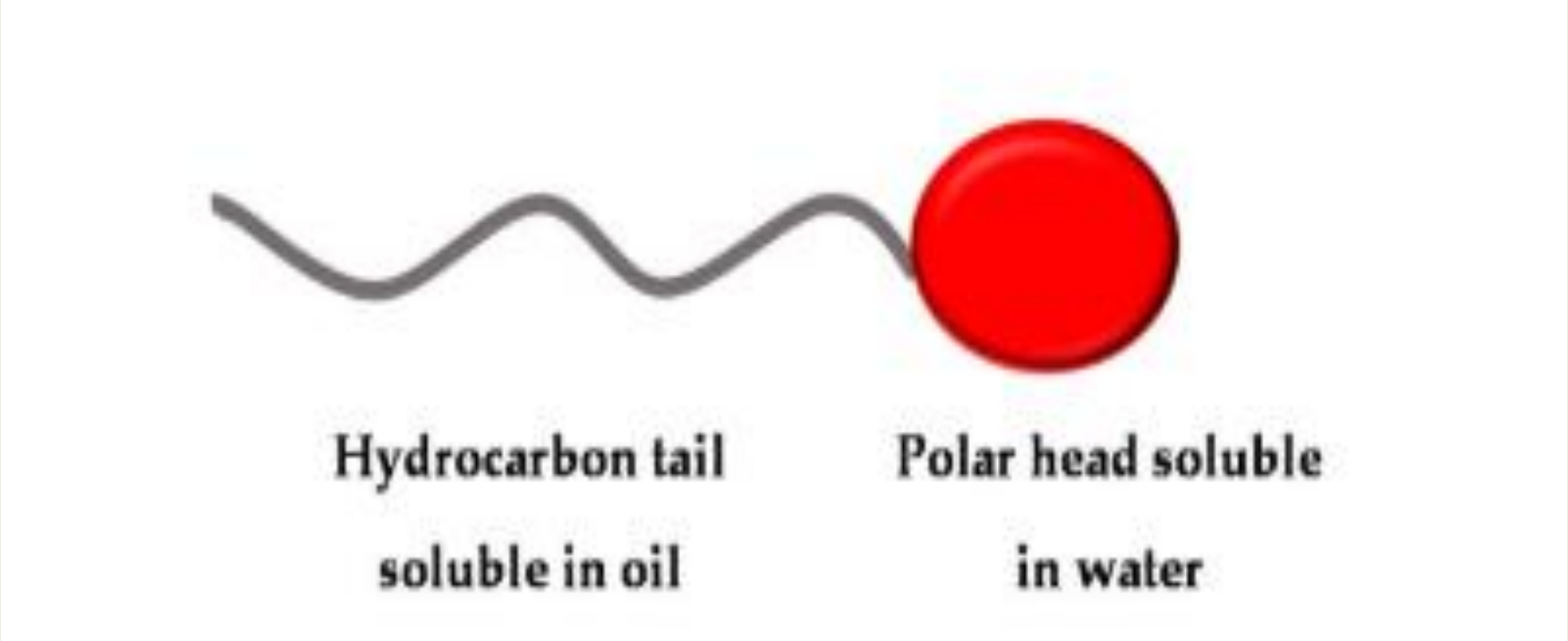
BIOSURFACTANTS AND BIOSOLVENTS ANALYSIS

Isaiah Brady

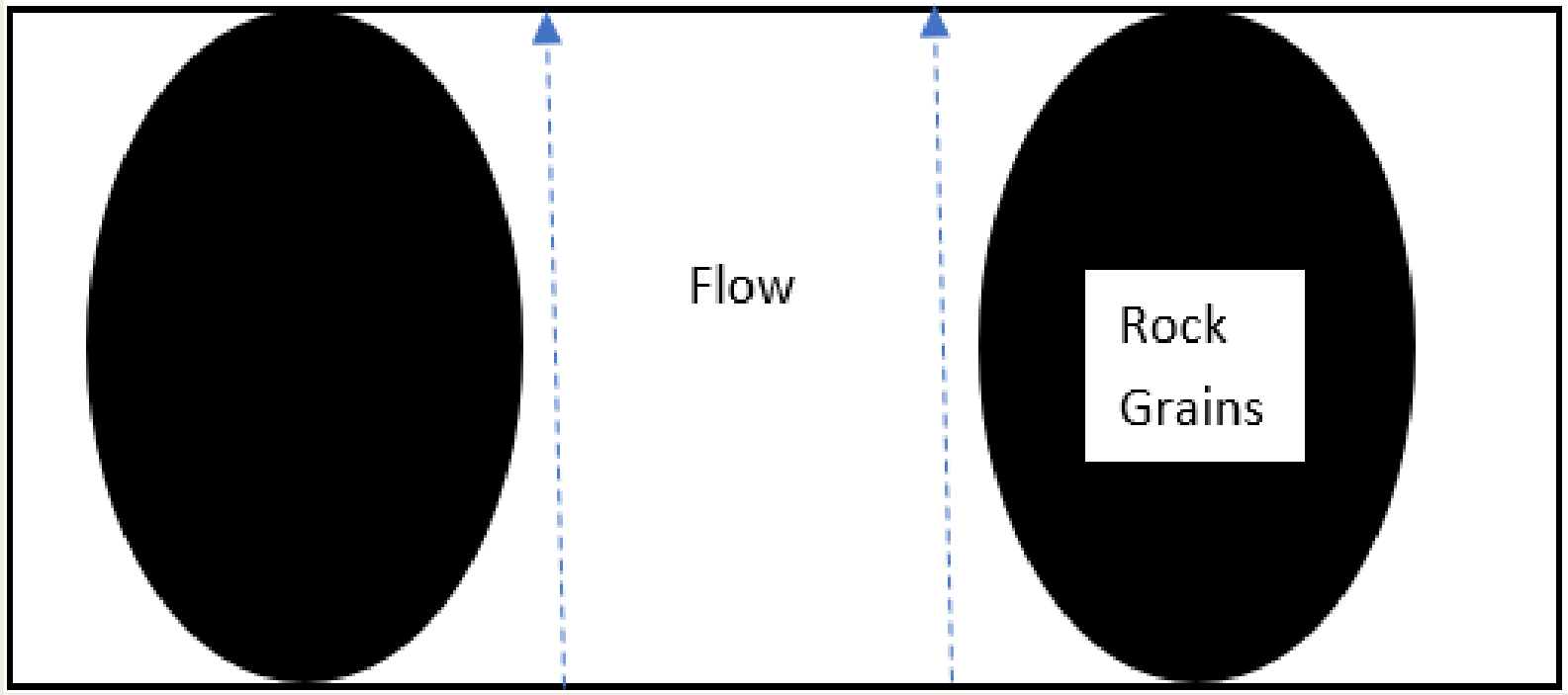
What are Biosurfactants?

- Paraffin Disposal
- Changing Wettability
- Hydrophobic and Hydrophilic Moieties



What are Biosolvents

- Enhanced Oil Recovery
- Lower Capillary Forces



Locus Bio-Energy

AssurEOR FLOW™

- Biosolvents and Biosurfactants
- Disperse Paraffin
- Bi-monthly Treatments
- 50% enhanced oil recovery

AssurEOR STIM™

- Biosolvents
- Singe Treatment
- 50-500% enhanced oil recovery

Pre-Treatment Testing

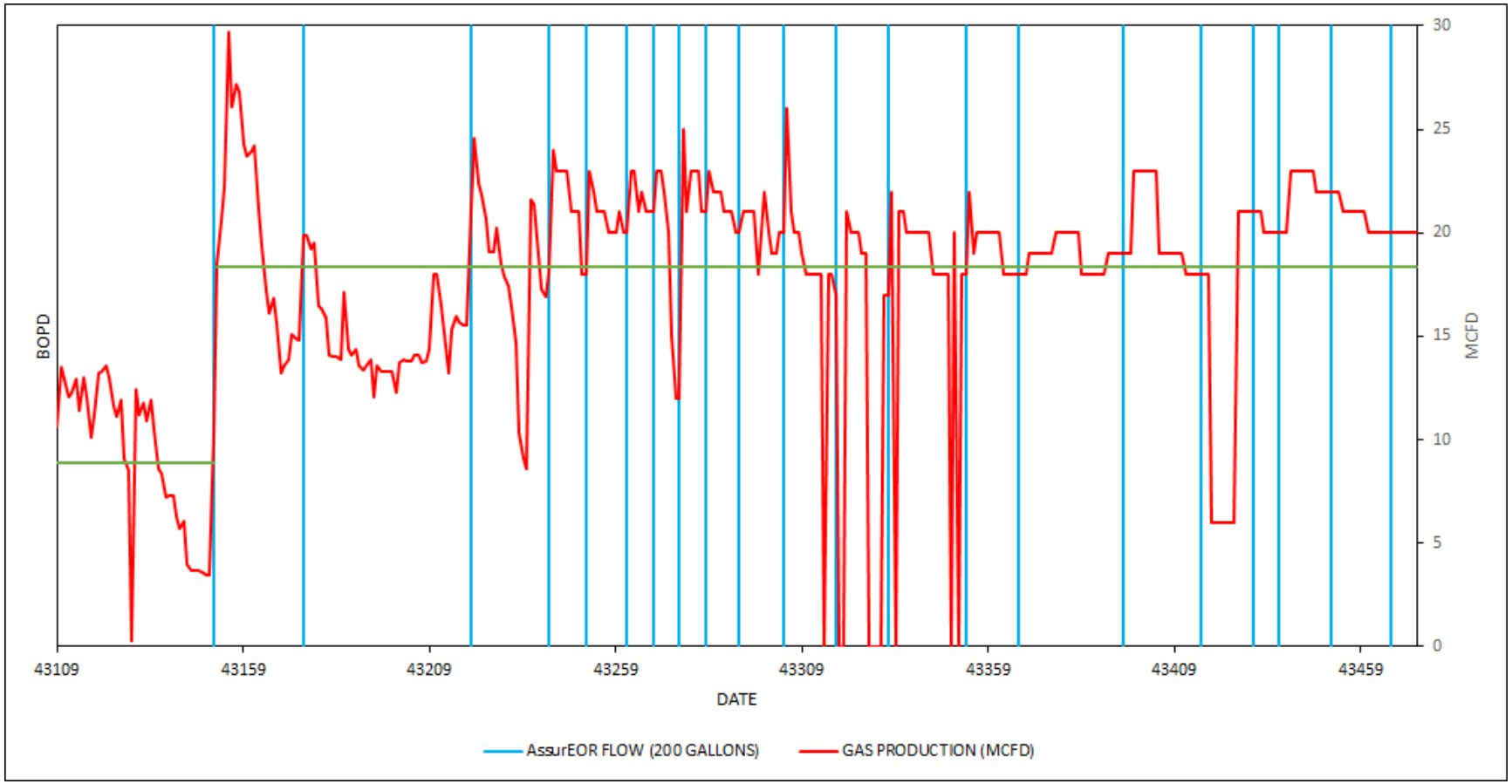
072518 WV Lippizan Petroleum Samples

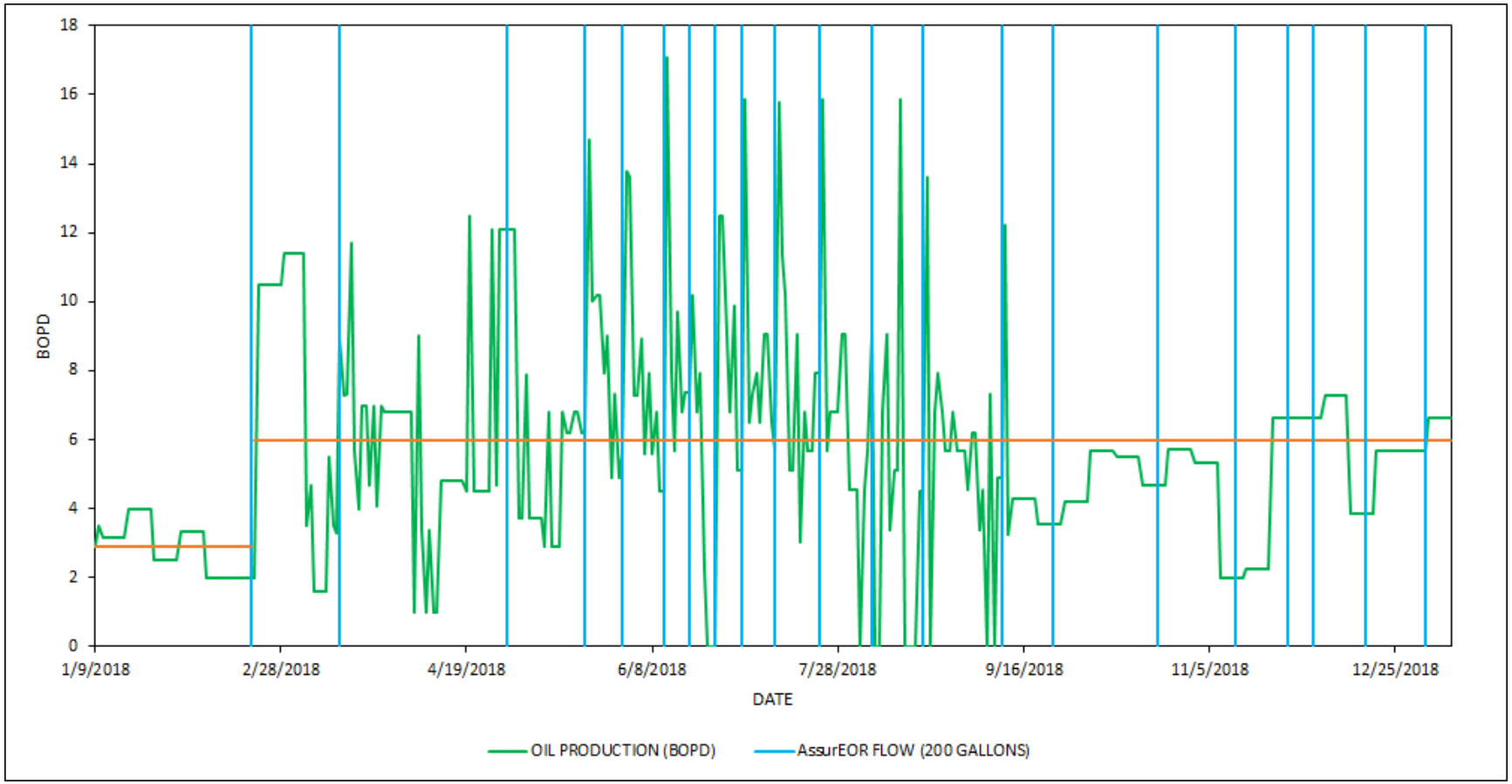
Sample Name	PF 003	PF010
F-1	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)
F-4	4 out of 5 rating (18hr)	5 out of 5 rating (18hr)
F-10	3 out of 5 rating (18hr)	5 out of 5 rating (18hr)
F-15	3 out of 5 rating (18hr)	5 out of 5 rating (18hr)
F-16	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)
FP-1	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)
FP-3	2 out of 5 rating (18hr)	5 out of 5 rating (18hr)
FP-4	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)
FP-5	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)

- Sample Paraffin from well in question
- Ranking 1-3
- Ranking 4-5

Case Study 1: Conventional Well

- Morgan County Ohio
- Production in the Berea Sandstone, Clinton Sand, and Medina Sand
- 5000' deep
- AssurEOR FLOW™ once to twice a month


30
25
20
15
10
5
0
BOPD
MCFD
43109
43159
43209
43259
43309
43359
43409
43459
DATE
AssurEOR FLOW (200 GALLONS)
GAS PRODUCTION (MCFD)


18
16
14
12
10
8
6
4
2
0
BOPD
1/9/2018
2/28/2018
4/19/2018
6/8/2018
7/28/2018
9/16/2018
11/5/2018
12/25/2018
DATE
OIL PRODUCTION (BOPD)
AssurEOR FLOW (200 GALLONS)

Case Study 1: Conventional Well

- Morgan County Ohio
- Production in the Berea Sandstone, Clinton Sand, and Medina Sand
- 5000' deep
- AssurEOR FLOW™ once to twice a month

Table 1: Pre and Post Production Rates			
Pre-Treatment Daily Average BBLS/D	Pre-Treatment Daily Average MCF/D	Post-Treatment Daily Average BBLS/D	Post-Treatment Daily Average MCF/D
2.89	8.91	5.99	18.34

Case Study 1: Conventional Well

Economic Relevance

Table 2: Economic Review with Constant Current Oil and Gas Prices				
	Pre-Treatment Oil	Post-Treatment Oil	Pre-Treatment Gas	Post Treatment Gas
Average bbls/Day	2.89	5.99	8.91	18.34
Bbls Produced	933.98	1934.64	2878.50*	5924.10
Revenue	$ 55,141.98	$ 114,221.15	$ 7,964.81	$ 16,391.98

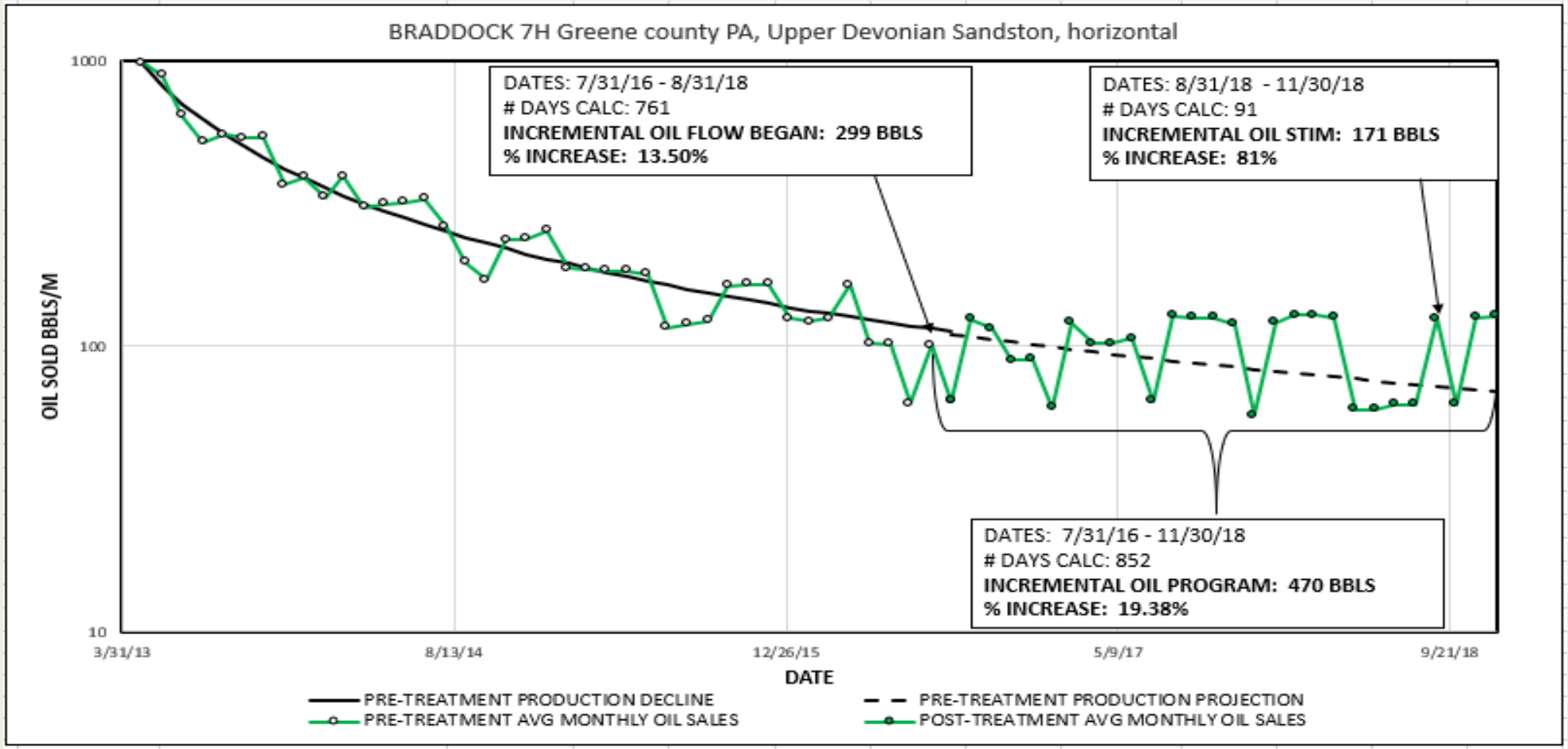
*Based on a current oil price of $59.04/bbl and $2.767/Mcf as of March 24th.

Case Study 2: Penneco Horizontal Well

Well Log

- Greene County, Pennsylvania
- Devonian Shale
- 3,500' deep
- 2,500' lateral
- AssurEOR FLOW™ bi-monthly
- AssurEOR STIM™ once

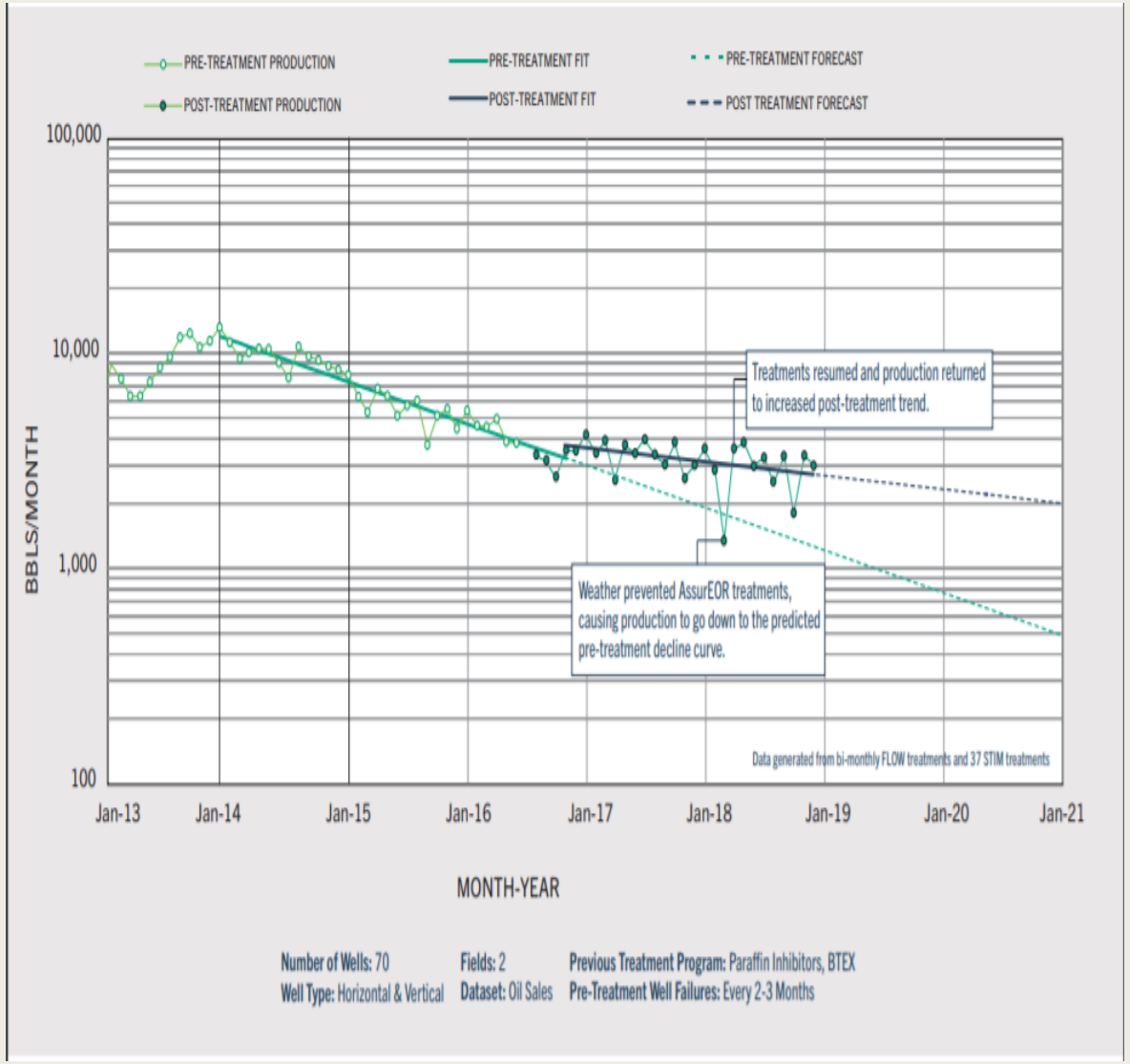
Case Study 2: Penneco Horizontal Well

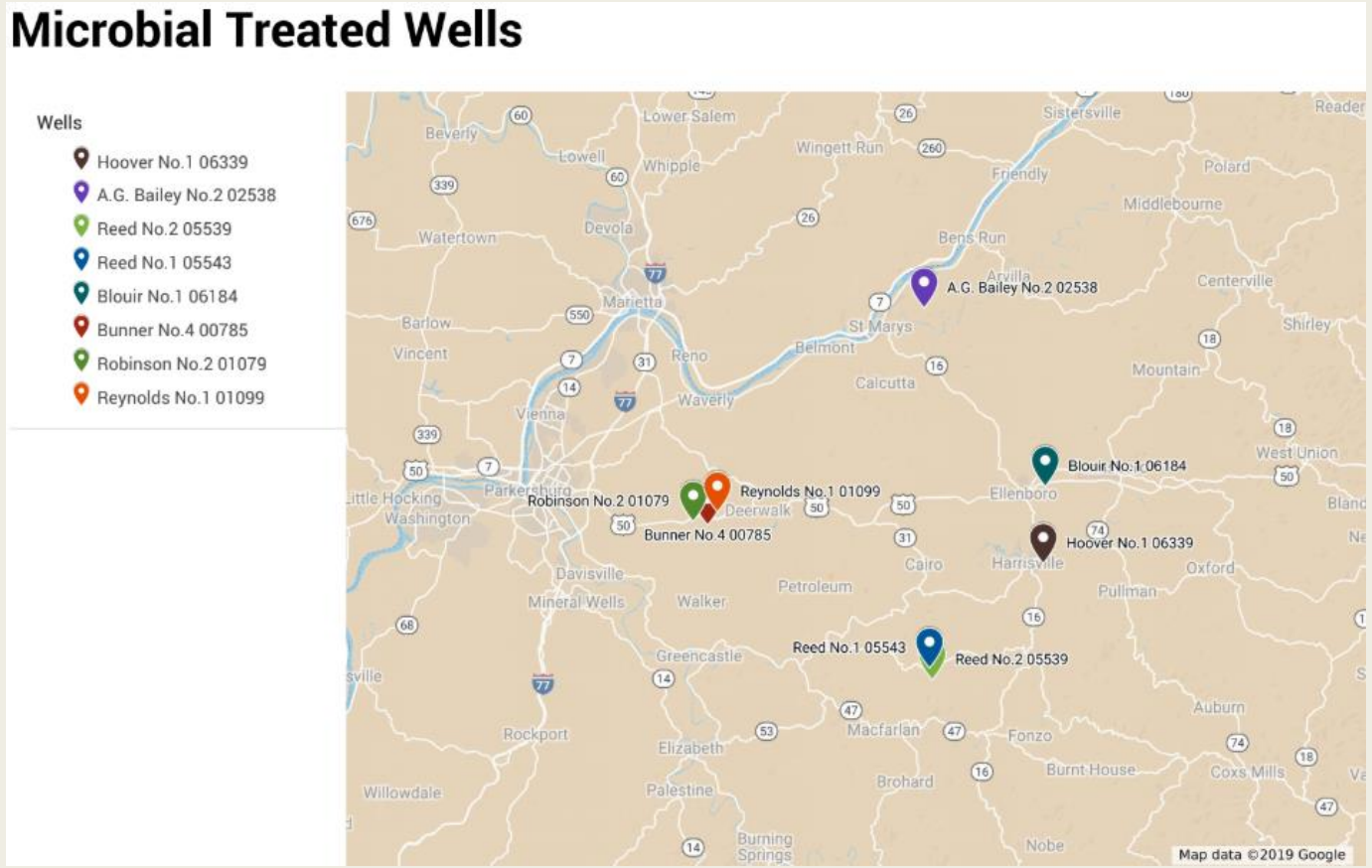


Case Study 2: Penneco Horizontal Well

Field Study

- 70 Conventional and Horizontal wells
- Same AssurEOR FLOW™ bi-monthly treatments
- 37 total AssurEOR STIM™ treatments
- No Paraffin related failure
- 95% of wells improved
- 46% increase in average production





Case 3: Lippizan Petroleum Conventional Pumping and Flowing Wells

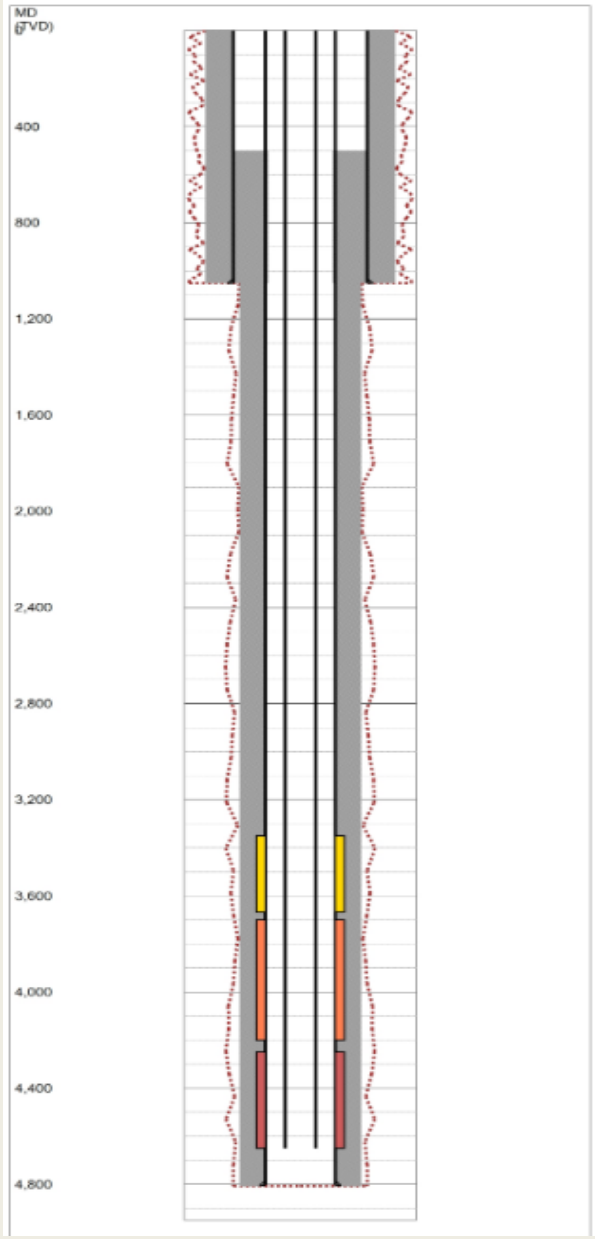
- Reed 1
- Reed 2
- Bailey 2
- Robinson 2c
- Bunner 4
- Blouir
- Hoover
- Reynolds
- Lincoln County Wells

Reed 2

47-085-05539

Pre-Treatment

- Conventional Pumping Well
- No production
- Multiple attempts at cleaning: all failed



Last Updated: 3/25/2019 01:06 PM

Field Name	Lease Name	Well No.
Microbial EOR	Reed	2

County	State	API No.
		47085055390000

Version	Version Tag
0	

GL (ft)	KB (ft)	Section	Township/Block	Range/Survey
		6		

Operator	Well Status	Latitude	Longitude

Dist. N/S (ft)	N/S Line	Dist. E/W (ft)	E/W Line	Footage From

Prop Num	Spud Date	Comp. Date

Additional Information

Other 1	Other 2	Other 3	Other 4

Prepared By	Updated By	Last Updated
jacob	jacob	3/25/2019 1:06 PM

Hole Summary

Date	Diam. (in)	Top (MD ft)	Bottom (MD ft)	Memo
	12.250	0	1,051	
	7.875	1,051	4,808	

Tubular Summary

Date	Description	O.D. (in)	Wt (lb/ft)	Grade	Top (MD ft)	Bottom (MD ft)
	Surface Casing	8.625			0	1,051
	Intermediate Casing	4.500			0	4,804
	Production Casing	2.000			0	4,650

Casing Cement Summary

C	Date	No. Sx	Csg. O.D. (in)	Top (MD ft)	Bottom (MD ft)	Memo
			8.625	0	1,051	
			4.200	500	1,051	
			4.500	1,051	4,808	

Perforation Summary

C	Date	Perf. Status	Formation	OA Top (MD ft)	OA Bottom (MD ft)
				3,350	3,667
		Open		3,700	4,200
		Open		4,250	4,650

Reed 2

Treatment

- AssurEOR FLOW™ treatment on August 31st, 2018
- 35bbls of oil in the first three weeks
- Decline to 2bbls/week
- AssurEOR FLOW™ treatment on November 8th, 2018
- 15bbls in the first week
- Declined to 2bbls/week

Reed 2

Cost Analysis

- Cost per Treatment is $500
- Increased revenue of $5,600

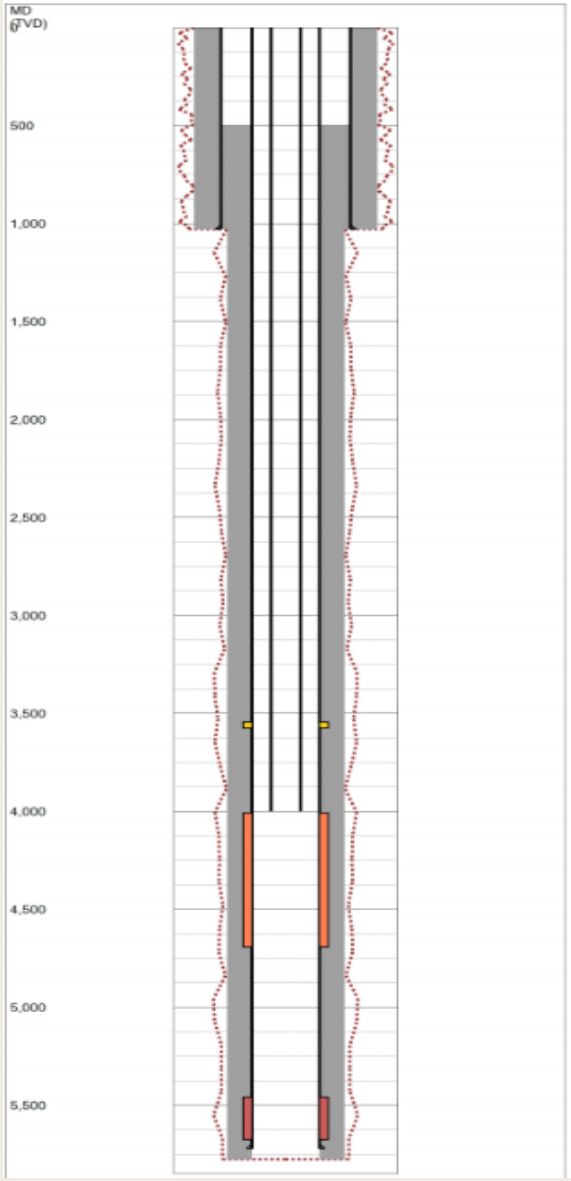
*Based on average oil price per month between September 2018 and March 2019

	Average $/Month	Reed 2 BBls/Month	Reed 2 $/Month
Sept	$ 66.09	40	$2,643.60
Oct	$ 66.72	8	$ 533.76
Nov	$ 52.85	32	$1,691.20
Dec	$ 44.82	12	$ 537.84
Jan	$ 47.48	8	$ 379.84
Feb	$ 51.08	8	$ 408.64
March	$ 58.94	8	$ 471.52
		Total	$6,666.40

Hoover

47-085-05539

- Conventional Flowing Well
- Devonian Shale
- Sealed off with paraffin
- Swabbed the well after treatment
- Production in less than a day



Last Updated: 3/25/2019 01:13 PM

Field Name	Lease Name	Well No.
Microbial EOR	Hoover	1

County	State	API No.
		47085063390000

Version	Version Tag
2	

GL (ft)	KB (ft)	Section	Township/Block	Range/Survey
		4		

Operator	Well Status	Latitude	Longitude

Dist. N/S (ft)	N/S Line	Dist. E/W (ft)	E/W Line	Footage From

Prop Num	Spud Date	Comp. Date

Additional Information

Other 1	Other 2	Other 3	Other 4

Prepared By	Updated By	Last Updated
jacob	jacob	3/25/2019 1:13 PM

Hole Summary

Date	Diam. (in)	Top (MD ft)	Bottom (MD ft)	Memo
	12.250	0	1,028	
	7.875	1,028	5,775	

Tubular Summary

Date	Description	O.D. (in)	Wt (lb/ft)	Grade	Top (MD ft)	Bottom (MD ft)
	Surface Casing	8.625			0	1,028
	Intermediate Casing	4.500			0	5,720
	Production Casing	2.000			0	4,000

Casing Cement Summary

C	Date	No. Sx	Csg. O.D. (in)	Top (MD ft)	Bottom (MD ft)	Memo
			8.625	0	1,028	
			4.500	500	1,028	
			4.500	1,028	5,775	

Perforation Summary

C	Date	Perf. Status	Formation	OA Top (MD ft)	OA Bottom (MD ft)
				3,543	3,553
		Open		4,007	4,690
		Open		5,457	5,673

Lincoln County

- Hamilton Creek
- Big Lime Limestone, McGrady, Squaw and Weir Sands

Lincoln County

- Tested with two types of AssurEOR FLOW™
- PF10 dispersed all paraffin

072518 WV Lippizan Petroleum Samples

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F-1	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)
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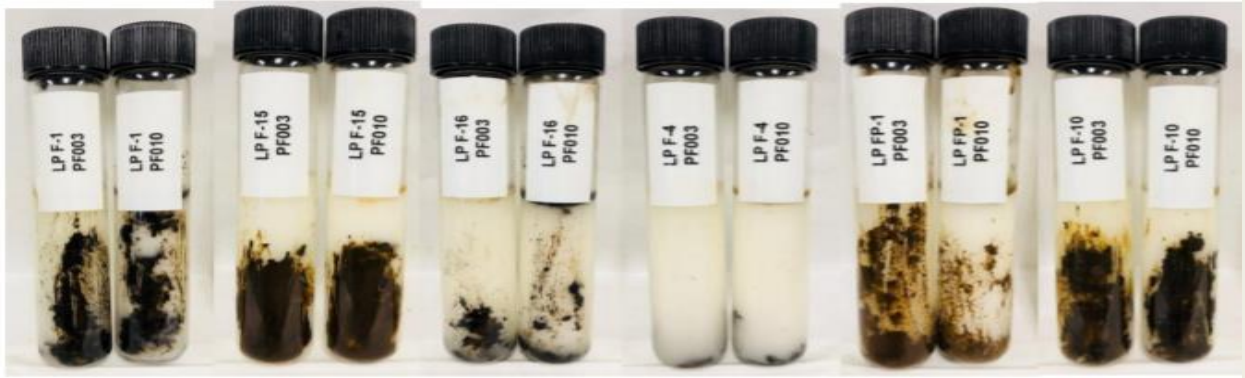
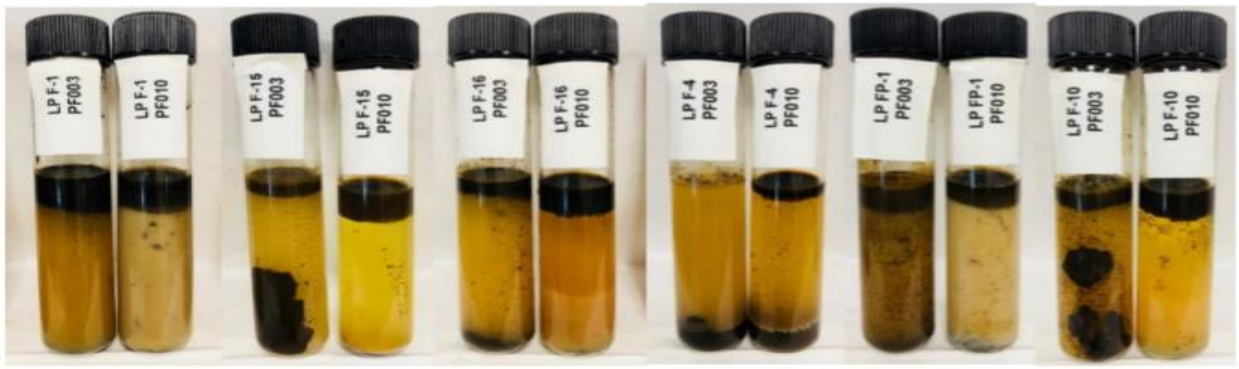
FP-3	2 out of 5 rating (18hr)	5 out of 5 rating (18hr)
FP-4	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)
FP-5	5 out of 5 rating (18hr)	5 out of 5 rating (18hr)

Lincoln County

Samples before test (set 1)

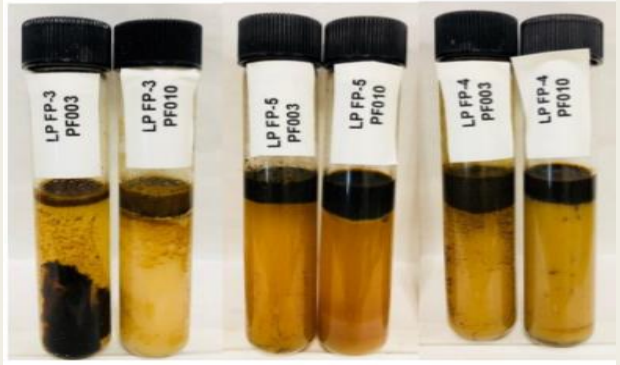


Samples after test (set 1)



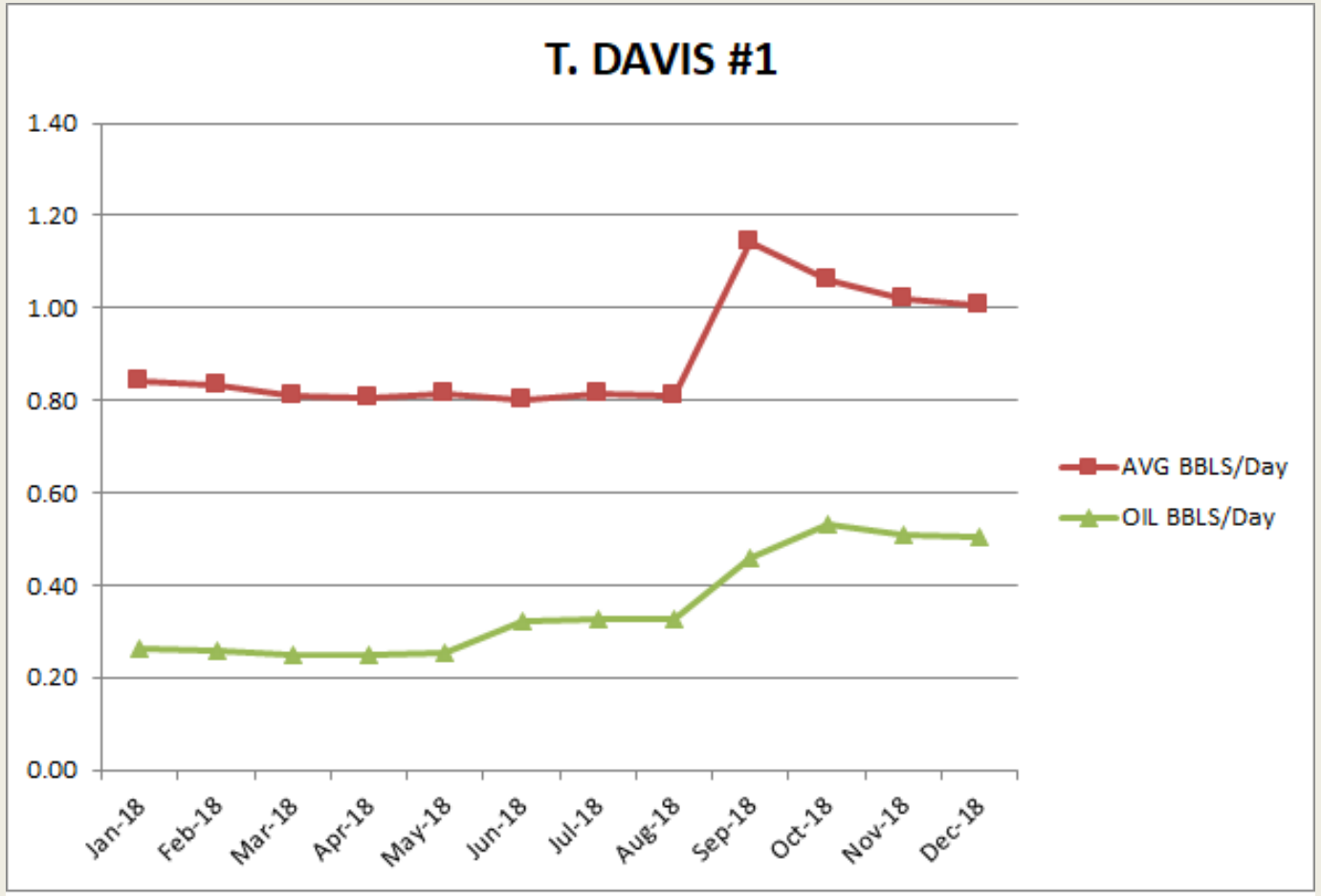
Samples before test (set 2)

Samples after test (set 2)



Lincoln County

- Hamilton Creek
- Big Lime Limestone, McGrady, Squaw and Weir Sands
- Treated on January 17th, 2019
- Flowing wells have seen improvements
- Data is limited due to poor weather and incomplete records from the pumper



Case 4: Leroy Baker's Well

- AssurEOR FLOW™ treatment in September 2018
- Average production rate rather than decline curve analysis
- 7.2 bbls/month of total fluid average increase
- Water accounts for 9% of increase

Recommendation and Analysis

- Biosurfactants and Biosolvents are viable options for producers
- Note there is no 100% guarantee

Acknowledgements

- Bob Matthey
- Leroy Baker
- Locus Bio-Energy

Questions?