

**SINCLAIR UNIT NO. 10  
WATERFLOOD EOR PROJECT**

**ANNUAL REPORT FOR 2015**

**April 27, 2016**

**Tundra Oil and Gas Partnership**

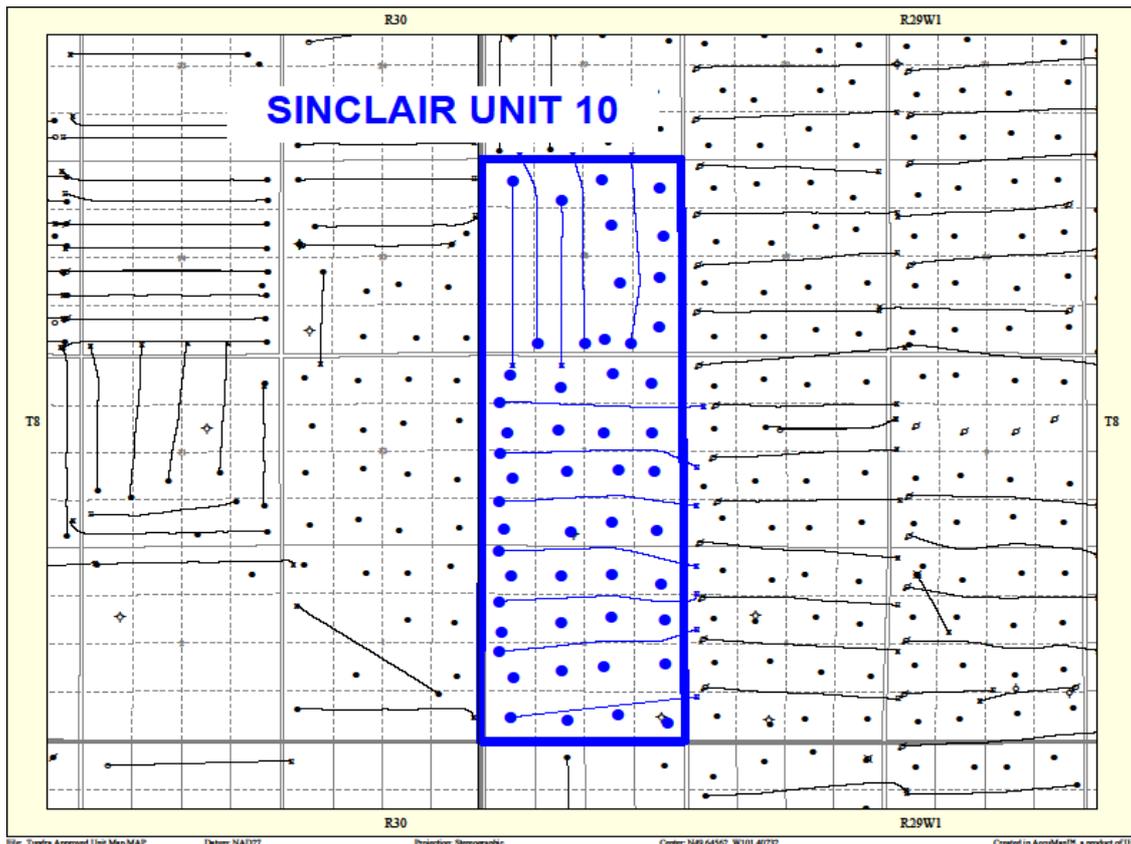
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102/05-06-008-29W1/0	
102/12-06-008-29W1/0	
102/13-06-008-29W1/0	
102/04-07-008-29W1/0	
102/05-07-008-29W1/0	
102/13-07-008-29W1/0	
102/02-18-008-29W1/0	
100/03-18-008-29W1/0	
102/03-18-008-29W1/0	

## **INTRODUCTION**

Sinclair Unit No. 10 was approved on August 1, 2013 with Tundra Oil and Gas (Tundra) as Operator. The Unit area contains 41 producing wells in 48 LSDs in Township 8 Range 29 W1 as shown in the figure below.

**Figure 1: Sinclair Unit No. 10 Area Outline**



In accordance with Section 73 of the Manitoba Drilling and Production Regulation, Tundra hereby submits the following 2015 Annual Progress Report for Sinclair Unit No. 10.

## **DISCUSSION**

### **Production History**

For the wells included in Sinclair Unit No. 10, production started in February 2003 with the 02/03-07-008-29W1 well. Average oil production peaked at 5.4 m<sup>3</sup>/d per well in July 2006. This production was coming from 27 wells and totaled 145.9 m<sup>3</sup>/d for the whole Unit. In December 2015, the Unit was producing 44.20 m<sup>3</sup>/d of oil and 22.69 m<sup>3</sup>/d of

water and had an average WOR of 0.46 m<sup>3</sup>/m<sup>3</sup> in 2015. Water injection commenced in Sinclair Unit No. 10 in October 2014. The rates and WOR are presented in Figure 2.

**Figure 2: Sinclair Unit No. 10 Production/Injection Rates and WOR vs Time**

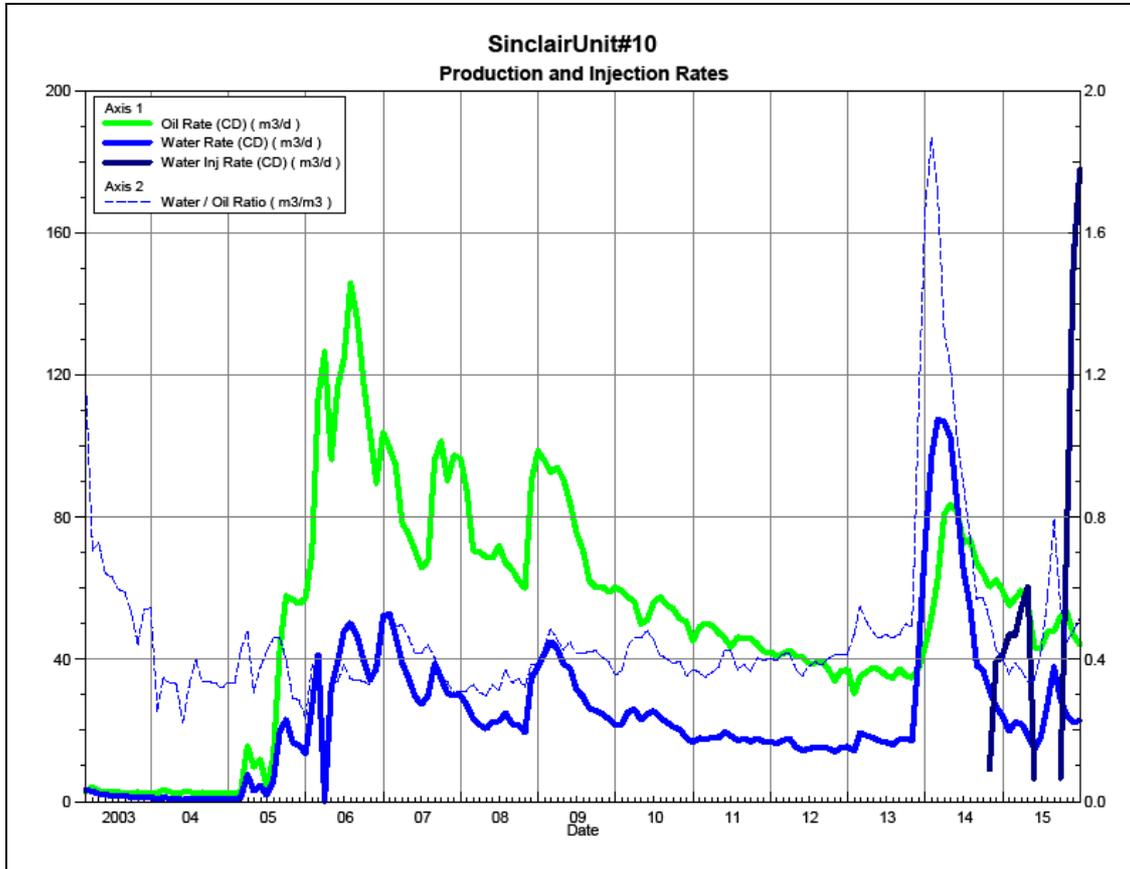
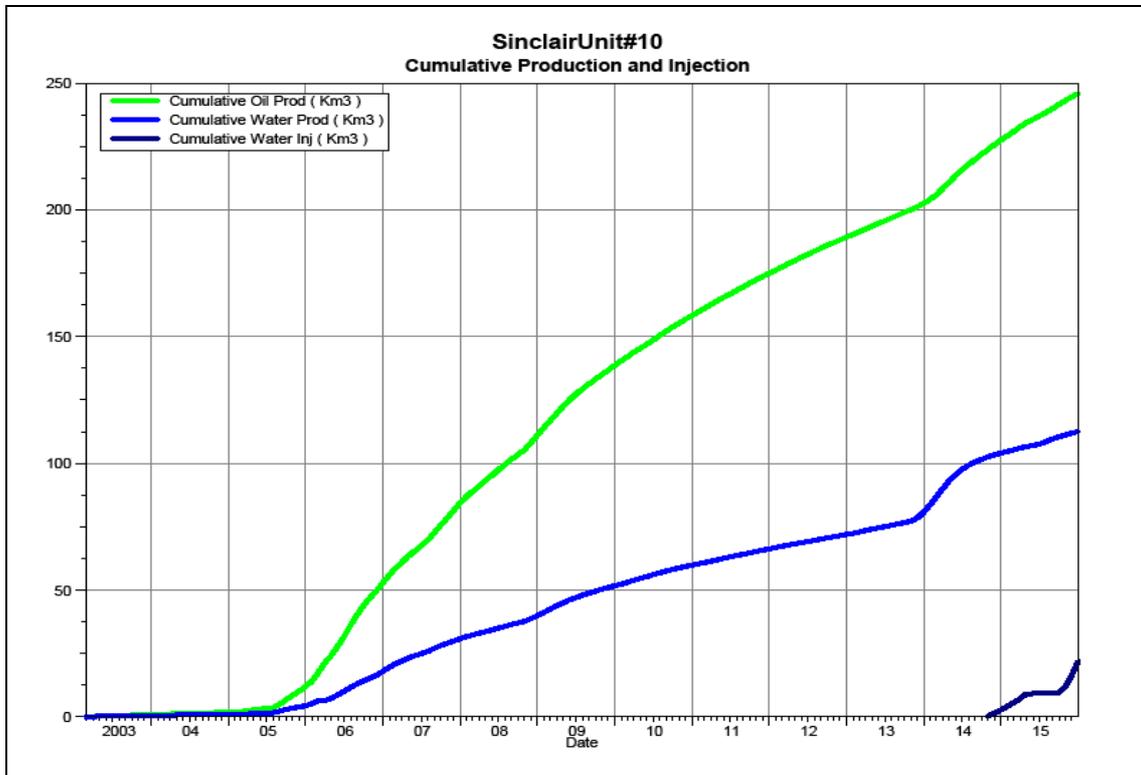


Figure 3 shows the cumulative production for Sinclair Unit No. 10 to the end of December 2015 as 245.9 e<sup>3</sup>m<sup>3</sup> of oil, and 112.6 e<sup>3</sup>m<sup>3</sup> of water, representing a 10.1% recovery factor of the OOIP.

**Figure 3: Sinclair Unit No. 10 Cumulative Oil, Water and Water Injected vs Time**



## **Waterflood Development Plan**

### **Sinclair Unit No. 10 Waterflood (WF) Development Plan**

Sinclair Unit No. 10 is still in the development phase at the end of 2015. In 2013, the 10 proposed horizontal injectors were drilled. In 2014, the 02/05-06, 02/12-06 and 02/05-07-008-29W1 wells were converted to water injection. In 2015, the 00/04-06 and 02/13-06-008-29W1 wells were converted to water injection. All of the horizontal wells are fracture stimulated to improve the injection rates. In order to maximize recovery from this Unit, Tundra expects to produce all of the injectors for a short period of time to clean-up the reservoir near the wellbores prior to being converted into water injectors.

Production performance by injector pattern are summarized in Appendix A.

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 Sinclair Unit No. 10 will be sourced from the 16-32-007-29W1 well (Lodgepole formation). The water is treated at the 03-04-008-29W1 battery where it is filtered to 0.5 microns and has scale inhibitor added. The injection water is then distributed to the injectors through the dedicated infrastructure system.

### **Injection Wellhead Pressures**

Injection started in this Unit in October 2014. The monthly wellhead injection pressure for each injector is summarized in Appendix C. Since injection in this Unit is still in the early stages, the injectors are still building up to a target injection pressure of 6300 kPaa.

### **Reservoir Pressure**

Where practical, Tundra is committed to collecting pressure data from newly drilled injection wells. For Sinclair Unit No. 10, pressure data taken in 2013 from 7 locations is available. A summary table is presented in Appendix B. Pressures are corrected to a common datum of -450 m SS for comparison with other units in the area.

### **Well Servicing**

The following table summarizes the well servicing performed within Sinclair Unit No. 10 during 2015:

**Table 1: Sinclair Unit No. 10 Well Servicing**

100.09-06-008-29W1.00	Pump Change	1/29/2015
100.04-06-008-29W1.00	WIW Conversion	2/7/2015
100.13-18-008-29W1.00	Pump Change	2/27/2015
100.13-18-008-29W1.00	PP Drill-out	7/20/2015
100.16-18-008-29W1.00	Pump Change	8/10/2015
100.13-07-008-29W1.00	Pump Change	8/25/2015
100.07-07-008-29W1.00	Pump Change	8/26/2015

### **Waterflood Performance Discussion**

At the end of 2015, the waterflood area had 5 of the proposed horizontal injection wells on injection and 5 wells still on production. Tundra anticipates converting 3 more locations to injectors in 2016. Conversion of the remaining horizontal wells to water injection wells is expected to take place in 2017.

Plots of the production and injection data along with the VRR information is presented in Appendix D for each of the injection patterns.

## List of Appendices

Appendix A: Sinclair Unit No. 10 Injection Pattern Summary

Appendix B: Sinclair Unit No. 10 Reservoir Pressure Summary

Appendix C: Sinclair Unit No. 10 Monthly Injection Pressures

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

100/04-06-008-29W1/0

102/05-06-008-29W1/0

102/12-06-008-29W1/0

102/13-06-008-29W1/0

102/04-07-008-29W1/0

102/05-07-008-29W1/0

102/13-07-008-29W1/0

102/02-18-008-29W1/0

100/03-18-008-29W1/0

102/03-18-008-29W1/0

Appendix A

Sinclair Unit No. 10 Injection Pattern Summary as of December 2015

Pattern Name	Injector BH Location (008-29W1)	Injector Surf. Location (008-29W1)	Status	No. of Supported Wells	Supported Wells (008-29W1)	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
00/04-06-008-29W1 Injector	00/04-06	04-05-008-29W1	Water Injection	7	02/01-06, 02-06, 03-06, 05-06, 06-06, 07-06, 08-06	0.5	Jul 2005	Apr 2015	1.1	1.8	1.69	38.4	12.0	12.5	3.0	13.0	0.12
02/05-06-008-29W1 Injector	02/05-06	02/12-05-008-29W1	Water Injection	8	05-06, 06-06, 07-06, 08-06, 09-06, 10-06, 11-06, 12-06	0.5	Dec 2005	Oct 2014	1.6	1.8	1.13	37.7	15.0	13.4	6.2	10.9	0.21
02/12-06-008-29W1 Injector	02/12-06	02/13-05-008-29W1	Water Injection	8	09-06, 10-06, 11-06, 12-06, 13-06, 14-06, 15-06, 16-06	0.5	Jan 2006	Oct 2014	1.7	1.6	0.97	38.9	16.2	12.6	6.7	11.4	0.22
02/13-06-008-29W1 Injector	02/13-06	02/13-05-008-29W1	Water Injection	8	13-06, 14-06, 15-06, 16-06, 01-07, 02-07, 02/03-07, 04-07	0.5	Feb 2003	Nov 2015	1.9	1.4	0.73	23.7	22.6	11.2	0.9	6.9	0.03
02/04-07-008-29W1 Injector	02/04-07	02/04-08-008-29W1	Capable of OIL Prod	8	01-07, 02-07, 02/03-07, 04-07, 05-07, 06-07, 07-07, 08-07	0.5	Feb 2003	-	7.5	5.0	0.67		28.9	10.0	0.0	0.0	0.00
02/05-07-008-29W1 Injector	02/05-07	02/05-08-008-29W1	Water Injection	8	05-07, 06-07, 07-07, 08-07, 09-07, 10-07, 11-07, 12-07	0.5	Mar 2005	Dec 2014	2.7	1.1	0.41	39.1	23.2	5.5	5.1	9.7	0.17
02/13-07-008-29W1 Injector	02/13-07	02/12-08-008-29W1	Capable of OIL Prod	8	09-07, 10-07, 11-07, 12-07, 13-07, 14-07, 15-07, 16-07	0.5	Feb 2005	-	8.2	1.7	0.21		28.9	7.4	0.0	0.0	0.00
02/02-18-008-29W1 Injector	02/02-18	02/02-19-008-29W1	Capable of OIL Prod	8	01-18, 02-18, 07-18, 08-18, 09-18, 10-18, 15-18, 16-18	0.5	Mar 2005	-	6.4	1.7	0.27		24.2	7.3	0.0	0.0	0.00
00/03-18-008-29W1 Injector	00/03-18	04-19-008-29W1	Capable of OIL Prod	2	13-18, 14-18	0.5	Oct 2008	-	4.1	2.4	0.58		19.0	10.2	0.0	0.0	0.00
02/03-18-008-29W1 Injector	02/03-18	02/03-19-008-29W1	Capable of OIL Prod	5	02-18, 07-18, 10-18, 14-18, 15-18	0.5	Mar 2005	-	3.3	2.0	0.61		18.0	9.6	0.0	0.0	0.00

## APPENDIX B

### Sinclair Unit No. 10 - Pressure Summary

Location	Test Date	Final Pressure (kPaa)	MPP (mTVD)	KB	Datum Depth	Gradient	Pressure @ -450 masl
02/12-06-008-29W1/0	Sept 19 - 24, 2013	3788.1	1008.75	529.81	-450	8.25	3549
02/13-06-008-29W1/0	Sept 10 - 22, 2013	2646.1	1003.49	529.59	-450	8.25	2449
02/04-07-008-29W1/0	Oct 16 - 26, 2013	2593.0	1003.8	529.06	-450	8.25	2389
02/05-07-008-29W1/0	Nov 23 - 25, 2013	2325.1	995.54	528.58	-450	8.25	2185
02/13-07-008-29W1/0	Nov 15 - 24, 2013	2447.0	997.5	530.4	-450	8.25	2306
02/02-18-008-29W1/0	Oct 24 - 31, 2013	2381.6	1004.15	541.14	-450	8.25	2274
00/03-18-008-29W1/0	Nov 8 - 15, 2013	2333.0	995.31	534.32	-450	8.25	2242

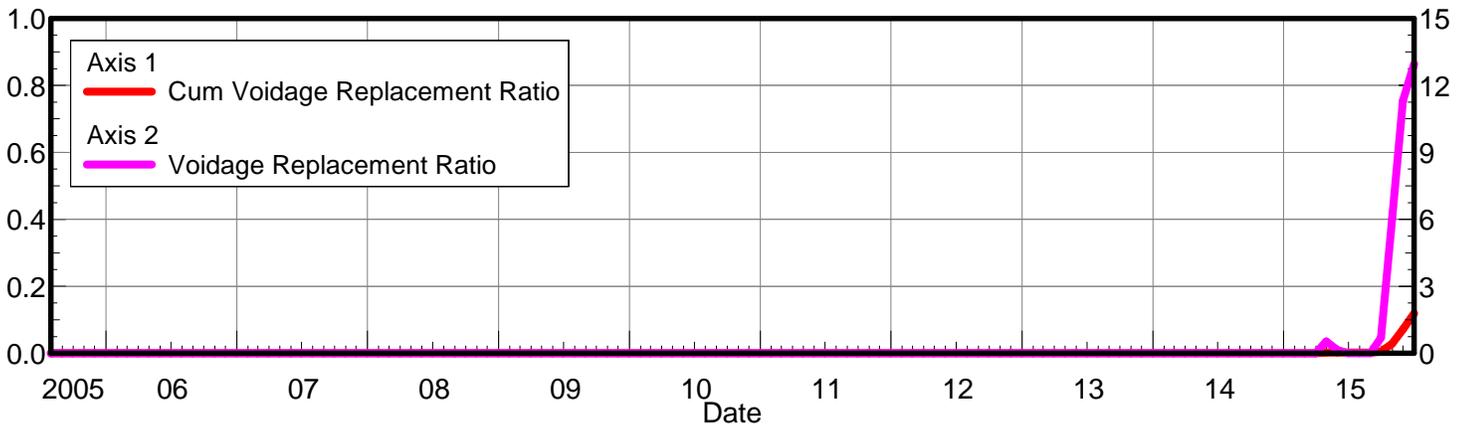
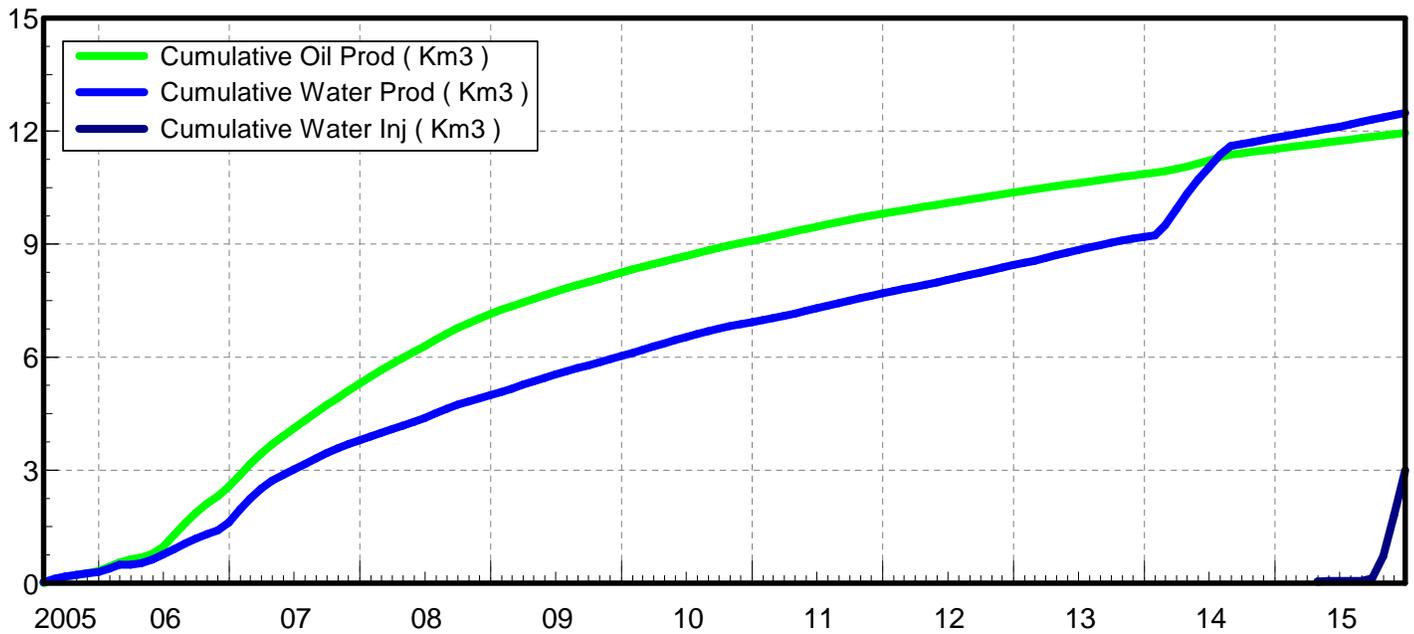
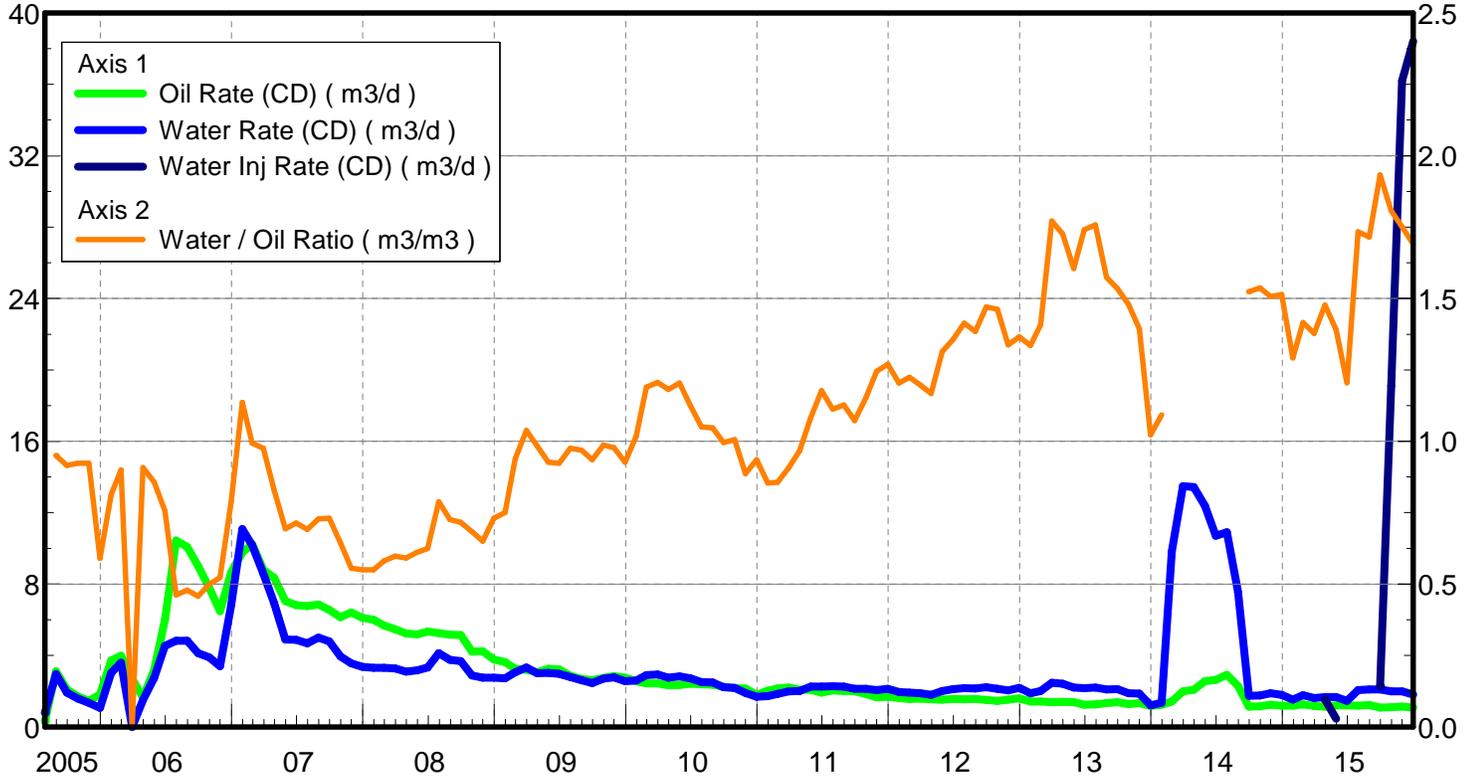
## Appendix C

Month	Average Monthly Injection Pressure				
	100/04-06	102/05-06	102/12-06	102/13-06	102/05-07
Jan-14	-	-	-	-	-
Feb-14	-	-	-	-	-
Mar-14	-	-	-	-	-
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	-	-	-
Jul-14	-	-	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	0	-76	-76	0	0
Nov-14	0	-83	-82	0	0
Dec-14	0	-82	-82	0	671
Jan-15	0	-50	-81	0	83
Feb-15	0	-42	-81	0	-78
Mar-15	0	-86	-84	0	-80
Apr-15	-32	40	-83	0	-78
May-15	-24	-86	-86	0	-79
Jun-15	-24	-86	-86	0	-79
Jul-15	-24	35	-86	0	-79
Aug-15	492	955	340	-79	-78
Sep-15	-71	-81	-75	0	-63
Oct-15	-24	-86	-86	0	-79
Nov-15	16	-42	-34	0	-79
Dec-15	-83	-62	-83	-10	-81

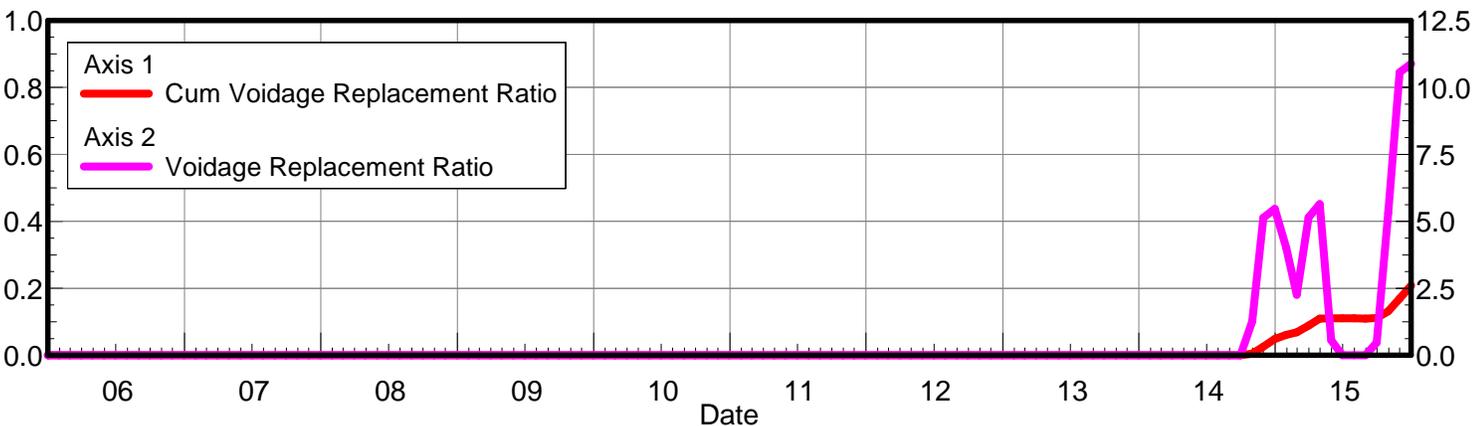
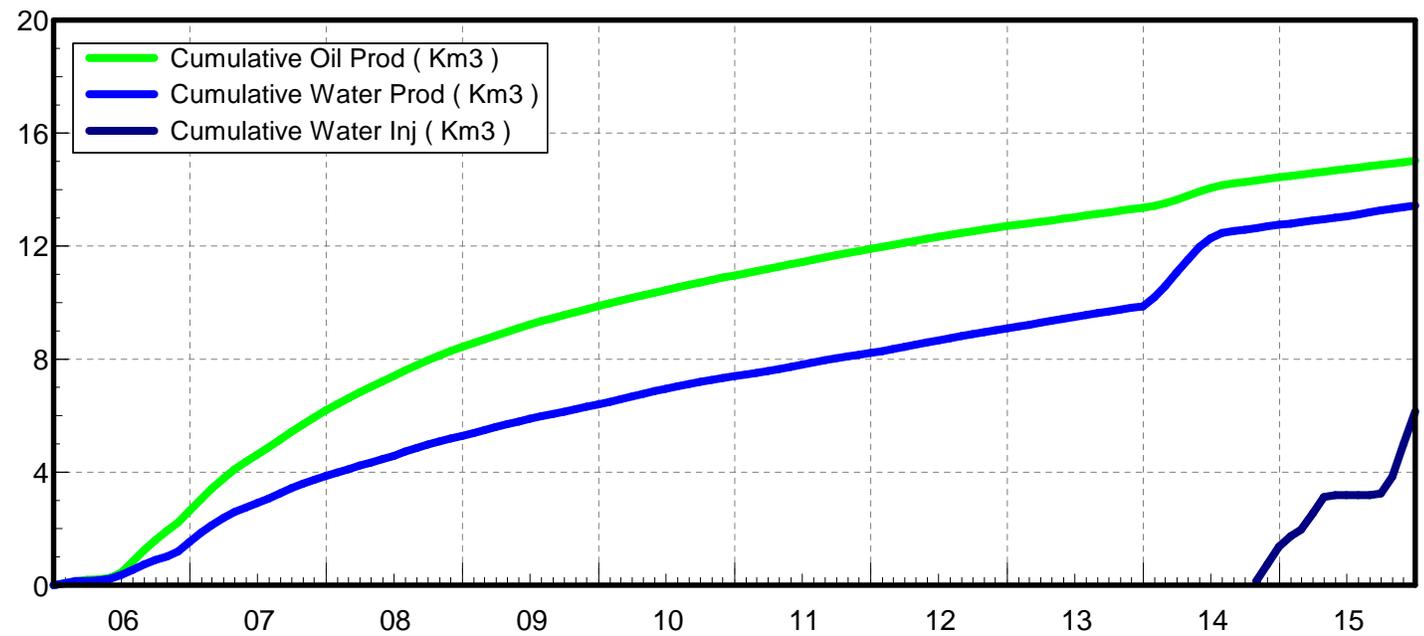
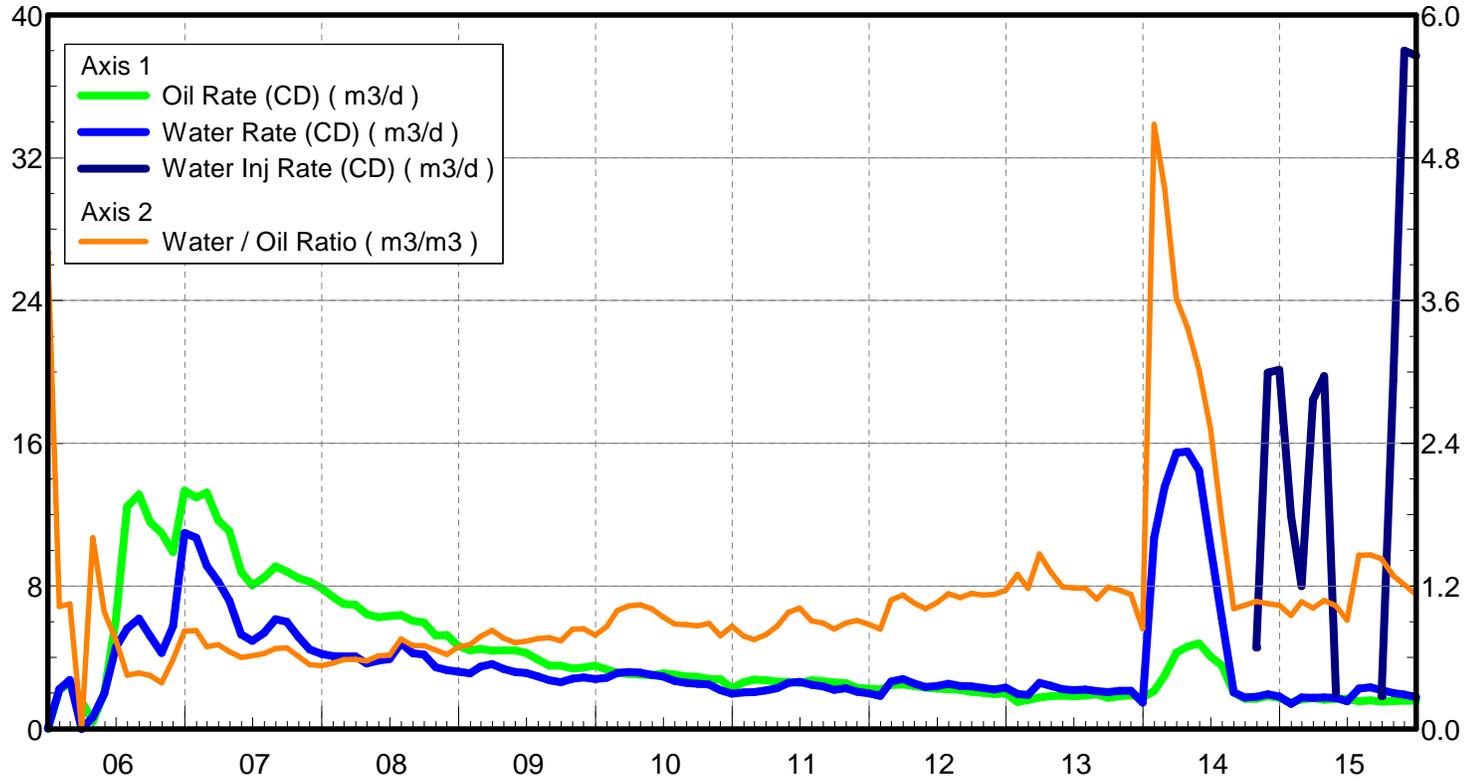
## **Appendix D**

### **Rates and VRR Plots**

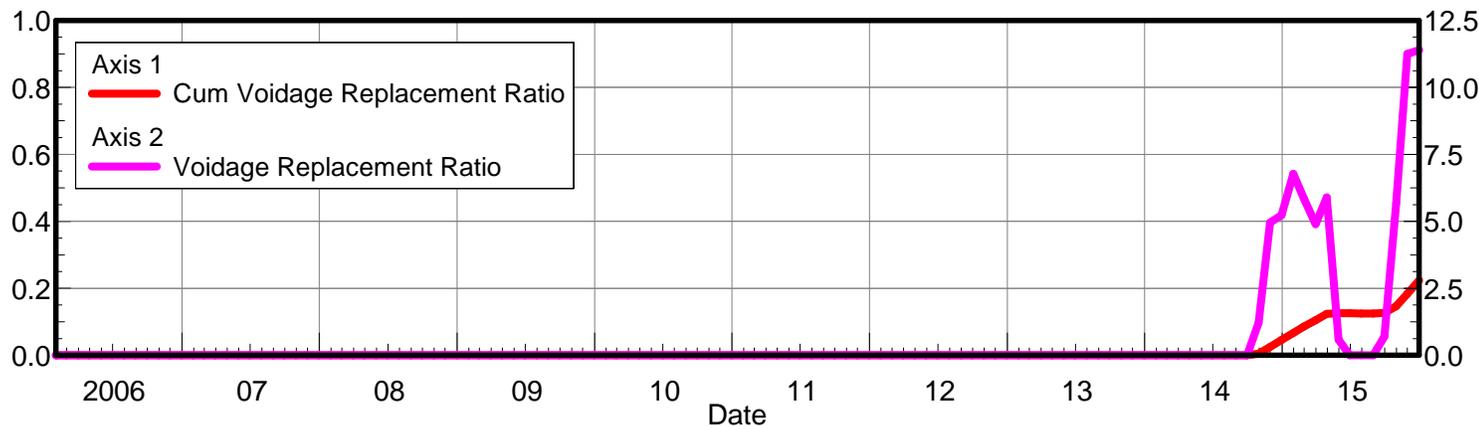
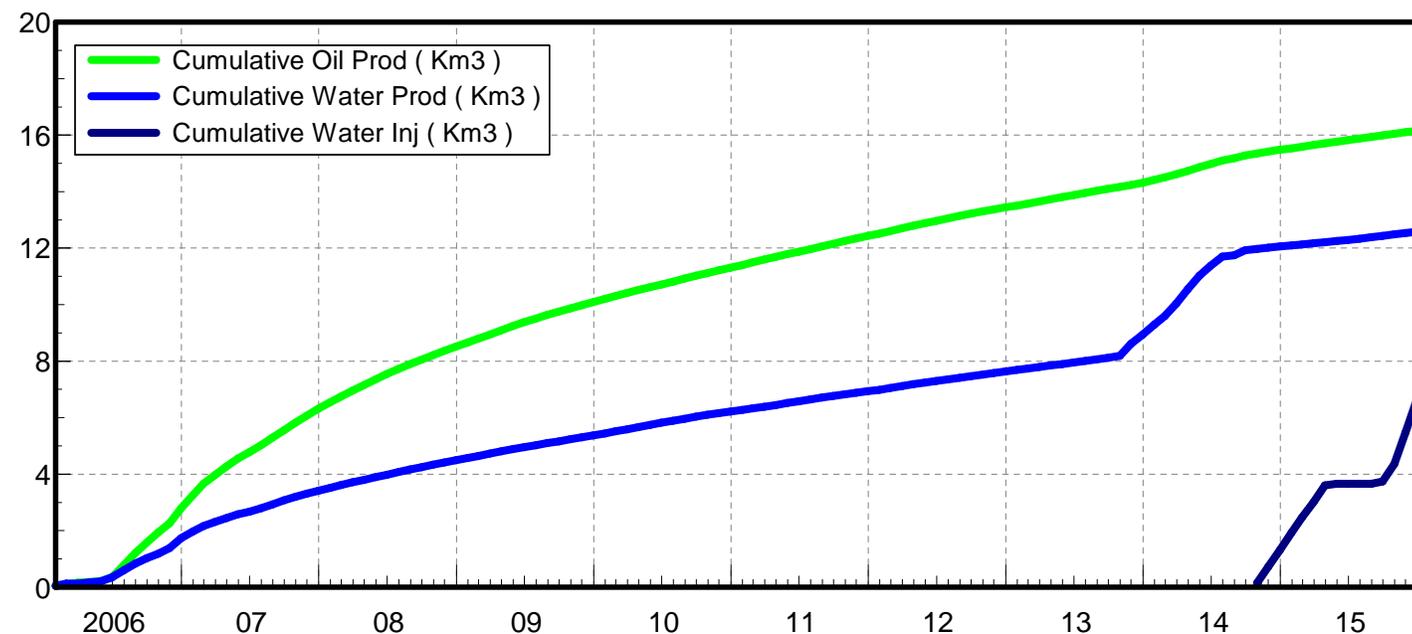
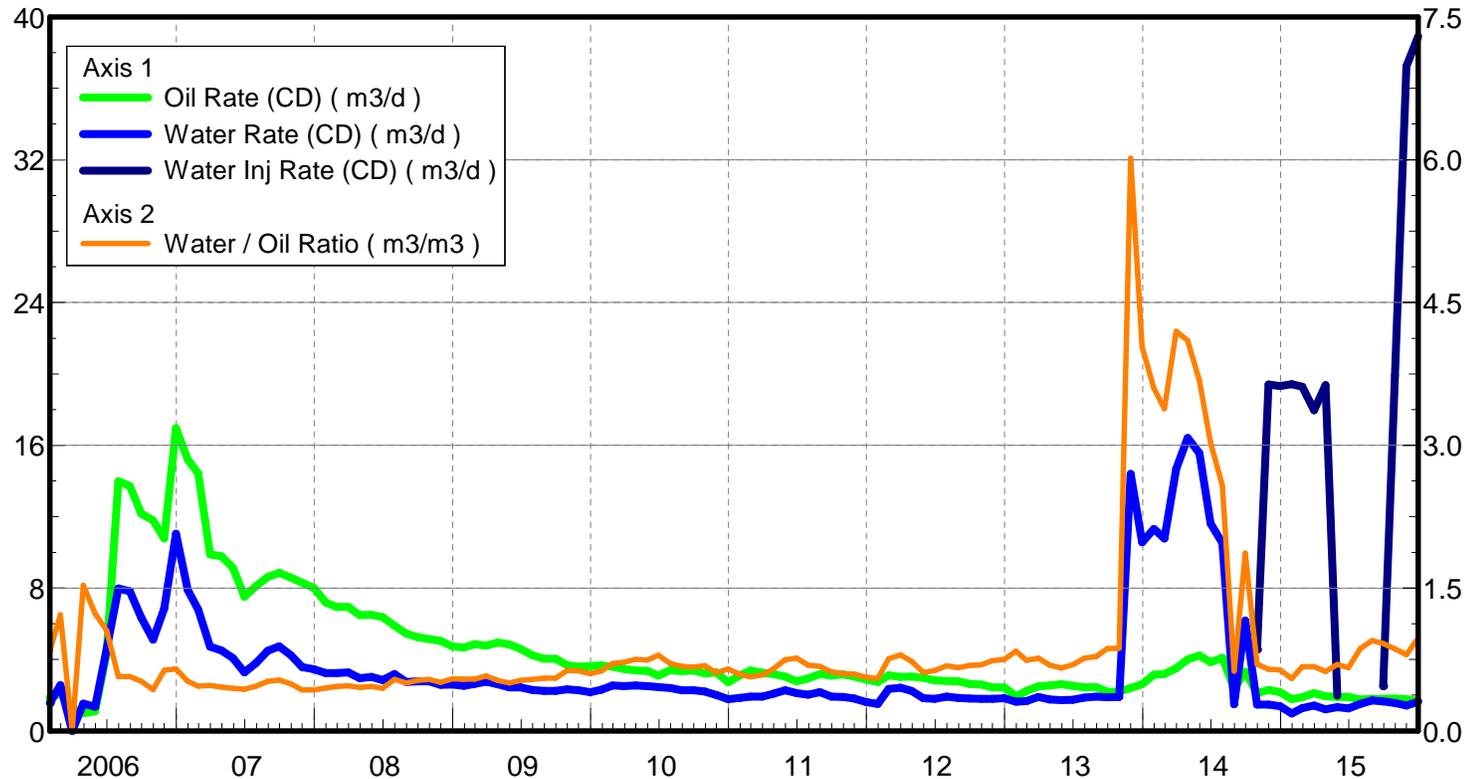
Oil Formation Vol Factor : 0.833333  
 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 1.42 m3/m3  
 April 27, 2016  
 Operator: Tundra\_O&G\_Prtshp  
 Pattern: 00/04-06-008-29  
 Inj Set: Sinclair  
 Unit#10  
 Oil Rate (CD) : 1.36 m3/d  
 Water Rate (CD) : 1.92 m3/d  
 Water Inj Rate (CD) : 38.94 m3/d



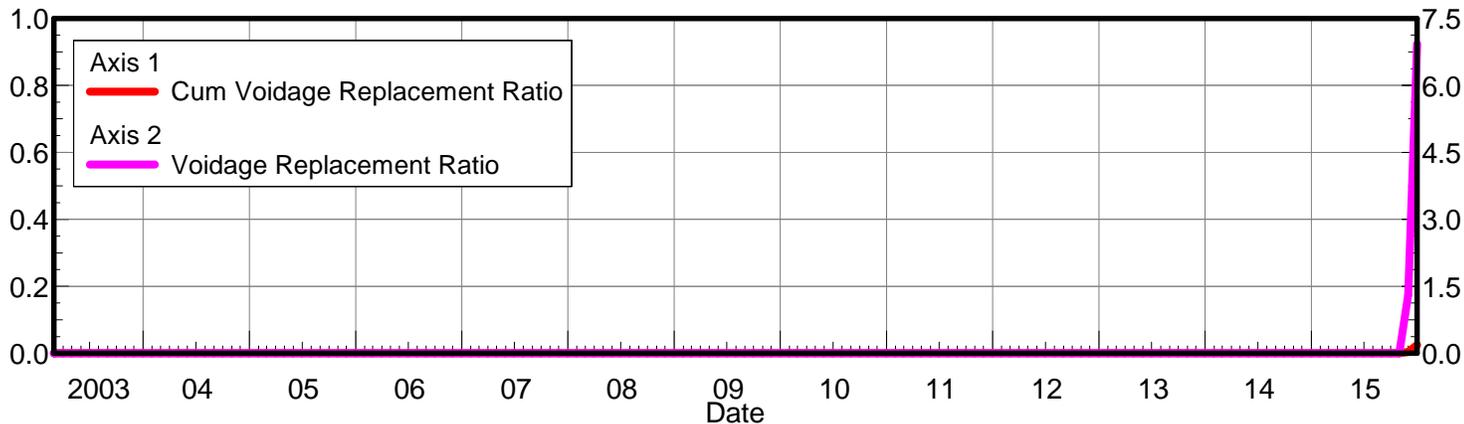
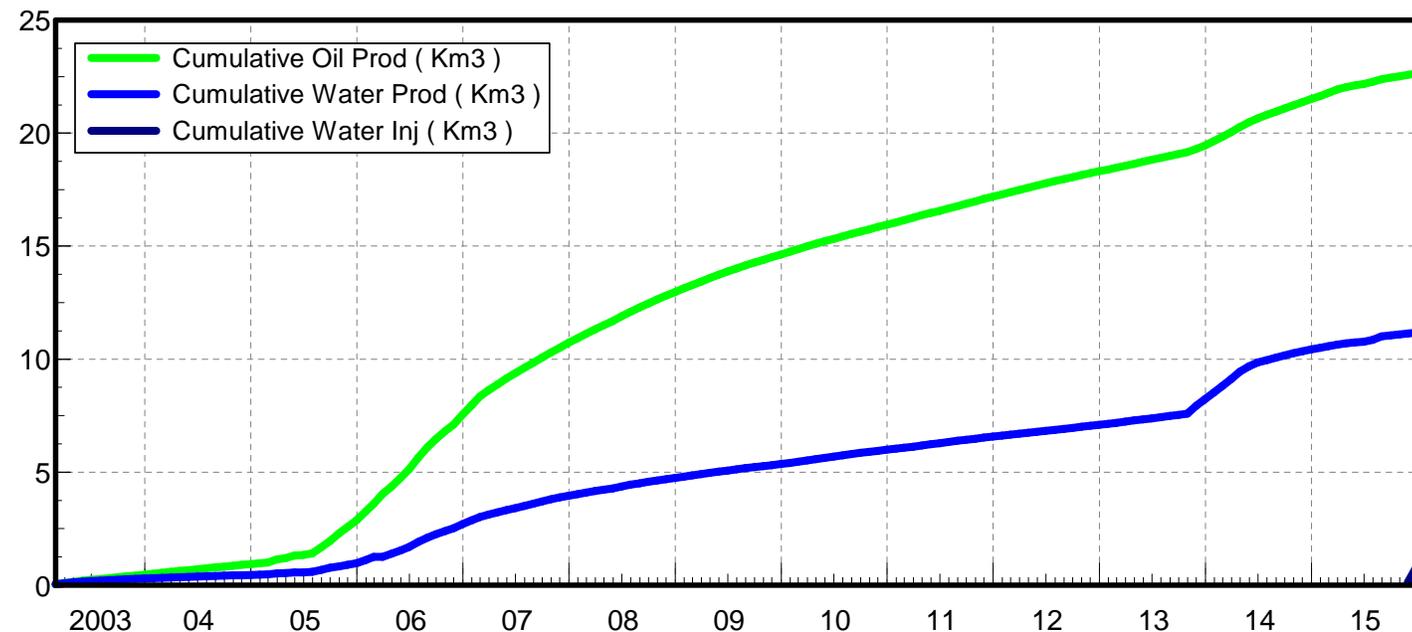
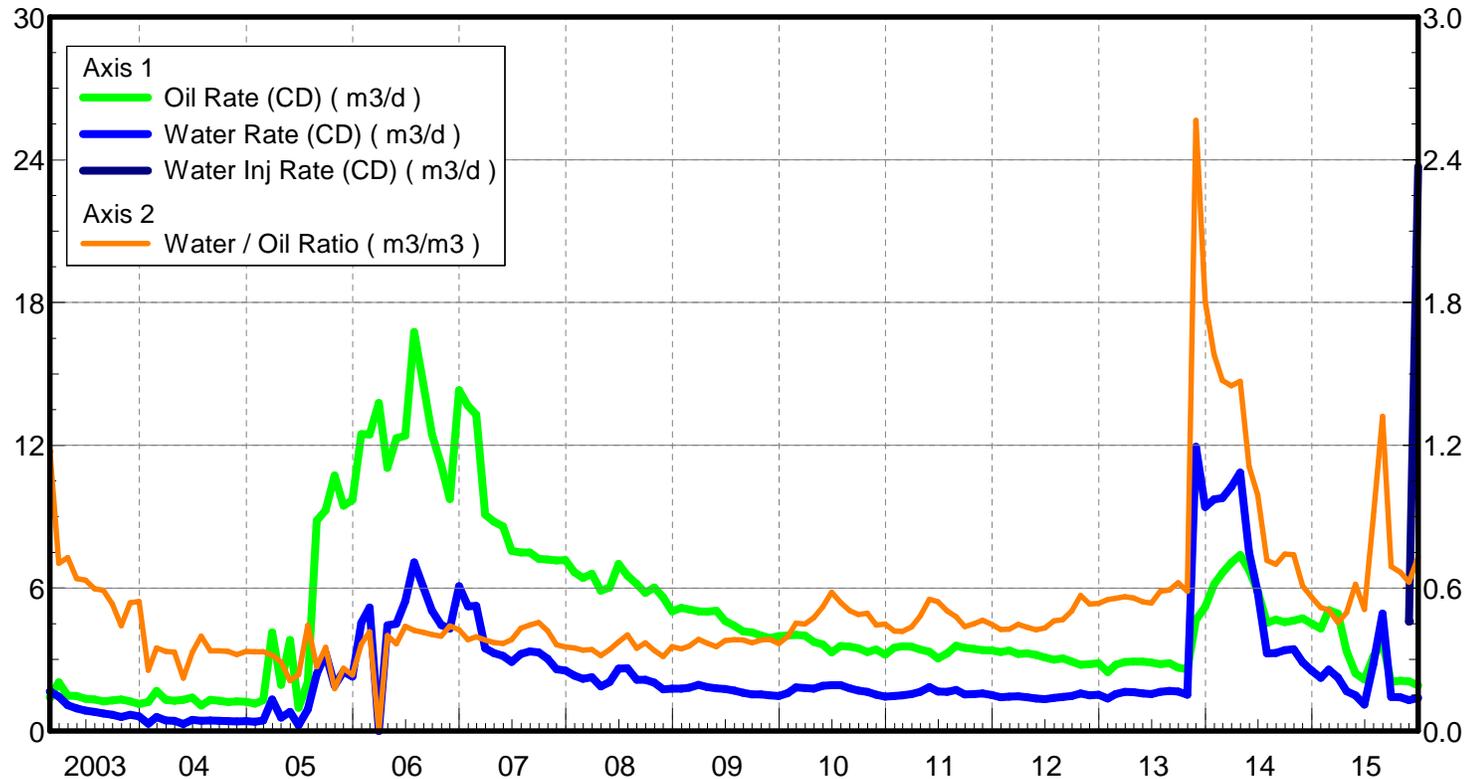
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 Oil Formation Vol Factor : 1.00150 m3/m3  
 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 0.94 m3/m3  
 Operator: Tundra\_O&G\_Prtshp  
 Oil Rate (CD) : 1.85 m3/d  
 Water Rate (CD) : 1.74 m3/d  
 Water Inj Rate (CD) : 38.77 m3/d



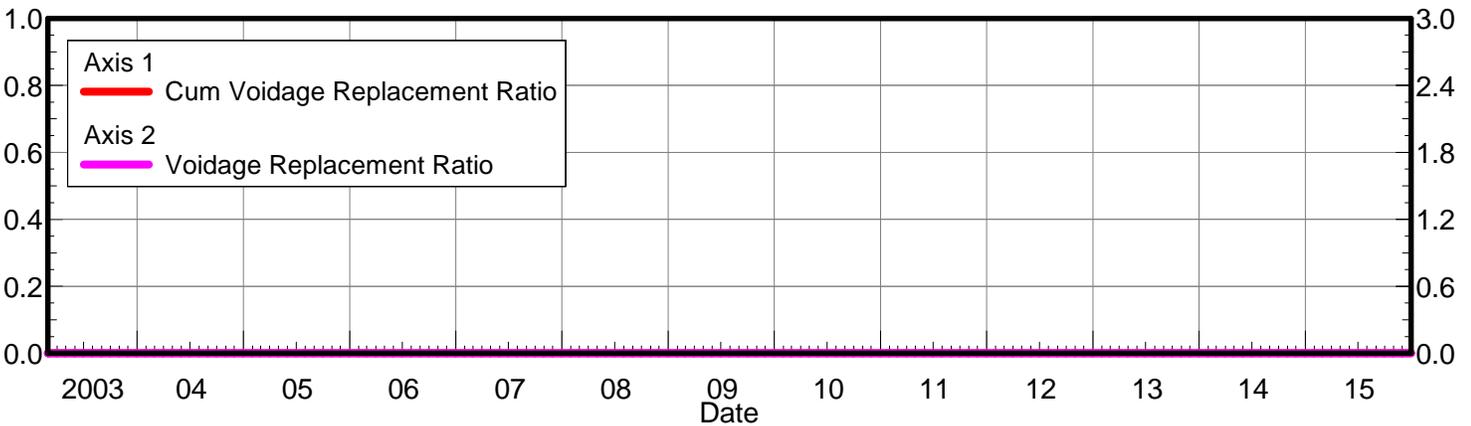
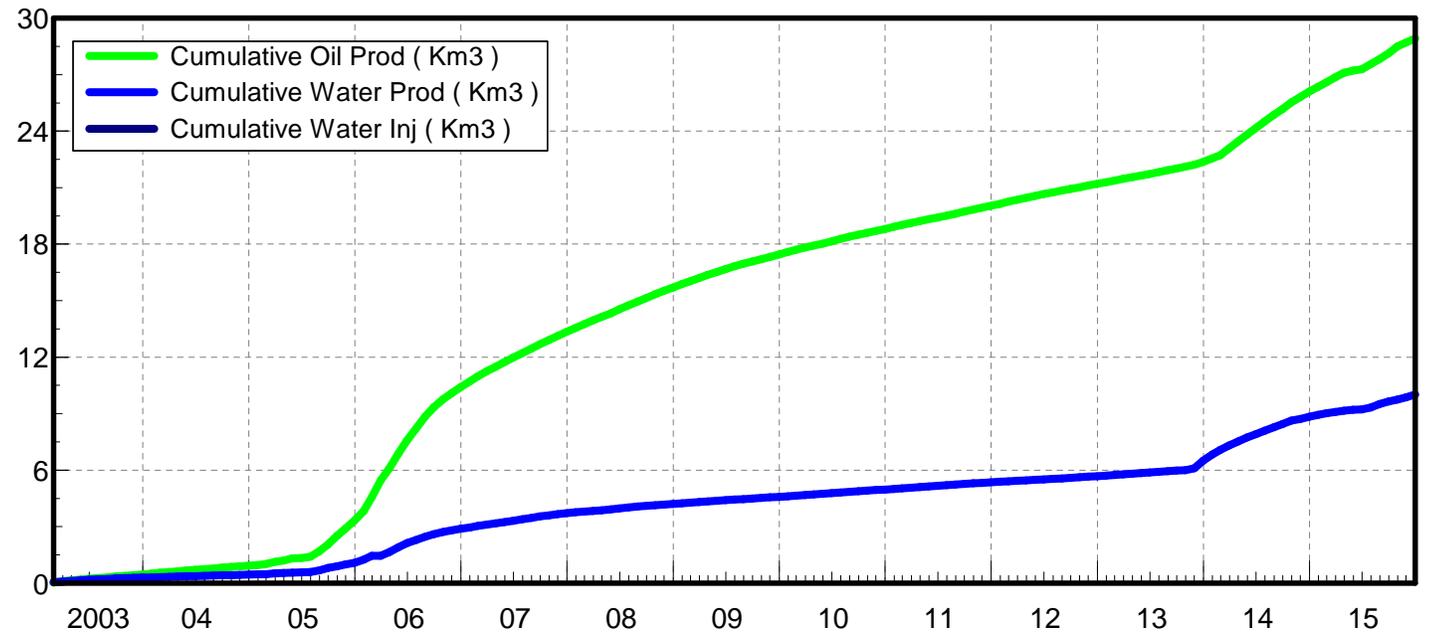
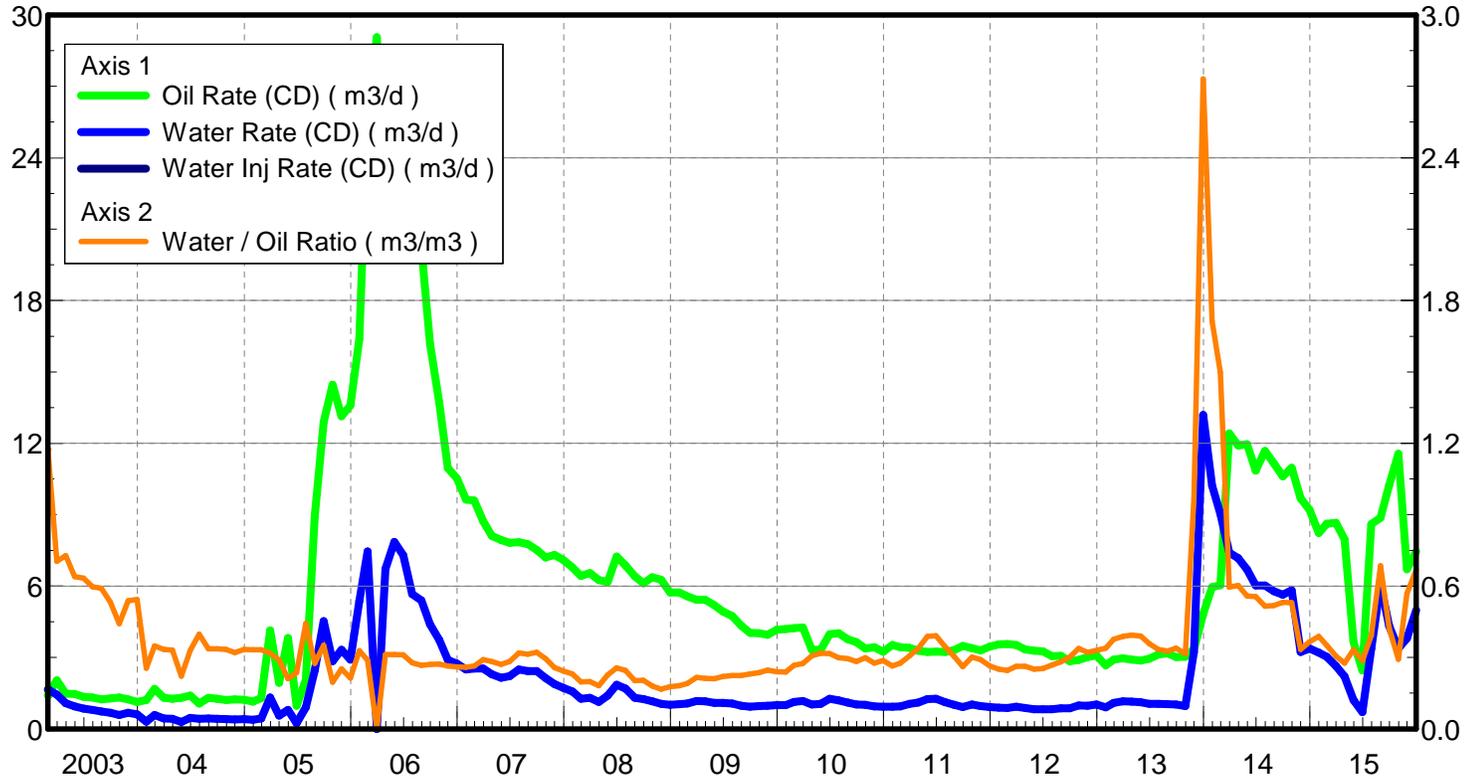
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 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 0.77 m3/m3  
 Pattern: 02/12-06-008-29  
 Inj Set: Sinclair  
 Unit#10  
 Oil Rate (CD) : 1.80 m3/d  
 Water Rate (CD) : 1.38 m3/d  
 Water Inj Rate (CD) : 26.61 m3/d  
 April 27, 2016  
 Operator: Tundra\_O&G\_Prtshp



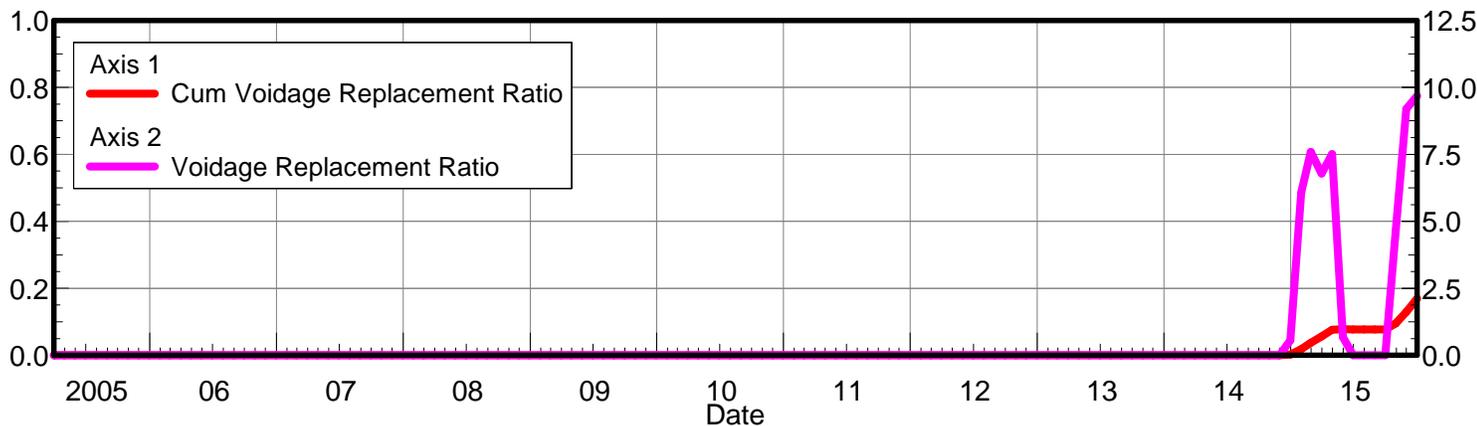
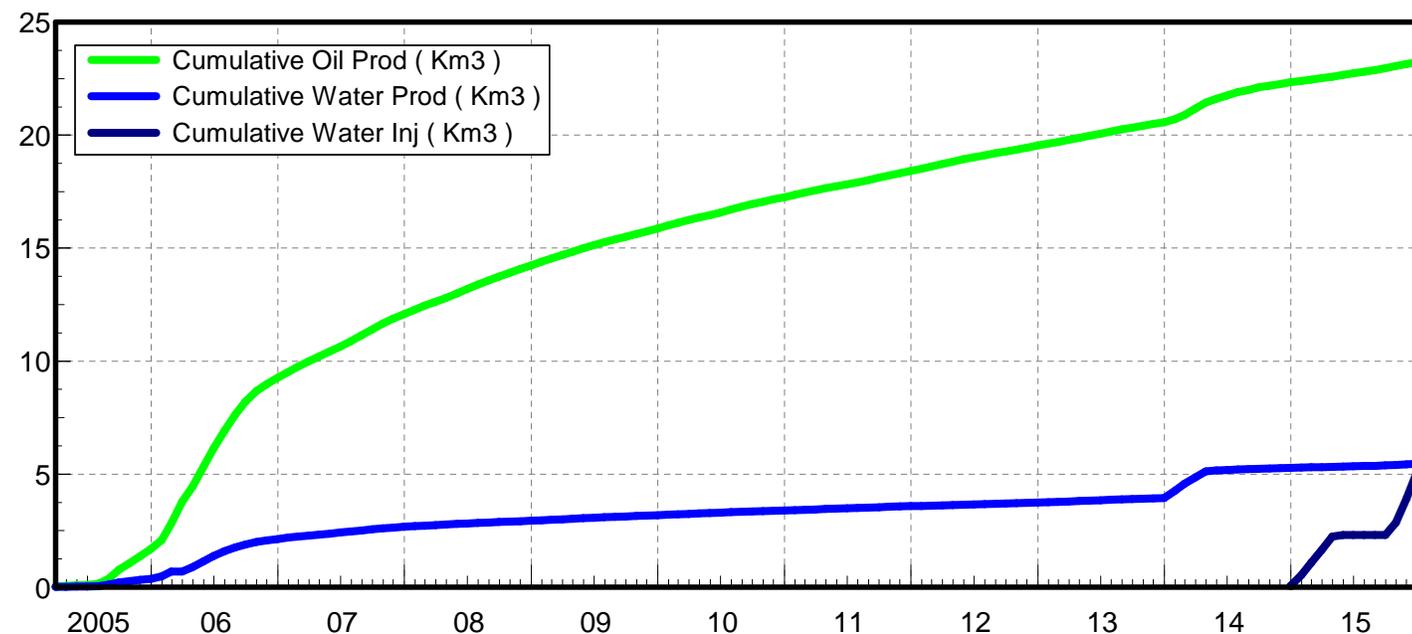
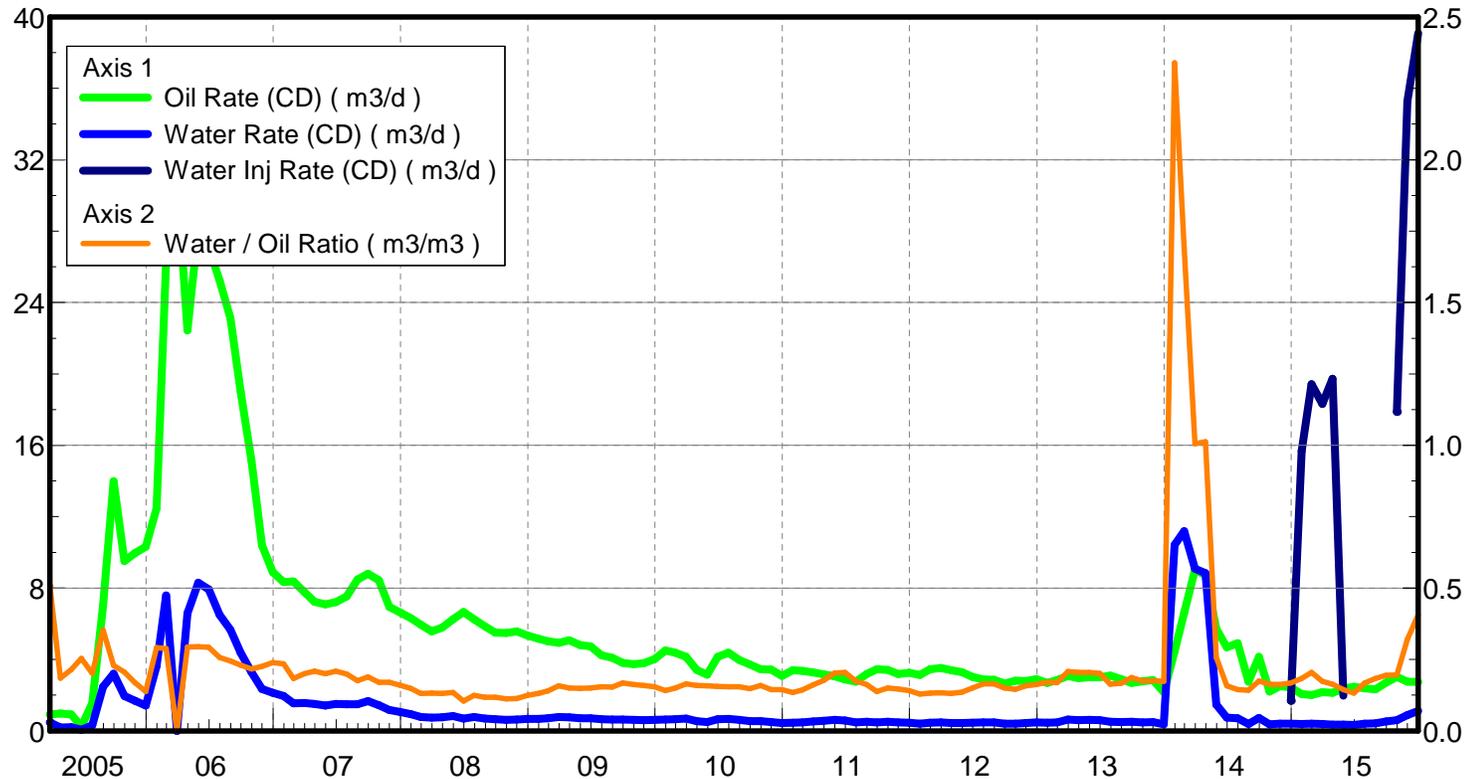
Oil Formation Vol Factor : 0.833333  
 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 0.66 m3/m3  
 Operator: Tundra\_O&G\_Prtshp  
 Oil Rate (CD) : 2.04 m3/d  
 Water Rate (CD) : 1.36 m3/d  
 Water Inj Rate (CD) : 38.42 m3/d

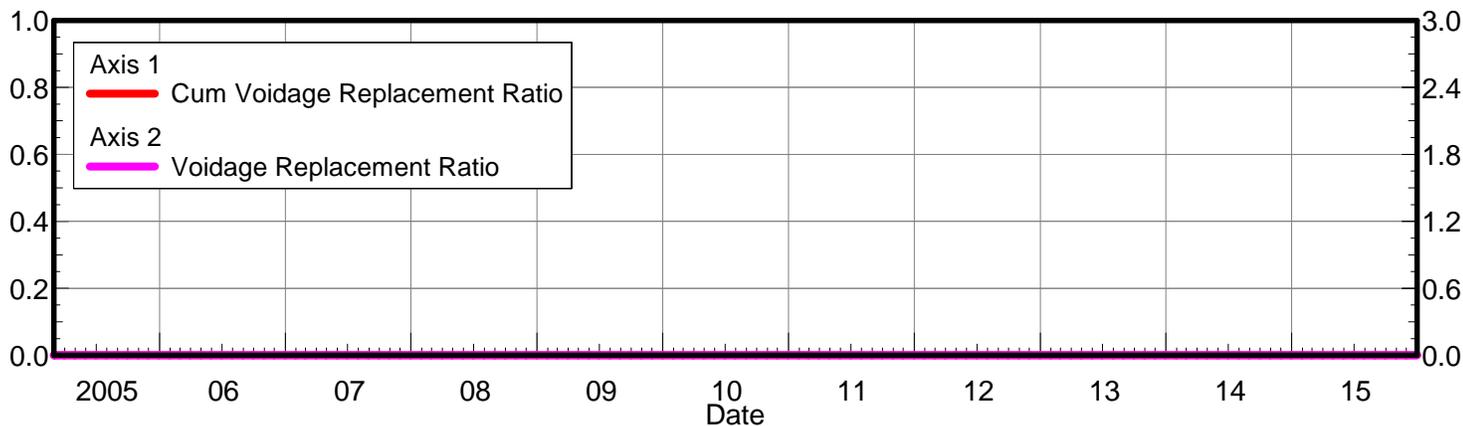
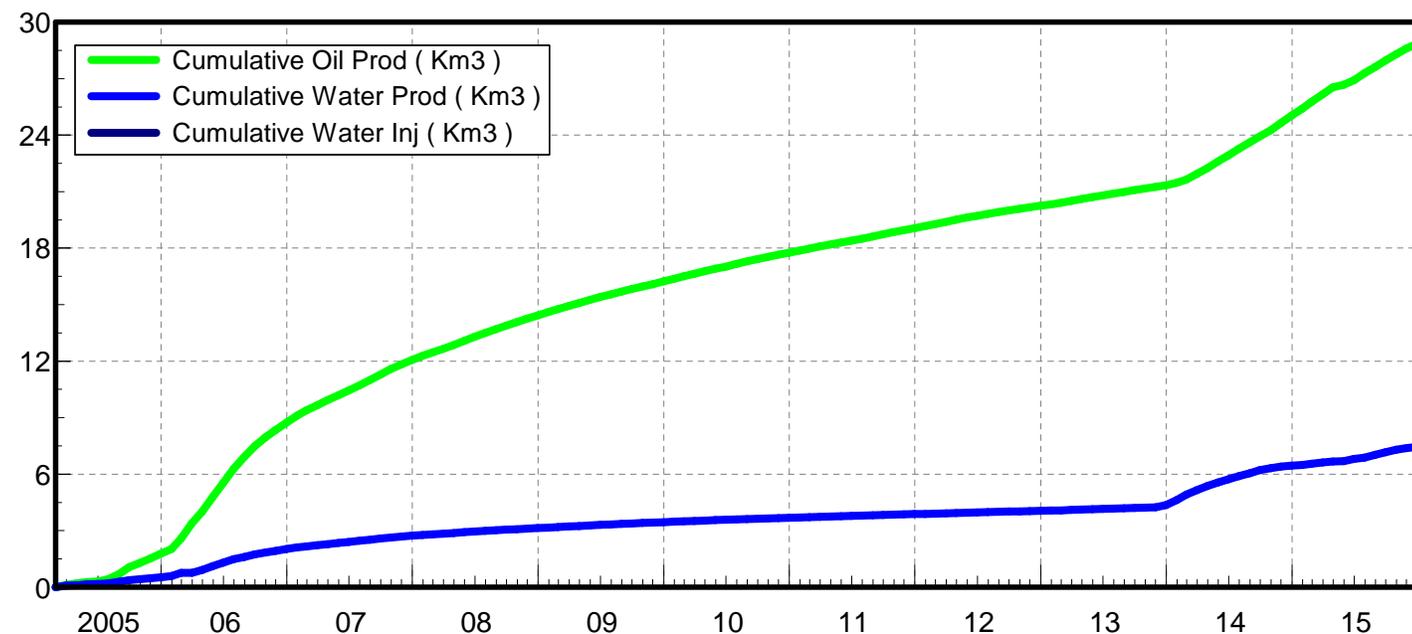
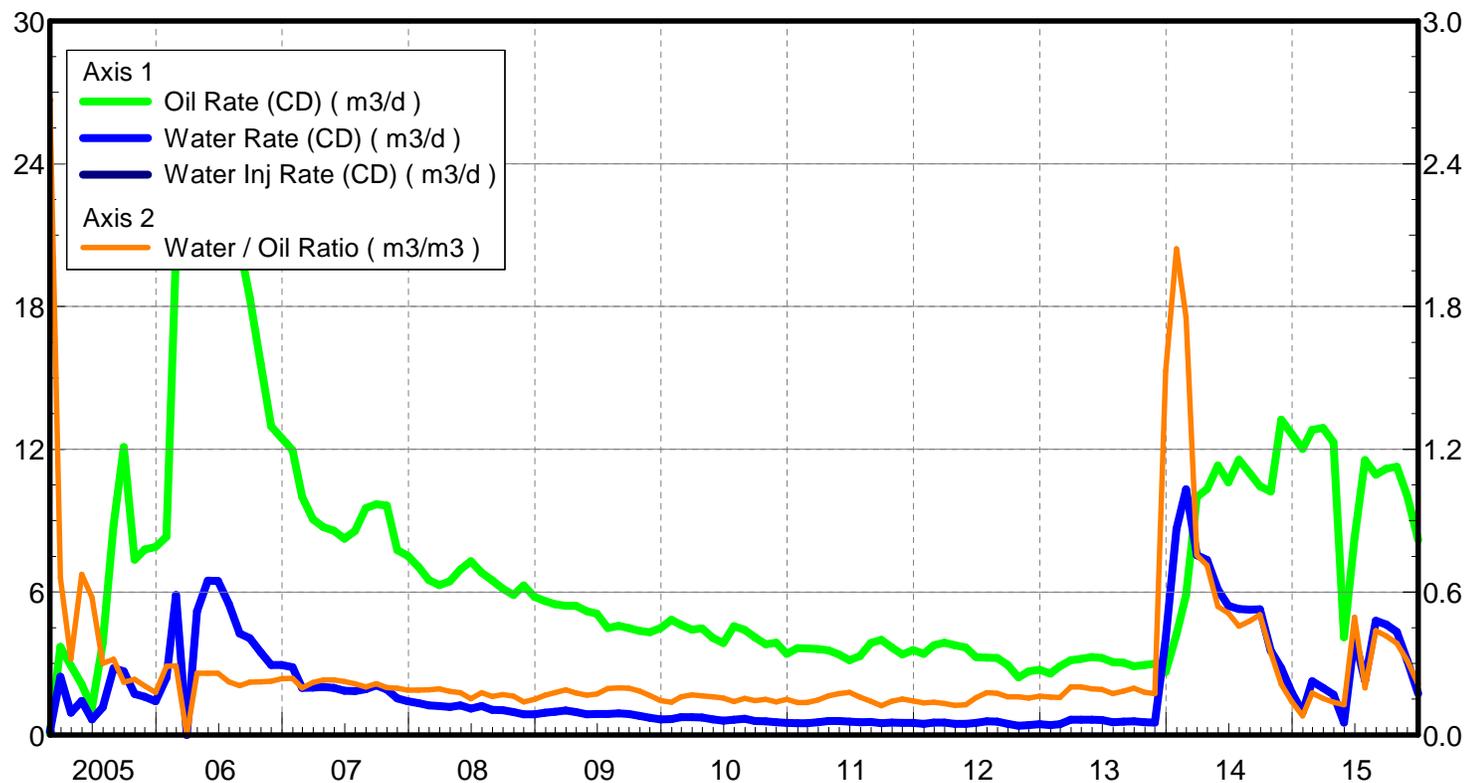


Oil Formation Vol Factor : 0.82  
 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 0.74 m3/m3  
 Pattern: 02/04-07-008-29 Inj Set: Sinclair Unit#10  
 April 27, 2016  
 Operator: Tundra\_O&G\_Prtshp  
 Oil Rate (CD) : 7.51 m3/d  
 Water Rate (CD) : 5.57 m3/d  
 Water Inj Rate (CD) : \* m3/d

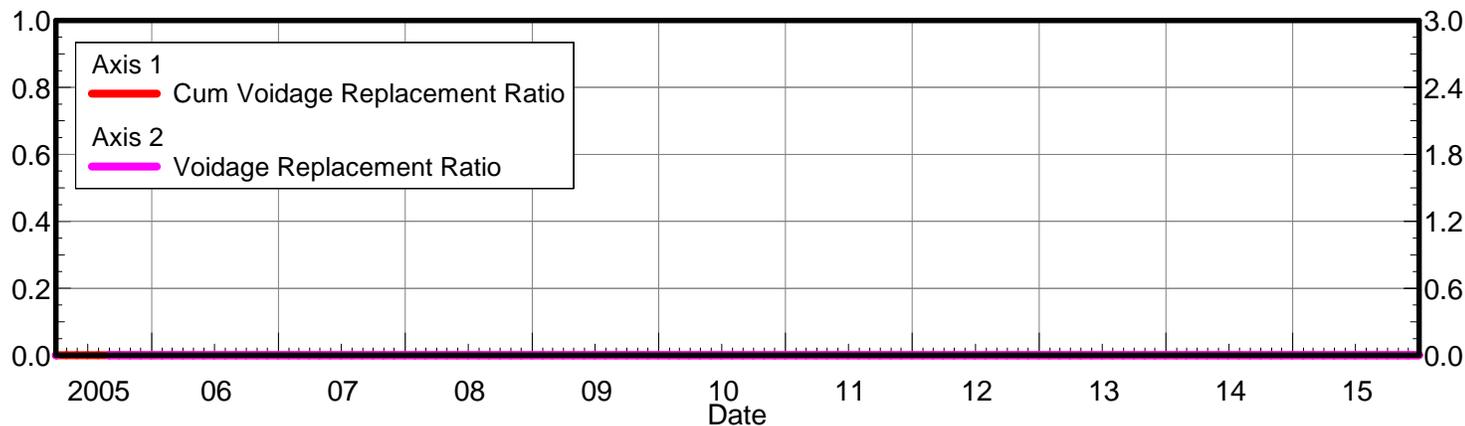
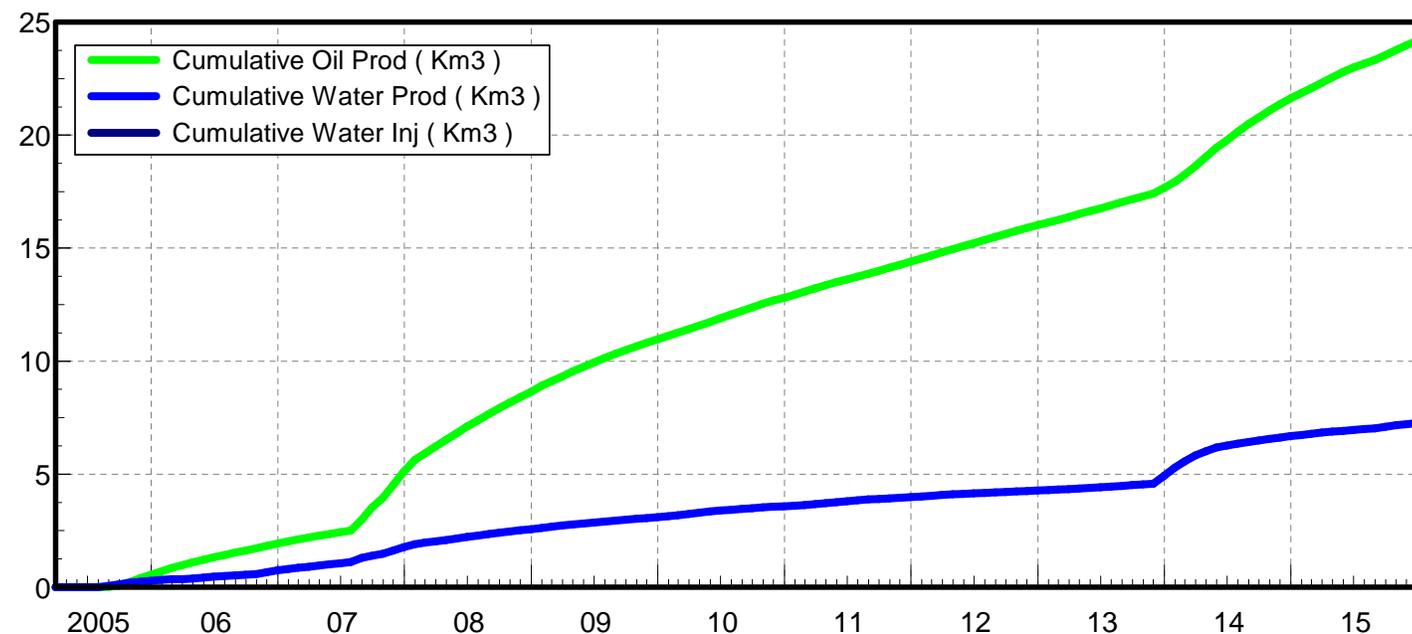
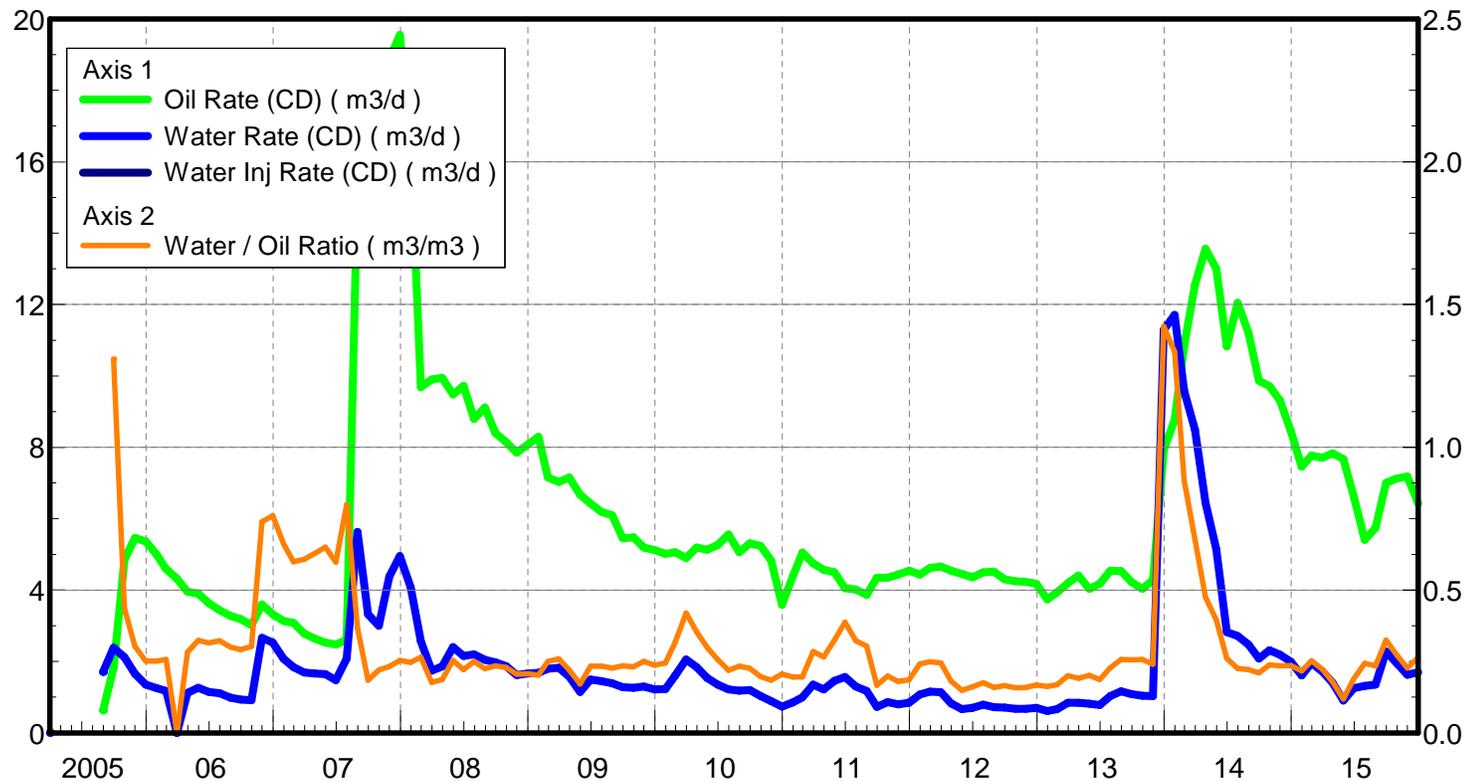


**Pattern: 02/05-07-008-29Inj Set: SinclairUnit#10**  
 Oil Formation Vol Factor : 1.3333333333333333  
 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 0.47 m3/m3  
 Operator: Tundra\_O&G\_Prtshp  
 Oil Rate (CD) : 2.38 m3/d  
 Water Rate (CD) : 1.12 m3/d  
 Water Inj Rate (CD) : 39.68 m3/d

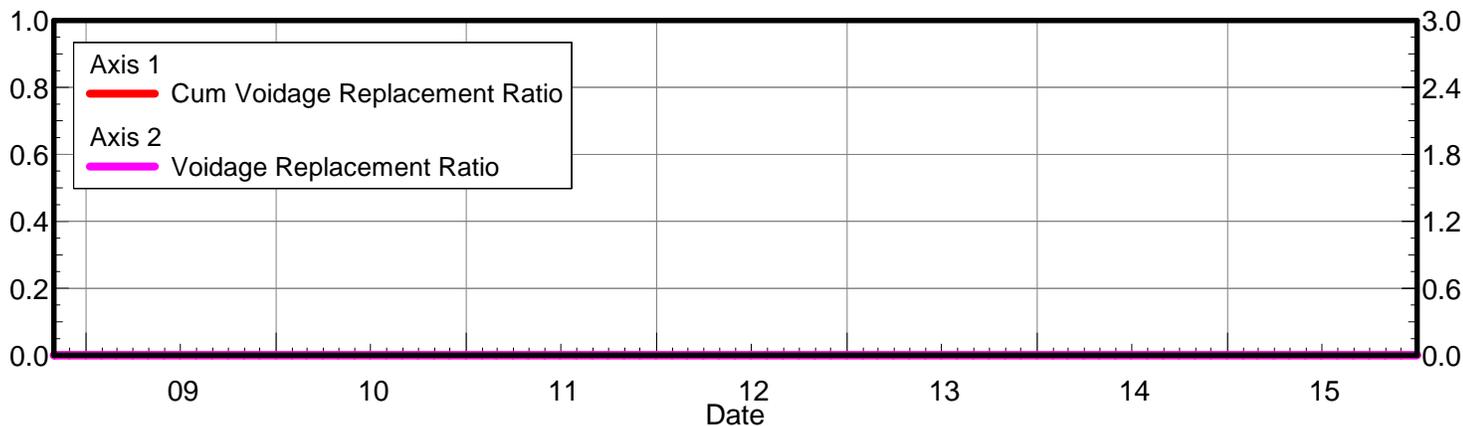
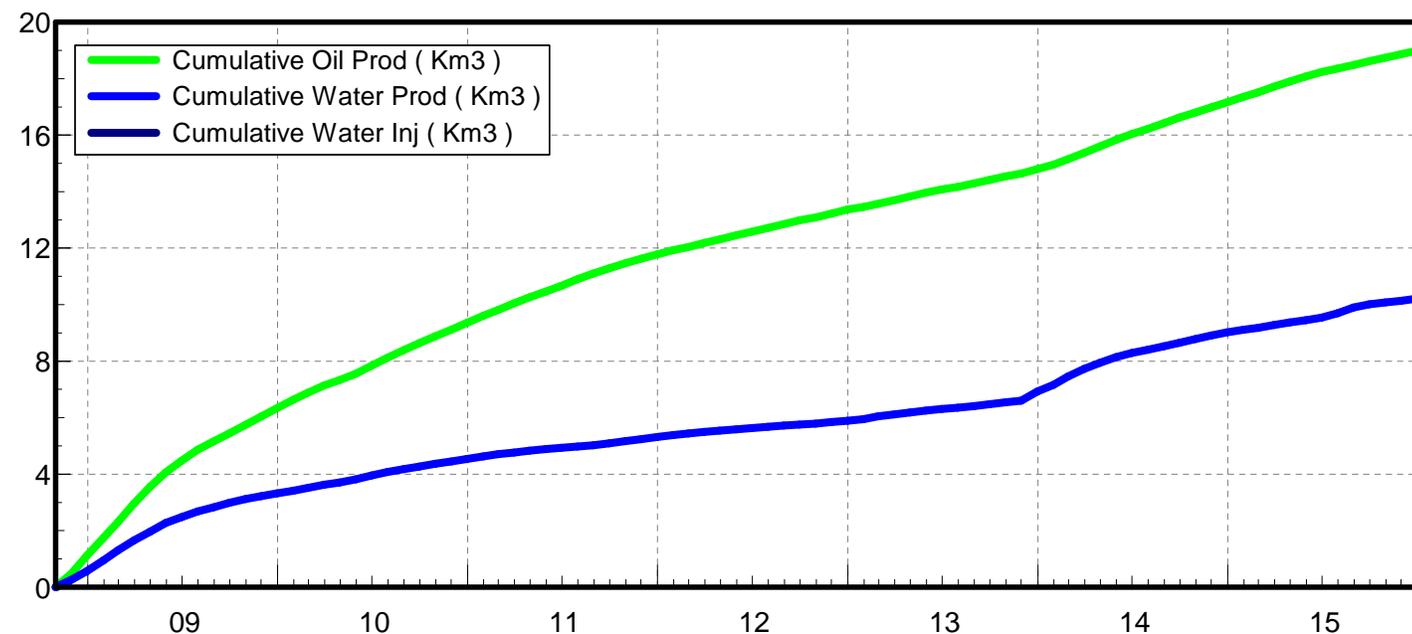
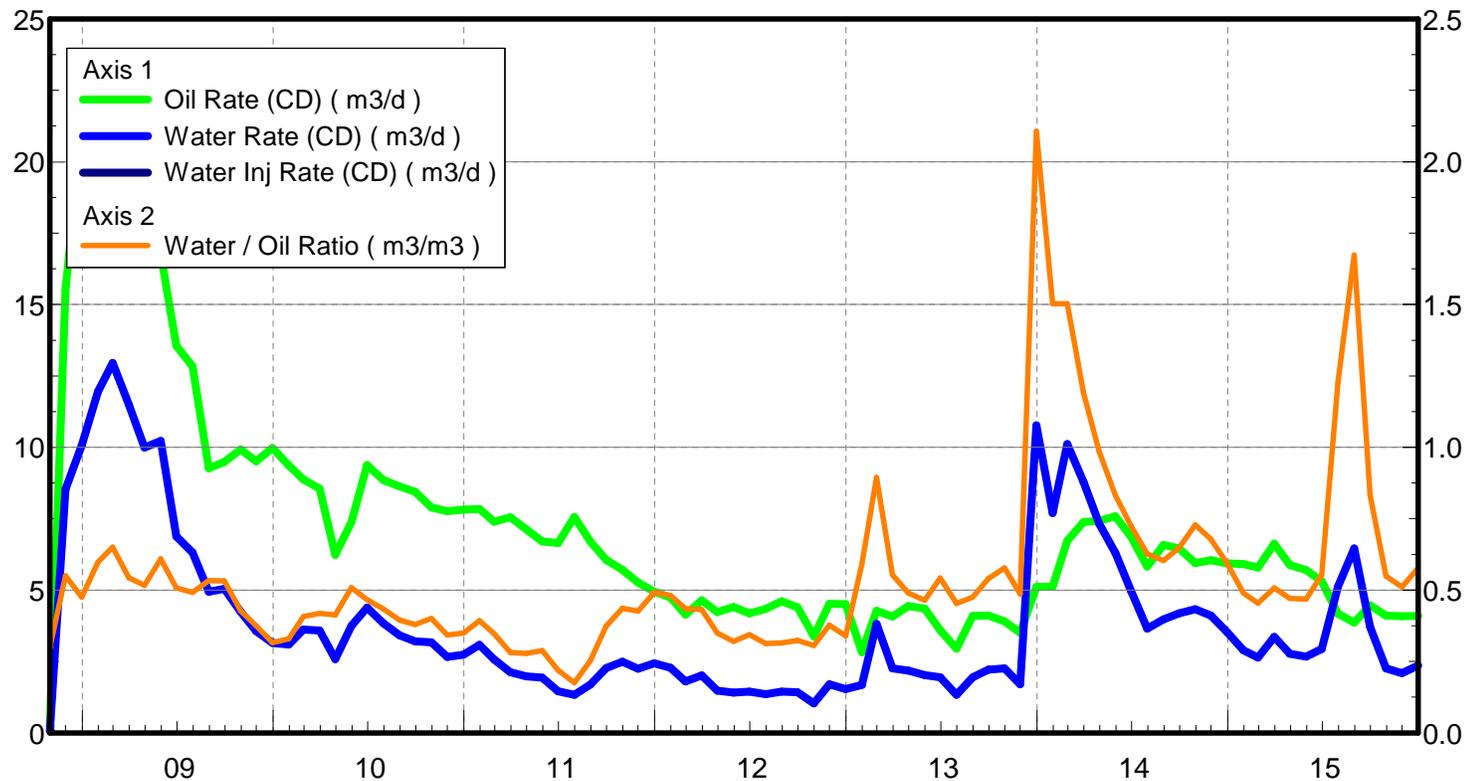




Oil Formation Vol Factor : 0.8333  
 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 0.29 m3/m3  
 Pattern: 02/02-18-008-29  
 Inj Set: Sinclair  
 Unit#10  
 Oil Rate (CD) : 6.45 m3/d  
 Water Rate (CD) : 1.87 m3/d  
 Water Inj Rate (CD) : \* m3/d  
 April 27, 2016  
 Operator: Tundra\_O&G\_Prtshp



Pattern: 00/03-18-008-29 Inj Set: Sinclair Unit#10 Oil Rate (CD) : 4.28 m3/d  
 Water Formation Vol Factor : 1.00150 m3/m3 April 27, 2016 Water Rate (CD) : 2.50 m3/d  
 Water / Oil Ratio : 0.58 m3/m3 Operator: Tundra\_O&G\_Prtshp Water Inj Rate (CD) : \* m3/d



Oil Formation Vol Factor : 0.837  
 Water Formation Vol Factor : 1.00150 m3/m3  
 Water / Oil Ratio : 0.63 m3/m3  
 Operator: Tundra\_O&G\_Prtshp  
 Pattern: 02/03-18-008-29Inj Set: SinclairUnit#10  
 Oil Rate (CD) : 3.28 m3/d  
 Water Rate (CD) : 2.06 m3/d  
 Water Inj Rate (CD) : \* m3/d

