

**Waskada Unit No. 6**

**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:**

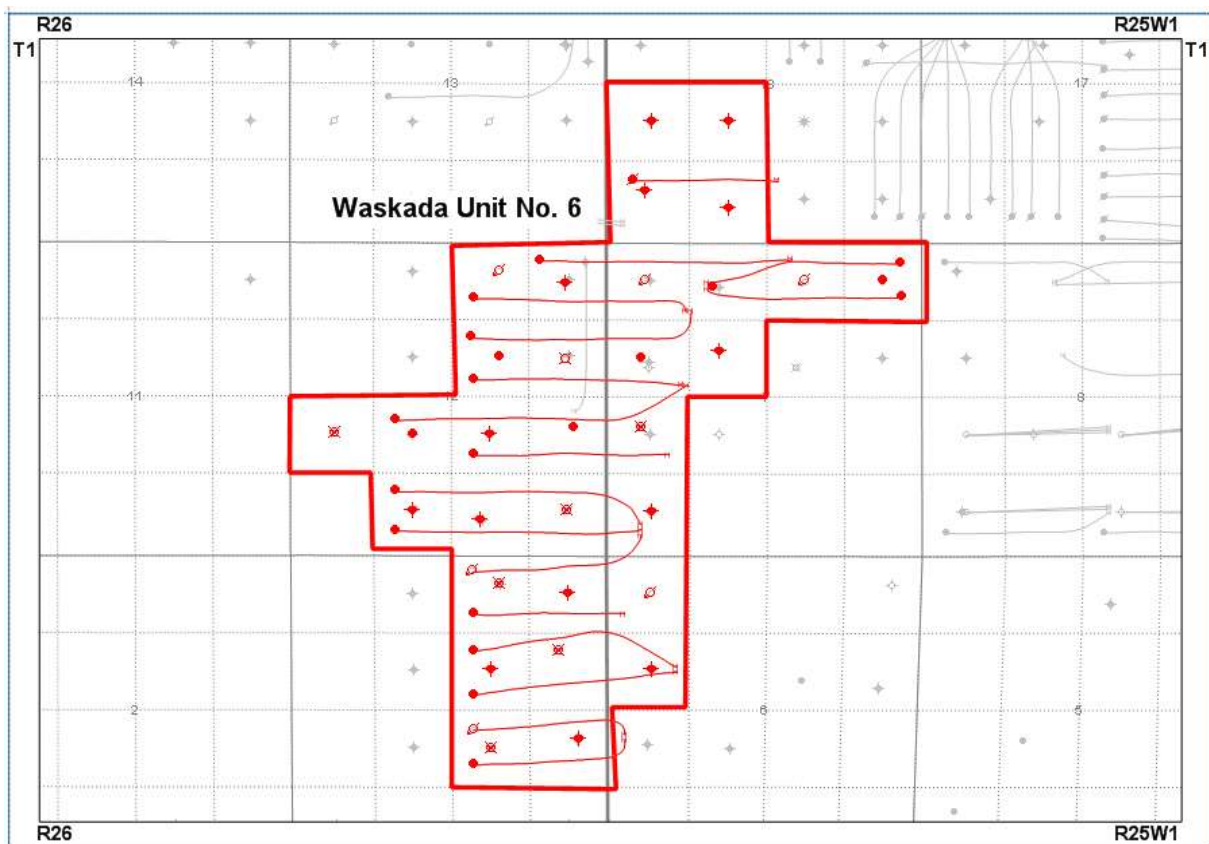
**Tundra Oil and Gas**

**March 19, 2020**

## INTRODUCTION

Waskada Unit No. 6 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM 44 effective May 1985 and then amended into WF Order No. 1 in May 1995. Waskada Unit No. 6 area contains 33 abandoned/suspended wells, including 13 inactive/abandoned injectors, and 15 producing/injection wells in 31 LSDs in Township 1, Range 26 W1 as shown in the figure below.

**Figure 1: Waskada Unit No. 6 Area Outline**



## Waskada Unit No. 6

Tundra Oil and Gas (Tundra), as the operator of the Waskada Unit No. 6 Enhanced Oil Recovery (EOR) project hereby submits the 2019 EOR report as per section 73 of the Drilling and Production Regulations.

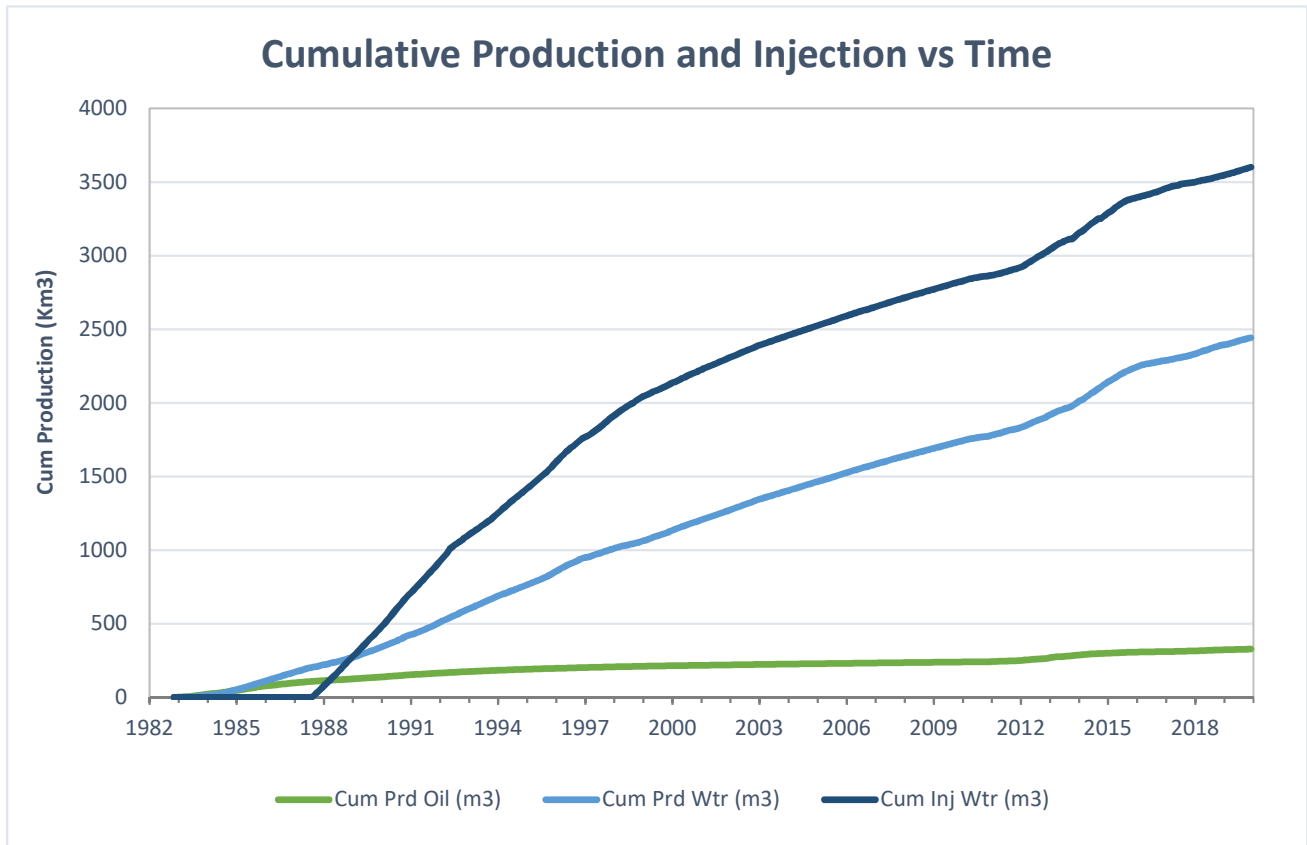
**a) Monthly oil and water production rates, injection rate, GOR and WOR**

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	14.53	96.13	142.84	6.62	26.65
Feb-2019	11.02	111.45	152.36	10.12	35.01
Mar-2019	14.49	141.93	154.29	9.79	26.27
Apr-2019	15.44	150.17	157.00	9.72	25.47
May-2019	11.35	136.92	154.71	12.07	0
Jun-2019	12.82	159.23	153.60	12.42	0
Jul-2019	15.86	149.60	144.52	9.43	0
Aug-2019	14.32	157.47	192.74	11.00	0
Sep-2019	13.36	147.15	166.17	11.01	0
Oct-2019	12.56	141.29	163.03	11.25	0
Nov-2019	12.79	124.02	164.00	9.69	0
Dec-2019	10.69	139.77	179.55	13.07	0

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

2019 PRODUCTION	
Produced Oil (m <sup>3</sup> )	4,849
Produced Gas (m <sup>3</sup> )	46
Produced Water (m <sup>3</sup> )	50,395
Fluid Injected (m <sup>3</sup> )	58,571
CUMULATIVE PRODUCTION	
Produced Oil (m <sup>3</sup> )	327,442
Produced Water (m <sup>3</sup> )	2,442,770

## Waskada Unit No. 6



c) Monthly wellhead injection pressure for each injection well

	00/15-12 Inj		00/15-07 Inj		03/15-01 Inj		02/07-01 Inj		03/10-01 Inj		03/03-12 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	0	0.0	0	1184.0	3723	1211.0	2695	957.0	2167	1076.0	375
Feb-2019	0.0	0	0.0	0	1071.0	3845	1172.0	2970	978.0	2610	1045.0	672
Mar-2019	0.0	0	0.0	0	1179.0	3959	1344.0	3182	1056.0	2800	1204.0	1050
Apr-2019	0.0	0	0.0	0	1153.0	3976	1331.0	3201	1037.0	2964	1189.0	1266
May-2019	0.0	0	0.0	0	1174.0	3980	1376.0	3219	1014.0	3086	1232.0	1446
Jun-2019	0.0	0	0.0	0	1116.0	3929	1393.0	3319	927.0	2969	1172.0	1275
Jul-2019	0.0	0	0.0	0	1057.0	3901	1357.0	3328	859.0	3428	1075.0	1402
Aug-2019	0.0	0	0.0	0	1136.0	3943	1527.0	3567	1014.0	2885	1233.0	1733
Sep-2019	0.0	0	0.0	0	1069.0	3917	1467.0	3326	77.0	159	1185.0	1810
Oct-2019	0.0	0	0.0	0	1099.0	3978	1521.0	3458	0.0	107	1212.0	1973
Nov-2019	0.0	0	0.0	0	1032.0	3868	1464.0	3515	118.0	45	1112.0	2082
Dec-2019	0.0	0	0.0	0	1028.0	3679	1465.0	3455	509.0	-91	1333.0	2375
<b>Total</b>	0.0		0.0		13298.0		16628.0		8546.0		14068.0	
<b>Avg Inj P</b>		0		0		3892		3270		1928		1455

	03/10-12 Inj		WU6	
MONTH	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)	Inj Water (m <sup>3</sup> )	Avg Inj P (kPa)
Jan-2019	0.0	0	4428.0	1493
Feb-2019	0.0	0	4266.0	1683
Mar-2019	0.0	0	4783.0	1832
Apr-2019	0.0	0	4710.0	1901
May-2019	0.0	0	4796.0	1955
Jun-2019	0.0	0	4608.0	1915
Jul-2019	132.0	106	4480.0	1817
Aug-2019	1065.0	-85	5975.0	1720
Sep-2019	1187.0	-84	4985.0	1304
Oct-2019	1222.0	-91	5054.0	1346
Nov-2019	1194.0	-91	4920.0	1346
Dec-2019	1231.0	-91	5566.0	1333
<b>Total</b>	6031.0		58571.0	
<b>Avg Inj P</b>		-28		1637

**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>	4428.0	4266.0	4783.0	4710.0	4796.0	4608.0	4480.0	5975.0	4985.0	5054.0	4920.0	5566.0
<b>Daily (m<sup>3</sup>/d)</b>	142.84	152.36	154.29	157.00	154.71	153.60	144.52	192.74	166.17	163.03	164.00	179.55

2019 AVG. ANNUAL DAILY INJECTION = 160.40 m3/d
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CUMULATIVE INJECTION TO Dec 31, 2018 = 3,542,888 m3
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TOTAL 2019 ANNUAL INJECTION = 58,571 m3
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CUMULATIVE INJECTION TO Dec 31, 2019 = 3,601,459 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
102.10-01-001-26W1.00	Rigless Acid	6/13/2019
102.15-01-001-26W1.00	Pump Change	2/1/2019
103.07-01-001-26W1.00	Rigless Acid	6/13/2019
102.03-12-001-26W1.00	Rigless Acid	6/13/2019
102.06-12-001-26W1.00	Pump Change	3/7/2019
102.06-12-001-26W1.00	Inspect Rods For Corrosion	11/14/2019
102.06-12-001-26W1.00	Pump Change	12/13/2019
102.07-12-001-26W1.00	Rigless Acid	7/5/2019
102.10-12-001-26W1.00	Pump Change	2/12/2019
102.10-12-001-26W1.00	Pump Change	5/31/2019
102.15-12-001-26W1.00	Pump Change/Acid Job	2/27/2019
102.15-12-001-26W1.00	Rod Failure / Pump Change	11/14/2019
103.10-12-001-26W1.00	WIW Conversion	1/23/2019

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	450.3	323.04	2980.1	2395.36	4428.0	3547.32	1.263	1.279
Feb-2019	308.5	323.35	3120.5	2398.48	4266.0	3551.58	1.225	1.279
Mar-2019	449.2	323.80	4399.9	2402.88	4783.0	3556.36	0.971	1.278
Apr-2019	463.3	324.26	4505.2	2407.38	4710.0	3561.07	0.933	1.278
May-2019	351.8	324.62	4244.5	2411.63	4796.0	3565.87	1.030	1.277
Jun-2019	384.6	325.00	4777	2416.40	4608.0	3570.48	0.882	1.277
Jul-2019	491.8	325.49	4637.7	2421.04	4480.0	3574.96	0.859	1.276
Aug-2019	443.9	325.94	4881.5	2425.92	5975.0	3580.93	1.106	1.276
Sep-2019	400.9	326.34	4414.6	2430.34	4985.0	3585.92	1.021	1.275
Oct-2019	389.5	326.73	4380.1	2434.72	5054.0	3590.97	1.045	1.275
Nov-2019	383.8	327.11	3720.7	2438.44	4920.0	3595.89	1.180	1.275
Dec-2019	331.4	327.44	4332.8	2442.77	5566.0	3601.46	1.179	1.274

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>
100/12-06-001-25W1/0	Vertical	Abandoned	-
100/13-06-001-25W1/0	Vertical	Injection	-
100/04-07-001-25W1/2	Vertical	Abandoned	-
102/05-07-001-25W1/0	Vertical	Abandoned	-
100/11-07-001-25W1/0	Vertical	Abandoned	-
103/12-07-001-25W1/0	Vertical	Producing	-
102/13-07-001-25W1/0	Vertical	Injection	-
102/14-07-001-25W1/0	Vertical	Abandoned Zone	-
100/15-07-001-25W1/0	Vertical	Injection	-
100/16-07-001-25W1/0	Vertical	Producing	-
102/16-07-001-25W1/0	Horizontal	Producing	-
103/16-07-001-25W1/0	Horizontal	Producing	-
100/03-18-001-25W1/0	Vertical	Abandoned Zone	-
100/04-18-001-25W1/0	Vertical	Abandoned	-
102/04-18-001-25W1/0	Horizontal	Suspended	-
100/05-18-001-25W1/0	Vertical	Abandoned	-
100/06-18-001-25W1/0	Vertical	Abandoned	-
100/07-01-001-26W1/0	Vertical	Abandoned	-
102/07-01-001-26W1/0	Horizontal	Injection	-
103/07-01-001-26W1/0	Horizontal	Producing	-
100/08-01-001-26W1/2	Vertical	Abandoned Zone	-
100/09-01-001-26W1/0	Vertical	Abandoned	-
100/10-01-001-26W1/2	Vertical	Abandoned Zone	-
102/10-01-001-26W1/0	Horizontal	Producing	-
103/10-01-001-26W1/0	Horizontal	Injection	-
100/15-01-001-26W1/2	Vertical	Abandoned	-
102/15-01-001-26W1/0	Horizontal	Producing	-
103/15-01-001-26W1/0	Horizontal	Injection	-
100/16-01-001-26W1/2	Vertical	Abandoned Zone	-
100/01-12-001-26W1/0	Vertical	Abandoned	-
100/02-12-001-26W1/2	Vertical	Abandoned	-
100/03-12-001-26W1/2	Vertical	Abandoned	-
102/03-12-001-26W1/0	Horizontal	Producing	-
103/03-12-001-26W1/0	Horizontal	Injection	-
100/05-12-001-26W1/0	Vertical	Abandoned	-
100/06-12-001-26W1/2	Vertical	Abandoned Zone	-
102/06-12-001-26W1/0	Horizontal	Producing	-
100/07-12-001-26W1/0	Vertical	Abandoned	-
102/07-12-001-26W1/0	Horizontal	Producing	-
100/08-12-001-26W1/0	Vertical	Abandoned Zone	-
102/09-12-001-26W1/0	Vertical	Source	-
100/10-12-001-26W1/0	Vertical	Producing	-
102/10-12-001-26W1/0	Horizontal	Producing	-
103/10-12-001-26W1/0	Horizontal	Injection	-
100/15-12-001-26W1/0	Vertical	Injection	-



**j) Well List****Waskada Unit No. 6 Well List**

<i><b>UWI</b></i>	<i><b>Type</b></i>	<i><b>Status</b></i>	<i><b>Future Plans</b></i>
102/15-12-001-26W1/0	Horizontal	Producing	-
102/16-12-001-26W1/0	Vertical	Abandoned Zone	-
104/16-12-001-26W1/0	Horizontal	Producing	-