

Waskada Unit No. 3

Waterflood Progress Report 2018

January 1st through December 31st 2018

Prepared for:

Manitoba Industry, Economic Development and Mines

Petroleum Branch

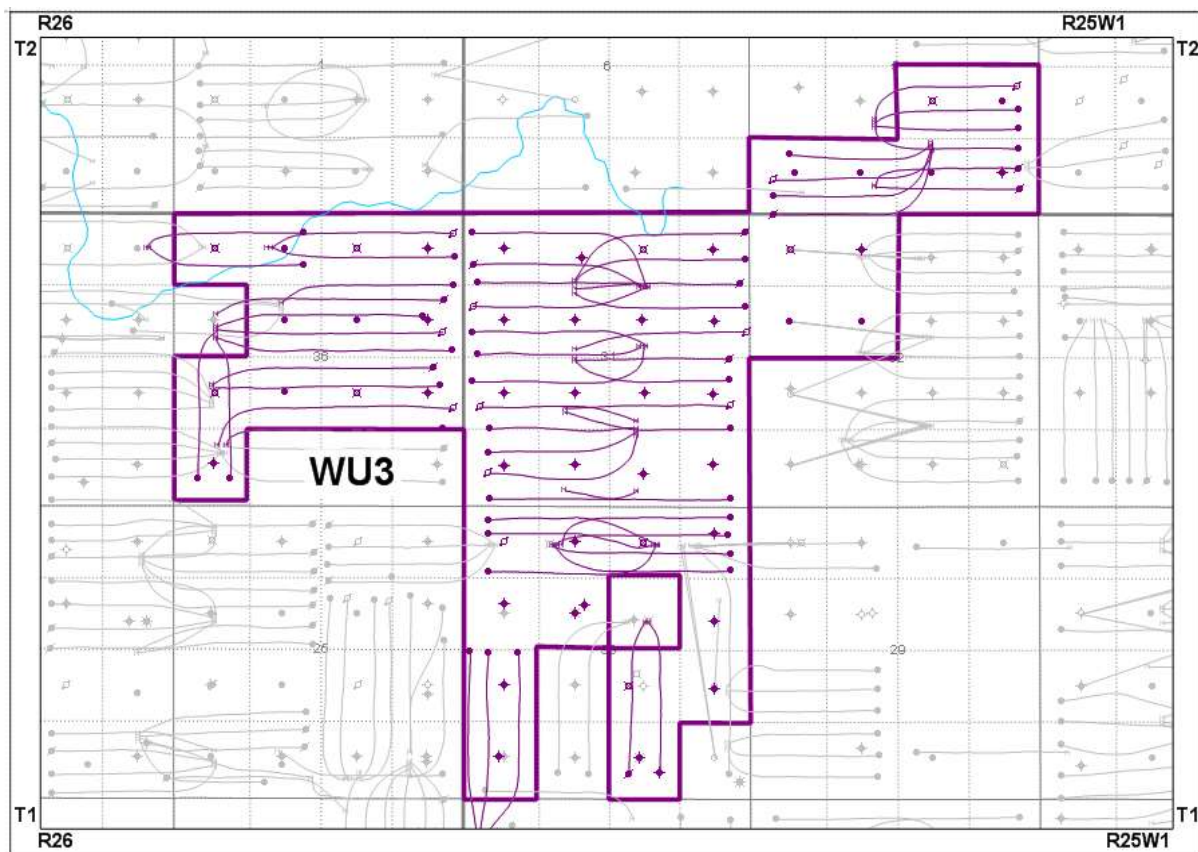
Prepared by:

Tundra Oil and Gas

June 27, 2019

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 56 abandoned/suspended wells, including 14 inactive/abandoned injectors, 41 producing wells, and 15 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 2018 EOR report as per section 73 of the Drilling and Production Regulations.

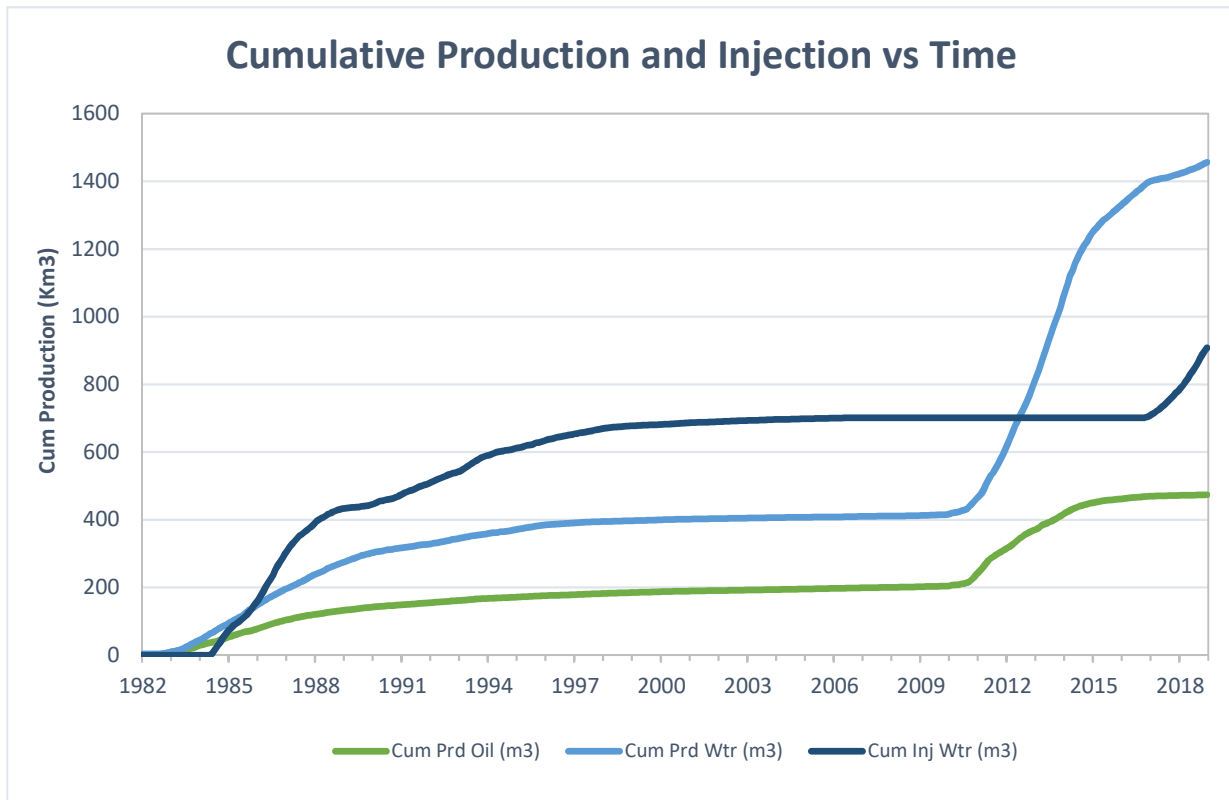
a) Monthly oil and water production rates, injection rate, GOR and WOR

MONTH	Cal Dly Oil m 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-2018	5.71	72.86	275.63	12.75	0
Feb-2018	3.46	62.52	290.71	18.07	0
Mar-2018	3.43	65.36	313.63	19.04	0
Apr-2018	6.72	126.23	331.15	18.77	0
May-2018	5.88	83.63	373.05	14.23	0
Jun-2018	4.53	74.66	362.82	16.48	0
Jul-2018	5.89	99.96	340.19	16.97	0
Aug-2018	4.98	88.31	397.27	17.74	0
Sep-2018	5.55	118.92	426.18	21.44	0
Oct-2018	6.33	130.56	477.09	20.62	0
Nov-2018	5.76	122.08	316.51	21.19	0
Dec-2018	4.48	98.78	386.05	22.03	0

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

2018 PRODUCTION	
Produced Oil (m ³)	1,912
Produced Gas (m ³)	0
Produced Water (m ³)	34,831
Fluid Injected (m ³)	127,540
CUMULATIVE PRODUCTION	
Produced Oil (m ³)	473,745
Produced Water (m ³)	1,456,075

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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		02/12-31 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-2018	0.0	0	613.0	310	917.2	-71	0.0	1350	916.0	-82	0.0	0
Feb-2018	0.0	0	624.0	908	825.1	-89	14.5	1302	921.0	-93	0.0	0
Mar-2018	0.0	0	429.0	378	923.6	-91	412.9	0	1107.0	-94	0.0	0
Apr-2018	0.0	0	658.0	1695	842.0	-89	479.1	358	1068.0	18	187.7	-26
May-2018	0.0	0	41.0	1298	1276.0	-88	0.0	900	1223.0	482	615.1	-89
Jun-2018	0.0	0	17.0	1071	1471.6	-84	35.9	817	1167.0	785	539.5	-86
Jul-2018	0.0	0	453.0	-29	1266.9	-87	355.0	226	1011.0	1028	468.7	108
Aug-2018	0.0	0	574.9	422	1437.0	-85	609.9	63	1143.2	995	576.1	-91
Sep-2018	0.0	0	674.1	1455	1486.9	-88	597.2	195	1075.8	1583	298.1	-91
Oct-2018	0.0	0	742.0	2061	1489.5	-87	460.0	410	1190.0	1735	744.4	-91
Nov-2018	0.0	0	590.0	1999	977.9	-57	320.0	284	746.0	1460	488.3	-61
Dec-2018	0.0	0	718.0	2417	973.8	-83	586.0	706	699.0	307	766.7	-86
Total	0.0		6134.0		13887.5		3870.5		12267.0		4684.5	
Avg Inj P		0		1165		-83		551		677		-43

	02/14-36 Inj		02/16-36 Inj		03/04-05 Inj		03/08-36 Inj		03/12-31 Inj		03/16-36 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-2018	0.0	0	0.0	0	658.1	931	0.0	0	918.5	1094	919.0	387
Feb-2018	0.0	0	0.0	0	450.7	966	0.0	0	824.9	1794	697.0	416
Mar-2018	0.0	0	0.0	0	656.0	848	0.0	0	924.1	2462	787.0	767
Apr-2018	282.0	174	0.0	0	605.1	569	283.0	-71	719.2	2211	761.0	1187
May-2018	543.0	-92	0.0	0	637.9	827	593.0	-90	837.0	2988	899.0	1845
Jun-2018	375.0	-85	0.0	0	578.4	902	583.0	-83	730.7	2954	760.0	1941
Jul-2018	442.0	-91	0.0	0	618.6	1213	515.0	-89	607.7	2980	759.0	2625
Aug-2018	657.3	-89	0.0	0	495.1	636	629.1	-85	742.0	2940	851.5	2582
Sep-2018	742.7	-92	0.0	0	824.2	0	738.9	-89	714.5	3148	788.5	3107
Oct-2018	737.0	-92	150.0	93	623.8	0	744.0	-90	734.1	3419	803.0	3225
Nov-2018	488.0	-68	175.0	-23	319.8	-13	487.0	-36	459.4	2324	493.0	2529
Dec-2018	680.0	-83	404.0	-57	614.2	208	699.0	334	550.0	2044	552.0	2270
Total	4947.0		729.0		7081.7		5272.0		8762.1		9070.0	
Avg Inj P		-43		1		591		-25		2530		1907

c) Monthly wellhead injection pressure for each injection well

	04/08-31 Inj		04/09-31 Inj		05/09-36 Inj		06/04-31 Inj		WU3	
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)
Jan-2018	915.6	-76	918.5	-76	851.0	-80	917.7	-65	8544.5	302
Feb-2018	1021.6	-89	1022.6	-88	913.0	-88	825.5	-91	8139.9	404
Mar-2018	1232.3	-91	1232.6	-89	1094.0	-93	924.0	-92	9722.4	317
Apr-2018	1068.8	-91	1068.5	-90	1070.0	-91	842.1	-91	9934.5	393
May-2018	1225.8	-91	1225.3	-89	1222.0	-91	1226.5	-53	11564.6	510
Jun-2018	1168.1	-89	1168.0	-84	1122.0	-81	1168.3	318	10884.4	546
Jul-2018	1013.3	-90	1013.0	-88	1009.0	-1	1013.8	630	10546.0	573
Aug-2018	1150.9	-90	1147.9	-87	1151.3	129	1149.2	523	12315.5	554
Sep-2018	1189.7	-90	1189.3	-87	1275.7	213	1189.8	1272	12785.4	745
Oct-2018	1191.5	-89	1190.2	-88	1489.0	312	1191.5	1599	13479.9	856
Nov-2018	781.9	-57	781.4	-59	974.0	372	773.7	1306	8855.4	660
Dec-2018	798.7	-85	975.9	-83	828.0	-66	922.1	645	10767.4	559
Total	12758.2		12933.2		12999.0		12144.2		127539.8	
Avg Inj P		-86		-84		36		492		535

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
Total m3	8544.5	8139.9	9722.4	9934.5	11564.6	10884.4	10546.0	12315.5	12785.4	13479.9	8855.4	10767.4
Daily (m³/d)	275.63	290.71	313.63	331.15	373.05	362.81	340.19	397.27	426.18	434.84	295.18	347.33

2018 AVG. ANNUAL DAILY INJECTION = 349.00 m3/d
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CUMULATIVE INJECTION TO Dec 31, 2017 = 780,754 m3

TOTAL 2018 ANNUAL INJECTION = 127,540 m3
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CUMULATIVE INJECTION TO Dec 31, 2018 = 908,294 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
102.08-31-001-25W1.00	Pump Change	6/26/2018
102.08-31-001-25W1.00	Pump Change	12/11/2018
102.08-31-001-25W1.00	Cemented Liner Clean Out	3/23/2018
103.04-30-001-25W1.00	Pump Change	9/28/2018
103.09-31-001-25W1.00	Cleanout	3/22/2018
102.04-36-001-26W1.00	WIW Cemented Liner Cleanout	6/24/2018
102.09-36-001-26W1.00	Pump Change	9/5/2018
102.09-36-001-26W1.00	Cemented Liner Clean Out	3/14/2018
104.09-36-001-26W1.00	Cemented Liner Clean Out	7/18/2018
103.04-05-002-25W1.00	Cemented Liner Clean Out	8/26/2018

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-2018	177.1	472.01	2258.8	1423.50	8544.6	789.30	3.465	0.399
Feb-2018	96.9	472.11	1750.5	1425.25	8139.9	797.44	4.367	0.403
Mar-2018	106.4	472.21	2026.1	1427.28	9722.4	807.16	4.521	0.408
Apr-2018	201.7	472.42	3786.8	1431.07	9934.5	817.10	2.470	0.412
May-2018	182.2	472.60	2592.6	1433.66	11564.6	828.66	4.122	0.417
Jun-2018	135.9	472.73	2239.9	1435.90	10884.5	839.54	4.537	0.422
Jul-2018	182.6	472.92	3098.8	1439.00	10546.0	850.09	3.184	0.427
Aug-2018	154.3	473.07	2737.6	1441.73	12315.4	862.41	4.220	0.432
Sep-2018	166.4	473.24	3567.7	1445.30	12785.4	875.19	3.398	0.438
Oct-2018	196.3	473.43	4047.5	1449.35	13479.9	888.67	3.152	0.444
Nov-2018	172.8	473.61	3662.3	1453.01	8855.4	897.53	2.291	0.447
Dec-2018	139.0	473.75	3062.2	1456.07	10767.4	908.29	3.339	0.452

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	Suspended	-
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 Zone	-
102/11-30-001-25W1/2	Vertical	Abandoned	-
102/12-30-001-25W1/0	Vertical	Abandoned	-
100/13-30-001-25W1/0	Vertical	Abandoned	-
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	-

j) Well List

Waskada Unit No.3 Well List

<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	Injection	-
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	-
102/14-32-001-25W1/0	Horizontal	Drilled & Cased	-
103/14-32-001-25W1/0	Horizontal	Drilled & Cased	-
104/01-36-001-26W1/0	Horizontal	Producing	-
100/04-36-001-26W1/0	Vertical	Abandoned	-
102/04-36-001-26W1/0	Horizontal	Injection	-
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	Injection	-
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	Abandoned Zone	-
100/11-36-001-26W1/0	Vertical	Abandoned Zone	-
100/13-36-001-26W1/0	Vertical	Abandoned	-
100/14-36-001-26W1/0	Vertical	Producing	-
102/14-36-001-26W1/0	Horizontal	Injection	-

j) Well List

Waskada Unit No.3 Well List

<i>UWI</i>	<i>Type</i>	<i>Status</i>	<i>Future Plans</i>
103/14-36-001-26W1/0	Horizontal	Producing	-
100/15-36-001-26W1/0	Vertical	Abandoned	-
100/16-36-001-26W1/0	Vertical	Abandoned	-
102/16-36-001-26W1/0	Horizontal	Injection	-
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	Abandoned Zone	-
100/03-05-002-25W1/0	Vertical	Abandoned Zone	-
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	-