



19-January-98

Mr. Joe Taylor  
Petroleum Engineer  
Chevron Canada Resources  
500-5th Ave. SW  
Calgary AB T2P 0L7

Dear Mr. Taylor:

**Re: Virden Roselea Unit No.'s 1, 2 & 3  
New Oil Status**

The Branch has reviewed the unit declines rates proposed in your letter dated 04-Dec-97. The proposed unit decline rates are reasonable and have been used by the Branch to determine the historical unit production rates listed in Attachment No. 1.

The Branch hereby approves new oil status for production from Virden Roselea Unit No.'s 1, 2 & 3, exceeding the historical unit production rate in any month. Approval of new oil status is effective 01-Oct-97.

The methodology for calculating royalty and production tax under this approval is to be identical to that used in NVSU No. 1 and Daly Unit No.'s 1 & 3. Chevron is to submit a royalty/tax spreadsheet for each unit using the format approved and recommended by the Branch in NVSU No. 1 and Daly Unit No.'s 1 & 3. Production from infill wells drilled on 8 ha spacing and horizontal wells continues to qualify as holiday oil or new oil and is not governed by this approval. Chevron is requested to submit amended royalty/tax statements for the 4<sup>th</sup> Qu/97 by February 6, 1998. This deadline is to ensure the Branch does not have to re-audit the royalty/tax statements.

Chevron has requested an effective date for new oil status of 01-Jul-97 based on the commencement of waterflood optimization activities in the units. The Branch has considered this request and cannot support an effective date of 01-Jul-97 for the following reasons:

- (1) A review of the recompletion/acidizing operations conducted by Chevron during the 3rd Qu/97 indicates only a slight increase in production from the wells. In the

original application Chevron indicated, in addition to the stimulations, a number of polymer treatments, conversions and injector rate changes would be conducted during the 3rd Qu/97. This work has not been done to date.

- (2) The Branch is currently completing royalty/ tax audits for the 3<sup>rd</sup> Qu/97. An effective date of 01-Jul-97 would result in amendments to royalty/tax statements submitted by the unit owners, a significant administrative burden for the both the companies and the Branch.

Chevron is to advise unit owners of this approval, the established methodology for calculating royalty and production tax, and the deadline for submission of amended 4<sup>th</sup> Qu/97 royalty/tax statements. If you have any questions regarding the royalty and production tax calculation under this approval, contact Carol Martiniuk, Manager, Administration and Geology at (204) 945-6570. Any other questions can be directed to the undersigned or John N. Fox at (204) 945-6573 or 945-6574, respectively.

Yours truly,

A handwritten signature in black ink, appearing to read 'L. R. Dubreuil', with a stylized flourish at the end.

L. R. Dubreuil  
Director, Petroleum and Energy Branch

cc: Administration

# ATTACHMENT NO. 1

## HISTORICAL PRODUCTION DECLINE FOR DETERMINATION OF NEW OIL

YEAR	MONTH	VRU NO. 1 Production		VRU NO. 2 Production		VRU NO. 3 Production	
		Exp. Decline Rate = 7.14%/yr		Exp. Decline Rate = 6.15%/yr		Exp. Decline Rate = 5.49%/yr	
		Daily (m3/d)	Monthly (m3)	Daily (m3/d)	Monthly (m3)	Daily (m3/d)	Monthly (m3)
1997	October	53.9	1671.3	24.5	761.0	53.4	1656.2
	November	53.6	1607.5	24.4	732.6	53.2	1595.2
	December	53.3	1650.8	24.3	753.0	52.9	1640.7
1998	January	52.9	1640.7	24.2	749.0	52.7	1633.0
	February	52.6	1472.8	24.0	673.0	52.4	1468.0
	March	52.3	1620.6	23.9	741.1	52.2	1617.7
	April	52.0	1558.6	23.8	713.4	51.9	1558.2
	May	51.6	1600.7	23.7	733.3	51.7	1602.6
	June	51.3	1539.5	23.5	705.9	51.5	1543.6
	July	51.0	1581.1	23.4	725.6	51.2	1587.6
	August	50.7	1571.3	23.3	721.8	51.0	1580.1
	September	50.4	1511.3	23.2	694.8	50.7	1522.0
	October	50.1	1552.1	23.0	714.2	50.5	1565.3
	November	49.8	1492.8	22.9	687.5	50.3	1507.7
	December	49.5	1533.0	22.8	706.7	50.0	1550.7
1999	January	49.1	1523.6	22.7	702.9	49.8	1543.4
	February	48.8	1367.7	22.6	631.5	49.6	1387.5
	March	48.5	1504.9	22.4	695.5	49.3	1529.0
	April	48.2	1447.4	22.3	669.5	49.1	1472.7
	May	48.0	1486.5	22.2	688.2	48.9	1514.7
	June	47.7	1429.7	22.1	662.5	48.6	1458.9
	July	47.4	1468.3	22.0	680.9	48.4	1500.5
	August	47.1	1459.2	21.9	677.4	48.2	1493.4
	September	46.8	1403.5	21.7	652.0	47.9	1438.5
	October	46.5	1441.3	21.6	670.2	47.7	1479.5
	November	46.2	1386.3	21.5	645.2	47.5	1425.0
	December	45.9	1423.7	21.4	663.2	47.3	1465.6
2000	January	45.6	1414.9	21.3	659.7	47.1	1458.8
	February	45.4	1315.5	21.2	613.8	46.8	1358.2
	March	45.1	1397.6	21.1	652.7	46.6	1445.1
	April	44.8	1344.2	20.9	628.3	46.4	1391.9
	May	44.5	1380.4	20.8	645.8	46.2	1431.6
	June	44.3	1327.7	20.7	621.7	46.0	1378.9
	July	44.0	1363.5	20.6	639.0	45.7	1418.2
	August	43.7	1355.1	20.5	635.7	45.5	1411.5
	September	43.4	1303.3	20.4	611.9	45.3	1359.6
	October	43.2	1338.5	20.3	629.0	45.1	1398.3
	November	42.9	1287.3	20.2	605.5	44.9	1346.9
	December	42.6	1322.1	20.1	622.3	44.7	1385.2

# ATTACHMENT NO. 1

## HISTORICAL PRODUCTION DECLINE FOR DETERMINATION OF NEW OIL

		VRU NO. 1 Production		VRU NO. 2 Production		VRU NO. 3 Production	
		Exp. Decline Rate = 7.14%/yr		Exp. Decline Rate = 6.15%/yr		Exp. Decline Rate = 5.49%/yr	
YEAR	MONTH	Daily	Monthly	Daily	Monthly	Daily	Monthly
		(m3/d)	(m3)	(m3/d)	(m3)	(m3/d)	(m3)
2001	January	42.4	1313.9	20.0	619.1	44.5	1378.7
	February	42.1	1179.5	19.9	556.2	44.3	1239.5
	March	41.9	1297.8	19.8	612.5	44.1	1365.8
	April	41.6	1248.2	19.7	589.6	43.9	1315.6
	May	41.4	1281.9	19.6	606.1	43.6	1353.1
	June	41.1	1232.9	19.4	583.4	43.4	1303.3
	July	40.8	1266.2	19.3	599.7	43.2	1340.4
	August	40.6	1258.4	19.2	596.5	43.0	1334.1
	September	40.3	1210.3	19.1	574.2	42.8	1285.0
	October	40.1	1243.0	19.0	590.3	42.6	1321.6
	November	39.8	1195.5	18.9	568.2	42.4	1273.0
	December	39.6	1227.7	18.8	584.0	42.2	1309.3
2002	January	39.4	1220.2	18.7	581.0	42.0	1303.1
	February	39.1	1095.3	18.6	522.0	41.8	1171.5
	March	38.9	1205.2	18.5	574.8	41.6	1290.9
	April	38.6	1159.2	18.4	553.4	41.4	1243.4
	May	38.4	1190.4	18.3	568.8	41.3	1278.8
	June	38.2	1145.0	18.3	547.5	41.1	1231.8
	July	37.9	1175.8	18.2	562.8	40.9	1266.9
	August	37.7	1168.6	18.1	559.8	40.7	1260.9
	September	37.5	1124.0	18.0	538.9	40.5	1214.5
	October	37.2	1154.3	17.9	553.9	40.3	1249.1
	November	37.0	1110.2	17.8	533.2	40.1	1203.2
	December	36.8	1140.1	17.7	548.1	39.9	1237.4

# Manitoba

## Action/Route Slip

**DATE:** January 16, 1998

**TO:** Bob Dubreuil

**FROM:** John Fox

**Telephone:** 945-6574

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**SUBJECT:** VRU No.'s 1, 2 & 3 - New Oil Status

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Chevron originally applied for new oil status for VRU No.'s 1, 2 & 3 on 26-Jun-97. The Branch advised Chevron on 04-Sep-97 that it did not agree with the proposed unit decline rates. Chevron submitted revised unit declines rates on 04-Dec-97 and requested an effective date of 01-Jul-97 for new oil status.

### Recommendations

It is recommended that the Branch approve new oil status for Virden Roselea Unit No.'s 1, 2 & 3 for a 5-year term, from 01-Oct-97 to 30-Sep-2002. An effective date of 01-Oct-97 is proposed to avoid having to re-audit royalty/tax statements for the 3<sup>rd</sup> Qu/97. Attached is the Branch's proposed letter of approval. Under the approval, Chevron is requested to submit amended royalty/tax statements for the 4<sup>th</sup> Qu/97 by 06-Feb-98.

### Discussion

Chevron's original unit decline rates, with the exception of VRU No. 2, were determined using performance over the past 5 years. The Branch made the observation that significant reductions in water injection into the units in the early 1990's has had an adverse impact on production. The Branch indicated unit decline rates should reflect a balance between pre-1990 and current unit performance. Chevron agreed with the Branch's interpretation and has submitted revised unit decline rates. Table 1 shows the Branch's unit decline rates and Chevron's original, revised and proposed unit decline rates.

**Table 1 - Unit Decline Rates**

Unit	Exponential Decline Rates			
	Branch	Chevron		
		Original	Revised	Proposed
VRU No. 1	7.11%	6.60%	7.17%	7.14%
VRU No. 2	5.71%	5.90%	6.24%	6.15%
VRU No. 3	5.42%	8.80%	5.56%	5.49%

Chevron has proposed that it's and the Branch's decline rates, determined using different production analysis software, be averaged to calculate the unit decline rate for determination of new oil. The Branch agrees with this approach. Chevron also suggested that reducing the analysis period for VRU No. 2, from 17 years to 9.5 years, would make it consistent with the analysis period used for the other units and would also yield a more representative decline. The Branch agrees with this suggestion.

The Branch reviewed the appropriateness of the proposed unit decline rates by determining the volume of new oil that would have been produced had the approval been in effect during the 3rd Qu/97. The results of this evaluation are shown on Table 2.

**Table 2 - New Oil Determination - 3rd Qu/97**

Unit	Monthly Production (m3/d)	Historical Production (m3/d)	New Oil Volume	
			(m3/d)	(%)
<b>VRU No. 1</b>				
July	56.8	54.9	1.9	3.3%
August	57.4	54.6	2.9	5.0%
September	58.0	54.3	3.8	6.5%
<b>VRU No. 2</b>				
July	25.3	24.9	0.4	1.4%
August	26.1	24.8	1.2	4.8%
September	24.6	24.7	0.0	0.0%
<b>VRU No. 3</b>				
July	53.7	54.2	0.0	0.0%
August	54.6	53.9	0.7	1.2%
September	55.8	53.7	2.1	3.8%
<b>Total New Oil</b>			4.3	3.1%

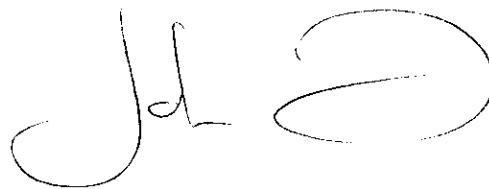
The volume of new oil ranges from an average of 0.5 m<sup>3</sup>/d in VRU No. 2 to 2.9 m<sup>3</sup>/d in VRU No. 1. Overall the proposed unit decline rates would have resulted in 3.1% of 3rd Qu/97 unit production being classified as new oil.

Chevron has requested an effective date for new oil status of 01-Jul-97 based on the commencement of waterflood optimization activities in the units. A review of the recompletion/acidizing activities conducted by Chevron during the 3rd Qu/97 indicates only a slight increase in production from the wells. In the original application Chevron indicated, in addition to the stimulations, a number of polymer treatments, conversions and injector rate changes would be conducted during the 3rd Qu/97. This work has not been done to date.

The Branch is currently completing royalty/ tax audits for the 3rd Qu/97. An effective date of 01-Jul-97 will result in amendments to royalty/ tax statements submitted by the unit owners, a significant administrative burden for the both the companies and the Branch. Therefore it is recommended that the Branch approve an effective date for new oil status of 01-Oct-97.

The previous analysis indicates the cost to Chevron of delaying the effective date is minimal. If the approval was effective 01-Jul-97, Chevron would have produced an average of 4.3 m<sup>3</sup>/d of new oil during the 3<sup>rd</sup> Qu/97. Chevron also significantly reduced its capital expenditures on waterflood modifications originally planned for the 3<sup>rd</sup> Qu/97.

Attached is a proposed letter approving new oil status for a 5-year term from 01-Oct-97 to 30-Sep-2002. Chevron is requested to submit a sample royalty/tax spreadsheet for each unit for review and acceptance by the Branch. The methodology for calculating royalty and production tax under this approval is to be identical to that used in NVSU No. 1 and Daly Unit No.'s 1 & 3. Chevron and other affected unit owners are also requested to submit amended royalty/ tax statements for the 4th Qu/97 by 06-Feb-98. This will ensure that Administration will not have to re-audit any statements as a result of this approval.

A handwritten signature in black ink, consisting of a large, stylized 'J' followed by a cursive 'L' and a large, loopy 'S'.

19-January-98

Mr. Joe Taylor  
Petroleum Engineer  
Chevron Canada Resources  
500-5th Ave. SW  
Calgary AB T2P 0L7

Dear Mr. Taylor:

**Re: Virден Roselea Unit No.'s 1, 2 & 3  
New Oil Status**

The Branch has reviewed the unit declines rates proposed in your letter dated 04-Dec-97. The proposed unit decline rates are reasonable and have been used by the Branch to determine the historical unit production rates listed in Attachment No. 1.

The Branch hereby approves new oil status for production from Virден Roselea Unit No.'s 1, 2 & 3, exceeding the historical unit production rate in any month. Approval of new oil status is for a 5-year term, from 01-Oct-97 to 30-Sep-2002.

The methodology for calculating royalty and production tax under this approval is to be identical to that used in NVSU No. 1 and Daly Unit No.'s 1 & 3. Chevron is to submit a sample royalty/tax spreadsheet for each unit for review and acceptance by the Branch. Production from infill wells drilled on 8 ha spacing and horizontal wells continues to qualify as holiday oil or new oil and is not governed by this approval. Chevron is requested to submit amended royalty/tax statements for the 4<sup>th</sup> Qu/97 by February 6, 1998. This deadline is to ensure the Branch does not have to re-audit the royalty/tax statements.

Chevron has requested an effective date for new oil status of 01-Jul-97 based on the commencement of waterflood optimization activities in the units. The Branch has considered this request and cannot support an effective date of 01-Jul-97 for the following reasons:

- (1) A review of the recompletion/acidizing operations conducted by Chevron during the 3rd Qu/97 indicates only a slight increase in production from the wells. In the



original application Chevron indicated, in addition to the stimulations, a number of polymer treatments, conversions and injector rate changes would be conducted during the 3rd Qu/97. This work has not been done to date.

- (2) The Branch is currently completing royalty/ tax audits for the 3<sup>rd</sup> Qu/97. An effective date of 01-Jul-97 would result in amendments to royalty/tax statements submitted by the unit owners, a significant administrative burden for the both the companies and the Branch.

Chevron is to advise unit owners of this approval, the methodology for calculating royalty and production tax, and the deadline for submission of amended 4<sup>th</sup> Qu/97 royalty/tax statements. If you have any questions regarding the royalty and production tax calculation under this approval, contact Carol Martiniuk, Manager, Administration and Geology at (204) 945-6570. Any other questions can be directed to the undersigned or John N. Fox at (204) 945-7573 or 945-6574, respectively.

Yours truly,

L. R. Dubreuil  
Director, Petroleum and Energy Branch

cc: Administration

**ATTACHMENT NO. 1**

**HISTORICAL PRODUCTION DECLINE FOR  
DETERMINATION OF NEW OIL**

YEAR	MONTH	VRU NO. 1 Production		VRU NO. 2 Production		VRU NO. 3 Production	
		Exp. Decline Rate = 7.14%/yr		Exp. Decline Rate = 6.15%/yr		Exp. Decline Rate = 5.49%/yr	
		Daily (m3/d)	Monthly (m3)	Daily (m3/d)	Monthly (m3)	Daily (m3/d)	Monthly (m3)
1997	October	53.9	1671.3	24.5	761.0	53.4	1656.2
	November	53.6	1607.5	24.4	732.6	53.2	1595.2
	December	53.3	1650.8	24.3	753.0	52.9	1640.7
1998	January	52.9	1640.7	24.2	749.0	52.7	1633.0
	February	52.6	1472.8	24.0	673.0	52.4	1468.0
	March	52.3	1620.6	23.9	741.1	52.2	1617.7
	April	52.0	1558.6	23.8	713.4	51.9	1558.2
	May	51.6	1600.7	23.7	733.3	51.7	1602.6
	June	51.3	1539.5	23.5	705.9	51.5	1543.6
	July	51.0	1581.1	23.4	725.6	51.2	1587.6
	August	50.7	1571.3	23.3	721.8	51.0	1580.1
	September	50.4	1511.3	23.2	694.8	50.7	1522.0
	October	50.1	1552.1	23.0	714.2	50.5	1565.3
	November	49.8	1492.8	22.9	687.5	50.3	1507.7
	December	49.5	1533.0	22.8	706.7	50.0	1550.7
1999	January	49.1	1523.6	22.7	702.9	49.8	1543.4
	February	48.8	1367.7	22.6	631.5	49.6	1387.5
	March	48.5	1504.9	22.4	695.5	49.3	1529.0
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	September	46.8	1403.5	21.7	652.0	47.9	1438.5
	October	46.5	1441.3	21.6	670.2	47.7	1479.5
	November	46.2	1386.3	21.5	645.2	47.5	1425.0
	December	45.9	1423.7	21.4	663.2	47.3	1465.6
2000	January	45.6	1414.9	21.3	659.7	47.1	1458.8
	February	45.4	1315.5	21.2	613.8	46.8	1358.2
	March	45.1	1397.6	21.1	652.7	46.6	1445.1
	April	44.8	1344.2	20.9	628.3	46.4	1391.9
	May	44.5	1380.4	20.8	645.8	46.2	1431.6
	June	44.3	1327.7	20.7	621.7	46.0	1378.9
	July	44.0	1363.5	20.6	639.0	45.7	1418.2
	August	43.7	1355.1	20.5	635.7	45.5	1411.5
	September	43.4	1303.3	20.4	611.9	45.3	1359.6
	October	43.2	1338.5	20.3	629.0	45.1	1398.3
	November	42.9	1287.3	20.2	605.5	44.9	1346.9
	December	42.6	1322.1	20.1	622.3	44.7	1385.2
2001	January	42.4	1313.9	20.0	619.1	44.5	1378.7
	February	42.1	1179.5	19.9	556.2	44.3	1239.5
	March	41.9	1297.8	19.8	612.5	44.1	1365.8
	April	41.6	1248.2	19.7	589.6	43.9	1315.6
	May	41.4	1281.9	19.6	606.1	43.6	1353.1
	June	41.1	1232.9	19.4	583.4	43.4	1303.3
	July	40.8	1266.2	19.3	599.7	43.2	1340.4

**ATTACHMENT NO. 1**

**HISTORICAL PRODUCTION DECLINE FOR  
DETERMINATION OF NEW OIL**

YEAR	MONTH	VRU NO. 1 Production		VRU NO. 2 Production		VRU NO. 3 Production	
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		Daily (m3/d)	Monthly (m3)	Daily (m3/d)	Monthly (m3)	Daily (m3/d)	Monthly (m3)
2002	August	40.6	1258.4	19.2	596.5	43.0	1334.1
	September	40.3	1210.3	19.1	574.2	42.8	1285.0
	October	40.1	1243.0	19.0	590.3	42.6	1321.6
	November	39.8	1195.5	18.9	568.2	42.4	1273.0
	December	39.6	1227.7	18.8	584.0	42.2	1309.3
	January	39.4	1220.2	18.7	581.0	42.0	1303.1
	February	39.1	1095.3	18.6	522.0	41.8	1171.5
	March	38.9	1205.2	18.5	574.8	41.6	1290.9
	April	38.6	1159.2	18.4	553.4	41.4	1243.4
	May	38.4	1190.4	18.3	568.8	41.3	1278.8
	June	38.2	1145.0	18.3	547.5	41.1	1231.8
	July	37.9	1175.8	18.2	562.8	40.9	1266.9
	August	37.7	1168.6	18.1	559.8	40.7	1260.9
	September	37.5	1124.0	18.0	538.9	40.5	1214.5



**Chevron**

December 4, 1997

Manitoba Energy and Mines  
Attention: Mr. John Fox  
1395 Ellice Avenue, Suite 360  
Winnipeg, Manitoba R3G 3P2

**Chevron Canada Resources**  
500 - 5<sup>th</sup> Ave. S.W.  
Calgary, AB T2P 0L7

**W. J. (Joe) Taylor**  
Petroleum Engineer  
Phone No. 403-234-5780  
Fax No. 403-234-5124

**APPLICATION FOR NEW OIL STATUS FOR ROYALTY  
AND MINERAL TAX CALCULATIONS  
VIRDEN ROSELEA UNIT #1  
VIRDEN ROSELEA UNIT #2  
VIRDEN ROSELEA UNIT #3**

Dear Mr. Fox:

The following discussion is submitted in response to your correspondence dated September 4, 1997. Upon reviewing your comments and calculations, Chevron Canada Resources as operator of the above three units, supports your calculations for base production decline for the above mentioned units. A summary of the calculated declines (Petroleum Branch's and Chevron's) is detailed in the attached discussion.

Chevron apologizes for any confusion caused in the original application due to internal data integrity problems. The recent launching of our new forecast software application (Dynamic Surveillance System 32) and the switching of data vendors (International Petrodata International) hopefully will eliminate future errors such as these.

At the Petroleum Branch's request, an updated timeline for future waterflood optimizations in the above mentioned units is also included. As indicated in your correspondence, Chevron has also outlined the modifications initiated in each of the units and has suggested coinciding effective dates for granting new oil status to for the waterflood modifications.

If you have any questions or concerns regarding this submission, please contact me at (403)-234-5780 or at the above letterhead address.

Sincerely,

W.J. (Joe) Taylor  
Petroleum Engineer

pc: D.J. (Dave) Sprague (Calgary)  
C.B. (Brett) Rishel (Virden)  
D.C. (Dale) Lewis (Virden)

## **LIST OF ATTACHMENTS**

Figure #1	Base case production forecast Virden Roselea #1
Figure #2	Base case production forecast Virden Roselea #2
Figure #3	Base case production forecast Virden Roselea #3
Figure #4	Gross daily field injection for Virden Roselea #1
Figure #5	Gross daily field injection for Virden Roselea #2
Figure #6	Gross daily field injection for Virden Roselea #3
Figure #7	Revised base case production forecast Virden Roselea #2

## **DISCUSSION**

In reference to the Petroleum Branch fax dated October 23, 1997, Chevron has verified its' database to only include the "old oil" status wells necessary to determine a base decline for each of the Roselea Units. Exponential decline analysis again was conducted on each of the unit's production history to determine a base decline. Chevron's results compared the Petroleum Branch's results are shown in Figures 1, 2, & 3 and are summarized in Table 1 as follows:

<b>Unit</b>	<b>Chevron's Historical Decline</b>	<b>Petroleum Branch's Historical Decline</b>	<b>Analysis Period</b>
VRU #1	7.17 %	7.11 %	Oct. / 87 - Dec. / 96
VRU #2	5.88 %	5.71 %	Jan. / 79 - Dec. / 96
VRU #3	5.56 %	5.42 %	Jul. / 86 - Dec. / 96

**Table 1: Calculated Base Decline Rates**

As indicated in Table 1, the decline rates calculated by Chevron's software (Dynamic Surveillance System 32) and the Petroleum Branch's software (Petrodesk) are very similar for the given analysis periods suggested by the Petroleum Branch. However, significant decreases in injection were initiated in each of the Roselea fields in the early 1990's as demonstrated in Figures 4, 5, and 6. Field injection for periods prior to injection rate changes and post rate changes are summarized in Table 2:

<b>Unit</b>	<b>Period</b>	<b>Avg. Injection (m3/d)</b>	<b>Period</b>	<b>Avg. Injection (m3/d)</b>	<b>% Decrease in Injection</b>
VRU #1	Jan/86 - Jan/93	1311.3	Feb/93 - Dec/96	797.4	39.1
VRU #2	Jan/86 - Mar/91	950.6	Apr/91 - Dec/96	524.2	44.9
VRU #3	Jan/86 - Jan/93	1479.2	Feb/93 - Dec/96	1254.6	15.2

**Table 2: Differences in Injection Rates (Pre-1990 and Post 1990)**

With this data in mind, Chevron agrees with the Petroleum Branch that an equitable balance between pre-1990 unit performance and post-1990 unit performance (period of reduced injection) should be used in the final determination of the base declines for each unit.

It is Chevron's position that as a compromise between the two independent calculations, the average of Chevron's and the Petroleum Branch's decline calculations be used to calculate the new oil status for each of the Roselea Units. Since all units experienced dramatic decreases in injection at approximately the same period, Chevron proposes to use the Petroleum Branch's suggested period of analysis for calculating the base declines. The only modification suggested would be to calculate VRU #2 base decline based on a similar 10 year period starting from July 1987 as indicated by the Petroleum Branch. In doing so, Chevron feels that this would better reflect an equitable balance of the pre-1990 performance and post-1990 unit performance given the significant decrease in injection (~45%) following 1990. The revised decline calculation for VRU #2 is detailed in Figure 7. The proposed base declines and averages for the given periods are outlined in Table 3.

Unit	Chevron's Historical Decline	Petroleum Branch's Historical Decline	Proposed Avg. Decline	Analysis Period
VRU #1	7.17 %	7.11 %	7.14 %	Oct. / 87 - Dec. / 96
VRU #2	6.24%	6.05 %	6.15 %	Jul. / 87 - Dec. / 96
VRU #3	5.56 %	5.42 %	5.49 %	Jul. / 86 - Dec. / 96

**Table 3: Proposed Base Declines**

As indicated in the cover page, Chevron has outlined the modifications initiated in each of the units and has suggested effective dates for granting new oil status for the waterflood modifications. A summary of the initial activities and proposed effective dates for each unit is detailed in Table 4.

Unit	Well	Waterflood Optimization	Date Work Commenced	Proposed Effective Date for New Oil Status
VRU #1	14-24-10-26 W1	Acid	97-07-22	97-07-01
	09-25-10-26 W1	Acid / Recompletion	97-09-17	
	10D-25-10-26 W1	Horizontal New Drill	97-10-10	
VRU #2	04-06-11-25 W1	Acid / Recompletion	97-05-08	97-07-01
	15A-06-10-26 W1	Horizontal New Drill	97-09-29	
VRU #3	05-14-10-26 W1	Acid / Recompletion	09-06-27	97-07-01
	03-14-10-26 W1	Acid	97-07-03	

**Table 4: Waterflood Optimization Summary and Proposed New Oil Status Effective Dates**

## **STATUS OF WATERFLOOD MODIFICATIONS**

Table 5 outlines the revised schedule for the 1998 waterflood modifications for the Roselea Units. Infrastructure modifications are planned to commence following the testing / evaluation of similar development items currently being evaluated in the North Virden Scallion Unit #1 field.

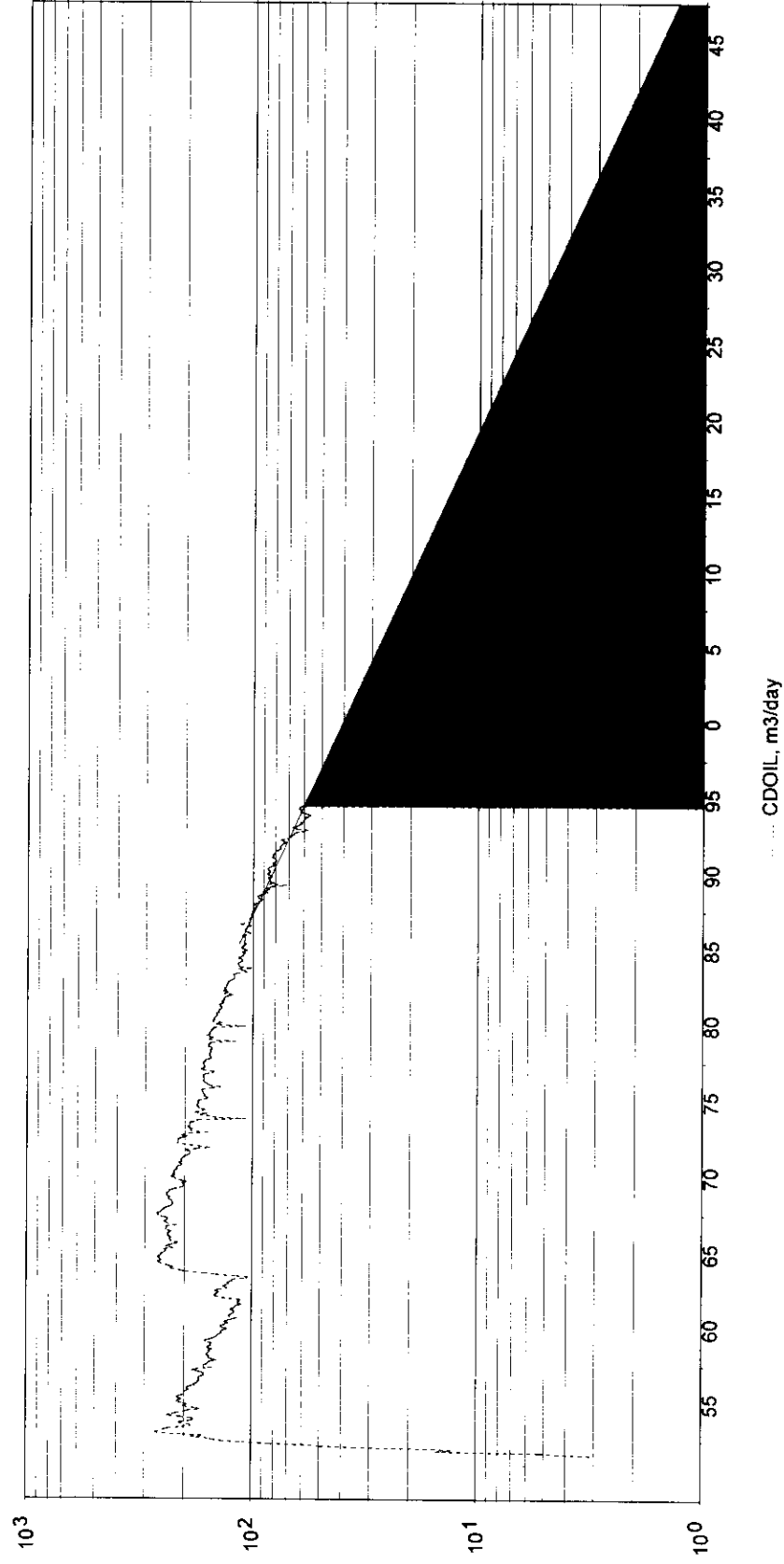
Two horizontal wells were drilled in 1997 in Roselea Units (VRU #1 02/10A-25-010-26 W1 and VRU #2 02/15A-06-011-25 W1). The VRU #1 02/10A-25-010-26 W1 well currently is the most successful well of the 1997 program, producing at rates of approximately 28 m<sup>3</sup> OPD and 7 m<sup>3</sup> WPD. VRU #2 02/15A-06-011-25 W1 producer also appears to have good oil production potential, but requires selective water shut-off with production packers in order to optimize the well as an economic oil producer. Given these encouraging results obtained in the Roselea Units, Chevron plans to follow-up this pilot with further drilling locations in 1998 in all three of the Roselea Units (locations pending).

<b>Unit</b>	<b>Injection Well Polymer Treatments</b>	<b>Stimulations / Rate Changes to Key Injectors / Producers</b>	<b>Conversions to Injection</b>	<b>Drilling of Horizontal Producers / Injectors</b>	<b>Injection Infrastructure Water Allocation Review</b>
VRU #1	3Q1998	1Q1998	3Q 1998	2Q 1998	1Q1998
VRU #2	3Q1998	1Q1998	3Q 1998	2Q 1998	1Q1998
VRU #3	3Q1998	1Q1998	3Q 1998	2Q 1998	1Q1998

**Table 5: Proposed Timeline for Waterflood Modifications**



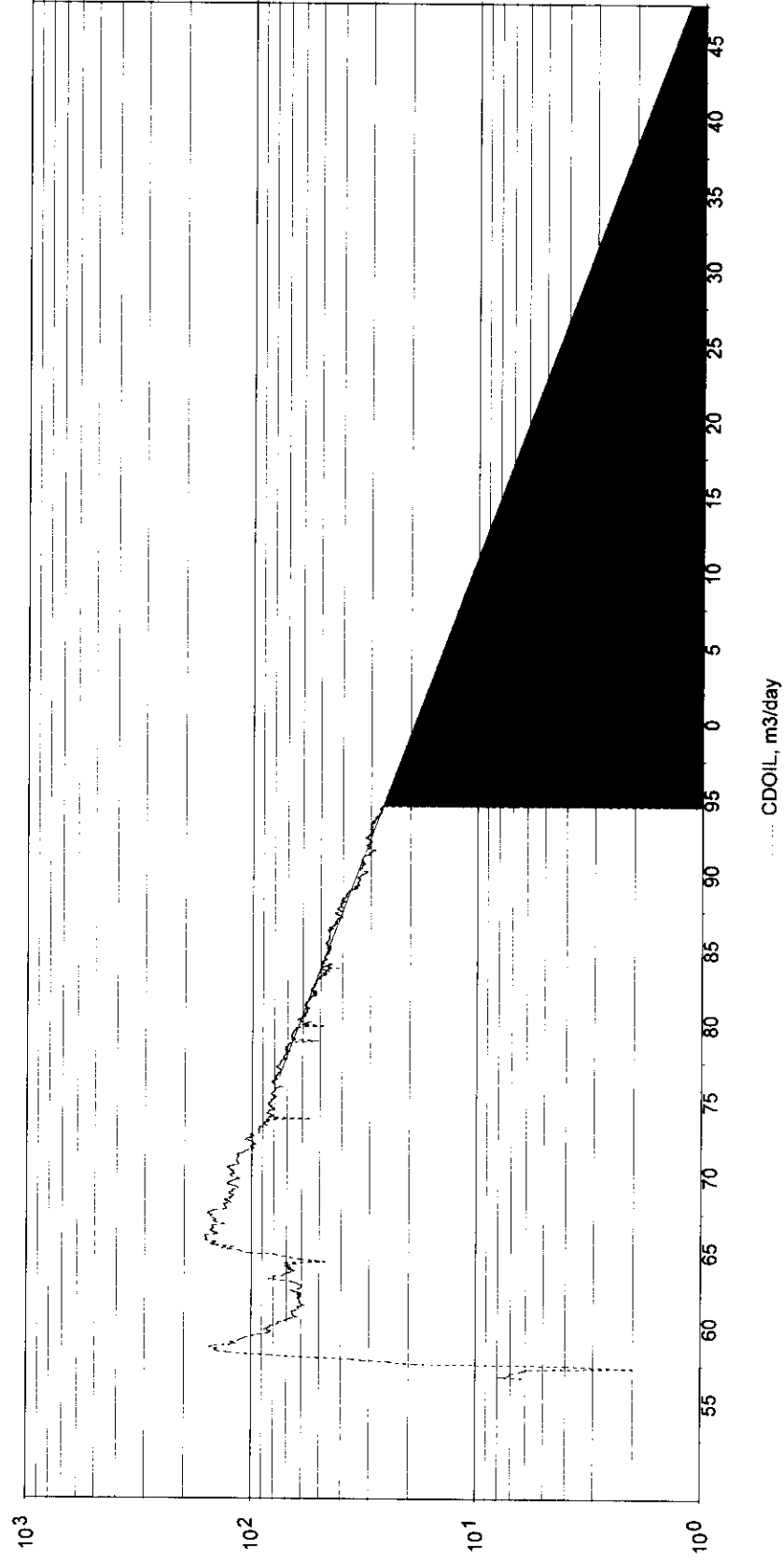
# Viriden Roselea Unit #1 Base Decline Analysis (Excluding New Drills)



Decline Stream: CDOIL Cum stream: OCUM, 2362527.2500 m3  
 Fit Decline, 1/yr: Exp, 0.0717  
 Forecast Decline, 1/yr: Exp, 0.0717  
 Begin Date, Rate: 12/1/96, 59.64  
 End Date, Rate, Yrs: 12/1/2050, 1.24, 54.00  
 Cum at Begin: 2362527.25  
 Remaining: 297298.11  
 Total Reserves: 2659825.36

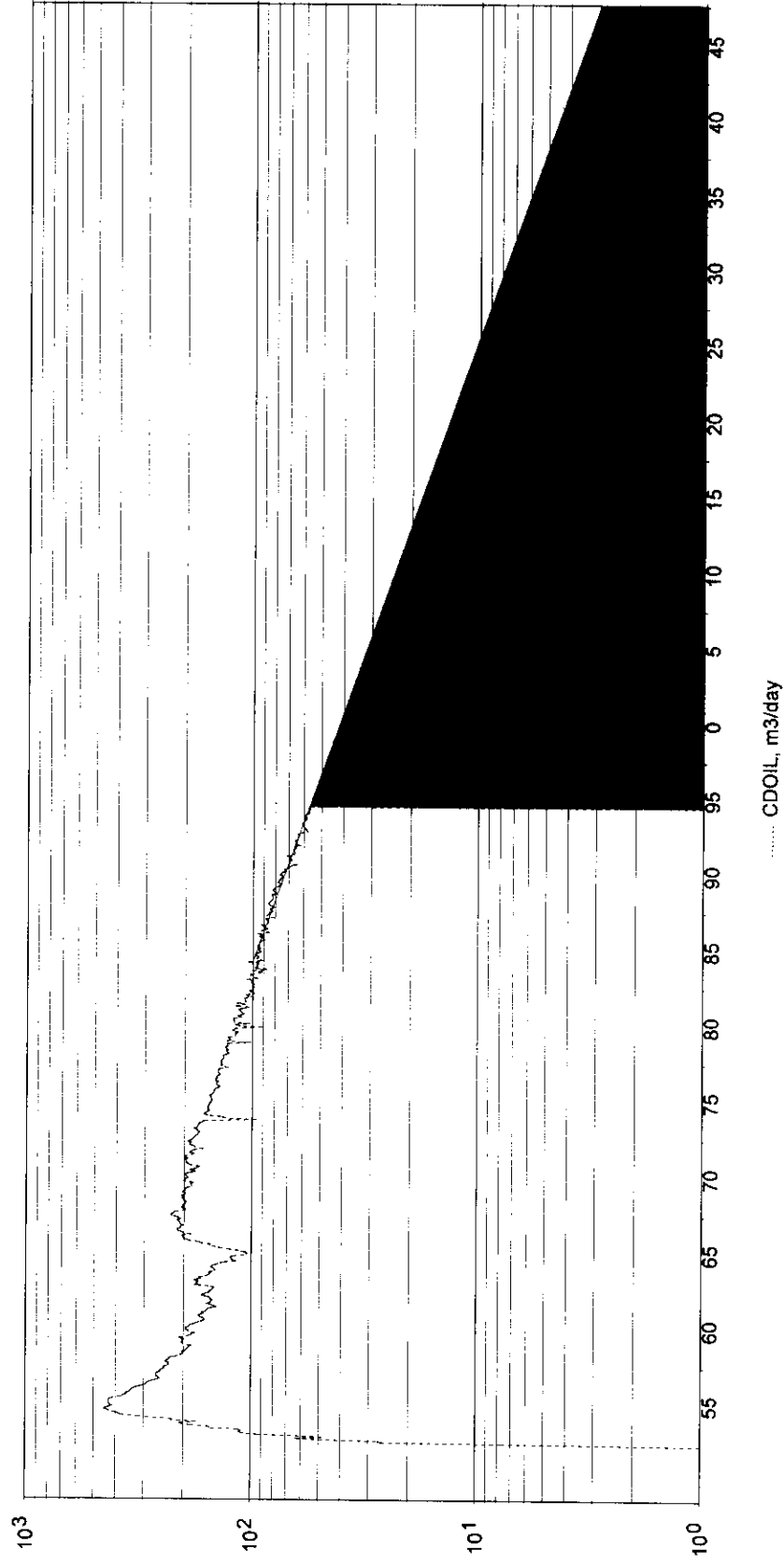
# Viriden Roselea Unit #2

## Base Decline Analysis (Excluding New Drills)



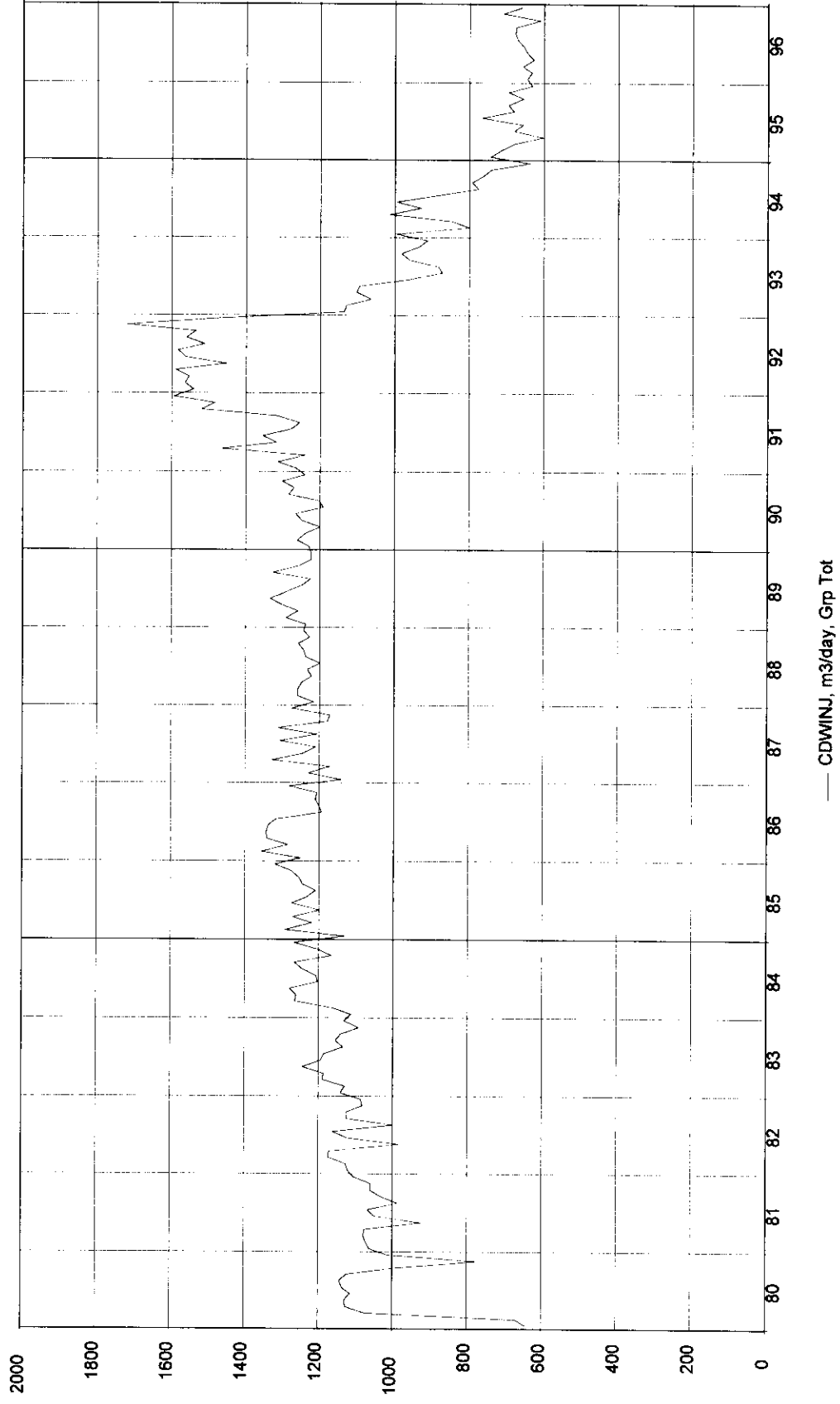
Decline Stream: CDOIL Cum stream: OCUM, 991907.0625 m3  
 Fit Decline, 1/yr: Exp, 0.0588  
 Forecast Decline, 1/yr: Exp, 0.0588  
 Begin Date, Rate: 12/1/96, 26.40  
 End Date, Rate, Yrs: 12/1/2050, 1.10, 54.00  
 Cum at Begin: 991907.06  
 Remaining: 157112.68  
 Total Reserves: 1149019.74

# Viriden Roselea Unit #3 Base Decline Analysis (Excluding New Drills)

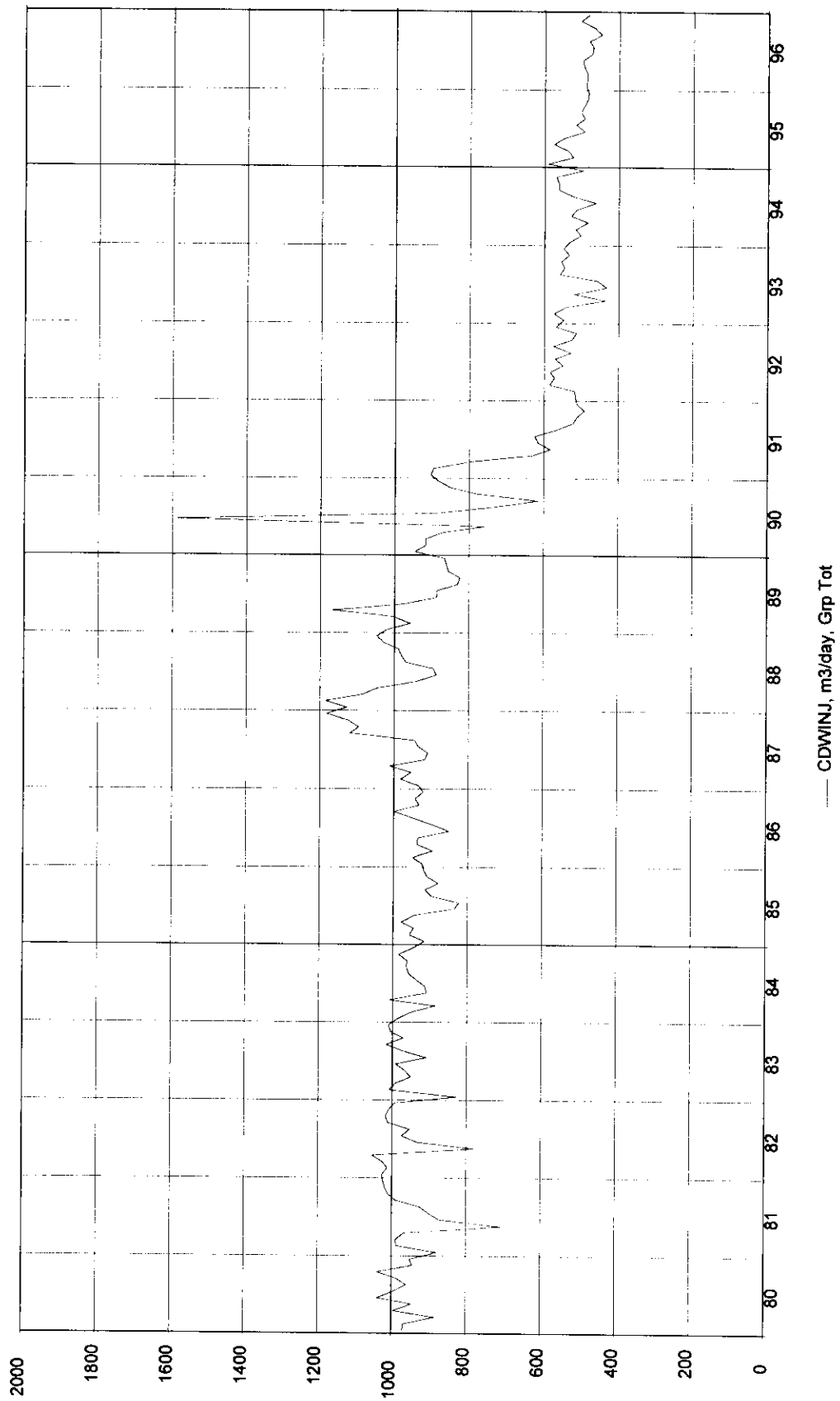


Decline Stream: CDOIL Cum stream: OCUM, 2332851.5000 m3  
 Fit Decline, 1/yr: Exp, 0.0556  
 Forecast Decline, 1/yr: Exp, 0.0556  
 Begin Date, Rate: 12/1/96, 56.49  
 End Date, Rate, Yrs: 12/1/2050, 2.80, 54.00  
 Cum at Begin: 2332851.50  
 Remaining: 352500.69  
 Total Reserves: 2685352.19

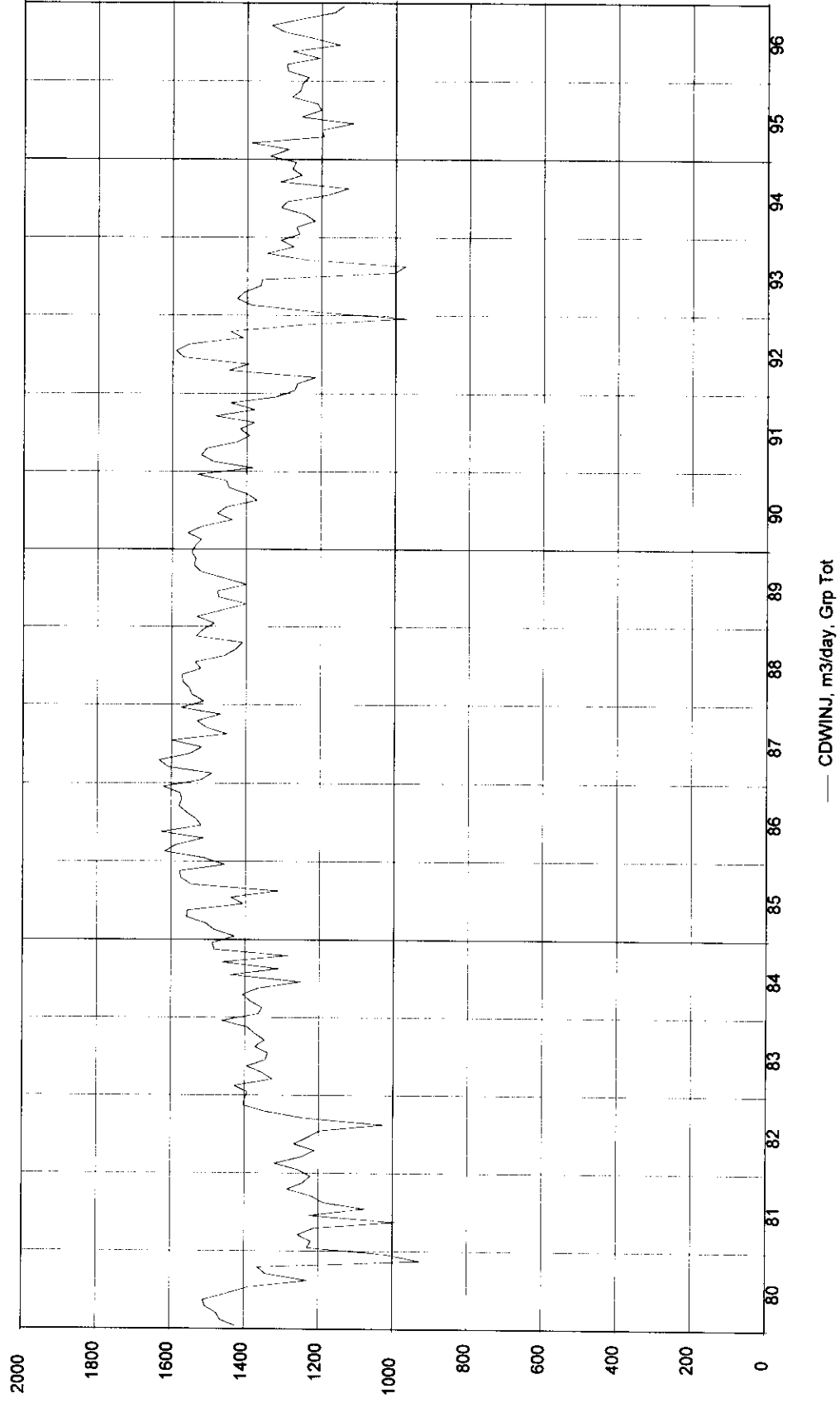
# Viriden Roselea Unit #1 Gross Daily Field Injection



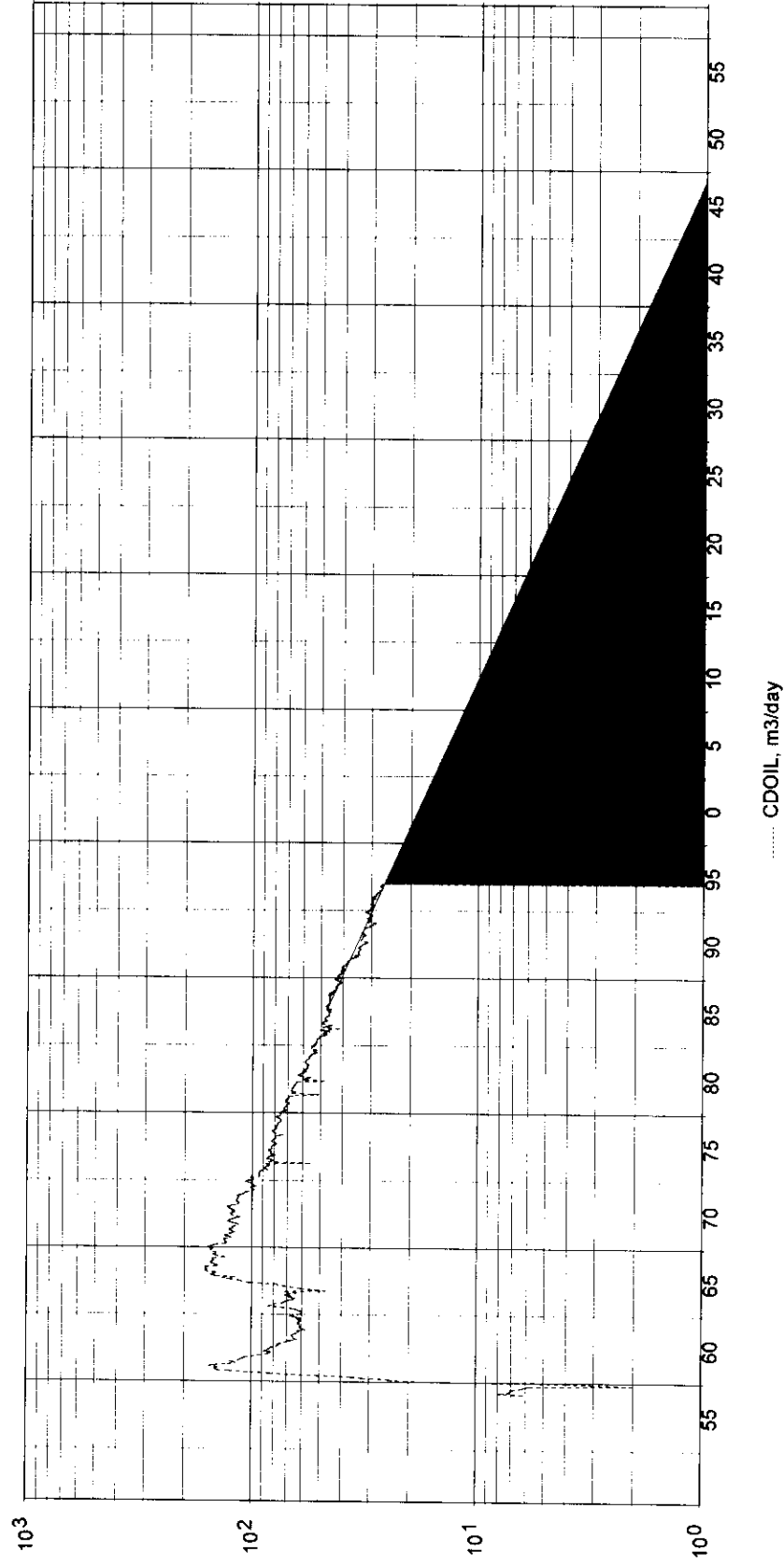
# Viriden Roselea Unit #2 Gross Daily Field Injection



# Viriden Roselea Unit #3 Gross Daily Field Injection



# Viriden Roselea Unit #2 Production Forecast



Decline Stream: CDOIL Cum stream: OCUM, 991907.0625 m3  
 Fit Decline, 1/yr: Exp, 0.0624  
 Forecast Decline, 1/yr: Exp, 0.0624  
 Begin Date, Rate: 12/1/96, 26.15  
 End Date, Rate, Yrs: 12/1/2050, 0.90, 54.00  
 Cum at Begin: 991907.06  
 Remaining: 147745.80  
 Total Reserves: 1139652.86



September 4, 1997

Mr. Joe Taylor  
Petroleum Engineer  
Chevron Canada Resources  
Box 100  
Virden MB R0M 1P0

Dear Mr. Taylor:

**Re: Virden Roselea Unit No.'s 1, 2 & 3  
New Oil Status**

The Branch has completed a preliminary review of your application for new oil status in VRU No.'s 1, 2 & 3 based on establishment of a historical production decline for each unit.

The Branch has determined proposed historical production declines that differ from those proposed by Chevron for each unit, with the exception of VRU No. 2. The table below compares the Branch's and Chevron's proposed decline rates:

Unit	Chevron's Historical Decline	Chevron's Analysis Period	Branch's Historical Decline	Branch's Analysis Period
VRU No. 1	6.6% p.a.	Dec/92 - Jan/97	7.11% p.a.	Oct/87 - Dec/96
VRU No. 2	5.9% p.a.	Jan/79 - Jan/97	5.71% p.a.	Jan/79 - Dec/96
VRU No. 3	8.8% p.a.	Jan/94 - Jan/97	5.42% p.a.	Jul/86 - Dec/96

The purpose of the historical production decline for each unit is to establish a baseline for determination of incremental recoverable reserves resulting from waterflood modifications. Between 1990 - 1996 Chevron reduced injection into the three units by 34.1%, from an average of  $109.7 \times 10^3 \text{ m}^3/\text{mon}$  to  $72.2 \times 10^3 \text{ m}^3/\text{mon}$ . The reduced injection, as acknowledged by Chevron, has had a negative impact on production with the aggregate decline rate for the three units increasing from 4.48% p.a. (1985-1990) to 6.98% p.a. (1990-1996). In establishing the historical production decline rate for each unit the Branch attempted to balanced current and pre-1990 unit performance.

For each unit the decline rate was analyzed over a number of different time frames, all ending December 31, 1996. The results of this analysis are tabulated in Table 1. Despite both the



Branch and Chevron using Merak's software for decline curve analysis, the Branch cannot duplicate Chevron's analysis. It appears the Branch's and Chevron's unit production data is slightly different. The Branch's production data has been verified against our historical records. It also appears that Chevron's production data for VRU No.'s 1 & 3 may be reversed.

For each unit the Branch chose what it believes to be the most representative historical production decline. Longer decline periods, in excess of 10 years, were selected. By comparison Chevron chose decline periods of less than 5 years, except in VRU No. 2. The Branch compared unit production predicted using our proposed historical decline, to actual unit production, for the period Jan/97 - May/97. During this period it is assumed no waterflood modifications were completed and the appropriate historical decline should yield little or no new oil. The comparison of actual vs predicted production for 1997 is shown in Table 2.

The proposed individual unit decline rates are discussed in the following sections.

### **VRU No. 1**

Chevron has proposed a historical decline of 6.6% p.a. based on unit performance between Dec/92 - Jan/97. For the same period the Branch has calculated a decline of 9.79% p.a. The historical decline of 9.79% p.a. significantly underestimates production for the 2nd half of 1996 and 1st five months of 1997. The Branch believes the decline between Oct/87 - Dec/96 of 7.11% p.a. (see Fig. 1) is more representative of historical unit performance than the accelerated decline since 1992 resulting from the reduction in injection, especially in light of the moderation in decline since mid-1996.

### **VRU No. 2**

Chevron has proposed a historical decline of 5.9% p.a. based on unit performance between Jan/79 - Jan/97. For the same period the Branch has calculated a decline of 5.71% p.a. As shown on Figure 2, this historical decline appears to slightly underestimate production for the period Oct/94 - Jun/96 but overall is representative of the unit performance.

### **VRU No. 3**

Chevron has proposed a historical decline of 8.8% p.a. based on unit performance between Jan/94 - Jan/97. For the same period the Branch has calculated a decline of 5.37% p.a. Using a longer decline period, Jul/86 - Jan/97, the Branch has calculated an almost identical decline rate of 5.42%. As shown on Figure 3, the historical decline of 5.42% p.a. is representative of the unit performance.

Chevron has requested a June 1, 1997 start date for new oil status which is retroactive to the date the application was made. The Branch is prepared to grant new oil status with an effective date to coincide with initiation of the waterflood modifications in each unit and in any event no earlier

than July 1, 1997. Chevron is requested to submit a more detailed update and status of its proposed water modifications in VRU No.'s 1, 2 & 3.

Please provide the Branch with your comments on our proposed decline rates for the units. Your comments will be taken into consideration in determining the final historical decline rates. If you have any questions in respect of this matter please contact the undersigned at (204) 945-6574.

Yours truly,

A handwritten signature in black ink, appearing to be 'J. N. Fox', with a large, stylized loop at the end.

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

cc. Carol Martiniuk

VRU No. 1 Old Oil Wells Data 01/54-12/96

Historical Production (Rate-Time)

qi: 113.798 m3/d, Oct, 1987

qf: 0.0765644 m3/d, Oct, 2086

di(Exp): 7.10647 CTD: 2.36344e+06 m3

RR: 284545 m3 Tot: 2.64798e+06 m3

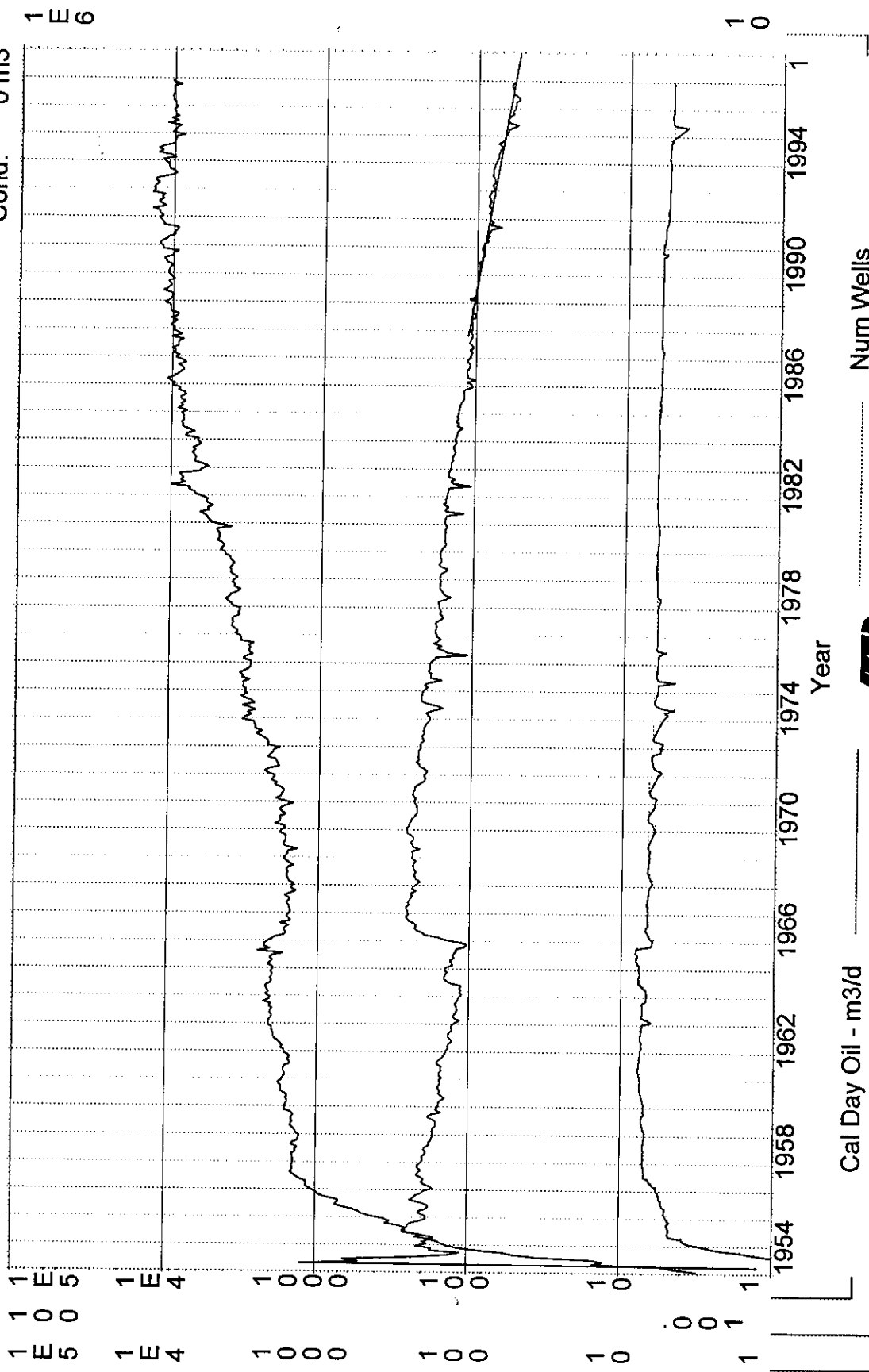
Production Cums

Oil: 2.36343e+06 m3

Gas: 0 E6m3

Water: 9.12296e+06 m3

Cond: 0 m3



Cal Day Oil - m3/d

WOR - m3/m3

Historical Production - m3/d

Num Wells



VRU No. 2 Data 02/59-12/96

Historical Production (Rate-Time)

qi: 76.1061 m3/d, Jan, 1979

qf: 1.58783 m3/d, Sep, 2044

di(Exp): 5.71179 CTD: 992319 m3

RR: 153976 m3 Tot: 1.14629e+06 m3

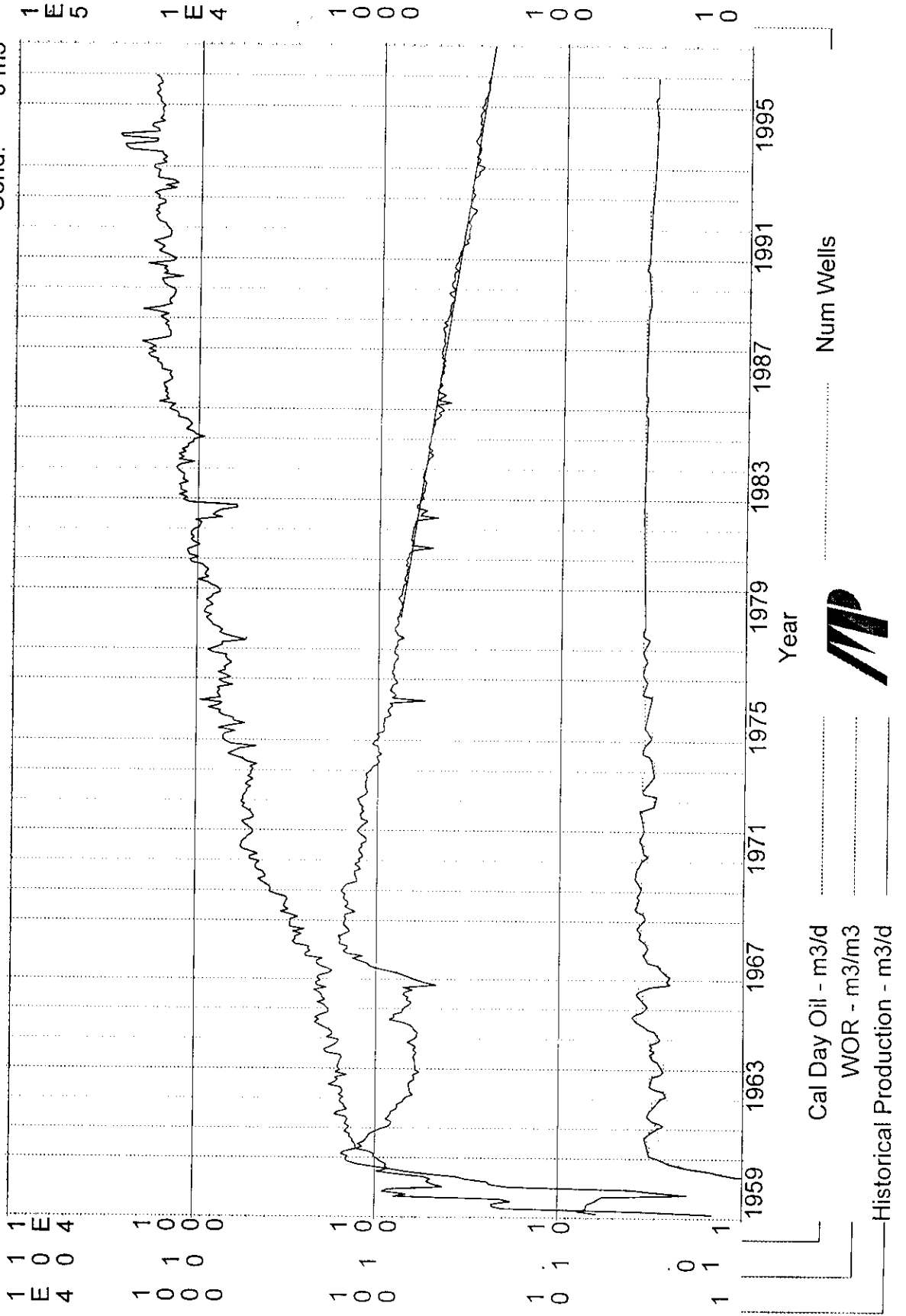
Production Cums

Oil: 992319 m3

Gas: 0 E6m3

Water: 6.74332e+06 m3

Cond: 0 m3



Historical Production (Rate-Time)

qi: 101.248 m3/d, Jul, 1986

qf: 2.18143 m3/d, May, 2055

di(Exp): 5.41625 CTD: 2.3337e+06 m3

RR: 355544 m3 Tot: 2.68925e+06 m3

Production Cums

Oil: 2.3337e+06 m3

Gas: 0 E6m3

Water: 1.71153e+07 m3

Cond: 0 m3

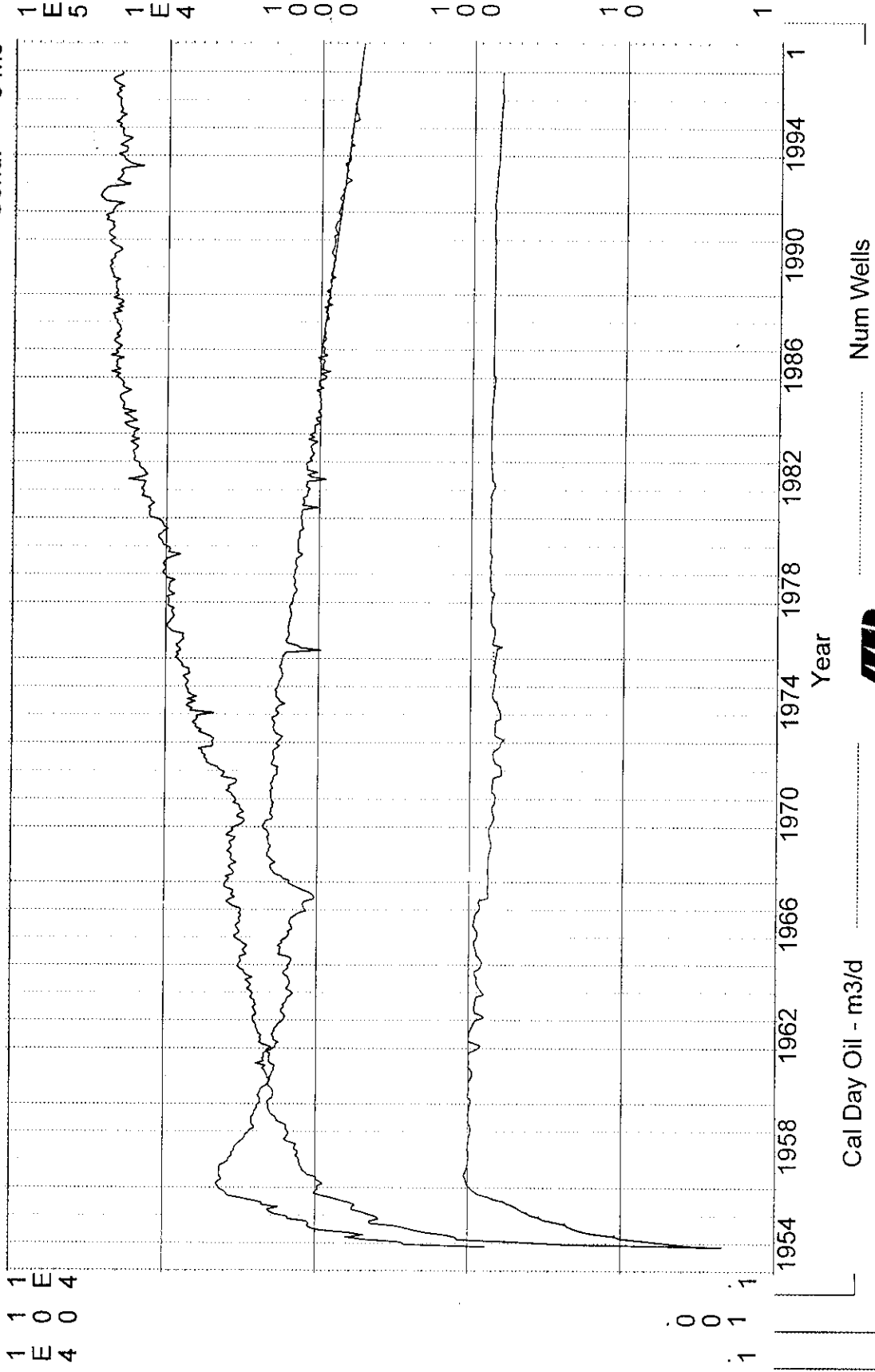


Table 1 Decline Analysis

Viriden Roselea Unit No. 1 - Decline Analysis				Viriden Roselea Unit No. 2 - Decline Analysis				Viriden Roselea Unit No. 3 - Decline Analysis			
Actual Average 1996 Production - 57.8 m3/d				Actual Average 1996 Production - 27.5 m3/d				Actual Average 1996 Production - 57.3 m3/d			
Actual Production May/97 - 56.2 m3/d				Actual Production May/97 - 26.0 m3/d				Actual Production May/97 - 53.9 m3/d			
Evaluation Period	Decline Rate	Predicted 1996 Aver. Production (m3/d)	Predicted May/97 Production (m3/d)	Evaluation Period	Decline Rate	Predicted 1996 Aver. Production (m3/d)	Predicted May/97 Production (m3/d)	Evaluation Period	Decline Rate	Predicted 1996 Aver. Production (m3/d)	Predicted May/97 Production (m3/d)
Nov/79 - Dec/96	5.79%	62.3	59.3	Jan/79 - Dec/96	5.71%	27.1	25.8	Aug/76 - Dec/96	4.86%	59.0	56.6
Dec/82 - Dec/96	6.14%	61.3	58.1	Jan/83 - Dec/96	5.57%	27.3	26.0	Sep/83 - Dec/96	4.87%	58.8	56.4
Oct/87 - Dec/96	7.11%	59.4	55.7	Jul/87 - Dec/96	6.05%	26.8	25.5	Jul/86 - Dec/96	5.42%	57.7	55.1
Jan/89 - Dec/96	7.47%	58.8	55.1	Jul/91 - Dec/96	4.20%	27.7	26.8	May/88 - Dec/96	5.82%	57.2	54.4
Jan/92 - Dec/96	9.01%	57.7	53.2	May/93 - Dec/96	4.35%	27.7	26.7	Jun/90 - Dec/96	6.32%	56.5	53.5
Dec/92 - Dec/96	9.79%	57.1	52.3	Sep/94 - Dec/96	6.76%	27.5	25.9	Dec/91 - Dec/96	5.97%	56.8	53.9
Jan/94 - Dec/96	9.43%	57.1	52.4					Jan/93 - Dec/96	5.28%	57.2	54.7
Sep/94 - Dec/96	7.14%	57.6	54.1					Jan/94 - Dec/96	5.37%	57.1	54.6
Jan/95 - Dec/96	4.07%	58.0	56.1								

Table 2 Comparison of Actual vs Predicted Production for 1997

Viriden Roselea Unit No. 1 - 6.14% p.a. Decline					Viriden Roselea Unit No. 1 - 7.11% p.a. decline					Viriden Roselea Unit No. 1 - 9.79% p.a. decline				
Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)		Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)		Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)	
January	57.47	59.36	-1.89		January	57.47	57.19	0.28		January	57.47	54.17	3.3	
February	56.69	59.05	-2.36		February	56.69	56.84	-0.15		February	56.69	53.71	2.98	
March	56.43	58.74	-2.31		March	56.43	56.49	-0.06		March	56.43	53.25	3.18	
April	54.7	58.43	-3.73		April	54.7	56.15	-1.45		April	54.7	52.8	1.9	
May	56.21	58.12	-1.91		May	56.21	55.8	0.41		May	56.21	52.34	3.87	

Table 2 Comparison of Actual vs Predicted Production for 1997 - Continued

Virden Roselea Unit No.2				Virden Roselea Unit No.3			
Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)	Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)
January	26.08	26.27	-0.19	January	55.91	56.16	-0.25
February	25.93	26.15	-0.22	February	55.38	55.90	-0.52
March	25.83	26.02	-0.19	March	54.66	55.64	-0.98
April	25.06	25.89	-0.83	April	54.97	55.39	-0.42
May	26.02	25.76	0.26	May	53.9	55.13	-1.23



# Manitoba

## Action/Route Slip

**DATE:** September 4, 1997

**TO:** Bob Dubreuil

**FROM:** John Fox

**Telephone:** 945-6574

---

**SUBJECT:** Application for New Oil Status  
Virden Roselea Unit No.'s 1, 2 & 3

---

Chevron Canada Resources, unit operator of Virden Roselea Unit No.'s 1, 2, & 3, has applied for new oil status (June 26, 1997) for the subject units based on establishment of a historical production decline.

### Recommendations

It is recommended that Chevron be advised of the Branch's preliminary decline curve analysis for the units and asked for its comments.

### Discussion

Chevron plans to carry out the following waterflood modifications in the three units between Jul/97 - Sep/97:

- injector profile modification
- producer/injector stimulations
- pattern balancing
- injector conversions
- horizontal drilling (producers/injectors)
- facility modifications for water handling/allocation

The plans outlined by Chevron appear to be in the preliminary stage with the locations of the proposed work listed as "To Be Announced". Chevron has requested a June 1, 1997 start date for new oil status. Chevron's proposed start date is retroactive to the date the application was received by the Branch (July 9, 1997) and a month before any of the proposed water

modifications were scheduled. A more reasonable start date is July 1 or August 1 depending on when Chevron commenced its proposed waterflood modifications. It is recommended that the Branch request Chevron provide an update of its proposed water modifications and indicate that an effective date for new oil status will be established to coincide with the implementation of the waterflood modifications.

## **Decline Analysis**

In an effort to balance injection volumes and reduce water handling Chevron reduced injection into the three units between 1990 - 1996 by 34.1%, from an average of  $109.7 \times 10^3 \text{ m}^3/\text{mon}$  to  $72.2 \times 10^3 \text{ m}^3/\text{mon}$ . The reduced injection had a negative impact on production with the aggregate decline rate for the three units increasing from 4.48% p.a. (1985-1990) to 6.98% p.a. (1990-1996).

Chevron acknowledged in the application that its pattern balancing scheme, which resulted in the voidage-replacement ratio (VRR) in VRU No.'s 1 & 3 dropping below 1.0, has had an adverse impact on waterflood performance and reserves recovery.

The Branch's determination of an appropriate historical decline for each unit has been complicated by the accelerated decline experienced by some of the units since 1990. The Branch used the following methodology to determine the historical production decline for each unit:

(1) For each unit the decline rate was analyzed over a number of different time frames, all ending December 31, 1996. The results of this analysis are tabulated in Table 1. Despite both the Branch and Chevron using Merak's software for decline curve analysis, the Branch cannot duplicate Chevron's analysis. It appears Chevron has used slightly different production data and may have mixed up the VRU No. 1 & 3 data.

(2) A comparison was made between production on a calendar day vs operating day to determine which rate should be used to determine the historical decline rates. A significant amount of well downtime could affect decline analysis done using calendar day production. Between 1994-1996, the ratio of calendar to operating day production was determined for each unit:

- VRU No. 1 - 98.1%
- VRU No. 2 - 99.2%
- VRU No. 3 - 99.3%

The high percentage of calendar day to operating day production for each unit indicates there is minimal well downtime and supports decline analysis done based on calendar day production.

(3) For each unit the most representative historical production decline was chosen. The Branch's predicted vs actual unit production was compared for Jan/97 - May/97 for each unit. During this period no waterflood modifications were completed and the appropriate historical decline should yield little or no new oil. The comparison of actual vs predicted production for 1997 is shown in Table 2.

### **VRU No. 1**

VRU No.1 is the unit that has been most dramatically effected by reduced injection volumes. Since 1992 injection volumes into VRU No. 1 have been reduced by 57.8%, from 47.4  $10^3 \text{ m}^3/\text{mon}$  to 20.0  $10^3 \text{ m}^3/\text{mon}$ . Excluding the 12 infills drilled in 1991 and 1994, the producing well count has dropped 13.3% from 60 wells in 1991 to 52 wells in 1996. The 12 infill wells currently account for 23.2% of the unit production and have been excluded from the decline analysis because they qualify as new oil wells.

Chevron has proposed a historical decline of 6.6% p.a. based on unit performance between Dec/92 - Jan/97. For the same period the Branch has calculated a decline of 9.79% p.a. Chevron's analysis appears to be incorrect and the company may have mixed up the VRU No. 1 and VRU No. 3 data. As shown on Figure 1, the historical decline of 9.79% p.a. significantly underestimates production for the 2nd half of 1996 and 1st five months of 1997. The average production for the 1st five months of 1997 is slightly higher than the same period in 1996. The Branch believes the decline between Oct/87 - Dec/96 of 7.11% p.a. is more representative of historical unit performance than the accelerated decline since 1992 resulting from the reduction in injection, especially in light of the moderation in decline since mid-1996. As shown on Table 2 the Branch's decline rate of 7.11% p.a. would have resulted in Chevron only receiving new oil status for 0.26  $\text{m}^3/\text{d}$  in May/97.

### **VRU No. 2**

Chevron has proposed a historical decline of 5.9% p.a. based on unit performance between Jan/79 - Jan/97. For the same period the Branch has calculated a decline of 5.71% p.a. As shown on Figure 2, this historical decline appears to slightly underestimate production for the period Oct/94 - Jun/96 but overall is representative of the unit performance. As shown on Table 2 the Branch's decline rate of 5.71% p.a. would have resulted in Chevron only receiving new oil status for 0.28  $\text{m}^3/\text{d}$  in Jan/97 and 0.41  $\text{m}^3/\text{d}$  in May/97.

### **VRU No. 3**

Chevron has proposed a historical decline of 8.8% p.a. based on unit performance between Jan/94 - Jan/97. For the same period the Branch has calculated a decline of 5.37% p.a. Using a longer period, Jul/86 - Jan/97, the Branch has calculated an almost identical decline rate of 5.42%. As shown on Figure 3, the Branch's historical decline of 5.42% p.a. is representative of

the unit performance. Chevron's analysis appears to be incorrect and the company may have mixed up the VRU No. 1 and VRU No. 3 data. As shown on Table 2 the Branch's decline rate of 5.42% p.a. would have resulted in Chevron not receiving new oil status for any production through May/97.

### Summary

The following table compares Chevron's and the Branch's proposed historical production declines be used to determine new oil in the three units:

Unit	Chevron's Historical Decline	Chevron's Analysis Period	Branch's Historical Decline	Branch's Analysis Period
VRU No. 1	6.6% p.a.	Dec/92 - Jan/97	7.11% p.a.	Oct/87 - Dec/96
VRU No. 2	5.9% p.a.	Jan/79 - Jan/97	5.71% p.a.	Jan/79 - Dec/96
VRU No. 3	8.8% p.a.	Jan/94 - Jan/97	5.42% p.a.	Jul/86 - Dec/96

# VRU No. 1 Old Oil Wells Data 01/54-12/96

Historical Production (Rate-Time)

qi: 113.798 m3/d, Oct, 1987

qf: 0.0765644 m3/d, Oct, 2086

di(Exp): 7.10647 CTD: 2.36344e+06 m3

RR: 284545 m3 Tot: 2.64798e+06 m3

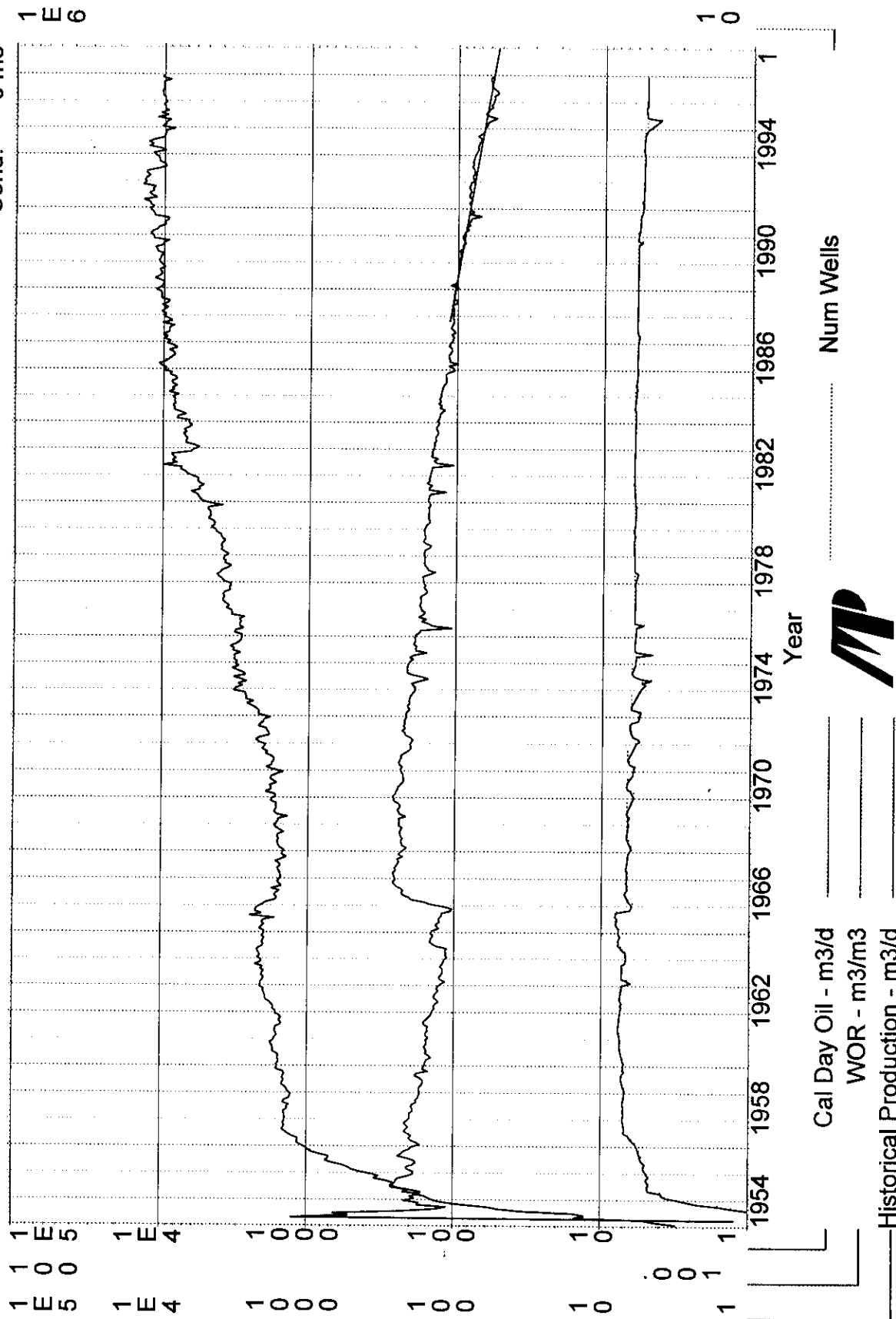
Production Cums

Oil: 2.36343e+06 m3

Gas: 0 E6m3

Water: 9.12296e+06 m3

Cond: 0 m3



Historical Production (Rate-Time)

qi: 76.1061 m3/d, Jan, 1979

qf: 1.58783 m3/d, Sep, 2044

di(Exp): 5.71179 CTD: 992319 m3

RR: 153976 m3 Tot: 1.14629e+06 m3

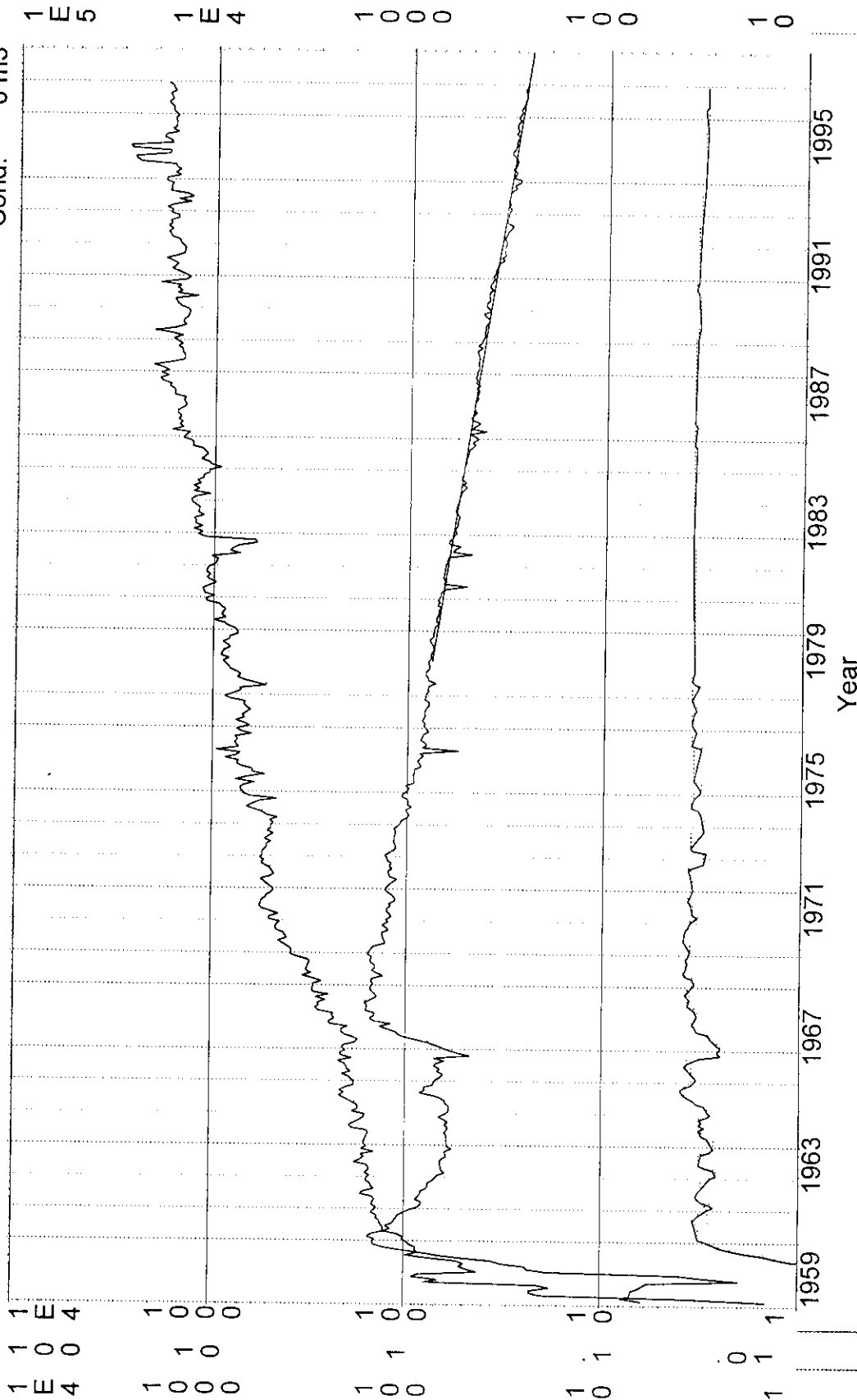
Production Cums

Oil: 992319 m3

Gas: 0 E6m3

Water: 6.74332e+06 m3

Cond: 0 m3



Cal Day Oil - m3/d

WOR - m3/m3

Historical Production - m3/d

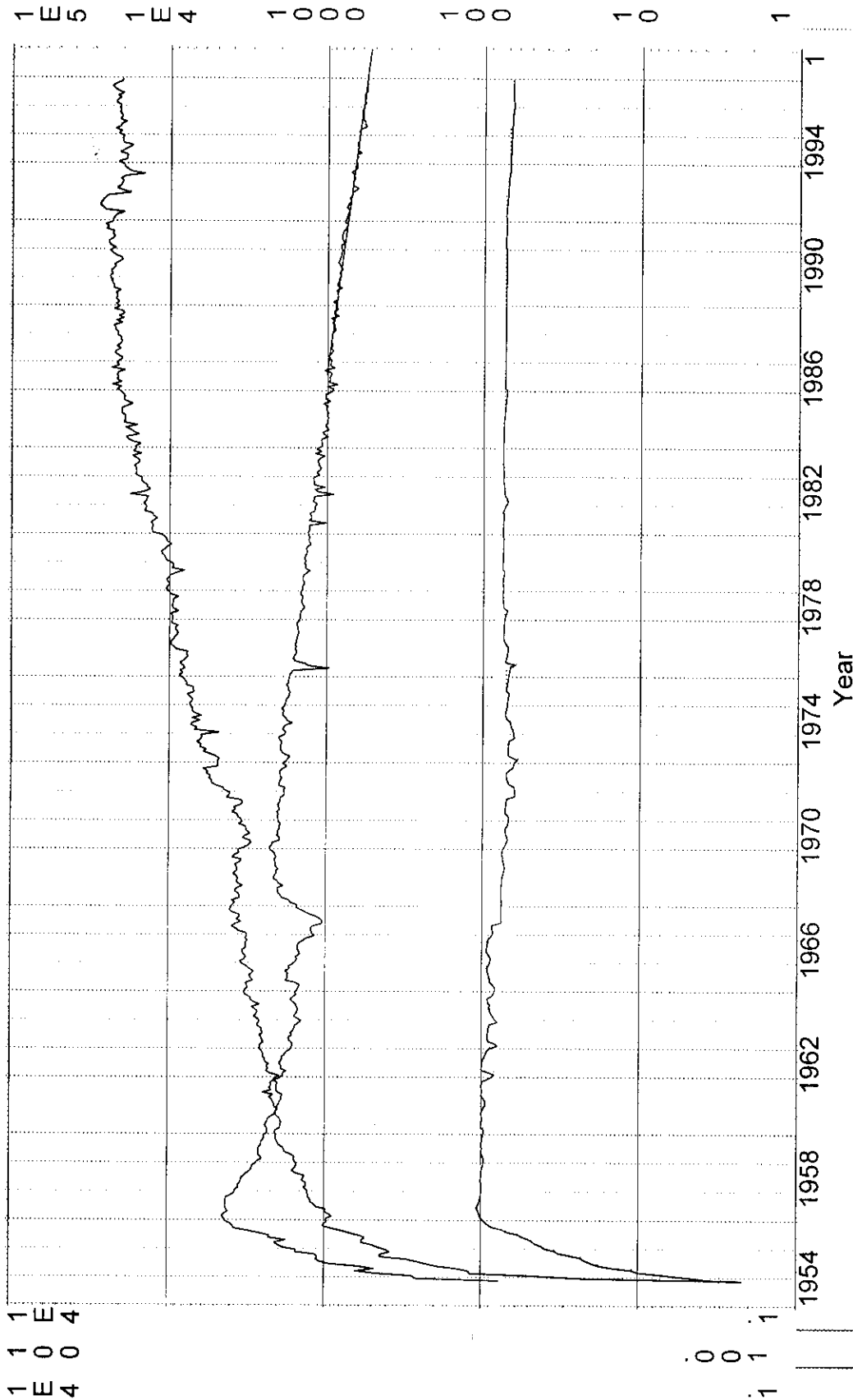
Num Wells



# Historical Production (Rate-Time)

qi: 101.248 m3/d, Jul, 1986  
 qf: 2.18143 m3/d, May, 2055  
 di(Exp): 5.41625 CTD: 2.3337e+06 m3  
 RR: 355544 m3 Tot: 2.68925e+06 m3

Production Cums  
 Oil: 2.3337e+06 m3  
 Gas: 0 E6m3  
 Water: 1.71153e+07 m3  
 Cond: 0 m3



Num Wells



Cal Day Oil - m3/d

WOR - m3/m3

Historical Production - m3/d

Table 1 Decline Analysis

Viriden Roselea Unit No. 1 - Decline Analysis				Viriden Roselea Unit No. 2 - Decline Analysis				Viriden Roselea Unit No. 3 - Decline Analysis			
Actual Average 1996 Production - 57.8 m3/d Actual Production May/97 - 56.2 m3/d				Actual Average 1996 Production - 27.5 m3/d Actual Production May/97 - 26.0 m3/d				Actual Average 1996 Production - 57.3 m3/d Actual Production May/97 - 53.9 m3/d			
Evaluation Period	Decline Rate	Predicted 1996 Aver. Production (m3/d)	Predicted May/97 Production (m3/d)	Evaluation Period	Decline Rate	Predicted 1996 Aver. Production (m3/d)	Predicted May/97 Production (m3/d)	Evaluation Period	Decline Rate	Predicted 1996 Aver. Production (m3/d)	Predicted May/97 Production (m3/d)
Nov/79 - Dec/96	5.79%	62.3	59.3	Jan/79 - Dec/96	5.71%	27.1	25.8	Aug/76 - Dec/96	4.86%	59.0	56.6
Dec/82 - Dec/96	6.14%	61.3	58.1	Jan/83 - Dec/96	5.57%	27.3	26.0	Sep/83 - Dec/96	4.87%	58.8	56.4
Oct/87 - Dec/96	7.11%	59.4	55.7	Jul/87 - Dec/96	6.05%	26.8	25.5	Jul/86 - Dec/96	5.42%	57.7	55.1
Jan/89 - Dec/96	7.47%	58.8	55.1	Jul/91 - Dec/96	4.20%	27.7	26.8	May/88 - Dec/96	5.82%	57.2	54.4
Jan/92 - Dec/96	9.01%	57.7	53.2	May/93 - Dec/96	4.35%	27.7	26.7	Jun/90 - Dec/96	6.32%	56.5	53.5
Dec/92 - Dec/96	9.79%	57.1	52.3	Sep/94 - Dec/96	6.76%	27.5	25.9	Dec/91 - Dec/96	5.97%	56.8	53.9
Jan/94 - Dec/96	9.43%	57.1	52.4					Jan/93 - Dec/96	5.28%	57.2	54.7
Sep/94 - Dec/96	7.14%	57.6	54.1					Jan/94 - Dec/96	5.37%	57.1	54.6
Jan/95 - Dec/96	4.07%	58.0	56.1								



Table 2 Comparison of Actual vs Predicted Production for 1997

Viriden Roselea Unit No. 1 – 6.14% p.a. Decline					Viriden Roselea Unit No. 1 – 7.11% p.a. decline					Viriden Roselea Unit No. 1 – 9.79% p.a. decline				
Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)		Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)		Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)	
January	57.47	59.36	-1.89		January	57.47	57.19	0.28		January	57.47	54.17	3.3	
February	56.69	59.05	-2.36		February	56.69	56.84	-0.15		February	56.69	53.71	2.98	
March	56.43	58.74	-2.31		March	56.43	56.49	-0.06		March	56.43	53.25	3.18	
April	54.7	58.43	-3.73		April	54.7	56.15	-1.45		April	54.7	52.8	1.9	
May	56.21	58.12	-1.91		May	56.21	55.8	0.41		May	56.21	52.34	3.87	

Table 2 Comparison of Actual vs Predicted Production for 1997 - Continued

Virden Roselea Unit No.2				Virden Roselea Unit No.3			
Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)	Month	Actual Production (m3/d)	Predicted Production (m3/d)	New Oil (m3/d)
January	26.08	26.27	-0.19	January	55.91	56.16	-0.25
February	25.93	26.15	-0.22	February	55.38	55.90	-0.52
March	25.83	26.02	-0.19	March	54.66	55.64	-0.98
April	25.06	25.89	-0.83	April	54.97	55.39	-0.42
May	26.02	25.76	0.26	May	53.9	55.13	-1.23



September 4, 1997

Mr. Joe Taylor  
Petroleum Engineer  
Chevron Canada Resources  
Box 100  
Virden MB R0M 1P0

Dear Mr. Taylor:

**Re: Virden Roselea Unit No.'s 1, 2 & 3  
New Oil Status**

The Branch has completed a preliminary review of your application for new oil status in VRU No.'s 1, 2 & 3 based on establishment of a historical production decline for each unit.

The Branch has determined proposed historical production declines that differ from those proposed by Chevron for each unit, with the exception of VRU No. 2. The table below compares the Branch's and Chevron's proposed decline rates:

Unit	Chevron's Historical Decline	Chevron's Analysis Period	Branch's Historical Decline	Branch's Analysis Period
VRU No. 1	6.6% p.a.	Dec/92 - Jan/97	7.11% p.a.	Oct/87 - Dec/96
VRU No. 2	5.9% p.a.	Jan/79 - Jan/97	5.71% p.a.	Jan/79 - Dec/96
VRU No. 3	8.8% p.a.	Jan/94 - Jan/97	5.42% p.a.	Jul/86 - Dec/96

The purpose of the historical production decline for each unit is to establish a baseline for determination of incremental recoverable reserves resulting from waterflood modifications. Between 1990 - 1996 Chevron reduced injection into the three units by 34.1%, from an average of  $109.7 \times 10^3 \text{ m}^3/\text{mon}$  to  $72.2 \times 10^3 \text{ m}^3/\text{mon}$ . The reduced injection, as acknowledged by Chevron, has had a negative impact on production with the aggregate decline rate for the three units increasing from 4.48% p.a. (1985-1990) to 6.98% p.a. (1990-1996). In establishing the historical production decline rate for each unit the Branch attempted to balanced current and pre-1990 unit performance.

For each unit the decline rate was analyzed over a number of different time frames, all ending December 31, 1996. The results of this analysis are tabulated in Table 1. Despite both the

Branch and Chevron using Merak's software for decline curve analysis, the Branch cannot duplicate Chevron's analysis. It appears the Branch's and Chevron's unit production data is slightly different. The Branch's production data has been verified against our historical records. It also appears that Chevron's production data for VRU No.'s 1 & 3 may be reversed.

For each unit the Branch chose what it believes to be the most representative historical production decline. Longer decline periods, in excess of 10 years, were selected. By comparison Chevron chose decline periods of less than 5 years, except in VRU No. 2. The Branch compared unit production predicted using our proposed historical decline, to actual unit production, for the period Jan/97 - May/97. During this period it is assumed no waterflood modifications were completed and the appropriate historical decline should yield little or no new oil. The comparison of actual vs predicted production for 1997 is shown in Table 2.

The proposed individual unit decline rates are discussed in the following sections.

### **VRU No. 1**

Chevron has proposed a historical decline of 6.6% p.a. based on unit performance between Dec/92 - Jan/97. For the same period the Branch has calculated a decline of 9.79% p.a. The historical decline of 9.79% p.a. significantly underestimates production for the 2nd half of 1996 and 1st five months of 1997. The Branch believes the decline between Oct/87 - Dec/96 of 7.11% p.a. (see Fig. 1) is more representative of historical unit performance than the accelerated decline since 1992 resulting from the reduction in injection, especially in light of the moderation in decline since mid-1996.

### **VRU No. 2**

Chevron has proposed a historical decline of 5.9% p.a. based on unit performance between Jan/79 - Jan/97. For the same period the Branch has calculated a decline of 5.71% p.a. As shown on Figure 2, this historical decline appears to slightly underestimate production for the period Oct/94 - Jun/96 but overall is representative of the unit performance.

### **VRU No. 3**

Chevron has proposed a historical decline of 8.8% p.a. based on unit performance between Jan/94 - Jan/97. For the same period the Branch has calculated a decline of 5.37% p.a. Using a longer decline period, Jul/86 - Jan/97, the Branch has calculated an almost identical decline rate of 5.42%. As shown on Figure 3, the historical decline of 5.42% p.a. is representative of the unit performance.

Chevron has requested a June 1, 1997 start date for new oil status which is retroactive to the date the application was made. The Branch is prepared to grant new oil status with an effective date to coincide with initiation of the waterflood modifications in each unit and in any event no earlier

than July 1, 1997. Chevron is requested to submit a more detailed update and status of its proposed water modifications in VRU No.'s 1, 2 & 3.

Please provide the Branch with your comments on our proposed decline rates for the units. Your comments will be taken into consideration in determining the final historical decline rates. If you have any questions in respect of this matter please contact the undersigned at (204) 945-6574.

Yours truly,

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

cc. Carol Martiniuk

# FAX

Date 23-OCT-97

Number of pages including cover sheet 8

TO: JOE TAYLOR  
CHEVRON CANADA

Phone

Fax Phone (403) 234-5124

CC:

FROM: John Fox, P.Eng.  
Manitoba Energy & Mines  
Petroleum & Energy Branch  
360, 1395 Ellice Avenue  
Winnipeg MB R3G 2P3

Phone 945-6574

Fax Phone 945-0586

e-mail jfox@em.gov.mb.ca

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please Comment

LIST OF PRODUCING WELLS FOR YIRDEN ROSELEA  
UNIT NO'S 1, 2 & 3. CALL ME IF YOU HAVE  
ANY QUESTIONS.

Well Identifier	Well Name	Type	Data From
Group: VRU No. 1 (excluding new well)			
000000218	VRU No. 1 Old Oil Wells		5401-9
00/01-30-010-25W1/0	Placer Virden 01-30-10-25W1		5607-9
00/02-30-010-25W1/0	Placer Virden 02-30-10-25W1		5506-9
00/03-30-010-25W1/0	Placer Virden 03-30-10-25W1		5502-9
00/04-30-010-25W1/0	Placer Virden 04-30-10-25W1		5501-9
00/06-30-010-25W1/0	Placer Virden 06-30-10-25W1		5501-9
00/08-30-010-25W1/0	Placer Virden 08-30-10-25W1		5601-9
00/10-30-010-25W1/0	Placer Virden 10-30-10-25W1		5505-9
00/11-30-010-25W1/0	Placer Virden 11-30-10-25W1		5502-9
00/12-30-010-25W1/0	Placer Virden 12-30-10-25W1		5412-9
00/05-30-010-25W1/0	Placer Virden WIW 05-30-10-25W1		5411-9
00/07-30-010-25W1/0	Placer Virden WIW 07-30-10-25W1		5502-9
00/13-19-010-25W1/0	Bracell East Virden 13-19-10-25W1		6501-7
00/09-19-010-25W1/0	CEGO Basco Virden 09-19-10-25W1		5703-6
00/16-19-010-25W1/0	CEGO Basco Virden 16-19-10-25W1		5612-6
00/02-28-010-25W1/0	Chevron East Virden 02-28-10-25W1		6607-9
00/01-29-010-25W1/0	Chevron East Virden Prov. 01-29-10-25W1		5707-9
00/02-29-010-25W1/0	Chevron East Virden Prov. 02-29-10-25W1		5706-9
00/03-28-010-25W1/0	Chevron East Virden Prov. 03-28-10-25W1		6603-9
00/03-29-010-25W1/0	Chevron East Virden Prov. 03-29-10-25W1		5707-8
00/04-28-010-25W1/0	Chevron East Virden Prov. 04-28-10-25W1		5707-9
00/06-29-010-25W1/0	Chevron East Virden Prov. 06-29-10-25W1		5702-9
00/08-29-010-25W1/0	Chevron East Virden Prov. 08-29-10-25W1		5708-9
00/10-29-010-25W1/0	Chevron East Virden Prov. 10-29-10-25W1		6605-9
00/11-29-010-25W1/0	Chevron East Virden Prov. 11-29-10-25W1		6508-9
00/12-29-010-25W1/0	Chevron East Virden Prov. 12-29-10-25W1		5706-9
00/05-28-010-25W1/0	Chevron East Virden Prov. WIW 05-28-10-2		5707-9
00/05-29-010-25W1/0	Chevron East Virden Prov. WIW 05-29-10-2		5704-9
00/01-26-010-26W1/0	Chevron Virden 01-26-10-26W1		5404-9
00/03-25-010-26W1/0	Chevron Virden 03-25-10-26W1		5407-9
00/04-25-010-26W1/0	Chevron Virden 04-25-10-26W1		5407-9
00/04-26-010-26W1/0	Chevron Virden 04-26-10-26W1		5403-9
00/06-25-010-26W1/0	Chevron Virden 06-25-10-26W1		5408-9
00/06-26-010-26W1/0	Chevron Virden 06-26-10-26W1		5505-7
00/07-26-010-26W1/0	Chevron Virden 07-26-10-26W1		5504-6
00/08-20-010-25W1/0	Chevron Virden 08-20-10-25W1		6006-6
00/08-26-010-26W1/0	Chevron Virden 08-26-10-26W1		5504-9
00/09-24-010-26W1/0	Chevron Virden 09-24-10-26W1		5610-7
00/10-20-010-25W1/0	Chevron Virden 10-20-10-25W1		6703-8
00/10-24-010-26W1/0	Chevron Virden 10-24-10-26W1		5610-7
00/11-24-010-26W1/0	Chevron Virden 11-24-10-26W1		5502-9
00/12-24-010-26W1/0	Chevron Virden 12-24-10-26W1		5407-9
00/12-25-010-26W1/0	Chevron Virden 12-25-10-26W1		5502-9
00/14-21-010-25W1/0	Chevron Virden 14-21-10-25W1		6412-9
00/14-24-010-26W1/0	Chevron Virden 14-24-10-26W1		5412-9
00/14-25-010-26W1/0	Chevron Virden 14-25-10-26W1		5502-9
00/16-20-010-25W1/0	Chevron Virden 16-20-10-25W1		5908-9
00/16-24-010-26W1/0	Chevron Virden 16-24-10-26W1		5412-9
00/01-25-010-26W1/0	Chevron Virden CPR 01-25-10-26W1		5501-9
00/02-25-010-26W1/0	Chevron Virden CPR 02-25-10-26W1		5409-9

00/08-25-010-26W1/0	Chevron Virden CPR 08-25-10-26W1	5410-9
00/08-25-010-26W1/0	Chevron Virden CPR 09-25-10-26W1	5411-9
00/10-25-010-26W1/0	Chevron Virden CPR 10-25-10-26W1	5410-9
00/16-25-010-26W1/0	Chevron Virden CPR 16-25-10-26W1	5412-9
00/07-25-010-26W1/0	Chevron Virden CPR WIW 07-25-10-26W1	5409-9
00/15-25-010-26W1/0	Chevron Virden CPR WIW 15-25-10-26W1	5501-9
00/04-29-010-25W1/0	Chevron Virden Prov. A04-29-10-25W1	5703-9
00/07-29-010-25W1/0	Chevron Virden Prov. WIW 07-29-10-25W1	5702-9
00/03-26-010-26W1/0	Chevron Virden WIW 03-26-10-26W1	5505-9
00/05-25-010-26W1/0	Chevron Virden WIW 05-25-10-26W1	5503-9
00/09-20-010-25W1/0	Chevron Virden WIW 09-20-10-25W1	5912-9
00/11-21-010-25W1/0	Chevron Virden WIW 11-21-10-25W1	6009-9
00/11-25-010-26W1/0	Chevron Virden WIW 11-25-10-26W1	5411-9
00/13-21-010-25W1/0	Chevron Virden WIW 13-21-10-25W1	6006-9
00/13-24-010-26W1/0	Chevron Virden WIW 13-24-10-26W1	5404-9
00/13-25-010-26W1/0	Chevron Virden WIW 13-25-10-26W1	5505-9
00/15-20-010-25W1/0	Chevron Virden WIW 15-20-10-25W1	5907-9
00/15-24-010-26W1/0	Chevron Virden WIW 15-24-10-26W1	5411-9
00/12-21-010-25W1/0	Chevron et al Virden 12-21-10-25W1	6003-9
00/07-21-010-25W1/0	Frontenac Read Virden 07-21-10-25W1	6105-9
00/05-21-010-25W1/0	Frontenac Sun Virden 05-21-10-25W1	6201-7
00/06-21-010-25W1/0	Frontenac Sun Virden 06-21-10-25W1	6102-9
00/10-21-010-25W1/0	Frontenac Sun Virden 10-21-10-25W1	6011-9
00/15-21-010-25W1/0	Frontenac Sun Virden 15-21-10-25W1	6508-6
00/01-36-010-26W1/0	K & N Virden 01-36-10-26W1	5711-9
02/09-19-010-25W1/0	Murphy Virden A09-19-10-25W1	6602-9
02/16-19-010-25W1/0	Murphy Virden A16-19-10-25W1	6412-9
00/09-26-010-26W1/0	Rundle Grasby Virden 09-26-10-26W1	5503-9
00/10-26-010-26W1/0	Rundle Grasby Virden 10-26-10-26W1	5503-9
00/15-26-010-26W1/0	Rundle Grasby Virden 15-26-10-26W1	5505-9
00/16-26-010-26W1/0	Rundle Grasby Virden 16-26-10-26W1	5503-6
00/02-36-010-26W1/0	Shannon Virden 02-36-10-26W1	5510-9
00/11-20-010-25W1/0	Sun M. Welch Virden 11-20-10-25W1	5706-9
00/14-20-010-25W1/0	Sun M. Welch Virden 14-20-10-25W1	5703-8
00/12-20-010-25W1/0	Sun M. Welch Virden SWD 12-20-10-25W1	5705-6
00/13-20-010-25W1/0	Sun M. Welch Virden WIW 13-20-10-25W1	5612-9
00/09-23-010-26W1/0	Teck Hepburn Virden 09-23-10-26W1	5411-9
00/10-23-010-26W1/0	Teck Hepburn Virden 10-23-10-26W1	5409-9
00/11-23-010-26W1/0	Teck Hepburn Virden 11-23-10-26W1	5408-9
00/13-23-010-26W1/0	Teck Hepburn Virden 13-23-10-26W1	5407-9
00/14-23-010-26W1/0	Teck Hepburn Virden 14-23-10-26W1	5410-9
00/16-23-010-26W1/0	Teck Hepburn Virden 16-23-10-26W1	5401-9
00/15-23-010-26W1/0	Teck Hepburn Virden WIW 15-23-10-26W1	5411-9
00/09-30-010-25W1/0	Virden Roselea Unit No. 1 WIW 09-30-10-2	5601-9
00/15-30-010-25W1/0	Virden Roselea Unit No. 1 WIW 15-30-10-2	5603-9



Well Identifier	Well Name	Type	Data From
Group: VRU No. 2			
000000210	VRU No. 2		5902-9
00/05-07-011-25W1/0	Chevron Bralorne Virden 05-07-11-25W1		6810-9
00/06-07-011-25W1/0	Chevron Bralorne Virden 06-07-11-25W1		7111-9
00/07-12-011-26W1/0	Chevron Bralorne Virden 07-12-11-26W1		7109-9
00/08-12-011-26W1/0	Chevron Bralorne Virden 08-12-11-26W1		6806-9
00/01-12-011-26W1/0	Chevron Virden 01-12-11-26W1		6708-9
00/03-06-011-25W1/0	Chevron Virden 03-06-11-25W1		6005-9
00/03-08-011-25W1/0	Chevron Virden 03-08-11-25W1		6506-7
00/05-05-011-25W1/0	Chevron Virden 05-05-11-25W1		6011-9
00/05-06-011-25W1/0	Chevron Virden 05-06-11-25W1		6006-9
00/06-06-011-25W1/0	Chevron Virden 06-06-11-25W1		6006-9
00/07-05-011-25W1/0	Chevron Virden 07-05-11-25W1		6609-6
00/09-01-011-26W1/0	Chevron Virden 09-01-11-26W1		6707-9
00/09-05-011-25W1/0	Chevron Virden 09-05-11-25W1		6510-9
00/10-01-011-26W1/0	Chevron Virden 10-01-11-26W1		6810-9
00/14-36-010-26W1/0	Chevron Virden 14-36-10-26W1		6003-7
00/15-01-011-26W1/0	Chevron Virden 15-01-11-26W1		6711-9
00/15-05-011-25W1/0	Chevron Virden 15-05-11-25W1		6507-9
00/16-01-011-26W1/0	Chevron Virden 16-01-11-26W1		6708-9
00/16-05-011-25W1/0	Chevron Virden 16-05-11-25W1		6510-9
00/01-06-011-25W1/0	Chevron Virden Prov. 01-06-11-25W1		6007-9
00/07-06-011-25W1/0	Chevron Virden Prov. 07-06-11-25W1		6007-9
00/09-06-011-25W1/0	Chevron Virden Prov. 09-06-11-25W1		6010-9
00/09-36-010-26W1/0	Chevron Virden Prov. 09-36-10-26W1		6008-9
00/11-05-011-25W1/0	Chevron Virden Prov. 11-05-11-25W1		6502-9
00/11-06-011-25W1/0	Chevron Virden Prov. 11-06-11-25W1		6009-9
00/13-05-011-25W1/0	Chevron Virden Prov. 13-05-11-25W1		6012-9
00/13-06-011-25W1/0	Chevron Virden Prov. 13-06-11-25W1		6708-9
00/15-06-011-25W1/0	Chevron Virden Prov. 15-06-11-25W1		6011-9
00/15-36-010-26W1/0	Chevron Virden Prov. 15-36-10-26W1		6001-9
00/16-36-010-26W1/0	Chevron Virden Prov. 16-36-10-26W1		6008-9
00/02-06-011-25W1/0	Chevron Virden Prov. WIW 02-06-11-25W1		6004-9
00/08-06-011-25W1/0	Chevron Virden Prov. WIW 08-06-11-25W1		6010-9
00/10-06-011-25W1/0	Chevron Virden Prov. WIW 10-06-11-25W1		6009-9
00/10-36-010-26W1/0	Chevron Virden Prov. WIW 10-36-10-26W1		5912-9
00/12-05-011-25W1/0	Chevron Virden Prov. WIW 12-05-11-25W1		6011-9
00/12-06-011-25W1/0	Chevron Virden Prov. WIW 12-06-11-25W1		6703-9
00/14-05-011-25W1/0	Chevron Virden Prov. WIW 14-05-11-25W1		6411-9
00/14-06-011-25W1/0	Chevron Virden Prov. WIW 14-06-11-25W1		6009-9
00/16-06-011-25W1/0	Chevron Virden Prov. WIW 16-06-11-25W1		6012-9
00/04-05-011-25W1/0	Chevron Virden WIW 04-05-11-25W1		6010-9
00/04-08-011-25W1/0	Chevron Virden WIW 04-08-11-25W1		6101-9
00/10-05-011-25W1/0	Chevron Virden WIW 10-05-11-25W1		6508-9
00/08-01-011-26W1/0	Chevron et al Virden 08-01-11-26W1		6806-9
00/13-31-010-25W1/0	Continental Virden 13-31-10-25W1		6009-9
00/12-31-010-25W1/0	Continental Virden WIW 12-31-10-25W1		6102-9
00/07-36-010-26W1/0	K & N Virden 07-36-10-26W1		5902-9
00/08-36-010-26W1/0	K & N Virden SWD 08-36-10-26W1		6109-6
00/01-07-011-25W1/0	Murphy Virden 01-07-11-25W1		6102-9
00/03-07-011-25W1/0	Murphy Virden 03-07-11-25W1		6006-9

00/05-31-010-25W1/0	Murphy Virden 05-31-10-25W1	6106-9
00/06-36-010-26W1/0	Murphy Virden 06-36-10-26W1	6612-9
00/02-07-011-25W1/0	Murphy Virden WIW 02-07-11-25W1	6102-9
00/04-07-011-25W1/0	Murphy Virden WIW 04-07-11-25W1	6006-9
00/11-36-010-26W1/0	Shannon Virden 11-36-10-26W1	6006-9
00/12-36-010-26W1/0	Shannon Virden 12-36-10-26W1	6007-9

Well Identifier	Well Name	Type	Data From
Group: VRU No. 3			
000000211	VRU No. 3		5411-9
00/01-13-010-26W1/0	Placer Virden 01-13-10-26W1		5512-9
00/02-01-010-26W1/0	Placer Virden 02-01-10-26W1		5610-9
00/02-14-010-26W1/0	Placer Virden 02-14-10-26W1		5604-9
00/04-13-010-26W1/0	Placer Virden 04-13-10-26W1		5603-9
00/05-13-010-26W1/0	Placer Virden 05-13-10-26W1		5511-9
00/07-01-010-26W1/0	Placer Virden 07-01-10-26W1		5610-9
00/07-13-010-26W1/0	Placer Virden 07-13-10-26W1		5505-9
00/08-13-010-26W1/0	Placer Virden 08-13-10-26W1		5510-9
00/06-13-010-26W1/0	Placer Virden WIW 06-13-10-26W1		5504-9
00/03-13-010-26W1/0	CEGO Virden 03-13-10-26W1		5511-6
00/10-10-010-26W1/0	Cdn. Res. et al Virden 10-10-10-26W1		5611-6
00/09-10-010-26W1/0	Chevron Fargo South Virden 09-10-10-26W1		5611-9
00/16-10-010-26W1/0	Chevron Fargo South Virden 16-10-10-26W1		5610-9
00/03-12-010-26W1/0	Chevron South Virden 03-12-10-26W1		5610-9
00/04-12-010-26W1/0	Chevron South Virden 04-12-10-26W1		5610-9
00/05-02-010-26W1/0	Chevron South Virden 05-02-10-26W1		5702-9
00/05-12-010-26W1/0	Chevron South Virden 05-12-10-26W1		5608-9
00/09-03-010-26W1/0	Chevron South Virden 09-03-10-26W1		5702-9
00/09-12-010-26W1/0	Chevron South Virden 09-12-10-26W1		5610-7
00/11-02-010-26W1/0	Chevron South Virden 11-02-10-26W1		5610-9
00/11-10-010-26W1/0	Chevron South Virden 11-10-10-26W1		5704-9
00/11-12-010-26W1/0	Chevron South Virden 11-12-10-26W1		5610-5
00/12-02-010-26W1/0	Chevron South Virden 12-02-10-26W1		5612-5
00/12-10-010-26W1/0	Chevron South Virden 12-10-10-26W1		5706-9
00/12-12-010-26W1/0	Chevron South Virden 12-12-10-26W1		5609-9
00/13-02-010-26W1/0	Chevron South Virden 13-02-10-26W1		5611-8
00/13-12-010-26W1/0	Chevron South Virden 13-12-10-26W1		5609-9
00/15-03-010-26W1/0	Chevron South Virden 15-03-10-26W1		5701-7
00/15-12-010-26W1/0	Chevron South Virden 15-12-10-26W1		5606-6
00/16-12-010-26W1/0	Chevron South Virden 16-12-10-26W1		5606-6
00/03-01-010-26W1/0	Chevron South Virden CPR 03-01-10-26W1		5702-9
00/05-01-010-26W1/0	Chevron South Virden CPR 05-01-10-26W1		5701-8
00/06-07-010-25W1/0	Chevron South Virden CPR 06-07-10-25W1		5605-6
00/08-07-010-25W1/0	Chevron South Virden CPR 08-07-10-25W1		5602-9
00/09-07-010-25W1/0	Chevron South Virden CPR 09-07-10-25W1		5604-9
00/11-01-010-26W1/0	Chevron South Virden CPR 11-01-10-26W1		5609-9
00/11-07-010-25W1/0	Chevron South Virden CPR 11-07-10-25W1		5511-9
00/12-01-010-26W1/0	Chevron South Virden CPR 12-01-10-26W1		5612-9
00/13-01-010-26W1/0	Chevron South Virden CPR 13-01-10-26W1		5610-9
00/13-07-010-25W1/0	Chevron South Virden CPR 13-07-10-25W1		5510-9
00/15-07-010-25W1/0	Chevron South Virden CPR 15-07-10-25W1		5603-9
00/16-07-010-25W1/0	Chevron South Virden CPR 16-07-10-25W1		5605-9
00/06-01-010-26W1/0	Chevron South Virden CPR WIW 06-01-10-26		5701-9
00/10-07-010-25W1/0	Chevron South Virden CPR WIW 10-07-10-25		5601-9
00/12-07-010-25W1/0	Chevron South Virden CPR WIW 12-07-10-25		5608-9
00/14-01-010-26W1/0	Chevron South Virden CPR WIW 14-01-10-26		5608-9
00/14-07-010-25W1/0	Chevron South Virden CPR WIW 14-07-10-25		5511-9
00/01-10-010-26W1/0	Chevron South Virden Prov. 01-10-10-26W1		5612-9
00/01-11-010-26W1/0	Chevron South Virden Prov. 01-11-10-26W1		5606-9

00/02-10-010-26W1/0	Chevron South Virden Prov. 02-10-10-26W1	5612-9
00/02-11-010-26W1/0	Chevron South Virden Prov. 02-11-10-26W1	5606-5
00/02-18-010-25W1/0	Chevron South Virden Prov. 02-18-10-25W1	5604-5
00/03-11-010-26W1/0	Chevron South Virden Prov. 03-11-10-26W1	5606-8
02/03-11-010-26W1/2	Chevron South Virden Prov. 03A-11-10-26W	7311-9
00/04-11-010-26W1/0	Chevron South Virden Prov. 04-11-10-26W1	5610-9
00/05-11-010-26W1/0	Chevron South Virden Prov. 05-11-10-26W1	5609-9
00/07-02-010-26W1/0	Chevron South Virden Prov. 07-02-10-26W1	5702-9
00/07-10-010-26W1/0	Chevron South Virden Prov. 07-10-10-26W1	5612-9
00/07-11-010-26W1/0	Chevron South Virden Prov. 07-11-10-26W1	5607-9
00/07-18-010-25W1/0	Chevron South Virden Prov. 07-18-10-25W1	6604-9
00/09-11-010-26W1/0	Chevron South Virden Prov. 09-11-10-26W1	5608-9
00/10-11-010-26W1/0	Chevron South Virden Prov. 10-11-10-26W1	5608-9
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00/15-11-010-26W1/0	Chevron South Virden Prov. 15-11-10-26W1	5611-9
00/06-11-010-26W1/0	Chevron South Virden Prov. WIW 06-11-10-	5608-9
00/08-02-010-26W1/0	Chevron South Virden Prov. WIW 08-02-10-	5701-9
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00/16-11-010-26W1/0	Chevron South Virden Prov. WIW 16-11-10-	5610-9
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00/14-02-010-26W1/0	Chevron South Virden WIW 14-02-10-26W1	5607-9
00/14-12-010-26W1/0	Chevron South Virden WIW 14-12-10-26W1	5607-9
00/16-03-010-26W1/0	Chevron South Virden WIW 16-03-10-26W1	5701-9
02/12-13-010-26W1/0	Chevron Virden 12D-13-10-26W1	7402-9
00/15-14-010-26W1/0	Chevron Virden 15-14-10-26W1	5510-9
00/16-14-010-26W1/0	Chevron Virden 16-14-10-26W1	5507-9
03/02-11-010-26W1/0	Chevron Virden Prov. A02-11-10-26W1	6002-9
02/02-18-010-25W1/0	Chevron Virden Prov. WIW A02-18-10-25W1	6606-9
04/02-11-010-26W1/0	Chevron et al Virden Prov. B02-11-10-26W	7304-9
00/02-23-010-26W1/0	Esso Virden 02-23-10-26W1	5505-9
00/04-23-010-26W1/0	Esso Virden 04-23-10-26W1	5411-9
00/05-23-010-26W1/0	Esso Virden 05-23-10-26W1	5411-9
00/06-23-010-26W1/0	Esso Virden 06-23-10-26W1	5411-9
00/07-23-010-26W1/0	Esso Virden 07-23-10-26W1	5502-9
00/03-23-010-26W1/0	Esso Virden WIW 03-23-10-26W1	5503-9
00/06-10-010-26W1/0	Gulf Duncan Virden WIW 06-10-10-26W1	5703-9
00/05-10-010-26W1/0	Gulf Security Duncan Virden 05-10-10-26W	5706-9
00/10-13-010-26W1/0	Gulf Union Welch Virden 10-13-10-26W1	5503-9
00/15-13-010-26W1/0	Gulf Union Welch Virden 15-13-10-26W1	5505-9
00/09-13-010-26W1/0	Gulf Union Welch Virden WIW 09-13-10-26W	5506-9
00/09-02-010-26W1/0	Mineraloid Virden 09-02-10-26W1	5603-9
00/09-15-010-26W1/0	Mineraloid Virden 09-15-10-26W1	5601-9
00/11-13-010-26W1/0	Mineraloid Virden 11-13-10-26W1	5502-9
00/12-13-010-26W1/0	Mineraloid Virden 12-13-10-26W1	5505-7
00/13-13-010-26W1/0	Mineraloid Virden 13-13-10-26W1	5503-9
00/14-14-010-26W1/0	Mineraloid Virden 14-14-10-26W1	5510-9
00/15-02-010-26W1/0	Mineraloid Virden 15-02-10-26W1	5512-9
02/10-02-010-26W1/0	Mineraloid Virden A10-02-10-26W1	6809-9
02/14-13-010-26W1/0	Mineraloid Virden SWD 14-13-10-26W1	5606-6
00/14-13-010-26W1/0	Mineraloid Virden WIW 14-13-10-26W1	5502-9
00/16-02-010-26W1/0	Mineraloid Virden WIW 16-02-10-26W1	5603-9
00/08-23-010-26W1/2	Murphy Virden RE08-23-10-26W1	6109-9
00/08-23-010-26W1/0	Murphy Virden RE08-23-10-26W1	5502-9
00/01-23-010-26W1/0	Murphy Virden WIW 01-23-10-26W1	5506-9
00/12-18-010-25W1/0	Rundle Welch Virden 12-18-10-25W1	5506-9
00/12-14-010-26W1/0	Rundle Williams Virden (Dual) 12-14-10-2	5507-6

00/03-14-010-26W1/0	Rundle Williams Virden 03-14-10-26W1	5601-9
00/05-14-010-26W1/0	Rundle Williams Virden 05-14-10-26W1	5601-9
00/06-14-010-26W1/0	Rundle Williams Virden 06-14-10-26W1	5511-9
00/04-14-010-26W1/0	Rundle Williams Virden WIW 04-14-10-26W1	5601-9
00/11-14-010-26W1/0	Rundle Williams Virden WIW 11-14-10-26W1	5508-9
00/03-18-010-25W1/0	Sun I. Welch Virden 03-18-10-25W1	5601-9
00/05-18-010-25W1/0	Sun I. Welch Virden 05-18-10-25W1	5508-9
00/06-18-010-25W1/0	Sun I. Welch Virden 06-18-10-25W1	5608-9
00/04-18-010-25W1/0	Sun I. Welch Virden WIW 04-18-10-25W1	5509-9