WIW 2-11-11-26
Chevron Scallion Prov. WIW 4-11-11-26
Chevron Scallion Prov. WIW 6-11-11-26
Chevron Scallion Prov. WIW 12-11-11-26
Chevron Scallion WIW 6-13-11-26
Chevron Scallion WIW 10-13-11-26
Chevron Scallion WIW 12-13-11-26
Chevron Scallion WIW 14-13-11-26
Dome Cdn. Sup. Scallion WIW 8-14-11-26
Cdn. Res. et al Scallion WIW 10-14-11-26
Sun G. Braybrook Scallion WIW 12-14-11-26
Chevron Scallion WIW 2-15-11-26
Chevron Scallion WIW 10-15-11-26
Cdn.-Sup. Veldhouse Scallion WIW 7-16-11-26
Shell Moir South Scallion WIW 10-21-11-26
Chevron Scallion WIW 2A-22-11-26
Chevron Scallion WIW 4-22-11-26
Sun T.L. Tapp Scallion WIW 10-22-11-26
Chevron Scallion WIW 12-22-11-26
Chevron Scallion WIW 12-23-11-26
Chevron Scallion WIW 14-23-11-26
Chevron Scallion WIW 16-23-11-26
Dome Cdn. Sup. Scallion WIW 6-24-11-26
Chevron Scallion Prov. WIW 12-24-11-26
Sun P.J. Tapp Scallion WIW 6-26-11-26
Cdn. Res. et al Scallion WIW 8-26-11-26
Chevron Scallion WIW 6-27-11-26
Sun W.C. Tapp Scallion WIW 8-27-11-26
Chevron Scallion WIW 14-27-11-26
Gulf Union Tapp Scallion WIW 6-28-11-26

Repealed
by PM 51

Cdn.-Sup. Whiteford Scallion WIW 6-28-11-26
 Gulf Union Tapp Scallion WIW 14-28-11-26
 Cdn.-Sup. Whiteford Scallion WIW 16-28-11-26
 Shell Moir North Scallion WIW 6-33-11-26
 Chevron Scallion WIW 8-33-11-26
 Shell Moir North Scallion WIW 14-33-11-26
 Vallat et al Scallion WIW 16-33-11-26
 Cdn. Res. et al Scallion WIW 6-34-11-26
 Dome Scallion WIW 4-3-12-26
 Dome Cdn. Sup. Scallion WIW 2-4-12-26
 Chevron North Scallion WIW 4-4-12-26
 Chevron North Scallion WIW 6-4-12-26
 Vallat Scallion WIW 10-4-12-26
 Chevron North Scallion WIW 12A-4-12-26

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5(1)

5(2)

5(3)

and, from time to time, in such other wells as the board may direct, or, upon application of the unit operator, may approve.

3. Rule 5 of the Pressure Maintenance Rules as set out in Schedule A of the regulation is repealed and the following rule is substituted therefor:

- 5(1) At least once every three years commencing in 1981, unless otherwise directed by the board, the unit operator shall carry out a subsurface pressure survey program to determine the reservoir pressure in the producing wells in the unit.
- 5(2) The unit operator shall submit the details of the pressure survey program to the Director of the Petroleum Branch including the wells to be surveyed, the measurement techniques to be used and the intended shut-in periods for each well, and shall first obtain approval of the program from the Director before it is carried out.
- 5(3) After receiving approval of the pressure survey program and after the program is carried out the unit operator shall submit a report thereon to the Director which shall include
- (a) the pressure data obtained from the program;
 - (b) an isobaric map of the reservoir or unit based on the data obtained; and
 - (c) an analysis of the survey results and pressure distribution in the reservoir.

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4. Schedule B of the regulation is repealed.
5. Subsection 1(1) of Schedule C of the regulation is repealed and the following subsection is substituted therefor:

- 1(1) Water shall be injected to the Virden and Scallion Members of the Lodgepole Formation of the Mississippian Age in the wells

Chevron Virden WIW 9-20-10-25
 Sun M. Welch Virden WIW 13-20-10-25
 Chevron Virden WIW 15-20-10-25
 Chevron Virden WIW 11-21-10-25
 Chevron Virden WIW 13-21-10-25
 Chevron East Virden Prov. WIW 5-28-10-25
 Chevron East Virden Prov. WIW 5-29-10-25
 Chevron East Virden Prov. WIW 7A-29-10-25
 Placer Virden WIW 5-30-10-25
 Placer Virden WIW 7-30-10-25
 Teck Hepburn Virden WIW 15-23-10-26
 Chevron Virden WIW 13-24-10-26
 Chevron Virden WIW 15-24-10-26
 Chevron Virden WIW 5-25-10-26
 Chevron Virden CPR WIW 7-25-10-26
 Chevron Virden WIW 11-25-10-26
 Chevron Virden WIW 13-25-10-26
 Chevron Virden CPR WIW 15-25-10-26
 Chevron Virden WIW 3-26-10-26

8. Rule
repea

5(1)

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and, from time to time, in such other wells as the board may direct, or, upon application of the unit operator, may approve.

6. Rule 5 of the Pressure Maintenance Rules as set out in Schedule C of the regulation is repealed and the following rule is substituted therefor:

- VR #1
- 5(1) At least once every three years commencing in 1981, unless otherwise directed by the board, the unit operator shall carry out a subsurface pressure survey program to determine the reservoir pressure in the producing wells in the unit.
- 5(2) The unit operator shall submit the details of the pressure survey program to the Director of the Petroleum Branch including the wells to be surveyed, the measurement techniques to be used and the intended shut-in periods for each well, and shall first obtain approval of the program from the Director before it is carried out.
- 5(3) After receiving approval of the pressure survey program and after the program is carried out the unit operator shall submit a report thereon to the Director which shall include
- (a) the pressure data obtained from the program;
 - (b) an isobaric map of the reservoir or unit based on the data obtained; and
 - (c) an analysis of the survey results and pressure distribution in the reservoir.

7. Subsection 1(1) of Schedule D of the regulation is repealed and the following subsection is substituted therefor:

- 1(1) Water shall be injected to the Virden and Scallion Member of the Lodgepole Formation of the Mississippian Age in the wells

Continental Virden WIW 12-31-10-25
Chevron Virden Prov. WIW 10-36-10-26
Chevron Virden WIW 4-5-11-25
Chevron Virden WIW 10-5-11-25
Chevron Virden Prov. WIW 12-5-11-25
Chevron Virden Prov. WIW 14-5-11-25
Chevron Virden Prov. WIW 2-6-11-25
Chevron Virden Prov. WIW 8-6-11-25
Chevron Virden Prov. WIW 10-6-11-25
Chevron Virden Prov. WIW 12-6-11-25
Chevron Virden Prov. WIW 14-6-11-25
Chevron Virden Prov. WIW 16-6-11-25
Murphy Virden WIW 2-7-11-25
Murphy Virden WIW 4-7-11-25
Chevron Virden WIW 4-8-11-25

and, from time to time, in such other wells as the board may direct, or, upon application of the unit operator, may approve.

8. Rule 5 of the Pressure Maintenance Rules as set out in Schedule D of the regulation is repealed and the following rule is substituted therefor:

- VR #2
- 5(1) At least once every three years commencing in 1981, unless otherwise directed by the board, the unit operator shall carry out a subsurface pressure survey program to determine the reservoir pressure in the producing wells in the unit.
- 5(2) The unit operator shall submit the details of the pressure survey program to the Director of the Petroleum Branch including the wells to be surveyed, the measurement techniques to be used and the intended shut-in periods for each well, and shall first obtain approval of the program from the Director before it is carried out.

- 5(3) After receiving approval of the pressure survey program and after the program is carried out the unit operator shall submit a report thereon to the Director which shall include
- the pressure data obtained from the program;
 - an isobaric map of the reservoir or unit based on the data obtained; and
 - an analysis of the survey results and pressure distribution in the reservoir.
9. Subsection 1(1) of Schedule E of the regulation is repealed and the following subsection is substituted therefor:
- 1(1) Water shall be injected to the Virden and Scallion Members of the Lodgepole Formation of the Mississippian Age in the wells
- Chevron South Virden CPR WIW 10-7-10-25
 Chevron South Virden CPR WIW 12-7-10-25
 Chevron South Virden CPR WIW 14-7-10-25
 Chevron East Virden Prov. WIW 2A-18-10-25
 Sun I. Welch Virden WIW 4-18-10-25
 Chevron South Virden CPR WIW 6-1-10-26
 Chevron South Virden CPR WIW 14-1-10-26
 Chevron South Virden Prov. WIW 8-2-10-26
 Chevron South Virden WIW 14-2-10-26
 Mineraloid Virden WIW 16-2-10-26
 Chevron South Virden WIW 16-3-10-26
 Gulf Duncan Virden WIW 6-10-10-26
 Chevron South Virden Prov. WIW 8-10-10-26
 Chevron South Virden Prov. WIW 6-11-10-26
 Chevron South Virden Prov. WIW 8-11-10-26
 Chevron South Virden Prov. WIW 12-11-10-26
 Chevron South Virden Prov. WIW 14-11-10-26
 Chevron South Virden Prov. WIW 16-11-10-26
 Chevron South Virden WIW 6-12-10-26
 Chevron South Virden WIW 14-12-10-26
 Placer Virden WIW 6-13-10-26
 Gulf Union Welch Virden WIW 9-13-10-26
 Mineraloid Virden WIW 14-13-10-26
 Rundle Williams Virden WIW 4-14-10-26
 Rundle Williams Virden WIW 11-14-10-26
 Murphy Virden WIW 1-23-10-26
 Esso Virden WIW 3-23-10-26
- and, from time to time, in such other wells as the board may direct, or, upon application of the unit operator, may approve.
10. Rule 5 of the Pressure Maintenance Rules as set out in Schedule E of the regulation is repealed and the following rule is substituted therefor:
- 5(1) At least once every three years commencing in 1981, unless otherwise directed by the board, the unit operator shall carry out a subsurface pressure survey program to determine the reservoir pressure in the producing wells in the unit.
- 5(2) The unit operator shall submit the details of the pressure survey program to the Director of the Petroleum Branch including the wells to be surveyed, the measurement techniques to be used and the intended shut-in periods for each well, and shall first obtain approval of the program from the Director before it is carried out.

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APPROV

Donald
Minister

July 5, 1980

July 5, 1980

THE MANITOBA GAZETTE

Vol. 109, No. 27

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reservoir.

subsection

geopole

5(3) After receiving approval of the pressure survey program and after the program is carried out the unit operator shall submit a report thereon to the Director which shall include

- (a) the pressure data obtained from the program;
- (b) an isobaric map of the reservoir or unit based on the data obtained; and
- (c) an analysis of the survey results and pressure distribution to the reservoir.

11. Subsection 1(1) of Schedule G of the regulation is repealed and the following subsection is substituted therefor:

1(1) Water shall be injected to the Whitewater Members of the Lodgepole Formation of the Mississippian Age in the wells

Chevron Whitewater WIW 13-16-3-21

Chevron Whitewater WIW 9-17-3-21

and, from time to time, in such other wells as the board may direct, or, upon application of the unit operator, may approve.

12. Schedules A, C, D, E, F and G of the regulation are further amended by striking out the word "Mines" in Rule 7 thereof and substituting therefor the word "Petroleum".

13. Schedule A of the regulation is further amended by striking out the word "Mines" in Rule 8(1) thereof and substituting therefor the word "Petroleum".

14. Schedules H and I of the regulation are repealed.

15. Order Nos. PM 22, 25, 26 and 27 of The Oil and Natural Gas Conservation Board and filed as Manitoba Regulations 206/73, 151/74, 154/74 and 155/74 respectively, are repealed.

Oil and Natural Gas Order No. PM 37
made and passed this 20th day of
June A.D., 1980 at the City
of Winnipeg, in the Province of
Manitoba, by The Oil and Natural
Gas Conservation Board.

"Paul E. Jarvis"

Paul E. Jarvis,
Chairman,
The Oil and Natural Gas
Conservation Board.

"Ian Haugh"

Dr. Ian Haugh,
Deputy Chairman,
The Oil and Natural Gas
Conservation Board.

upon

"James F. Redgwell"

J. F. Redgwell,
Member,
The Oil and Natural Gas
Conservation Board.

ulation is

directed by
program

APPROVED:

"D. W. Craik"

Donald W. Craik,
Minister of Energy and Mines.

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carried out.

New Oil Definition - justification for deletion of entire clause - Provide Cher. with our proposed regulation wording point out also req'd in O+GPT Reg.

What involvement does Stan Puchniak have
We now look after O+GPT.

- Plans to obtain reservoir info in infill wells
- Re analysis of older cores?

call from Jim Roy
line shoe
checked with Charlie Stewart
D show
call from Ingelberg
phoned Charlie Stewart

- Attachment No. 2 wells would be called Chevron Virden -

- Present + Planned completion intervals for existing wells

Check test results on wells 11-25
11-24
11-26
11-27

4-1 Pool recovery is 27% (pool or unit?)
R_{icut} = 32% - bases - decline

Fig No 1 what is scale

Significance of land map

24-3 - Reduced well spacing will increase both vertical & areal sweep eff.
 Expand on the effect of impact on vertical sweep efficiency

Copy of Reference #1

Unit OOIP = 33 000 000

Cum Prod to date. 8.98×10^6 = 27.2%

~~Decline~~

$q_i = 370$ \pm 23.0

$A_i = 6.5$ $q_e = 79.1$

$N_p = 1,590,000$

Basis of q_{abd}

$\frac{1200}{450} = 2.66$
 rate before WF

Peak rate 165% of orig prod rate $\frac{1200-950}{950} = 26\%$

16C-22 pattern - wells included 15-22

when drilled $\frac{16-22}{1-27}$
 2-27

- no major change in decline rate of original wells when 16C-22 drilled

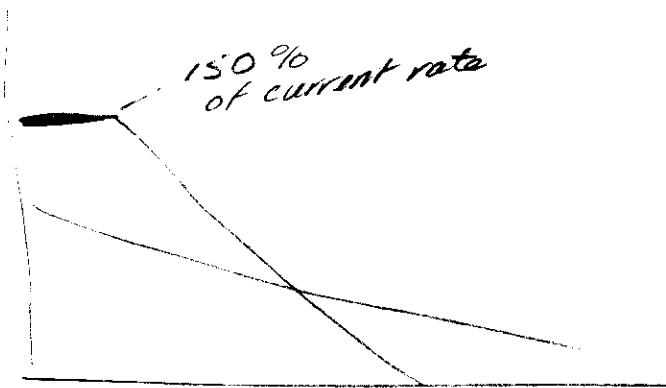
- some of production response for pattern not attributable to 16C-22 - may be measurement recovery, pressure

- 8.0% decline before 16C-22 reasonable

because - Unit total is 65%

- Area of limited pressure support - decline should be

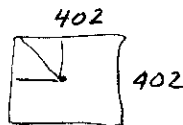
- When was Daly Unit # established
- 55% production from inside pilot
45% from outside) how determined significance?



7.6% incremental includes WF benefits within project

- Incremental reserves outside project area of 11900 - how determined

- In ~~economy~~ royalty / tax calculations is this incorporated in base / old oil ~~project~~ column.



$$VK = 0.2845$$

$$\sqrt{(201.2)^2 + (201.2)^2}$$

$$\frac{284.5}{1000}$$

Tabular Info

Year	Total Prod	Base (old)	Roy/Tax Total	Roy/Tax Base
------	------------	------------	------------------	-----------------

On aerial photo - would be useful to show ideal locations
Change in well 8.

- 10-1 - Drilling Fluid disposal
- if any sandy soil may require lined pits or mud tanks.

Surface Casings

- DRIFT THICK 2 6-75m

- 10-4 Will new ^{ing} flowlines & wells be cathodically protected

Pigging schedule - How frequent will lines be pigged

How frequently will facilities be monitored

- 11- Moving location ~~56~~ 4 & 5 N of E/W road all allowance would ~~reduce~~ ^{reduce} agric impact. Comments

- 11-2 - Relaxation of spacing to road to say 38m could be done easily

Well 4 - could it be moved east ~~to~~ adjacent
to 15-23 lease road

Barrier Report

min set back distance from H/A
due to drilling concerns is 60' = 20m

$$2000 \text{ kpa} = 1160 \text{ psi}$$

$$\text{WHP} = \nabla_p \text{ Depth}$$

$$1160 = (\nabla - \nabla_w) 2000$$

$$\nabla - \nabla_w = \frac{1160}{2000} = \text{gradient} = 1.01$$

What is free gradient and how do you know.

21 - ~~What~~
- Plan to calibrate net oil computer
as other testing methods in Manitoba
situation.

- monthly progress report should
include - results of all prod tests
- graph or table of prod
prod (unit + projected area) with actual.

Crown Royalty Calculation

Old Crown Royalty = old oil portion of production calculated
(A) (m³) at the old oil royalty rate

New Crown Royalty = $\left(\left(\begin{array}{c} \text{Total production} \\ \text{at the old oil rate} \end{array} \right) - \left(\begin{array}{c} \text{old oil production} \\ \text{at the old oil rate} \end{array} \right) \right) \times 0.55$
(B) (m³) new oil factor

Total Crown Royalty Payable (m³) = (A) + (B)

TABLE 1

CROWN ROYALTY CALCULATION

TOTAL OIL RATE (m3/ao)	% NEW OIL (%)
11122.2	15.43

TRACT FACTOR	ALLOCATED PRODUCTION		TOTAL CROWN ROYALTY BASE		OLD CROWN ROYALTY BASE		OLD ROYALTY	NEW ROYALTY	TOTAL ROYALTY
	TOTAL	OLD	Q<50	Q>=50	Q<50	Q>=50	(m3/ao)	(m3/ao)	(m3/ao)
	(m3/ao)	(m3/ao)	(m3/ao)	(m3/ao)	(m3/ao)	(m3/ao)	(m3/ao)	(m3/ao)	(m3/ao)
0.0004859	5.4 ✓	4.6 ✓	0.1 ✓	0.0	0.1 ✓	0.0	0.1 ✓	0.0	0.1 ✓
0.0023308	25.9	21.9	2.5	0.0	1.8	0.0	1.8	0.4	2.2 ✓
0.0014463	16.1	13.6	1.0	0.0	0.7	0.0	0.7	0.2	0.9
0.0002109	27.9 ✓	23.6 ✓	2.9 ✓	0.0	2.1 ✓	0.0	2.1 ✓	0.3	2.4 ✓
0.0024659	27.4	23.2	2.8	0.0	2.0	0.0	2.0	0.4	2.5 ✓
0.0014195	15.8	13.4	0.9	0.0	0.7	0.0	0.7	0.1	0.8
0.0014473	16.1	13.6	1.0	0.0	0.7	0.0	0.7	0.2	0.9
0.0018943	21.1	17.8	1.7	0.0	1.2	0.0	1.2	0.3	1.5
0.0007409	8.2	7.0	0.3	0.0	0.2	0.0	0.2	0.0	0.2
0.0006268	7.0	5.9	0.2	0.0	0.1	0.0	0.1	0.0	0.1
0.0027178	30.2	25.6	3.4	0.0	2.5	0.0	2.5	0.5	3.0
0.0017894	19.9	16.8	1.5	0.0	1.1	0.0	1.1	0.2	1.3
0.0014086	15.7	13.2	0.9	0.0	0.7	0.0	0.7	0.1	0.8
0.0005226	5.8	4.9	0.1	0.0	0.1	0.0	0.1	0.0	0.1
0.0073335	81.6 ✓	69.0 ✓	0.0	0.0	23.6	0.0	18.0	3.1	21.1 ✓
0.0010983	12.2	10.3	0.6	0.0	0.4	0.0	0.4	0.1	0.5
0.0046646	51.9	43.9	0.0	0.0	10.3	0.0	0.0	1.7	8.9
0.0162047	186.9 ✓	158.1 ✓	0.0	0.0	71.0	0.0	58.0	2.1	60.1 ✓
0.0045666	50.8	43.0	0.0	0.0	9.8	0.0	0.0	1.6	8.5
0.0007119	7.9	6.7	0.2	0.0	0.2	0.0	0.2	0.0	0.2
0.0013085	14.6	12.3	0.8	0.0	0.6	0.0	0.6	0.1	0.7
0.0043678	48.6	41.1	8.9	0.0	6.4	0.0	6.4	1.4	7.8
0.0022290	24.8	21.0	2.3	0.0	1.7	0.0	1.7	0.4	2.0
0.0000000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0092479	102.9	87.0	0.0	0.0	33.2	0.0	26.1	3.9	30.0
0.0034235	38.1	32.2	5.5	0.0	0.0	3.9	0.0	0.9	4.8
TOTAL	0.0775633	862.7	729.6	37.7	147.9	41.2	102.1	143.3	23.3
									166.6

these
don't
add
up

8
9
10
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Oil & Gas Production Tax Calculation

1/ Bradd's way

① Old Oil Tax Rate (%) = old oil tax rate as determined on the old oil ^(base) portion of production

② New Oil Tax Rate (%) = new oil tax rate as determined on the total production minus new oil tax rate as determined on the old oil ^(base) production

Total Oil & Gas Production Tax Rate (%) = ① + ②

2/ Daly's way

① Old Oil Tax Rate (%) = old oil tax rate as determined on the total production ^{times} X the % of old oil

② New Oil Tax Rate (%) = new oil tax rate as determined on the total production ^{times} X the % of new oil

Total Oil & Gas Production Tax Rate (%) = ① + ②

Chevron's way

- 3/
- (A) Old Oil Tax = $\frac{\text{old oil tax rate as determined on the old oil portion of production expressed as } m^3}{\text{Volume}(m^3)}$
- (B) New Oil Tax = $\frac{\text{new oil tax rate as determined on the total production expressed as } m^3 \text{ minus new oil tax rate as determined on the old oil production expressed as } m^3}{\text{Volume}(m^3)}$

$$\frac{\text{Total Oil \& Gas Production}}{\text{Tax Volume}(m^3)} = (A) + (B)$$

- ✓ - Presumably in the final calculation they will be converting this m^3 to a %
- if we are going to accept this method of calculation have Chevron supply us with a diskette copy of the final program they will using to allow us to check their version monthly by just plugging in the right numbers i.e. production, AWP, etc.

and

have rounding be consistent.

TABLE 2

MINERAL TAX CALCULATION

TOTAL OIL
RATE
(m3/mo)

11122.2

% NEW
OIL
(%)

15.43

84.57% old

as percentages according to 1

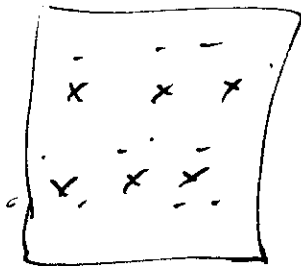
TRACT	TRACT FACTOR	ALLOCATED PRODUCTION		OLD MINERAL TAX		***** NEW MINERAL TAX *****		TOTAL	
		TOTAL	OLD	20<Q<65	Q>=65	TOTAL PRODUCTION	OLD OIL PRODUCTION	NEW TAX	MINERAL TAX
		(m3/mo)	(m3/mo)	(m3/mo)	(m3/mo)	(m3/mo)	(m3/mo)	(m3/mo)	(m3/mo)
06-02	0.0000096	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
07-02	0.0000148	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
10-02	0.0005438	6.0	5.1	0.0	1.39	0.0	0.0	0.0	0.0
11-02	0.0012345	13.7	11.6	0.0	0.0	0.0	0.0	0.0	0.0
13-02	0.0023775	26.4	22.3	0.3	0.0	0.0	0.0	0.0	0.0
14-02	0.0017602	19.6	16.6	0.0	0.0	0.0	0.0	0.0	0.0
15-02	0.0007861	8.7	7.4	0.0	0.0	0.0	0.0	0.0	0.0
16-02	0.0002958	3.3	2.8	0.0	0.0	0.0	0.0	0.0	0.0
03-03	0.0110989	123.4	104.4	0.0	28.39	0.0	16.0	12.3	3.7
04-03	0.0140283	156.0	132.0	0.0	41.4	0.0	22.4	17.6	4.7
05-03	0.0032245	35.9	30.3	1.5	0.0	0.0	0.0	0.0	0.0
06-03	0.0008362	9.3	7.9	0.0	0.0	0.0	0.0	0.0	0.0
12-03	0.0001554	1.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0
01-04	0.0031930	35.5	30.0	1.4	0.0	0.0	0.0	0.0	0.0
02-04	0.0049150	54.7	46.2	5.4	0.0	2.4	0.0	1.2	1.3
03-04	0.0085193	94.7	80.1	0.0	46.7.3	0.0	10.4	7.5	2.9
04-04	0.0066001	73.4	62.1	11.5	0.0	8.42	6.2	3.9	2.4
05-04	0.0069117	76.9	65.0	0.0	12.8	0.0	6.9	4.5	2.3
06-04	0.0027567	30.7	25.9	0.8	0.0	0.0	0.0	0.0	0.0
07-04	0.0015830	17.6	14.9	0.0	0.0	0.0	0.0	0.0	0.0
08-04	0.0047525	52.9	44.7	4.9	0.0	2.1	0.0	1.0	1.2
09-04	0.0067035	74.6	62.1	11.9	0.0	6.4	4.0	0.0	2.4
10-04	0.0075827	84.3	71.3	0.0	15.5	0.0	8.3	5.8	2.5
11-04	0.0094587	105.2	89.0	0.0	23.06	0.0	12.4	9.2	3.2
12-04	0.0122186	135.9	114.9	0.0	34.1	0.0	18.4	14.3	4.1
13-04	0.0048607	54.1	45.7	5.2	0.0	2.3	0.0	1.1	1.2
04-04	0.0108811	121.0	102.3	0.0	28.8	0.0	15.5	11.8	3.7
15-04	0.0038930	43.3	36.6	2.7	0.0	0.8	0.0	0.1	0.7
01-05	0.0051873	57.7	48.8	6.2	0.0	3.0	0.0	1.5	1.5
07-05	0.0001592	1.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0
08-05	0.0026800	29.8	25.2	0.7	0.0	0.0	0.0	0.0	0.0
09-05	0.0019689	21.9	18.5	0.0	0.0	0.0	0.0	0.0	0.0
16-05	0.0022697	25.2	21.3	0.2	0.0	0.0	0.0	0.0	0.2
09-09	0.0035529	39.5	33.4	2.0	0.0	0.4	0.0	0.0	0.4
15-09	0.0000795	0.9	0.7	0.0	0.0	0.0	0.0	0.0	0.0
16-09	0.0120881	134.4	113.7	0.0	33.6	0.0	18.1	14.1	4.1
01-10	0.0021619	24.0	20.3	0.1	0.0	0.0	0.0	0.0	0.1
02-10	0.0029284	31.5	26.6	0.9	0.0	0.0	0.0	0.0	0.9
03-10	0.0000707	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05-10	0.0032054	35.7	30.2	1.4	0.0	0.0	0.0	0.0	1.4
06-10	0.0040391	44.9	38.0	3.1	0.0	1.0	0.0	0.2	0.8
07-10	0.0039145	43.5	36.8	2.8	0.0	0.8	0.0	0.1	0.7

check new oil definition with Ches.

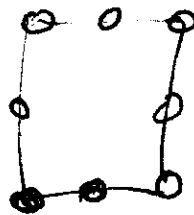
$$9 \sqrt[6]{61}$$

$$\frac{61}{23}$$

$$\frac{20}{16}$$



$$\sum y$$

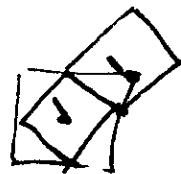


$$6.31 \sqrt[200]{200^2}$$

300 deep

$$x + \sum y$$

$$= 2.5x$$



$$5m^3/d$$

Confirm OOIIP #

What is outside prop. boundary consist of

Effect of project on freehold mineral owner.

13-24 locations is our map right?

Injection conversions - Rm of Wallace?
why

A real photo labelled incorrectly

Cherty Zone OOIP Est

LSD	A	ϕ	ϕh	A ϕh	$\frac{167409 N}{A \phi h (1-S_w)} \frac{1}{B_{oi}} 7758$
9-23	20	.16		3.2	535 709
10-23	20	.14		2.8	468 745
11-23	10	.13		1.3	217 631
14-23	20	.11		2.2	368 300
15-23	20	.12		4.8	803 563
16-23	40	.11		4.4	736 600
12-24	20	.15		3.0	502 227
13-24	20	.10		2.0	334 818
4-25	20	.14		2.8	468 745
5-25	10	.14		1.4	234 373
1-26	40	.14		5.6	937 490
2-26	40	.13		5.2	870 527
3-26	20	.10		2.0	334 818
6-26	10	.12		1.2	200 891
7-26	20	.16		3.2	535 709
8-26	20	.14		2.8	468 745

8 018, 891 bbl
1, 274, 863 m³

$$S_w = 0.45$$

$$B_{oi} = 1.045$$

$$\frac{7758 (1-S_w)}{1.045} \frac{1}{B_{oi} h}$$

$$= \frac{7758 (0.55)}{1.045} = 4083 h$$

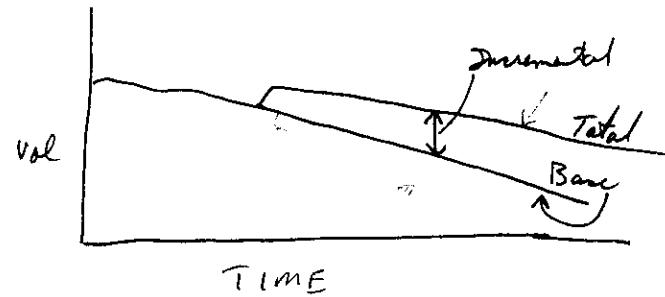
$$= 4083 \times 12.5 \times 3.29 = 167409$$

This estimate of OOIP is based on total pay of 12.5m and ϕ from the Scallion. Since ϕ in the Oolites is lower than Scallion the overall oil in place number is high. Chevron has been asked to supply separate net pay or ϕh maps

Bob. This is one way Chevron could calculate revenue to the province in the NUS #7 Reduced Spacing Pilot.

For Freehold Tract:

$$\frac{\text{Total Allocated production to Tract} - \text{Base Allocated production to Tract}}{\text{Incremental Production to Tract}}$$



Old Oil Tax on Total Production = A

Old Oil Tax on Base Production = B

New Oil Tax on Total Production = C

New Oil Tax on Base Production = D

Total - Base Tax (Old Oil) = E

Total - Base Tax (New Oil) = F

Total Tax Payable (with new oil status) = B + F = G.

Savings to Chevron = A - G = H

Additional Revenue to Crown From Incremental Production = F

Andy

COMPARISON OF INITIAL OIL RATES IN CORRIDOR AREA - ORIGINAL WELLS VS INFILL WELLS

Well	DATE ON	FIRST 4 MONTHS RATE OIL	FIRST DAYS	AVE RATE
14 D-21	7802	1798	94	19.1
14C-22	78 02	6283	101	62.2
16C-22	78 02	198	92	2.1
13C-23	(77-78)	6433	112	57.4
4 B-27	74 08	10137	122	83.1
1 B-28	78 02	5902	94	62.8
		31551	615	51.3

Ave. Corridor Wells.

14-21	56 01	6265	93	67.4
15-21	55-56/2	3749	59	63.5
16-21	56 01	6322	85	74.4
13-22	55 08	7804	100	78.0
14-22	(55-56) 1	5771	82	70.4
15-22	(55-56) 10	3261	80	40.8
16-22	(55-56) 11	1552	84	18.5
13-23	56 02	3218	65	58.7
4-26	(55-56) 12	3431	85	40.4
1-27	(55-56) 11	3096	93	33.3
2-27	(55-56) 10	3300	87	37.9
3-27	(55-56) 12	5570	84	66.3
4-27	55 09	8196	116	70.6
1-28	55 08	5651	117	48.3
2-28	55 09	5692	109	52.2
3-28	55 10	7415	103	72.0
		50876	1442	56.1

Ave. 40 acre spacing wells in corridor area

Serge Scarfield
2593

Oil 100 000 m³ incremental.

Corridor wells 16C-22 converted

ϕ 12% Soi 56% k 5-300 md.

OOIP 33 $\times 10^6$

Pilot 2×10^6

net pay
drainage 40 ac.
ave ϕ & Soi

Low current
Low Lit.
Not supp by aquif.

9 wells - gone 1 totally enclosed pattern

Literature

for given wells

5 spot has higher recovery than 9 spot
50% for Dalg.

If injectors drilled

would have to convert 5 wells
Producers - flush production.) technical decision

- response to 40 ac sp.
- response to corridor wells
- response to 16C-22
- Dalg unit

Peak oil \geq Primary peak

2 year response on 40

$R_i = 32\%$

Current 27%

New wells have WOR 70% lower than surrounding wells.

Recoveries in area are high - partially due to aquifer

16C-22

inc oil due to 20 acre sp $\approx 6\%$ OOIP
saw total fluid + pressure response in 9 months

Should see $>6\%$ increase in OOIP

Daly 1

1 year response
incem. recoveries 4-9%

Pilot

have rec. 23% of OOIP

5-8% / year decline

30 year life for base (pilot has shorter life)
assumed constant fluid rate (based on unit performance)

WOR would decrease by 70%

Water break through in 1 year

15% / year decline

7.6% incremental oil

100,000 m³.

$R_{i,ULT} = 38\%$

Expansions 40 wells each
600,000 m³/oil

Royalties

- based on total unit
- allocated prod.
- total prod from new wells is new
- determined % new / total

$$(OLD\ TOT - OLD\ OLD) \times 0.55 + OLD\ OLD$$

royalties would be lower due
to royalty holiday.

- Flat farm land -

Municipal ~~affairs~~ concerns
are they interested in ~~the~~ a small
pilot area.

- Pilot by Jan 1
-

Economics.

Daily - cash flow going to better projects.

- Home money for NWS now may not in the future.

Not to be included

NVS
Pilot would
not proceed
with old oil.

- Correlative Rights - statement.

Daly Unit 3

Status:

- royalty incentives based on marginal rate of return

- didn't have money to spend at that marginal rate

- evaluate NVS and possibly reactivate Daly

~~- pilot~~

sumps pushed in

final cleanup in spring.

6A well prob abandon in spring

8-18 - Sedco 98.

Battery

lines in

constructing -

by end of Jan on line.

~~8-18~~

Routledge

2 infill wells on 20 acre
spring (areas with high net pay
and low recoveries)

Daily Unit 5

11-9 5 m³/d @ 25% (Daily member)

12-9 - 6 m³/TF @ 75%

13-9 not to good.

Proposed Unit No 5

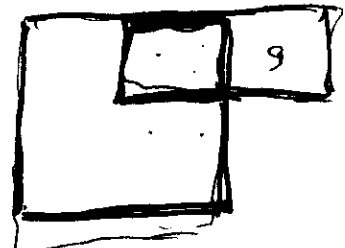
maybe 1 year from now.

Daily Unit 4

15D - 27

180 m³/d @ 5400 kPa

- Dec 7
recomplete 1C-35 in 1-2 mon.



SPILLS

Flying fuels
2 x per week.

spotted 10 leaks.

- could have prevented
major spills.

25 spills

- 0.2 ha off lease.

340 m³ water 25 oil

Soil reclaim -

got to all sites

did prelim work on all

deep tillage

Air pass for service rig pursue with WPS+H

Burn pit.

- test wells - have chlorides

- @ 11000 Cl⁻

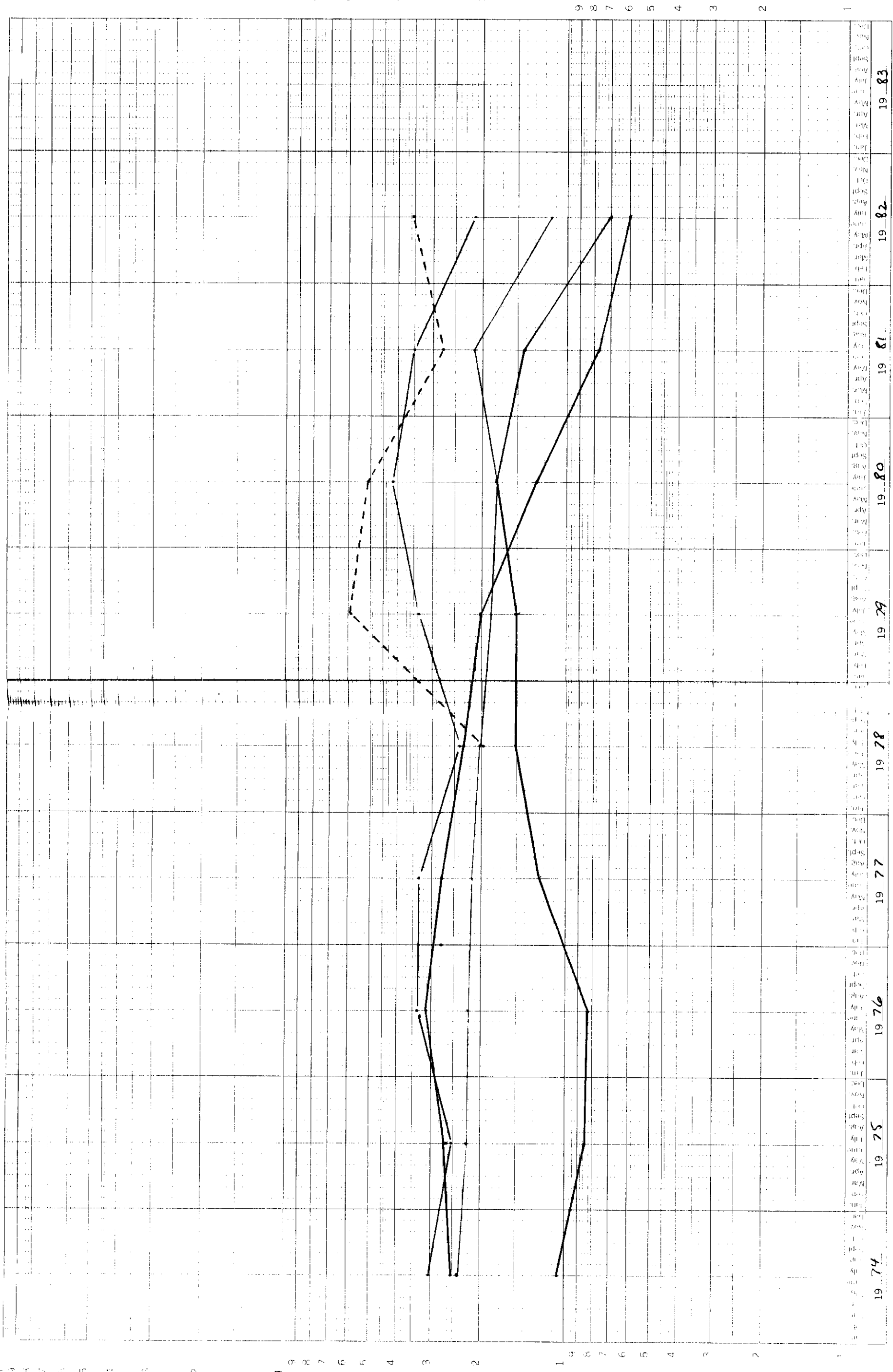
control well 700 Cl⁻

Fence on Drilling site

11 Packer installations. total of 34 so far

Well Testing Frequency.

2-27 --- 16C-22
15-22



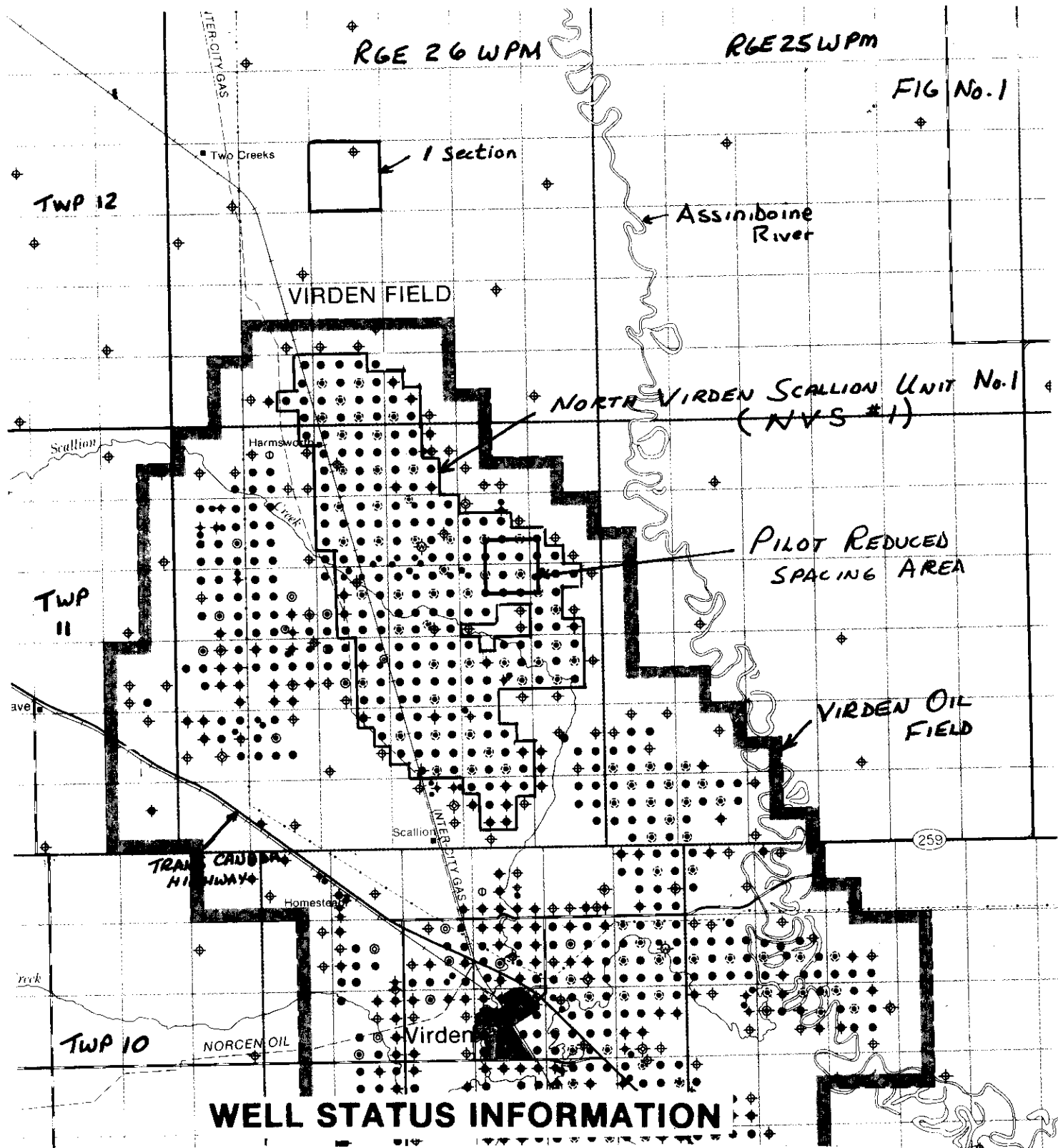


FIG No.1

RGE 26 WPM

RGE 25 WPM

TWP 12

Two Creeks

1 Section

Assiniboine River

VIRDEN FIELD

NORTH VIRDEN SCALLION UNIT No.1
(NVS #1)

PILOT REDUCED
SPACING AREA

TWP
11

VIRDEN OIL
FIELD

TRAN CANADA
HIGHWAY

Homestead

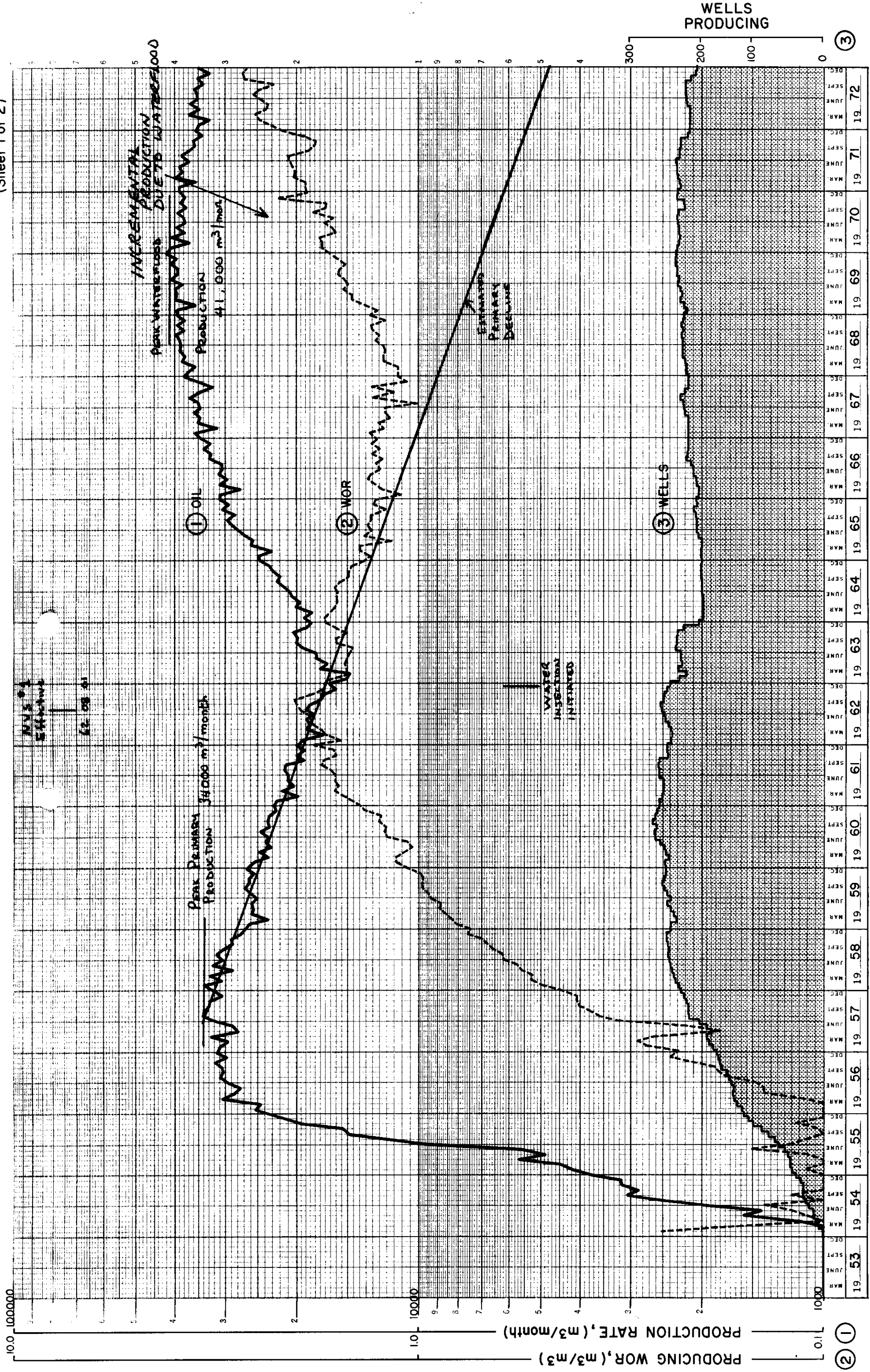
Scallion

259

TWP 10

NORGEN OIL

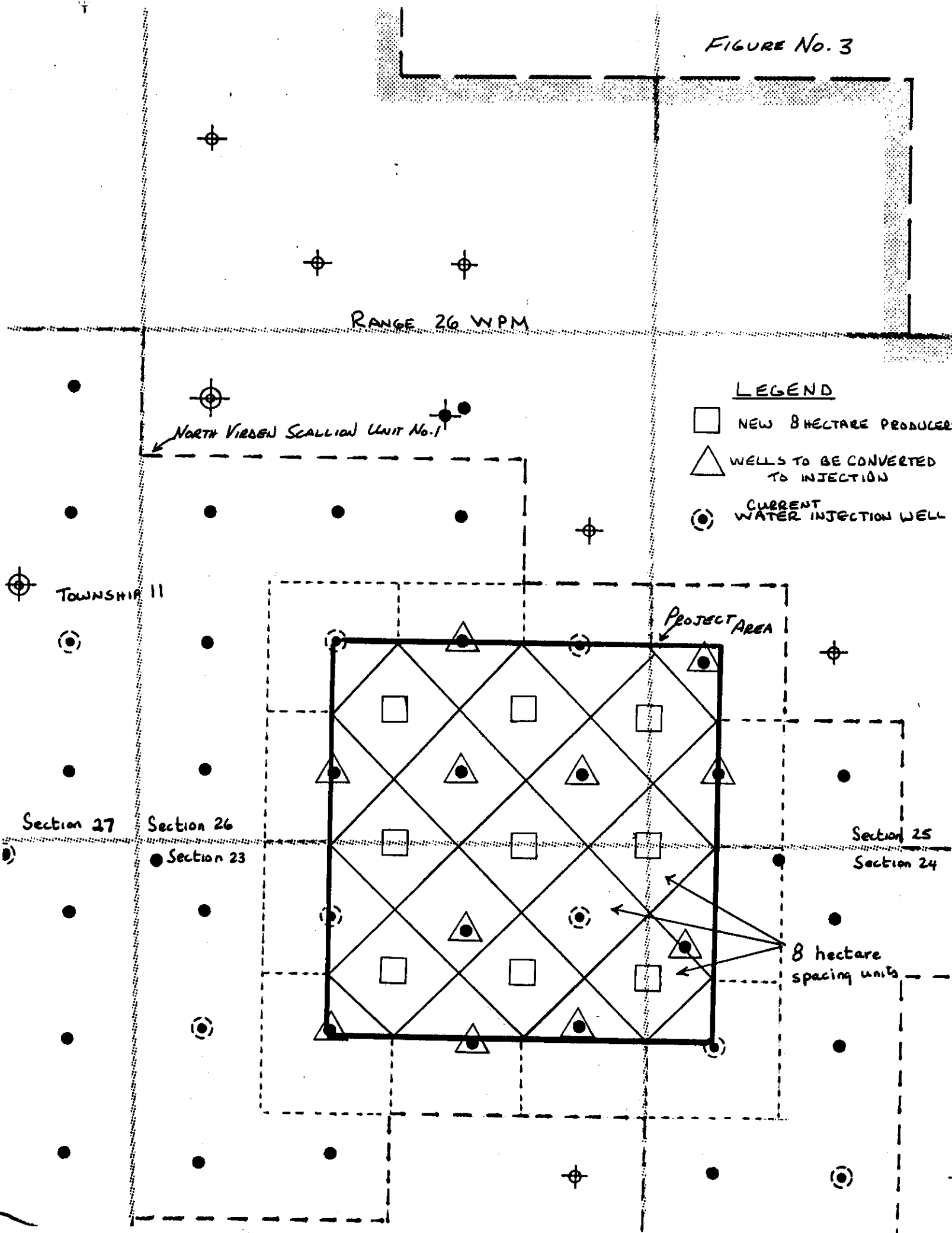
Virden



FIELD : VIRDEN
POOL : LODGEPOLE A

RESERVOIR PERFORMANCE CHART

FIGURE No. 3



SCHEDULE A
Daly Unit No. 3
8 Hectare Drilling Spacing Units

