

Sinclair Unit No. 15: EOR Report 2018



Overview

The Sinclair Unit No. 15 waterflood is a one section (15-007-29W1), one pattern flood within the Bakken Three Forks formation operated by VermilionEnergy. The pattern consists of eight horizontal wellbores predominantly oriented east-west and spaced at 185-300m. Two injectors are located at 00/05-15 and 00/02-15, while six producers are located at 00/03-15, 02/03-15, 00/04-15, 00/09-15, 00/15-15 and 00/16-15. There is one producing vertical well at 01-15. Figure 1 below is a Unit map showing the wellbore layout.

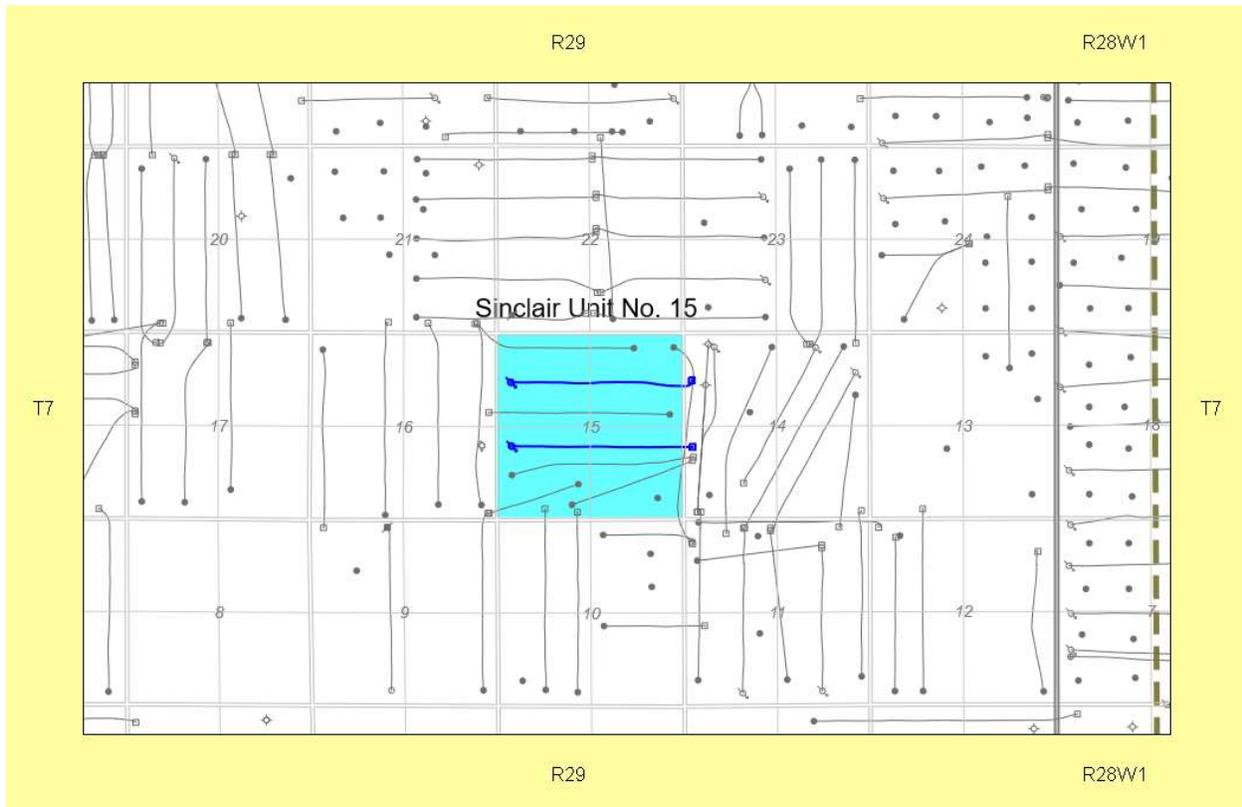


Figure 1: Sinclair Unit No. 15 Map

The main productive zones within the Three Forks in section 15-007-29W1 are the Upper Devonian Lyleton A Dolomitic Siltstone member and the overlying Mississippian Middle Bakken Siltstone member. Horizontal wells in section 15 have undulated through both the Three Forks Lyleton A Member and the Bakken Siltstones over the length of the laterals.

Vermilion estimates that original-oil-in-place for Unit No. 15 is $838.3 \times 10^3 \text{m}^3$ (5,272 mstb). Current recovery to date is $51.1 \times 10^3 \text{m}^3$ (321.5 mstb) which provides a current rf of 6.1% of the OOIP. Primary recovery was originally estimated to recover 6.8%. An incremental 10-15% secondary recovery is expected, bringing the total estimated recovery factor to 15-20%.

Performance Discussion

Two new producers (00/04-15 and 00/16-15) were drilled and brought on production in Unit 15 in August 2017. Injection at Sinclair Unit No 15 commenced in October 2017 into both active injection wells (00/05-15 and 00/15-15). To-date the producing wells in Unit 15 haven't shown any significant response to water injection. The injection volume fillup time is important to consider when observing early waterflood performance trends. Similar Bakken Three Forks waterfloods have taken up to 24 months before response to pressure support was observed.

Although early in the waterflood's life, initial indications are positive as the injection wells have demonstrated an ability to meet VRR targets without any abnormal early pressure buildup. Overall Unit WOR for the year averaged 5.63, bringing the cumulative Unit WOR to 2.23 at year end. A yearly average VRR of 1.35 helped increase the Unit cumulative VRR to 0.18 from 0.04 in 2017. Figure 2 in appendix A illustrates the overall pattern performance in graphical and tabular format. Appendix A, Table 1 illustrates the overall pool performance, both monthly and cumulatively, in tabular format. Appendix A also includes individual injection well profiles and monthly average injection pressures.

73(1) (a-c)(f) Production and Injection Data

The requested data referred to in clauses 1(a) to (c) and (f) of subsection 73(1) of the Oil and Gas Act (C.C.S.M. c. 034) is attached in appendix A as follows:

1. Figure 2: Monthly produced fluids and ratios in graphical and tabular format
2. Table 1: Monthly and cumulative produced fluids and ratios in tabular format
3. Individual injection well rate and pressure profiles:
 - a. 100/05-15
 - b. 100/12-15

4. Table 2: Monthly average injection rate and pressure data

73(1) (d) Reservoir Pressure Surveys

There were no pressure surveys executed in Unit No. 15 in 2018.

73(1) (e) Well Servicing

Other than routine pump changes there were no servicing operations completed within Unit No. 15 in 2018.

73(1) (g) Injection Fluid Quality Control and Treatment

Injection water for Sinclair Unit No. 15 is sourced from the Manville formation via the 100/14-09-007-29W1 water source well. The 100/14-09 source well is pipeline connected to Vermilion's 08-16 facility. At 08-16, injection water is filtered to 1 micron nominal remaining particulate through two six-bag canister filters and injected down the two unit injection wells. All water is treated with scale inhibitor and biocide.

Figure 4: Sinclair Unit #15 Produced Fluids

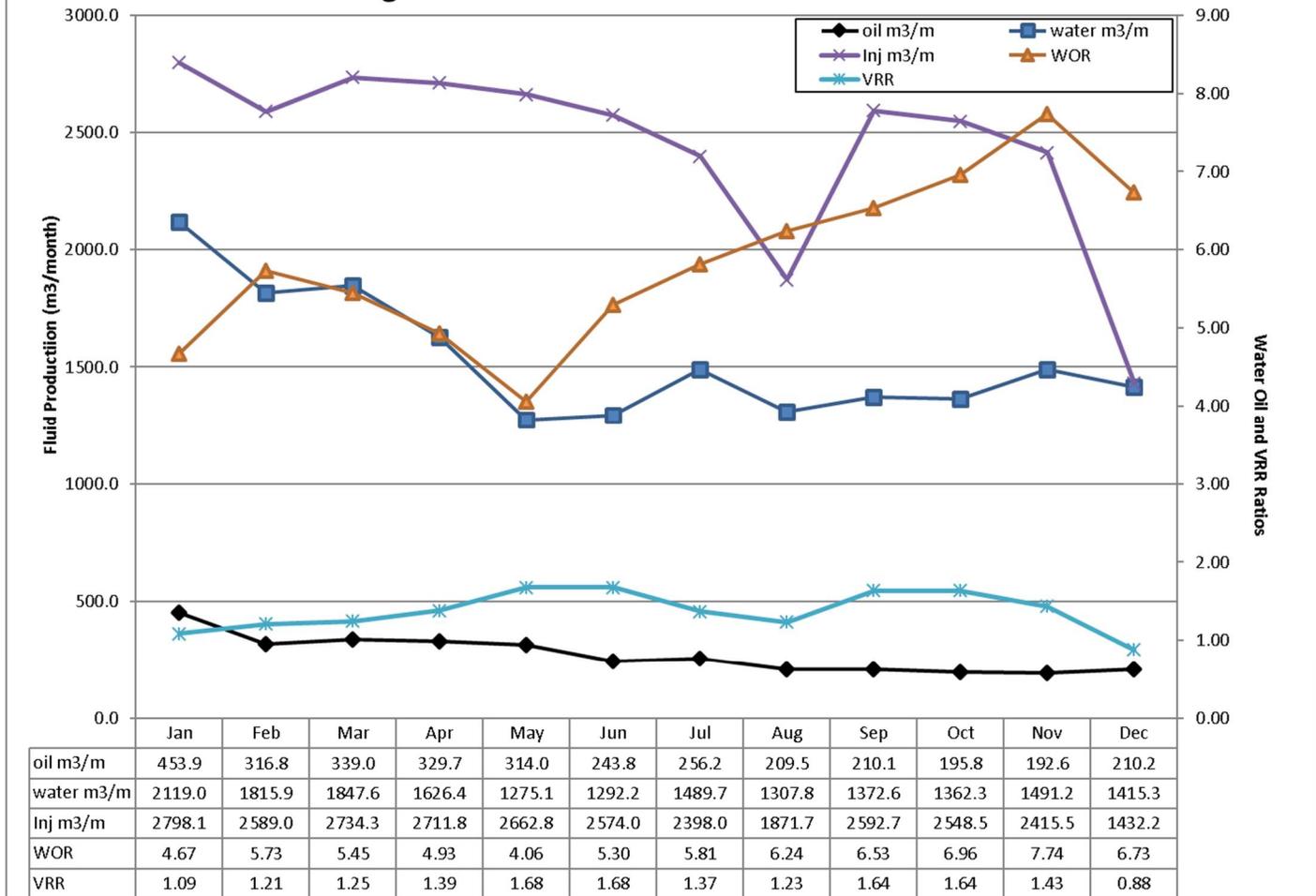


Table 1: Sinclair Unit #15 Produced Fluids

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2018	CTD
2018 Oil Production m3/month	Prior CTD	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2018	CTD
Unit #15 Total Production	47834.3	453.9	316.8	339.0	329.7	314.0	243.8	256.2	209.5	210.1	195.8	192.6	210.2	3271.6	51105.9
2018 Water Production m3/month	Prior CTD	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2018	CTD
Unit #15 Total Production	95691.5	2119.0	1815.9	1847.6	1626.4	1275.1	1292.2	1489.7	1307.8	1372.6	1362.3	1491.2	1415.3	18415.0	114106.5
Unit #15 WOR	2.00	4.67	5.73	5.45	4.93	4.06	5.30	5.81	6.24	6.53	6.96	7.74	6.73	5.63	2.23
2018 Water Injection m3/month	Prior CTD	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	2018	CTD
Unit #15 Injection	0.0	2798.1	2589.0	2734.3	2711.8	2662.8	2574.0	2398.0	1871.7	2592.7	2548.5	2415.5	1432.2	29328.6	29328.6
Unit #15 VRR	0.00	1.09	1.21	1.25	1.39	1.68	1.68	1.37	1.23	1.64	1.64	1.43	0.88	1.35	0.18

