

**NORTH EBOR UNIT NO. 1  
WATERFLOOD EOR PROJECT**

**ANNUAL REPORT FOR 2010**

**July 28, 2011**

**Tundra Oil and Gas Partnership**

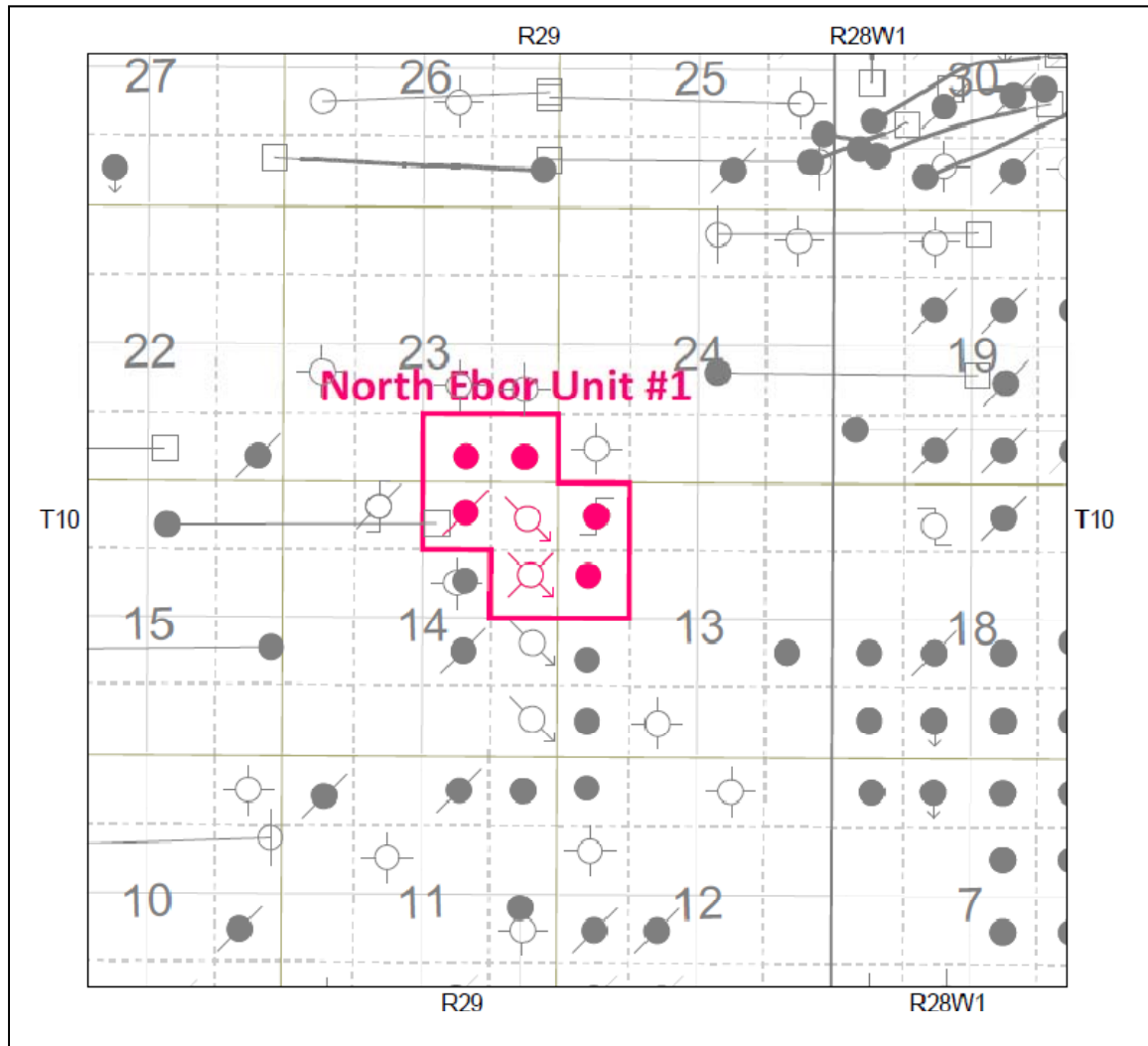
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## INTRODUCTION

North Ebor Unit No. 1 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM 62 effective July 1, 1990 with Tundra Oil and Gas as Operator. The EOR project area, outlined in pink the attached Figure 1, contains 7 wells over 7 LSDs in Township 10, Range 29 W1. Well list and well status is available in Appendix A.

**Figure 1: North Ebor Unit # 1 Area Outline**



In accordance with Section 73 of the Manitoba Drilling and Production Regulation, Tundra submits the following 2010 Annual Progress Report for North Ebor Unit No. 1 as required by Board Order No. PM 62.

## **DISCUSSION**

### **Production History**

For the wells included in North Ebor Unit No. 1, production started in June 1987 with 00/16-14-010-29W1/00. Oil production peaked at 21.5 m<sup>3</sup>/d in August of 1989. The water oil ratio (WOR) averaged 2.28 m<sup>3</sup>/m<sup>3</sup> over the last half of 2010. In December 2010, the Unit was producing 1.18 m<sup>3</sup>/d of oil and 3.03 m<sup>3</sup>/d of water. The oil production rate, injection rate, and WOR during each month for each injection pattern and for whole project are presented in Appendix D. The rates and WOR are presented in Figure 2.

**Figure 2: North Ebor Unit No.1 Production/Injection Rates and WOR vs. Time**

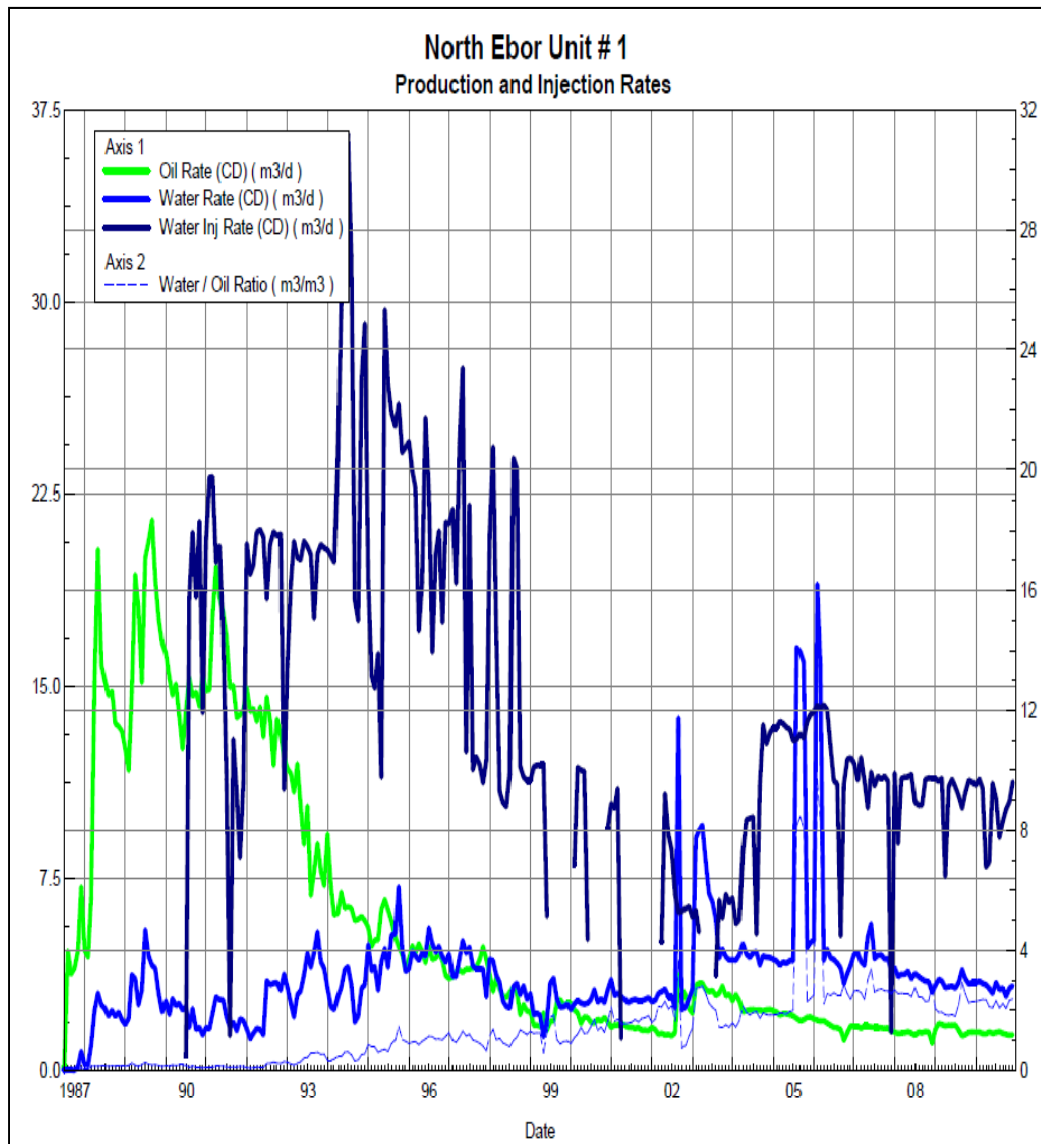
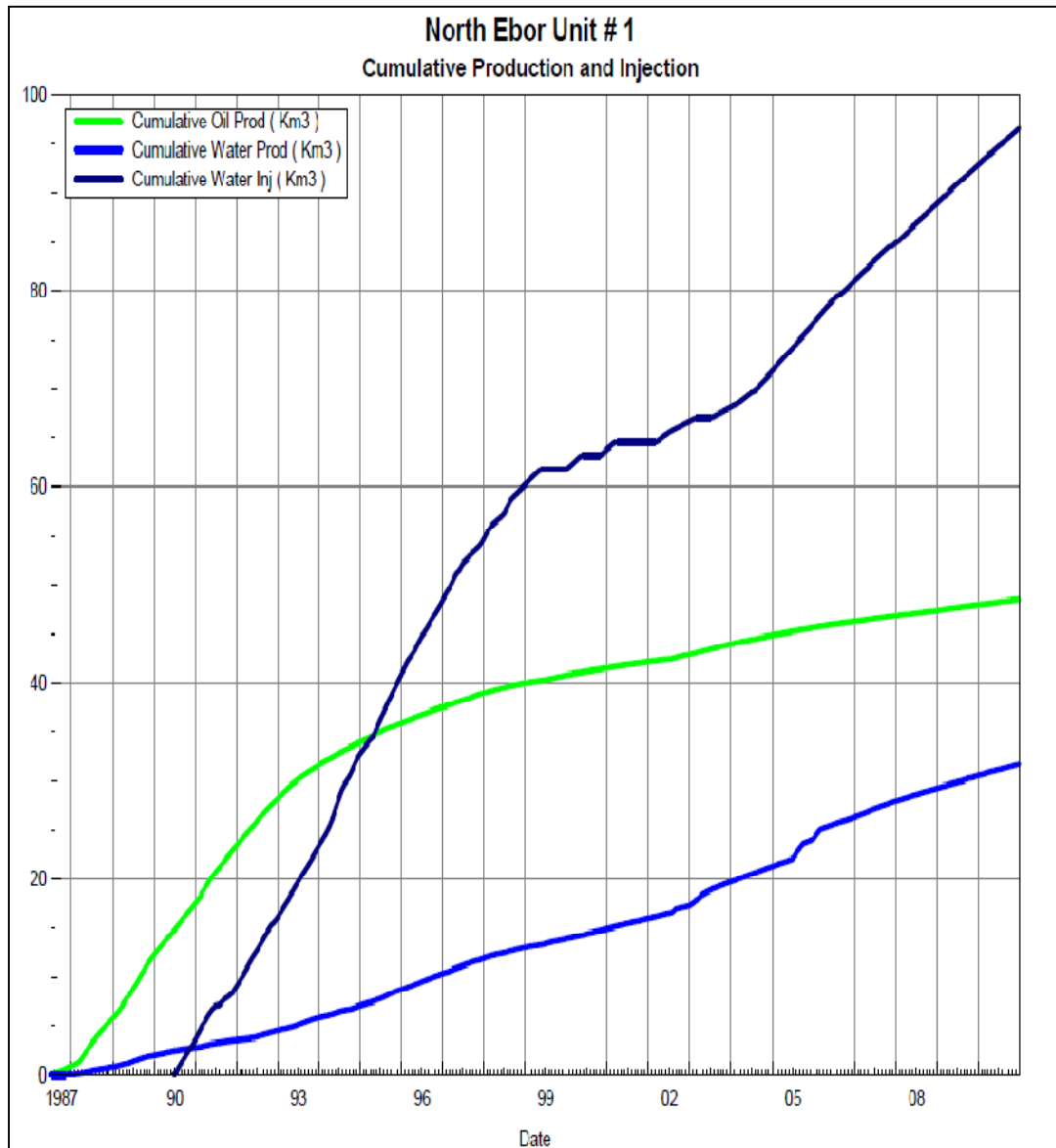


Figure 3 shows the cumulative production for North Ebor Unit No. 1 to the end of December 2010 as 48.5 E<sup>3</sup>m<sup>3</sup> of oil, and 31.7 E<sup>3</sup>m<sup>3</sup> of water. The cumulative water injected is over 96.5 E<sup>3</sup>m<sup>3</sup>. The Original Oil-In-Place (OOIP) for North Ebor Unit No. 1 is

330 E<sup>3</sup>m<sup>3</sup>. The cumulative volume of oil, and water produced and fluid injected is presented in Appendix D.

**Figure 3: North Ebor Unit No. 1 Cumulative Oil, and Water Injected vs. Time**



### **Waterflood History**

As of December 2010 the Unit has 1 active vertical injector. Water injection started in June 1990 in the two injector's 00/09-14-010-29W1/0 and 00/16-14-0101-29W1/0. The 00/09-14-010-29W1/0 injector has been abandoned since September 1998, and water has only been injected through 00/16-14-010-29W1/0.

Any future revisions to the waterflood development or surveillance plan would be based on new production or performance response data, technical studies, or observed reservoir behavior and reserves recovery interpretations.

## **Waterflood EOR Operating Strategy and Performance**

### **Water Source and Quality**

The injection water for North Ebor Unit No. 1 is sourced from the 00/13-13-010-29W1/00 well (Lodgepole formation). Injected fluid consists of water producing from the Lodgepole formation, from the unit and surrounding area. Water is filtered to 25 microns prior to re-injection.

### **Injection Wellhead Pressures**

The monthly wellhead injection pressure is summarized in Appendix B, and shows all injection pressure since 2003. Average Injection pressure from injector 00/16-14-010-29W1/0 was 10243 kPag in 2010.

### **Reservoir Pressure**

No reservoir pressure measurements were taken at North Ebor Unit No. 1, in 2010.

### **Well Servicing**

No maintenance was required on the 7 wells in North Ebor Unit No. 1, in 2010.

### **Voidage Replacement**

Cumulative voidage for the North Ebor Unit No. 1 was 2.09 in December 2010. As of 1990, monthly voidage is significantly greater than 1, which puts the North Ebor Unit No. 1 on track to achieve a cumulative VRR of 1. Calculation, plots and tables of the Voidage replacement ratio on a monthly and cumulative basis for each injection pattern and for the project area are presented in Appendix D.

### **Waterflood Performance Discussion**

The original oil-in-place (OOIP) of the Unit is estimated at 330 E<sup>3</sup>m<sup>3</sup>. In 2010, recovery factor of the Unit is 14.7% based on 48,500 m<sup>3</sup> of cumulative oil recovered to date. The ultimate expected recoverable reserve based on decline analysis is 54,000 m<sup>3</sup> or an ultimate recovery factor of 16.4%.

The overall performance of this waterflood has been good as indicated by waterflood response observable in the individual wells and the recovery factor is above what is attainable under primary production. However sweep efficiency has been disappointing given the volume of water injected over time and any increased or supported oil rates, that may be as a result of injected water sweeping the reservoir, are not sustained for a very long time.

Trends in production are very stable and at a mature state. No changes are anticipated in the future trends. Optimization of the waterflood will be evaluated to understand why the sweep efficiency is not higher.

## **List of Appendices**

Appendix A: Well Name and Well Status

Appendix B: Monthly Injection Wellhead Pressures Table and Plots

Appendix C: North Ebor No.1 Injection Pattern Summary

Appendix D: Injector Pattern Production/Injection Rates, Cumulative and VRRs

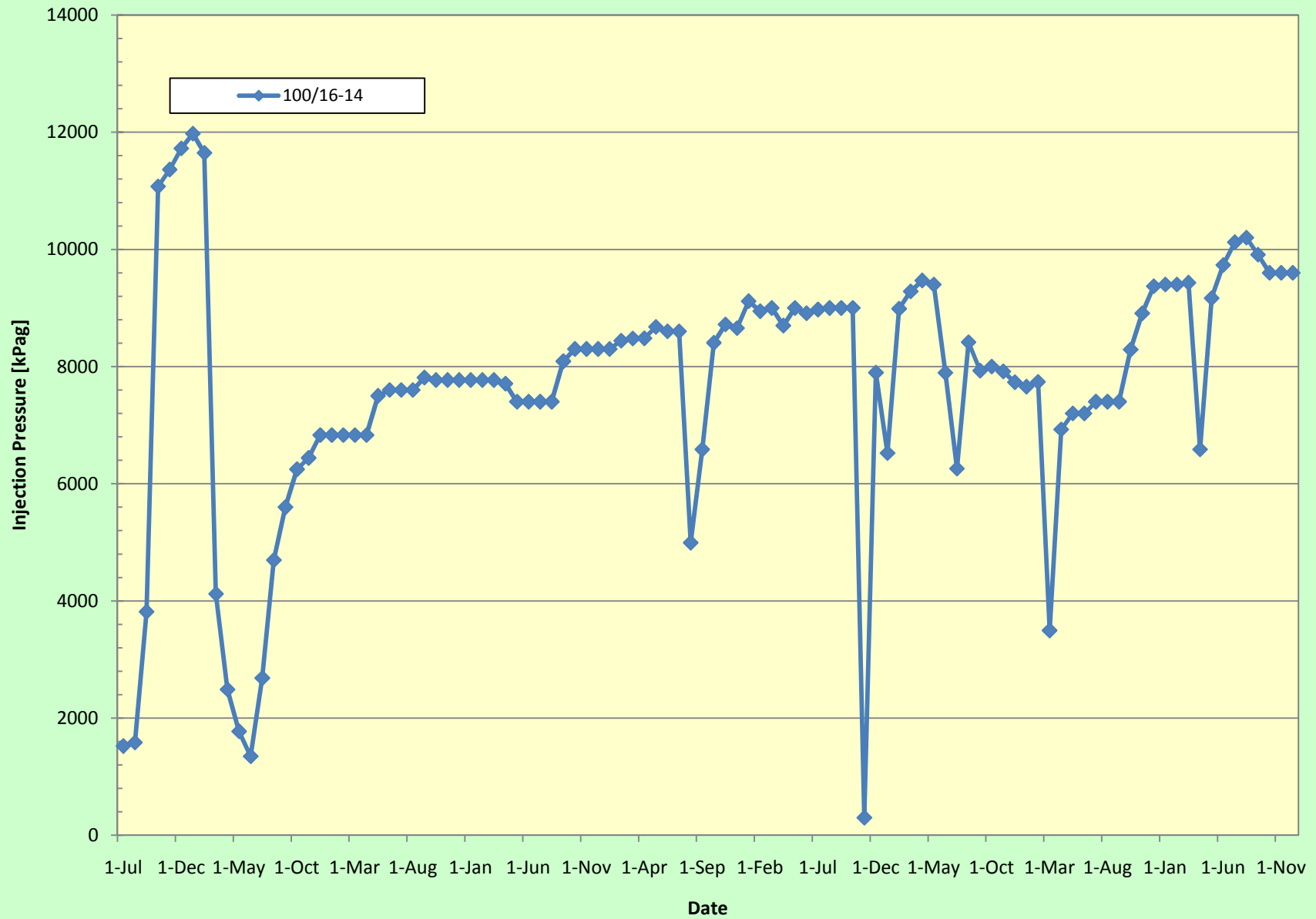
Plots and Tables for the following injectors:

00/16-14-010-29W1/0

## Appendix A

UWI	Well Status
100/12-13-010-29W1/00	Capable of OIL Prod
100/13-13-010-29W1/00	Capable of OIL Prod
100/09-14-010-29W1/00	ABD WTR Injection
100/15-14-010-29W1/00	ABD Producer
100/16-14-010-29W1/00	WTR Injection
100/01-23-010-29W1/00	Capable of OIL Prod
100/02-23-010-29W1/00	Capable of OIL Prod

## 100/16-14 Injection Pressures vs Time



## Appendix B

### Average Monthly Injection Pressure (kPag)

	Pattern
Month	100/16-14
Jul-02	1522
Aug-02	1583
Sep-02	3815
Oct-02	11075
Nov-02	11364
Dec-02	11723
Jan-03	11976
Feb-03	11647
Mar-03	4119
Apr-03	2488
May-03	1773
Jun-03	1347
Jul-03	2683
Aug-03	4697
Sep-03	5600
Oct-03	6247
Nov-03	6440
Dec-03	6830
Jan-04	6830
Feb-04	6830
Mar-04	6830
Apr-04	6830
May-04	7501
Jun-04	7600
Jul-04	7600
Aug-04	7600
Sep-04	7813
Oct-04	7770
Nov-04	7770
Dec-04	7770
Jan-05	7770
Feb-05	7770
Mar-05	7770
Apr-05	7708
May-05	7400
Jun-05	7400
Jul-05	7400
Aug-05	7400
Sep-05	8090
Oct-05	8300
Nov-05	8300
Dec-05	8300

# Average Monthly Injection Pressure (kPag)

	Pattern
Month	100/16-14
Jan-06	8300
Feb-06	8441
Mar-06	8480
Apr-06	8483
May-06	8678
Jun-06	8601
Jul-06	8600
Aug-06	4994
Sep-06	6585
Oct-06	8406
Nov-06	8720
Dec-06	8657
Jan-07	9116
Feb-07	8945
Mar-07	9000
Apr-07	8700
May-07	9000
Jun-07	8910
Jul-07	8974
Aug-07	9000
Sep-07	9000
Oct-07	9001
Nov-07	300
Dec-07	7897
Jan-08	6523
Feb-08	8986
Mar-08	9284
Apr-08	9470
May-08	9400
Jun-08	7893
Jul-08	6258
Aug-08	8417
Sep-08	7930
Oct-08	8000
Nov-08	7917
Dec-08	7732
Jan-09	7656
Feb-09	7739
Mar-09	3495
Apr-09	6927
May-09	7200
Jun-09	7200
Jul-09	7400

**Average Monthly Injection Pressure (kPag)**

	Pattern
Month	100/16-14
Aug-09	7400
Sep-09	7400
Oct-09	8290
Nov-09	8909
Dec-09	9373
Jan-10	9400
Feb-10	9401
Mar-10	9432
Apr-10	6587
May-10	9168
Jun-10	9733
Jul-10	10123
Aug-10	10200
Sep-10	9910
Oct-10	9600
Nov-10	9600
Dec-10	9600

Pattern Name	Injector Location (010-29W1)	Status	Supported Wells (010-29W1)	No. of Supported Wells	Allocation Factor	Pattern Prod Start Month	Inj Start Month	Oil Rate (m³/d)	Water Rate (m³/d)	WOR (m³/m³)	Water Injection (m³/d)	Cum Oil (E³m³)	Cum Water (E³m³)	Cum Inj Water (E³m³)	Monthly VRR	Cum VRR
00/16-14-010-29W1 Injector	00/16-14	WTR Injection	01-23, 02-23, 09-14, 12-13, 13-13, 15-14	6	1	Jun 1987	Jun 1990	1.2	3.0	2.56	11.0	48.5	31.7	96.5	3.3	2.11

Appendix C

# Pattern: 00/16-14-010-29W1 Set: North Ebor Unit # 1

Oil Formation Vol. Factor : 1.05 m3/m3

Water Formation Vol Factor : 1.00 m3/m3

Water / Oil Ratio : 2.18 m3/m3

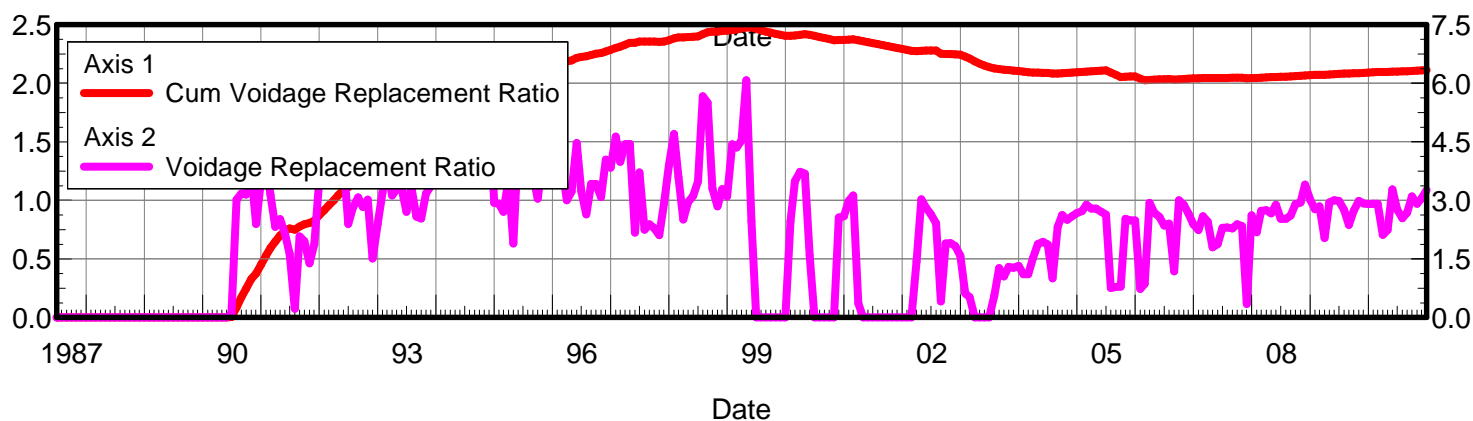
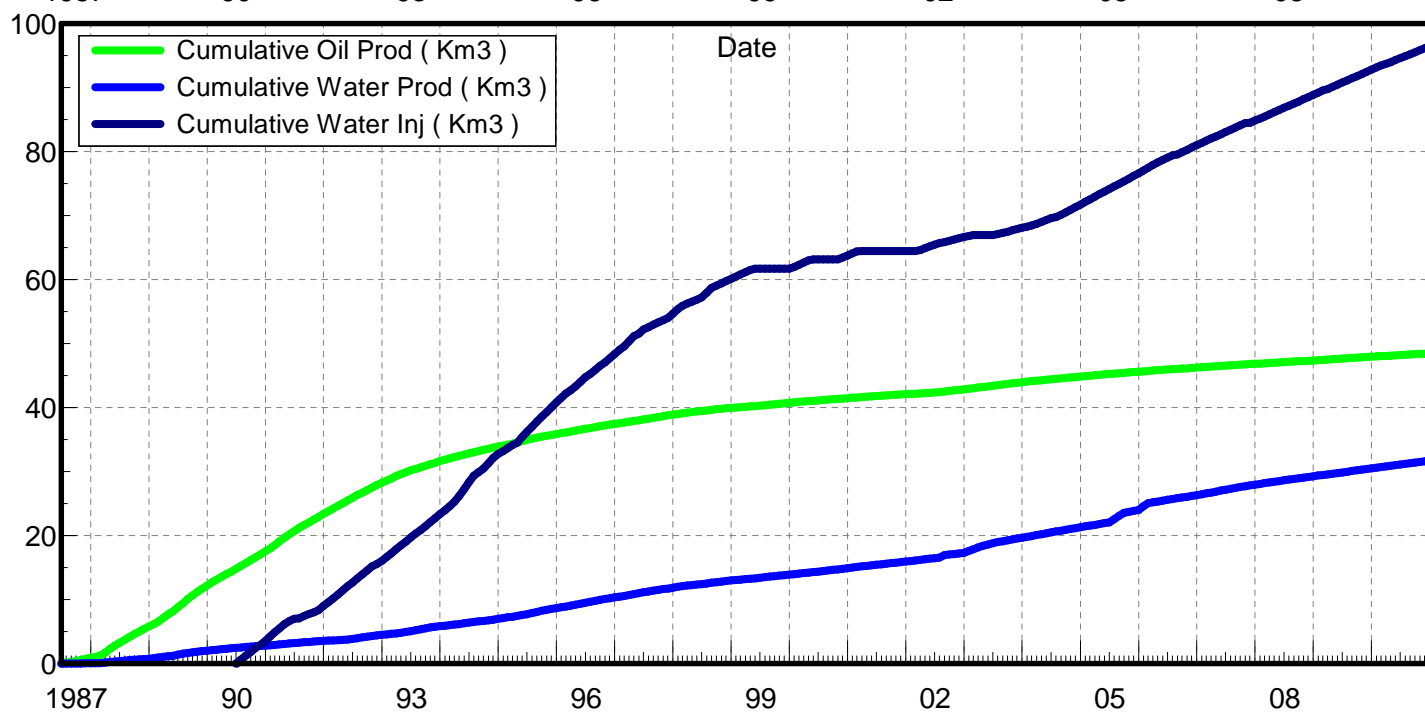
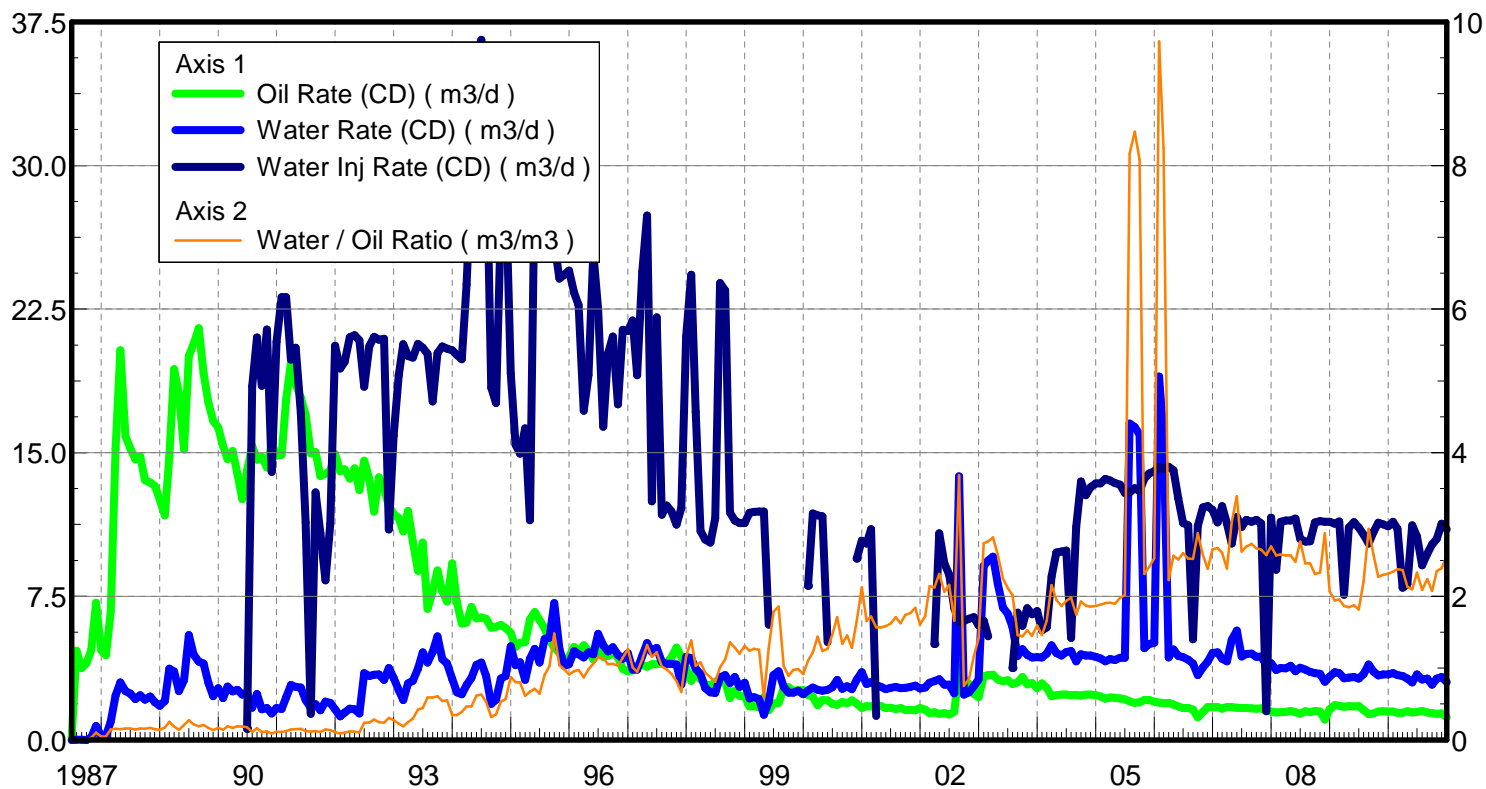
July 26, 2011

Operator: Tundra\_Oil\_and\_Gas\_Patnership

Oil Rate (CD) : 1.57 m3/d

Water Rate (CD) : 3.43 m3/d

Water Inj Rate (CD) : 11.92 m3/d



Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacement Ratio
6/30/1987	0.16	0.00	0.00		0.00	0.00	0.00	0.000	0.000
7/31/1987	4.65	0.01	0.00		0.15	0.00	0.00	0.000	0.000
8/31/1987	3.76	0.01	0.00		0.27	0.00	0.00	0.000	0.000
9/30/1987	4.00	0.00	0.00		0.39	0.00	0.00	0.000	0.000
10/31/1987	4.68	0.13	0.03		0.53	0.00	0.00	0.000	0.000
11/30/1987	7.16	0.73	0.10		0.75	0.03	0.00	0.000	0.000
12/31/1987	4.69	0.21	0.05		0.89	0.03	0.00	0.000	0.000
1/31/1988	4.43	0.21	0.05		1.03	0.04	0.00	0.000	0.000
2/29/1988	6.71	0.96	0.14		1.22	0.07	0.00	0.000	0.000
3/31/1988	15.21	2.32	0.15		1.69	0.14	0.00	0.000	0.000
4/30/1988	20.36	3.00	0.15		2.30	0.23	0.00	0.000	0.000
5/31/1988	15.85	2.55	0.16		2.80	0.31	0.00	0.000	0.000
6/30/1988	15.24	2.41	0.16		3.25	0.38	0.00	0.000	0.000
7/31/1988	14.65	2.13	0.15		3.71	0.45	0.00	0.000	0.000
8/31/1988	14.82	2.33	0.16		4.17	0.52	0.00	0.000	0.000
9/30/1988	13.56	2.10	0.16		4.57	0.58	0.00	0.000	0.000
10/31/1988	13.45	2.26	0.17		4.99	0.65	0.00	0.000	0.000
11/30/1988	13.27	1.97	0.15		5.39	0.71	0.00	0.000	0.000
12/31/1988	12.57	1.78	0.14		5.78	0.77	0.00	0.000	0.000
1/31/1989	11.73	2.03	0.17		6.14	0.83	0.00	0.000	0.000
2/28/1989	14.78	3.73	0.25		6.56	0.93	0.00	0.000	0.000
3/31/1989	19.36	3.57	0.18		7.16	1.04	0.00	0.000	0.000
4/30/1989	18.10	2.55	0.14		7.70	1.12	0.00	0.000	0.000
5/31/1989	15.17	3.13	0.21		8.17	1.22	0.00	0.000	0.000
6/30/1989	20.04	5.47	0.27		8.77	1.38	0.00	0.000	0.000
7/31/1989	20.69	4.45	0.22		9.41	1.52	0.00	0.000	0.000
8/31/1989	21.50	4.09	0.19		10.08	1.65	0.00	0.000	0.000
9/30/1989	19.17	3.99	0.21		10.65	1.77	0.00	0.000	0.000
10/31/1989	17.62	2.98	0.17		11.20	1.86	0.00	0.000	0.000
11/30/1989	16.68	2.29	0.14		11.70	1.93	0.00	0.000	0.000
12/31/1989	16.31	2.70	0.17		12.21	2.01	0.00	0.000	0.000
1/31/1990	15.35	2.19	0.14		12.68	2.08	0.00	0.000	0.000
2/28/1990	14.67	2.79	0.19		13.09	2.16	0.00	0.000	0.000
3/31/1990	15.09	2.53	0.17		13.56	2.24	0.00	0.000	0.000
4/30/1990	13.88	2.61	0.19		13.98	2.31	0.00	0.000	0.000
5/31/1990	12.58	2.36	0.19		14.37	2.39	0.00	0.000	0.000
6/30/1990	14.06	2.48	0.18	0.57	14.79	2.46	0.02	0.088	0.003
7/31/1990	15.35	1.67	0.11	18.47	15.26	2.51	0.59	3.022	0.085
8/31/1990	14.63	2.39	0.16	21.02	15.72	2.59	1.24	3.173	0.174
9/30/1990	14.78	1.60	0.11	18.50	16.16	2.64	1.80	3.148	0.246
10/31/1990	14.23	1.67	0.12	21.44	16.60	2.69	2.46	3.705	0.329
11/30/1990	15.46	1.38	0.09	14.00	17.07	2.73	2.88	2.393	0.376
12/31/1990	14.85	1.66	0.11	20.78	17.53	2.78	3.53	3.489	0.449
1/31/1991	14.89	1.62	0.11	23.12	17.99	2.83	4.24	3.902	0.528
2/28/1991	17.77	2.22	0.12	23.13	18.48	2.89	4.89	3.144	0.594
3/31/1991	19.69	2.86	0.15	19.86	19.10	2.98	5.51	2.321	0.647
4/30/1991	18.56	2.76	0.15	20.49	19.65	3.06	6.12	2.520	0.700
5/31/1991	17.88	2.74	0.15	17.06	20.21	3.15	6.65	2.157	0.739

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacement Ratio
6/30/1991	16.97	2.08	0.12	11.37	20.72	3.21	6.99	1.626	0.760
7/31/1991	14.97	1.69	0.11	1.36	21.18	3.26	7.03	0.226	0.749
8/31/1991	15.04	1.87	0.12	12.92	21.65	3.32	7.43	2.077	0.776
9/30/1991	13.79	1.54	0.11	10.81	22.06	3.37	7.76	1.955	0.796
10/31/1991	13.90	2.00	0.14	8.33	22.49	3.43	8.02	1.384	0.807
11/30/1991	14.07	1.94	0.14	11.29	22.91	3.49	8.35	1.880	0.826
12/31/1991	14.93	1.60	0.11	20.58	23.38	3.54	8.99	3.476	0.873
1/31/1992	14.04	1.23	0.09	19.40	23.81	3.58	9.59	3.669	0.917
2/29/1992	14.13	1.43	0.10	19.74	24.22	3.62	10.17	3.577	0.957
3/31/1992	13.65	1.63	0.12	21.03	24.64	3.67	10.82	3.770	1.002
4/30/1992	14.19	1.59	0.11	21.13	25.07	3.72	11.45	3.712	1.044
5/31/1992	13.05	1.39	0.11	20.86	25.47	3.76	12.10	4.044	1.087
6/30/1992	14.58	3.49	0.24	18.44	25.91	3.86	12.65	2.394	1.114
7/31/1992	13.65	3.34	0.24	20.57	26.33	3.97	13.29	2.823	1.147
8/31/1992	11.93	3.40	0.29	21.05	26.70	4.07	13.94	3.073	1.182
9/30/1992	13.71	3.42	0.25	20.90	27.12	4.17	14.57	2.830	1.212
10/31/1992	13.13	3.14	0.24	20.95	27.52	4.27	15.22	3.023	1.244
11/30/1992	12.25	3.75	0.31	11.00	27.89	4.38	15.55	1.508	1.249
12/31/1992	11.80	3.23	0.27	15.89	28.26	4.48	16.04	2.392	1.267
1/31/1993	11.59	2.61	0.22	19.05	28.61	4.57	16.63	3.196	1.295
2/28/1993	10.89	2.09	0.19	20.67	28.92	4.62	17.21	3.946	1.325
3/31/1993	11.97	2.96	0.25	20.04	29.29	4.72	17.83	3.122	1.352
4/30/1993	10.35	3.09	0.30	19.96	29.60	4.81	18.43	3.282	1.379
5/31/1993	8.84	3.71	0.42	20.69	29.88	4.92	19.07	3.299	1.406
6/30/1993	10.31	4.58	0.44	20.48	30.18	5.06	19.69	2.708	1.428
7/31/1993	6.84	4.03	0.59	20.16	30.40	5.19	20.31	3.355	1.453
8/31/1993	7.77	4.59	0.59	17.68	30.64	5.33	20.86	2.584	1.470
9/30/1993	8.86	5.40	0.61	20.20	30.90	5.49	21.47	2.537	1.488
10/31/1993	7.77	4.23	0.54	20.55	31.14	5.62	22.10	3.175	1.511
11/30/1993	7.23	3.99	0.55	20.43	31.36	5.74	22.72	3.362	1.534
12/31/1993	9.22	3.19	0.35	20.35	31.65	5.84	23.35	3.471	1.557
1/31/1994	7.16	2.48	0.35	20.10	31.87	5.92	23.97	4.420	1.584
2/28/1994	6.07	2.38	0.39	19.88	32.04	5.98	24.53	4.807	1.608
3/31/1994	6.13	2.86	0.47	23.79	32.23	6.07	25.26	5.135	1.641
4/30/1994	6.95	3.24	0.47	29.67	32.44	6.17	26.15	5.650	1.682
5/31/1994	6.34	3.93	0.62	35.74	32.63	6.29	27.26	6.203	1.733
6/30/1994	6.39	4.04	0.63	36.56	32.83	6.41	28.36	6.209	1.783
7/31/1994	6.33	3.34	0.53	31.78	33.02	6.52	29.34	6.146	1.826
8/31/1994	5.86	1.88	0.32	18.40	33.20	6.57	29.91	5.146	1.849
9/30/1994	5.90	2.10	0.36	17.59	33.38	6.64	30.44	4.615	1.869
10/31/1994	6.00	3.21	0.53	26.96	33.57	6.74	31.28	5.455	1.902
11/30/1994	5.85	3.34	0.57	29.11	33.74	6.84	32.15	5.791	1.937
12/31/1994	5.59	4.90	0.88	19.15	33.92	6.99	32.74	2.940	1.949
1/31/1995	4.85	3.90	0.80	15.42	34.07	7.11	33.22	2.910	1.959
2/28/1995	5.08	4.06	0.80	14.95	34.21	7.22	33.64	2.705	1.965
3/31/1995	5.10	3.13	0.61	16.27	34.37	7.32	34.15	3.534	1.978
4/30/1995	6.29	4.23	0.67	11.47	34.55	7.45	34.49	1.895	1.978
5/31/1995	6.67	4.75	0.71	29.66	34.76	7.59	35.41	4.442	2.006

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacement Ratio
6/30/1995	6.26	4.03	0.64	26.79	34.95	7.71	36.21	4.587	2.032
7/31/1995	5.83	5.28	0.91	25.62	35.13	7.88	37.01	3.680	2.052
8/31/1995	5.20	5.34	1.03	25.13	35.29	8.04	37.79	3.671	2.070
9/30/1995	4.82	7.15	1.48	25.99	35.44	8.26	38.57	3.040	2.084
10/31/1995	4.55	4.75	1.04	24.09	35.58	8.41	39.31	3.972	2.103
11/30/1995	3.93	3.87	0.98	24.30	35.69	8.52	40.04	4.857	2.125
12/31/1995	4.34	3.96	0.91	24.51	35.83	8.64	40.80	4.700	2.147
1/31/1996	4.85	4.64	0.96	23.35	35.98	8.79	41.53	3.863	2.163
2/29/1996	4.60	4.47	0.97	22.71	36.11	8.92	42.18	3.914	2.179
3/31/1996	4.94	4.30	0.87	17.19	36.27	9.05	42.72	2.999	2.186
4/30/1996	4.65	4.57	0.98	19.07	36.41	9.19	43.29	3.221	2.195
5/31/1996	4.21	4.47	1.06	25.43	36.54	9.33	44.08	4.473	2.216
6/30/1996	4.83	5.55	1.15	22.51	36.68	9.49	44.75	3.242	2.226
7/31/1996	4.34	4.94	1.14	16.36	36.82	9.65	45.26	2.643	2.230
8/31/1996	4.39	4.63	1.05	20.18	36.95	9.79	45.89	3.423	2.241
9/30/1996	4.57	4.84	1.06	21.08	37.09	9.93	46.52	3.423	2.251
10/31/1996	4.30	4.43	1.03	17.53	37.22	10.07	47.06	3.088	2.258
11/30/1996	3.70	4.23	1.14	21.42	37.33	10.20	47.70	4.042	2.272
12/31/1996	3.58	4.53	1.26	21.36	37.44	10.34	48.37	3.838	2.285
1/31/1997	3.64	3.68	1.01	21.91	37.56	10.45	49.04	4.632	2.301
2/28/1997	3.87	3.66	0.95	19.05	37.67	10.56	49.58	3.984	2.311
3/31/1997	3.91	4.38	1.12	24.46	37.79	10.69	50.34	4.436	2.328
4/30/1997	3.82	5.05	1.32	27.39	37.90	10.84	51.16	4.447	2.346
5/31/1997	3.96	4.59	1.16	12.46	38.02	10.99	51.54	2.172	2.345
6/30/1997	3.95	4.81	1.22	22.08	38.14	11.13	52.21	3.712	2.356
7/31/1997	3.98	4.07	1.02	11.75	38.27	11.26	52.57	2.250	2.355
8/31/1997	4.03	3.96	0.98	12.25	38.39	11.38	52.95	2.388	2.355
9/30/1997	4.31	3.96	0.92	11.95	38.52	11.50	53.31	2.293	2.355
10/31/1997	4.82	3.95	0.82	11.24	38.67	11.62	53.66	2.106	2.353
11/30/1997	4.33	2.88	0.66	12.12	38.80	11.71	54.02	2.932	2.356
12/31/1997	3.71	4.33	1.17	21.05	38.91	11.84	54.67	3.893	2.367
1/31/1998	3.09	4.27	1.38	24.29	39.01	11.97	55.43	4.700	2.383
2/28/1998	3.61	3.72	1.03	17.12	39.11	12.08	55.91	3.596	2.390
3/31/1998	3.17	3.43	1.08	10.91	39.21	12.18	56.24	2.507	2.391
4/30/1998	2.90	2.71	0.93	10.46	39.30	12.27	56.56	2.951	2.393
5/31/1998	2.85	2.48	0.87	10.31	39.39	12.34	56.88	3.120	2.397
6/30/1998	3.02	2.44	0.81	11.58	39.48	12.42	57.22	3.489	2.401
7/31/1998	3.24	3.27	1.01	23.86	39.58	12.52	57.96	5.669	2.419
8/31/1998	3.03	3.39	1.12	23.47	39.67	12.62	58.69	5.502	2.436
9/30/1998	2.18	2.96	1.36	11.87	39.74	12.71	59.05	3.306	2.440
10/31/1998	2.56	3.29	1.28	11.46	39.82	12.81	59.40	2.844	2.442
11/30/1998	2.31	2.77	1.20	11.33	39.88	12.90	59.74	3.292	2.445
12/31/1998	2.28	2.99	1.31	11.32	39.96	12.99	60.09	3.101	2.448
1/31/1999	1.75	2.17	1.24	11.87	40.01	13.06	60.46	4.441	2.455
2/28/1999	1.76	2.23	1.27	11.92	40.06	13.12	60.80	4.355	2.461
3/31/1999	1.70	2.14	1.26	11.93	40.11	13.18	61.17	4.533	2.468
4/30/1999	2.23	1.32	0.59	11.92	40.18	13.22	61.52	6.078	2.476
5/31/1999	1.55	1.98	1.27	6.00	40.23	13.29	61.71	2.470	2.476

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacement Ratio
6/30/1999	1.90	3.39	1.79		40.28	13.39	61.71	0.000	2.465
7/31/1999	1.94	3.59	1.86		40.34	13.50	61.71	0.000	2.452
8/31/1999	2.69	2.76	1.03		40.43	13.58	61.71	0.000	2.441
9/30/1999	2.75	2.46	0.90		40.51	13.66	61.71	0.000	2.432
10/31/1999	2.54	2.47	0.97		40.59	13.73	61.71	0.000	2.422
11/30/1999	2.60	2.57	0.99		40.67	13.81	61.71	0.000	2.413
12/31/1999	2.60	2.38	0.91		40.75	13.89	61.71	0.000	2.404
1/31/2000	2.35	2.59	1.10	8.05	40.82	13.97	61.96	2.460	2.404
2/29/2000	2.24	2.73	1.22	11.83	40.88	14.05	62.30	3.496	2.408
3/31/2000	1.82	2.62	1.44	11.73	40.94	14.13	62.67	3.729	2.413
4/30/2000	2.08	2.57	1.24	11.68	41.00	14.20	63.02	3.681	2.418
5/31/2000	2.06	2.62	1.27	5.10	41.07	14.29	63.17	1.587	2.415
6/30/2000	1.87	2.75	1.47		41.12	14.37	63.17	0.000	2.406
7/31/2000	1.84	3.14	1.71		41.18	14.46	63.17	0.000	2.395
8/31/2000	1.99	2.66	1.34		41.24	14.55	63.17	0.000	2.386
9/30/2000	1.92	2.79	1.46		41.30	14.63	63.17	0.000	2.377
10/31/2000	2.06	2.65	1.28		41.36	14.71	63.17	0.000	2.368
11/30/2000	1.90	3.14	1.65	9.46	41.42	14.81	63.46	2.562	2.369
12/31/2000	1.66	3.53	2.12	10.41	41.47	14.92	63.78	2.593	2.370
1/31/2001	1.76	2.93	1.66	10.25	41.53	15.01	64.10	2.983	2.372
2/28/2001	1.75	3.01	1.72	11.00	41.58	15.09	64.41	3.127	2.375
3/31/2001	1.83	2.87	1.57	1.25	41.63	15.18	64.45	0.367	2.367
4/30/2001	1.77	2.77	1.56		41.69	15.26	64.45	0.000	2.359
5/31/2001	1.67	2.65	1.58		41.74	15.35	64.45	0.000	2.351
6/30/2001	1.68	2.72	1.62		41.79	15.43	64.45	0.000	2.342
7/31/2001	1.62	2.77	1.71		41.84	15.51	64.45	0.000	2.334
8/31/2001	1.67	2.71	1.62		41.89	15.60	64.45	0.000	2.325
9/30/2001	1.56	2.71	1.74		41.94	15.68	64.45	0.000	2.318
10/31/2001	1.56	2.76	1.77		41.99	15.77	64.45	0.000	2.309
11/30/2001	1.54	2.83	1.84		42.03	15.85	64.45	0.000	2.301
12/31/2001	1.67	2.68	1.61		42.08	15.93	64.45	0.000	2.293
1/31/2002	1.58	2.73	1.72		42.13	16.02	64.45	0.000	2.285
2/28/2002	1.40	2.99	2.14		42.17	16.10	64.45	0.000	2.277
3/31/2002	1.44	3.06	2.13	5.01	42.22	16.20	64.60	1.440	2.274
4/30/2002	1.37	3.17	2.31	10.80	42.26	16.29	64.92	3.030	2.277
5/31/2002	1.40	2.88	2.06	9.21	42.30	16.38	65.21	2.808	2.279
6/30/2002	1.33	2.88	2.16	8.63	42.34	16.47	65.47	2.644	2.280
7/31/2002	1.46	2.43	1.66	6.89	42.39	16.54	65.68	2.414	2.281
8/31/2002	3.74	13.76	3.68	6.16	42.50	16.97	65.87	0.415	2.251
9/30/2002	3.15	2.37	0.75	6.20	42.60	17.04	66.06	1.893	2.250
10/31/2002	2.92	2.48	0.85	6.32	42.69	17.12	66.26	1.902	2.249
11/30/2002	2.41	2.80	1.16	6.40	42.76	17.20	66.45	1.833	2.247
12/31/2002	2.23	3.16	1.42	5.98	42.83	17.30	66.63	1.573	2.245
1/31/2003	3.31	9.08	2.74	6.23	42.93	17.58	66.83	0.620	2.228
2/28/2003	3.39	9.38	2.77	5.41	43.03	17.84	66.98	0.522	2.212
3/31/2003	3.40	9.57	2.82		43.13	18.14	66.98	0.000	2.188
4/30/2003	3.16	8.15	2.58		43.23	18.38	66.98	0.000	2.169
5/31/2003	3.07	6.91	2.25		43.32	18.60	66.98	0.000	2.152

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacement Ratio
6/30/2003	3.11	6.59	2.12		43.41	18.80	66.98	0.000	2.136
7/31/2003	2.93	5.90	2.02	3.75	43.51	18.98	67.09	0.557	2.126
8/31/2003	3.01	4.39	1.46	6.65	43.60	19.11	67.30	1.264	2.121
9/30/2003	3.28	4.73	1.44	5.96	43.70	19.26	67.48	1.048	2.116
10/31/2003	2.91	4.44	1.53	6.87	43.79	19.39	67.69	1.301	2.112
11/30/2003	2.97	4.31	1.45	6.56	43.88	19.52	67.89	1.270	2.108
12/31/2003	2.71	4.32	1.60	6.74	43.96	19.66	68.10	1.320	2.104
1/31/2004	2.95	4.30	1.46	5.73	44.05	19.79	68.28	1.110	2.099
2/29/2004	2.71	4.50	1.66	5.87	44.13	19.92	68.45	1.110	2.094
3/31/2004	2.29	4.93	2.15	8.53	44.20	20.07	68.71	1.524	2.091
4/30/2004	2.33	4.53	1.95	9.79	44.27	20.21	69.00	1.880	2.090
5/31/2004	2.36	4.40	1.86	9.85	44.34	20.35	69.31	1.936	2.089
6/30/2004	2.37	4.59	1.94	9.89	44.42	20.48	69.61	1.874	2.088
7/31/2004	2.34	4.63	1.98	5.33	44.49	20.63	69.77	1.004	2.083
8/31/2004	2.35	4.11	1.75	11.13	44.56	20.76	70.12	2.324	2.084
9/30/2004	2.32	4.47	1.93	13.50	44.63	20.89	70.52	2.627	2.087
10/31/2004	2.36	4.41	1.87	12.77	44.70	21.03	70.92	2.506	2.089
11/30/2004	2.37	4.41	1.86	13.20	44.77	21.16	71.31	2.591	2.091
12/31/2004	2.33	4.34	1.86	13.40	44.85	21.29	71.73	2.675	2.093
1/31/2005	2.26	4.26	1.88	13.39	44.92	21.42	72.14	2.724	2.096
2/28/2005	2.15	4.10	1.91	13.63	44.98	21.54	72.52	2.884	2.099
3/31/2005	2.21	4.23	1.91	13.55	45.05	21.67	72.94	2.786	2.102
4/30/2005	2.20	4.18	1.90	13.41	45.11	21.80	73.35	2.786	2.105
5/31/2005	2.17	4.29	1.98	13.33	45.18	21.93	73.76	2.709	2.108
6/30/2005	2.12	4.28	2.02	12.89	45.24	22.06	74.15	2.633	2.110
7/31/2005	2.02	16.52	8.17	12.94	45.31	22.57	74.55	0.756	2.090
8/31/2005	1.93	16.34	8.47	13.15	45.37	23.08	74.96	0.778	2.071
9/30/2005	1.97	15.95	8.08	13.00	45.42	23.55	75.35	0.787	2.053
10/31/2005	2.07	4.79	2.31	13.64	45.49	23.70	75.77	2.529	2.056
11/30/2005	2.08	5.00	2.41	13.91	45.55	23.85	76.19	2.484	2.058
12/31/2005	2.00	5.07	2.53	14.03	45.61	24.01	76.62	2.484	2.060
1/31/2006	1.95	18.99	9.73	14.25	45.67	24.60	77.06	0.729	2.038
2/28/2006	1.92	15.83	8.24	14.15	45.73	25.04	77.46	0.863	2.024
3/31/2006	1.93	4.30	2.23	14.27	45.79	25.18	77.90	2.938	2.028
4/30/2006	1.84	4.72	2.57	14.08	45.84	25.32	78.32	2.681	2.030
5/31/2006	1.75	4.39	2.51	12.61	45.90	25.45	78.71	2.578	2.033
6/30/2006	1.66	4.32	2.60	11.32	45.95	25.58	79.05	2.356	2.034
7/31/2006	1.66	4.18	2.52	11.20	46.00	25.71	79.40	2.402	2.035
8/31/2006	1.58	3.99	2.52	5.26	46.05	25.84	79.56	1.183	2.032
9/30/2006	1.18	3.39	2.88	11.18	46.08	25.94	79.90	3.000	2.035
10/31/2006	1.47	3.78	2.58	12.15	46.13	26.06	80.28	2.890	2.038
11/30/2006	1.72	4.09	2.38	12.21	46.18	26.18	80.64	2.660	2.040
12/31/2006	1.71	4.54	2.65	12.02	46.23	26.32	81.02	2.389	2.041
1/31/2007	1.71	4.58	2.67	11.36	46.29	26.46	81.37	2.238	2.042
2/28/2007	1.63	4.25	2.61	12.22	46.33	26.58	81.71	2.590	2.044
3/31/2007	1.72	4.11	2.39	11.30	46.38	26.71	82.06	2.451	2.045
4/30/2007	1.72	5.22	3.03	10.26	46.44	26.86	82.37	1.796	2.044
5/31/2007	1.68	5.71	3.40	11.65	46.49	27.04	82.73	1.881	2.043

Date	Oil Rate (CD) m3/d	Water Rate (CD) m3/d	Water Oil Ratio m3/m3	Water Inj Rate (CD) m3/d	Cum Oil Prod Km3	Cum Water Prod Km3	Cum Water Inj Km3	Voidage Replacement Ratio	Cum Voidage Replacement Ratio
6/30/2007	1.66	4.36	2.62	11.13	46.54	27.17	83.06	2.298	2.044
7/31/2007	1.67	4.50	2.70	11.48	46.59	27.31	83.42	2.306	2.045
8/31/2007	1.65	4.51	2.73	11.38	46.64	27.45	83.77	2.284	2.046
9/30/2007	1.63	4.34	2.67	11.50	46.69	27.58	84.12	2.391	2.047
10/31/2007	1.65	4.36	2.65	11.30	46.74	27.72	84.47	2.338	2.048
11/30/2007	1.52	3.91	2.57	1.49	46.79	27.83	84.51	0.343	2.043
12/31/2007	1.49	4.01	2.69	11.60	46.83	27.96	84.87	2.615	2.045
1/31/2008	1.42	3.66	2.57	8.88	46.88	28.07	85.15	2.181	2.045
2/29/2008	1.45	3.75	2.58	11.40	46.92	28.18	85.48	2.732	2.047
3/31/2008	1.46	3.75	2.57	11.46	46.96	28.30	85.83	2.751	2.050
4/30/2008	1.51	3.87	2.57	11.47	47.01	28.41	86.18	2.663	2.051
5/31/2008	1.45	3.58	2.48	11.56	47.05	28.52	86.53	2.889	2.054
6/30/2008	1.36	3.77	2.76	10.50	47.09	28.64	86.85	2.524	2.055
7/31/2008	1.49	3.66	2.46	10.35	47.14	28.75	87.17	2.528	2.057
8/31/2008	1.45	3.56	2.46	10.37	47.19	28.86	87.49	2.609	2.058
9/30/2008	1.51	3.48	2.31	11.37	47.23	28.96	87.83	2.903	2.061
10/31/2008	1.48	3.45	2.33	11.43	47.28	29.07	88.19	2.942	2.063
11/30/2008	1.06	3.04	2.88	11.40	47.31	29.16	88.53	3.407	2.066
12/31/2008	1.60	3.31	2.07	11.39	47.36	29.26	88.88	3.021	2.069
1/31/2009	1.82	3.54	1.94	11.30	47.41	29.37	89.23	2.776	2.071
2/28/2009	1.79	3.49	1.96	11.41	47.46	29.47	89.55	2.845	2.073
3/31/2009	1.73	3.22	1.87	7.58	47.52	29.57	89.79	2.038	2.073
4/30/2009	1.76	3.25	1.85	11.09	47.57	29.67	90.12	2.949	2.075
5/31/2009	1.75	3.28	1.87	11.37	47.63	29.77	90.47	3.001	2.078
6/30/2009	1.76	3.20	1.82	11.09	47.68	29.87	90.81	2.986	2.080
7/31/2009	1.56	3.43	2.20	10.72	47.73	29.97	91.14	2.761	2.082
8/31/2009	1.34	3.94	2.94	10.25	47.77	30.10	91.46	2.371	2.083
9/30/2009	1.39	3.57	2.58	10.86	47.81	30.20	91.78	2.732	2.084
10/31/2009	1.48	3.36	2.27	11.34	47.86	30.31	92.13	2.989	2.087
11/30/2009	1.49	3.42	2.30	11.26	47.90	30.41	92.47	2.921	2.089
12/31/2009	1.47	3.42	2.32	11.15	47.95	30.52	92.82	2.902	2.091
1/31/2010	1.49	3.48	2.34	11.38	47.99	30.62	93.17	2.909	2.093
2/28/2010	1.42	3.38	2.38	11.03	48.03	30.72	93.48	2.908	2.095
3/31/2010	1.41	3.34	2.37	7.95	48.08	30.82	93.72	2.119	2.095
4/30/2010	1.50	3.20	2.13	8.13	48.12	30.92	93.97	2.238	2.096
5/31/2010	1.43	3.00	2.10	11.21	48.16	31.01	94.32	3.279	2.099
6/30/2010	1.47	3.42	2.33	10.62	48.21	31.11	94.63	2.766	2.100
7/31/2010	1.51	3.15	2.09	9.11	48.26	31.21	94.92	2.543	2.101
8/31/2010	1.43	3.21	2.24	9.73	48.30	31.31	95.22	2.686	2.103
9/30/2010	1.39	2.89	2.07	10.20	48.34	31.40	95.52	3.099	2.105
10/31/2010	1.36	3.21	2.35	10.50	48.38	31.50	95.85	2.916	2.107
11/30/2010	1.38	3.29	2.39	11.28	48.43	31.60	96.19	3.059	2.109
12/31/2010	1.18	3.03	2.56	11.00	48.46	31.69	96.53	3.268	2.112