

**Waskada Unit No. 17**

**Waterflood Progress Report 2019**

**January 1<sup>st</sup> through December 31<sup>st</sup> 2019**

**Prepared for:**

**Manitoba Industry, Economic Development and Mines**

**Petroleum Branch**

**Prepared by:**

**Tundra Oil and Gas**

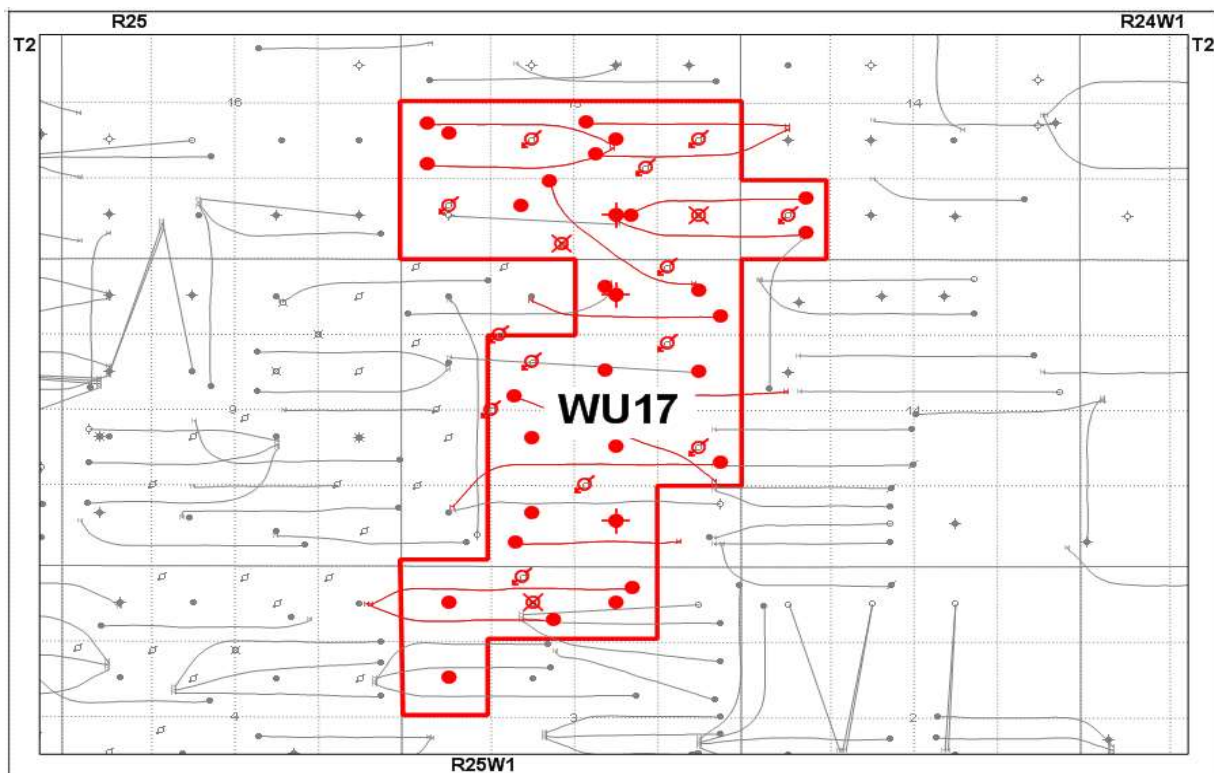
**March 19, 2020**

## INTRODUCTION

The Waskada Unit No.17 pressure maintenance project commenced water injection into the Lower Amaranth A pool in accordance with Manitoba Energy and Mines Order No. PM 66, dated October 1, 1991. Waskada Unit No. 17 was acquired from EOG Resources Canada Inc. effective October 1, 2014 (closing date December 1, 2014) with Tundra Oil and Gas (Tundra) as the new operator. The EOR project area, outlined in red in Figure 1, contains 50 wells (9 abandoned, 28 producing/inactive and 13 injectors) over 23 LSDs in Township 2, Range 25W1.

**This unit is currently not on injection.**

**Figure 1: Waskada Unit No. 17 Area Outline**



## Waskada Unit No.17

Tundra Oil and Gas (Tundra), as the operator of the Waskada Unit 17 Enhanced Oil Recovery (EOR) project hereby submits the 2019 EOR report as per section 73 of the Drilling and Production Regulations.

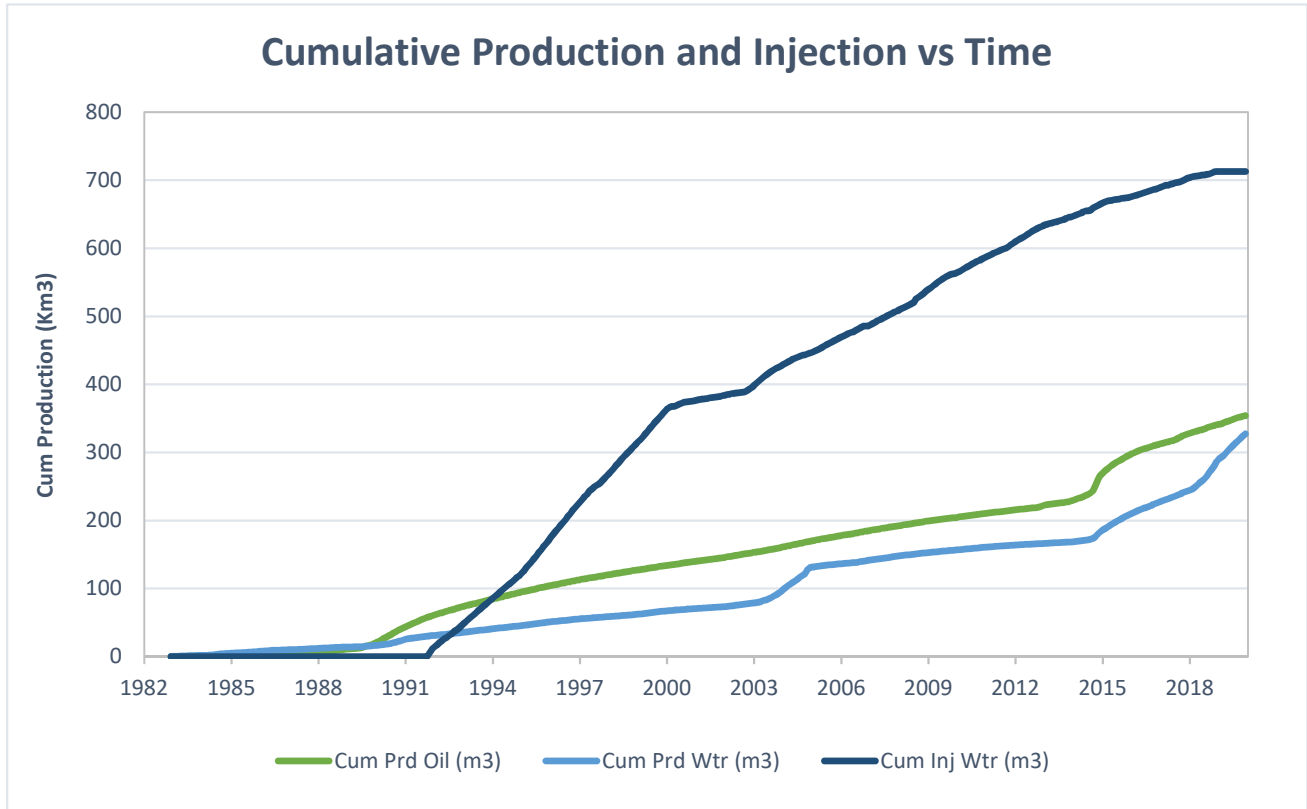
**a) Monthly oil and water production rates, injection rate, GOR and WOR**

MONTH	Cal Dly Oil m <sup>3</sup> /day	Cal Dly Wtr m <sup>3</sup> /day	Cal Inj Wtr m <sup>3</sup> /day	WOR m <sup>3</sup> /m <sup>3</sup>	GOR m <sup>3</sup> /m <sup>3</sup>
Jan-2019	28.37	145.18	0.00	5.12	0.00
Feb-2019	30.34	72.42	0.00	2.39	0.00
Mar-2019	47.59	98.98	0.00	2.08	0.00
Apr-2019	46.64	124.37	0.00	2.67	0.00
May-2019	45.13	130.89	0.00	2.90	0.00
Jun-2019	42.39	121.48	0.00	2.87	0.00
Jul-2019	42.09	117.12	0.00	2.78	0.00
Aug-2019	38.47	111.07	0.00	2.89	0.00
Sep-2019	36.87	107.72	0.00	2.92	0.00
Oct-2019	33.81	111.06	0.00	3.28	0.00
Nov-2019	29.95	106.34	0.00	3.55	0.00
Dec-2019	30.06	102.37	0.00	3.41	0.00

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

2019 PRODUCTION	
Produced Oil (m <sup>3</sup> )	13,756
Produced Gas (m <sup>3</sup> )	0
Produced Water (m <sup>3</sup> )	41,142
Fluid Injected (m <sup>3</sup> )	0
CUMMULATIVE PRODUCTION	
Produced Oil (m <sup>3</sup> )	354,064
Produced Water (m <sup>3</sup> )	327,436

## Waskada Unit No.17



c) Monthly wellhead injection pressure for each injection well

	00/04-14 Inj		00/06-15 Inj		00/08-10 Inj		00/08-15 Inj		C0/08-10 Inj		C0/16-10 Inj	
MONTH	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)
Jan-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Feb-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Mar-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Apr-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
May-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Jun-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Jul-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Aug-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Sep-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Oct-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Nov-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
Dec-2019	0.0	4976	0.0	5000	0.0	5000	0.0	268	0.0	5000	0.0	5000
<b>Total</b>	0.0		0.0		0.0		0.0		0.0		0.0	
<b>Avg Inj P</b>		4976		5000		5000		268		5000		5000

	WU17	
MONTH	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)
Jan-2019	0.0	4207
Feb-2019	0.0	4207
Mar-2019	0.0	4207
Apr-2019	0.0	4207
May-2019	0.0	4207
Jun-2019	0.0	4207
Jul-2019	0.0	4207
Aug-2019	0.0	4207
Sep-2019	0.0	4207
Oct-2019	0.0	4207
Nov-2019	0.0	4207
Dec-2019	0.0	4207
<b>Total</b>	0.0	
<b>Avg Inj P</b>		4207

**c) Monthly wellhead injection pressure for each injection well**

MONTH	Jan-2019	Feb-2019	Mar-2019	Apr-2019	May-2019	Jun-2019	Jul-2019	Aug-2019	Sep-2019	Oct-2019	Nov-2019	Dec-2019
<b>Total m3</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Daily (m<sup>3</sup>/d)</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2019 AVG. ANNUAL DAILY INJECTION = 0.00 m3/d
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CUMULATIVE INJECTION TO Dec 31, 2018 = 712,764 m3
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TOTAL 2019 ANNUAL INJECTION = 0 m3
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CUMULATIVE INJECTION TO Dec 31, 2019 = 712,764 m3
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**d) Summary of the result of any survey of reservoir pressure conducted in 2019. N/A**

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

Well	Service Description	Date
102.01-10-002-25W1.00	Pump Change	2/20/2019
102.01-10-002-25W1.00	Pump Change	4/11/2019
102.09-10-002-25W1.00	Water Shut Off	3/16/2019
102.15-03-002-25W1.00	Rigless Acid	8/6/2019
103.04-15-002-25W1.00	Water Shut Off	2/14/2019
103.07-15-002-25W1.00	Cemented Liner Cleanout & Pressure Test	1/31/2019

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

**VOIDAGE CALCULATIONS**

OIL FORMATION VOLUME FACTOR (Rm3/Sm3) = 1.17

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-2019	879.6	341.19	4500.5	290.79	0.0	712.76	0.000	1.033
Feb-2019	849.6	342.04	2027.7	292.82	0.0	712.76	0.000	1.029
Mar-2019	1475.2	343.51	3068.3	295.89	0.0	712.76	0.000	1.021
Apr-2019	1399.1	344.91	3731.2	299.62	0.0	712.76	0.000	1.014
May-2019	1398.9	346.31	4057.6	303.68	0.0	712.76	0.000	1.006
Jun-2019	1271.6	347.58	3644.4	307.32	0.0	712.76	0.000	0.998
Jul-2019	1304.9	348.89	3630.7	310.95	0.0	712.76	0.000	0.991
Aug-2019	1192.6	350.08	3443.2	314.40	0.0	712.76	0.000	0.984
Sep-2019	1106.1	351.18	3231.5	317.63	0.0	712.76	0.000	0.978
Oct-2019	1048.2	352.23	3442.8	321.07	0.0	712.76	0.000	0.972
Nov-2019	898.5	353.13	3190.2	324.26	0.0	712.76	0.000	0.967
Dec-2019	931.9	354.06	3173.4	327.44	0.0	712.76	0.000	0.961

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

The injected fluid is treated by filtration.

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**

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/12-03-002-25W1/0	Vertical	Producing	-
100/13-03-002-25W1/0	Vertical	Pumping	-
100/14-03-002-25W1/0	Vertical	Abandoned	-
102/14-03-002-25W1/0	Vertical	Injection	-
103/14-03-002-25W1/0	Horizontal	Producing	WIW Conversion
100/15-03-002-25W1/0	Vertical	Abandoned Zone	-
102/15-03-002-25W1/0	Horizontal	Producing	-
100/02-10-002-25W1/0	Vertical	Abandoned Zone	-
1C0/02-10-002-25W1/0	Vertical	Abandoned	-
100/03-10-002-25W1/0	Vertical	Producing	-
102/03-10-002-25W1/0	Horizontal	Producing	-
100/06-10-002-25W1/0	Vertical	Producing	-
1C0/06-10-002-25W1/0	Vertical	Injection	-
100/07-10-002-25W1/0	Vertical	Pumping	-
100/08-10-002-25W1/0	Vertical	Injection	-
103/08-10-002-25W1/0	Horizontal	Producing	-
1C0/08-10-002-25W1/0	Vertical	Injection	-
100/09-10-002-25W1/0	Vertical	Pumping	-
102/09-10-002-25W1/0	Horizontal	Producing	-
1C0/09-10-002-25W1/0	Vertical	Injection	-
100/10-10-002-25W1/0	Vertical	Pumping	-
100/11-10-002-25W1/0	Vertical	Injection	-
103/11-10-002-25W1/0	Horizontal	Producing	-
104/11-10-002-25W1/0	Horizontal	Producing	-
1C0/11-10-002-25W1/0	Vertical	Injection	-
100/15-10-002-25W1/0	Vertical	Abandoned	-
102/15-10-002-25W1/0	Vertical	Pumping	-
100/16-10-002-25W1/0	Vertical	Pumping	-
103/16-10-002-25W1/0	Horizontal	Producing	-
1C0/16-10-002-25W1/0	Vertical	Injection	-
100/04-14-002-25W1/0	Vertical	Injection	-
102/04-14-002-25W1/0	Horizontal	Producing	-
103/04-14-002-25W1/0	Horizontal	Producing	-
100/01-15-002-25W1/0	Vertical	Abandoned	-
100/02-15-002-25W1/0	Vertical	Abandoned	-
102/02-15-002-25W1/0	Vertical	Abandoned Zone	-
100/03-15-002-25W1/0	Vertical	Producing	-
103/03-15-002-25W1/0	Horizontal	Producing	-
1A0/03-15-002-25W1/0	Vertical	Abandoned	-
102/04-15-002-25W1/0	Vertical	Injection	-
103/04-15-002-25W1/0	Horizontal	Producing	-
100/05-15-002-25W1/0	Vertical	Producing	-
102/05-15-002-25W1/0	Horizontal	Producing	-
103/05-15-002-25W1/0	Horizontal	Producing	-
100/06-15-002-25W1/0	Vertical	Injection	-



**j) Well List****Waskada Unit No. 17 Well List**

<i><b>UWI</b></i>	<i><b>Type</b></i>	<i><b>Status</b></i>	<i><b>Future Plans</b></i>
100/07-15-002-25W1/0	Vertical	Pumping	-
103/07-15-002-25W1/0	Horizontal	Producing	-
104/07-15-002-25W1/0	Horizontal	Producing	-
1A0/07-15-002-25W1/0	Vertical	Injection	-
100/08-15-002-25W1/0	Vertical	Injection	-