

**Ebor Unit No. 2**

**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:**

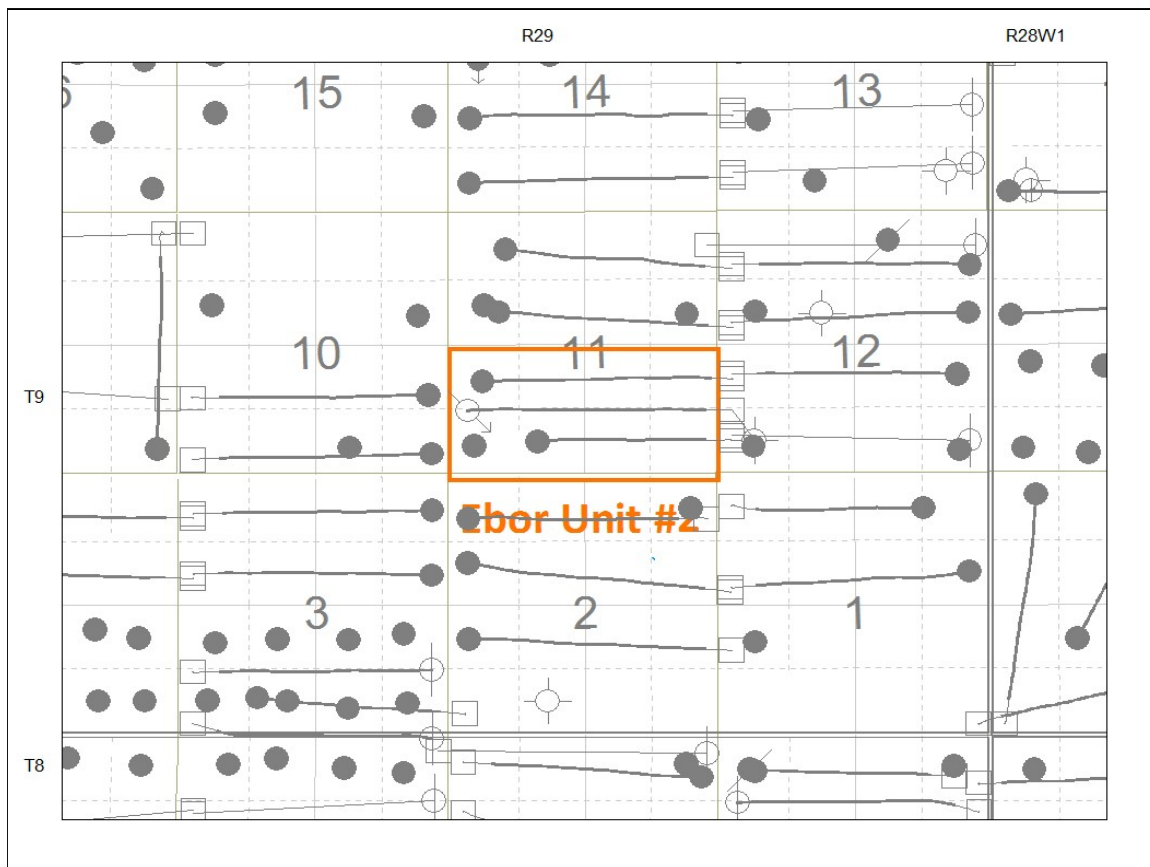
**Tundra Oil and Gas**

**April 23, 2020**

## INTRODUCTION

Ebor Unit No. 2 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 20 effective March 2010 with Tundra Oil and Gas (Tundra) as Operator. The EOR project area, outlined in orange in Figure 1, contains 4 wells in the south half of Section 11 in Township 9, Range 29 W1.

**Figure 1: Ebor Unit No. 2 Area Outline**



## Ebor Unit No. 2

Tundra Oil and Gas (Tundra), as the operator of the Ebor Unit No. 2 Enhanced Oil Recovery (EOR) project hereby submits the 2019 EOR report as per section 73 of the Drilling and Production Regulations.

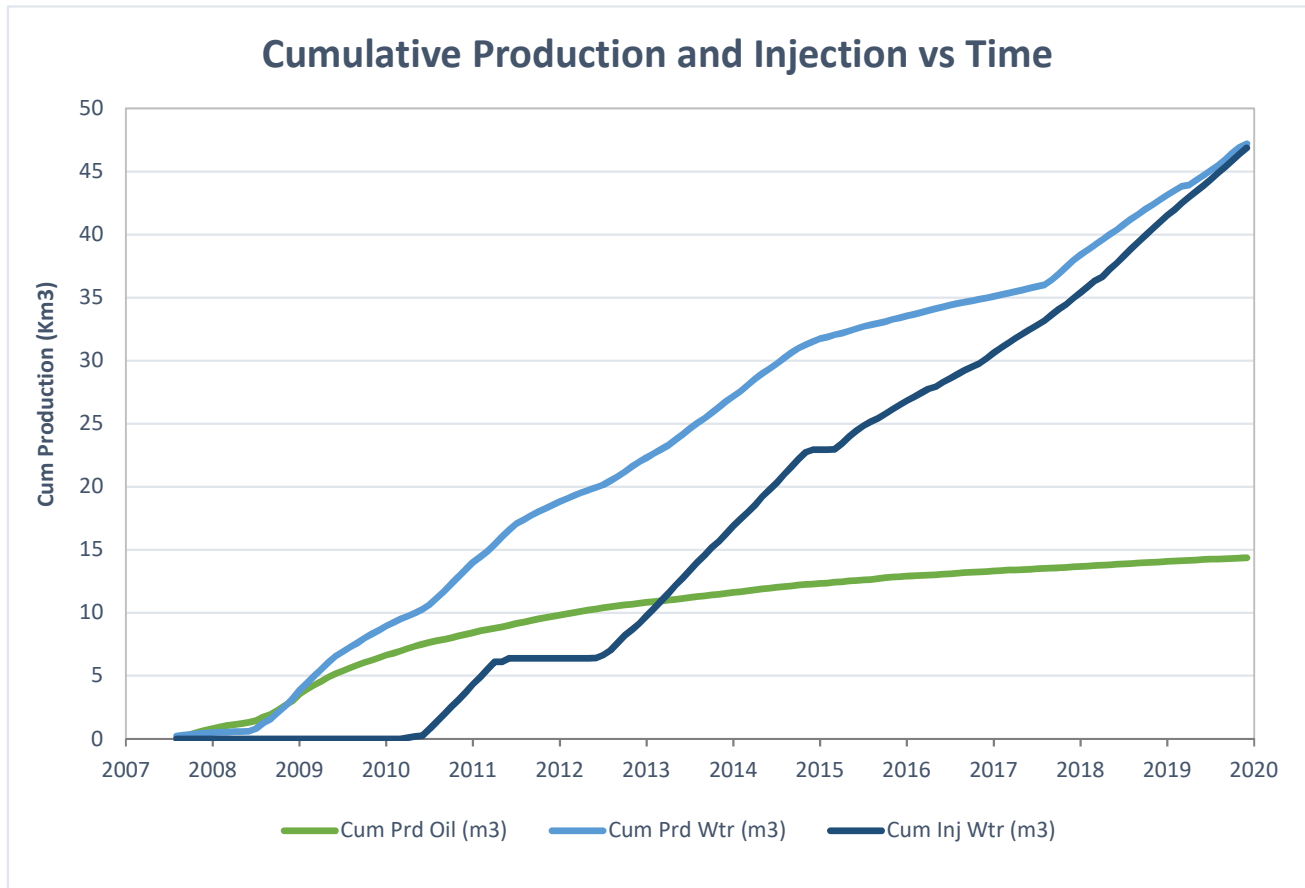
**a) Monthly oil and water production rates, injection rate, GOR and WOR**

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	1.02	12.63	16.97	12.43	0
Feb-2019	1.00	12.62	16.68	12.62	0
Mar-2019	1.04	10.59	16.45	10.19	0
Apr-2019	0.81	3.43	15.27	4.23	0
May-2019	1.11	12.36	15.03	11.14	0
Jun-2019	1.00	12.66	15.50	12.66	0
Jul-2019	0.88	12.77	15.65	14.45	0
Aug-2019	0.62	12.40	16.00	19.92	0
Sep-2019	0.56	15.61	16.47	27.88	0
Oct-2019	0.79	16.74	16.35	21.27	0
Nov-2019	0.94	14.97	17.13	15.87	0
Dec-2019	0.87	9.28	16.03	10.66	0

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

2019 PRODUCTION	
Produced Oil (m <sup>3</sup> )	324
Produced Gas (m <sup>3</sup> )	0
Produced Water (m <sup>3</sup> )	4,443
Fluid Injected (m <sup>3</sup> )	5,885
CUMULATIVE PRODUCTION	
Produced Oil (m <sup>3</sup> )	14,359
Produced Water (m <sup>3</sup> )	47,203

## Ebor Unit No. 2



c) Monthly wellhead injection pressure for each injection well

MONTH	02/04-11 Inj		EBOR2	
	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)
Jan-2019	526.0	6537	526.0	6537
Feb-2019	467.0	6556	467.0	6556
Mar-2019	510.0	6543	510.0	6543
Apr-2019	458.0	6461	458.0	6461
May-2019	466.0	6338	466.0	6338
Jun-2019	465.0	6167	465.0	6167
Jul-2019	485.0	6182	485.0	6182
Aug-2019	496.0	6160	496.0	6160
Sep-2019	494.0	6366	494.0	6366
Oct-2019	507.0	6378	507.0	6378
Nov-2019	514.0	6382	514.0	6382
Dec-2019	497.0	6421	497.0	6421
<b>Total</b>	<b>5885.0</b>		<b>5885.0</b>	
<b>Avg Inj P</b>		<b>6374</b>		<b>6374</b>

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>	526.0	467.0	510.0	458.0	466.0	465.0	485.0	496.0	494.0	507.0	514.0	497.0
<b>Daily (m<sup>3</sup>/d)</b>	16.97	16.68	16.45	15.27	15.03	15.50	15.65	16.00	16.47	16.35	17.13	16.03

2019 AVG. ANNUAL DAILY INJECTION = 16.13 m3/d
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CUMULATIVE INJECTION TO Dec 31, 2018 = 40,992 m3
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TOTAL 2019 ANNUAL INJECTION = 5,885 m3
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CUMULATIVE INJECTION TO Dec 31, 2019 = 46,877 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

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

**VOIDAGE CALCULATIONS**

OIL FORMATION VOLUME FACTOR (Rm<sup>3</sup>/Sm<sup>3</sup>) = 1.071

MONTH	Mth Oil Prod (m <sup>3</sup> )	Cum Oil Prod (Km <sup>3</sup> )	Mth Water Prod (m <sup>3</sup> )	Cum Water Prod (Km <sup>3</sup> )	Mth Water Inj (m <sup>3</sup> )	Cum Water Inj (Km <sup>3</sup> )	VRR	Cum VRR
Jan-2019	31.5	14.07	391.5	43.15	526.0	41.52	1.237	0.713
Feb-2019	28.0	14.09	353.3	43.50	467.0	41.98	1.218	0.716
Mar-2019	32.2	14.13	328.2	43.83	510.0	42.49	1.406	0.721
Apr-2019	24.3	14.15	102.9	43.94	458.0	42.95	3.552	0.727
May-2019	34.4	14.19	383.2	44.32	466.0	43.42	1.109	0.730
Jun-2019	30.0	14.22	379.7	44.70	465.0	43.88	1.129	0.732
Jul-2019	27.4	14.24	395.8	45.09	485.0	44.37	1.141	0.735
Aug-2019	19.3	14.26	384.5	45.48	496.0	44.86	1.224	0.738
Sep-2019	16.8	14.28	468.3	45.95	494.0	45.36	1.016	0.741
Oct-2019	24.4	14.30	518.9	46.47	507.0	45.87	0.930	0.742
Nov-2019	28.3	14.33	449.2	46.92	514.0	46.38	1.072	0.745
Dec-2019	27.0	14.36	287.7	47.20	497.0	46.88	1.570	0.749

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

The injection water for Ebor Unit No. 2 was sourced from the 02/16-32-007-29W1 well (Lodgepole formation) until June 2016 when it was switched over to the newly recompleted source water well at 02/14-30-007-28W1 (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****Ebor Unit No. 2 Well List**

<i><b>UWI</b></i>	<i><b>Type</b></i>	<i><b>Status</b></i>	<i><b>Future Plans</b></i>
100/03-11-009-29W1/0	Horizontal	Producing	-
100/04-11-009-29W1/0	Vertical	Producing	-
102/04-11-009-29W1/2	Horizontal	Injection	-
100/05-11-009-29W1/0	Horizontal	Producing	-

**k) Discussion**

Water injection started in April 2010 and was suspended in June 2011 after signs of breakthrough in the horizontal producer at 00/05-11 shortly after injection began. In July 2012, injection was restarted.