

**Sinclair Unit No. 12**

**Waterflood Progress Report 2018**

**January 1<sup>st</sup> through December 31<sup>st</sup> 2018**

**Prepared for:**

**Manitoba Industry, Economic Development and Mines**

**Petroleum Branch**

**Prepared by:**

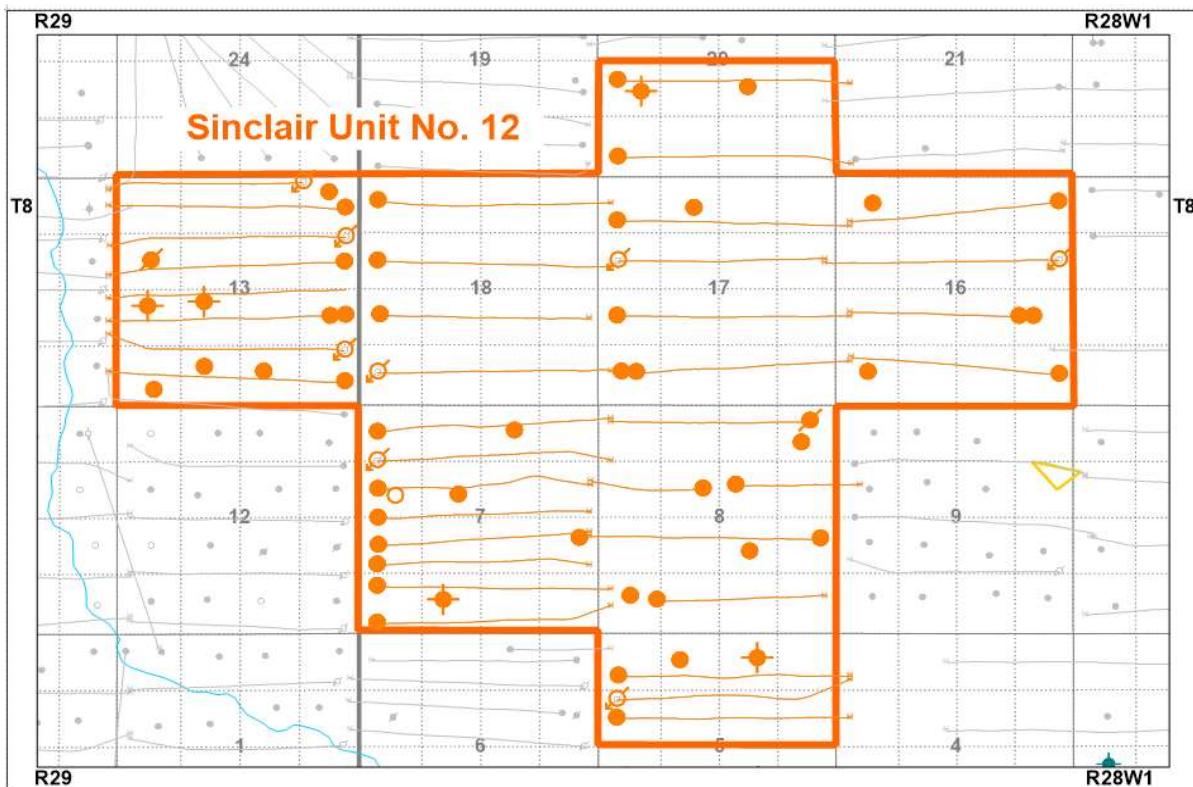
**Tundra Oil and Gas**

**May 30, 2019**

## INTRODUCTION

Sinclair Unit No. 12 Enhanced Oil Recovery (EOR) Waterflood Project was approved under Waterflood Order No. 44, effective February 1, 2015 with Tundra Oil and Gas (Tundra) as Operator. The EOR Unit area, outlined in orange, contains 45 producing wells and 9 injection wells in 112 LSDs in Township 8 Ranges 28 & 29 W1 as shown in the figure below.

**Figure 1: Sinclair Unit No. 12 Area Outline**



## Sinclair Unit No. 12

Tundra Oil and Gas (Tundra), as the operator of the Sinclair Unit No. 12 Enhanced Oil Recovery (EOR) project hereby submits the 2018 EOR report as per section 73 of the Drilling and Production Regulations.

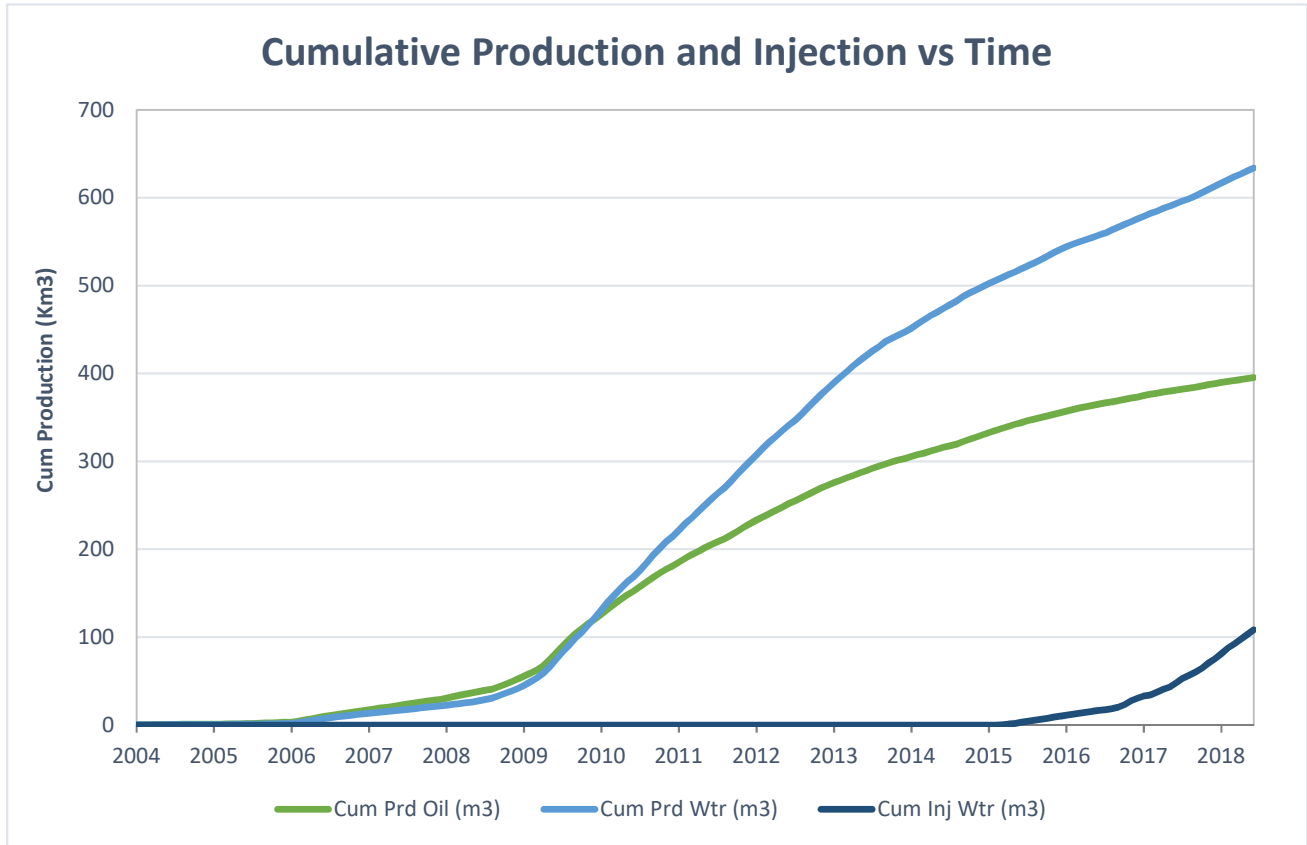
### a) Monthly oil and water production rates, injection rate, GOR and WOR

MONTH	Cal Dly Oil m <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-2018	33.16	94.50	157.58	2.85	0
Feb-2018	33.63	90.88	128.25	2.70	0
Mar-2018	41.06	109.88	119.26	2.68	0
Apr-2018	45.05	120.20	148.28	2.67	0
May-2018	43.13	117.55	185.18	2.73	0
Jun-2018	43.15	115.53	160.63	2.68	0.15
Jul-2018	40.73	115.31	195.00	2.83	0
Aug-2018	39.86	125.24	204.23	3.14	0
Sep-2018	40.09	113.36	156.90	2.83	0
Oct-2018	34.69	100.94	168.00	2.91	7.72
Nov-2018	34.89	116.58	177.67	3.34	0.48
Dec-2018	34.78	107.59	180.26	3.09	0

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

2018 PRODUCTION	
Produced Oil (m <sup>3</sup> )	14,127
Produced Gas (m <sup>3</sup> )	9
Produced Water (m <sup>3</sup> )	40,416
Fluid Injected (m <sup>3</sup> )	60,390
CUMULATIVE PRODUCTION	
Produced Oil (m <sup>3</sup> )	395,365
Produced Water (m <sup>3</sup> )	633,904

## Sinclair Unit No. 12



c) Monthly wellhead injection pressure for each injection well

	02/05-07 Inj		02/12-05 Inj		00/04-18 Inj		00/09-16 Inj		00/12-17 Inj		03/12-07 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-2018	0.0	0	0.0	-92	846.0	6514	1195.0	5602	1189.9	4857	1149.0	-94
Feb-2018	0.0	0	0.0	-92	740.0	6487	0.0	4452	823.1	4982	1112.0	22
Mar-2018	0.0	0	0.0	-92	675.0	5892	0.0	1795	612.2	4758	1059.0	316
Apr-2018	0.0	0	0.0	-92	667.0	5936	183.5	2167	548.8	4899	1121.0	820
May-2018	0.0	0	0.0	-92	716.0	6052	267.5	3073	571.2	5221	1230.0	1506
Jun-2018	0.0	0	0.0	-92	556.0	5285	221.0	3125	809.0	5846	1041.0	1572
Jul-2018	0.0	0	0.0	-92	703.0	5750	214.0	3368	856.0	6140	1097.0	2143
Aug-2018	0.0	0	0.0	-92	765.0	6456	482.0	4306	919.0	6536	891.0	1687
Sep-2018	0.0	0	0.0	-92	688.0	6125	473.0	5157	668.0	6486	608.0	967
Oct-2018	96.0	-26	0.0	-92	738.0	6329	576.0	5722	605.0	6513	704.0	878
Nov-2018	343.0	-89	0.0	-92	706.0	6447	565.0	6141	499.0	6491	939.0	1869
Dec-2018	581.0	-95	0.0	-92	706.0	6448	479.0	6175	476.0	6531	1154.0	2793
<b>Total</b>	1020.0		0.0		8506.0		4656.0		8577.2		12105.0	
<b>Avg Inj P</b>		-18		-92		6143		4257		5772		1206

	03/09-13 Inj		03/16-13 Inj		03/01-13 Inj		SU12	
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)
Jan-2018	457.0	-96	0.0	0	48.0	5	4884.8	2627
Feb-2018	583.0	-96	0.0	0	333.0	-52	3591.1	2243
Mar-2018	777.0	-93	85.0	-44	489.0	-77	3697.2	1667
Apr-2018	800.0	-92	401.0	-92	727.0	-83	4448.3	1683
May-2018	1201.0	524	700.0	-62	1055.0	-88	5740.7	2017
Jun-2018	805.0	877	623.0	662	764.0	137	4819.0	2177
Jul-2018	1172.0	2051	975.0	2305	1028.0	414	6045.0	2760
Aug-2018	1189.0	2856	921.0	2933	1164.0	1632	6331.0	3289
Sep-2018	532.0	826	731.0	3244	1007.0	2313	4707.0	3128
Oct-2018	732.0	1191	682.0	2975	1075.0	2894	5208.0	3019
Nov-2018	849.0	2318	582.0	2981	847.0	2955	5330.0	3224
Dec-2018	758.0	2285	571.0	2960	863.0	3146	5588.0	3350
<b>Total</b>	9855.0		6271.0		9400.0		60390.1	
<b>Avg Inj P</b>		1046		1489		1100		2599

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
<b>Total m3</b>	4884.8	3591.1	3697.2	4448.3	5740.7	4819.0	6045.0	6331.0	4707.0	5208.0	5330.0	5588.0
<b>Daily (m<sup>3</sup>/d)</b>	157.57	128.25	119.26	148.28	185.18	160.63	195.00	204.23	156.90	168.00	177.67	180.26

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

2018 AVG. ANNUAL DAILY INJECTION =	165.10 m3/d
CUMULATIVE INJECTION TO Dec 31, 2017 =	47,992 m3
TOTAL 2018 ANNUAL INJECTION =	60,390 m3
CUMULATIVE INJECTION TO Dec 31, 2018 =	108,382 m3

**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
100.10-07-007-28W1.00	Pump Change & Acid Job	12/5/2017
102.13-07-007-28W1.00	WIW Cemented Liner Cleanout	8/18/2017
102.09-08-007-28W1.00	Broken Polish Rod / Pump Change	5/26/2017
100.04-17-007-28W1.00	Pump Change	12/20/2017
100.08-17-007-28W1.00	Tbg Leak & Acid Job	10/13/2017
100.13-17-007-28W1.00	Rigless Acid Stimulation	8/15/2017

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

**VOIDAGE CALCULATIONS**

OIL FORMATION VOLUME FACTOR (Rm3/Sm3) = 1.071

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	1028.1	382.27	2929.5	596.42	4884.9	52.88	1.212	0.053
Feb-2018	941.6	383.21	2544.7	598.96	3591.1	56.47	1.011	0.056
Mar-2018	1273.0	384.48	3406.4	602.37	3697.2	60.17	0.775	0.059
Apr-2018	1351.6	385.83	3606.1	605.98	4448.3	64.61	0.880	0.063
May-2018	1337.0	387.17	3643.9	609.62	5740.7	70.35	1.131	0.069
Jun-2018	1294.4	388.46	3465.8	613.08	4819.0	75.17	0.993	0.073
Jul-2018	1262.6	389.73	3574.5	616.66	6045.0	81.22	1.227	0.079
Aug-2018	1235.6	390.96	3882.4	620.54	6331.0	87.55	1.216	0.084
Sep-2018	1202.7	392.16	3400.7	623.94	4707.0	92.26	1.004	0.088
Oct-2018	1075.5	393.24	3129	627.07	5208.0	97.46	1.217	0.093
Nov-2018	1046.7	394.29	3497.4	630.57	5330.0	102.79	1.154	0.098
Dec-2018	1078.1	395.36	3335.2	633.90	5588.0	108.38	1.245	0.103

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

The injection water for Sinclair Unit No. 12 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**

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
100/12-05-008-28W1/0	Horizontal	Producing	-
102/12-05-008-28W1/0	Horizontal	Injection	-
100/13-05-008-28W1/0	Horizontal	Producing	-
100/14-05-008-28W1/0	Vertical	Producing	-
100/15-05-008-28W1/2	Vertical	Abandoned Zone	-
100/03-07-008-28W1/0	Vertical	Abandoned Zone	-
100/04-07-008-28W1/0	Horizontal	Producing	-
103/04-07-008-28W1/0	Horizontal	Producing	-
100/05-07-008-28W1/0	Horizontal	Producing	-
102/05-07-008-28W1/0	Horizontal	Injection	-
103/05-07-008-28W1/0	Horizontal	Producing	-
100/08-07-008-28W1/0	Vertical	Producing	-
100/11-07-008-28W1/0	Vertical	Producing	-
100/12-07-008-28W1/0	Vertical	Potential	-
102/12-07-008-28W1/0	Horizontal	Producing	-
103/12-07-008-28W1/0	Horizontal	Injection	-
100/13-07-008-28W1/0	Horizontal	Producing	-
100/15-07-008-28W1/0	Vertical	Producing	-
100/04-08-008-28W1/0	Vertical	Producing	-
102/04-08-008-28W1/0	Horizontal	Producing	-
100/07-08-008-28W1/0	Vertical	Producing	-
100/08-08-008-28W1/0	Horizontal	Producing	-
100/10-08-008-28W1/0	Horizontal	Producing	-
100/11-08-008-28W1/0	Horizontal	Producing	-
100/16-08-008-28W1/0	Vertical	Producing	-
102/16-08-008-28W1/0	Horizontal	Suspended	-
100/01-16-008-28W1/0	Horizontal	Producing	-
100/04-16-008-28W1/0	Vertical	Producing	-
100/08-16-008-28W1/0	Vertical	Producing	-
102/08-16-008-28W1/0	Horizontal	Producing	-
100/09-16-008-28W1/0	Horizontal	Injection	-
100/13-16-008-28W1/0	Vertical	Producing	-
100/16-16-008-28W1/0	Horizontal	Producing	-
100/04-17-008-28W1/0	Vertical	Producing	-
102/04-17-008-28W1/0	Horizontal	Producing	-
100/05-17-008-28W1/0	Horizontal	Producing	-
100/12-17-008-28W1/0	Horizontal	Injection	-
100/13-17-008-28W1/0	Horizontal	Producing	-
100/14-17-008-28W1/0	Vertical	Producing	-
100/04-18-008-28W1/0	Horizontal	Injection	-
100/05-18-008-28W1/0	Horizontal	Producing	-
100/12-18-008-28W1/0	Horizontal	Producing	-
100/13-18-008-28W1/0	Horizontal	Producing	-
100/04-20-008-28W1/0	Horizontal	Producing	-
100/05-20-008-28W1/0	Vertical	Abandoned Zone	-



## j) Well List

## Sinclair Unit No. 12 Well List

<i><b>UWI</b></i>	<i><b>Type</b></i>	<i><b>Status</b></i>	<i><b>Future Plans</b></i>
102/05-20-008-28W1/0	Horizontal	Producing	-
100/07-20-008-28W1/2	Vertical	Producing	-
102/01-13-008-29W1/0	Horizontal	Producing	-
103/01-13-008-29W1/0	Horizontal	Injection	-
100/02-13-008-29W1/0	Vertical	Producing	-
100/03-13-008-29W1/0	Vertical	Producing	-
100/04-13-008-29W1/0	Vertical	Producing	-
100/05-13-008-29W1/0	Vertical	Abandoned Zone	-
100/06-13-008-29W1/0	Vertical	Abandoned Zone	-
100/08-13-008-29W1/0	Horizontal	Producing	-
102/08-13-008-29W1/0	Horizontal	Producing	-
102/09-13-008-29W1/0	Horizontal	Producing	-
103/09-13-008-29W1/0	Horizontal	Injection	-
100/12-13-008-29W1/0	Vertical	Suspended	-
100/16-13-008-29W1/0	Vertical	Producing	-
102/16-13-008-29W1/0	Horizontal	Producing	-
103/16-13-008-29W1/0	Horizontal	Injection	-