North Virden Scallion Unit No. 2

Waterflood Progress Report 2019

January 1st through December 31st 2019

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

Prepared by:

Tundra Oil and Gas

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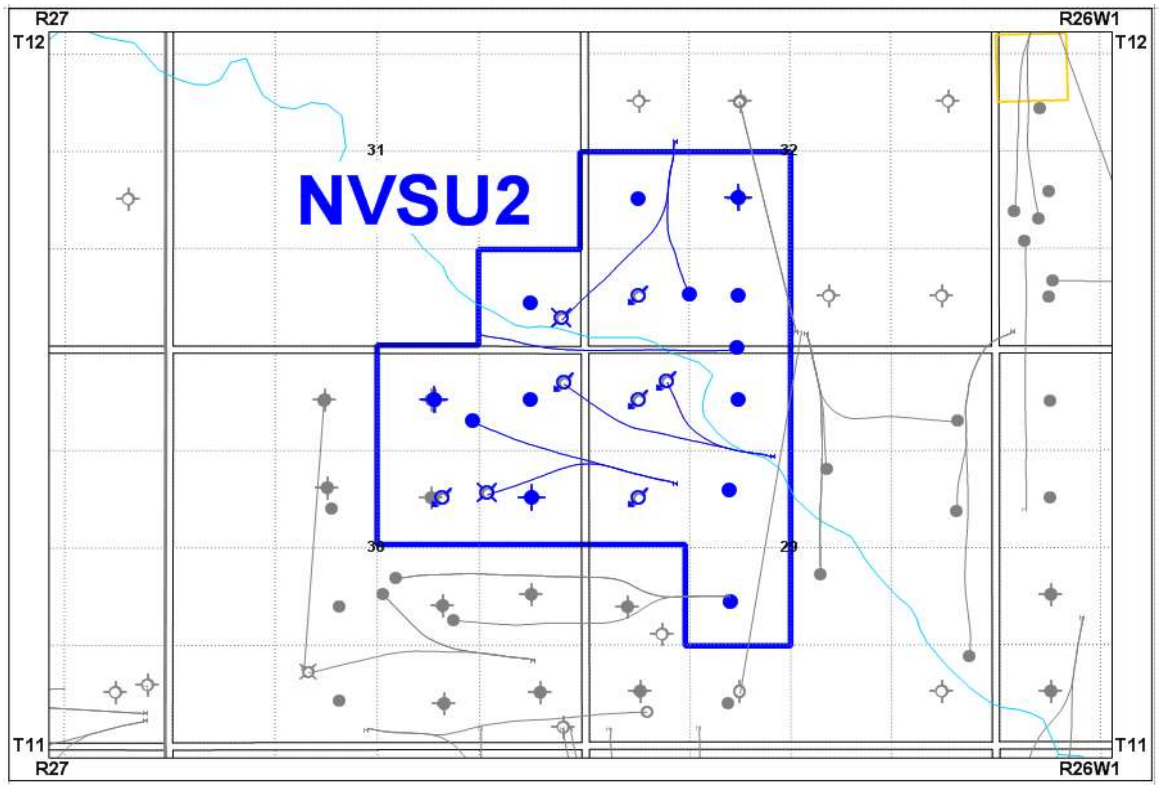
INTRODUCTION

North Virden Scallion Unit No. 2 (NVSU2) Enhanced Oil Recovery (EOR) Waterflood Project was approved under Board Order No. PM 59 effective August 1989 with Saskoil and Gas Corporation as Operator. Mountcliff Resources Ltd. acquired the unit from Saskoil and Gas Corporation and became operator in January 1993. Tundra Oil and Gas (Tundra) acquired the unit from Mountcliff Resources Ltd. in January 2000 and is the current operator of the unit. The EOR project area contains 24 wells in 14 LSDs in Township 11, Range 26 W1 as shown in the figure below.

Figure 1: North Virden Scallion Unit No. 2 Area Outline



North Virden Scallion Unit No. 2

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

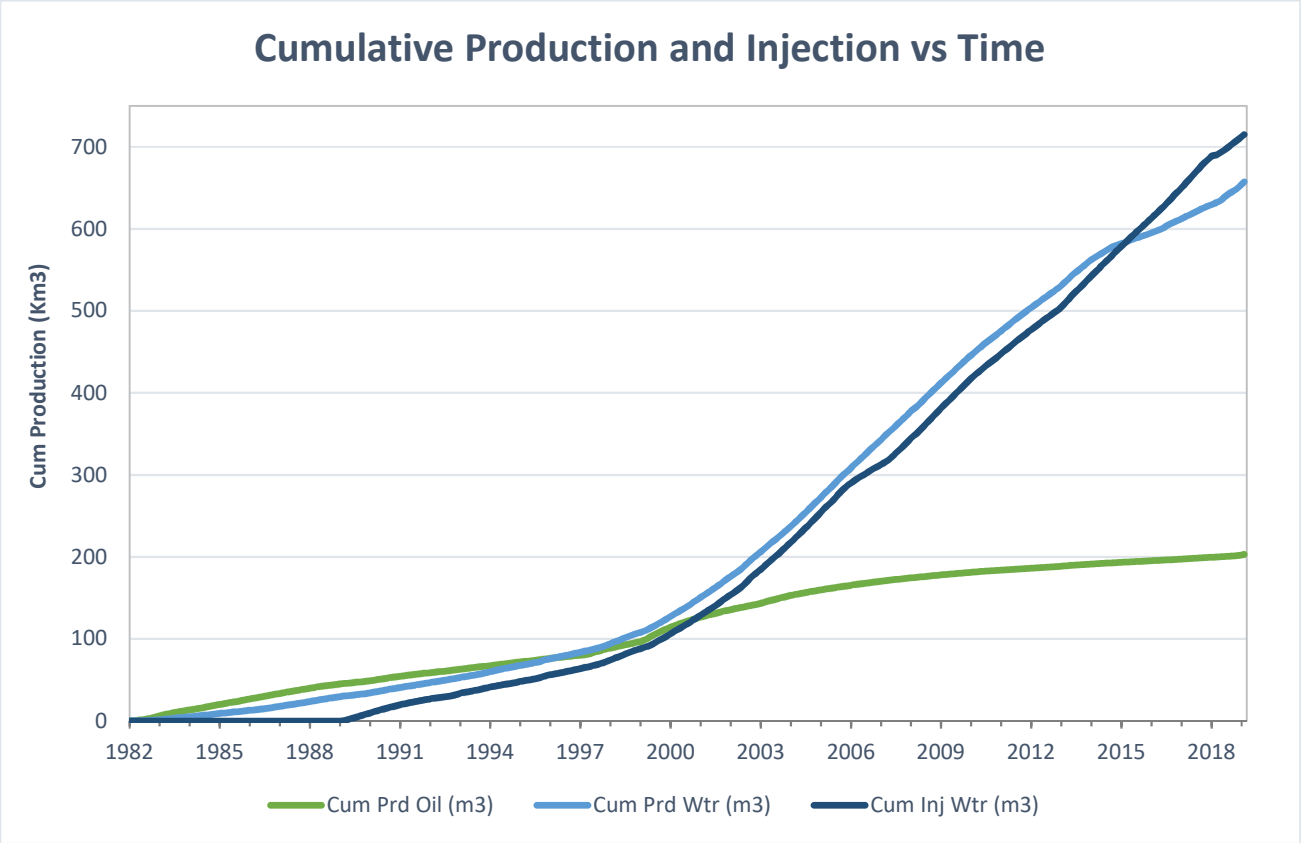
a) Monthly oil and water production rates, injection rate, GOR and WOR

MONTH	Cal Dly Oil m^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-2019	5.89	42.51	16.12	7.21	0
Feb-2019	6.43	45.67	63.00	7.11	0
Mar-2019	6.04	64.92	66.32	10.76	0
Apr-2019	6.35	96.89	66.83	15.27	0
May-2019	5.95	84.43	71.00	14.18	0
Jun-2019	5.52	72.81	80.47	13.18	0
Jul-2019	5.07	53.74	77.13	10.60	0
Aug-2019	6.75	63.43	80.58	9.40	0
Sep-2019	8.90	61.84	73.00	6.95	0
Oct-2019	15.38	93.05	80.48	6.05	0
Nov-2019	19.19	95.08	79.80	4.95	0
Dec-2019	18.25	91.22	79.45	5.00	0

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

2019 PRODUCTION	
Produced Oil (m^3)	3,342
Produced Gas (m^3)	0
Produced Water (m^3)	26,370
Fluid Injected (m^3)	25,371
CUMULATIVE PRODUCTION	
Produced Oil (m^3)	203,093
Produced Water (m^3)	657,294

North Virden Scallion Unit No. 2



c) Monthly wellhead injection pressure for each injection well

MONTH	02/16-30 Inj		00/04-32 Inj		NVSU2	
	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-2019	259.7	460	240.1	753	499.8	606
Feb-2019	956.0	2097	808.0	3887	1764.0	2992
Mar-2019	1133.8	2459	922.2	4029	2056.0	3244
Apr-2019	1105.1	2453	899.9	4075	2005.0	3264
May-2019	1188.2	2337	1012.8	4413	2201.0	3375
Jun-2019	1263.7	2593	1150.3	5691	2414.0	4142
Jul-2019	1312.3	2501	1078.7	5701	2391.0	4101
Aug-2019	1301.7	2489	1196.3	5627	2498.0	4058
Sep-2019	1107.2	2044	1082.8	5486	2190.0	3765
Oct-2019	1298.0	2233	1197.0	5742	2495.0	3988
Nov-2019	1235.6	2195	1158.4	5715	2394.0	3955
Dec-2019	1248.6	1965	1214.4	5720	2463.0	3843
Total	13409.9		11960.9		25370.8	
Avg Inj P		2152		4736		3444

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
Total m3	499.8	1764.0	2056.0	2005.0	2201.0	2414.0	2391.0	2498.0	2190.0	2495.0	2394.0	2463.0
Daily (m^3/d)	16.12	63.00	66.32	66.83	71.00	80.47	77.13	80.58	73.00	80.48	79.80	79.45

2019 AVG. ANNUAL DAILY INJECTION =	69.52 m3/d
CUMULATIVE INJECTION TO Dec 31, 2018 =	689,611 m3
TOTAL 2019 ANNUAL INJECTION =	25,371 m3
CUMULATIVE INJECTION TO Dec 31, 2019 =	714,982 m3

d) Reservoir Pressure Surveys

Where practicial, Tundra is committed to collecting pressure data from newly drilled wells. For NVSU2, pressures are available for the wells listed below.

UWI	Date	Depth (mTVD)	Pressure (kPaa)	Temp (°C)
02/11-29-011-26W1/0	August 8 - 22, 2019	652.7	2961	28.4
04/15-30-011-26W1/0	August 13 - Sept 9, 2019	642.4	3886	28.5
05/15-30-011-26W1/0	August 4 - 29, 2019	652.4	2765	28.2

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 (Rm3/Sm3) = 1.05

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	182.7	199.93	1317.9	632.24	499.8	690.11	0.331	0.819
Feb-2019	179.9	200.11	1278.8	633.52	1764.0	691.88	1.202	0.820
Mar-2019	187.1	200.30	2012.4	635.53	2056.0	693.93	0.931	0.820
Apr-2019	190.4	200.49	2906.8	638.44	2005.0	695.94	0.645	0.820
May-2019	184.6	200.68	2617.3	641.06	2201.0	698.14	0.783	0.820
Jun-2019	165.7	200.84	2184.3	643.24	2414.0	700.55	1.024	0.820
Jul-2019	157.1	201.00	1665.9	644.91	2391.0	702.94	1.306	0.821
Aug-2019	209.1	201.21	1966.4	646.87	2498.0	705.44	1.143	0.822
Sep-2019	267.1	201.47	1855.2	648.73	2190.0	707.63	1.025	0.823
Oct-2019	476.7	201.95	2884.7	651.61	2495.0	710.13	0.737	0.822
Nov-2019	575.8	202.53	2852.3	654.47	2394.0	712.52	0.693	0.822
Dec-2019	565.7	203.09	2827.8	657.29	2463.0	714.98	0.720	0.821

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

Currently there is no source water being used at NVSU2. Produced water is re-injected back into the formation after 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

j) Well List

North Virden Scallion Unit No. 2 Well List

UWI	*Type*	*Status*	*Future Plans*
100/06-29-011-26W1/0	Vertical	Producing	-
100/11-29-011-26W1/0	Vertical	Producing	-
102/11-29-011-26W1/0	Horizontal	Producing	-
100/12-29-011-26W1/0	Vertical	Injection	-
100/13-29-011-26W1/0	Vertical	Injection	-
102/13-29-011-26W1/2	Horizontal	Injection	-
100/14-29-011-26W1/0	Vertical	Producing	-
100/09-30-011-26W1/0	Vertical	Abandoned Zone	-
102/09-30-011-26W1/2	Horizontal	Drain	-
102/10-30-011-26W1/0	Vertical	Injection	-
102/15-30-011-26W1/0	Vertical	Abandoned	-
103/15-30-011-26W1/0	Horizontal	Pumping	-
104/15-30-011-26W1/0	Horizontal	Producing	-
105/15-30-011-26W1/0	Horizontal	Producing	-
100/16-30-011-26W1/0	Vertical	Producing	-
102/16-30-011-26W1/0	Horizontal	Injection	-
100/01-31-011-26W1/0	Vertical	Abandoned Zone	-
102/01-31-011-26W1/2	Horizontal	Injection	-
100/03-32-011-26W1/0	Vertical	Producing	-
102/03-32-011-26W1/0	Horizontal	Injection	-
103/03-32-011-26W1/0	Horizontal	Producing	-
100/04-32-011-26W1/0	Vertical	Injection	-
100/05-32-011-26W1/0	Vertical	Producing	-
100/06-32-011-26W1/0	Vertical	Abandoned	-

k) Discussion

Tundra plans to alter the way in which the waterflood at NVSU2 is currently operating, by converting horizontal wells into injection, in order to change streamlines and optimize the waterflood.