

Ewart Unit No. 9

Waterflood Progress Report 2018

January 1st through December 31st 2018

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

Prepared by:

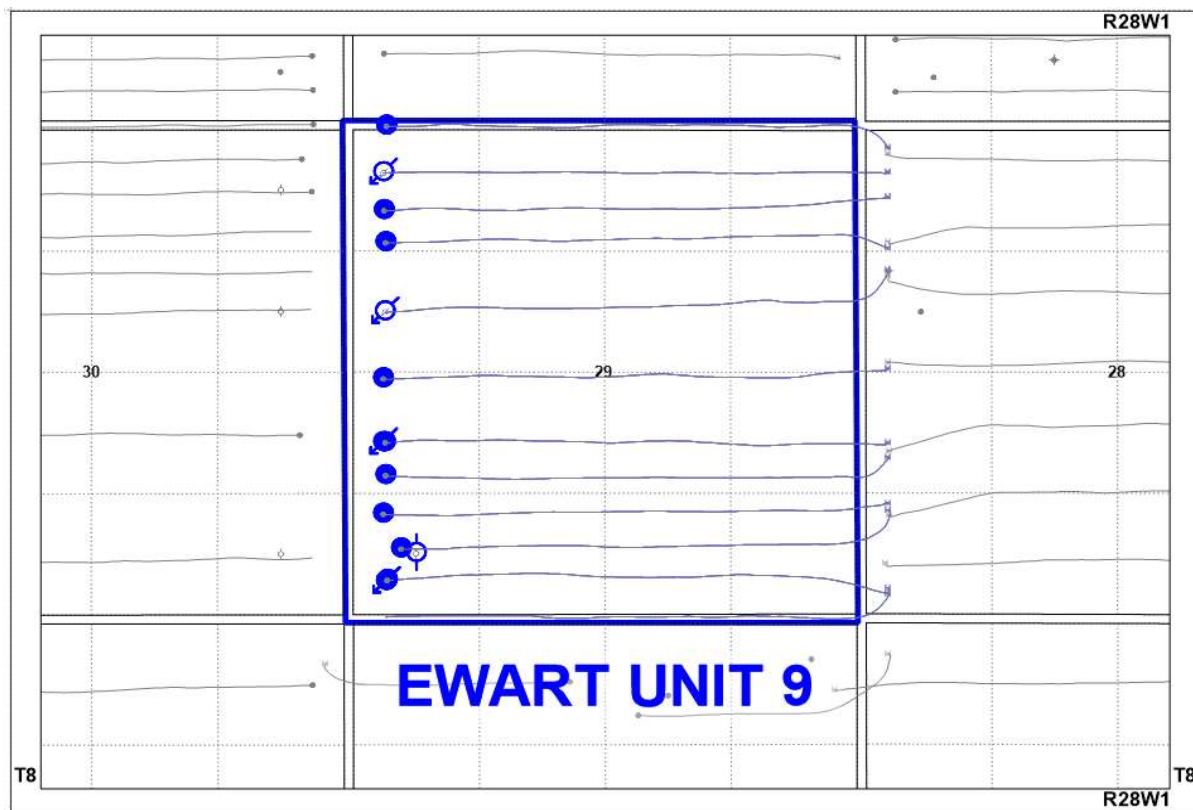
Tundra Oil and Gas

July 15, 2019

INTRODUCTION

Ewart Unit No. 9 Enhanced Oil Recovery (EOR) Waterflood Project was approved effective September 1st, 2015 with Tundra Oil and Gas as Operator. The EOR project area, outlined in blue in Figure 1, contains 7 horizontal producing wells, 4 horizontal injectors and 1 horizontal well waiting to be completed in 16 LSDs in Township 8, Range 28W1.

Figure 1: Ewart Unit No. 9 Area Outline



Ewart Unit No. 9

Tundra Oil and Gas (Tundra), as the operator of the Ewart Unit No. 9 Enhanced Oil Recovery (EOR) project hereby submits the 2018 EOR report as per section 73 of the Drilling and Production Regulations.

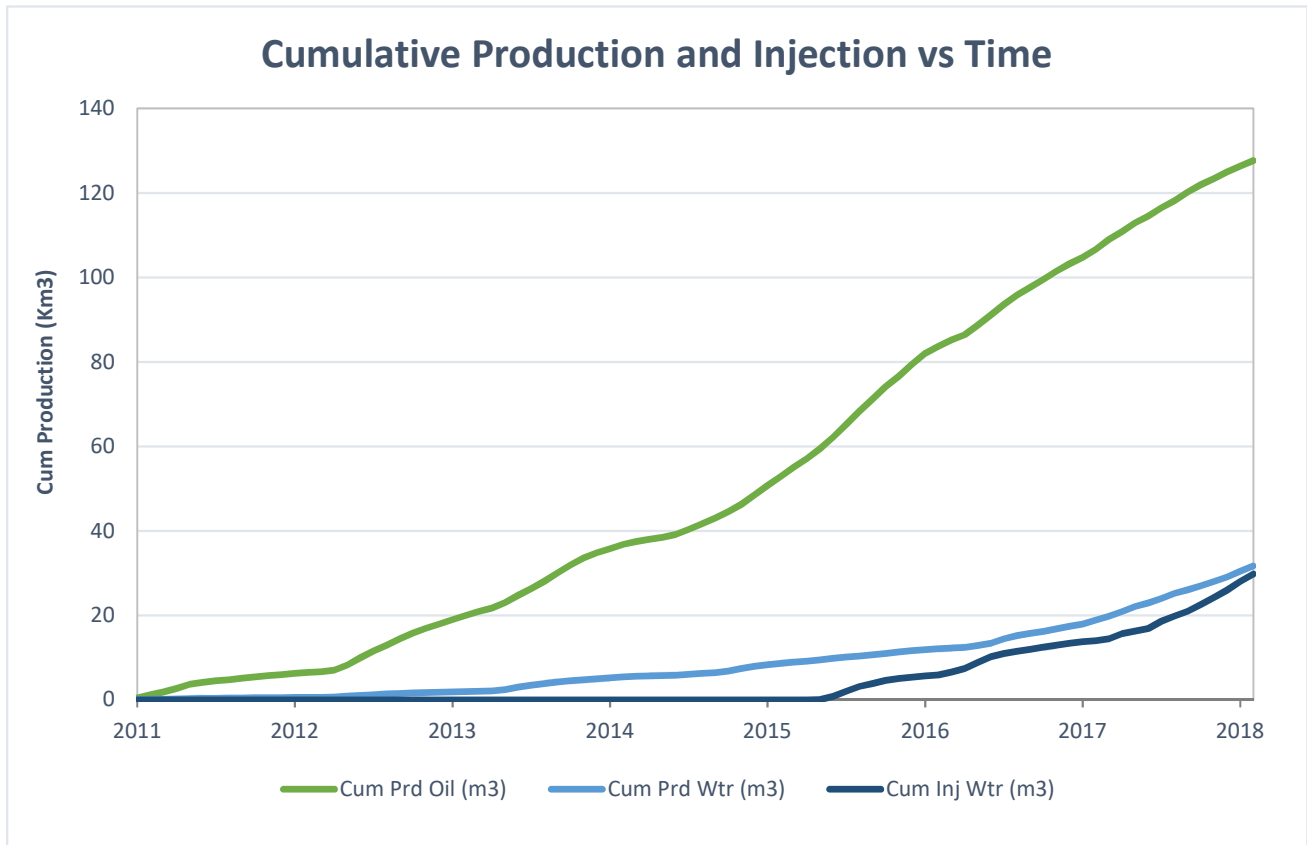
a) Monthly oil and water production rates, injection rate, GOR and WOR

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	75.58	30.80	15.25	0.41	0
Feb-2018	66.21	40.94	44.58	0.62	0
Mar-2018	66.82	38.18	18.95	0.57	0
Apr-2018	53.48	27.63	18.84	0.52	0
May-2018	64.03	34.01	56.41	0.53	0
Jun-2018	55.84	39.74	41.40	0.71	0
Jul-2018	65.40	27.82	37.36	0.43	0
Aug-2018	55.80	29.63	50.10	0.53	0
Sep-2018	49.33	34.70	55.51	0.70	0
Oct-2018	51.42	35.48	55.78	0.69	0
Nov-2018	44.89	44.79	68.93	1.00	0
Dec-2018	42.86	40.22	56.66	0.94	0

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

2018 PRODUCTION	
Produced Oil (m ³)	21,039
Produced Gas (m ³)	0
Produced Water (m ³)	12,873
Fluid Injected (m ³)	15,795
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	127,684
Produced Water (m ³)	31,714

Ewart Unit No. 9



c) Monthly wellhead injection pressure for each injection well

	03/04-29 Inj		02/13-29 Inj		04/12-29 Inj		03/05-29 Inj		EU9	
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)	Inj Water (m ³)	Avg Inj P (kPa)	Inj Water (m ³)	Avg Inj P (kPa)
Jan-2018	0.0	0	307.8	307	164.9	6770	0.0	0	472.7	3538
Feb-2018	0.0	0	1102.6	3009	145.7	6778	0.0	0	1248.3	4893
Mar-2018	0.0	0	431.3	622	156.2	6672	0.0	0	587.5	3647
Apr-2018	31.4	64	392.8	-94	120.8	6072	20.3	418	565.2	2455
May-2018	288.3	-46	1013.7	-86	158.6	6654	288.2	-19	1748.8	1626
Jun-2018	388.4	-95	476.8	208	161.2	6569	215.7	-59	1242.1	1656
Jul-2018	582.9	-93	80.3	-12	160.0	6802	335.1	-29	1158.3	1667
Aug-2018	490.9	20	354.4	-82	99.6	6145	608.3	-93	1553.2	1497
Sep-2018	505.2	-94	424.6	-94	190.1	6834	545.5	-93	1665.4	1638
Oct-2018	539.5	-91	452.1	-92	158.4	6893	579.2	-91	1729.2	1655
Nov-2018	593.7	-94	587.9	-94	148.8	6871	737.5	-93	2067.8	1648
Dec-2018	612.8	-94	614.1	-94	87.6	6327	442.0	-92	1756.5	1512
Total	4033.0		6238.4		1751.9		3771.6		15795.0	
Avg Inj P		-43		291		6616		-13		2286

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	472.7	1248.3	587.5	565.2	1748.8	1242.1	1158.3	1553.2	1665.4	1729.2	2067.8	1756.5
Daily (m³/d)	15.25	44.58	18.95	18.84	56.41	41.40	37.36	50.10	55.51	55.78	68.93	56.66

2018 AVG. ANNUAL DAILY INJECTION =	43.32 m3/d
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CUMULATIVE INJECTION TO Dec 31, 2017 =	13,995 m3
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TOTAL 2018 ANNUAL INJECTION =	15,795 m3
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CUMULATIVE INJECTION TO Dec 31, 2018 =	29,790 m3
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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
102.13-29-008-28W1.00	Shut Sleeves	7/28/2018
103.05-29-008-28W1.00	Cleanout & Convert to WIW	3/19/2018
105.05-29-008-28W1.00	Pump Change	9/19/2018

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

VOIDAGE CALCULATIONS

OIL FORMATION VOLUME FACTOR (Rm3/Sm3) = 1.05

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	2343.1	108.99	954.8	19.80	472.7	14.47	0.138	0.108
Feb-2018	1854.0	110.84	1146.3	20.94	1248.3	15.72	0.404	0.114
Mar-2018	2071.4	112.91	1183.7	22.13	587.5	16.30	0.175	0.116
Apr-2018	1604.5	114.52	828.9	22.96	565.3	16.87	0.225	0.118
May-2018	1984.9	116.50	1054.2	24.01	1748.8	18.62	0.557	0.127
Jun-2018	1675.2	118.18	1192.1	25.20	1242.1	19.86	0.421	0.133
Jul-2018	2027.4	120.20	862.5	26.06	1158.3	21.02	0.387	0.138
Aug-2018	1729.8	121.93	918.6	26.98	1553.2	22.57	0.568	0.146
Sep-2018	1479.8	123.41	1040.9	28.02	1665.4	24.24	0.642	0.154
Oct-2018	1593.9	125.01	1100	29.12	1729.2	25.97	0.623	0.162
Nov-2018	1346.7	126.35	1343.8	30.47	2067.9	28.03	0.750	0.172
Dec-2018	1328.7	127.68	1246.7	31.71	1756.5	29.79	0.665	0.180

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

The injection water for Ewart Unit No. 9 will be 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. 9 Well List

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
103/04-29-008-28W1/0	Horizontal	Injection	-
104/04-29-008-28W1/0	Horizontal	Producing	-
105/04-29-008-28W1/0	Horizontal	Producing	-
106/04-29-008-28W1/0	Horizontal	Drilled & Cased	-
103/05-29-008-28W1/0	Horizontal	Injection	-
104/05-29-008-28W1/0	Horizontal	Producing	-
105/05-29-008-28W1/0	Horizontal	Producing	-
104/12-29-008-28W1/2	Horizontal	Injection	-
102/13-29-008-28W1/0	Horizontal	Injection	-
103/13-29-008-28W1/0	Horizontal	Producing	-
104/13-29-008-28W1/0	Horizontal	Producing	-
105/13-29-008-28W1/0	Horizontal	Producing	-