

NORTH VIRDEN SCALLION UNIT NO. 2

WATERFLOOD EOR PROJECT

ANNUAL REPORT FOR 2016

July 31, 2017

Tundra Oil and Gas Partnership

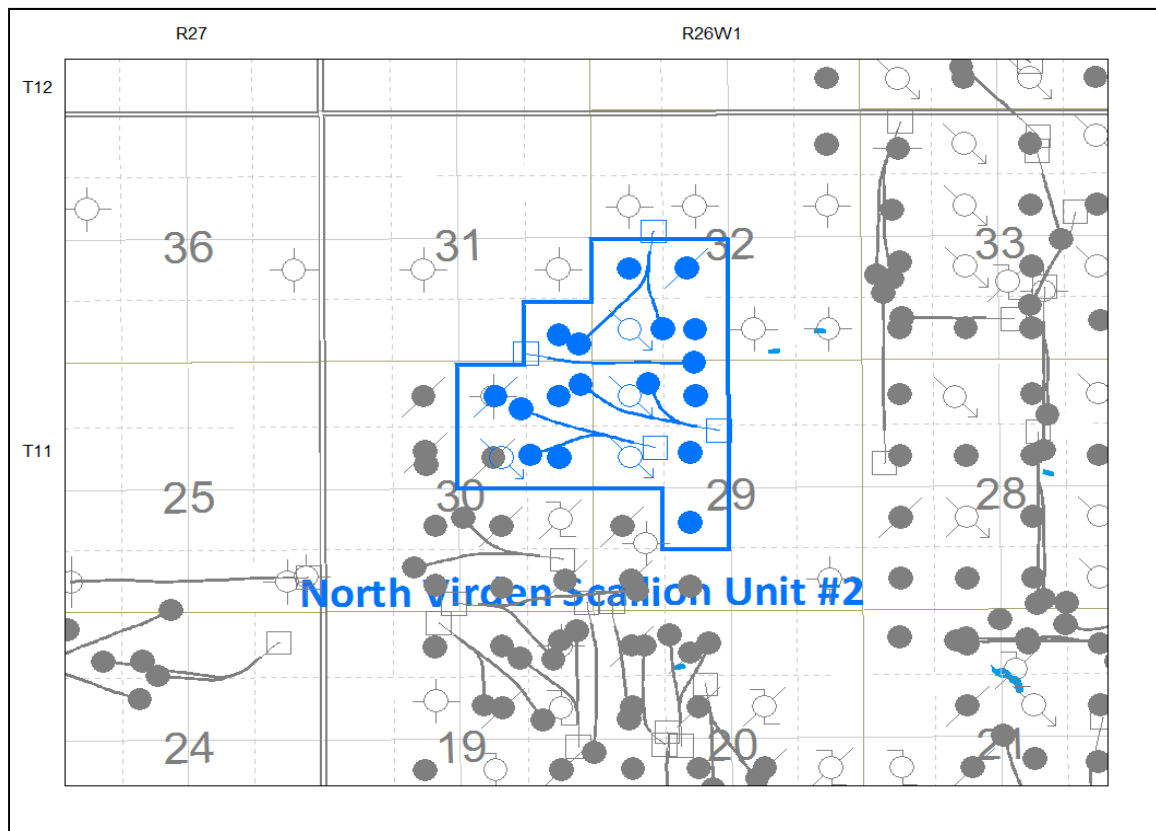
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INTRODUCTION

North Virden Scallion Unit No. 2 (NVSU2) Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM 59 effective August 1989 with Saskoil and Gas Corporation as Operator. Mountcliff Resources Ltd. acquired the unit from Saskoil and Gas Corporation and became operator in January 1993. Tundra acquired the unit from Mountcliff Resources Ltd. in January 2000 and is the current operator of the unit. The EOR project area contains 21 wells in 14 LSDs in Township 11, Range 26 W1 as shown in the figure below. Well list and well status is available in Appendix A.

Figure 1: NVSU2 Area Outline



In accordance with Section 73 of the Manitoba Drilling and Production Regulation, Tundra hereby submits the 2016 Annual Progress Report for NVSU2 as required by Board Order No. PM 59.

DISCUSSION

Production History

For the wells included in North Virden Scallion Unit No. 2, production started November 1982 with the 00/13-29-009-26W1/0 well. Oil production peaked at 59.2 m³/d in March 2000. The Unit was producing 5.59 m³/d of oil and 38.29 m³/d of water at the end of 2016, with a WOR of 6.85 m³/m³. The rates and WOR are plotted in Figure 2.

Figure 2: NVSU2 Production/Injection Rates and WOR vs. Time

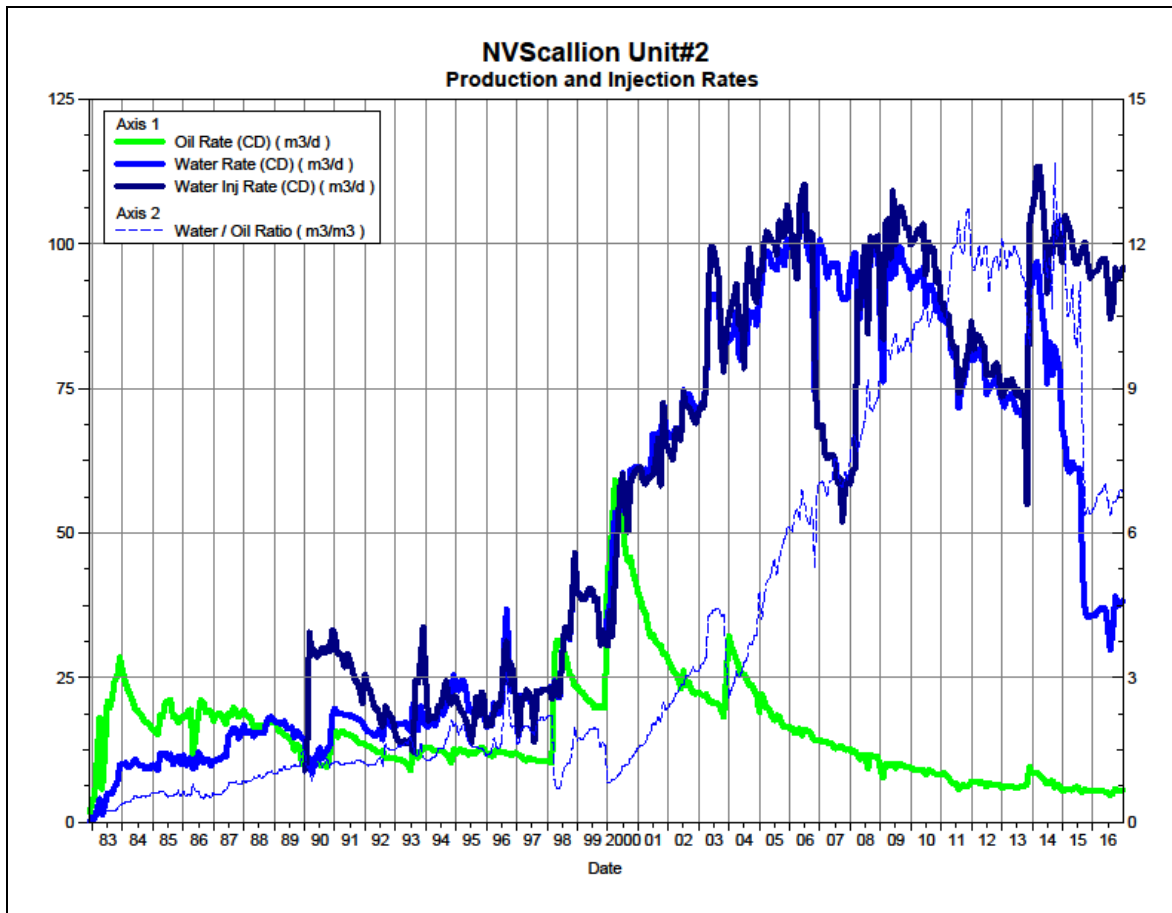
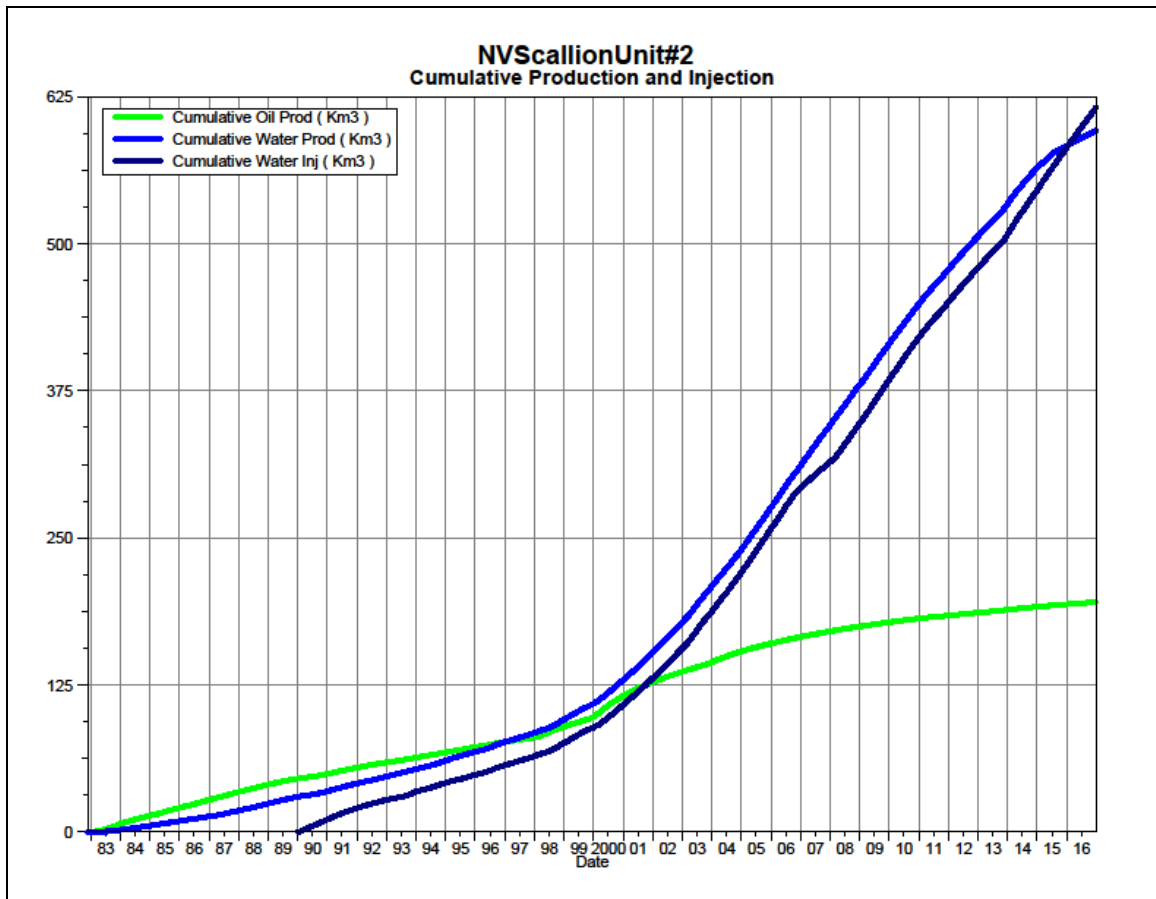


Figure 3 shows the cumulative production for NVSU2 to the end of December 2016 as 195.56 e³m³ of oil, and 596.48 e³m³ of water. The cumulative water injected is 616.2 e³m³.

Figure 3: NVSU2 Cumulative Oil, Water and Water Injected vs. Time



Waterflood History

As of December 2016, the Unit has 4 active vertical injectors in 3 injector patterns. Water injection started in December 1989. An overall summary for each injector pattern is presented in Appendix C.

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

Currently there is no source water being used at NVSU2. Produced water is re-injected back into the formation after filtration.

Injection Wellhead Pressures

The average monthly wellhead injection pressures, for each injection well, are summarized in Appendix B, and show all injection pressures since 2002. The average injection pressure for each injection well was 5766 kPag for 2016.

Reservoir Pressure

No reservoir pressure measurements were taken at NVSU2 in 2016.

Well Servicing

No maintenance was required on the 21 wells in NVS Unit No. 2 in 2016.

Voidage Replacement

Cumulative voidage for the NVSU2 was 0.765 in December 2016. Tundra hopes to maintain this cumulative VRR, by keeping water injection at its current rate for the foreseeable future. Plots of the Voidage Replacement Ratio on a monthly and cumulative basis for each injection pattern are presented in Appendix D.

Waterflood Performance Discussion

OOIP for NVSU2 is 554 e³m³. Current recovery factor within the unit is approximately 35.3%. Ultimate recovery factor for the NVSU2 is estimated to approach 36% by decline analysis.

Overall this waterflood has been quite effective as evident by the high estimated ultimate recovery factor. Likely the most significant factor that has contributed to this unit's high recovery factor was the application of horizontal drilling technology. From 1998-2002, 4 horizontal wells were drilled into the unit and since then the wells have recovered an average 20.0 e³m³ each. A portion of the reserves recovered by each horizontal well can be attributed to production acceleration, however, decline analysis clearly indicates that incremental reserves were also encountered when the horizontal wells were drilled. These incremental reserves have contributed to the unit's overall high recovery factor.

Tundra has plans in 2017 to significantly alter the way in which the waterflood at NVSU2 is currently operating, by converting horizontal wells into injection, in order to change streamlines and optimize the waterflood.

List of Appendices

Appendix A: Well Name and Well Status

Appendix B: Monthly Injection Wellhead Pressures Table

Appendix C: Injection Pattern Summary

Appendix D: Injector Pattern Production/Injection Rates, Cumulative and VRR Plots
for the following injectors:

00/12-29-011-26W1/00

02/10-30-011-26W1/00

00/04-32-011-26W1/00

Appendix A

UWI	Surface Location	Well Status
100/06-29-011-26W1/00		Capable of OIL Prod
100/11-29-011-26W1/00		Capable of OIL Prod
100/12-29-011-26W1/00		WTR Injection
100/13-29-011-26W1/00		WTR Injection
102/13-29-011-26W1/02	11-29-011-26W1	Capable of OIL Prod
100/14-29-011-26W1/00		Capable of OIL Prod
100/09-30-011-26W1/00		Capable of OIL Prod
102/09-30-011-26W1/02	12-29-011-26W1	Capable of OIL Prod
102/10-30-011-26W1/00		WTR Injection
102/15-30-011-26W1/00		ABD Producer
103/15-30-011-26W1/00	12-29-011-26W1	Capable of OIL Prod
100/16-30-011-26W1/00		Capable of OIL Prod
102/16-30-011-26W1/00	11-29-011-26W1	Capable of OIL Prod
100/01-31-011-26W1/00		Capable of OIL Prod
102/01-31-011-26W1/02	12-32-011-26W1	Capable of OIL Prod
100/03-32-011-26W1/00		Capable of OIL Prod
102/03-32-011-26W1/00	12-32-011-26W1	Capable of OIL Prod
103/03-32-011-26W1/00	01-31-011-26W1	Capable of OIL Prod
100/04-32-011-26W1/00		WTR Injection
100/05-32-011-26W1/00		Capable of OIL Prod
100/06-32-011-26W1/00		ABD Producer

Appendix B

Injection Pressure				
Month	100/12-29	100/13-29	102/10-30	100/04-32
Jan-06	7524	7524	7524	7524
Feb-06	7796	7796	7796	7796
Mar-06	7053	7053	7053	7053
Apr-06	6417	6417	6417	6417
May-06	6719	6719	6719	6719
Jun-06	7002	7002	7002	7002
Jul-06	6416	5059	6416	6416
Aug-06	5609	5609	5609	5609
Sep-06	5796	5796	5796	5796
Oct-06	4804	4804	4804	4003
Nov-06	5235	5235	5235	5235
Dec-06	5636	5636	5636	5636
Jan-07	5798	5798	5798	5798
Feb-07	5817	5817	5817	5817
Mar-07	5720	5720	5720	5720
Apr-07	5839	5839	5839	5839
May-07	5947	5947	5947	5947
Jun-07	5920	5920	5920	5920
Jul-07	6016	6016	6016	6016
Aug-07	5927	5927	5927	5927
Sep-07	5955	5955	5961	4769
Oct-07	5755	5755	5790	5755
Nov-07	5998	5998	5998	5998
Dec-07	6375	5433	6375	6375
Jan-08	6408	6408	6408	6408
Feb-08	6645	6645	6645	6645
Mar-08	6637	6637	6637	6637
Apr-08	6670	6670	6670	6670
May-08	7224	7224	7224	7224
Jun-08	6619	6619	6619	6619
Jul-08	6599	6599	6599	6599
Aug-08	6431	6431	6431	6431
Sep-08	6987	6987	6987	6987
Oct-08	6963	6963	6963	6963
Nov-08	6863	6863	6863	6863
Dec-08	6826	6826	6826	6826
Jan-09	6405	6405	6405	6405
Feb-09	7239	7239	7239	7239
Mar-09	7362	7362	7362	7362
Apr-09	6812	6812	6812	6812
May-09	7203	7203	7203	7203
Jun-09	6966	6966	6966	6966
Jul-09	5563	5563	5563	5563
Aug-09	5102	5102	5102	5102
Sep-09	4964	4964	4964	4964
Oct-09	4979	4979	4979	4979
Nov-09	4964	4964	4964	4964
Dec-09	4964	4964	4964	4964

Injection Pressure				
Month	100/12-29	100/13-29	102/10-30	100/04-32
Jan-10	4964	4964	4964	4964
Feb-10	4856	4856	4856	4856
Mar-10	5104	5104	5104	5104
Apr-10	5171	5171	5171	5171
May-10	5171	5171	5171	5171
Jun-10	5171	5171	5171	5171
Jul-10	5171	5171	5171	5171
Aug-10	5224	5224	5224	5224
Sep-10	5240	5240	5240	5240
Oct-10	5240	5240	5240	5240
Nov-10	5056	5056	5056	5056
Dec-10	4550	4550	4550	4550
Jan-11	4479	4479	4479	4479
Feb-11	4299	4299	4299	4299
Mar-11	4274	4274	4274	4274
Apr-11	4274	4274	4274	4274
May-11	4274	4274	4274	4274
Jun-11	4274	4274	4274	4274
Jul-11	4136	4274	3309	4274
Aug-11	5303	5303	0	5303
Sep-11	5054	5054	1641	5054
Oct-11	6676	6676	6676	6676
Nov-11	6894	6894	6894	6894
Dec-11	7361	7361	7361	7361
Jan-12	7860	7860	7860	7860
Feb-12	7860	7860	7860	7860
Mar-12	7860	7860	7860	7860
Apr-12	7860	7860	7860	7860
May-12	7860	7860	7860	7860
Jun-12	7860	7860	7860	7860
Jul-12	7860	7860	7860	7860
Aug-12	7860	7860	7860	7860
Sep-12	7860	7860	7860	7860
Oct-12	7860	7860	7860	7860
Nov-12	7860	7860	7860	7860
Dec-12	7860	7860	7860	7860
Jan-13	7860	7860	7860	7860
Feb-13	7860	7860	7860	7860
Mar-13	7860	7860	7860	7860
Apr-13	7860	7860	7860	7860
May-13	7860	7860	7860	7860
Jun-13	7860	7860	7860	7860
Jul-13	7539	7539	3803	7539
Aug-13	7239	7239	0	7239
Sep-13	7239	7239	0	7239
Oct-13	4688	4688	0	4688
Nov-13	4839	3150	4839	4839
Dec-13	5377	5377	5377	5377

Injection Pressure				
Month	100/12-29	100/13-29	102/10-30	100/04-32
Jan-14	5297	5297	5297	5297
Feb-14	5171	5171	5171	5171
Mar-14	5171	5171	5171	5171
Apr-14	5171	5171	5171	5171
May-14	4951	4902	4951	4951
Jun-14	4550	4412	4550	4550
Jul-14	4550	4412	4550	4550
Aug-14	4550	4412	4550	4550
Sep-14	4550	4412	4550	4550
Oct-14	4550	4412	4550	4550
Nov-14	4910	4882	4910	4910
Dec-14	5071	5071	5071	5071
Jan-15	5200	5200	5200	5200
Feb-15	5200	5200	5200	5200
Mar-15	5200	5200	5200	5200
Apr-15	5200	5200	5200	5200
May-15	5200	5200	5200	5200
Jun-15	5186	5186	5186	5186
Jul-15	5171	5171	5171	5171
Aug-15	5365	5365	5410	5410
Sep-15	5600	5600	5700	5700
Oct-15	5600	5600	5700	5700
Nov-15	5600	5600	5700	5700
Dec-15	5600	5600	5700	5700
Jan-16	5632	5616	5716	5716
Feb-16	5800	5700	5800	5800
Mar-16	5800	5700	5800	5800
Apr-16	5800	5700	5800	5800
May-16	5800	5700	5800	5800
Jun-16	5800	5700	5800	5800
Jul-16	5800	5700	5800	5800
Aug-16	5800	5700	5800	5800
Sep-16	5800	5700	5800	5800
Oct-16	5800	5700	5800	5800
Nov-16	5800	5700	5800	5800
Dec-16	5800	5700	5800	5800

Appendix C

North Virden Scallion Unit 2 Pattern Summary as of December 2015

[illegible]

Pattern: 04-32-11-26 Set: NVScallionUnit#2

Oil Formation Vol Factor : 1.07100 m3/m3

Water Formation Vol Factor : 1.00150 m3/m3

Water / Oil Ratio : 10.35 m3/m3

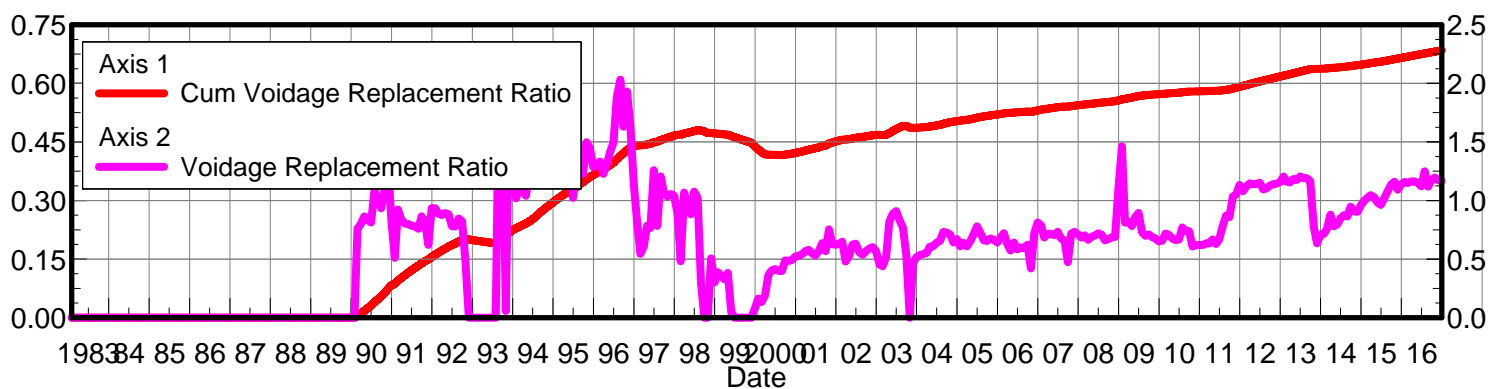
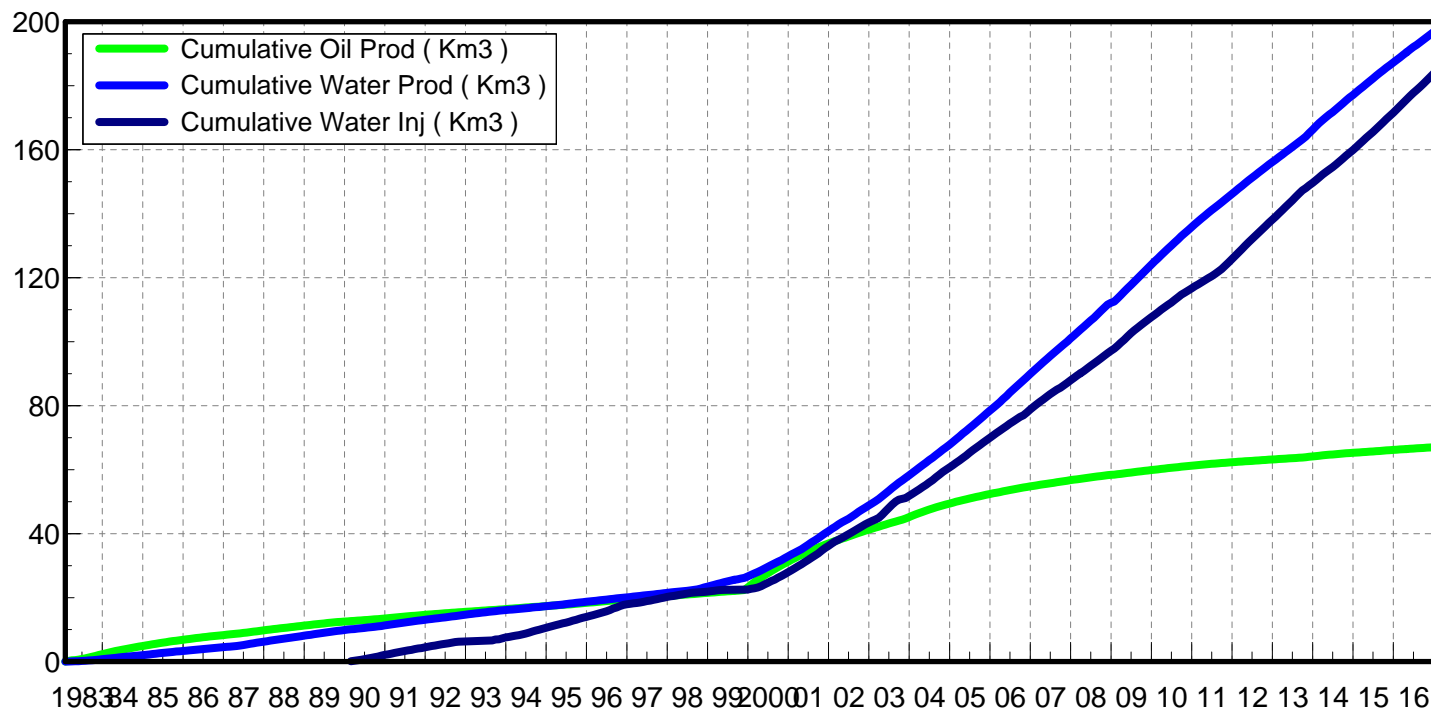
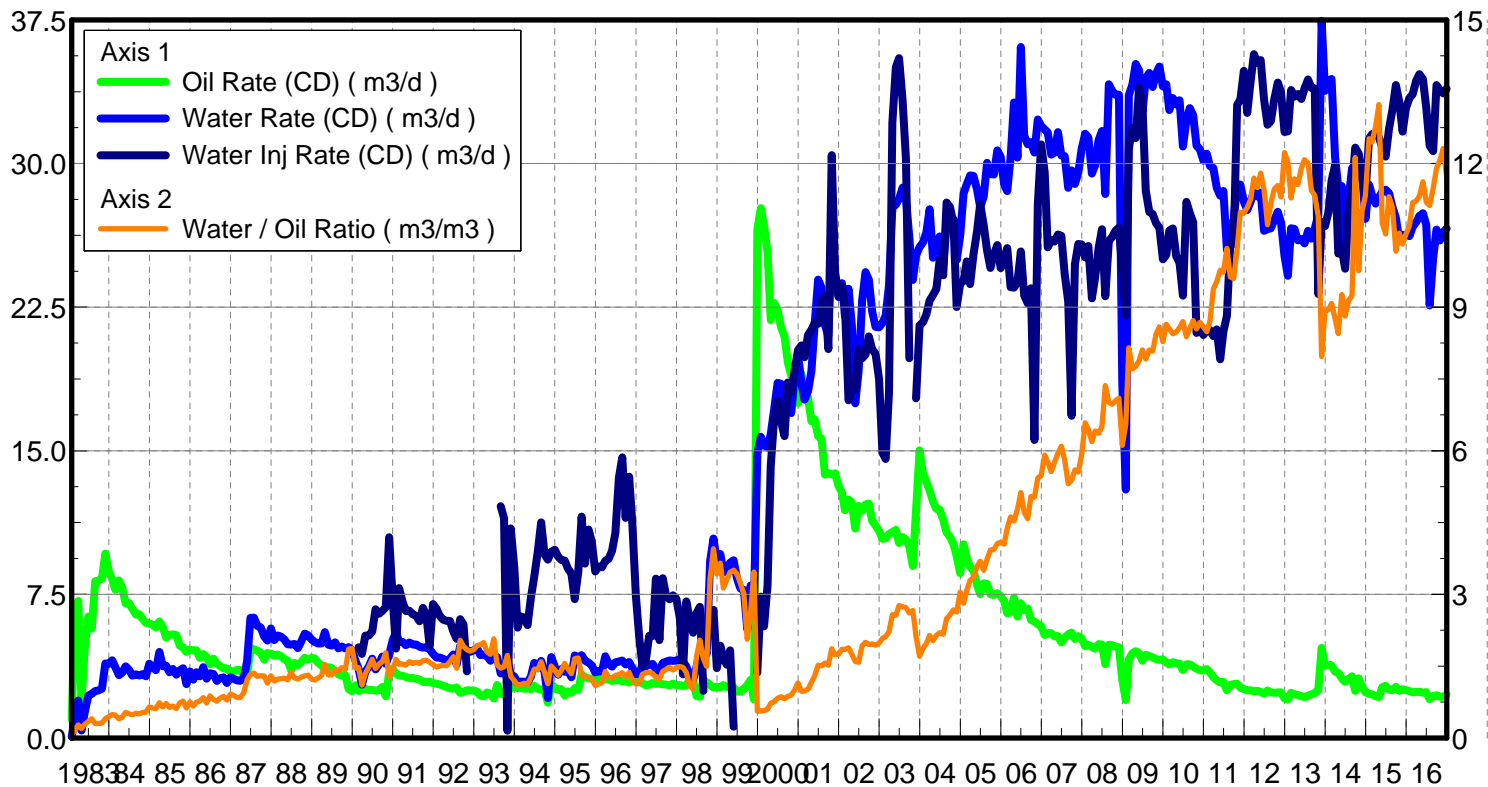
August 01, 2017

Operator: TUNDRA_OIL_ & GAS_LIMITED

Oil Rate (CD) : 1.94 m3/d

Water Rate (CD) : 23.46 m3/d

Water Inj Rate (CD) : 34.77 m3/d



Pattern: 12-29-11-26 Set: NVScallionUnit#2

Oil Formation Vol Factor : 1.07100 m3/m3

Water Formation Vol Factor : 1.00150 m3/m3

Water / Oil Ratio : 4.22 m3/m3

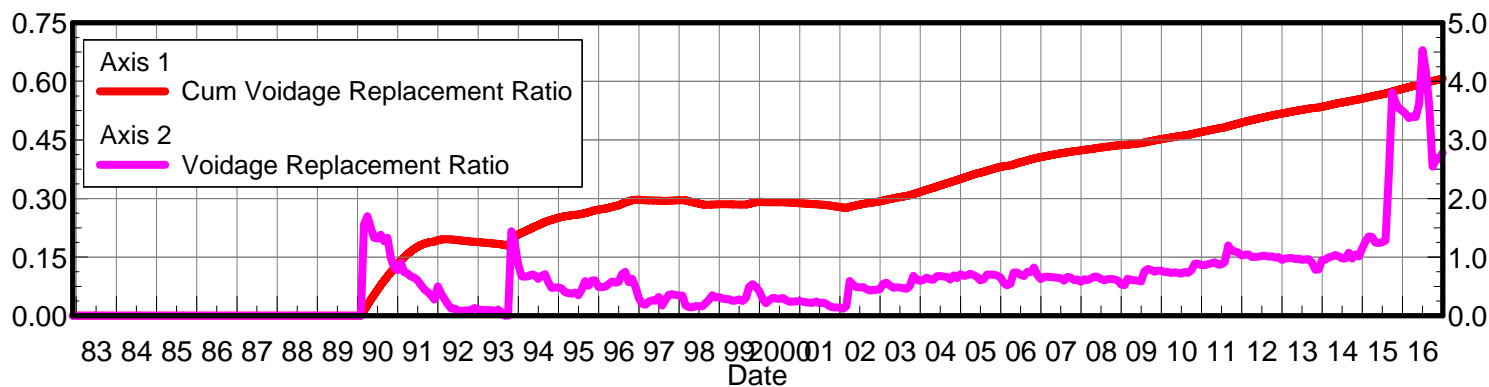
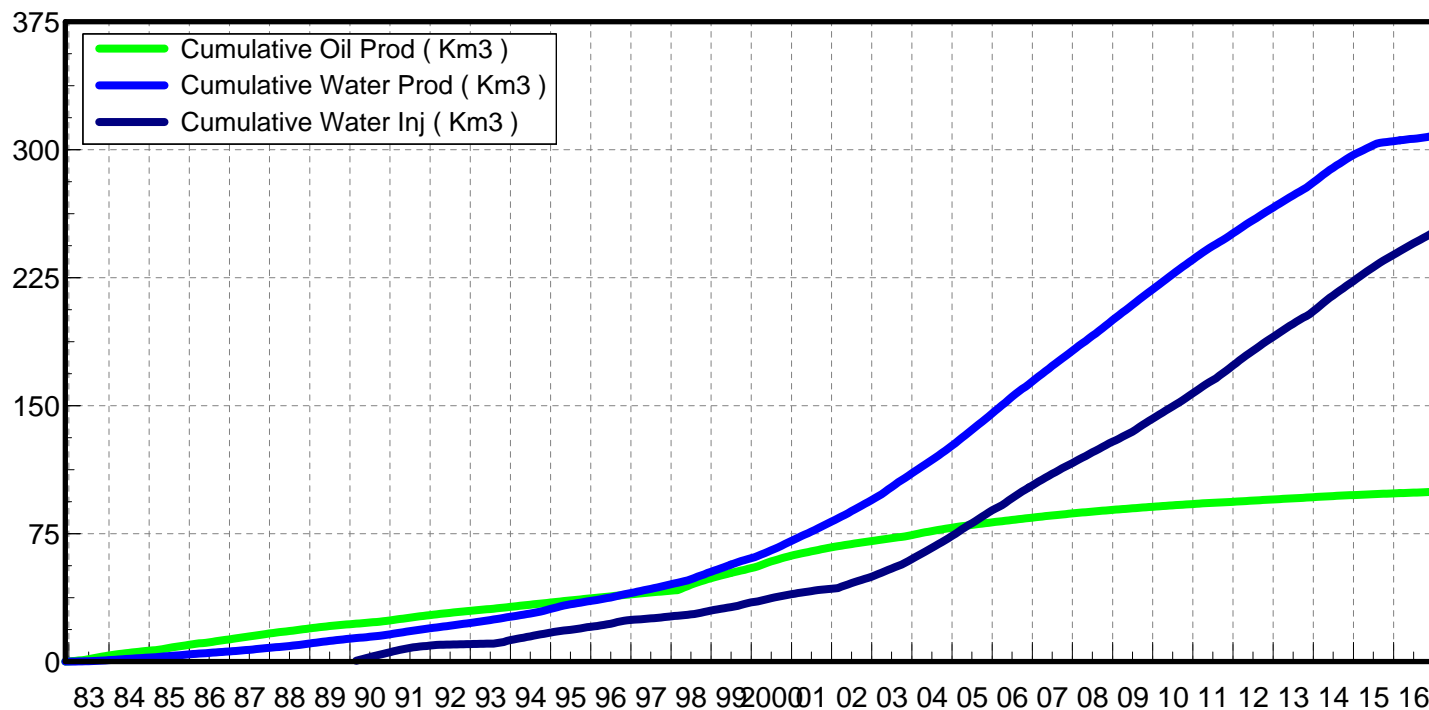
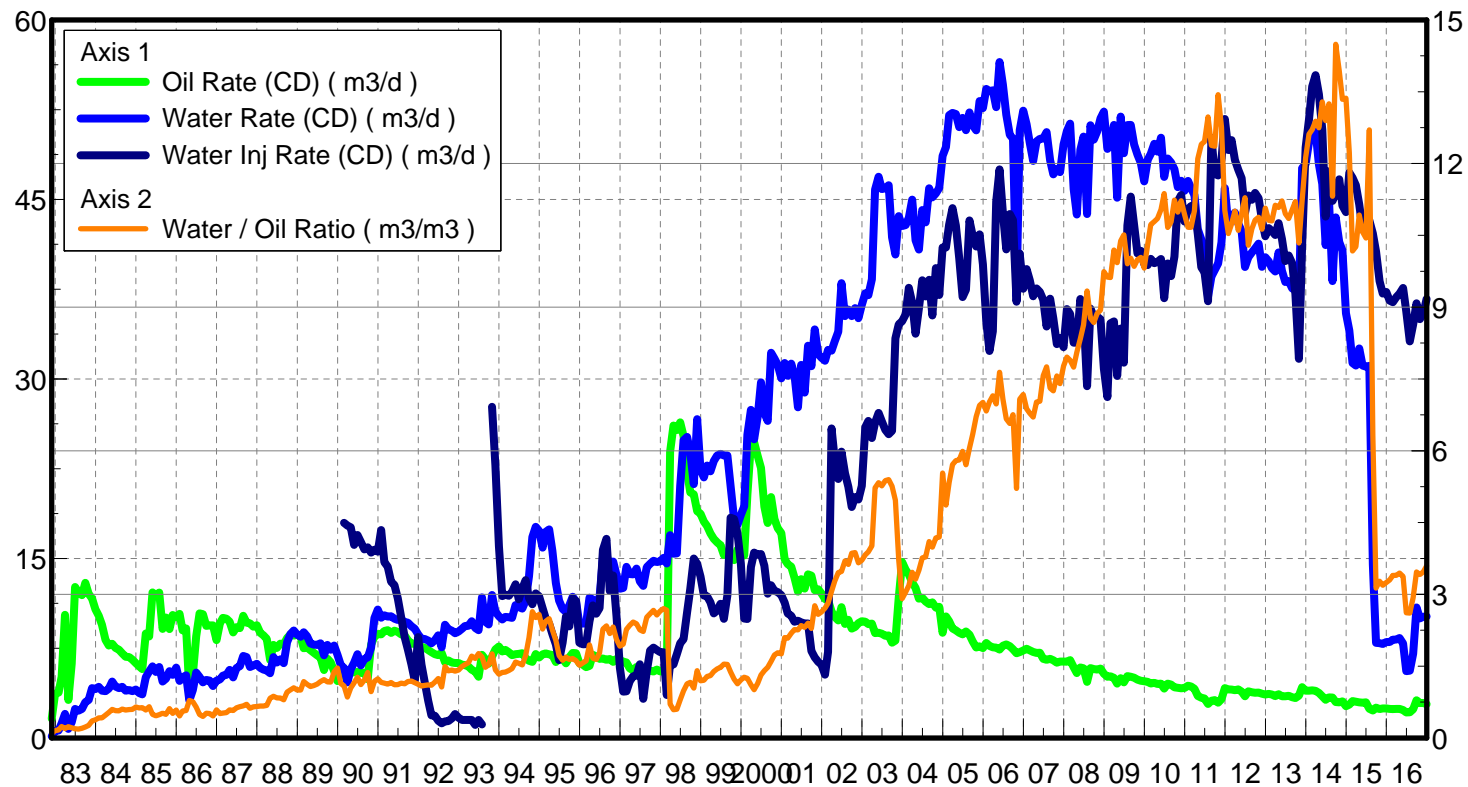
August 01, 2017

Operator: TUNDRA_OIL_&_GAS_LIMITED

Oil Rate (CD) : 2.43 m3/d

Water Rate (CD) : 19.89 m3/d

Water Inj Rate (CD) : 39.20 m3/d



Pattern: 02/10-30-11-26 Set: NVScallionUnit#2

Oil Formation Vol Factor : 1.07100 m3/m3

Water Formation Vol Factor : 1.00150 m3/m3

Water / Oil Ratio : 3.69 m3/m3

August 01, 2017

Operator: TUNDRA_OIL_ & GAS_LIMITED

Oil Rate (CD) : 0.44 m3/d

Water Rate (CD) : 9.07 m3/d

Water Inj Rate (CD) : 26.04 m3/d

