

Ewart Unit No. 8

Waterflood Progress Report 2018

January 1st through December 31st 2018

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

Prepared by:

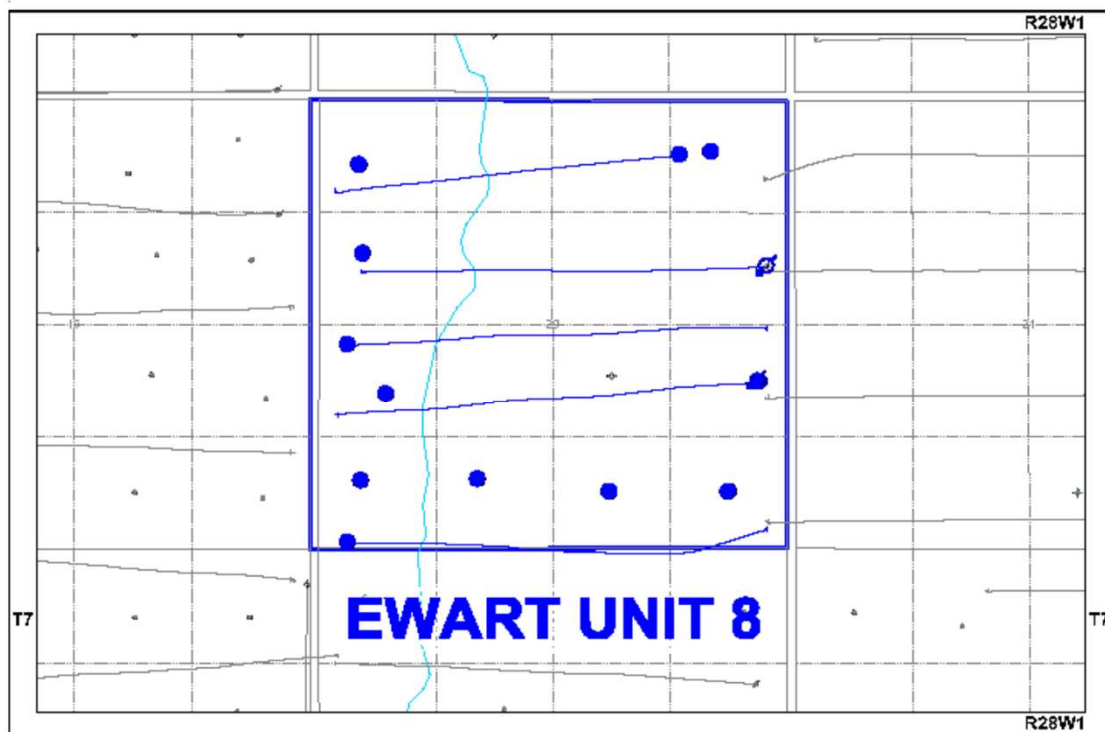
Tundra Oil and Gas

April 25, 2019

INTRODUCTION

Ewart Unit No. 8 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 41, effective January 1, 2015 with Tundra Oil and Gas (Tundra) as Operator. The EOR project area, outlined in blue in Figure 1, contains 8 vertical and 3 horizontal producing wells and 2 horizontal injection wells in 16 LSDs in Township 7, Range 28W1.

Figure 1: Ewart Unit No. 8 Area Outline



Ewart Unit No. 8

Tundra Oil and Gas (Tundra), as the operator of the Ewart Unit No. 8 Enhanced Oil Recovery (EOR) project hereby submits the 2018 EOR report as per section 73 of the Drilling and Production Regulations.

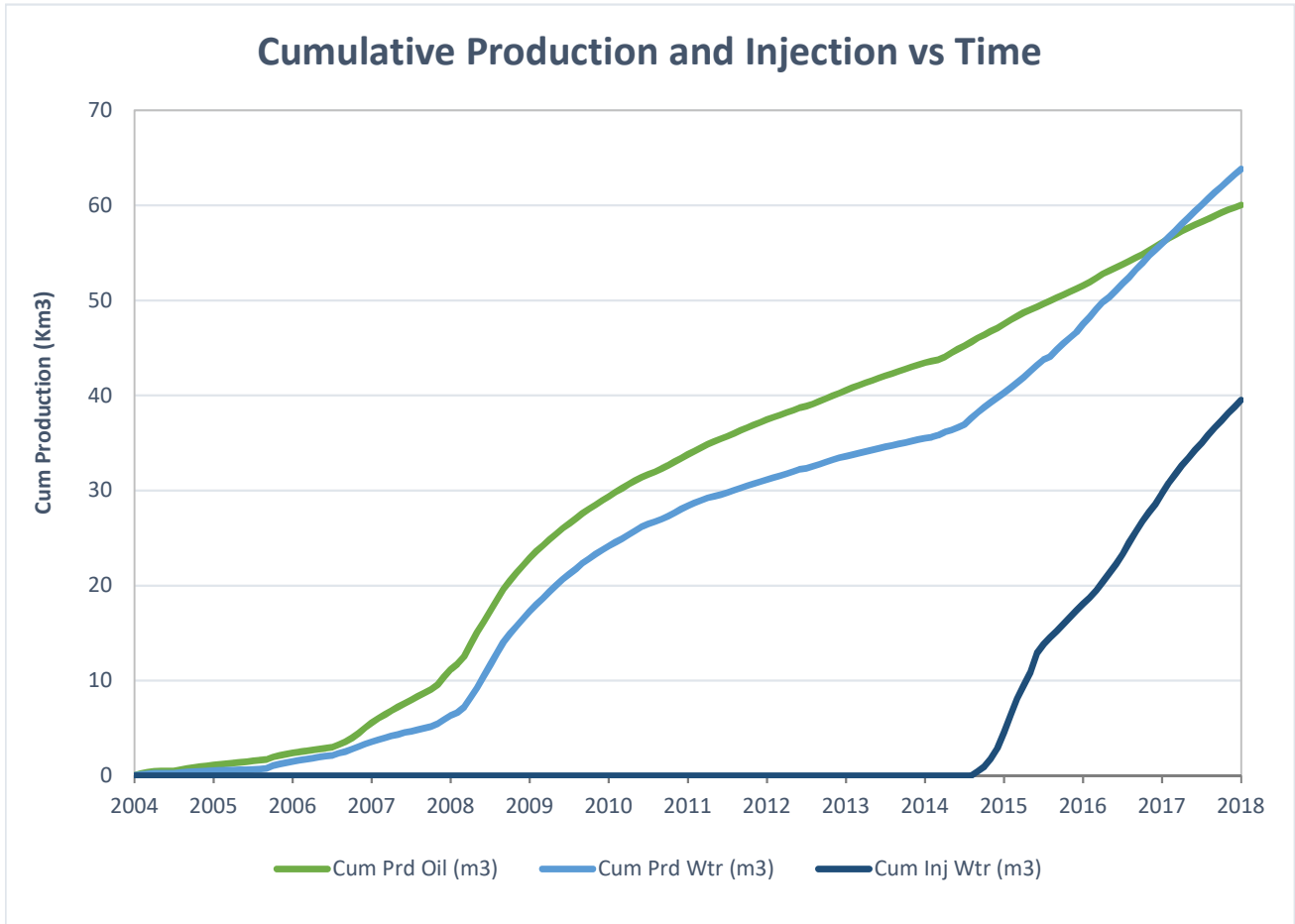
a) Monthly oil and water production rates, injection rate, GOR and WOR

MONTH	Cal Dly Oil m ³ /day	Cal Dly Wtr m ³ /day	Cal Inj Wtr m ³ /day	WOR m ³ /m ³	GOR m ³ /m ³
Jan-2018	14.12	22.54	35.68	1.60	0
Feb-2018	14.06	22.91	32.61	1.63	0
Mar-2018	12.13	23.06	29.00	1.90	0
Apr-2018	11.11	22.44	26.53	2.02	0
May-2018	10.93	22.48	28.06	2.06	0
Jun-2018	9.32	21.35	24.13	2.29	0
Jul-2018	10.22	21.55	26.32	2.11	0
Aug-2018	11.06	21.42	25.00	1.94	0
Sep-2018	11.12	19.23	24.73	1.73	0
Oct-2018	9.23	20.85	24.55	2.26	0
Nov-2018	8.21	20.84	23.77	2.54	0
Dec-2018	8.40	19.54	22.77	2.33	0

b) Cumulative volume of oil, gas and water produced and fluid injected

2018 PRODUCTION	
Produced Oil (m ³)	3,945
Produced Gas (m ³)	0
Produced Water (m ³)	7,852
Fluid Injected (m ³)	9,821
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	60,042
Produced Water (m ³)	63,834

Ewart Unit No. 8



c) Monthly wellhead injection pressure for each injection well

	00/08-20 Inj		00/09-20 Inj		EU8	
MONTH	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)
Jan-2018	567.0	6566	539.0	6563	1106.0	6564
Feb-2018	462.0	6547	451.0	6557	913.0	6552
Mar-2018	439.0	6424	460.0	6465	899.0	6444
Apr-2018	397.0	6395	399.0	6415	796.0	6405
May-2018	423.0	6484	447.0	6434	870.0	6459
Jun-2018	369.0	6152	355.0	5982	724.0	6067
Jul-2018	397.0	6546	419.0	6485	816.0	6516
Aug-2018	379.0	6572	396.0	6553	775.0	6562
Sep-2018	344.0	6469	398.0	6477	742.0	6473
Oct-2018	359.0	6546	402.0	6543	761.0	6544
Nov-2018	335.0	6547	378.0	6553	713.0	6550
Dec-2018	326.0	6562	380.0	6565	706.0	6564
Total	4797.0		5024.0		9821.0	
Avg Inj P		6484		6466		6475

MONTH	Jan-2018	Feb-2018	Mar-2018	Apr-2018	May-2018	Jun-2018	Jul-2018	Aug-2018	Sep-2018	Oct-2018	Nov-2018	Dec-2018
Total m3	1106.0	913.0	899.0	796.0	870.0	724.0	816.0	775.0	742.0	761.0	713.0	706.0
Daily (m³/d)	35.68	32.61	29.00	26.53	28.06	24.13	26.32	25.00	24.73	24.55	23.77	22.77

2018 AVG. ANNUAL DAILY INJECTION =	26.93 m3/d
CUMULATIVE INJECTION TO Dec 31, 2017 =	29,704 m3
TOTAL 2018 ANNUAL INJECTION =	9,821 m3
CUMULATIVE INJECTION TO Dec 31, 2018 =	39,525 m3

d) Summary of the result of any survey of reservoir pressure conducted in 2018. N/A

e) **Date and type of any well servicing.**

Well	Service Description	Date
100.03-20-007-28W1.00	Pump Change & Acid Job	10/2/2018

f) **Calculations of voidage replacement ratio on a monthly and cumulative basis**

VOIDAGE CALCULATIONS

OIL FORMATION VOLUME FACTOR (Rm3/Sm3) = 1.071

MONTH	Mth Oil Prod (m3)	Cum Oil Prod (Km3)	Mth Water Prod (m3)	Cum Water Prod (Km3)	Mth Water Inj (m3)	Cum Water Inj (Km3)	VRR	Cum VRR
Jan-2018	437.6	56.53	698.8	56.68	1106.0	30.81	0.947	0.263
Feb-2018	393.7	56.93	641.4	57.32	913.0	31.72	0.859	0.268
Mar-2018	376.0	57.30	714.9	58.04	899.0	32.62	0.804	0.273
Apr-2018	333.3	57.64	673.3	58.71	796.0	33.42	0.773	0.277
May-2018	338.7	57.98	696.9	59.41	870.0	34.29	0.821	0.282
Jun-2018	279.5	58.26	640.5	60.05	724.0	35.01	0.770	0.286
Jul-2018	316.8	58.57	668	60.72	816.0	35.83	0.810	0.290
Aug-2018	342.9	58.92	664.1	61.38	775.0	36.60	0.751	0.294
Sep-2018	333.6	59.25	576.8	61.96	742.0	37.35	0.794	0.298
Oct-2018	286.2	59.54	646.5	62.60	761.0	38.11	0.799	0.302
Nov-2018	246.3	59.78	625.2	63.23	713.0	38.82	0.802	0.305
Dec-2018	260.3	60.04	605.8	63.83	706.0	39.53	0.798	0.308

g) **An outline of the method used for quality control and treatment of the injected fluid**

The injection water for Ewart Unit No. 8 is sourced from the 02/14-30-007-28W1 well (Mannville formation). The water is treated at the 04-01-008-29W1 filtration plant where it is filtered to 0.1 microns and has scale inhibitor and biocide added. The injection water is then distributed to the injectors through the dedicated infrastructure system.

h) **A report of any unusual performance problems and remedial measures taken or being considered. N/A**

i) **Any other information necessary to evaluate the project**

j) Well List

Ewart Unit No. 8 Well List

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/01-20-007-28W1/0	Vertical	Producing	-
100/02-20-007-28W1/0	Vertical	Producing	-
100/03-20-007-28W1/0	Vertical	Producing	-
100/04-20-007-28W1/0	Vertical	Producing	-
102/04-20-007-28W1/0	Horizontal	Producing	-
102/05-20-007-28W1/0	Vertical	Producing	-
103/05-20-007-28W1/0	Horizontal	Producing	-
100/08-20-007-28W1/0	Horizontal	Injection	-
100/09-20-007-28W1/0	Horizontal	Injection	-
100/12-20-007-28W1/0	Vertical	Producing	-
100/13-20-007-28W1/0	Vertical	Producing	-
100/16-20-007-28W1/0	Vertical	Suspended	-
102/16-20-007-28W1/0	Horizontal	Producing	-

k) Discussion

In 2015, the 00/08-20 and 00/09-20-007-28W1 existing horizontal producers were converted to horizontal injection wells. This unit will have a combination of waterflood patterns at 20 acre and 40 acre spacing having utilized the existing horizontal and vertical wells in the area. An inter-unit horizontal well was drilled at 02/04-20-007-28W1/0 in December 2014. Tundra has no immediate plans to convert this inter-unit well to an injector and will continue to produce it.