

Waskada Unit No. 3

Waterflood Progress Report 2017

January 1st through December 31st 2017

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

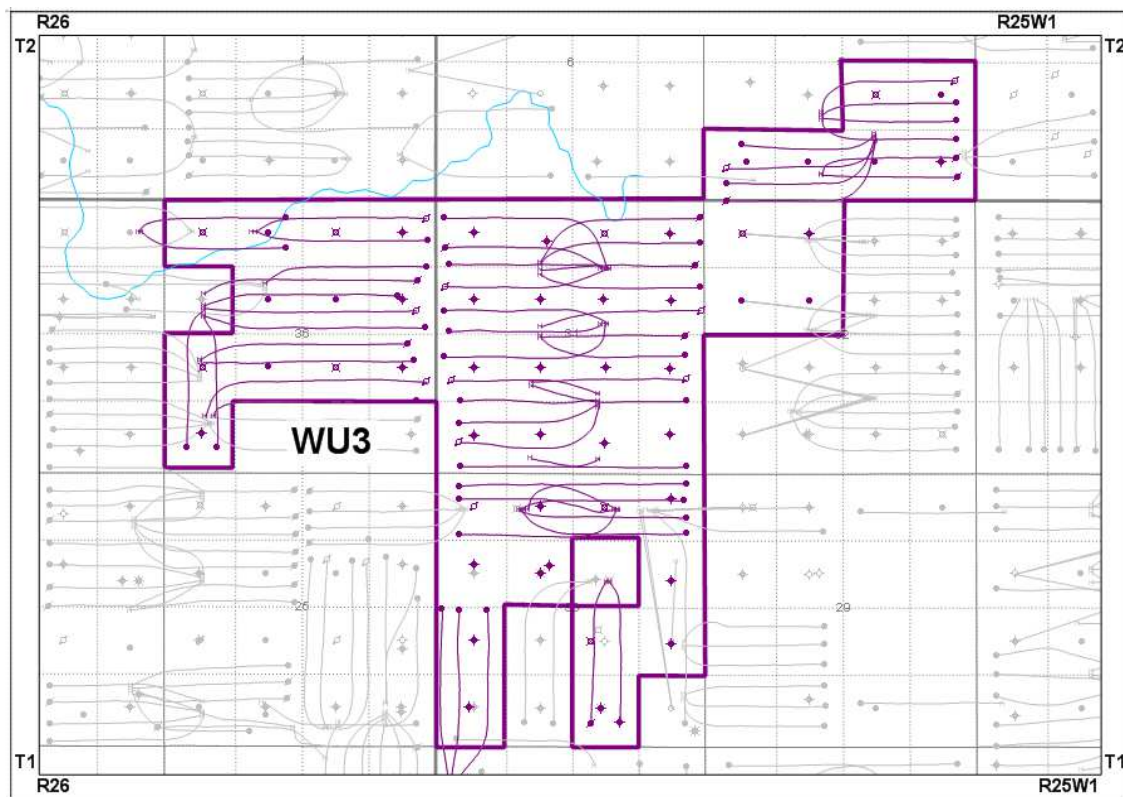
Prepared by:

Tundra Oil and Gas

July 20, 2018

INTRODUCTION

Waskada Unit No. 3 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM58 effective May 1984. The Unit area contains 50 abandoned/suspended wells, including 14 inactive/abandoned injectors, 56 producing wells, and 5 active injectors in 50 LSDs in Townships 1 & 2, Ranges 25 & 26 W1 as shown in the figure below.



Waskada Unit No.3

Tundra Oil and Gas (Tundra), as the operator of the Waskada Unit 3 Enhanced Oil Recovery (EOR) project hereby submits the 2017 EOR report as per section 73 of the Drilling and Production Regulations:

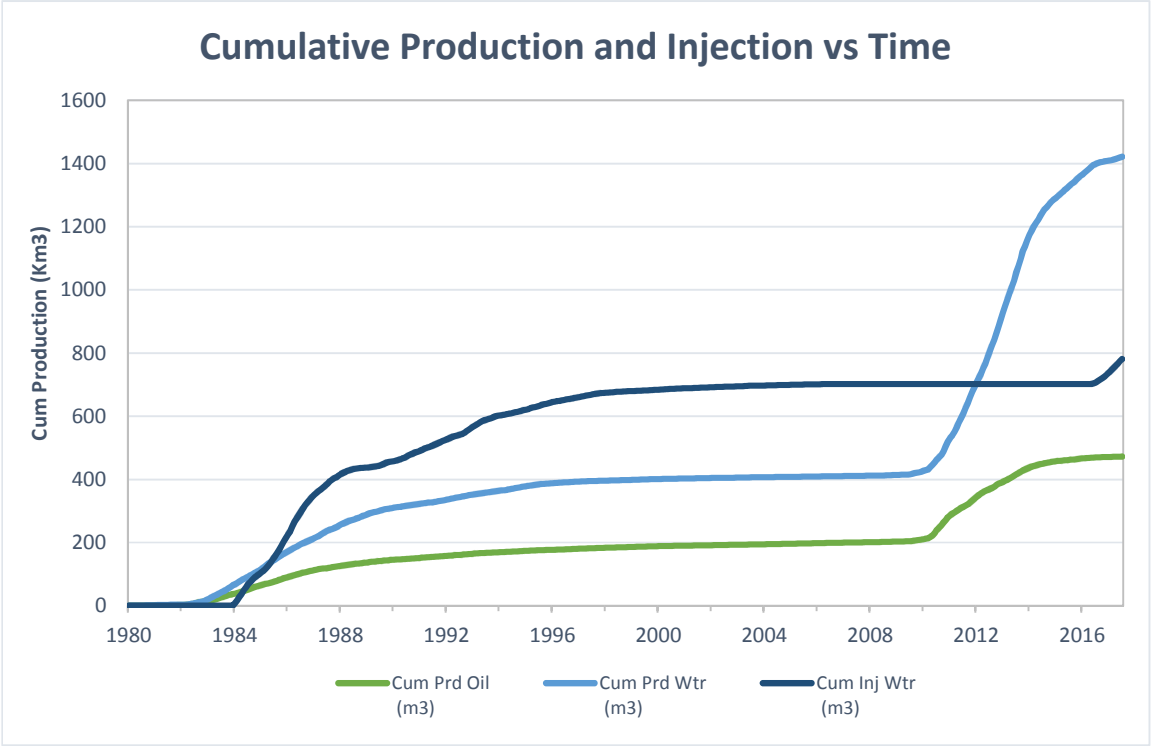
a) Monthly oil and water production rates, injection rate, GOR and WOR

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-2017	9.65	81.89	154.51	8.48	0
Feb-2017	11.93	68.93	152.21	5.78	0
Mar-2017	12.46	57.10	167.26	4.58	0
Apr-2017	8.57	54.12	164.54	6.32	0
May-2017	5.85	47.26	200.07	8.08	0
Jun-2017	3.80	34.15	210.70	8.98	0
Jul-2017	4.16	34.14	200.24	8.20	0
Aug-2017	7.71	54.73	248.34	7.10	0
Sep-2017	7.85	64.86	229.25	8.26	0
Oct-2017	4.81	88.04	238.95	18.29	0
Nov-2017	5.30	87.27	275.97	16.47	0
Dec-2017	3.74	64.20	188.74	17.17	0

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

2017 PRODUCTION	
Produced Oil (m ³)	2,600
Produced Gas (m ³)	0
Produced Water (m ³)	22,390
Fluid Injected (m ³)	74,017
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	471,834
Produced Water (m ³)	1,421,244

Waskada Unit No.3



c) Monthly wellhead injection pressure for each injection well

	00/13-30 Inj		02/04-36 Inj		02/05-31 Inj		02/08-05 Inj		02/08-36 Inj		03/04-05 Inj	
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)	Inj Water (m ³)	Avg Inj P (kPa)
Jan-2017	0.0	0	0.0	0	615.3	-54	0.0	0	606.9	-65	0.0	0
Feb-2017	0.0	0	0.0	0	546.5	-93	0.0	0	544.2	-96	0.0	0
Mar-2017	0.0	0	315.0	-26	614.0	-84	0.0	0	615.0	-91	0.0	0
Apr-2017	0.0	0	591.0	-99	590.2	-94	0.0	0	589.0	-96	0.0	0
May-2017	0.0	0	618.0	182	748.0	-66	0.0	0	615.0	-74	0.0	0
Jun-2017	0.0	0	477.0	120	744.6	-92	0.0	0	707.8	-94	0.0	0
Jul-2017	0.0	0	80.0	719	765.8	-92	0.0	0	766.2	-94	0.0	0
Aug-2017	0.0	0	508.0	12	899.5	-91	0.0	0	899.0	-93	0.0	0
Sep-2017	0.0	0	594.0	-94	887.6	-91	0.0	0	496.0	-92	0.0	0
Oct-2017	0.0	0	617.0	-66	347.3	-39	0.0	0	922.0	-86	0.0	0
Nov-2017	0.0	0	597.0	-93	896.3	-90	124.2	1503	895.0	-93	392.4	0
Dec-2017	0.0	0	419.0	-90	593.3	-85	0.0	1350	547.0	-93	715.7	355
Total	0.0		4816.0		8248.4		124.2		8203.1		1108.1	
Avg Inj P		0		47		-81		238		-89		30

	03/12-31 Inj		03/16-36 Inj		04/08-31 Inj		04/09-31 Inj		05/09-36 Inj		06/04-31 Inj	
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)	Inj Water (m ³)	Avg Inj P (kPa)
Jan-2017	615.8	-66	505.1	-46	615.9	0	616.2	-56	599.2	-65	615.4	-59
Feb-2017	546.1	-95	545.1	-94	546.6	-63	547.3	-93	439.8	-94	546.4	-93
Mar-2017	616.0	-89	565.0	-82	615.0	-64	614.0	-82	616.0	-86	615.0	-83
Apr-2017	590.1	-95	218.0	-76	588.8	-82	591.5	-92	588.0	-95	589.7	-95
May-2017	748.1	-76	614.0	-64	747.8	-58	748.3	-72	615.0	-69	748.0	-67
Jun-2017	745.1	-94	708.6	-94	743.1	-92	744.2	-91	706.0	-94	744.7	-93
Jul-2017	766.1	-93	765.5	-93	765.6	-92	766.3	-90	766.0	-93	766.0	-92
Aug-2017	899.4	-92	898.0	-92	899.1	-92	899.1	-89	897.0	-92	899.5	-91
Sep-2017	888.0	-92	888.0	-92	887.7	-91	888.1	-89	887.0	-92	461.2	-86
Oct-2017	915.1	-43	922.0	-77	920.2	-60	920.9	-78	922.0	-83	920.8	-75
Nov-2017	897.8	405	893.0	-88	896.2	-91	896.7	-89	894.0	-92	896.6	-91
Dec-2017	593.3	193	608.0	-71	592.4	-84	580.8	-86	607.0	-91	594.3	-84
Total	8820.8		8130.2		8818.3		8813.4		8536.9		8397.6	
Avg Inj P		-20		-81		-73		-84		-87		-84

c) Monthly wellhead injection pressure for each injection well

Waskada Unit 3		
MONTH	Inj Water (m ³)	Avg Inj P (kPa)
Jan-2017	4789.8	-46
Feb-2017	4261.9	-80
Mar-2017	5185.0	-69
Apr-2017	4936.2	-82
May-2017	6202.1	-36
Jun-2017	6321.0	-62
Jul-2017	6207.4	-2
Aug-2017	7698.6	-72
Sep-2017	6877.6	-82
Oct-2017	7407.3	-61
Nov-2017	8279.2	98
Dec-2017	5851.0	101
Total	74017.0	
Avg Inj P		-33

MONTH	Jan-2017	Feb-2017	Mar-2017	Apr-2017	May-2017	Jun-2017	Jul-2017	Aug-2017	Sep-2017	Oct-2017	Nov-2017	Dec-2017
Total m3	4789.8	4261.9	5185.0	4936.2	6202.1	6321.0	6207.4	7698.6	6877.6	7407.3	8279.2	5851.0
Daily (m³/d)	154.51	152.21	167.26	164.54	200.07	210.70	200.24	248.34	229.25	238.95	275.97	188.74

2017 AVG. ANNUAL DAILY INJECTION = 202.56 m3/d
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CUMULATIVE INJECTION TO Dec 31, 2016 = 706,736 m3

TOTAL 2017 ANNUAL INJECTION = 74,017 m3

CUMULATIVE INJECTION TO Dec 31, 2017 = 780,754 m3

d) Summary of the result of any survey of reservoir pressure conducted in 2017. N/A

e) Date and type of any well servicing.

Well	Service Description	Date
102.01-31-001-25W1.00	Pump Change	9/20/2017
102.05-31-001-25W1.00	Packer Change	10/25/2017
103.04-31-001-25W1.00	Pump Change	8/22/2017
106.04-31-001-25W1.00	WIW Repair - Failed Packer Integrity Test	9/21/2017
102.04-36-001-26W1.00	WIW Repair - Failed Packer Integrity Test	8/3/2017
102.04-36-001-26W1.00	Spearfish Producer to WIW Conversion	2/8/2017
102.04-36-001-26W1.00	WIW Repair - Failed Packer Integrity Test	6/8/2017
102.08-36-001-26W1.00	WIW Repair - Failed Packer Integrity Test	9/21/2017
102.14-36-001-26W1.00	Pump Change	6/19/2017
102.16-36-001-26W1.00	Cemented Liner Clean Out	8/1/2017
103.14-36-001-26W1.00	Pump Change	6/21/2017
102.08-05-002-25W1.00	Spearfish Producer to WIW Conversion	2/13/2017
103.04-05-002-25W1.00	Spearfish Producer to WIW Conversion	2/23/2017
103.08-05-002-25W1.00	Pump Change	10/6/2017

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-2017	299.2	469.53	2538.5	1401.39	4789.8	711.53	1.658	0.365
Feb-2017	334.1	469.87	1929.9	1403.32	4262.0	715.79	1.836	0.366
Mar-2017	386.3	470.25	1770.1	1405.09	5185.0	720.97	2.333	0.369
Apr-2017	257.0	470.51	1623.5	1406.72	4936.3	725.91	2.565	0.371
May-2017	181.3	470.69	1465.2	1408.18	6202.2	732.11	3.698	0.374
Jun-2017	114.1	470.81	1024.5	1409.21	6321.1	738.43	5.459	0.377
Jul-2017	129.0	470.93	1058.4	1410.26	6207.5	744.64	5.133	0.380
Aug-2017	239.1	471.17	1696.6	1411.96	7698.6	752.34	3.895	0.383
Sep-2017	235.6	471.41	1945.9	1413.91	6877.6	759.22	3.096	0.386
Oct-2017	149.2	471.56	2729.2	1416.64	7407.3	766.62	2.551	0.389
Nov-2017	159.0	471.72	2618.2	1419.25	8279.2	774.90	2.952	0.393
Dec-2017	115.9	471.83	1990.1	1421.24	5850.8	780.75	2.752	0.396

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>
100/02-30-001-25W1/0	Vertical	Abandoned	-
102/02-30-001-25W1/0	Horizontal	Suspended	-
103/02-30-001-25W1/0	Horizontal	Abandoned Zone	-
102/04-30-001-25W1/0	Vertical	Abandoned	-
100/05-30-001-25W1/2	Vertical	Abandoned	-
102/05-30-001-25W1/0	Horizontal	Producing	-
103/05-30-001-25W1/0	Horizontal	Producing	-
104/05-30-001-25W1/0	Horizontal	Producing	-
102/07-30-001-25W1/0	Vertical	Abandoned	-
100/08-30-001-25W1/2	Vertical	Abandoned	-
100/09-30-001-25W1/0	Vertical	Abandoned Zone	-
100/11-30-001-25W1/2	Vertical	Abandoned	-
102/11-30-001-25W1/2	Vertical	Abandoned	-
102/12-30-001-25W1/0	Vertical	Abandoned	-
100/13-30-001-25W1/0	Vertical	Injection	-
102/13-30-001-25W1/0	Horizontal	Producing	-
103/13-30-001-25W1/0	Horizontal	Producing	-
104/13-30-001-25W1/0	Horizontal	Producing	-
100/14-30-001-25W1/0	Vertical	Abandoned	-
100/15-30-001-25W1/0	Vertical	Abandoned	-
100/16-30-001-25W1/0	Vertical	Abandoned	-
102/16-30-001-25W1/0	Horizontal	Producing	-
103/16-30-001-25W1/0	Horizontal	Producing	-
104/16-30-001-25W1/0	Horizontal	Producing	-
105/16-30-001-25W1/0	Horizontal	Producing	-
100/01-31-001-25W1/0	Vertical	Abandoned	-
102/01-31-001-25W1/0	Horizontal	Producing	-
100/02-31-001-25W1/0	Vertical	Abandoned	-
100/03-31-001-25W1/0	Vertical	Abandoned	-
102/04-31-001-25W1/0	Vertical	Abandoned	-
103/04-31-001-25W1/0	Horizontal	Producing	-
104/04-31-001-25W1/0	Horizontal	Producing	-
105/04-31-001-25W1/0	Horizontal	Producing	-
106/04-31-001-25W1/0	Horizontal	Injection	-
100/05-31-001-25W1/0	Vertical	Abandoned	-
102/05-31-001-25W1/0	Horizontal	Injection	-
103/05-31-001-25W1/0	Horizontal	Producing	-
100/06-31-001-25W1/0	Vertical	Abandoned	-
100/07-31-001-25W1/0	Vertical	Abandoned	-
100/08-31-001-25W1/0	Vertical	Abandoned	-
102/08-31-001-25W1/0	Horizontal	Producing	-
103/08-31-001-25W1/0	Horizontal	Producing	-
104/08-31-001-25W1/0	Horizontal	Injection	-
100/09-31-001-25W1/0	Vertical	Abandoned	-
102/09-31-001-25W1/0	Horizontal	Suspended	-

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
103/09-31-001-25W1/0	Horizontal	Producing	-
104/09-31-001-25W1/0	Horizontal	Injection	-
100/10-31-001-25W1/0	Vertical	Abandoned	-
100/11-31-001-25W1/0	Vertical	Abandoned	-
100/12-31-001-25W1/2	Vertical	Abandoned	-
102/12-31-001-25W1/0	Horizontal	Producing	WIW Conversion
103/12-31-001-25W1/0	Horizontal	Injection	-
104/12-31-001-25W1/0	Horizontal	Producing	-
100/13-31-001-25W1/0	Vertical	Abandoned	-
102/13-31-001-25W1/0	Horizontal	Producing	-
103/13-31-001-25W1/0	Horizontal	Producing	-
104/13-31-001-25W1/0	Horizontal	Suspended	-
100/14-31-001-25W1/0	Vertical	Abandoned	-
100/15-31-001-25W1/0	Vertical	Abandoned	-
100/16-31-001-25W1/0	Vertical	Abandoned	-
102/16-31-001-25W1/0	Horizontal	Suspended	-
103/16-31-001-25W1/0	Horizontal	Producing	-
104/16-31-001-25W1/0	Horizontal	Suspended	-
100/11-32-001-25W1/0	Vertical	Producing	-
100/12-32-001-25W1/0	Vertical	Producing	-
100/13-32-001-25W1/0	Vertical	Abandoned	-
102/13-32-001-25W1/0	Horizontal	Suspended	-
100/14-32-001-25W1/0	Vertical	Abandoned	-
104/01-36-001-26W1/0	Horizontal	Producing	-
100/04-36-001-26W1/0	Vertical	Abandoned	-
102/04-36-001-26W1/0	Horizontal	Producing	-
103/04-36-001-26W1/0	Horizontal	Producing	-
100/05-36-001-26W1/0	Vertical	Abandoned	-
100/06-36-001-26W1/0	Vertical	Producing	-
100/07-36-001-26W1/0	Vertical	Abandoned	-
100/08-36-001-26W1/0	Vertical	Abandoned	-
102/08-36-001-26W1/0	Horizontal	Injection	-
103/08-36-001-26W1/0	Horizontal	Suspended	WIW Conversion
104/08-36-001-26W1/0	Horizontal	Producing	-
100/09-36-001-26W1/2	Vertical	Abandoned	-
102/09-36-001-26W1/0	Horizontal	Producing	-
103/09-36-001-26W1/0	Horizontal	Suspended	-
104/09-36-001-26W1/0	Horizontal	Producing	-
105/09-36-001-26W1/0	Horizontal	Injection	-
100/10-36-001-26W1/0	Vertical	Producing	-
100/11-36-001-26W1/0	Vertical	Producing	-
100/13-36-001-26W1/0	Vertical	Abandoned	-
100/14-36-001-26W1/0	Vertical	Producing	-
102/14-36-001-26W1/0	Horizontal	Producing	WIW Conversion
103/14-36-001-26W1/0	Horizontal	Producing	-
100/15-36-001-26W1/0	Vertical	Abandoned	-

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/16-36-001-26W1/0	Vertical	Abandoned	-
102/16-36-001-26W1/0	Horizontal	Producing	-
103/16-36-001-26W1/0	Horizontal	Injection	-
104/16-36-001-26W1/0	Horizontal	Producing	-
100/01-05-002-25W1/0	Vertical	Abandoned Zone	-
102/01-05-002-25W1/0	Horizontal	Producing	-
103/01-05-002-25W1/0	Horizontal	Suspended	-
104/01-05-002-25W1/0	Horizontal	Suspended	-
100/02-05-002-25W1/0	Vertical	Producing	-
100/03-05-002-25W1/0	Vertical	Producing	-
100/04-05-002-25W1/0	Vertical	Producing	-
102/04-05-002-25W1/0	Horizontal	Producing	-
103/04-05-002-25W1/0	Horizontal	Injection	-
104/04-05-002-25W1/0	Horizontal	Producing	-
100/07-05-002-25W1/0	Vertical	Abandoned	-
100/08-05-002-25W1/0	Vertical	Producing	-
102/08-05-002-25W1/0	Horizontal	Injection	-
103/08-05-002-25W1/0	Horizontal	Producing	-
104/08-05-002-25W1/0	Horizontal	Producing	-