Scientific Drilling

Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	Oasis Petroleum
Well Name & No.	Lewis Federal 5300 11-31 4BR OH
API #	33-053-08946
County & State	McKenzie County, ND
SDI Job #	OP.016663
Rig	Nabors B21
Survey Date	14-Mar-2019

I, Seth M. Burstad, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 0 feet to a measured depth of 16577 feet is true and correct as determined from all available records.

Seth Burstad

Signature

14-Mar-2019

Date

Seth M. Burstad
Rockies Region Well Planner
Scientific Drilling - Rocky Mountain District

Project: McKenzie County, ND
Site: Lewis Federal
Well: Lewis Federal 5300 11-31 4BR
Wellbore: OH
Design: OH

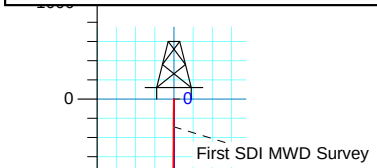
WELL DETAILS: Lewis Federal 5300 11-31 4BR			
GL 2110' & KB 25' @ 2135.00ft (Nabors B21)		2110.00	
Northing	Easting	Latitude	Longitude
393064.15	1209533.06	48° 2' 8.330 N	103° 36' 11.190 W

Design: OH (Lewis Federal 5300 11-31 4BR/OH)
Created By: Seth Burstad

PROJECT DETAILS: McKenzie County, ND	
Geodetic System:	US State Plane 1983
Datum:	North American Datum 1983
Ellipsoid:	GRS 1980
Zone:	North Dakota Northern Zone
System Datum:	Mean Sea Level
Local North:	True

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Departure	Annotation
287.99	288.00	0.90	188.060	-2.24	-0.32	-0.32	2.26	First SDI MWD Survey
10788.26	11194.00	78.21	95.170	-819.51	506.39	506.39	1429.82	First SDI MWD Lateral Survey
10833.82	16442.00	88.12	92.400	-855.68	5749.92	5749.92	6674.95	Last SDI MWD Lateral Survey
10838.25	16577.00	88.12	92.400	-861.33	5884.73	5884.73	6809.88	Projection to TD



Oasis Petroleum

McKenzie County, ND
Lewis Federal
Lewis Federal 5300 11-31 4BR

OH

Design: OH

Standard Survey Report

14 March, 2019

Scientific Drilling

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Casper District

Project McKenzie County, ND

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	North Dakota Northern Zone		

Site Lewis Federal, Site Center: Lewis Federal 5300 11-31 2B

Site Position:		**Northing:**	393,162.02 usft	**Latitude:**	48° 2' 9.300 N
From:	Lat/Long	**Easting:**	1,209,545.85 usft	**Longitude:**	103° 36' 11.060 W
Position Uncertainty:	0.00 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-2.31 °

Well Lewis Federal 5300 11-31 4BR, 1149' FNL 257' FWL Sec 31 T153N R100W

Well Position	**+N/-S**	0.00 ft	**Northing:**	393,064.15 usft	**Latitude:**	48° 2' 8.330 N
	+E/-W	0.00 ft	**Easting:**	1,209,533.06 usft	**Longitude:**	103° 36' 11.190 W
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	0.00 ft	**Ground Level:**	2,110.00 ft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	1/30/2019	7.87	72.68	55,761

Design OH

Audit Notes:

Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	0.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	90.000

Survey Program **Date** 3/14/2019

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
288.00	3,554.00	Survey #1 - Surface (OH)	MWD+HDGM	OWSG MWD + HDGM
3,638.00	11,105.00	Survey #2 - Vertical / Curve (OH)	MWD+HDGM	OWSG MWD + HDGM
11,194.00	16,577.00	Survey #3 - Lateral (OH)	MWD+HDGM	OWSG MWD + HDGM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
288.00	0.90	188.060	287.99	-2.24	-0.32	-0.32	0.31	0.31	0.00
First SDI MWD Survey									
349.00	1.64	200.830	348.97	-3.53	-0.69	-0.69	1.29	1.21	20.93
411.00	1.69	197.440	410.95	-5.23	-1.28	-1.28	0.18	0.08	-5.47
445.00	1.91	202.750	444.93	-6.23	-1.65	-1.65	0.81	0.65	15.62
536.00	1.92	196.610	535.88	-9.09	-2.68	-2.68	0.23	0.01	-6.75
627.00	1.92	199.630	626.83	-11.99	-3.62	-3.62	0.11	0.00	3.32
717.00	1.77	198.590	716.78	-14.73	-4.57	-4.57	0.17	-0.17	-1.16

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
807.00	1.11	176.790	806.75	-16.91	-4.97	-4.97	0.94	-0.73	-24.22
898.00	0.89	166.310	897.74	-18.48	-4.75	-4.75	0.31	-0.24	-11.52
988.00	1.33	186.270	987.72	-20.20	-4.70	-4.70	0.64	0.49	22.18
1,078.00	1.73	204.520	1,077.69	-22.47	-5.38	-5.38	0.70	0.44	20.28
1,169.00	1.10	199.130	1,168.66	-24.55	-6.23	-6.23	0.71	-0.69	-5.92
1,260.00	0.57	168.630	1,259.65	-25.82	-6.43	-6.43	0.74	-0.58	-33.52
1,349.00	0.39	180.450	1,348.65	-26.55	-6.35	-6.35	0.23	-0.20	13.28
1,441.00	0.81	186.100	1,440.64	-27.51	-6.42	-6.42	0.46	0.46	6.14
1,531.00	1.02	162.450	1,530.63	-28.91	-6.24	-6.24	0.48	0.23	-26.28
1,621.00	1.39	160.160	1,620.61	-30.70	-5.63	-5.63	0.41	0.41	-2.54
1,712.00	1.47	149.540	1,711.59	-32.74	-4.67	-4.67	0.30	0.09	-11.67
1,805.00	1.20	159.690	1,804.56	-34.69	-3.72	-3.72	0.38	-0.29	10.91
1,898.00	1.01	156.900	1,897.54	-36.35	-3.06	-3.06	0.21	-0.20	-3.00
1,992.00	0.74	174.150	1,991.53	-37.72	-2.68	-2.68	0.40	-0.29	18.35
2,085.00	0.79	210.830	2,084.52	-38.87	-2.94	-2.94	0.52	0.05	39.44
2,179.00	0.62	226.850	2,178.52	-39.77	-3.65	-3.65	0.28	-0.18	17.04
2,272.00	0.69	202.510	2,271.51	-40.63	-4.23	-4.23	0.31	0.08	-26.17
2,365.00	0.37	182.910	2,364.51	-41.45	-4.46	-4.46	0.39	-0.34	-21.08
2,459.00	0.33	126.440	2,458.51	-41.91	-4.26	-4.26	0.35	-0.04	-60.07
2,552.00	0.49	101.900	2,551.50	-42.15	-3.65	-3.65	0.25	0.17	-26.39
2,646.00	0.90	99.950	2,645.50	-42.36	-2.53	-2.53	0.44	0.44	-2.07
2,739.00	0.97	112.260	2,738.48	-42.79	-1.08	-1.08	0.23	0.08	13.24
2,832.00	0.57	114.810	2,831.48	-43.28	0.07	0.07	0.43	-0.43	2.74
2,926.00	0.51	88.260	2,925.47	-43.46	0.91	0.91	0.27	-0.06	-28.24
3,019.00	0.64	123.490	3,018.47	-43.74	1.76	1.76	0.40	0.14	37.88
3,112.00	0.42	124.420	3,111.46	-44.22	2.47	2.47	0.24	-0.24	1.00
3,205.00	1.14	162.250	3,204.45	-45.29	3.03	3.03	0.91	0.77	40.68
3,299.00	1.20	162.880	3,298.43	-47.12	3.61	3.61	0.07	0.06	0.67
3,392.00	1.25	172.310	3,391.41	-49.06	4.03	4.03	0.22	0.05	10.14
3,485.00	1.39	167.100	3,484.39	-51.16	4.42	4.42	0.20	0.15	-5.60
3,554.00	1.17	174.350	3,553.37	-52.68	4.67	4.67	0.40	-0.32	10.51
3,638.00	1.94	184.080	3,637.34	-54.95	4.66	4.66	0.97	0.92	11.58
3,669.00	1.89	183.670	3,668.32	-55.99	4.59	4.59	0.17	-0.16	-1.32
3,762.00	3.22	177.900	3,761.23	-60.13	4.58	4.58	1.45	1.43	-6.20
3,856.00	2.80	175.600	3,855.10	-65.05	4.86	4.86	0.46	-0.45	-2.45
3,949.00	3.06	180.750	3,947.98	-69.80	5.00	5.00	0.40	0.28	5.54
4,042.00	3.62	180.650	4,040.82	-75.22	4.93	4.93	0.60	0.60	-0.11
4,136.00	3.53	198.070	4,134.64	-80.94	4.00	4.00	1.16	-0.10	18.53
4,229.00	5.83	202.880	4,227.32	-88.01	1.28	1.28	2.51	2.47	5.17
4,323.00	7.95	202.300	4,320.64	-98.43	-3.05	-3.05	2.26	2.26	-0.62
4,416.00	9.26	204.280	4,412.59	-111.20	-8.56	-8.56	1.44	1.41	2.13
4,509.00	10.91	201.980	4,504.15	-126.18	-14.93	-14.93	1.83	1.77	-2.47
4,604.00	11.90	197.750	4,597.27	-143.85	-21.29	-21.29	1.36	1.04	-4.45

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
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Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,699.00	11.59	193.020	4,690.29	-162.47	-26.42	-26.42	1.06	-0.33	-4.98
4,794.00	11.74	189.640	4,783.33	-181.30	-30.19	-30.19	0.74	0.16	-3.56
4,889.00	10.74	184.060	4,876.51	-199.66	-32.44	-32.44	1.55	-1.05	-5.87
4,984.00	10.37	181.050	4,969.90	-217.04	-33.22	-33.22	0.70	-0.39	-3.17
5,079.00	10.31	178.570	5,063.36	-234.08	-33.16	-33.16	0.47	-0.06	-2.61
5,174.00	11.20	178.370	5,156.69	-251.81	-32.69	-32.69	0.94	0.94	-0.21
5,269.00	12.50	179.710	5,249.66	-271.31	-32.37	-32.37	1.40	1.37	1.41
5,363.00	13.90	181.030	5,341.18	-292.77	-32.53	-32.53	1.52	1.49	1.40
5,458.00	15.23	182.020	5,433.12	-316.65	-33.17	-33.17	1.42	1.40	1.04
5,553.00	15.99	186.960	5,524.62	-342.11	-35.20	-35.20	1.61	0.80	5.20
5,621.00	15.33	191.700	5,590.10	-360.21	-38.15	-38.15	2.12	-0.97	6.97
5,648.00	15.46	193.420	5,616.13	-367.21	-39.71	-39.71	1.76	0.48	6.37
5,743.00	16.38	193.820	5,707.48	-392.53	-45.85	-45.85	0.98	0.97	0.42
5,838.00	15.73	200.280	5,798.79	-417.62	-53.52	-53.52	2.00	-0.68	6.80
5,932.00	15.06	200.610	5,889.41	-441.00	-62.23	-62.23	0.72	-0.71	0.35
6,025.00	13.49	198.540	5,979.54	-462.60	-69.93	-69.93	1.77	-1.69	-2.23
6,093.00	13.07	196.440	6,045.72	-477.49	-74.63	-74.63	0.94	-0.62	-3.09
6,180.00	11.45	193.180	6,130.74	-495.34	-79.38	-79.38	2.02	-1.86	-3.75
6,212.00	10.24	188.810	6,162.16	-501.24	-80.54	-80.54	4.57	-3.78	-13.66
6,305.00	7.89	177.100	6,254.00	-515.79	-81.49	-81.49	3.20	-2.53	-12.59
6,398.00	7.12	169.480	6,346.21	-527.83	-80.11	-80.11	1.35	-0.83	-8.19
6,491.00	6.90	166.570	6,438.51	-538.93	-77.76	-77.76	0.45	-0.24	-3.13
6,585.00	6.60	161.270	6,531.86	-549.54	-74.72	-74.72	0.74	-0.32	-5.64
6,678.00	5.81	164.320	6,624.32	-559.13	-71.73	-71.73	0.92	-0.85	3.28
6,772.00	5.33	161.760	6,717.87	-567.86	-69.08	-69.08	0.57	-0.51	-2.72
6,865.00	5.72	185.650	6,810.45	-576.58	-68.18	-68.18	2.49	0.42	25.69
6,959.00	6.23	186.870	6,903.94	-586.30	-69.25	-69.25	0.56	0.54	1.30
7,052.00	6.03	189.110	6,996.41	-596.13	-70.63	-70.63	0.34	-0.22	2.41
7,145.00	5.99	189.880	7,088.90	-605.74	-72.23	-72.23	0.10	-0.04	0.83
7,239.00	6.00	188.550	7,182.39	-615.43	-73.81	-73.81	0.15	0.01	-1.41
7,332.00	6.12	188.480	7,274.87	-625.14	-75.26	-75.26	0.13	0.13	-0.08
7,426.00	5.95	189.620	7,368.34	-634.90	-76.81	-76.81	0.22	-0.18	1.21
7,519.00	5.70	187.870	7,460.86	-644.22	-78.25	-78.25	0.33	-0.27	-1.88
7,613.00	5.41	188.920	7,554.42	-653.23	-79.58	-79.58	0.33	-0.31	1.12
7,706.00	5.20	188.060	7,647.02	-661.73	-80.85	-80.85	0.24	-0.23	-0.92
7,800.00	5.25	189.730	7,740.63	-670.19	-82.17	-82.17	0.17	0.05	1.78
7,893.00	5.33	185.690	7,833.24	-678.68	-83.32	-83.32	0.41	0.09	-4.34
7,986.00	4.69	183.850	7,925.88	-686.77	-84.00	-84.00	0.71	-0.69	-1.98
8,080.00	3.87	179.320	8,019.62	-693.78	-84.22	-84.22	0.94	-0.87	-4.82
8,173.00	3.23	177.340	8,112.44	-699.53	-84.06	-84.06	0.70	-0.69	-2.13
8,266.00	3.57	182.280	8,205.28	-705.04	-84.06	-84.06	0.48	0.37	5.31
8,360.00	3.65	184.990	8,299.09	-710.95	-84.44	-84.44	0.20	0.09	2.88
8,453.00	3.61	188.680	8,391.90	-716.79	-85.13	-85.13	0.25	-0.04	3.97
8,546.00	3.44	189.970	8,484.73	-722.43	-86.06	-86.06	0.20	-0.18	1.39

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Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,640.00	3.32	189.240	8,578.56	-727.90	-86.98	-86.98	0.14	-0.13	-0.78
8,733.00	3.34	191.490	8,671.41	-733.21	-87.96	-87.96	0.14	0.02	2.42
8,826.00	3.24	194.000	8,764.25	-738.42	-89.13	-89.13	0.19	-0.11	2.70
8,920.00	2.93	196.020	8,858.12	-743.30	-90.44	-90.44	0.35	-0.33	2.15
9,013.00	2.80	193.750	8,951.00	-747.79	-91.63	-91.63	0.19	-0.14	-2.44
9,107.00	2.27	191.390	9,044.91	-751.85	-92.55	-92.55	0.57	-0.56	-2.51
9,200.00	2.66	183.050	9,137.82	-755.81	-93.03	-93.03	0.57	0.42	-8.97
9,294.00	2.69	183.230	9,231.72	-760.19	-93.27	-93.27	0.03	0.03	0.19
9,388.00	2.50	182.750	9,325.63	-764.44	-93.49	-93.49	0.20	-0.20	-0.51
9,483.00	2.14	190.020	9,420.55	-768.26	-93.90	-93.90	0.49	-0.38	7.65
9,577.00	2.09	186.260	9,514.48	-771.69	-94.39	-94.39	0.16	-0.05	-4.00
9,672.00	1.98	186.180	9,609.42	-775.04	-94.75	-94.75	0.12	-0.12	-0.08
9,767.00	2.08	193.580	9,704.36	-778.35	-95.34	-95.34	0.30	0.11	7.79
9,862.00	1.84	194.540	9,799.31	-781.50	-96.12	-96.12	0.25	-0.25	1.01
9,956.00	1.92	188.870	9,893.26	-784.52	-96.75	-96.75	0.22	0.09	-6.03
10,051.00	1.76	188.540	9,988.21	-787.53	-97.21	-97.21	0.17	-0.17	-0.35
10,145.00	1.54	194.390	10,082.17	-790.18	-97.74	-97.74	0.29	-0.23	6.22
10,239.00	1.07	182.720	10,176.15	-792.28	-98.09	-98.09	0.57	-0.50	-12.41
10,302.00	1.45	182.190	10,239.13	-793.67	-98.15	-98.15	0.60	0.60	-0.84
10,333.00	4.83	122.350	10,270.08	-794.76	-97.06	-97.06	13.83	10.90	-193.03
10,364.00	10.21	110.030	10,300.81	-796.40	-93.37	-93.37	18.02	17.35	-39.74
10,396.00	14.86	100.620	10,332.04	-798.13	-86.67	-86.67	15.82	14.53	-29.41
10,427.00	19.15	92.230	10,361.68	-799.06	-77.68	-77.68	15.91	13.84	-27.06
10,459.00	22.16	82.360	10,391.63	-798.46	-66.45	-66.45	14.35	9.41	-30.84
10,491.00	24.20	76.060	10,421.05	-796.08	-54.10	-54.10	10.03	6.38	-19.69
10,522.00	26.57	78.520	10,449.06	-793.17	-41.13	-41.13	8.37	7.65	7.94
10,554.00	31.08	77.830	10,477.08	-790.00	-26.04	-26.04	14.13	14.09	-2.16
10,585.00	35.46	79.500	10,503.00	-786.67	-9.37	-9.37	14.43	14.13	5.39
10,617.00	39.27	81.180	10,528.43	-783.43	9.78	9.78	12.32	11.91	5.25
10,648.00	43.83	86.880	10,551.63	-781.34	30.21	30.21	19.10	14.71	18.39
10,680.00	46.99	87.200	10,574.09	-780.16	52.96	52.96	9.90	9.88	1.00
10,711.00	47.56	87.440	10,595.12	-779.10	75.71	75.71	1.92	1.84	0.77
10,743.00	48.71	88.940	10,616.48	-778.35	99.53	99.53	5.01	3.59	4.69
10,774.00	52.13	90.300	10,636.23	-778.19	123.42	123.42	11.54	11.03	4.39
10,805.00	54.64	93.710	10,654.72	-779.08	148.27	148.27	11.98	8.10	11.00
10,836.00	55.44	98.270	10,672.49	-781.73	173.53	173.53	12.33	2.58	14.71
10,868.00	59.03	99.470	10,689.81	-785.89	200.11	200.11	11.65	11.22	3.75
10,899.00	63.11	100.520	10,704.80	-790.60	226.82	226.82	13.49	13.16	3.39
10,930.00	65.67	100.150	10,718.20	-795.61	254.32	254.32	8.33	8.26	-1.19
10,961.00	66.82	99.390	10,730.69	-800.43	282.28	282.28	4.34	3.71	-2.45
10,992.00	68.21	98.560	10,742.54	-804.89	310.58	310.58	5.12	4.48	-2.68
11,024.00	72.78	94.650	10,753.23	-808.35	340.53	340.53	18.34	14.28	-12.22
11,055.00	76.21	93.500	10,761.51	-810.47	370.32	370.32	11.63	11.06	-3.71

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,086.00	81.12	92.150	10,767.60	-811.96	400.67	400.67	16.40	15.84	-4.35
11,105.00	79.23	93.540	10,770.85	-812.89	419.36	419.36	12.28	-9.95	7.32
11,194.00	78.21	95.170	10,788.26	-819.51	506.39	506.39	2.13	-1.15	1.83
First SDI MWD Lateral Survey									
11,224.00	78.63	93.800	10,794.28	-821.81	535.69	535.69	4.69	1.40	-4.57
11,255.00	83.65	93.690	10,799.05	-823.81	566.24	566.24	16.20	16.19	-0.35
11,286.00	88.86	92.480	10,801.07	-825.48	597.12	597.12	17.25	16.81	-3.90
11,317.00	94.19	91.860	10,800.25	-826.65	628.07	628.07	17.31	17.19	-2.00
11,348.00	95.30	92.890	10,797.69	-827.93	658.94	658.94	4.88	3.58	3.32
11,378.00	95.44	92.590	10,794.88	-829.36	688.77	688.77	1.10	0.47	-1.00
11,409.00	92.95	92.460	10,792.61	-830.72	719.66	719.66	8.04	-8.03	-0.42
11,440.00	93.01	92.450	10,791.00	-832.04	750.59	750.59	0.20	0.19	-0.03
11,471.00	91.94	92.850	10,789.66	-833.48	781.53	781.53	3.68	-3.45	1.29
11,502.00	91.00	91.730	10,788.87	-834.71	812.49	812.49	4.72	-3.03	-3.61
11,594.00	90.27	91.160	10,787.85	-837.03	904.45	904.45	1.01	-0.79	-0.62
11,686.00	90.94	91.620	10,786.87	-839.27	996.42	996.42	0.88	0.73	0.50
11,778.00	91.14	92.260	10,785.20	-842.38	1,088.35	1,088.35	0.73	0.22	0.70
11,870.00	90.50	91.250	10,783.89	-845.20	1,180.30	1,180.30	1.30	-0.70	-1.10
11,962.00	88.46	90.120	10,784.72	-846.30	1,272.28	1,272.28	2.53	-2.22	-1.23
12,053.00	90.23	90.140	10,785.76	-846.50	1,363.27	1,363.27	1.95	1.95	0.02
12,146.00	92.30	89.100	10,783.71	-845.89	1,456.24	1,456.24	2.49	2.23	-1.12
12,238.00	92.30	89.800	10,780.02	-845.00	1,548.16	1,548.16	0.76	0.00	0.76
12,330.00	92.35	90.300	10,776.29	-845.09	1,640.09	1,640.09	0.55	0.05	0.54
12,425.00	90.17	90.830	10,774.20	-846.02	1,735.05	1,735.05	2.36	-2.29	0.56
12,520.00	88.09	89.190	10,775.64	-846.04	1,830.03	1,830.03	2.79	-2.19	-1.73
12,614.00	89.23	88.720	10,777.84	-844.32	1,923.99	1,923.99	1.31	1.21	-0.50
12,710.00	90.60	89.820	10,777.98	-843.10	2,019.98	2,019.98	1.83	1.43	1.15
12,806.00	89.63	89.800	10,777.79	-842.78	2,115.98	2,115.98	1.01	-1.01	-0.02
12,901.00	88.76	89.920	10,779.12	-842.55	2,210.97	2,210.97	0.92	-0.92	0.13
12,995.00	87.22	88.510	10,782.42	-841.26	2,304.89	2,304.89	2.22	-1.64	-1.50
13,090.00	85.88	89.880	10,788.14	-839.93	2,399.71	2,399.71	2.02	-1.41	1.44
13,184.00	87.36	89.670	10,793.68	-839.56	2,493.54	2,493.54	1.59	1.57	-0.22
13,280.00	88.43	90.650	10,797.20	-839.83	2,589.47	2,589.47	1.51	1.11	1.02
13,374.00	88.89	91.040	10,799.40	-841.22	2,683.44	2,683.44	0.64	0.49	0.41
13,470.00	90.17	91.680	10,800.19	-843.50	2,779.40	2,779.40	1.49	1.33	0.67
13,565.00	90.54	91.660	10,799.60	-846.26	2,874.36	2,874.36	0.39	0.39	-0.02
13,659.00	89.80	90.870	10,799.32	-848.34	2,968.34	2,968.34	1.15	-0.79	-0.84
13,754.00	89.13	90.100	10,800.21	-849.14	3,063.33	3,063.33	1.07	-0.71	-0.81
13,848.00	90.37	90.060	10,800.62	-849.27	3,157.33	3,157.33	1.32	1.32	-0.04
13,943.00	90.40	90.270	10,799.98	-849.55	3,252.32	3,252.32	0.22	0.03	0.22
14,037.00	90.17	89.590	10,799.51	-849.43	3,346.32	3,346.32	0.76	-0.24	-0.72
14,132.00	89.83	89.670	10,799.51	-848.82	3,441.32	3,441.32	0.37	-0.36	0.08
14,227.00	88.90	89.120	10,800.57	-847.82	3,536.31	3,536.31	1.14	-0.98	-0.58

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	OH	**Survey Calculation Method:**	Minimum Curvature
Design:	OH	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
14,322.00	87.52	88.690	10,803.53	-846.00	3,631.24	3,631.24	1.52	-1.45	-0.45
14,416.00	89.30	89.350	10,806.14	-844.40	3,725.19	3,725.19	2.02	1.89	0.70
14,511.00	89.26	89.400	10,807.34	-843.36	3,820.17	3,820.17	0.07	-0.04	0.05
14,605.00	88.63	89.070	10,809.07	-842.10	3,914.15	3,914.15	0.76	-0.67	-0.35
14,700.00	89.63	88.800	10,810.51	-840.34	4,009.12	4,009.12	1.09	1.05	-0.28
14,794.00	89.50	89.230	10,811.22	-838.72	4,103.10	4,103.10	0.48	-0.14	0.46
14,889.00	88.79	88.940	10,812.64	-837.21	4,198.08	4,198.08	0.81	-0.75	-0.31
14,983.00	89.50	89.160	10,814.04	-835.65	4,292.06	4,292.06	0.79	0.76	0.23
15,078.00	89.43	89.730	10,814.93	-834.73	4,387.05	4,387.05	0.60	-0.07	0.60
15,173.00	89.00	89.840	10,816.23	-834.37	4,482.04	4,482.04	0.47	-0.45	0.12
15,268.00	88.53	88.640	10,818.28	-833.11	4,577.00	4,577.00	1.36	-0.49	-1.26
15,362.00	88.56	88.490	10,820.67	-830.76	4,670.94	4,670.94	0.16	0.03	-0.16
15,456.00	89.26	87.910	10,822.45	-827.81	4,764.88	4,764.88	0.97	0.74	-0.62
15,550.00	91.14	89.600	10,822.13	-825.76	4,858.85	4,858.85	2.69	2.00	1.80
15,644.00	91.41	90.890	10,820.03	-826.17	4,952.82	4,952.82	1.40	0.29	1.37
15,739.00	88.90	92.050	10,819.78	-828.60	5,047.78	5,047.78	2.91	-2.64	1.22
15,834.00	89.63	93.460	10,821.00	-833.17	5,142.66	5,142.66	1.67	0.77	1.48
15,929.00	87.02	93.060	10,823.77	-838.57	5,237.46	5,237.46	2.78	-2.75	-0.42
16,024.00	87.52	91.490	10,828.30	-842.34	5,332.27	5,332.27	1.73	0.53	-1.65
16,119.00	88.13	90.390	10,831.90	-843.89	5,427.19	5,427.19	1.32	0.64	-1.16
16,214.00	90.74	91.930	10,832.84	-845.82	5,522.16	5,522.16	3.19	2.75	1.62
16,308.00	89.93	92.630	10,832.29	-849.55	5,616.08	5,616.08	1.14	-0.86	0.74
16,348.00	90.03	92.770	10,832.30	-851.44	5,656.03	5,656.03	0.43	0.25	0.35
16,442.00	88.12	92.400	10,833.82	-855.68	5,749.92	5,749.92	2.07	-2.03	-0.39
Last SDI MWD Lateral Survey									
16,577.00	88.12	92.400	10,838.25	-861.33	5,884.73	5,884.73	0.00	0.00	0.00
Projection to TD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
288.00	287.99	-2.24	-0.32	First SDI MWD Survey
11,194.00	10,788.26	-819.51	506.39	First SDI MWD Lateral Survey
16,442.00	10,833.82	-855.68	5,749.92	Last SDI MWD Lateral Survey
16,577.00	10,838.25	-861.33	5,884.73	Projection to TD

Checked By: _____ Approved By: _____ Date: _____

Scientific Drilling

Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	Oasis Petroleum
Well Name & No.	Lewis Federal 5300 11-31 4BR ST1
API #	33-053-08946
County & State	McKenzie County, ND
SDI Job #	OP.016663
Rig	Nabors B21
Survey Date	14-Mar-2019

I, Seth M. Burstad, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 11224 feet to a measured depth of 11466 feet is true and correct as determined from all available records.

Seth Burstad

Signature

14-Mar-2019

Date

Seth M. Burstad
Rockies Region Well Planner
Scientific Drilling - Rocky Mountain District

Project: McKenzie County, ND
Site: Lewis Federal
Well: Lewis Federal 5300 11-31 4BR
Wellbore: ST 1
Design: ST 1

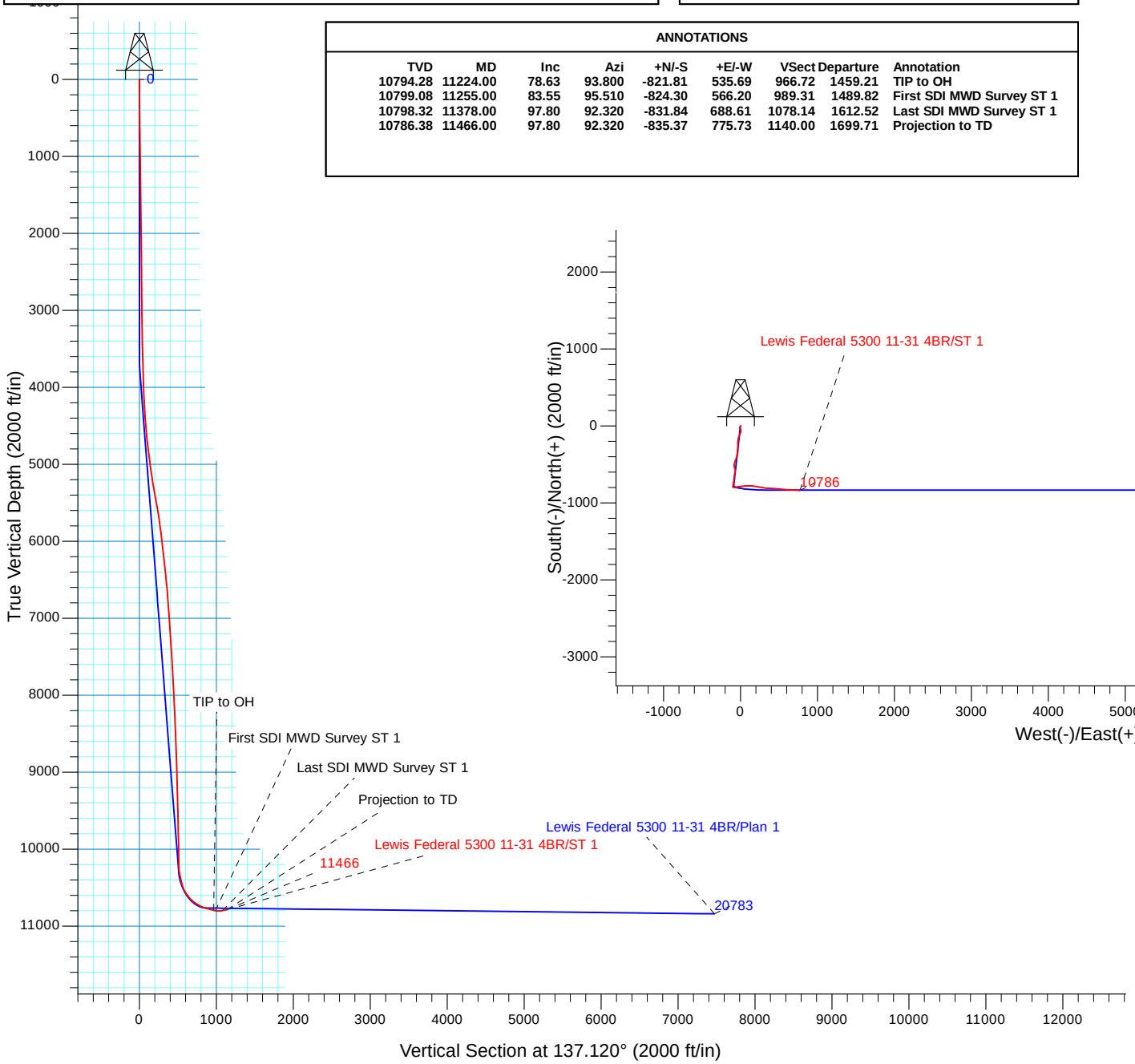
WELL DETAILS: Lewis Federal 5300 11-31 4BR			
GL 2110' & KB 25' @ 2135.00ft (Nabors B21)		2110.00	
Northing	Easting	Latitude	Longitude
393064.15	1209533.06	48° 2' 8.330 N	103° 36' 11.190 W

Design: ST 1 (Lewis Federal 5300 11-31 4BR/ST 1)
Created By: Seth Burstad

PROJECT DETAILS: McKenzie County, ND	
Geodetic System:	US State Plane 1983
Datum:	North American Datum 1983
Ellipsoid:	GRS 1980
Zone:	North Dakota Northern Zone
System Datum:	Mean Sea Level
Local North:	True

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Departure	Annotation
10794.28	11224.00	78.63	93.800	-821.81	535.69	966.72	1459.21	TIP to OH
10799.08	11255.00	83.55	95.510	-824.30	566.20	989.31	1489.82	First SDI MWD Survey ST 1
10798.32	11378.00	97.80	92.320	-831.84	688.61	1078.14	1612.52	Last SDI MWD Survey ST 1
10786.38	11466.00	97.80	92.320	-835.37	775.73	1140.00	1699.71	Projection to TD



Oasis Petroleum

McKenzie County, ND
Lewis Federal
Lewis Federal 5300 11-31 4BR

ST 1

Design: ST 1

Standard Survey Report

14 March, 2019

Scientific Drilling

www.scientificdrilling.com

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 1	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 1	**Database:**	Casper District

Project McKenzie County, ND

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	North Dakota Northern Zone		

Site Lewis Federal, Site Center: Lewis Federal 5300 11-31 2B

Site Position:		**Northing:**	393,162.02 usft	**Latitude:**	48° 2' 9.300 N
From:	Lat/Long	**Easting:**	1,209,545.85 usft	**Longitude:**	103° 36' 11.060 W
Position Uncertainty:	0.00 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-2.31 °

Well Lewis Federal 5300 11-31 4BR, 1149' FNL 257' FWL Sec 31 T153N R100W

Well Position	**+N/-S**	0.00 ft	**Northing:**	393,064.15 usft	**Latitude:**	48° 2' 8.330 N
	+E/-W	0.00 ft	**Easting:**	1,209,533.06 usft	**Longitude:**	103° 36' 11.190 W
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	0.00 ft	**Ground Level:**	2,110.00 ft

Wellbore ST 1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/14/2019	7.85	72.68	55,749

Design ST 1

Audit Notes:

Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	11,224.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	137.120

Survey Program **Date** 3/14/2019

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
288.00	3,554.00	Survey #1 - Surface (OH)	MWD+HDGM	OWSG MWD + HDGM
3,638.00	11,105.00	Survey #2 - Vertical / Curve (OH)	MWD+HDGM	OWSG MWD + HDGM
11,194.00	11,224.00	Survey #3 - Lateral (OH)	MWD+HDGM	OWSG MWD + HDGM
11,255.00	11,466.00	Survey #1 (ST 1)		

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,224.00	78.63	93.800	10,794.28	-821.81	535.69	966.72	4.69	1.40	-4.57
TIP to OH									
11,255.00	83.55	95.510	10,799.08	-824.30	566.20	989.31	16.78	15.87	5.52
First SDI MWD Survey ST 1									
11,286.00	87.02	94.990	10,801.63	-827.13	596.96	1,012.31	11.32	11.19	-1.68
11,317.00	90.13	94.350	10,802.40	-829.65	627.84	1,035.18	10.24	10.03	-2.06
11,348.00	93.76	90.780	10,801.34	-831.04	658.79	1,057.25	16.42	11.71	-11.52

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 1	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 1	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,378.00	97.80	92.320	10,798.32	-831.84	688.62	1,078.14	14.40	13.47	5.13
Last SDI MWD Survey ST 1									
11,466.00	97.80	92.320	10,786.38	-835.37	775.73	1,140.00	0.00	0.00	0.00
Projection to TD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
11,224.00	10,794.28	-821.81	535.69	TIP to OH
11,255.00	10,799.08	-824.30	566.20	First SDI MWD Survey ST 1
11,378.00	10,798.32	-831.84	688.62	Last SDI MWD Survey ST 1
11,466.00	10,786.38	-835.37	775.73	Projection to TD

Checked By: _____ Approved By: _____ Date: _____

Scientific Drilling

Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	Oasis Petroleum
Well Name & No.	Lewis Federal 5300 11-31 4BR ST2
API #	33-053-08946
County & State	McKenzie County, ND
SDI Job #	OP.016663
Rig	Nabors B21
Survey Date	22-Mar-2019

I, Seth M. Burstad, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 11105 feet to a measured depth of 16014 feet is true and correct as determined from all available records.

Seth Burstad

Signature

22-Mar-2019

Date

Seth M. Burstad
Rockies Region Well Planner
Scientific Drilling - Rocky Mountain District

Project: McKenzie County, ND
Site: Lewis Federal
Well: Lewis Federal 5300 11-31 4BR
Wellbore: ST 2
Design: ST 2

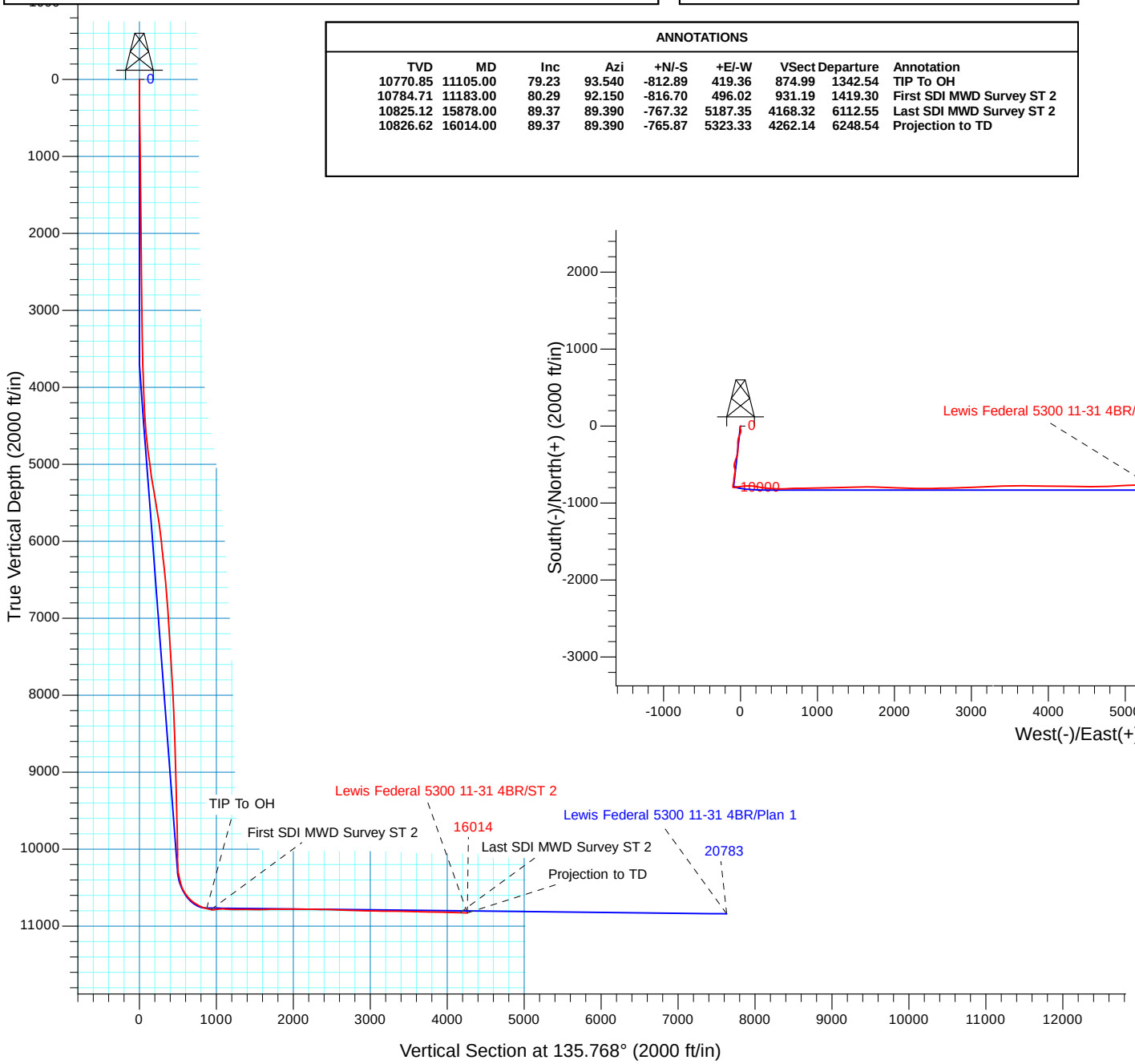
WELL DETAILS: Lewis Federal 5300 11-31 4BR			
GL 2110' & KB 25' @ 2135.00ft (Nabors B21)		2110.00	
Northing	Easting	Latitude	Longitude
393064.15	1209533.06	48° 2' 8.330 N	103° 36' 11.190 W

Design: ST 2 (Lewis Federal 5300 11-31 4BR/ST 2)
Created By: Seth Burstad

PROJECT DETAILS: McKenzie County, ND	
Geodetic System:	US State Plane 1983
Datum:	North American Datum 1983
Ellipsoid:	GRS 1980
Zone:	North Dakota Northern Zone
System Datum:	Mean Sea Level
Local North:	True

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Departure	Annotation
10770.85	11105.00	79.23	93.540	-812.89	419.36	874.99	1342.54	TIP To OH
10784.71	11183.00	80.29	92.150	-816.70	496.02	931.19	1419.30	First SDI MWD Survey ST 2
10825.12	15878.00	89.37	89.390	-767.32	5187.35	4168.32	6112.55	Last SDI MWD Survey ST 2
10826.62	16014.00	89.37	89.390	-765.87	5323.33	4262.14	6248.54	Projection to TD



Oasis Petroleum

McKenzie County, ND
Lewis Federal
Lewis Federal 5300 11-31 4BR

ST 2

Design: ST 2

Standard Survey Report

22 March, 2019

Scientific Drilling

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 2	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 2	**Database:**	Casper District

Project McKenzie County, ND

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	North Dakota Northern Zone		

Site Lewis Federal, Site Center: Lewis Federal 5300 11-31 2B

Site Position:		**Northing:**	393,162.02 usft	**Latitude:**	48° 2' 9.300 N
From:	Lat/Long	**Easting:**	1,209,545.85 usft	**Longitude:**	103° 36' 11.060 W
Position Uncertainty:	0.00 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-2.31 °

Well Lewis Federal 5300 11-31 4BR, 1149' FNL 257' FWL Sec 31 T153N R100W

Well Position	**+N/-S**	0.00 ft	**Northing:**	393,064.15 usft	**Latitude:**	48° 2' 8.330 N
	+E/-W	0.00 ft	**Easting:**	1,209,533.06 usft	**Longitude:**	103° 36' 11.190 W
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	0.00 ft	**Ground Level:**	2,110.00 ft

Wellbore ST 2

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/15/2019	7.85	72.68	55,749

Design ST 2

Audit Notes:

Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	11,105.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	135.768

Survey Program **Date** 3/22/2019

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
288.00	3,554.00	Survey #1 - Surface (OH)	MWD+HDGM	OWSG MWD + HDGM
3,638.00	11,105.00	Survey #2 - Vertical / Curve (OH)	MWD+HDGM	OWSG MWD + HDGM
11,183.00	16,014.00	Survey #1 - Lateral (ST 2)	MWD+HDGM	OWSG MWD + HDGM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,105.00	79.23	93.540	10,770.85	-812.89	419.36	874.99	12.28	-9.95	7.32
TIP To OH									
11,183.00	80.29	92.150	10,784.71	-816.70	496.02	931.19	2.22	1.36	-1.78
First SDI MWD Survey ST 2									
11,198.00	83.60	89.460	10,786.81	-816.91	510.87	941.70	28.32	22.07	-17.93
11,228.00	91.87	88.070	10,788.00	-816.26	540.81	962.12	27.95	27.57	-4.63
11,259.00	97.49	88.010	10,785.47	-815.20	571.68	982.89	18.13	18.13	-0.19
11,290.00	96.27	88.340	10,781.76	-814.22	602.44	1,003.65	4.07	-3.94	1.06

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 2	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 2	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,321.00	94.45	87.610	10,778.86	-813.13	633.28	1,024.38	6.32	-5.87	-2.35
11,352.00	92.52	87.550	10,776.98	-811.82	664.20	1,045.01	6.23	-6.23	-0.19
11,413.00	89.43	88.500	10,775.94	-809.72	725.14	1,086.02	5.30	-5.07	1.56
11,444.00	87.72	88.960	10,776.71	-809.04	756.13	1,107.14	5.71	-5.52	1.48
11,475.00	87.53	88.990	10,777.99	-808.48	787.09	1,128.34	0.62	-0.61	0.10
11,506.00	86.99	89.010	10,779.48	-807.94	818.05	1,149.55	1.74	-1.74	0.06
11,536.00	86.61	88.810	10,781.15	-807.37	848.00	1,170.04	1.43	-1.27	-0.67
11,567.00	88.06	88.370	10,782.59	-806.61	878.96	1,191.08	4.89	4.68	-1.42
11,598.00	88.73	88.830	10,783.46	-805.85	909.94	1,212.15	2.62	2.16	1.48
11,690.00	91.84	89.440	10,783.00	-804.46	1,001.91	1,275.32	3.44	3.38	0.66
11,782.00	89.40	89.220	10,782.01	-803.39	1,093.89	1,338.71	2.66	-2.65	-0.24
11,874.00	88.42	88.700	10,783.76	-801.72	1,185.86	1,401.66	1.21	-1.07	-0.57
11,966.00	89.20	89.090	10,785.67	-799.95	1,277.82	1,464.54	0.95	0.85	0.42
12,057.00	91.00	88.390	10,785.51	-797.94	1,368.80	1,526.57	2.12	1.98	-0.77
12,150.00	90.40	87.200	10,784.37	-794.37	1,461.72	1,588.82	1.43	-0.65	-1.28
12,242.00	91.07	89.180	10,783.19	-791.46	1,553.66	1,650.88	2.27	0.73	2.15
12,334.00	92.28	91.130	10,780.50	-791.71	1,645.61	1,715.20	2.49	1.32	2.12
12,427.00	89.33	91.510	10,779.20	-793.85	1,738.57	1,781.58	3.20	-3.17	0.41
12,518.00	90.10	90.960	10,779.65	-795.81	1,829.55	1,846.44	1.04	0.85	-0.60
12,610.00	90.94	91.700	10,778.82	-797.95	1,921.52	1,912.13	1.22	0.91	0.80
12,702.00	90.60	93.220	10,777.58	-801.90	2,013.42	1,979.07	1.69	-0.37	1.65
12,794.00	90.60	93.020	10,776.62	-806.90	2,105.28	2,046.73	0.22	0.00	-0.22
12,886.00	86.88	90.550	10,778.64	-809.77	2,197.19	2,112.90	4.85	-4.04	-2.68
12,977.00	90.43	90.730	10,780.77	-810.79	2,288.14	2,177.07	3.91	3.90	0.20
13,069.00	90.27	89.740	10,780.21	-811.16	2,380.14	2,241.52	1.09	-0.17	-1.08
13,161.00	89.50	89.130	10,780.40	-810.26	2,472.13	2,305.04	1.07	-0.84	-0.66
13,253.00	87.69	88.170	10,782.65	-808.09	2,564.08	2,367.62	2.23	-1.97	-1.04
13,290.00	88.76	89.340	10,783.80	-807.29	2,601.05	2,392.84	4.28	2.89	3.16
13,345.00	90.70	90.020	10,784.06	-806.98	2,656.04	2,430.98	3.74	3.53	1.24
13,365.00	89.80	89.650	10,783.97	-806.92	2,676.04	2,444.89	4.87	-4.50	-1.85
13,437.00	88.09	88.500	10,785.30	-805.76	2,748.02	2,494.27	2.86	-2.38	-1.60
13,528.00	87.76	88.130	10,788.59	-803.08	2,838.92	2,555.76	0.54	-0.36	-0.41
13,620.00	88.49	88.060	10,791.60	-800.03	2,930.82	2,617.67	0.80	0.79	-0.08
13,712.00	89.00	87.460	10,793.62	-796.43	3,022.72	2,679.21	0.86	0.55	-0.65
13,804.00	90.43	87.290	10,794.07	-792.22	3,114.62	2,740.30	1.57	1.55	-0.18
13,896.00	87.86	87.180	10,795.45	-787.78	3,206.50	2,801.21	2.80	-2.79	-0.12
13,988.00	87.86	86.680	10,798.88	-782.86	3,298.30	2,861.72	0.54	0.00	-0.54
14,080.00	89.40	87.430	10,801.08	-778.13	3,390.15	2,922.40	1.86	1.67	0.82
14,171.00	89.97	90.310	10,801.58	-776.34	3,481.12	2,984.57	3.23	0.63	3.16
14,266.00	89.50	91.040	10,802.02	-777.46	3,576.11	3,051.64	0.91	-0.49	0.77
14,361.00	87.99	90.170	10,804.10	-778.46	3,671.08	3,118.60	1.83	-1.59	-0.92
14,455.00	90.13	89.900	10,805.64	-778.52	3,765.06	3,184.20	2.29	2.28	-0.29
14,551.00	89.77	91.270	10,805.73	-779.50	3,861.06	3,251.87	1.48	-0.38	1.43
14,647.00	89.43	90.280	10,806.40	-780.80	3,957.04	3,319.76	1.09	-0.35	-1.03

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 2	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 2	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
14,742.00	89.50	89.140	10,807.29	-780.32	4,052.04	3,385.67	1.20	0.07	-1.20
14,836.00	88.73	90.900	10,808.74	-780.35	4,146.02	3,451.26	2.04	-0.82	1.87
14,931.00	89.50	91.600	10,810.20	-782.42	4,240.99	3,518.99	1.10	0.81	0.74
15,025.00	90.37	91.790	10,810.31	-785.20	4,334.94	3,586.52	0.95	0.93	0.20
15,121.00	87.59	90.640	10,812.02	-787.24	4,430.90	3,654.91	3.13	-2.90	-1.20
15,215.00	88.36	89.680	10,815.34	-787.50	4,524.84	3,720.63	1.31	0.82	-1.02
15,311.00	89.60	88.690	10,817.05	-786.13	4,620.81	3,786.60	1.65	1.29	-1.03
15,406.00	89.93	89.080	10,817.44	-784.29	4,715.79	3,851.53	0.54	0.35	0.41
15,500.00	90.07	87.450	10,817.44	-781.44	4,809.74	3,915.03	1.74	0.15	-1.73
15,595.00	88.26	87.350	10,818.82	-777.13	4,904.63	3,978.13	1.91	-1.91	-0.11
15,689.00	88.26	86.910	10,821.68	-772.43	4,998.47	4,040.22	0.47	0.00	-0.47
15,784.00	89.10	88.760	10,823.87	-768.84	5,093.37	4,103.85	2.14	0.88	1.95
15,878.00	89.37	89.390	10,825.12	-767.32	5,187.35	4,168.32	0.73	0.29	0.67
Last SDI MWD Survey ST 2									
16,014.00	89.37	89.390	10,826.62	-765.87	5,323.33	4,262.14	0.00	0.00	0.00
Projection to TD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
11,105.00	10,770.85	-812.89	419.36	TIP To OH
11,183.00	10,784.71	-816.70	496.02	First SDI MWD Survey ST 2
15,878.00	10,825.12	-767.32	5,187.35	Last SDI MWD Survey ST 2
16,014.00	10,826.62	-765.87	5,323.33	Projection to TD

Checked By: _____ Approved By: _____ Date: _____

Scientific Drilling

Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	Oasis Petroleum
Well Name & No.	Lewis Federal 5300 11-31 4BR ST3
API #	33-053-08946
County & State	McKenzie County, ND
SDI Job #	OP.016663
Rig	Nabors B21
Survey Date	22-Mar-2019

I, Seth M. Burstad, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 14931 feet to a measured depth of 15658 feet is true and correct as determined from all available records.

Seth Burstad

Signature

22-Mar-2019

Date

Seth M. Burstad
Rockies Region Well Planner
Scientific Drilling - Rocky Mountain District

Project: McKenzie County, ND
Site: Lewis Federal
Well: Lewis Federal 5300 11-31 4BR
Wellbore: ST 3
Design: ST 3

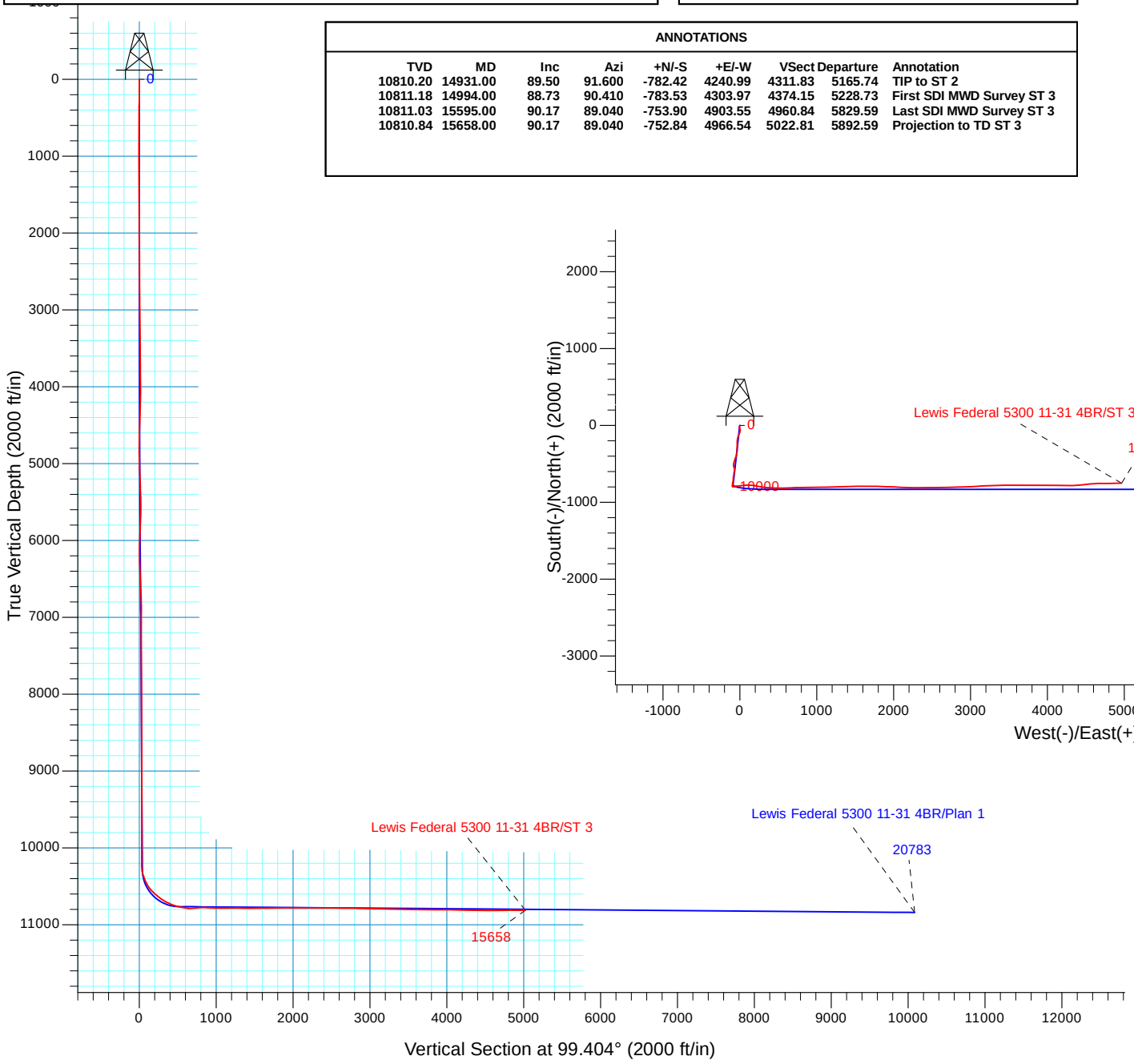
WELL DETAILS: Lewis Federal 5300 11-31 4BR			
GL 2110' & KB 25' @ 2135.00ft (Nabors B21)		2110.00	
Northing	Easting	Latitude	Longitude
393064.15	1209533.06	48° 2' 8.330 N	103° 36' 11.190 W

Design: ST 3 (Lewis Federal 5300 11-31 4BR/ST 3)
Created By: Seth Burstad

PROJECT DETAILS: McKenzie County, ND	
Geodetic System:	US State Plane 1983
Datum:	North American Datum 1983
Ellipsoid:	GRS 1980
Zone:	North Dakota Northern Zone
System Datum:	Mean Sea Level
Local North:	True

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Departure	Annotation
10810.20	14931.00	89.50	91.600	-782.42	4240.99	4311.83	5165.74	TIP to ST 2
10811.18	14994.00	88.73	90.410	-783.53	4303.97	4374.15	5228.73	First SDI MWD Survey ST 3
10811.03	15595.00	90.17	89.040	-753.90	4903.55	4960.84	5829.59	Last SDI MWD Survey ST 3
10810.84	15658.00	90.17	89.040	-752.84	4966.54	5022.81	5892.59	Projection to TD ST 3



Oasis Petroleum

McKenzie County, ND
Lewis Federal
Lewis Federal 5300 11-31 4BR

ST 3

Design: ST 3

Standard Survey Report

27 March, 2019

Scientific Drilling

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 3	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 3	**Database:**	Casper District

Project McKenzie County, ND

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	North Dakota Northern Zone		

Site Lewis Federal, Site Center: Lewis Federal 5300 11-31 2B

Site Position:		**Northing:**	393,162.02 usft	**Latitude:**	48° 2' 9.300 N
From:	Lat/Long	**Easting:**	1,209,545.85 usft	**Longitude:**	103° 36' 11.060 W
Position Uncertainty:	0.00 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-2.31 °

Well Lewis Federal 5300 11-31 4BR, 1149' FNL 257' FWL Sec 31 T153N R100W

Well Position	**+N/-S**	0.00 ft	**Northing:**	393,064.15 usft	**Latitude:**	48° 2' 8.330 N
	+E/-W	0.00 ft	**Easting:**	1,209,533.06 usft	**Longitude:**	103° 36' 11.190 W
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	0.00 ft	**Ground Level:**	2,110.00 ft

Wellbore ST 3

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/22/2019	7.85	72.68	55,747

Design ST 3

Audit Notes:

Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	14,931.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	99.404

Survey Program **Date** 3/24/2019

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
288.00	3,554.00	Survey #1 - Surface (OH)	MWD+HDGM	OWSG MWD + HDGM
3,638.00	11,105.00	Survey #2 - Vertical / Curve (OH)	MWD+HDGM	OWSG MWD + HDGM
11,183.00	14,931.00	Survey #1 - Lateral (ST 2)	MWD+HDGM	OWSG MWD + HDGM
14,994.00	15,658.00	Survey #1 - Lateral (ST 3)	MWD+HDGM	OWSG MWD + HDGM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
14,931.00	89.50	91.600	10,810.20	-782.42	4,240.99	4,311.83	1.10	0.81	0.74
TIP to ST 2									
14,994.00	88.73	90.410	10,811.18	-783.53	4,303.97	4,374.15	2.25	-1.22	-1.89
First SDI MWD Survey ST 3									
15,025.00	87.01	88.300	10,812.33	-783.18	4,334.94	4,404.65	8.78	-5.55	-6.81
15,057.00	87.29	86.260	10,813.92	-781.66	4,366.86	4,435.90	6.43	0.88	-6.38
15,089.00	88.96	84.690	10,814.97	-779.14	4,398.75	4,466.94	7.16	5.22	-4.91

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 3	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 3	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
15,121.00	89.30	84.100	10,815.45	-776.01	4,430.59	4,497.84	2.13	1.06	-1.84
15,152.00	90.60	83.400	10,815.48	-772.64	4,461.40	4,527.69	4.76	4.19	-2.26
15,184.00	90.87	83.290	10,815.07	-768.93	4,493.19	4,558.44	0.91	0.84	-0.34
15,215.00	90.77	83.920	10,814.63	-765.48	4,523.99	4,588.27	2.06	-0.32	2.03
15,247.00	90.60	84.520	10,814.24	-762.26	4,555.82	4,619.15	1.95	-0.53	1.88
15,279.00	91.21	86.670	10,813.74	-759.80	4,587.72	4,650.21	6.98	1.91	6.72
15,311.00	91.47	86.190	10,812.99	-757.81	4,619.65	4,681.39	1.71	0.81	-1.50
15,374.00	91.41	89.420	10,811.41	-755.39	4,682.58	4,743.08	5.13	-0.10	5.13
15,406.00	91.24	89.140	10,810.67	-754.99	4,714.57	4,774.57	1.02	-0.53	-0.88
15,468.00	89.16	89.800	10,810.45	-754.42	4,776.56	4,835.64	3.52	-3.35	1.06
15,500.00	89.56	90.300	10,810.81	-754.45	4,808.56	4,867.21	2.00	1.25	1.56
15,595.00	90.17	89.040	10,811.03	-753.90	4,903.55	4,960.84	1.47	0.64	-1.33
Last SDI MWD Survey ST 3									
15,658.00	90.17	89.040	10,810.84	-752.84	4,966.54	5,022.81	0.00	0.00	0.00
Projection to TD ST 3									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
14,931.00	10,810.20	-782.42	4,240.99	TIP to ST 2
14,994.00	10,811.18	-783.53	4,303.97	First SDI MWD Survey ST 3
15,595.00	10,811.03	-753.90	4,903.55	Last SDI MWD Survey ST 3
15,658.00	10,810.84	-752.84	4,966.54	Projection to TD ST 3

Checked By: _____ Approved By: _____ Date: _____

Scientific Drilling

Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	Oasis Petroleum
Well Name & No.	Lewis Federal 5300 11-31 4BR ST4
API #	33-053-08946
County & State	McKenzie County, ND
SDI Job #	OP.016663
Rig	Nabors B21
Survey Date	22-Mar-2019

I, Seth M. Burstad, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 14455 feet to a measured depth of 17079 feet is true and correct as determined from all available records.

Seth Burstad

Signature

22-Mar-2019

Date

Seth M. Burstad
Rockies Region Well Planner
Scientific Drilling - Rocky Mountain District

Project: McKenzie County, ND
Site: Lewis Federal
Well: Lewis Federal 5300 11-31 4BR
Wellbore: ST 4
Design: ST 4

WELL DETAILS: Lewis Federal 5300 11-31 4BR			
GL 2110' & KB 25' @ 2135.00ft (Nabors B21)		2110.00	
Northing	Easting	Latitude	Longitude
393064.14	1209533.06	48° 2' 8.330 N	103° 36' 11.190 W

Design: ST 4 (Lewis Federal 5300 11-31 4BR/ST 4)

Created By: Seth Burstad

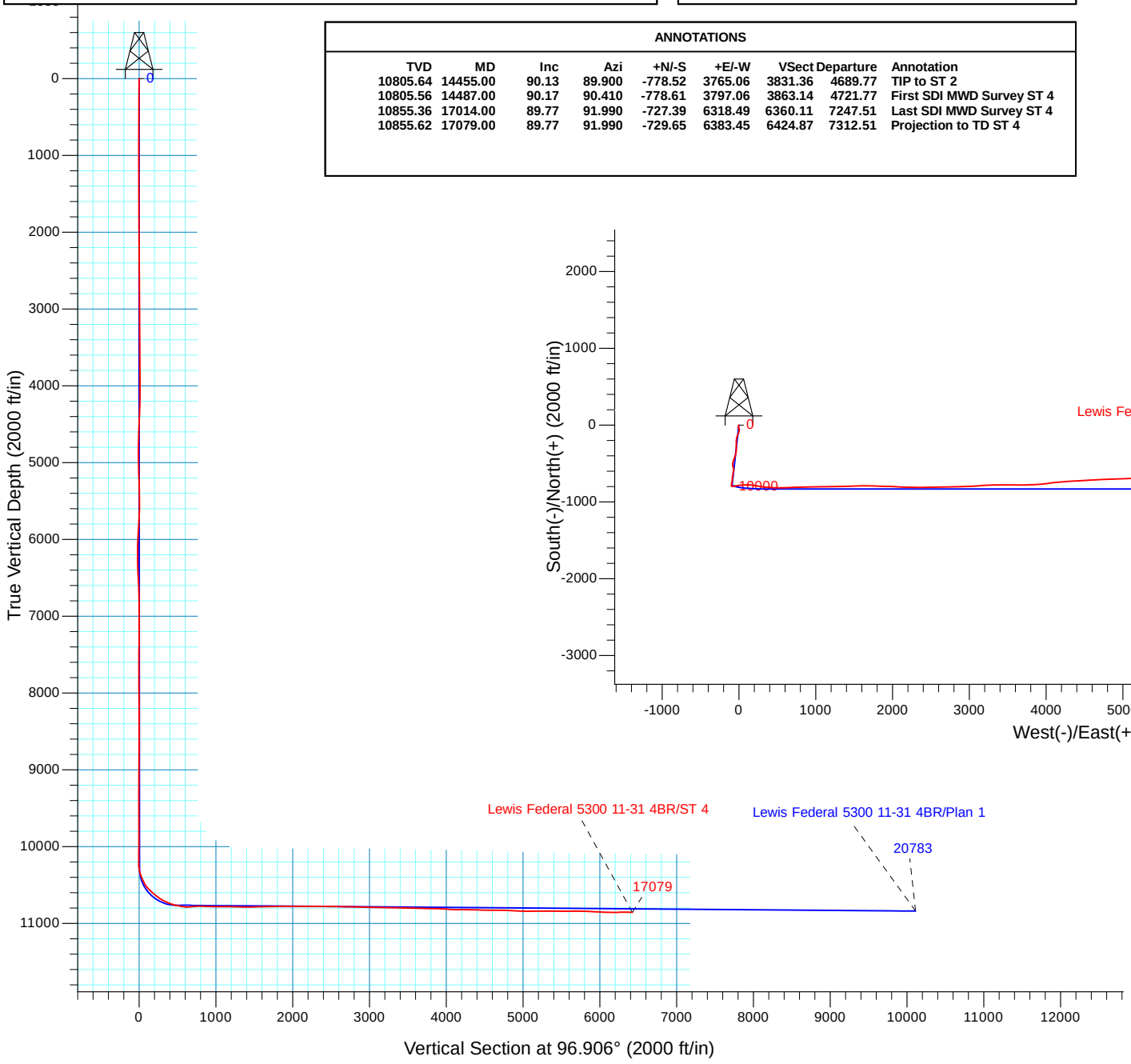
PROJECT DETAILS: McKenzie County, ND

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: North Dakota Northern Zone

System Datum: Mean Sea Level
Local North: True

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Departure	Annotation
10805.64	14455.00	90.13	89.900	-778.52	3765.06	3831.36	4689.77	TIP to ST 2
10805.56	14487.00	90.17	90.410	-778.61	3797.06	3863.14	4721.77	First SDI MWD Survey ST 4
10855.36	17014.00	89.77	91.990	-727.39	6318.49	6360.11	7247.51	Last SDI MWD Survey ST 4
10855.62	17079.00	89.77	91.990	-729.65	6383.45	6424.87	7312.51	Projection to TD ST 4



Oasis Petroleum

McKenzie County, ND
Lewis Federal
Lewis Federal 5300 11-31 4BR

ST 4

Design: ST 4

Standard Survey Report

27 March, 2019

Scientific Drilling

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 4	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 4	**Database:**	Casper District

Project McKenzie County, ND

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	North Dakota Northern Zone		

Site Lewis Federal, Site Center: Lewis Federal 5300 11-31 2B

Site Position:		**Northing:**	393,162.02 usft	**Latitude:**	48° 2' 9.300 N
From:	Lat/Long	**Easting:**	1,209,545.85 usft	**Longitude:**	103° 36' 11.060 W
Position Uncertainty:	0.00 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-2.31 °

Well Lewis Federal 5300 11-31 4BR, 1149' FNL 257' FWL Sec 31 T153N R100W

Well Position	**+N/-S**	0.00 ft	**Northing:**	393,064.14 usft	**Latitude:**	48° 2' 8.330 N
	+E/-W	0.00 ft	**Easting:**	1,209,533.06 usft	**Longitude:**	103° 36' 11.190 W
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	0.00 ft	**Ground Level:**	2,110.00 ft

Wellbore ST 4

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/24/2019	7.85	72.68	55,747

Design ST 4

Audit Notes:

Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	14,455.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	96.906

Survey Program **Date** 3/27/2019

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
288.00	3,554.00	Survey #1 - Surface (OH)	MWD+HDGM	OWSG MWD + HDGM
3,638.00	11,105.00	Survey #2 - Vertical / Curve (OH)	MWD+HDGM	OWSG MWD + HDGM
11,183.00	14,455.00	Survey #1 - Lateral (ST 2)	MWD+HDGM	OWSG MWD + HDGM
14,487.00	17,079.00	Survey #1 - Lateral (ST 4)	MWD+HDGM	OWSG MWD + HDGM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
14,455.00	90.13	89.900	10,805.64	-778.52	3,765.06	3,831.36	2.29	2.28	-0.29
TIP to ST 2									
14,487.00	90.17	90.410	10,805.56	-778.61	3,797.06	3,863.14	1.60	0.13	1.59
First SDI MWD Survey ST 4									
14,519.00	87.15	89.410	10,806.31	-778.56	3,829.05	3,894.88	9.94	-9.44	-3.13
14,551.00	85.61	86.770	10,808.33	-777.49	3,860.97	3,926.44	9.54	-4.81	-8.25
14,583.00	84.94	84.690	10,810.97	-775.12	3,892.77	3,957.72	6.81	-2.09	-6.50

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 4	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 4	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
14,615.00	84.50	82.770	10,813.91	-771.64	3,924.44	3,988.75	6.13	-1.38	-6.00
14,647.00	86.41	82.520	10,816.45	-767.55	3,956.07	4,019.66	6.02	5.97	-0.78
14,679.00	88.56	82.100	10,817.85	-763.28	3,987.75	4,050.60	6.85	6.72	-1.31
14,710.00	89.26	82.250	10,818.44	-759.06	4,018.46	4,080.57	2.31	2.26	0.48
14,742.00	89.16	82.660	10,818.88	-754.86	4,050.18	4,111.56	1.32	-0.31	1.28
14,773.00	88.46	83.970	10,819.52	-751.25	4,080.96	4,141.68	4.79	-2.26	4.23
14,836.00	88.63	84.930	10,821.12	-745.16	4,143.64	4,203.18	1.55	0.27	1.52
14,931.00	88.66	85.900	10,823.37	-737.57	4,238.31	4,296.25	1.02	0.03	1.02
15,025.00	88.86	86.400	10,825.41	-731.26	4,332.08	4,388.57	0.57	0.21	0.53
15,121.00	89.46	86.590	10,826.81	-725.39	4,427.89	4,482.98	0.66	0.63	0.20
15,215.00	89.33	86.800	10,827.81	-719.97	4,521.73	4,575.49	0.26	-0.14	0.22
15,311.00	89.36	86.340	10,828.90	-714.22	4,617.55	4,669.93	0.48	0.03	-0.48
15,406.00	88.79	88.110	10,830.44	-709.63	4,712.42	4,763.56	1.96	-0.60	1.86
15,468.00	87.19	88.220	10,832.61	-707.64	4,774.35	4,824.80	2.59	-2.58	0.18
15,595.00	86.82	87.280	10,839.25	-702.66	4,901.08	4,950.01	0.79	-0.29	-0.74
15,689.00	89.40	87.480	10,842.35	-698.37	4,994.92	5,042.65	2.75	2.74	0.21
15,753.00	91.17	87.810	10,842.03	-695.74	5,058.86	5,105.81	2.81	2.77	0.52
15,784.00	91.21	87.200	10,841.38	-694.39	5,089.82	5,136.39	1.97	0.13	-1.97
15,847.00	90.33	89.740	10,840.54	-692.71	5,152.79	5,198.70	4.27	-1.40	4.03
15,878.00	89.90	89.800	10,840.48	-692.58	5,183.79	5,229.46	1.40	-1.39	0.19
15,973.00	90.67	89.490	10,840.00	-692.00	5,278.79	5,323.69	0.87	0.81	-0.33
16,068.00	89.26	89.780	10,840.06	-691.39	5,373.78	5,417.93	1.52	-1.48	0.31
16,099.00	88.79	90.500	10,840.59	-691.47	5,404.78	5,448.71	2.77	-1.52	2.32
16,163.00	89.03	90.280	10,841.81	-691.90	5,468.76	5,512.28	0.51	0.38	-0.34
16,226.00	90.10	89.570	10,842.28	-691.82	5,531.76	5,574.81	2.04	1.70	-1.13
16,257.00	91.31	89.850	10,841.90	-691.66	5,562.76	5,605.56	4.01	3.90	0.90
16,320.00	90.64	92.610	10,840.83	-693.01	5,625.73	5,668.24	4.51	-1.06	4.38
16,352.00	90.44	92.820	10,840.53	-694.53	5,657.69	5,700.15	0.91	-0.63	0.66
16,383.00	89.53	93.500	10,840.54	-696.24	5,688.64	5,731.09	3.66	-2.94	2.19
16,415.00	87.45	93.720	10,841.38	-698.25	5,720.57	5,763.02	6.54	-6.50	0.69
16,446.00	87.55	93.740	10,842.73	-700.27	5,751.47	5,793.94	0.33	0.32	0.06
16,478.00	87.72	93.470	10,844.05	-702.28	5,783.38	5,825.86	1.00	0.53	-0.84
16,509.00	87.82	93.690	10,845.26	-704.21	5,814.30	5,856.79	0.78	0.32	0.71
16,541.00	87.62	93.220	10,846.53	-706.14	5,846.21	5,888.70	1.60	-0.63	-1.47
16,572.00	87.45	92.960	10,847.87	-707.81	5,877.14	5,919.61	1.00	-0.55	-0.84
16,635.00	87.32	92.900	10,850.74	-711.03	5,939.99	5,982.39	0.23	-0.21	-0.10
16,666.00	87.09	93.310	10,852.25	-712.70	5,970.91	6,013.28	1.52	-0.74	1.32
16,698.00	87.02	93.000	10,853.90	-714.46	6,002.82	6,045.17	0.99	-0.22	-0.97
16,730.00	88.32	92.340	10,855.20	-715.95	6,034.76	6,077.06	4.56	4.06	-2.06
16,761.00	88.66	92.610	10,856.01	-717.29	6,065.72	6,107.96	1.40	1.10	0.87
16,793.00	88.76	92.220	10,856.73	-718.64	6,097.68	6,139.85	1.26	0.31	-1.22
16,824.00	90.40	92.290	10,856.96	-719.86	6,128.65	6,170.75	5.30	5.29	0.23
16,856.00	90.84	92.540	10,856.61	-721.21	6,160.62	6,202.64	1.58	1.38	0.78
16,888.00	91.34	92.400	10,856.01	-722.58	6,192.59	6,234.54	1.62	1.56	-0.44

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 4	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 4	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
16,919.00	90.90	92.820	10,855.40	-724.00	6,223.55	6,265.45	1.96	-1.42	1.35
16,951.00	89.90	91.830	10,855.18	-725.29	6,255.52	6,297.35	4.40	-3.13	-3.09
17,014.00	89.77	91.990	10,855.36	-727.39	6,318.49	6,360.11	0.33	-0.21	0.25
Last SDI MWD Survey ST 4									
17,079.00	89.77	91.990	10,855.62	-729.65	6,383.45	6,424.87	0.00	0.00	0.00
Projection to TD ST 4									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
14,455.00	10,805.64	-778.52	3,765.06	TIP to ST 2
14,487.00	10,805.56	-778.61	3,797.06	First SDI MWD Survey ST 4
17,014.00	10,855.36	-727.39	6,318.49	Last SDI MWD Survey ST 4
17,079.00	10,855.62	-729.65	6,383.45	Projection to TD ST 4

Checked By: _____ Approved By: _____ Date: _____

Scientific Drilling

Survey Certification

7327 West Barton Road
Casper, WY 82604
(307)-472-6621 Fax (307) 472-5439

Operator	Oasis Petroleum
Well Name & No.	Lewis Federal 5300 11-31 4BR ST6
API #	33-053-08946
County & State	McKenzie County, ND
SDI Job #	OP.016663
Rig	Nabors B21
Survey Date	22-Mar-2019

I, Seth M. Burstad, having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 16226 feet to a measured depth of 20780 feet is true and correct as determined from all available records.

Seth Burstad

Signature

22-Mar-2019

Date

Seth M. Burstad
Rockies Region Well Planner
Scientific Drilling - Rocky Mountain District

Project: McKenzie County, ND
Site: Lewis Federal
Well: Lewis Federal 5300 11-31 4BR
Wellbore: ST 6
Design: ST 6

WELL DETAILS: Lewis Federal 5300 11-31 4BR			
GL 2110' & KB 25' @ 2135.00ft (Nabors B21)		2110.00	
Northing	Easting	Latitude	Longitude
393064.14	1209533.06	48° 2' 8.330 N	103° 36' 11.190 W

Design: ST 6 (Lewis Federal 5300 11-31 4BR/ST 6)

Created By: Seth Burstad

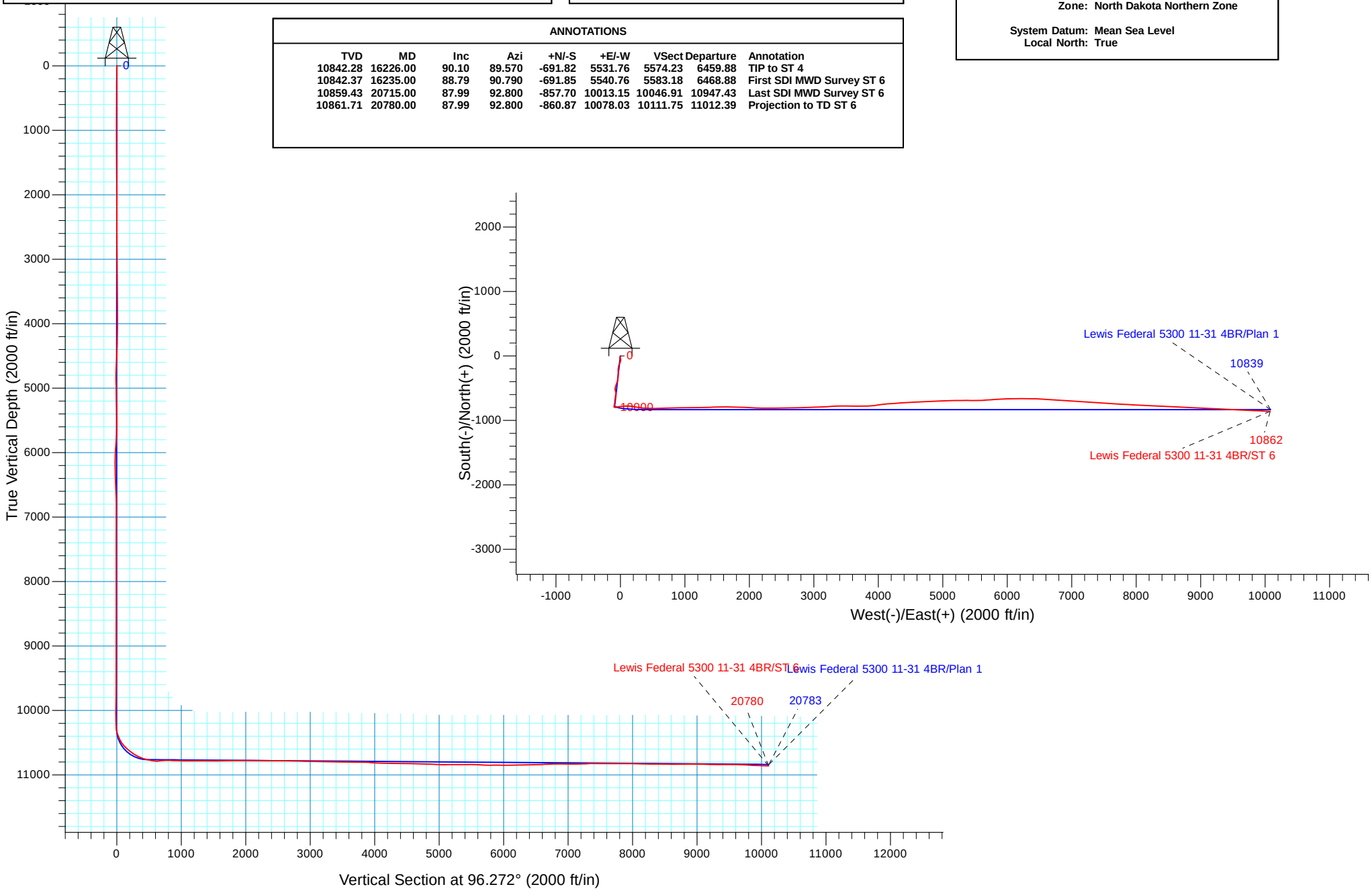
PROJECT DETAILS: McKenzie County, ND

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: North Dakota Northern Zone

System Datum: Mean Sea Level
Local North: True

ANNOTATIONS

TVD	MD	Inc	Azi	+N/-S	+E/-W	VSect	Departure	Annotation
10842.28	16226.00	90.10	89.570	-691.82	5531.76	5574.23	6459.88	TIP to ST 4
10842.37	16235.00	88.79	90.790	-691.85	5540.76	5583.18	6468.88	First SDI MWD Survey ST 6
10859.43	20715.00	87.99	92.800	-857.70	10013.15	10046.91	10947.43	Last SDI MWD Survey ST 6
10861.71	20780.00	87.99	92.800	-860.87	10078.03	10111.75	11012.39	Projection to TD ST 6



Oasis Petroleum

McKenzie County, ND
Lewis Federal
Lewis Federal 5300 11-31 4BR

ST 6

Design: ST 6

Standard Survey Report

01 April, 2019

Scientific Drilling

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 6	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 6	**Database:**	Casper District

Project McKenzie County, ND

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	North Dakota Northern Zone		

Site Lewis Federal, Site Center: Lewis Federal 5300 11-31 2B

Site Position:		**Northing:**	393,162.02 usft	**Latitude:**	48° 2' 9.300 N
From:	Lat/Long	**Easting:**	1,209,545.85 usft	**Longitude:**	103° 36' 11.060 W
Position Uncertainty:	0.00 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-2.31 °

Well Lewis Federal 5300 11-31 4BR, 1149' FNL 257' FWL Sec 31 T153N R100W

Well Position	**+N/-S**	0.00 ft	**Northing:**	393,064.14 usft	**Latitude:**	48° 2' 8.330 N
	+E/-W	0.00 ft	**Easting:**	1,209,533.06 usft	**Longitude:**	103° 36' 11.190 W
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	0.00 ft	**Ground Level:**	2,110.00 ft

Wellbore ST 6

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/27/2019	7.85	72.68	55,746

Design ST 6

Audit Notes:

Version:	1.0	**Phase:**	ACTUAL	**Tie On Depth:**	16,226.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	96.272

Survey Program **Date** 4/1/2019

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
288.00	3,554.00	Survey #1 - Surface (OH)	MWD+HDGM	OWSG MWD + HDGM
3,638.00	11,105.00	Survey #2 - Vertical / Curve (OH)	MWD+HDGM	OWSG MWD + HDGM
11,183.00	14,455.00	Survey #1 - Lateral (ST 2)	MWD+HDGM	OWSG MWD + HDGM
14,487.00	16,226.00	Survey #1 - Lateral (ST 4)	MWD+HDGM	OWSG MWD + HDGM
16,235.00	20,780.00	Survey #1 - Lateral (ST 6)	MWD+HDGM	OWSG MWD + HDGM

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
16,226.00	90.10	89.570	10,842.28	-691.82	5,531.76	5,574.23	2.04	1.70	-1.13
TIP to ST 4									
16,235.00	88.79	90.790	10,842.37	-691.85	5,540.76	5,583.18	19.89	-14.56	13.56
First SDI MWD Survey ST 6									
16,267.00	86.88	88.420	10,843.58	-691.63	5,572.73	5,614.94	9.51	-5.97	-7.41
16,298.00	86.42	87.200	10,845.39	-690.44	5,603.66	5,645.55	4.20	-1.48	-3.94
16,330.00	86.25	85.990	10,847.44	-688.55	5,635.53	5,677.03	3.81	-0.53	-3.78

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 6	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 6	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
16,348.00	86.21	86.080	10,848.62	-687.31	5,653.45	5,694.70	0.55	-0.22	0.50
16,361.00	86.31	85.970	10,849.47	-686.41	5,666.39	5,707.47	1.14	0.77	-0.85
16,379.00	87.25	85.720	10,850.48	-685.10	5,684.32	5,725.14	5.40	5.22	-1.39
16,393.00	88.63	85.600	10,850.98	-684.05	5,698.27	5,738.89	9.89	9.86	-0.86
16,408.00	89.56	86.570	10,851.22	-683.02	5,713.23	5,753.65	8.96	6.20	6.47
16,425.00	90.47	86.630	10,851.22	-682.01	5,730.20	5,770.41	5.36	5.35	0.35
16,440.00	91.04	86.890	10,851.02	-681.17	5,745.18	5,785.20	4.18	3.80	1.73
16,456.00	91.27	86.700	10,850.70	-680.27	5,761.15	5,800.98	1.86	1.44	-1.19
16,470.00	91.27	86.530	10,850.39	-679.45	5,775.12	5,814.78	1.21	0.00	-1.21
16,488.00	91.34	86.010	10,849.98	-678.27	5,793.08	5,832.50	2.91	0.39	-2.89
16,503.00	91.27	85.860	10,849.63	-677.21	5,808.03	5,847.25	1.10	-0.47	-1.00
16,519.00	90.57	85.700	10,849.38	-676.03	5,823.99	5,862.99	4.49	-4.38	-1.00
16,535.00	89.87	86.040	10,849.32	-674.88	5,839.95	5,878.72	4.86	-4.38	2.13
16,550.00	89.80	86.220	10,849.36	-673.87	5,854.91	5,893.49	1.29	-0.47	1.20
16,582.00	89.66	86.350	10,849.51	-671.80	5,886.85	5,925.00	0.60	-0.44	0.41
16,613.00	89.67	86.160	10,849.69	-669.77	5,917.78	5,955.53	0.61	0.03	-0.61
16,645.00	89.26	86.800	10,849.99	-667.81	5,949.72	5,987.06	2.38	-1.28	2.00
16,676.00	89.03	87.830	10,850.45	-666.35	5,980.68	6,017.68	3.40	-0.74	3.32
16,708.00	89.70	87.730	10,850.81	-665.12	6,012.65	6,049.33	2.12	2.09	-0.31
16,739.00	90.43	89.080	10,850.77	-664.25	6,043.64	6,080.03	4.95	2.35	4.35
16,771.00	90.57	89.600	10,850.49	-663.88	6,075.64	6,111.80	1.68	0.44	1.63
16,802.00	90.80	89.980	10,850.12	-663.77	6,106.63	6,142.60	1.43	0.74	1.23
16,834.00	90.94	91.180	10,849.64	-664.09	6,138.63	6,174.44	3.78	0.44	3.75
16,865.00	91.10	90.480	10,849.08	-664.54	6,169.62	6,205.29	2.32	0.52	-2.26
16,897.00	91.10	90.640	10,848.47	-664.86	6,201.61	6,237.13	0.50	0.00	0.50
16,929.00	91.21	90.410	10,847.82	-665.15	6,233.60	6,268.96	0.80	0.34	-0.72
16,961.00	91.07	90.530	10,847.19	-665.41	6,265.60	6,300.79	0.58	-0.44	0.38
16,992.00	91.14	90.170	10,846.59	-665.60	6,296.59	6,331.62	1.18	0.23	-1.16
17,023.00	91.34	90.170	10,845.92	-665.69	6,327.58	6,362.43	0.65	0.65	0.00
17,055.00	91.34	89.940	10,845.17	-665.72	6,359.57	6,394.24	0.72	0.00	-0.72
17,086.00	91.20	89.820	10,844.48	-665.66	6,390.57	6,425.04	0.59	-0.45	-0.39
17,118.00	90.94	92.040	10,843.89	-666.18	6,422.55	6,456.89	6.98	-0.81	6.94
17,150.00	90.94	92.020	10,843.36	-667.31	6,454.53	6,488.80	0.06	0.00	-0.06
17,181.00	91.34	92.150	10,842.74	-668.44	6,485.50	6,519.71	1.36	1.29	0.42
17,198.00	91.68	93.270	10,842.30	-669.24	6,502.48	6,536.67	6.88	2.00	6.59
17,213.00	91.95	93.320	10,841.82	-670.10	6,517.45	6,551.64	1.83	1.80	0.33
17,244.00	92.21	93.120	10,840.70	-671.84	6,548.38	6,582.58	1.06	0.84	-0.65
17,275.00	92.89	94.000	10,839.32	-673.77	6,579.29	6,613.51	3.59	2.19	2.84
17,307.00	93.01	93.660	10,837.67	-675.90	6,611.17	6,645.44	1.13	0.38	-1.06
17,338.00	93.28	92.840	10,835.97	-677.66	6,642.07	6,676.35	2.78	0.87	-2.65
17,369.00	93.25	92.600	10,834.20	-679.13	6,672.99	6,707.24	0.78	-0.10	-0.77
17,401.00	92.38	93.220	10,832.63	-680.75	6,704.91	6,739.15	3.34	-2.72	1.94
17,432.00	90.77	93.800	10,831.78	-682.65	6,735.84	6,770.10	5.52	-5.19	1.87

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 6	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 6	**Database:**	Casper District

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
17,464.00	90.87	94.210	10,831.32	-684.88	6,767.76	6,802.07	1.32	0.31	1.28
17,495.00	89.43	93.800	10,831.24	-687.04	6,798.68	6,833.04	4.83	-4.65	-1.32
17,527.00	89.36	94.300	10,831.58	-689.30	6,830.60	6,865.02	1.58	-0.22	1.56
17,621.00	89.73	94.020	10,832.33	-696.12	6,924.35	6,958.95	0.49	0.39	-0.30
17,716.00	90.23	93.790	10,832.36	-702.59	7,019.13	7,053.87	0.58	0.53	-0.24
17,811.00	90.54	93.090	10,831.72	-708.29	7,113.95	7,148.75	0.81	0.33	-0.74
17,906.00	92.18	94.050	10,829.47	-714.21	7,208.74	7,243.61	2.00	1.73	1.01
17,938.00	92.42	93.730	10,828.18	-716.38	7,240.64	7,275.56	1.25	0.75	-1.00
18,001.00	91.91	93.810	10,825.80	-720.52	7,303.46	7,338.46	0.82	-0.81	0.13
18,096.00	90.10	93.520	10,824.14	-726.59	7,398.24	7,433.34	1.93	-1.91	-0.31
18,190.00	89.23	93.840	10,824.68	-732.62	7,492.05	7,527.24	0.99	-0.93	0.34
18,285.00	88.93	92.800	10,826.21	-738.12	7,586.87	7,622.10	1.14	-0.32	-1.09
18,379.00	89.56	93.560	10,827.45	-743.33	7,680.72	7,715.95	1.05	0.67	0.81
18,474.00	90.70	93.820	10,827.23	-749.45	7,775.52	7,810.86	1.23	1.20	0.27
18,568.00	90.94	93.450	10,825.89	-755.41	7,869.32	7,904.75	0.47	0.26	-0.39
18,663.00	88.76	92.850	10,826.14	-760.63	7,964.17	7,999.60	2.38	-2.29	-0.63
18,757.00	88.16	91.660	10,828.66	-764.32	8,058.06	8,093.33	1.42	-0.64	-1.27
18,852.00	89.06	93.500	10,830.97	-768.60	8,152.93	8,188.10	2.16	0.95	1.94
18,946.00	88.59	92.660	10,832.90	-773.65	8,246.78	8,281.94	1.02	-0.50	-0.89
19,041.00	90.37	93.320	10,833.76	-778.60	8,341.64	8,376.77	2.00	1.87	0.69
19,136.00	89.80	93.210	10,833.62	-784.02	8,436.48	8,471.64	0.61	-0.60	-0.12
19,230.00	89.50	92.320	10,834.19	-788.55	8,530.37	8,565.46	1.00	-0.32	-0.95
19,325.00	89.06	92.140	10,835.38	-792.25	8,625.29	8,660.22	0.50	-0.46	-0.19
19,419.00	90.20	92.410	10,835.99	-795.98	8,719.22	8,753.98	1.25	1.21	0.29
19,514.00	91.64	93.010	10,834.47	-800.47	8,814.09	8,848.79	1.64	1.52	0.63
19,577.00	91.58	93.220	10,832.70	-803.89	8,876.98	8,911.67	0.35	-0.10	0.33
19,608.00	89.46	92.810	10,832.41	-805.52	8,907.93	8,942.61	6.97	-6.84	-1.32
19,640.00	88.59	92.790	10,832.96	-807.08	8,939.89	8,974.55	2.72	-2.72	-0.06
19,703.00	89.30	92.620	10,834.12	-810.06	9,002.81	9,037.42	1.16	1.13	-0.27
19,798.00	88.26	92.380	10,836.14	-814.20	9,097.69	9,132.19	1.12	-1.09	-0.25
19,892.00	88.09	91.860	10,839.14	-817.67	9,191.58	9,225.89	0.58	-0.18	-0.55
19,986.00	89.46	92.720	10,841.15	-821.43	9,285.48	9,319.64	1.72	1.46	0.91
20,051.00	90.84	93.670	10,840.97	-825.05	9,350.38	9,384.54	2.58	2.12	1.46
20,148.00	90.50	93.630	10,839.84	-831.23	9,447.17	9,481.44	0.35	-0.35	-0.04
20,243.00	88.49	92.140	10,840.68	-836.01	9,542.04	9,576.26	2.63	-2.12	-1.57
20,337.00	88.12	92.740	10,843.46	-840.01	9,635.91	9,670.01	0.75	-0.39	0.64
20,431.00	86.78	92.820	10,847.64	-844.56	9,729.71	9,763.74	1.43	-1.43	0.09
20,525.00	87.11	92.630	10,852.65	-849.03	9,823.47	9,857.42	0.40	0.35	-0.20
20,620.00	88.36	92.520	10,856.40	-853.29	9,918.30	9,952.15	1.32	1.32	-0.12
20,715.00	87.99	92.800	10,859.43	-857.70	10,013.15	10,046.91	0.49	-0.39	0.29
Last SDI MWD Survey ST 6									
20,780.00	87.99	92.800	10,861.71	-860.87	10,078.03	10,111.75	0.00	0.00	0.00
Projection to TD ST 6									

Company:	Oasis Petroleum	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Project:	McKenzie County, ND	**TVD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Site:	Lewis Federal	**MD Reference:**	GL 2110' & KB 25' @ 2135.00ft (Nabors B21)
Well:	Lewis Federal 5300 11-31 4BR	**North Reference:**	True
Wellbore:	ST 6	**Survey Calculation Method:**	Minimum Curvature
Design:	ST 6	**Database:**	Casper District

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
16,226.00	10,842.28	-691.82	5,531.76	TIP to ST 4
16,235.00	10,842.37	-691.85	5,540.76	First SDI MWD Survey ST 6
20,715.00	10,859.43	-857.70	10,013.15	Last SDI MWD Survey ST 6
20,780.00	10,861.71	-860.87	10,078.03	Projection to TD ST 6

Checked By: _____ Approved By: _____ Date: _____

AUTHORIZATION TO PURCHASE AND TRANSPORT OIL FROM LEASE – FORM 8

INDUSTRIAL COMMISSION OF NORTH DAKOTA
OIL AND GAS DIVISION
600 EAST BOULEVARD DEPT 405
BISMARCK, ND 58505-0840
SFN 5698 (03-2000)

TH

Well File No.
36047

Received
NOV 12 2019
ND Oil & Gas Division

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.
PLEASE SUBMIT THE ORIGINAL.

Well Name and Number	Qtr-Qtr	Section	Township	Range	County
LEWIS FEDERAL 5300 11-31 4BR	LOT1	153	100	0	McKenzie

Operator	Telephone Number	Field
Oasis Petroleum North America LLC	(281) 404-9573	BAKER

Address	City	State	Zip Code
1001 Fannin, Suite 1500	Houston	TX	77002

Name of First Purchaser	Telephone Number	% Purchased	Date Effective
Oasis Petroleum Marketing LLC	(281) 404-9627	100%	August 11, 2019

Principal Place of Business	City	State	Zip Code
1001 Fannin, Suite 1500	Houston	TX	77002

Field Address	City	State	Zip Code

Names of Transporter	Telephone Number	% Transported	Date Effective
Hiland Crude, LLC	(918) 588-5000	95%	August 11, 2019

Address	City	State	Zip Code
8811 South Yale Avenue, Suite 200	Tulsa	OK	74137

The above named producer authorizes the above named purchaser to purchase the percentage of oil stated above which is produced from the lease designated above until further notice. The oil will be transported by the above named transporter.

Other First Purchasers Purchasing From This Lease	% Purchased	Date Effective
		August 11, 2019
Other First Purchasers Purchasing From This Lease	% Purchased	Date Effective
		August 11, 2019
Other Transporters Transporting From This Lease	% Transported	Date Effective
Power Energy Logistics, LLC	5%	August 11, 2019
Other Transporters Transporting From This Lease	% Transported	Date Effective
		August 11, 2019
Comments		

I hereby swear or affirm that all transporters of Bakken Petroleum System oil, listed above implement or adhere to a tariff specification as stringent as the Commission's $VPCR_4$ requirement. ☒ 13.7 $VPCR_4$ Tariff Specification DAPL Tariff Authority

I hereby swear or affirm that the information provided is true, complete and correct as determined from all available records.		Date
		November 5, 2019
Signature	Printed Name	Title
	Claudia Arguelles	Contracts Administrator

Above Signature Witnessed By:

Signature	Printed Name	Witness Title
	Kenzie Buchanan	Scheduler

FOR STATE USE ONLY

Date Approved	NDIC CTB NO.
NOV 15 2019	29890
By	Melissa Hall
Title	Oil & Gas Production Analyst

Industrial Commission of North Dakota
Oil and Gas Division
Verbal Approval To Purchase and Transport Oil

Well or Facility No **36047**

Tight Hole **No**

OPERATOR

Operator	Representative	Rep Phone
OASIS PETROLEUM NORTH AMERICA LL	**Mike Haase**	**(701) 570-6752**

WELL INFORMATION

Well Name: **LEWIS FEDERAL 5300 11-31 4BR**

Inspector: **Richard Dunn**

Well Location	QQ	Sec	Twp		Rng	
	LOT1	**31**	**153**	**N**	**100**	**W**

County: **MCKENZIE**

Field: **BAKER**

Footages		
1149	Feet From the **N**	Line
257	Feet From the **W**	Line

Pool: **BAKKEN**

Date of First Production Through Permanent Wellhead **8/11/2019** **This Is The First Sales**

PURCHASER / TRANSPORTER

Purchaser	Transporter
OASIS PETROLEUM MARKETING LLC	**HILAND CRUDE, LLC**

TANK BATTERY

Single Well Tank Battery Number : 136047-01

SALES INFORMATION **This Is The First Sales**

ESTIMATED BARRELS TO BE SOLD	ACTUAL BARRELS SOLD	DATE
15000 BBLS	**600** BBLS	**8/11/2019**
BBLS	BBLS	
BBLS	BBLS	
BBLS	BBLS	
BBLS	BBLS	
BBLS	BBLS	
BBLS	BBLS	
BBLS	BBLS	
BBLS	BBLS	
BBLS	BBLS	

DETAILS

Must also forward Forms 6 & 8 to State prior to reaching 15000 Bbl estimate or no later than required time frame for submitting those forms.

Start Date	**8/11/2019**
Date Approved	**8/22/2019**
Approved By	**Richard Dunn**

RECEIVED
AUG 2 2 2019
ND OIL & GAS DIVISION

SUNDRY NOTICES AND REPORTS ON WELLS - FORM 4

INDUSTRIAL COMMISSION OF NORTH DAKOTA
OIL AND GAS DIVISION
600 EAST BOULEVARD DEPT 405
BISMARCK, ND 58505-0840
SFN 5749 (09-2006)

Well File No.
36047

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.
PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

☐ Notice of Intent	Approximate Start Date	☐ Drilling Prognosis	☐ Spill Report
☑ Report of Work Done	Date Work Completed: **August 11, 2019**	☐ Redrilling or Repair	☐ Shooting
☐ Notice of Intent to Begin a Workover Project that may Qualify for a Tax Exemption Pursuant to NDCC Section 57-51.1-03.	Approximate Start Date	☐ Casing or Liner	☐ Acidizing
		☐ Plug Well	☐ Fracture Treatment
		☑ Supplemental History	☐ Change Production Method
		☐ Temporarily Abandon	☐ Reclamation
		☑ Other	**Change well status to CONFIDENTIAL**

Well Name and Number					
Lewis Federal 5300 11-31 4BR					
Footages	Qtr-Qtr	Section	Township	Range	
1149 F N L 257 F W L	**LOT1**	**31**	**153 N**	**100 W**	
Field	Pool	County			
Baker	**Bakken**	**McKenzie**			

24-HOUR PRODUCTION RATE

Before		After	
Oil	Bbls	Oil	Bbls
Water	Bbls	Water	Bbls
Gas	MCF	Gas	MCF

Name of Contractor(s)			
Address	City	State	Zip Code

DETAILS OF WORK

Effective immediately, we request CONFIDENTIAL STATUS for the above referenced well.

Date of First Production August 11, 2019.

off confidential 2/11/20

Company		Telephone Number
Oasis Petroleum North America LLC		**713-770- 6570**
Address		
1001 Fannin, Suite 1500		
City	State	Zip Code
Houston	**TX**	**77002**

Signature	Printed Name
Jasmine Crawford	**Jasmine Crawford**
Title	Date
Regulatory Specialist	**August 13, 2019**
Email Address	
jcrawford@oasispetroleum.com	

FOR STATE USE ONLY

☐ Received	☒ Approved
Date: 8/23/19	
By: Matthew Eibek	
Title: Petroleum Resource Specialist	

WELL COMPLETION OR RECOMPLETION REPORT - FORM 6

INDUSTRIAL COMMISSION OF NORTH DAKOTA
OIL AND GAS DIVISION
600 EAST BOULEVARD DEPT 405
BISMARCK, ND 58505-0840
SFN 2468 (04-2010)

Received
JUN 19 2019
ND Oil & Gas Division

Well File No. **36047**

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.
PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

Designate Type of Completion
☑ Oil Well ☐ EOR Well ☐ Recompletion ☐ Deepened Well ☐ Added Horizontal Leg ☐ Extended Horizontal Leg
☐ Gas Well ☐ SWD Well ☐ Water Supply Well ☐ Other:

Well Name and Number	Spacing Unit Description
Lewis Federal 5300 11-31 4BR	**Sec. 31/32 T153N R100W**

Operator	Telephone Number	Field
Oasis Petroleum North America	**(281) 404-9500**	**Baker**

Address	Pool
1001 Fannin, Suite 1500	**Bakken**

City	State	Zip Code	Permit Type
Houston	**TX**	**77002**	☐ Wildcat ☑ Development ☐ Extension

LOCATION OF WELL

At Surface	Qtr-Qtr	Section	Township	Range	County
1149 F N L 257 F WL	**LOT1**	**31**	**153 N**	**100 W**	**McKenzie**

Spud Date	Date TD Reached	Drilling Contractor and Rig Number	KB Elevation (Ft)	Graded Elevation (Ft)
February 18, 2019	**March 29, 2019**	**Nabors B21**	**2135**	**2110**

Type of Electric and Other Logs Run (See Instructions)
MWD/GR from KOP to TD; CBL from int. TD to surface

CASING & TUBULARS RECORD (Report all strings set in well)

Well Bore	String Type	String Size (Inch)	Top Set (MD Ft)	Depth Set (MD Ft)	Hole Size (Inch)	Weight (Lbs/Ft)	Anchor Set (MD Ft)	Packer Set (MD Ft)	Sacks Cement	Top of Cement
Surface Hole	Surface	13 3/8	0	3948	17 1/2	54.5			1840	0
Vertical Hole	Intermediate	9 5/8	0	6141	13 1/2	36			1150	
Vertical Hole	Intermediate	7	0	11154	8 3/4	32			495	
Lateral1	Liner	4 1/2	10499	20757	6	13.5				

PERFORATION & OPEN HOLE INTERVALS

Well Bore	Well Bore TD Drillers Depth (MD Ft)	Completion Type	Open Hole/Perforated Interval (MD,Ft) Top	Bottom	Kick-off Point (MD Ft)	Top of Casing Window (MD Ft)	Date Perf'd or Drilled	Date Isolated	Isolation Method	Sacks Cement
Lateral1	20780	Perforations			10301					

PRODUCTION

Current Producing Open Hole or Perforated Interval(s), This Completion, Top and Bottom, (MD Ft)	Name of Zone (If Different from Pool Name)
Lateral 1-	

Date Well Completed (SEE INSTRUCTIONS)	Producing Method	Pumping-Size & Type of Pump	Well Status (Producing or Shut-In)

Date of Test	Hours Tested	Choke Size	Production for Test	Oil (Bbls)	Gas (MCF)	Water (Bbls)	Oil Gravity-API (Corr.) °	Disposition of Gas
		/64						

Flowing Tubing Pressure (PSI)	Flowing Casing Pressure (PSI)	Calculated 24-Hour Rate	Oil (Bbls)	Gas (MCF)	Water (Bbls)	Gas-Oil Ratio

GEOLOGICAL MARKERS

Formation	MD (Ft)	TVD (Ft)
Dakota	**5036**	**5021**
Kibbey Lime	**8478**	**8417**
First Charles Salt	**8622**	**8561**
UB		
Base Last Salt	**9304**	**9242**
Ratcliffe		
Mission Canyon	**9510**	**9448**
Lodgepole	**10079**	**10016**
False Bakken	**10961**	**10731**
Scallion		
Upper Bakken	**10987**	**10741**
Middle Bakken	**11038**	**10757**
Target		

PLUG BACK INFORMATION

Well Bore	Type of Plug	Top (Ft)	Bottom (Ft)	Sacks Cement

CORES CUT

Top (Ft)	Bottom (Ft)	Formation	Top (Ft)	Bottom (Ft)	Formation

Drill Stem Test

Test Date	Formation	Top (Ft)	Bottom (Ft)	BH Temp (ºF)	CL ppm	H2S ppm	Shut-in 1 (PSIG)	Shut-in 2 (PSIG)

Drill Pipe Recovery

Sample Chamber Recovery

Test Date	Formation	Top (Ft)	Bottom (Ft)	BH Temp (ºF)	CL ppm	H2S ppm	Shut-in 1 (PSIG)	Shut-in 2 (PSIG)

Drill Pipe Recovery

Sample Chamber Recovery

Test Date	Formation	Top (Ft)	Bottom (Ft)	BH Temp (ºF)	CL ppm	H2S ppm	Shut-in 1 (PSIG)	Shut-in 2 (PSIG)

Drill Pipe Recovery

Sample Chamber Recovery

Test Date	Formation	Top (Ft)	Bottom (Ft)	BH Temp (ºF)	CL ppm	H2S ppm	Shut-in 1 (PSIG)	Shut-in 2 (PSIG)

Drill Pipe Recovery

Sample Chamber Recovery

Test Date	Formation	Top (Ft)	Bottom (Ft)	BH Temp (ºF)	CL ppm	H2S ppm	Shut-in 1 (PSIG)	Shut-in 2 (PSIG)

Drill Pipe Recovery

Sample Chamber Recovery

Well Specific Stimulations

Date Stimulated	Stimulated Formation	Top (Ft)	Bottom (Ft)	Stimulation Stages	Volume	Volume Units **Barrels**
Type Treatment **Sand Frac**	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)	Maximum Treatment Rate (BBLS/Min)		
Details						

Date Stimulated	Stimulated Formation	Top (Ft)	Bottom (Ft)	Stimulation Stages	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)	Maximum Treatment Rate (BBLS/Min)		
Details						

Date Stimulated	Stimulated Formation	Top (Ft)	Bottom (Ft)	Stimulation Stages	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)	Maximum Treatment Rate (BBLS/Min)		
Details						

Date Stimulated	Stimulated Formation	Top (Ft)	Bottom (Ft)	Stimulation Stages	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)	Maximum Treatment Rate (BBLS/Min)		
Details						

Date Stimulated	Stimulated Formation	Top (Ft)	Bottom (Ft)	Stimulation Stages	Volume	Volume Units
Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)	Maximum Treatment Rate (BBLS/Min)		
Details						

ADDITIONAL INFORMATION AND/OR LIST OF ATTACHMENTS

This is a preliminary completion report. A supplemental report will be filed upon first production of the well.

I hereby swear or affirm that the information provided is true, complete and correct as determined from all available records.	Email Address **jswenson@oasispetroleum.com**		Date **06/18/2019**
Signature	Printed Name **Jennifer Swenson**	Title **Regulatory Specialist**	

SUNDRY NOTICES AND REPORTS ON WELLS - FORM 4

INDUSTRIAL COMMISSION OF NORTH DAKOTA
OIL AND GAS DIVISION
600 EAST BOULEVARD DEPT 405
BISMARCK, ND 58505-0840
SFN 5749 (09-2006)

RECEIVED
JUN - 6 2019
ND OIL & GAS DIVISION

Well File No.
36047

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.
PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

☑ Notice of Intent	Approximate Start Date: **June 4, 2019**	☐ Drilling Prognosis	☐ Spill Report
☐ Report of Work Done	Date Work Completed:	☐ Redrilling or Repair	☐ Shooting
☐ Notice of Intent to Begin a Workover Project that may Qualify for a Tax Exemption Pursuant to NDCC Section 57-51.1-03.	Approximate Start Date:	☐ Casing or Liner	☐ Acidizing
		☐ Plug Well	☐ Fracture Treatment
		☐ Supplemental History	☐ Change Production Method
		☐ Temporarily Abandon	☐ Reclamation
		☑ Other	**Waiver from tubing/packer requirement**

Well Name and Number					
Lewis Federal 5300 11-31 4BR					
Footages	Qtr-Qtr	Section	Township	Range	
1149 F N L 257 F W L	**LOT1**	**31**	**153 N**	**100 W**	
Field	Pool	County			
Baker	**Bakken**	**McKenzie**			

24-HOUR PRODUCTION RATE

Before		After	
Oil	Bbls	Oil	Bbls
Water	Bbls	Water	Bbls
Gas	MCF	Gas	MCF

Name of Contractor(s)			
Address	City	State	Zip Code

DETAILS OF WORK

Oasis Petroleum North America LLC requests a variance to NDAC 43-02-03-21 for the tubing/packer requirement: Casing, tubing, and cementing requirements during the completion period immediately following the upcoming fracture stimulation.

The following assurances apply:

1. the well is equipped with new 29# and 32# casing at surface with an API burst rating of 11,220 psi;
2. The Frac design will use a safety factor of 0.85 API burst rating to determine the maximum pressure;
3. Damage to the casing during the frac would be detected immediately by montioring equipement;
4. The casing is exposed to significantly lower rates and pressures during flowback than during the frac job;
5. The frac fluid and formation fluids have very low corrosion and erosion rates;
6. Production equipment will be installed as soon as possible after the well ceases flowing;
7. A 300# gauge will be installed on the surface casing during the flowback period

Company	Telephone Number		
Oasis Petroleum North America LLC	**281-404-9436**		
Address			
1001 Fannin, Suite 1500			
City	State	Zip Code	
Houston	**TX**	**77002**	
Signature	Printed Name		
	Jennifer Swenson		
Title	Date		
Regulatory Specialist	**June 4, 2019**		
Email Address			
jswenson@oasispetroleum.com			

FOR STATE USE ONLY

☐ Received	☒ Approved
Date: June 11, 2019	
By:	
Title: PETROLEUM ENGINEER	

Oasis Petroleum North America LLC

Lewis Federal 5300 11-31 4BR

1,149' FNL & 257' FWL
Lot 1 Section 31, T153N, R100W
Baker Field / Middle Bakken
McKenzie County, North Dakota

BOTTOM HOLE LOCATION:
860.57' S & 10,078' E of surface location or approx.
2,009.57' FNL & 190.57' FEL Lot 4 Sec. 32, T153N, R100W

Prepared for:
John O'Donnell
Oasis Petroleum North America LLC
1001 Fannin Suite 1500
Houston, TX 77002

Prepared by:
Dillon Johnson, Michelle Baker, Chris Kyler
PO Box 80507; Billings, MT 59108
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www.sunburstconsulting.com

Oasis Petroleum North America, LLC.
Lewis Federal 5300 11-31 4BR
Well Evaluation

Figure 1. Nabors drilling rig #B21 at the Oasis Petroleum NA, LLC. Lewis Federal 5300 11-31 4BR; March 2019, McKenzie County, North Dakota.

Introduction

The Oasis Petroleum NA, LLC. Lewis Federal 5300 11-31 4BR is located in Baker Field of the Williston Basin [Lot 1 Section 31, T153N, R100W]. The subject well is located approximately 8 miles south of the town of Williston, in McKenzie County, North Dakota **(Figure 1)**. The Lewis Federal 5300 11-31 4BR is the fourth of four wells drilled on the Lewis Federal 5300 11-31 pad. The subject well was drilled to replace the Lewis Federal 5300 11-31 4B, which had drilled to kick off point before being plugged and abandoned. This pad is set up as a 1,280 acre laydown spacing unit, with 500' N/S and 150' E/W drilling setbacks. The subject well is permitted to drill east from the surface location in section 31 into section 32. The well consists of a single Middle Bakken Member lateral, targeting a silty sandstone facies, with intent to intersect preferred porosity and fractures.

Engineering Operations Overview

The Lewis Federal 5300 11-31 4BR was spud on February 18, 2019. The surface hole was drilled with one 17.5" assembly to a depth of 3,629'. The complete BHA accomplishments can be found in an appendix to this report. The 13 3/8" surface casing was set to a depth of 3,598'. Due to the presence of several salt water disposal wells in the immediate area the decision was made to set a 9 5/8" isolation casing string through the Inyan Kara and into the Swift. The isolation portion was drilled with two 12 ¼" assemblies. The 9 5/8" casing was then set to set to a depth of 6,142'. The remainder of the vertical hole was completed with two 8.75" assemblies. The first vertical assembly drilled to a depth of 8,609' before being replace due to low ROP, the second drilled to a depth of 10,301' (KOP).

The curve assembly consisted of an 8.75" Baker DD505TS PDC bit, a 2.38° NOV mud motor, and Scientific Drilling's MWD tools. The curve was successfully landed at 11,170' MD on March 3, 2019. The projection to bit upon reaching casing point was that the assembly had an inclination of 91° and was at a TVD of 10,773', approximately 16' below the Upper Bakken Shale. Seven inch diameter 32# P-110 intermediate casing was set to 11,155' MD at landing. As the first lateral assembly drilled out of casing it was realized that the inclination in which casing was set was much less than had been projected. The first survey read an inclination of 78.21°. Projecting to the bit this placed the wellbore ~2' from the top of the Lower Bakken Shale. After confirming that the 78.21° was correct the decision was made to trip out and pick up a higher bend motor and displace the salt water drilling fluid with oil-based mud and slide drill ahead through the Lower Shale and return to the Middle Bakken. This resulted in 144' on Lower Bakken Shale exposure.

Due to the heavy (10.8 ppg) invert mud weight drill rates were substantially slower than the previous wells on the Lewis Federal 11-31 pad. The second lateral assembly drilled to a depth of 16,577' before a trip was required due to low ROP. While tripping in with the third lateral assembly, tight hole conditions were experienced at the Lower Bakken Shale contact. As the assembly was washing through the shale the BHA was oriented to the high side. The assembly washed through to a depth of 11,456' before stopping due to the rising MWD continuous inclination (98.53°). Since this inclination was ~5° higher than the surveys observed while drilling on March 7, it was postulated the assembly had unintentionally sidetracked while washing through the shale. This new wellbore was titled Sidetrack #1 and can be found in the surveys appendix of this report. The decision was made to set a cement plug at the intermediate casing shoe, sidetrack off the plug and proceed with a new lateral, titled Sidetrack #2.

Sidetrack#2 was drilled off the cement plug of the original wellbore at 11,152' on March 15, 2019. It drilled to a depth of 16,014' and was terminated in the Upper Bakken Shale on March 20, 2019. At this time the integrity of the survey data and calculated true vertical depths came into question due to corresponding depths of the previous wellbores that had been drilled on the pad. Several surveys were reshot throughout the sidetrack which resulted in inclination and azimuth swings of no more than 0.20 degrees.

Sidetrack #3 was initiated at 14,990' on March 21, 2019 and was drilled off of Sidetrack #2. Sidetrack #3 was terminated in the Upper Bakken Shale at a measured depth of 15,669' on March 22, 2019, 15' of TVD above Sidetrack #2, resulting in a formation dip of 87.31°. The decision to drill an additional sidetrack in effort to complete the lateral was made.

Sidetrack #4 was drilled was drilled off of Sidetrack #2, it was initiated at 14,500' on March 22, 2019. Sidetrack #4 was terminated in the Lower Bakken Shale on March 24, 2019, at 17,079'. An additional sidetrack was planned at this time. Sidetrack # 5 was drilled off of Sidetrack #4 at 16,825', it drilled to a depth of 16,834' at which point it was abandoned by order of Oasis Petroleum, and a new sidetrack point was picked.

Sidetrack #6 was drilled off of Sidetrack #4 at 16,235’ on March 26, 2019. The first lateral assembly of Sidetrack #6 drilled to a depth of 20,195’ before a trip was warranted due to an MWD failure. The final lateral assembly reached a total depth of 20,780’ on March 29, 2019, without further incident.

Thirteen six-inch lateral assemblies were used on this wellbore, which included tri-cones, sidetrack bits, and PDC’s, along with 1.5° and 2.25° motors. The last lateral assembly being bit #15RR2, a Reed PDC TKC53 with a 1.5° fixed Discovery motor. A total depth of 20,780’ was reached at 20:45 hours, central time, on March 29, 2019.

Offset Control

Offset well data can be found in the ‘Control Data’ section appended to this report. Offset wells were essential in providing control, making it possible to develop a prognosis of formation tops and curve landing target depth. The three primary offsets were, The *Oasis Petroleum North America, LLC, Lewis Federal 5300 11-31 3B,* the *Oasis Petroleum North America, LLC, Lewis Federal 5300 11-31 2B,* and the *Oasis Petroleum North America, LLC, Wade Federal 5300 41-30 8T3.* By referencing the gamma signature of these offsets and using formation thicknesses, a model was formed for the target interval pinpointing a strategic landing**.** Formation thicknesses expressed by gamma ray signatures in these offset wells were compared to gamma data collected during drilling operations in to successfully land the curve.

Geology

Sample evaluation began in the Otter Formation at 8,260’ measured depth (MD). Lagged samples were caught by Sunburst personnel in 30’ intervals through the vertical and curve, and 50’ intervals in the lateral. Rock samples were evaluated under wet and dry conditions using a stereo zoom binocular microscope for the identification of lithology including the presence of porosity and oil. Only observed prospective intervals are described here, but detailed lithological descriptions for all formations are provided in the ‘Lithology’ appendix.

The **Mission Canyon Formation** [Mississippian, Madison Group] was logged at 9,510' MD, 9,448’ TVD (-7,313' MSL). The Mission Canyon Formation is described as light to medium gray, cream, and light brown gray in color. Samples are predominately microcrystalline and are a firm mudstone. The limestone has an earthy, rarely crystalline texture. Also noted in in several samples are traces of fossil fragments. The lime mudstone is argillaceous in part throughout this interval. In certain areas poor intercrystalline was noted but there was no significant oil staining observed in samples. Throughout the Mission Canyon gas shows are promising, but slightly less than two previous wells on this pad, with an average background gasses ~31u with gas shows peaking at 77u.

Figure 2. Wet sample cuttings of silty sandstone from the Mission Canyon.

The **Bakken Formation**

The Upper Bakken Shale Member [Mississippian] was recorded at 10,987' MD, 10,741’ TVD (-8,606' MSL). Entry into this member is characterized by high gamma counts (>300 API), elevated background gas and increased rates of penetration. While drilling through the Upper Bakken Shale gas a background gas of 800u was observed, as well as a survey gas of 1917u. The distinct black shale is carbonaceous and *petroliferous,* as well as, firm and platy. Minerals including disseminated/nodular pyrite and trace calcite fracture fill were observed.

The Middle Bakken Member [Mississippian-Devonian] was entered at 11,038’ MD, 10,757' TVD (-8,622' MSL). Samples in the Middle Bakken are predominantly a light brown, medium to light gray, light brown gray, and occasionally cream silty sandstone. The silty sandstone is fine to very fine grained, friable to occasionally firm. The Middle Bakken typically contains sub-round to sub-angular grains. Samples are smooth, moderately sorted and poorly cemented by calcite. Rare to trace quantities of disseminated and nodular pyrite is present as is *trace to fair intergranular porosity*. Trace to rare *light-medium brown, spotty oil stain* was visible in many of these samples. While drilling the Middle Bakken background gasses ranged from ~200 to 3,000 units while several shows exceeded 3500u. Upon starting sidetrack#4 at 14,500’ the gas buster was turned on, gases averaged 1,000 to 3,000 units after that point.

Figure 3. Wet sample cuttings of silty sandstone from the Middle Bakken.

Geosteering

Well control insinuated the structure of the Lewis Federal 11-31 4BR would be a consistent down dip over the course of the lateral. Oasis operations geologists provided casing point slides prior to drill out, with Upper Bakken structure maps, in which they anticipated the structure to be down at 89.55º for the first 4,000’ of vertical section, then steepen to 89.20º to 6,000’ of vertical section, followed by 89.50º for the remainder of the lateral to completion. It was also suggested that the structure would be much like that of the first and closest lateral drilled on the pad, the Lewis Federal 5300 11-31 3B.

While drilling the curve of the Lewis Federal 5300 11-31 4BR the Lower Bakken Shale was contacted. Due to the lower than anticipated build rates through the curve, it was possible to use the gamma signatures throughout the middle member as a type log. Upon exiting the cement plug of Sidetrack #2 and coming down into target, it became apparent that the gamma signature was very similar to the initial curve landing and was the best reference to use as a control. The Middle Bakken Member of the Lewis Federal 5300 11-31 4BR was 39’ from shale to shale. Whereas when drilling the Lewis Federal 5300 11-31 3B, a thinner Middle Bakken model of 36’ was used.

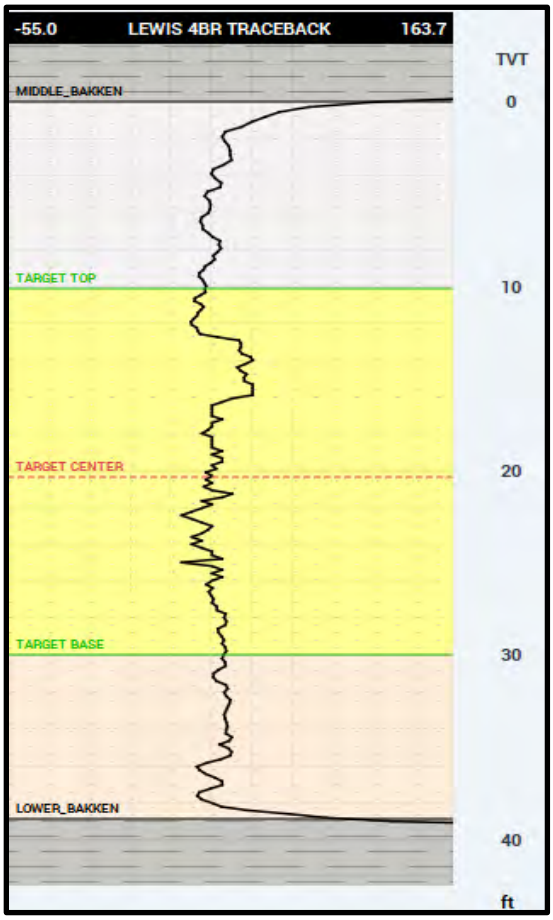

Figure 4. Target definition for the Oasis Petroleum, Lewis Federal 5300 11-31 4BR.

The target interval was defined by proximity to the shales and not by an ideal porosity interval. The 20’ target began 10’ below the Upper Bakken Shale and extended to 9’ above the Lower Bakken Shale. Prior to drilling out Sidetrack#2, it was determined by the initial drilling of Sidetrack#1, that the warmer chattery gamma located at 13’ TVT through 16’ TVT was going to be the most consistent steering guide in recognizing the upper portion of target. The non-descript, featureless gamma of 26’ TVT to 30’ TVT would

be the best indicator of being in the lower portion of target (**Figure 4**). The cool gamma markers located at 7' TVT and 36' TVT would be predications of close shale proximity and should not be approached as to make steering decision, but only be used as a last-ditch effort to pull a stop card, avoiding any shale strikes.

As drilling began into Sidetrack #2 it became apparent that subtle changes in gamma signature were hard to distinguish from one another. Average gamma counts of 44 api, with a maximum of 56 api, were present throughout target. The coolest gamma counts witnessed were 26-29 api, which was attributed to the marker just below target center at 23' TVT or the gamma Marker out target top at 7' TVT. With such a minuscule change in gamma signature it was possible to misinterpret one portion of target for another. The notion of targeting 13-16' TVT was possible, however, it was easily mistaken for the gamma near 21-26' TVT. The gamma signature as well as the exact count were near identical when exiting the top of target and the bottom of target. It is also worth mentioning that when the wellbore is being drilled at or near formation dip, gamma signature does not change, and can be easily misinterpreted as moving through either of these sections.

While drilling Sidetrack #2 several interpretations varying by 17' TVT in both directions, plausibly overlaid the gamma of the type log. As a result, best practices suggested to use the interpretation that most closely placed the wellbore near the TVD of the first wellbore, the Lewis Federal 5300 11-314BR, since the lateral was safely drilled to 16,577' MD (5,935.68' VS) without contacting the shale. As Sidetrack #2 was drilled ahead, projected target TVDs were set, that most closely matched the target TVDs of the original wellbore, as well as using the most plausible interpretations of gamma overlay to match. At an approximate measured depth 15,947' (~5,302' VS) and TVD of 10,825.88' the shale was contacted solely based on drilling parameters (lost weight on bit, increased rate of penetration). The driller continued drilling ahead to 16,014', when drilling parameters did not return to normal, and gamma visibly heated up, at which point he was instructed to pull off bottom. Bottoms up was circulated and shale was confirmed in the sample. The previous wellbore had been drilled within half a foot of TVD at this exact vertical section. Due to this it was thought that surveys were bad, and a gyro truck was called. Prior to the gyro truck's arrival Oasis had the rig trip out, re-shooting several surveys along the way. When the survey data came back with no less than 0.20° swings in azimuth or inclination, the decision was made not to drop a gyro and the truck was called off.

Two viable interpretations using gamma signature upon entering the shale could be done, placing the wellbore in the lower or upper shale. Unable to get a solid confirmation through sample cuttings or gamma overlay both scenarios were inspected closer. An Upper Bakken Shale strike scenario calculated a -0.80° dip from Upper Bakken Shale at curve landing to the shale strike. Whereas a lower shale strike calculation from Lower Bakken Shale at landing to shale strike produced a -0.35° dip calculation. The average dip of the first lateral from target entry to termination was exactly -0.80°. When the survey data of all re-shot surveys was imported it showed the TVD moving upward with each edit. Though unreliable, Directional Drillers plotted the continuous inclinations which also showed a substantial rise in TVD. It should be noted that not one of these tools could indicate the exact shale that was entered with 100% certainty alone. However, using all the information at hand Sunburst personnel came to the solid conclusion that the Shale strike was in fact an Upper Bakken Shale strike. The Oasis Operations Geologist was contacted by Sunburst in which valid concerns were made of an Upper Bakken Shale strike, and each piece of evidence voiced in favor of the Upper versus the Lower Shale, it was also stated how detrimental the conclusion was prior to drilling out the next sidetrack. Sunburst was informed that the Oasis Geologist's as a whole concluded that it was a Lower Bakken Shale strike and to proceed ahead using that interpretation.

Sidetrack #3 was then initiated at 14,990' under Oasis's assumption that the previous sidetrack struck the Lower Bakken Shale and therefore was drilled above Sidetrack #2. While drilling ahead a cool gamma Marker of 27 api was encountered at 15,460' which was the marker at 7' TVT, 7' from the Upper Bakken Shale. At 15,622' while sliding 90º left to veer Sidetrack #3 away from the existing sidetrack rates of penetration increased from 2.7 minutes a foot to one minute per foot. It was at this time the shale was

assumed to be entered near a TVD of 10,811'. The driller drilled to 15,669' feet before being instructed to pull of bottom. A bottoms up was circulated and shale was confirmed in the sample. The two shale strikes resulted in a dip calculation of approximately -2.69º. This abrupt drop in formation was not expected nor seen on both of the wells drilled on the pad. At this point Oasis geologists, onsite Sunburst Geology, and Sunburst's remote steering center all did completely separate interpretations of both shale strikes. The consensus of Sunburst geology, both onsite and remote, was that both shale strikes took place in the Upper Bakken Shale, Oasis geologists also came to that conclusion.

Sidetrack #4 was kicked off of Sidetrack #2 at 14,500'. Directional drillers were instructed by Oasis's drilling department to stay 10' of TVD below Sidetrack #2 at all times, and to not steer using gamma markers until safely past the first wellbore attempt. At this time, it was known that between the two shale strikes from 15,622' to 15,947' that there was a -2.69º down dip. At 16,315' a stop card was pulled by onsite geology because low gamma counts of 30 api were witnessed, along with the bit building to 91.31º resulting in a TVD of 10,842'. After speaking via phone call with Oasis Geology and drilling superintendents the decision was made to drop through target to a TVD of 10,871' (a vertical drop of nearly 30') at 17,000' or approximately 6,300' VS. Anticipating that the steep dip was still present Sunburst Geology agreed with the plan and directional proceeded ahead sliding down and keeping inclinations low enough, as to move down in section and gain on dip. The bit drilled to the deepest TVD of 10,857' when a combination of upward slides and building while rotating brought the bit upward 2' of TVD to 10,855'. At 17,015' a slide was initiated to attempt to push the bit back under dip. At 17,030' while sliding 160L rates of penetration increased from 2.1 minutes per foot to 1.13 minutes per foot, and weight on bit dropped off, which are classic signs of a shale strike. The driller was forced to stop drilling at 17,079' because he was unable to rotate ahead. A bottoms up was circulated confirming a shale strike. The approximate TVD of the shale strike was 10,855.77'. Considering we had previously drilled deeper than this, along with the fact that we were chasing a -2.70º down dip and confronted the shale with an inclination of 89.77º it was originally thought that it was the Upper Bakken Shale. Upon further investigation Geology was indecisive about which shale had been contacted. Recent dip calculation and bit inclination were suggestive of an Upper Bakken strike, but regional structure indicated a Lower Bakken Shale strike.

A fifth sidetrack was started at 16,825' and drilled to a depth of 16,834' at which point it was abandoned due the indecisiveness of the previous shale strike.

Oasis Geologists reached out to Sunburst Geology and the question of differentiating Upper from Lower Bakken Shale was asked as well as if minerals were present in sample cuttings that would prove the presence of a fault. Sunburst Geology went through all the of the shale samples that were onsite and concluded that there were no minerals out of the ordinary, no visible indications of coming into contact with a fault, and general lithology of both shales was too similar to distinguish between the two. Oasis requested to have the samples pulled from the Lower Bakken Shale strike while coming into the first lateral lab tested against the shale strike samples in the sidetracks. The Lower Bakken Shale samples were inspected, however the low quality and quantity of actual shale in those cuttings made extensive testing implausible. With the inability to distinguish between the shales through sample cuttings and gamma signature, the decision was made by Oasis to drill a sixth sidetrack at a depth between both known shales and proceed ahead cautiously.

At 16,235' Sidetrack #6 was drilled off of Sidetrack #4. The sidetrack was initially drilled downward dropping in TVD by 8'. 15' surveys were taken at this time and Sunburst was in contact with Oasis Operations Geologist after each survey, as well as drilling superintendents. Per discussion with the drilling superintendent Sunburst requested that the wellbore was not dropped past a depth of 10,855' TVD as to avoid the depth at which the previous shale strike took place and the Oasis drilling superintendent agreed, at an approximate MD of 16,450' and TVD of 10,850' the wellbore was leveled off with hopes to contact a recognizable gamma signature and calculate dip rate. As the wellbore was drilled ahead gamma closely resembled that of near to under target center. As drilling continued with near flat inclinations gamma

became non-descript, which was most indicative of moving through the lower half of target. At this point it was concluded that the previous shale strike was that of the Lower Bakken and a dip reversal took place. Near 17,100' a stop card was pulled by Sunburst Geology. Knowing the TVD of the Lower Bakken Shale was at 10,855' and having data suggestive of dip rolling over, becoming upward of more than 1º, it was imperative to slide up immediately to avoid another Lower Bakken strike. A sliding plan was then put in place with directional and the wellbore was safely veered back into target following a dip of +1.18º. As the wellbore ascended through target gamma overlaid near perfectly with the type log. Using the method of rotating and allowing the bit to gently build followed by a down slide, and gentle descent it was possible to find repeating gamma markers with indisputable dip calculations. Gamma markers mirrored the type log from 20,243' to 20,780' while descending almost the entire target confirming our correct position. Upon reaching TD the wellbore was just above the base of target.

Throughout each sidetrack regardless of position in zone the assembly consistently built inclination on rotation. There did not appear to be any noticeable hard streaks or intervals that were more or less favorable in relation to ROP. Drilling parameters proved to be the best and most reliable indication of a shale strike. It was impossible to pinpoint stratigraphic position or proximity to shales on sample cuttings alone, nor was it possible to differentiate an upper from lower shale strike.

The Lewis Federal 5300 11-31 4BR had an estimated overall formation dip of approximately -0.40º, which resulted in a shallower gross dip than that of the Lewis Federal 5300 11-31 3B. Local formation was much more severe from 5,000' VS to 6,000' VS, with averaged dips of -1.30º. From 6,000' VS to 8,000' VS unexpected up dips averaging +0.50º were present, follow by an average dip of -0.73º to TD. The lateral was drilled in 23 days from casing exit to total depth, with 13 lateral assemblies. A total depth of 20,780' MD was achieved at 20:45 hours on March 29, 2019.

Hydrocarbon Shows

Gas was continuously recorded from 3,650' to the completion of the lateral, along with the monitoring of free oil at the possum belly and shakers. In the closed mud system, hydrostatic conditions were maintained near balance, this allowed gas and fluid gains from the well to be evaluated. During the vertical, gas shows ranged from 10 to 1,145 units, against a 10.4 to 12.9 pound per gallon (PPG) diesel-invert, mud weight. Background concentrations in the lateral ranged from 200 to 3,000 units while several shows exceeded 3,500u. Upon starting Sidetrack #4 at 14,500' the gas buster was turned on, gases averaged 1,000 to 3,000 units after that point, against a 9.35-9.6 PPG saltwater gel drilling fluid. Chromatography of gas revealed typical concentrations of methane, ethane and propane characteristic of the Middle Bakken. Sample cuttings were examined for hydrocarbon "cut" by immersion of trichloroethylene and inspection under a UV fluoroscope. *Fluorescent cuts were generally pale yellow in color and had a diffuse habit at a slow to moderate speed*. *Visible green oil sheen* was present at the shakers while drilling Sidetrack #6, as well as a bright orange 5'-10' intermittent flare. While tripping at 20,195' a forceful, almost geyser-like flare was present of 20'+, along with *large amounts of green oil at the shaker* (**Figures 5** and **6** next page).

Figure 5. Oil at shakers and flare from trip at 20,195'.

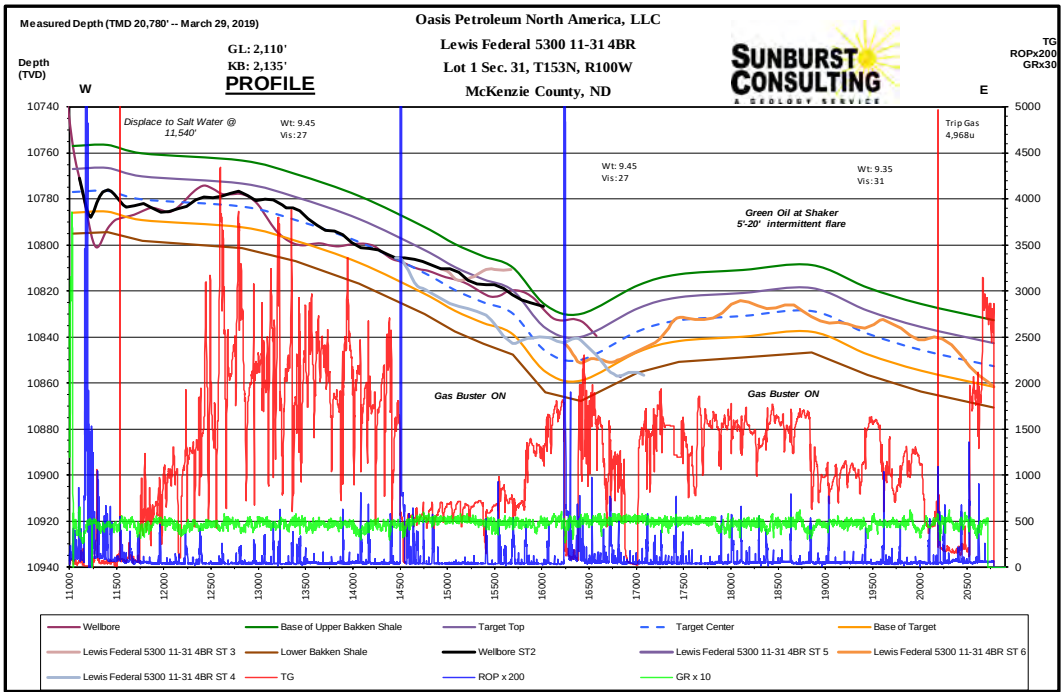

Figure 6. Cross-sectional profile of the Lewis Federal 5300 11-31 34BR displaying stratigraphic position, total gas, rate of penetration and gamma values.

Lessons Learned

While drilling Sidetrack #2 the accuracy of surveys and calculated TVD came into question. When there is an initial curve landing and drill out that produces severe dog legs, the accuracy of calculated TVD can have a large factor on TVD error. As a result, it's possible to have two wells drilled at the same TVD but at completely different portions of target, or in this case the shale. It's always best to just "drill the well you're on". Forcing gamma overlays to match with previously drilled wellbores can spell disaster quickly. The further you drill out, closing in on TD, makes the survey accuracy even worse. Drilling a lateral with intentions to TD at a certain TVD based on offset control, can be helpful at times, but should rarely outweigh

a recent, confident gamma correlation tied to a nearby stratigraphic type log. Projected structure should always be changed to actual apparent dip, based on recorded data.

Extensive testing, as suggested by Oasis, should be done on Upper Bakken and Lower Bakken samples in the near future. This testing could have prevented Sidetrack #3 along with much of the confusion of the shale strike terminating Sidetrack #4.

When following steep local dips, it's best to stop after a substantial amount of TVD has been drilled to reevaluate the situation and recalculate dip. It's imperative to catch and follow local structure, keeping regional structure in mind as well to anticipate any changes.

Finally, no matter how many wells are drilled on a pad, it does not mean that the subject well is going to follow that same structure. Following calculated structure known to be true with the data available is always best, as well as using regional dip as a secondary tool. Ignoring current gamma correlations to follow TVD targets based off control wells can be disastrous over great distances as TVD error compounds with each survey.

Summary

The *Lewis Federal 5300 11-31 4BR* is a well in Oasis Petroleum's horizontal Middle Bakken Member development program, in McKenzie County, North Dakota. The project was drilled from surface casing to total depth in 40 days. A total depth of 20,780' MD was achieved at 20:45 hours on 29 March 2019. The well-site team worked together to maintain the final sidetrack in the desired target interval for 97% within target.

Samples in the Middle Bakken Member are predominantly silty sandstone. These samples are light to medium gray, light brown, and occasionally cream silty sandstone. The silty sandstone is fine to very fine grained. The middle member typically contains sub round and occasionally sub-angular grains. Samples are smooth, moderately sorted and poorly cemented by calcite. Rare quantities of disseminated and nodular pyrite are present as is trace to fair intergranular porosity. Trace to rare light-medium brown, spotty oil stain was visible in most of these samples. The overall hydrocarbon "cuts", gas and hydrocarbon shows were encouraging and indicate an oil and gas rich system in the Middle Bakken Member.

The *Oasis Petroleum North America, LLC, Lewis Federal 5300 11-31 4BR* awaits completion operations to determine its ultimate production potential and commercial value.

Respectfully,

Dillon Johnson
Well Site Geologist
Vertical hole to Sidetrack #1

Michelle Baker
Well Site Geosteering Consultant
Sidetrack #2 to Total Depth

Sunburst Consulting, Inc.
01 April 2019

WELL DATA SUMMARY

OPERATOR:	**Oasis Petroleum North America LLC**
ADDRESS:	1001 Fannin Suite 1500 Houston, TX 77002
WELL NAME:	**Lewis Federal 5300 11-31 4BR**
API #:	33-053-08946
WELL FILE #:	36047
SURFACE LOCATION:	1,149' FNL & 257' FWL Lot 1 Section 31, T153N, R100W
FIELD/ OBJECTIVE:	Baker Field / Middle Bakken
COUNTY, STATE:	McKenzie County, North Dakota
RESERVATION:	N/A
BASIN:	Williston Basin
WELL TYPE:	Horizontal Development
ELEVATION:	GL: 2,110' KB: 2,135'
SPUD DATE:	February 18, 2018
BOTTOM HOLE LOCATION:	860.57' S & 10,078' E of surface location or approx. 2,009.57' FNL & 190.57' FEL Lot 4 Sec. 32, T153N, R100W
CLOSURE COORDINATES:	Closure Azimuth: 94.88° Closure Distance: 10,114.68'
TOTAL DEPTH / DATE:	20,780' on March 29, 2019 97.60% within target interval
TOTAL DRILLING DAYS:	40 days
PUMP INFO:	Stroke length - 12" Liner Inner Diameter - 6" for surface; 5.0" for vertical, curve and lateral
COMPANY MEN:	Doug Rakstad, Ian Anderson, Mike Ziegler, Mike Crow
COMPANY GEOLOGIST:	John O'Donnell

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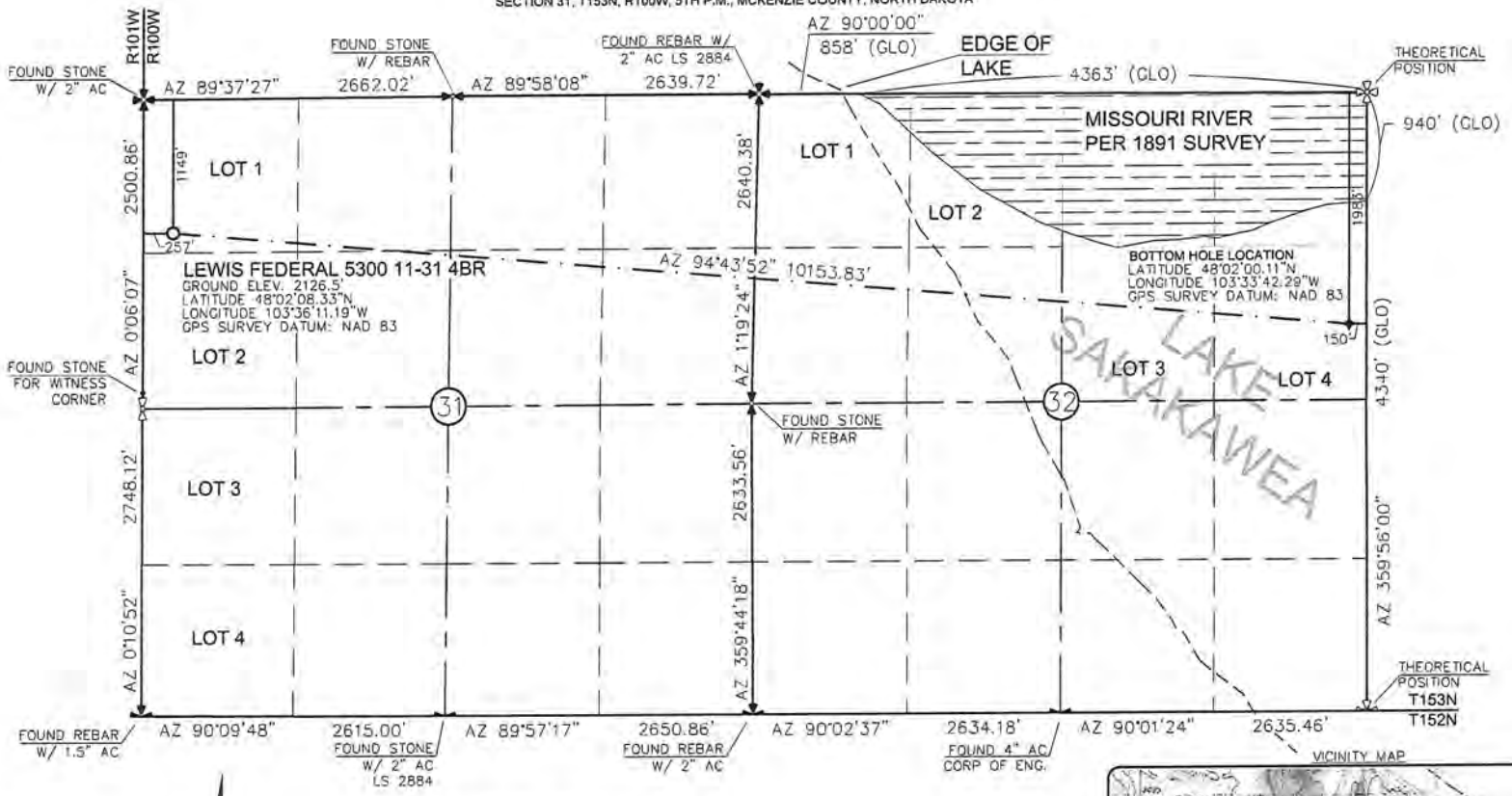
WELLSITE GEOLOGISTS:	Dillon Johnson, Michelle Baker, Chris Kyler
ROCK SAMPLING:	50' from 3,650' - 6,150' 30' from 8,260' - 11,152' 50' from 11,152 - 20,780' (TD)
SAMPLE CUTS:	Trichloroethylene
GAS DETECTION:	Terra SLS, Inc. TGC - total gas w/ chromatograph Serial Number(s): ML-466
DIRECTIONAL DRILLERS:	RPM Consulting, Pat's Consulting Christopher Bohn, Patrick Bidegaray, Jason Strandalien, Willem Zylstra
MWD:	Scientific Drilling Steve Gray, Matt Diaz
CASING:	Surface: 13 3/8" 54.5# J-55 set to 3,629' Isolation: 9 5/8" 36# J-55 set to 6,142' Intermediate: 7" 32# set to 11,152'
KEY OFFSET WELLS:	**Oasis Petroleum North America, LLC** **Lewis Federal 5300 11-31 3B** Lot 1 Section 31, T153N, R100W McKenzie County, ND **NDIC:** 30197 **KB:** 2,135'
	Oasis Petroleum North America, LLC **Lewis Federal 5300 11-31 2B** Lot 1 Section 31, T153N, R100W McKenzie County, ND **NDIC:** 30189 **KB:** 2,135'
	Oasis Petroleum North America, LLC **Wade Federal 5300 41-30 8T3** Lot 6 Sec. 30, T153N, R100W McKenzie County, ND **NDIC:** 28558 **KB:** 2,077'

WELL LOCATION

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



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0 1000
1" = 1000'

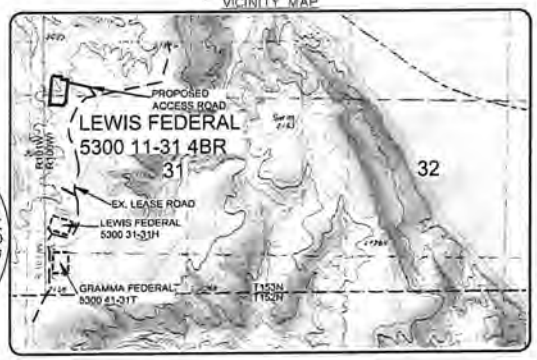
STAKED ON 3/26/18
VERTICAL CONTROL DATUM WAS BASED UPON CONTROL POINT 705 WITH AN ELEVATION OF 2158.3'

THIS SURVEY AND PLAT IS BEING PROVIDED AT THE REQUEST OF JOHN LEE OF OASIS PETROLEUM. I CERTIFY THAT THIS PLAT CORRECTLY REPRESENTS WORK PERFORMED BY ME OR UNDER MY SUPERVISION AND IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Joseph L. Kauffman
JOSEPH L. KAUFFMAN LS-9153

REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

VICINITY MAP



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OASIS PETROLEUM NORTH AMERICA, LLC
WELL LOCATION
SECTION 31, T153N, R100W, 5TH P.M.
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: JTH | Project No.: 517-09-183
Checked By: JLK | Date: JAN 2018

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www.interstateeng.com
Other offices in Minnesota, North Dakota and South Dakota

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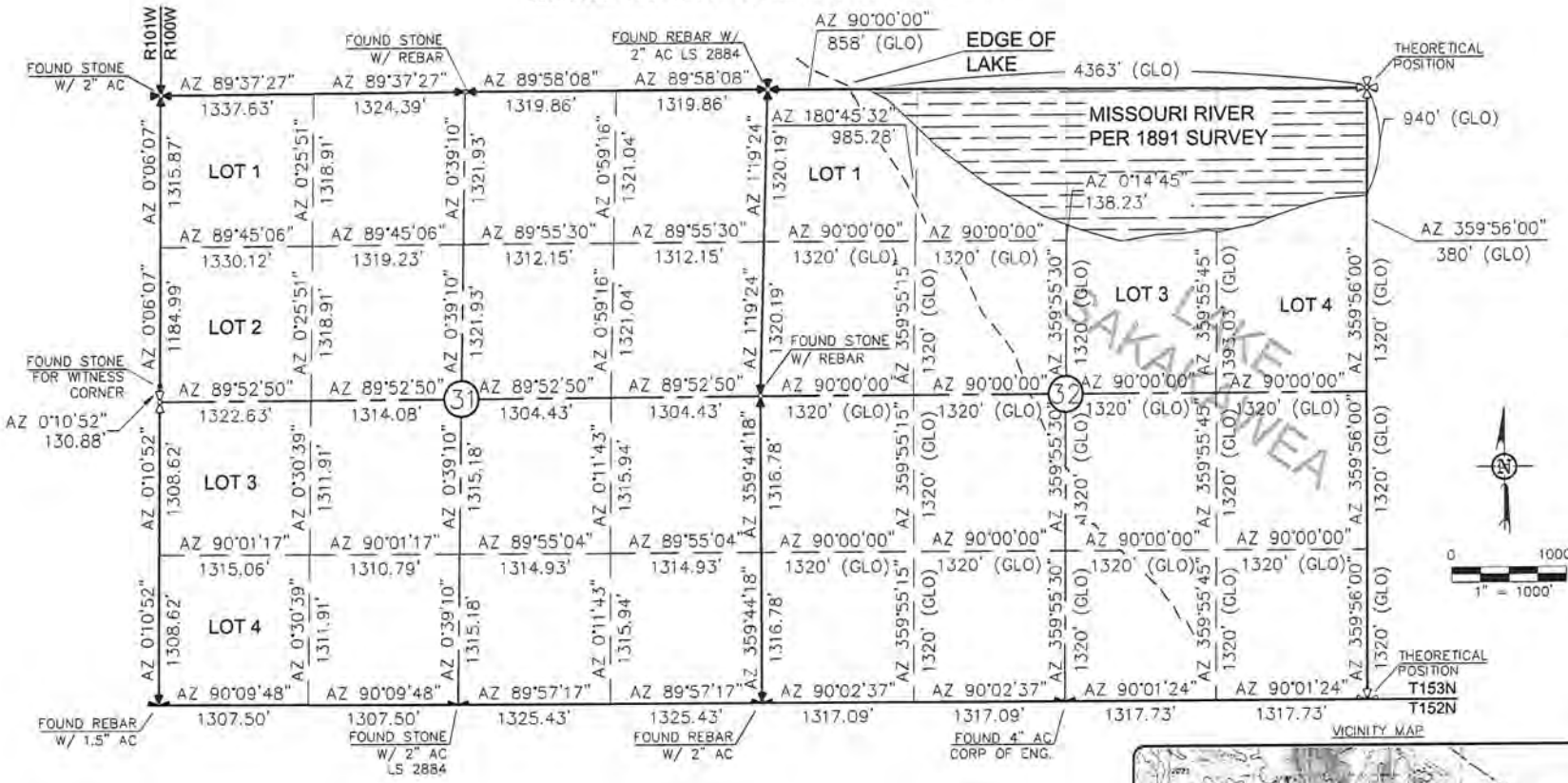
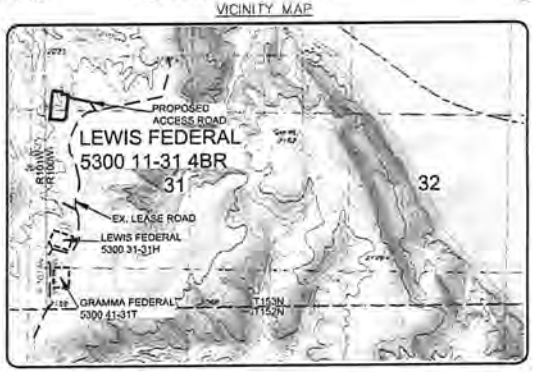
SHEET NO. 1/9

SECTION BREAKDOWN

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



VICINITY MAP



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ALL AZIMUTHS ARE BASED ON G.P.S. OBSERVATIONS. THE ORIGINAL SURVEY OF THIS AREA FOR THE GENERAL LAND OFFICE (G.L.O.) WAS 1897. THE CORNERS FOUND ARE AS INDICATED AND ALL OTHERS ARE COMPUTED FROM THOSE CORNERS FOUND AND BASED ON G.L.O. DATA. THE MAPPING ANGLE FOR THIS AREA IS APPROXIMATELY -0°03'.

REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

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SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: JDH | Project No.: 812-09-163
Checked By: JLK | Date: JULY 2018

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PAD LAYOUT

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
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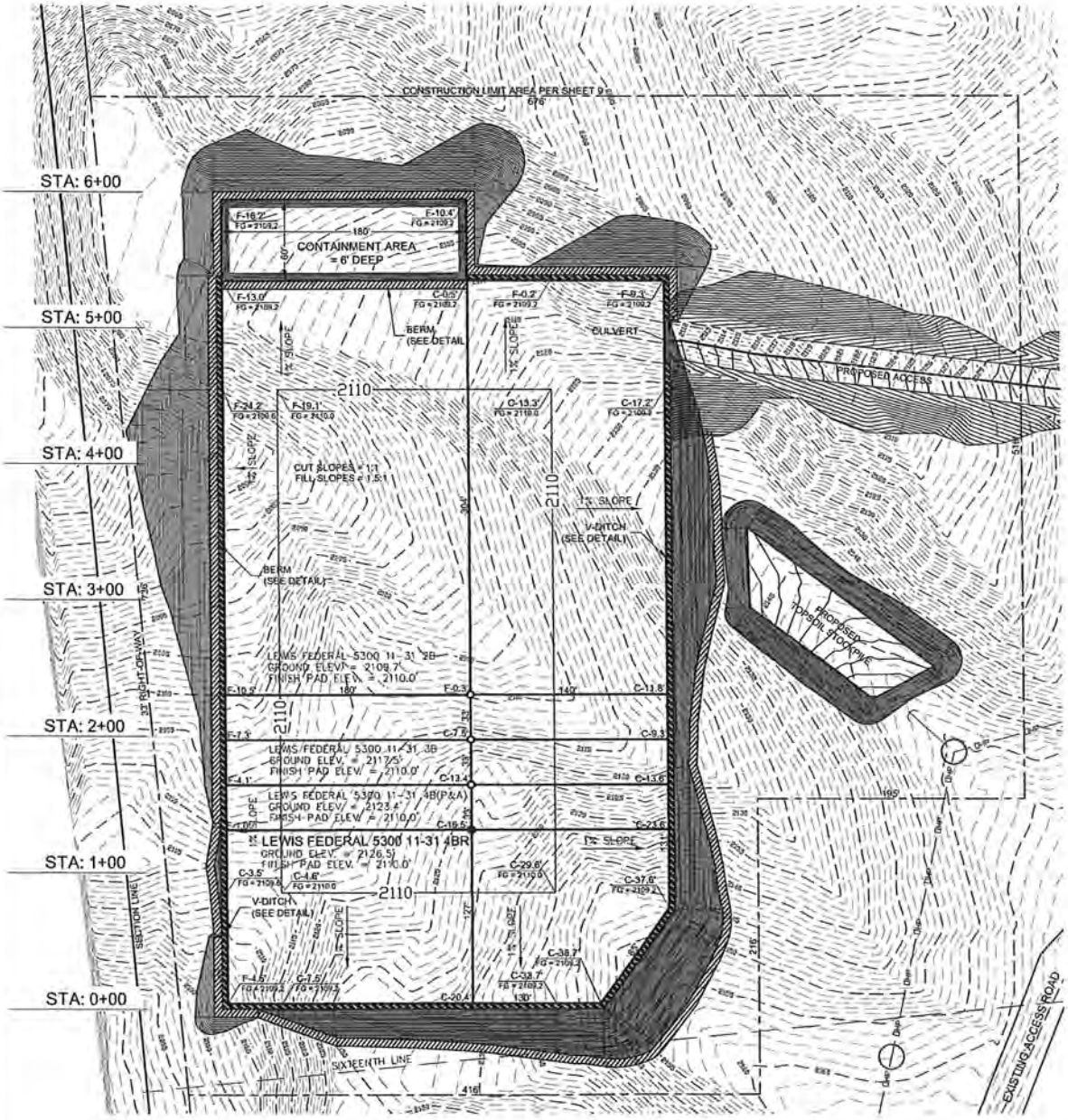
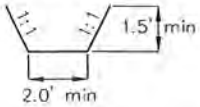


NOTE: Pad dimensions shown are to usable area, the v-ditch and berm areas shall be built to the outside of the pad dimensions.

V-DITCH DETAIL



– BERM
– DITCH
—— Proposed Contours
– – – – – – Original Contours

REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

NOTE: All utilities shown are preliminary only, a complete utilities location is recommended before construction.

0 80
1" = 80'

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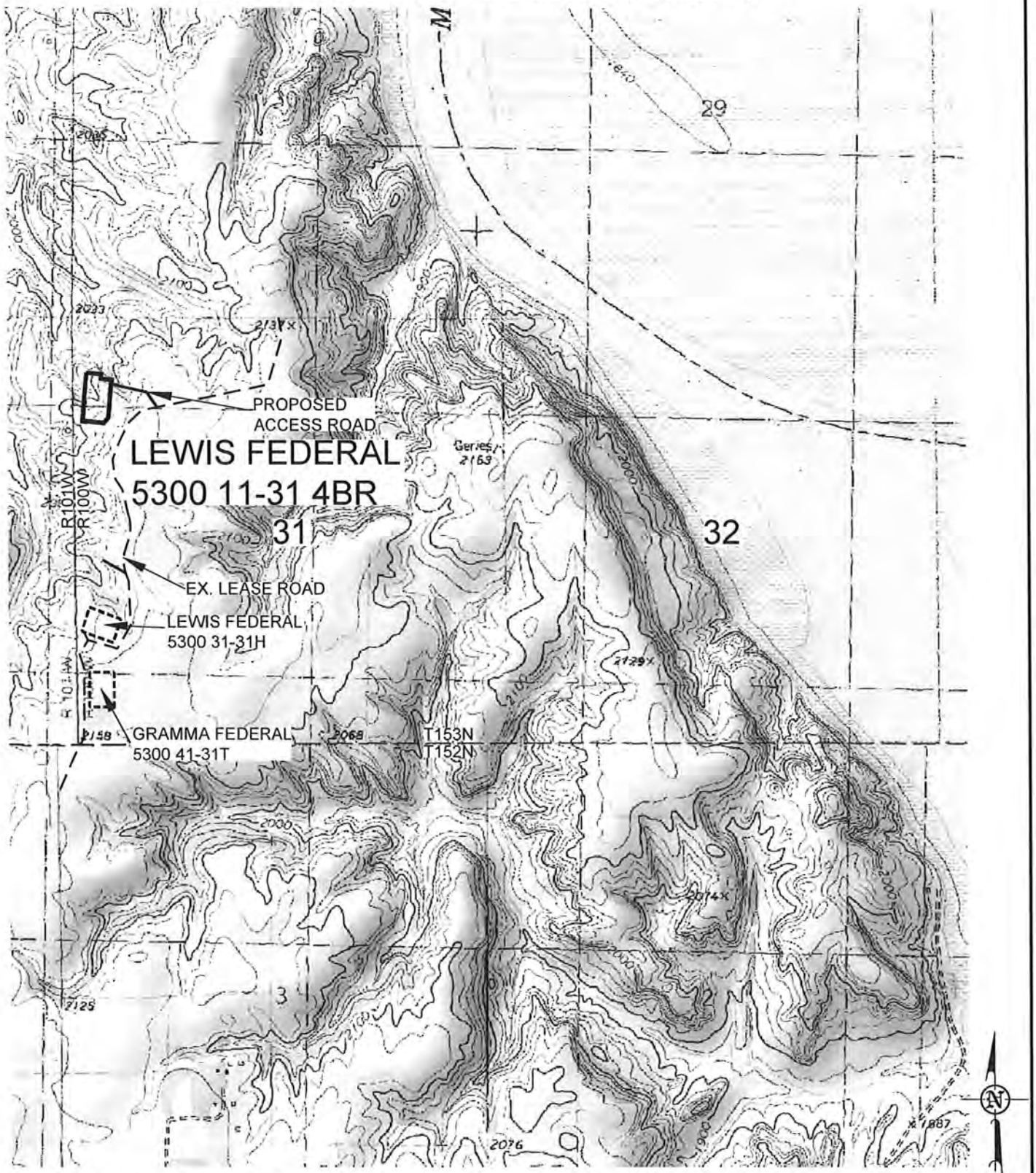
OASIS PETROLEUM NORTH AMERICA, LLC
PAD LAYOUT
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

Revision No.	Date	By	Description

QUAD MAP

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



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OASIS PETROLEUM NORTH AMERICA, LLC
QUAD MAP
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

Revision No.	Date	By	Description

COUNTY ROAD MAP

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
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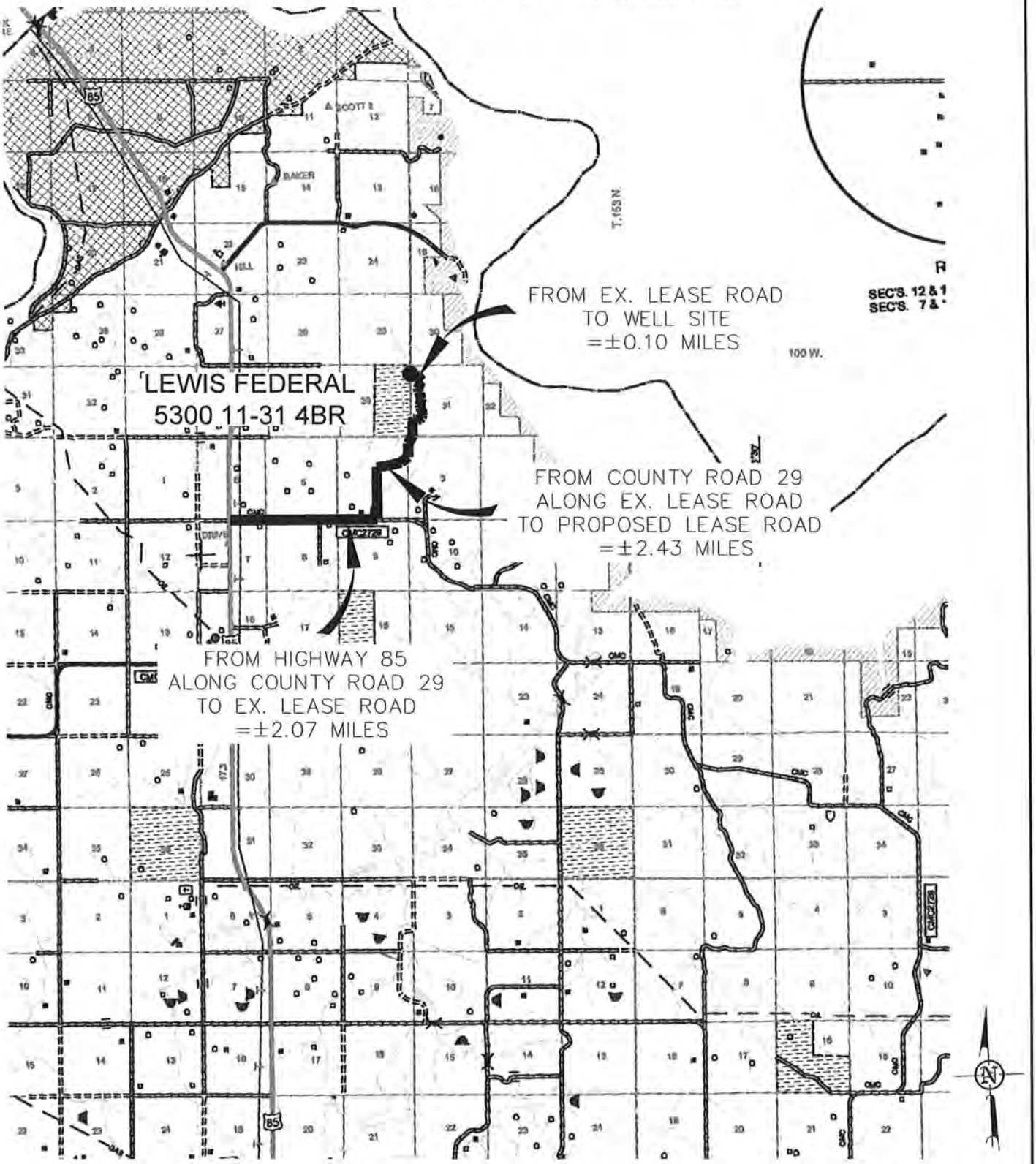

SCALE: 1" = 2 MILE

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OASIS PETROLEUM NORTH AMERICA, LLC
COUNTY ROAD MAP
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
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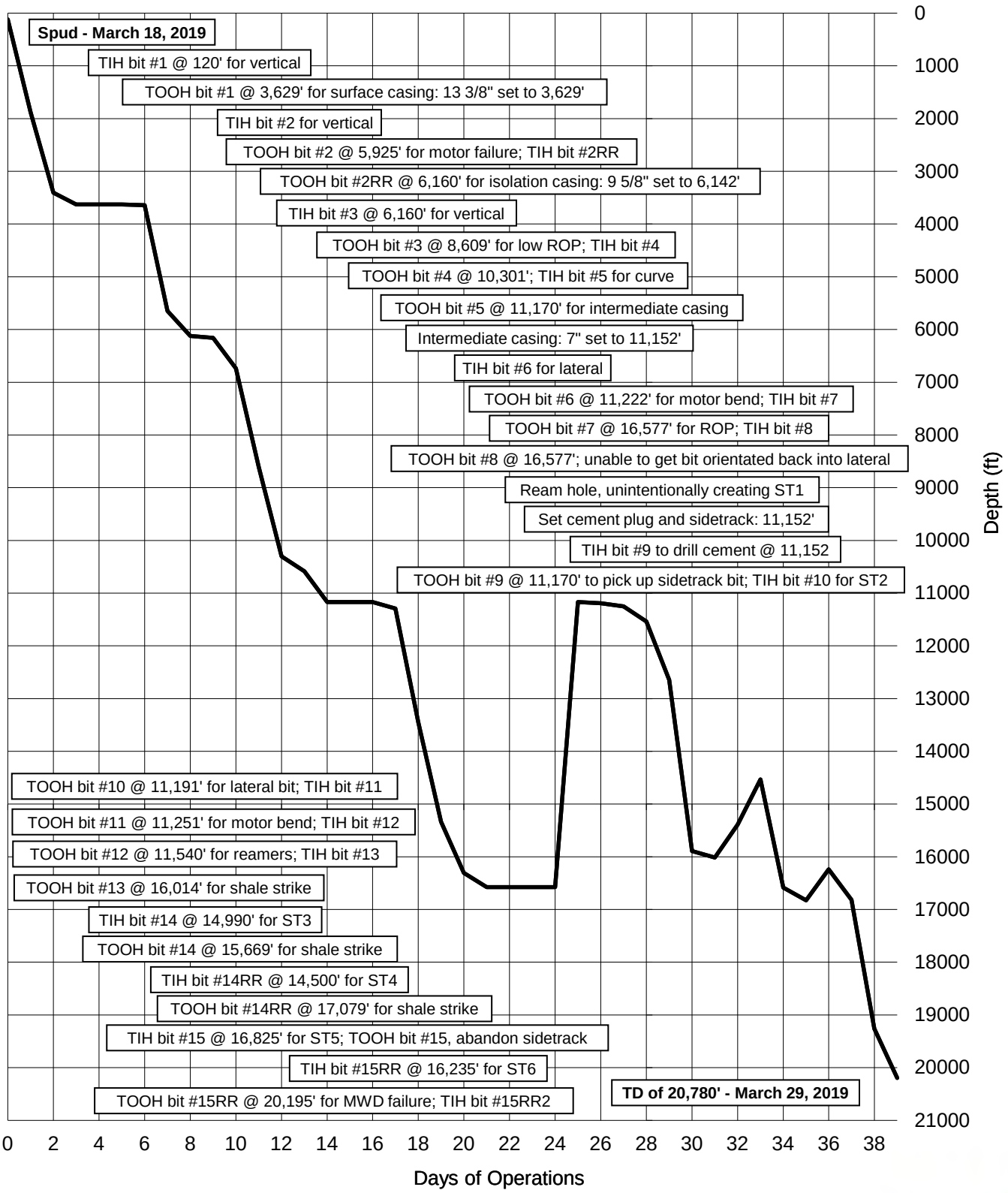
Revision No.	Date	By	Description

TIME VS. DEPTH

Oasis Petroleum North America LLC

Lewis Federal 5300 11-31 4BR



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MORNING REPORT SUMMARY

Rig Contractor:				Nabors B21					Tool Pushers:					Matt Piehl, Todd Miller, Darren Birkeland	
Day	Date 2019	Depth (0600 Hrs)	24 Hr Footage	Bit #	WOB (Klbs) RT	RPM (RT)	WOB (Klbs) MM	RPM (MM)	PP	SPM 1	SPM 2	SPM 3	GPM	24 Hr Activity Summary	Formation
0	2/18	120'	0'	-	-	-	-	-	-	-	-	-	-	Skid rig from Lewis Federal 5300 11-31 2B to the Lewis Feral 5300 11-31 4BR; rig up; prepare mud tanks; slip and cut 84' of drill line; rig service.	-
1	2/19	1,880'	1,760'	1	23	55	20	171	3200	85	85	85	1068	Clean pit; get fresh water going; pretreat fresh water with gypsum; get gun line for cellar rigged up; pre-job safety and pre-spud meeting; pick up BHA; spud well at 20:00 hours on 2/18/19; rotary drilling from 120'-177'; trouble shoot MWD tool, change transducer; rotary drilling, sliding as needed, from 177'-1,880'.	-
2	2/20	3,405'	1,525'	1	23	75	25	171	3400	85	85	85	1068	Circulate and condition; circulate mud ring; rotary drilling, sliding as needed, from 1,880'-2,827'; rig service; downtime working on resetting electrical rectifiers; rig service; circulate and condition; pump bottoms up x2; rotary drilling, sliding as needed, from 2,827'-3,405'.	Pierre
3	2/21	3,629'	224'	1	25	75	25	171	3400	85	85	85	1068	Rotary drilling from 3,405'-3,529'; circulate and condition bottoms up 1.5x; TOOH strapping pipe; lay down BHA; pick up BHA; TIH; ream hole from 2,350'-3,529'; rotary drilling, sliding as needed, from 3,529'-3,629'; circulate and condition bottoms up 1.5x; rig service; back ream and blow down kelly x3; TOOH; lay down collars and BHA; rig service; clean rig floor to run casing; pre-job safety meeting with Noble; rig up Noble casing crew; run casing.	Pierre
4	2/22	3,629'	0'	-	-	-	-	-	-	-	-	-	-	Run casing; circulate casing; rig service; circulate and condition; rig down casing crew; rig up cementers; blow down mud system and flush with diesel; primary cementing; displace cement with invert; rig down cementers, drain and cutoff casing with welder.	Pierre
5	2/23	3,629'	0'	-	-	-	-	-	-	-	-	-	-	Install well heads; cut casing; lay down casing; remove casing elevators and bell extensions; install 5" elevators; rig up flare line and panic line; clean pits; nipple up BOPs B-section; stab BOP; nipple up BOP; rig service; pre-job safety meeting prior to testing; test BOPs; annular failed to test.	Pierre
6	2/24	3,644'	15'	2	10	25	10	87	2400	62	62	62	541	Test BOPs and blinds, failed test; lay over catwalk; remove rotating head; remove flow line, fill line, spacer spool, catch pan; change out annular; test BOPs and annular; install catch pan; nipple up BOPs; install rotating head; hammer up; test BOPs; test orbital valve to 1000 psi, pass test; remove wear bushing; lay down BHA from previous well; pick up BHA; trip in hole; test MWD tool at 1,500'; drill cement out of 13 3/8" casing, tag float at 3,587' and shoe at 3,629'; rotate ahead 15' to 3,644'; circulate and condition bottoms up.	Pierre
7	2/25	5,650'	2,006'	2	15	45	10	110	4550	79	79	79	689	Circulate and condition; FIT using 13.8 ppg EMW held to 502 psi; rotary drilling, sliding as needed, from 3,644'-3,932'; troubleshoot MWD equipment; rotary drilling, sliding as needed, from 3,932'-4,766'; rig service; rotary drilling, sliding as needed, from 4,766'-5,336'; circulate and condition; weight mud up to 12.8+ ppg; rotary drilling, sliding as needed, from 5,336'-5,650'.	Inyan Kara
8	2/26	6,122'	472'	2RR	25	45	10	117	4650	79	79	79	689	Rotary drilling, sliding as needed, from 5,650'-5,925; work as directed by operator, troubleshoot MWD and mud motor; back reaming out of hole 5,925'-5,000'; spot pill, flow check, spot LCM pill; flow check; service rig; TOOH, 100'/min; lay down BHA; working as directed by operator, clean floor; pick up BHA; TIH; drill F/ 5,925'-6,004'; service rig; drill F/6,004'-6,122'.	Swift

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MORNING REPORT SUMMARY

Rig Contractor:				Nabors B21					Tool Pushers:					Matt Piehl, Todd Miller, Darren Birkeland	
Day	Date 2019	Depth (0600 Hrs)	24 Hr Footage	Bit #	WOB (Klbs) RT	RPM (RT)	WOB (Klbs) MM	RPM (MM)	PP	SPM 1	SPM 2	SPM 3	GPM	24 Hr Activity Summary	Formation
9	2/27	6,160'	38'	2RR	15	50	-	117	4700	79	79	79	689	Rotary drilling F/6,122'-6,160'; circulate and condition 1.5 bottoms up; back ream 6,160'-5,000'; spot pill, flow check, spot LCM pill; TOOH @ 100'/min; lay down BHA; install/remove wear bushing; PJSA w/ casing crew; rig up casing crew; run casing; service top drive.	Swift
10	2/28	6,740'	580'	3	25	50	20	159	4500	69	69	69	613	Run casing; circulate/cement/displace; circulate casing; pre job safety with casing crew; rig up/down to run casing - run down casing crew; pre job safety with cement crew; circulate/cement/displace - rig up cementers; circulate/cement/displace - pump cement, 120 spacer, 291 cement, 492 OBM; pre job safety - with cement crew; circulate/cement/displace - rig down cementers; working as directed by operator lay down landing joint, rig down bell ext, casing elevators, install 5" elevators, OBM yes; service rig; working as directed by operator install packoff with cactus; install/remove wear bushing; pick up BHA; TIH; drilling cement float at 6,104' shoe at 6,147' drill to 6,180'; C&C; FIT to 13 ppg equivalent 630 PSI, rotary drilling F/6,180'-6,740'; service top drive.	Rierdon
11	3/1	8,609'	1,869'	3	30	45	35	159	3600	69	69	69	613	Drills-BOP etc. - BOP drill 47 secs to stations; rotary drilling sliding when needed F/6,740'-8,142'; drills-BOP etc. - H2S drill; rotary drilling sliding as needed F/8,142'-8,609'; circulate and condition, build and pump dry job; TOOH; PJSA to lay down BHA; service rig.	Kibbey "Lime"
12	3/2	10,301'	1,692'	4	40	45	40	157	4300	68	68	68	603	Pre job safety - on BHA; lay down BHA -lay down bit, motor, pick up bit, motor, function blinds/HCR; TIH; working as directed by operator - fill pipe, test tool; cut drilling line - 14 wraps; service rig; TIH; rotary drilling - sliding when needed 8,609'-9,200', OBM yes; rotary drilling sliding as needed F/9,200'-10,301'; C&C btms up; TOOH.	Lodgepole
13	3/3	10,587'	286'	5	25	20	60	266	3000	59	59	59	531	TOOH - strap out of hole; pre job safety - on BHA; lay down BHA - bit, motor, 3 monels, pony, MWD, function blinds/HCR; pre job safety - with wireline crew; cased hole logs- rig up wireline crew; cased hole logs CBL 9 5/8; pre job safety - with wireline crew; open hole logs - with wireline crew; pre job safety - on BHA; pick up BHA - bit, motor, 3 monels, pony, MWD, function blinds/HCR; TIH - OBM yes; TIH; reaming/washing salts; TIH; service rig; service top drive; pre job safety mid tour on extreme weather conditions; slide drilling building curve F/10,301'-10,492'; Direction work trouble shoot MWD; slide drilling rotate as needed F/10,492'-10,587'.	Lodgepole
14	3/4	11,170'	583'	5	25	20	45	263	3300	59	59	59	536	Slide drilling -rotating when needed F/10,587'-11,057'; tool orientation - trouble shoot MWD; service rig OBM yes; tool orientation trouble shoot MWD; slide drilling building curve F/ 11,057'-11,150' ; reaming/washing to bottom; rotary drilling F/11,150'-11,170'; short trip; C&C; lay down drill pipe; service rig.	Middle Bakken
15	3/5	11,170'	0'	5	-	-	-	-	-	-	-	-	-	Lay down drill pipe 5" DP and HWDP; service rig; lay down drill pipe 5" DP and HWDP; pre job safety - on BHA; lay down BHA - bit, motor, 3 monels, 2 pony, MWD, function blinds, HCR; install/remove wear bushing; pre job safety - with casing crew; rig up/down to run casing - rig up casing crew; pre job safety - run meeting; run casing - 7" casing; run casing; service rig.	Middle Bakken

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MORNING REPORT SUMMARY

Rig Contractor:				Nabors B21					Tool Pushers:					Matt Piehl, Todd Miller, Darren Birkeland	
Day	Date 2019	Depth (0600 Hrs)	24 Hr Footage	Bit #	WOB (Klbs) RT	RPM (RT)	WOB (Klbs) MM	RPM (MM)	PP	SPM 1	SPM 2	SPM 3	GPM	24 Hr Activity Summary	Formation
16	3/6	11,170'	0'	6	-	-	-	-	-	-	-	-	-	Pre job safety with Nabors casing; run casing; C&C B/U; run casing; C&C; waiting on 3rd party personnel/Halliburton; pre job safety with Nabors casing; lay down 3rd party tools R/D Nabors casing crew; C&C; pre job safety with Halliburton; pick up 3rd party tools R/U Halliburton; primary cementing OBM yes; primary cementing; pressure test CSSG/Shoe /2500 PSI for 30 min; pre job safety / to rig down cementers; primary cementing/ rig down cementers; working as directed by operator/install pack off; install/remove wear bushing; working as directed by operator/ change out saver sub/ elevators; pick up BHA; TIH/test tool; service top drive; cut drilling line/14 wraps; TIH; drilling cement.	Middle Bakken
17	3/7	11,293'	123'	7	15	25	26	262	2950	53	53	-	308	Drilling cement float @ 11,067' shoe @ 11,152;' C&C B/U; FIT @ 11,185' 13 PPG EMW 1825 PSI 30 min; rotary drilling F/11,185'-11,222'; C&C wait on orders mix and send slug; TOOH remove RHR install TN; pre job safety PJSM for BHA; lay down BHA; working as directed by operator clean pits; service rig OBM no boiler yes; working as directed by operator/clean pits; pick up BHA; TIH/fill pipe/pull trip, install rotating head; displace to OBM; C&C/ get mud weigh 11 PPG/ 80 20 oil water; rotary drilling F/11,222'-11,293'.	Lower Bakken Shale
18	3/8	13,443'	2,150'	7	20	45	25	262	2950	53	53	-	308	Rotary drilling F/11,293'-12,299'; service rig OBM yes; rotary drilling F/12,299-13,443'; service top drive.	Middle Bakken
19	3/9	15,337'	1,894'	7	20	45	25	262	5000	-	53	53	308	Rotary drilling F/13,443'-14,391'; service rig OBM yes; rotary drilling F/14,391'-15,337'; service top drive.	Middle Bakken
20	3/10	16,305'	968'	7	22	55	20	262	5100	-	53	53	308	Rotary drilling F/15,337'-15,777'; service rig OBM yes; rotary drilling F/15,777'-16,305'; service rig.	Middle Bakken
21	3/11	16,577'	272'	8	25	55	20	262	5200	-	53	53	308	Rotary drilling F/16,305'-16,398'; pre job safety for TOOH; TOOH 20 STDS of DP and run in 20 STDS HWDP; rotary drilling F/16,398'-16,577'; spot pill mix and send slug; TOOH 100'/min as per oasis; service rig OBM yes; TOOH/pull rotating head; lay down BHA; pick up BHA; TOOH; pre job safety for cut and slip fill pipe test tool; cut drilling line; working as directed by operator/pick up shock sub and agitator - 40 stands below test tool; TIH/install rotating head; reaming/washing F/11,270'-11,380'; service top drive.	Middle Bakken
22	3/12	16,577'	0'	8	-	-	-	-	-	-	-	-	-	Reaming/washing; service rig OBM yes; C&C/pump dry job; TOOH pull rotating head; lay down BHA; pick up BHA; TIH @ 120 FPM/fill pipe/test tool/ install shock sub and agitator/test tool again; reaming & washing through shale	Middle Bakken
23	3/13	16,577'	0'	-	-	-	-	-	-	-	-	-	-	Reaming/washing; C&C; TOOHL/D agitator/shock sub and remove RHR and install TN; pre job safety for laying down BHA; lay down BHA; pre job safety with Noble; pick up 3rd party tools R/U Noble; waiting on 3rd party personnel trouble shoot Noble casing tongs pick up 2 7/8 tubing OBM yes; working as directed by operator run 600 ft 2 7/8 tubing; pre job safety to rig down Noble/rig down Noble; TOOH/100 FPM/install rotating head; reaming/washing T/11,400'; waiting on 3rd party personnel/Halliburton.	Middle Bakken

MORNING REPORT SUMMARY

Rig Contractor:		Nabors B21							Tool Pushers:					Matt Piehl, Todd Miller, Darren Birkeland	
Day	Date 2019	Depth (0600 Hrs)	24 Hr Footage	Bit #	WOB (Klbs) RT	RPM (RT)	WOB (Klbs) MM	RPM (MM)	PP	SPM 1	SPM 2	SPM 3	GPM	24 Hr Activity Summary	Formation
24	3/14	16,577'	0'	-	-	-	-	-	-	-	-	-	-	Circulate and condition; rig up Halliburton; cement plug; TOOH at 20'/min as per Oasis; rig down Halliburton; laydown Halliburton tools; circulate and condition; rig service; waiting on cement to cure; TOOH; lay down 2 7/8" tubing with Noble; rig down Noble.	Middle Bakken
25	3/15	11,170'	18'	9	-	-	241	255	3600	51	-	51	297	Pre-job safety meeting for BHA; pick up BHA; TIH; service rig; wait on cement plug to cure; waiting on cement; pre-job safety meeting for trip; trip out/install rotating head; TIH; reaming/washing from 10,544'-11,130'; circulate and condition bottoms up; drilling cement from 11,130'-11,152'; start sidetrack, slide drilling from 11,152'-11,170'; circulate and condition bottoms up; service top drive.	Middle Bakken
26	3/16	11,191'	21'	10	-	-	17	241	3700	51	-	51	297	Pre-job safety meeting; TOOH remove rotating head rubber and install trip nipple; pre-job safety meeting for BHA; lay down BHA; pick up sidetrack bit and motor, scribe; TIH; remove trip nipple and install rotating head rubber; service rig; slide drilling from 11,170'-11,176'; slide drilling from 11,176'-11,191'; circulate and condition bottoms up; pre-job safety meeting; TOOH.	Middle Bakken
27	3/17	11,251'	60'	11	-	-	30	252	3650	51	-	51	297	TOOH; remove rotating head rubber and install trip nipple; pre-job safety meeting for BHA; lay down BHA; pick up BHA; TIH; service rig; directional work troubleshoot MWD and rig watch; slide drilling from 11,191'-11,237'; slide drilling from 11,237'-11,251'; circulate and condition; high side motor; pump dry job; TOOH; pre-job safety meeting to lay down BHA; lay down BHA; pick up BHA; service top drive, change draw works filter and top drive filter; TIH; test tool; slip and cut drilling line; TIH; install rotating head rubber.	Middle Bakken
28	3/18	11,540'	289'	12	18	45	20	252	4500	51	-	51	297	Rotary drilling, sliding as needed, from 11,251'-11,293'; service rig; rotary drilling, sliding as needed, from 11,293'-11,329'; waiting on orders; rotary drilling, sliding as needed, from 11,329'-11,540'; TOOH, send slug; TOOH; pull rotating head; pre-job safety meeting to pick up reamers; pick up 3 reamers; TIH; test tool; install rotating head; circulate and condition; fill pipe and high side tool; reaming/washing with reamers from 11,152'-11,540'.	Middle Bakken
29	3/19	12,647'	1,107'	13	25	50	30	272	4200	55	-	55	320	Displace to water base; circulate and condition salt water; clean mud tanks; on OBM until 1300 hrs; working as directed by operator; ream out of sidetrack and orient back through; spot pill mix and send slug; TOOH; remove rotating head rubber and install trip nipple; pre-job safety meeting for BHA; lay down BHA; pick up BHA; service rig; TIH; fill pipe and test tool; install rotating head; circulate and condition; high side tool; TIH; rotary drilling, sliding as needed, from 11,540'-12,647'.	Middle Bakken
30	3/20	15,891'	3,244'	13	20	50	40	272	4250	55	-	55	320	Rotary drilling, sliding as needed, from 12,647'-14,331'; service rig; rotary drilling, sliding as needed, from 14,331'-15,891'.	Middle Bakken

SUNBURST CONSULTING
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MORNING REPORT SUMMARY

Rig Contractor:				Nabors B21					Tool Pushers:					Matt Piehl, Todd Miller, Darren Birkeland	
Day	Date 2019	Depth (0600 Hrs)	24 Hr Footage	Bit #	WOB (Klbs) RT	RPM (RT)	WOB (Klbs) MM	RPM (MM)	PP	SPM 1	SPM 2	SPM 3	GPM	24 Hr Activity Summary	Formation
31	3/21	16,014'	123'	14	20	50	40	272	4000	55	-	55	320	Rotary drilling, sliding as needed, from 15,891'-16,014'; circulate bottoms up sample; confirm shale strike; circulate, pump dry job; TOOH; circulate and condition bottoms up, 100 bbls 12 ppg; service rig; TOOH; lay down BHA; install/remove wear bushing; rig up to test BOP; pre-job safety meeting with BOP tester; test BOPs, test 4" DP; service top drive; rig down BOP tester; install wear bushing; pick up BHA: bit, motor, MWD, 3 monels, pony, cross over; function blinds/HCR; TIH; reshoot selected surveys; circulate out gas, flare present; relog gamma section, confirm overlay; reshoot surveys.	Upper Bakken Shale
32	3/22	15,391'	-623'	14	25	45	34	272	3600	55	-	55	320	Reshoot directional surveys and re-log gamma; trough from 14,995'-14,990'; time drill from 14,990'-15,005'; service rig; control slide drilling to 15,030' holding 120L; control slide to 15,040' holding 60L; rotary drilling, sliding as needed, from 15,040'-15,391'; service rig.	Middle Bakken
33	3/23	14,535'	-856'	14RR	20	50	15	272	3600	55	-	55	320	Rotary drilling, sliding as needed, from 15,391'-15,669'; circulate bottoms up; confirm shale strike; build volume and weight; service rig; downtime to fix top drive; TOOH to 14,470'; directional surveys; reaming/washing troughing from 14,470'-14,500'; start sidetrack at 14,500'; time drilling at 150L from 14,500' to14,520; control slide drilling at 260L from 14,520-14,535'.	Middle Bakken
34	3/24	16,586'	2,051'	14RR	25	45	28	272	4900	55	-	55	320	Rotary drilling, sliding as needed, from 14,535'-15,545'; service rig; working as directed by operator clean out suctions on pumps; slide drilling from 15,545'-15,565'; BOP drill; rotary drilling, sliding as needed, from 15,563'-16,586'; service rig.	Middle Bakken
35	3/25	16,825'	239'	15	25	55	50	272	4600	55	-	55	320	Waiting on orders; service top drive; rotary drilling, sliding as needed, from 16,593'-17,079'; circulate bottoms up, confirm shale strike in sample; wait on orders; build dry job and pump; TOOH; lay down BHA, bit, motor, MWD; function blinds/HCR; pick up BHA, reamer, shock sub, agitator, 2 crossovers; function blinds/HCR; TIH; circulate and condition; circulate out gas; slip and cut drilling line 14 wraps; change BUW die block, change quill (CET). Circulating, flaring gas.	Lower Bakken Shale
36	3/26	16,237'	-588'	15RR	-	-	2	251	3700	50	-	50	295	Circulate and condition bottoms up; re-shoot directional surveys and re-log gamma; reaming/washing and troughing from 16,785'-16,825'; time drilling from 16,825'-16,834'; abandon side-track as per Oasis and pull back; service rig; TOOH; re-shoot directional surveys and re-log gamma from 16,200'-16,800'; TOOH 5 stands; troughing new sidetrack from 16,200-16,235' at 150L tool face; time drill from 16,235'- 16,237'; service rig.	Middle Bakken
37	3/27	16,818'	581'	15RR	18	45	35	251	4600	50	-	50	295	Time drilling from 16,237'-16,250'; control slide drilling, from 16,250-16,280'; waiting on orders; rotary drilling, sliding as needed, from 16,280'-16818'; take 15' surveys as needed, rig service.	Middle Bakken
38	3/28	19,260'	2,442'	15RR	20	45	46	251	4750	100	-	-	295	Rotary drilling, sliding as needed, from 16,818'-17,920'; service rig; rotary drilling, sliding as needed, from 17,920'-19,260'; service rig.	Middle Bakken

SUNBURST CONSULTING
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MORNING REPORT SUMMARY

Rig Contractor:			Nabors B21						Tool Pushers:				Matt Piehl, Todd Miller, Darren Birkeland		
Day	Date 2019	Depth (0600 Hrs)	24 Hr Footage	Bit #	WOB (Klbs) RT	RPM (RT)	WOB (Klbs) MM	RPM (MM)	PP	SPM 1	SPM 2	SPM 3	GPM	24 Hr Activity Summary	Formation
39	3/29	20,195'	935'	15RR	20	45	46	251	4750	100	-	-	295	Rotary drilling, sliding as needed, from 19,260'-20,195'; tool orientation, trouble shooting MWD, unable to pump up a survey; circulate and condition, pump dry job; TOOH; working as directed by operator ream side track from 16,235'-16,250' with 300 GPM at 45 RPM; TOOH; working as directed by operator ream side track from 14,500'-14,515' with 300 GPM at 45 RPM; TOOH; lay down BHA, shock sub, agitator, 2 cross overs, motor, MWD; function blinds/HCR; pick up BHA, bit, motor, MWD; function blinds/HCR; TIH.	Middle Bakken
40	3/30	20,780'	585'	15RR2	23	45	70	259	4200	-	105	-	305	TIH; orientate into sidetrack; TIH; circulate; orientate into sidetrack; TIH; circulate; orientate into sidetrack; circulate bottoms up; rig service; rotary drilling, sliding as needed, from 20,195'-20,780'; reach TD of 20,780' at 20:45 hours on 4/29/2019; circulate bottoms up; TOOH; circulate and condition bottoms up; pump kill mud; TOOH.	Middle Bakken

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DAILY MUD SUMMARY

Chemical Company: Reliable Drilling Fluids							Mud Engineer: Scott Zimmerman					Fresh water in surface; Diesel invert to 11,540'; Salt Water there after									
Date 2019	Mud Depth	Mud WT (ppg)	VIS (sec/qt)	PV (cP)	YP (lbs/ 100 ft^2)	Gels (lbs/ 100 ft^2)	600/ 300	Oil/ H_20 (ratio)	Oil/ H_20 (%)	Cake (API/ HTHP)	Solids (%)	Cor. Solids (%)	Alk	pH	Excess Lime (lb/bbl)	Cl^- (mg/L)	LGS/ HGS (%)	Salinity (ppm)	Electrical Stability	Mud loss (bbls)	Mud Gain (bbls)
02/18	63'	8.4	27	2	1	1/1/1	5/3	-	-/100	-	0.1	0.04	0.1	8.5	0	1300	0.04/0	-	-	-	-
02/19	2,300'	9.7	31	4	9	9/14/16	17/13	-	0/95	-	5	4.95	0.1	8	0	1100	4.95/0	-	-	-	-
02/20	3,529'	8.95	27	3	4	3/3/3	10/7	-	0/97.5	-	2.5	2.44	0.1	8	0	1300	2.44/0	-	-	-	-
02/21	3,629'	8.95	27	3	4	3/3/4	10/8	-	0/97.6	-	2.5	2.44	0.1	8	0	1300	2.44/1	-	-	-	-
02/22	3,629'	8.95	27	3	4	3/3/5	10/9	-	0/97.7	-	2.5	2.44	0.1	8	0	1300	2.44/2	-	-	-	-
02/23	3,629'	10.95	49	11	6	6/10/13	28/17	76/24	65/20	3	15	12.76	1.9	-	2.46	37k	1.1/11.66	233646	225	-	-
02/24	4,890'	11.85	42	20	12	8/13/-	52/32	79/21	63/17	-/3	20	18.13	1.2	-	1.55	31k	4.95/13.18	231075	565	-	-
02/25	5,750'	12.9	43	28	17	8/13/-	73/45	79/21	60/16	-/3	24	22.19	1.5	-	1.94	30k	5.47/16.72	236058	560	-	-
02/26	6,020'	12.9	43	26	12	11/15/18	64/38	79/21	59.5/24.5	-/3	24.5	22.81	2.2	-	2.85	28k	6.63/16.18	223844	605	-	-
02/27	6,160'	12.8	45	23	13	9/14/18	59/36	79/21	60/16	-/2	24	22.31	1.9	-	2.46	28k	6.33/15.98	223844	605	-	-
02/28	7,100'	10.6	41	15	10	7/10/14	40/25	80/20	68.5/17	-/2	14.5	12.63	2.4	-	3.11	31k	2.69/9.94	231075	610	-	-
03/01	8,885'	10.4	41	16	12	7/6/8	44/28	80/20	67/17	-/2	16	13.87	1.8	-	2.33	38k	6.46/7.41	264592	610	-	-
03/02	10,302'	10.4	54	21	11	6/5/9	53/32	80/20	67.5/17	-/2	15..5	13.23	2.1	-	2.72	38k	5.03/8.2	264424	725	-	-
03/03	10,915'	10.4	41	17	9	8/11/14	43/26	80/20	68/16.5	-/2	15.5	13.44	2	-	2.59	39k	5.41/8.03	264704	760	-	-
03/04	11,170'	10.8	48	21	11	9/11/15	53/32	81/19	67.5/16	-/2	16.5	14.5	1.9	-	2.46	38k	4.53/9.97	264830	790	-	-
03/05	11,170'	10.8	52	21	11	9/11/15	45/27	80/20	66/17	-/2	17	14.9	1.5	-	1.94	37k	5.62/9.28	261654	600	-	-
03/06	11,170'	11	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03/07	11,550'	11.1	48	10	10	9/11/14	30/20	78/22	64/18	-/2	18	15.85	1.7	-	2.2	38k	5.59/10.26	255868	806	-	-
03/08	14,000'	10.9	48	10	10	9/11/14	30/20	78/22	64/18	-/2	18	15.85	1.7	-	2.2	38k	5.59/10.26	255868	806	-	-
03/09	14,985'	10.8	48	19	13	9/13/17	43/27	78/22	63/18	-/3	19	16.79	2.3	-	2.98	39k	6.76/10.03	260903	1181	-	-
03/10	16,425'	10.8	48	16	12	10/13/18	44/28	79/21	64/17	-/3	19	16.88	1.7	-	2.46	39k	6.67/10.21	264592	551	-	-
03/11	16,577'	11.25	46	25	12	11/14/18	62/37	80/20	64/16	3	20	18.01	2	-	2.59	36k	7.03/10.98	264830	1641	-	-
03/12	16,577'	12.05	48	24	15	13/16/21	63/39	81/19	62/15	3	23	21.22	1.8	-	2.33	32k	7.52/13.7	257442	770	-	-
03/13	16,577'	12.1	62	23	11	9/14/-	57/34	82/18	63/14	3	23	21.26	1.7	-	2.2	33k	7.03/14.23	265516	770	-	-
03/14	16,577'	12.2	68	24	12	11/16/-	60/36	83/17	64.5/13.5	3	22	20.33	1.6	-	2.07	34k	5.73/14.6	265747	665	-	-
03/15	11,170'	12.35	71	29	11	11/16/-	69/40	83/17	64/13	3	23	21.39	1.8	-	2.33	34k	6.73/14.66	266012	605	-	-
03/16	11,190'	12.05	56	25	13	9/13/-	63/38	82/18	64/14	3	22	230.26	2.2	-	2.85	40k	6.85/13.41	265516	805	-	-
03/17	11,435'	12.15	49	22	11	10/15/-	55/33	81/19	62/15	3	23	21.14	2.1	-	2.72	39k	7.47/13.67	265131	577	-	-

SUNBURST CONSULTING
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DAILY MUD SUMMARY

Chemical Company: Reliable Drilling Fluids							Mud Engineer: Scott Zimmerman					Fresh water in surface; Diesel invert to 11,540'; Salt Water there after									
Date 2019	Mud Depth	Mud WT (ppg)	VIS (sec/qt)	PV (cP)	YP (lbs/ 100 ft^2)	Gels (lbs/ 100 ft^2)	600/ 300	Oil/ H_20 (ratio)	Oil/ H_20 (%)	Cake (API/ HTHP)	Solids (%)	Cor. Solids (%)	Alk	pH	Excess Lime (lb/bbl)	Cl^- (mg/L)	LGS/ HGS (%)	Salinity (ppm)	Electrical Stability	Mud loss (bbls)	Mud Gain (bbls)
03/18	11,540'	Displace mud from diesel invert to salt water																			
03/19	13,350'	9.45	27	2	1	1/1/-	5/3	-	1.5/91	-	7.5	0.37	0.1	8.5	0	147k	0.37/0	-	-	-	-
03/20	15,891'	9.4	28	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-
03/21	14,991'	9.35	28	2	1	1/1/-	5/3	-	1/92	-	7	0.22	0.1	7.5	0	139k	0.22/0	-	-		
03/22	15,391'	9.3	28	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-
03/23	15,300'	9.3	28	2	1	1/1/-	5/3	-	1/92	-	7	0.42	0.1	8	0	135k	0.42/0	-	-	-	-
03/24	16,586'	9.35	29	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-
03/25	16,832'	9.35	31	2	1	1/1/-	5/3		3.5/90	-	6.5	1.7	0.1	7.5	0	104k	1.7/0	-	-	-	-
03/26	16,237'	9.35	20	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-
03/27	17,525'	9.5	27	2	1	1/1/-	5/3		1.5/95	-	7.5	0.23	0.1	7.5	0	150k	0.23/0	-	-	-	-
03/28	19,260'	9.5	27	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-
03/29	20,195'	9.5	27	2	1	1/1/-	5/3		1.5/95	-	7.5	0.23	0.1	7.5	0	150k	0.23/0	-	-	-	-
03/30	20,780'	9.6	28	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-	-

SUNBURST CONSULTING
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BOTTOM HOLE ASSEMBLY RECORD

Bit Data											Motor Data					Reason For Removal
Bit #	Size (in.)	Type	Make	Model	Depth In	Depth Out	Footage	Hours	Σ hrs	Vert. Dev.	Make	Lobe	Stage	Bend	Rev/Gal	
1	17 1/2	PDC	Ulterra	CF616	120'	3,629'	3,509'	42	42	Surface	Stickman	5/6	6.0	2.0°	0.16	TD surface
2	12 1/4	PDC	Ulterra	SPL616	3,629'	5,925'	2,296'	18.5	60.5	Inyan Kara Isolation	Stickman	5/6	6.0	2.0°	0.23	Motor failure
2RR	12 1/4	PDC	Ulterra	SPL616	5,925'	6,160'	235'	5.5	66	Inyan Kara Isolation	NOV	7/8	4.0	2.12°	0.17	TD isolation portion
3	8 3/4	PDC	Smith	XS616	6,160'	8,609'	2,449'	24.5	90.5	Vertical	Hunting	7/8	8.5	2.0°	0.26	Low ROP
4	8 3/4	PDC	Smith	XS616	8,609'	10,301'	1,692'	17	107.5	Vertical	Hunting	7/8	8.5	1.50°	0.26	TD vertical
5	8 3/4	PDC	Baker	DT505TS	10,301'	11,170'	869'	16	123.5	Curve	NOV	4/5	7.0	2.38°	0.5	TD curve
6	6	PDC	HDBS	GTD54HE	11,170'	11,222'	52'	0.5	124	Lateral	Discovery	7/8	10.6	1.50°	0.85	TOOH for high bend motor
7	6	PDC	Reed	TKC53	11,222'	16,577'	5,355'	78	202	Lateral	Discovery	7/8	10.6	1.83°	0.85	Low ROP
8	6	PDC	Reed	TKC53	16,577'	16,577'	0'	0	202	-	Discovery	7/8	10.6	1.50°	0.85	Couldn't orientate back into lateral
9	6	Tri-cone	Smith	F30T	11,152'	11,170'	18'	5	207	Cement plug	Discovery	7/8	10.6	1.50°	0.85	Pickup a sidetrack assembly
10	6	Sidetrack	Smith	DST12	11,170'	11,191'	21'	13	220	Sidetrack	Stickman	6/7	8.0	2.25°	0.81	Completed orientating sidetrack
11	6	PDC	Reed	TKC63	11,191'	11,251'	60'	7	227	Sidetrack	Stickman	6/7	8.0	2.25°	0.81	Motor bend
12	6	PDC	Reed	TKC63	11,251'	11,540'	289'	9	236	Lateral	Discovery	7/8	10.6	1.50°	0.85	Pick up reamers, displace
13	6	PDC	Reed	TKC55	11,540'	16,014'	4,474'	30	266	Lateral	Discovery	7/8	10.6	1.50°	0.85	Shale strike, reshoot surveys
14	6	PDC	Reed	TKC53	14,990'	15,669'	679'	20	286	Lateral	Discovery	7/8	10.6	1.50°	0.85	Shale strike
14RR	6	PDC	Reed	TKC55	14,500'	17,079'	2,579'	38	324	Lateral	Discovery	7/8	10.6	1.50°	0.85	Shale strike
15	6	PDC	Reed	TKC53	16,825'	16,834'	9'	8.5	332.5	Sidetrack	Discovery	7/8	10.6	1.50°	0.85	Oasis picked a new sidetrack point
15RR	6	PDC	Reed	TKC53	16,235'	20,195'	3,960'	53	385.5	Lateral	Discovery	7/8	10.6	1.50°	0.85	MWD survey tool failure
15RR2	6	PDC	Reed	TKC53	20,195'	20,780'	585'	7	392.5	Lateral	Discovery	7/8	10.6	1.50°	0.85	TD lateral

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Note: 1,280 acre laydown spacing unit with 500' N/S & 150' E/W setbacks

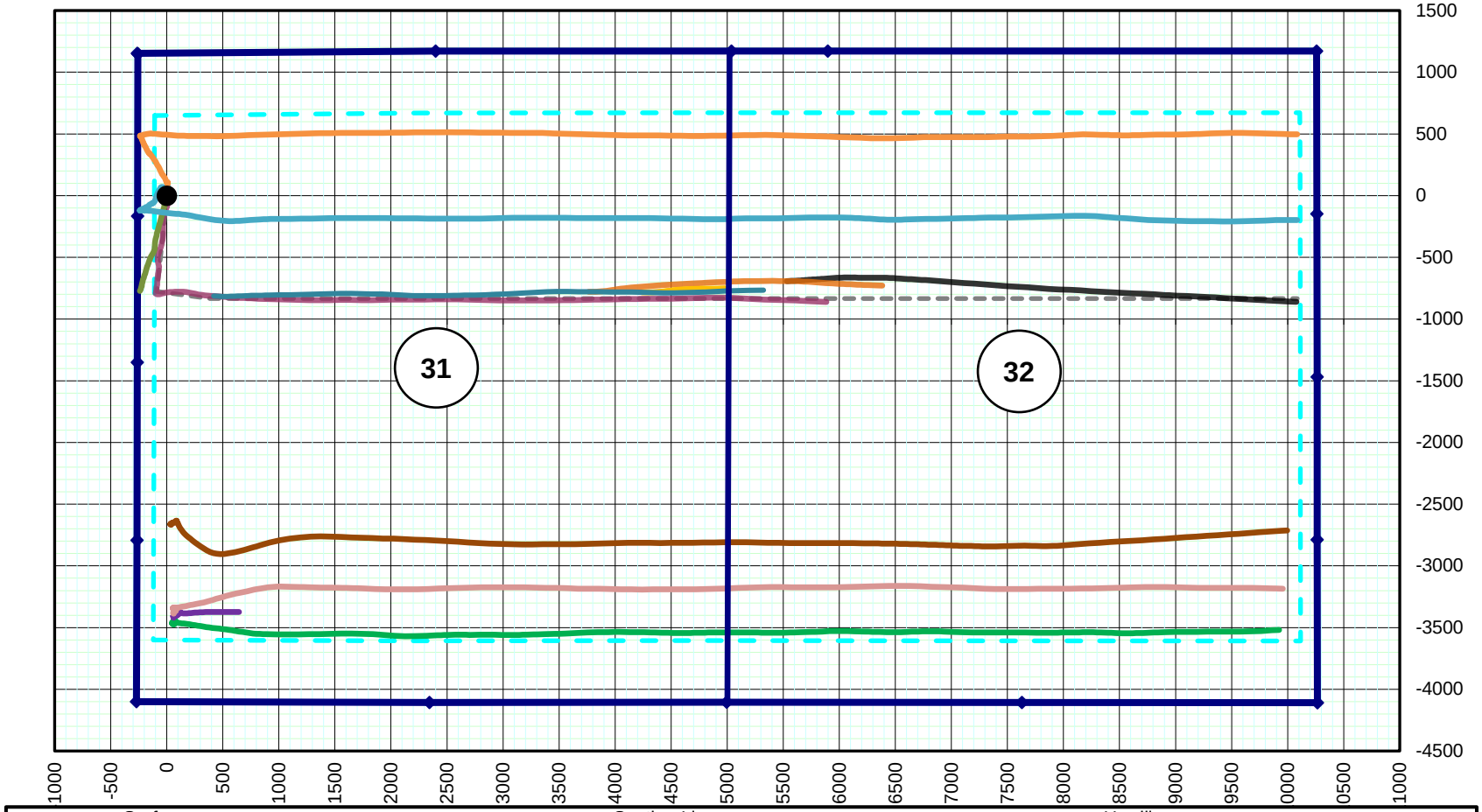
PLAN VIEW

Oasis Petroleum North America, LLC
Lewis Federal 5300 11-31 4BR
1,149' FNL & 257' FWL
Lot 1 Sec. 31, T153N, R100W

N
W E
S

Bottom Hole Location

860.57' S & 10,078' E of surface location
or 2,009.57' FNL & 190.57' FEL
Lot 4 Sec. 32, T153N, R100W



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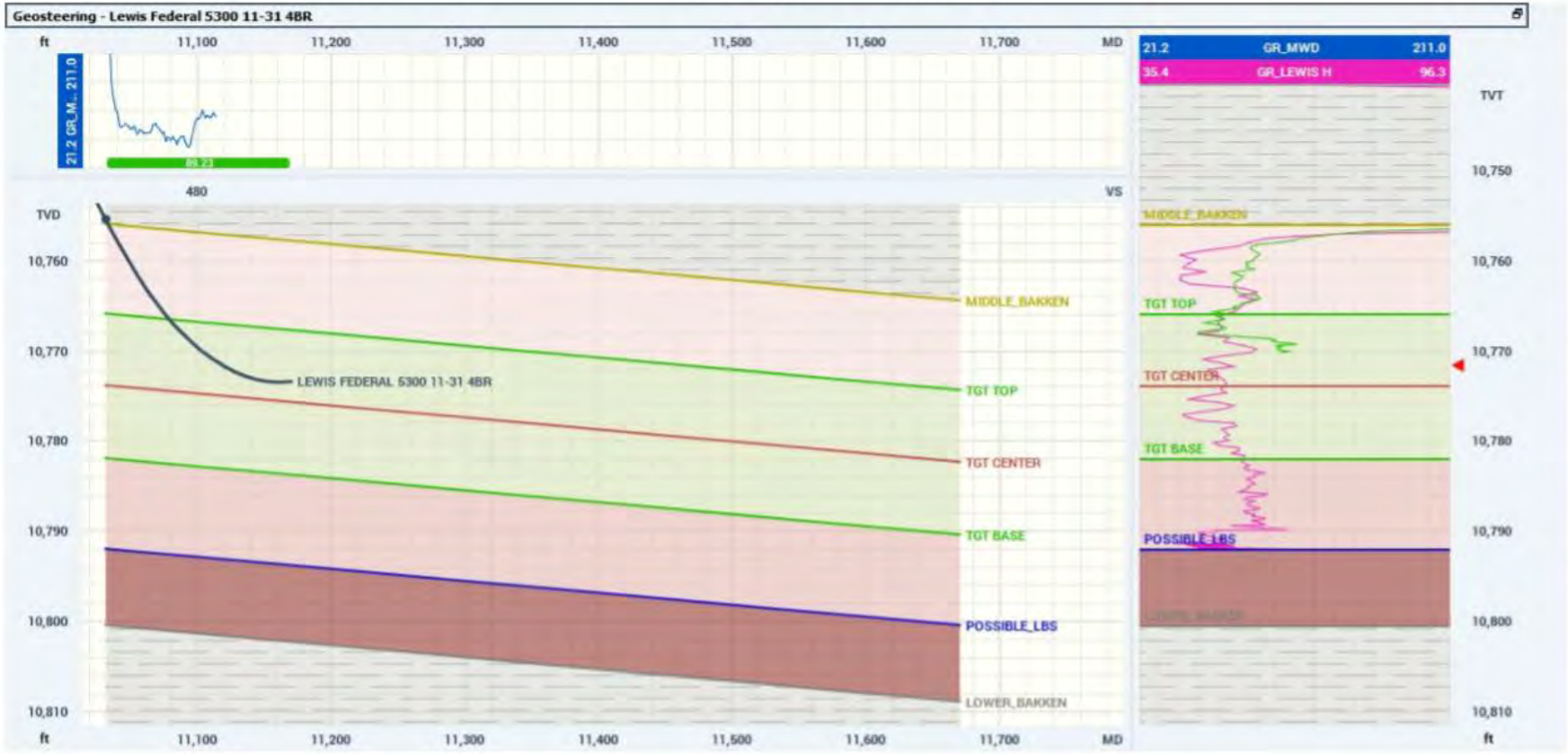
Landing Profile

WELL

Lewis Federal 5300 11-31 4BR

API	TYPEWELL	FIELD	INTERPRETER	DATE	VS AZIMUTH
33-053-08946	Lewis Federal 5300 31-31H	Baker	D. Johnson, C. Kyler	3/5/2019 6:50 AM	94.73°



Last Surveys

MD	INCL	AZIM	TVD	VS	DLS
11,086.0	81.12	92.2	10,767.6	466.4	16.4
11,170.0	91.00	93.6	10,773.4	550.0	11.9

Last Segment Dip
89.23°

LANDING PROJECTION

Formation/ Zone:	Proposed Landing Target From:			
	Lewis Federal 5300 11-31 3B	Lewis Federal 5300 11-31 2B	Wade Federal 5300 41-30 8T3	Average of Offset Wells
Pierre	-	-	-	-
Greenhorn	10,768'	10,773'	10,750'	10,764'
Mowry (Dakota Group)	10,769'	10,767'	10,754'	10,764'
Inyan Kara (Dakota Group)	10,772'	10,767'	10,761'	10,767'
Swift (Base Dakota Group)	10,759'	10,762'	10,734'	10,752'
Rierdon	10,732'	10,719'	10,694'	10,715'
Dunham Salt	10,723'	10,704'	10,681'	10,703'
Dunham Salt Base	10,761'	10,740'	10,718'	10,740'
Pine Salt	10,781'	10,780'	10,765'	10,776'
Pine Salt Base	10,782'	10,793'	10,787'	10,787'
Opeche Salt	10,785'	10,791'	10,788'	10,788'
Opeche Salt Base	10,782'	10,790'	10,789'	10,787'
Amsden	10,783'	10,788'	10,786'	10,786'
Tyler	10,784'	10,790'	10,778'	10,784'
Otter/Base Minnelusa	10,777'	10,783'	10,775'	10,778'
Kibbey "Lime"	10,784'	10,792'	10,777'	10,784'
Charles Salt	10,778'	10,789'	10,779'	10,782'
Base Last Salt	10,776'	10,783'	10,775'	10,778'
Mission Canyon	10,778'	10,779'	10,767'	10,775'
Lodgepole	10,775'	10,781'	10,766'	10,774'
Lodgepole A	10,774'	10,781'	10,765'	10,773'
Lodgepole B	10,792'	10,778'	10,796'	10,789'
Lodgepole C	10,772'	10,783'	10,803'	10,786'
Lodgepole D	10,780'	10,778'	10,773'	10,777'
Lodgepole E	10,778'	10,786'	10,777'	10,780'
Lodgepole F	10,771'	10,772'	10,769'	10,771'
False Bakken	10,772'	10,774'	10,772'	10,773'
Upper Bakken Shale	10,772'	10,774'	10,774'	10,774'
Middle Bakken	10,775'	10,775'	10,775'	10,775'

Current Landing Target (18' below the base of the UBS): **10,774'**

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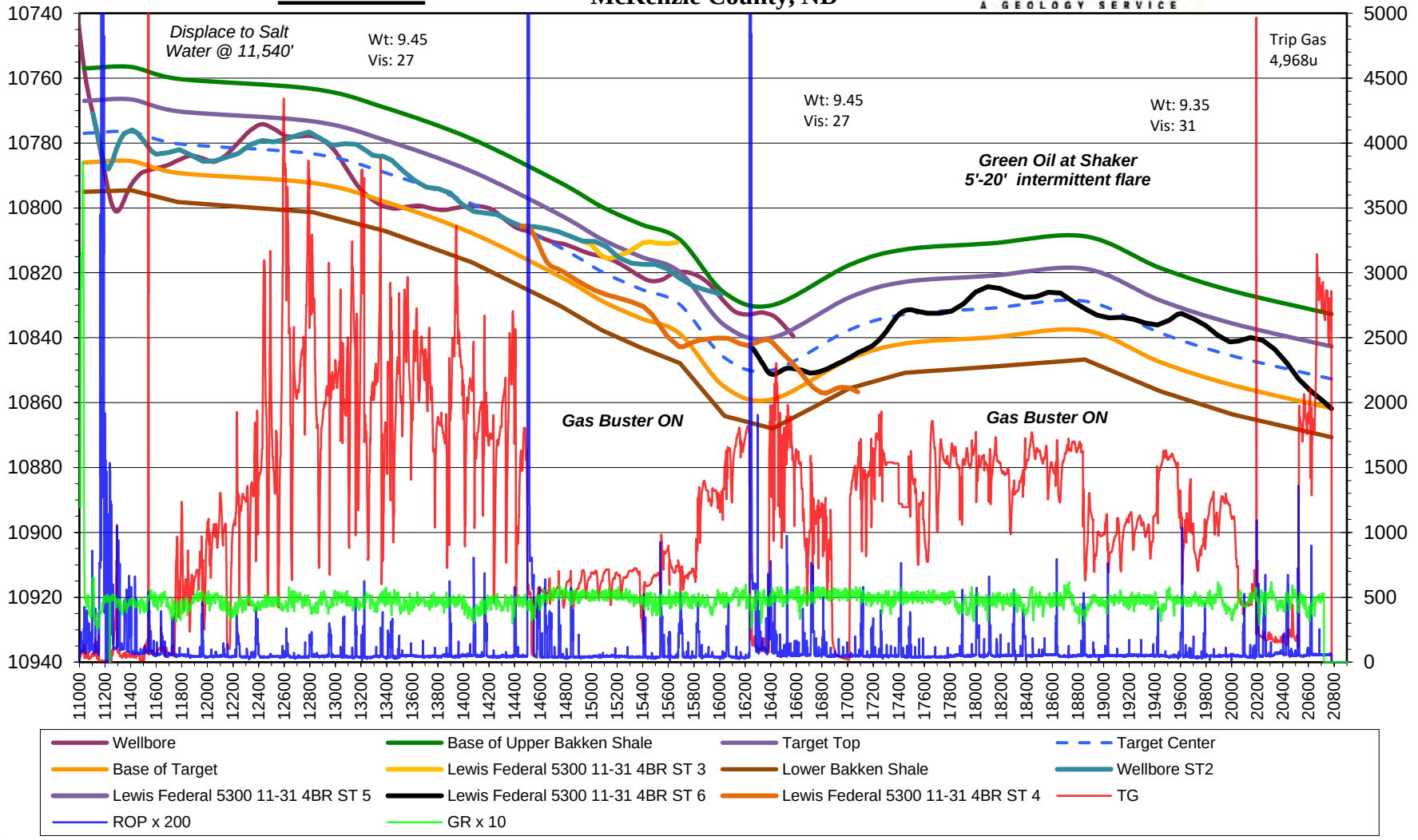
Measured Depth (TMD 20,780' -- March 29, 2019)

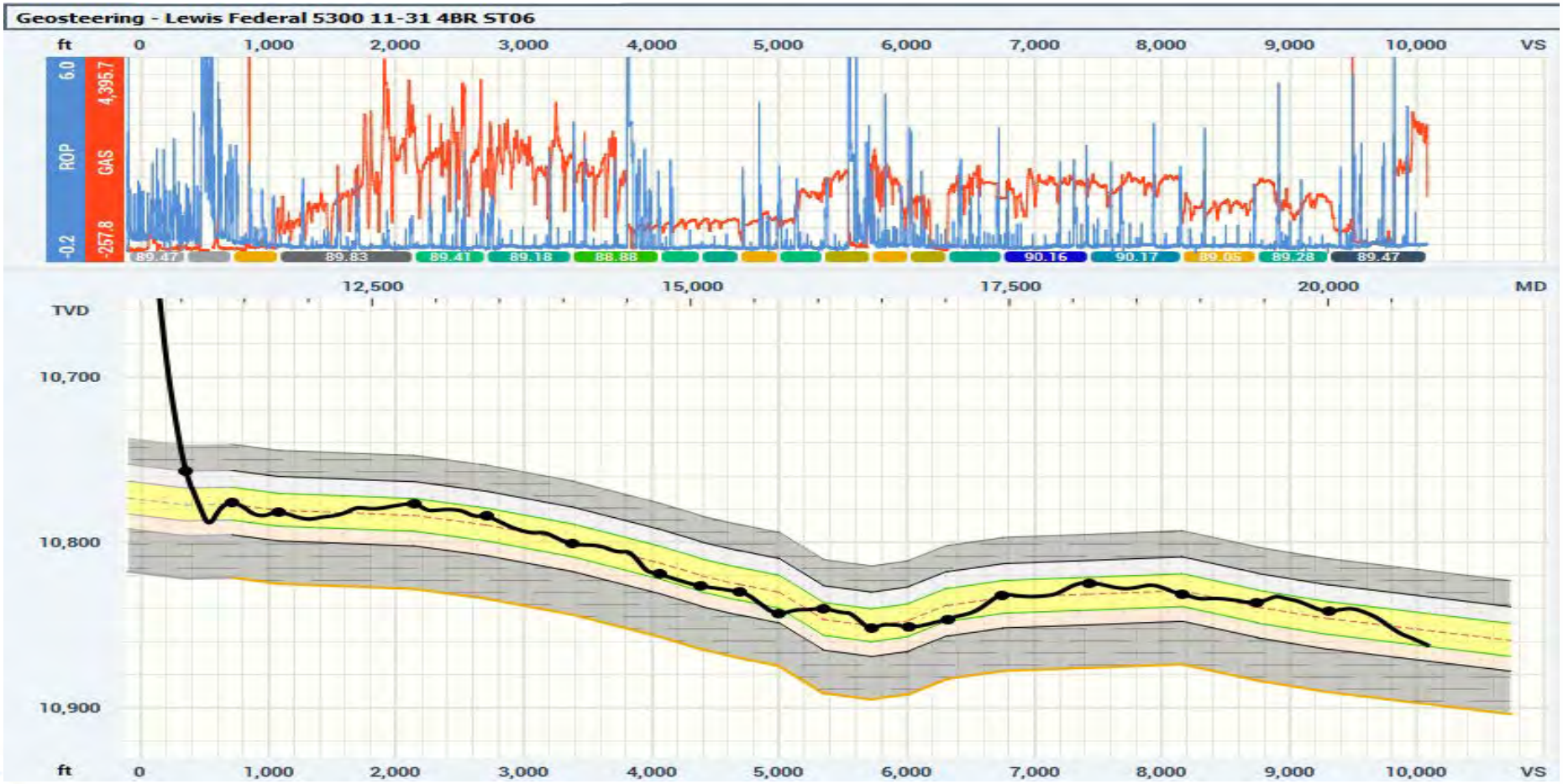
Oasis Petroleum North America, LLC
Lewis Federal 5300 11-31 4BR
Lot 1 Sec. 31, T153N, R100W
McKenzie County, ND

GL: 2,110'
KB: 2,135'

PROFILE



Summary Data Profile



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Subsurface Structure Points - Lewis Federal 5300 11-31 4BR

GL: 2,110'
KB: 2,135'

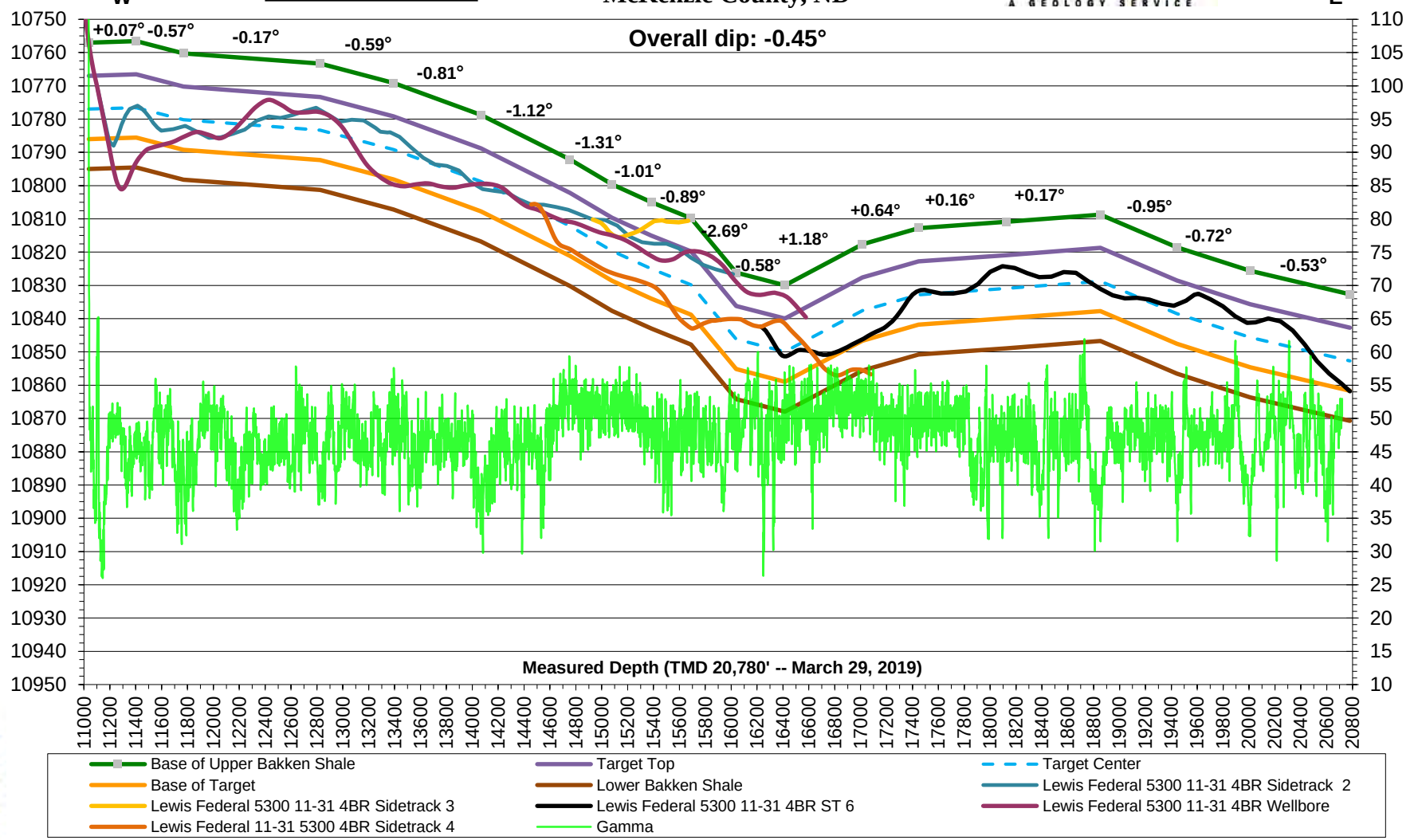
	Thickness		*10*	*10*	*9*	*9*		
Measured Depth	**Base of Upper Bakken Shale (TVD)**	**Target Top (TVD)**	**Target Center (TVD)**	**Base of Target (TVD)**	**Lower Bakken Shale (TVD)**	**Dip**	**Up/Down**
11,037'	10757.00	10767.00	10777.00	10786.00	10795.00		Flat
11,404'	10756.55	10766.55	10776.55	10785.55	10794.55	***0.07°***	Up
11,769'	10760.21	10770.21	10780.21	10789.21	10798.21	***-0.57°***	Down
12,825'	10763.32	10773.32	10783.32	10792.32	10801.32	***-0.17°***	Down
13,392'	10769.17	10779.17	10789.17	10798.17	10807.17	***-0.59°***	Down
14,066'	10778.76	10788.76	10798.76	10807.76	10816.76	***-0.81°***	Down
14,755'	10792.18	10802.18	10812.18	10821.18	10830.18	***-1.12°***	Down
15,080'	10799.63	10809.63	10819.63	10828.63	10837.63	***-1.31°***	Down
15,382'	10804.98	10814.98	10824.98	10833.98	10842.98	***-1.01°***	Down
15,691'	10809.79	10819.79	10829.79	10838.79	10847.79	***-0.89°***	Down
16,039'	10826.16	10836.16	10846.16	10855.16	10864.16	***-2.69°***	Down
16,414'	10829.95	10839.95	10849.95	10858.95	10867.95	***-0.58°***	Down
17,013'	10817.61	10827.61	10837.61	10846.61	10855.61	***1.18°***	Up
17,447'	10812.79	10822.79	10832.79	10841.79	10850.79	***0.64°***	Up
18,124'	10810.90	10820.90	10830.90	10839.90	10848.90	***0.16°***	Up
18,853'	10808.73	10818.73	10828.73	10837.73	10846.73	***0.17°***	Up
19,443'	10818.51	10828.51	10838.51	10847.51	10856.51	***-0.95°***	Down
20,009'	10825.62	10835.62	10845.62	10854.62	10863.62	***-0.72°***	Down
20,780'	10832.69	10842.69	10852.69	10861.69	10870.69	***-0.53°***	Down

SUNBURST CONSULTING
A GEOLOGY SERVICE

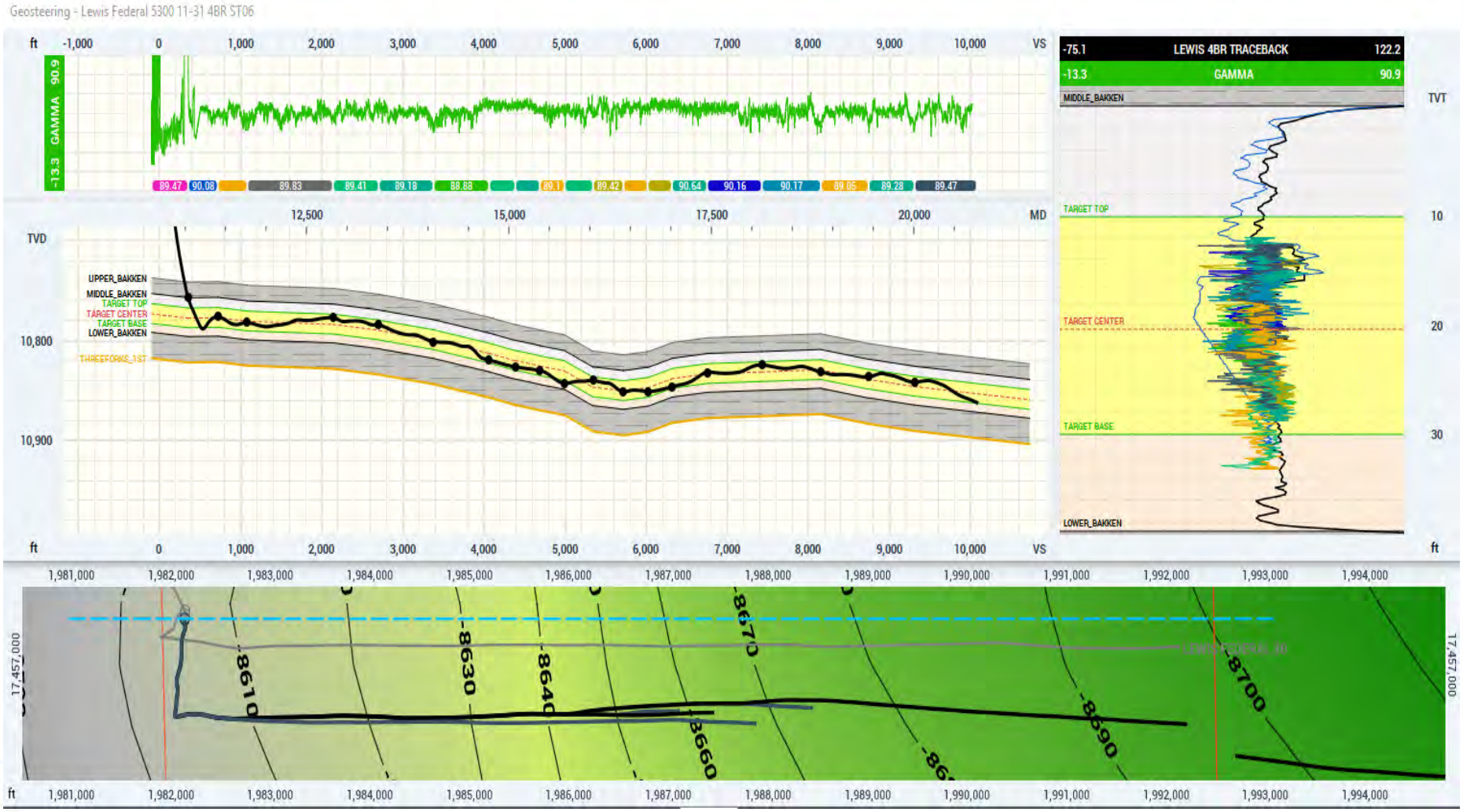
GL: 2,110'
KB: 2,135'

DIP PROFILE

Oasis Petroleum North America, LLC
Lewis Federal 5300 11-31 4BR
Lot 1 Sec. 31, T153N, R100W
McKenzie County, ND



Geosteering Profile



Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	861.44' S & 5,884.69' E of surface location or 2,010' FNL & 896.12' FEL SW NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2019
Finish:	3/12/2019

Directional Supervision:
Scientific Drilling
RPM Consulting

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
Tie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	288.00	0.90	188.06	287.99	-2.24	-0.32	-0.13	0.31
2	349.00	1.64	200.83	348.97	-3.53	-0.69	-0.40	1.29
3	411.00	1.69	197.44	410.95	-5.23	-1.28	-0.85	0.18
4	445.00	1.91	202.75	444.93	-6.23	-1.65	-1.13	0.81
5	536.00	1.92	196.61	535.88	-9.09	-2.68	-1.92	0.23
6	627.00	1.92	199.63	626.83	-11.99	-3.62	-2.62	0.11
7	717.00	1.77	198.59	716.78	-14.73	-4.57	-3.34	0.17
8	807.00	1.11	176.79	806.75	-16.91	-4.97	-3.56	0.94
9	898.00	0.89	166.31	897.74	-18.48	-4.75	-3.21	0.31
10	988.00	1.33	186.27	987.72	-20.20	-4.70	-3.02	0.64
11	1078.00	1.73	204.52	1077.69	-22.47	-5.38	-3.51	0.70
12	1169.00	1.10	199.13	1168.66	-24.55	-6.23	-4.19	0.71
13	1260.00	0.57	168.63	1259.65	-25.82	-6.43	-4.28	0.74
14	1349.00	0.39	180.45	1348.65	-26.55	-6.35	-4.13	0.23
15	1441.00	0.81	186.10	1440.64	-27.51	-6.42	-4.13	0.46
16	1531.00	1.02	162.45	1530.63	-28.91	-6.24	-3.84	0.48
17	1621.00	1.39	160.16	1620.61	-30.70	-5.63	-3.08	0.41
18	1712.00	1.47	149.54	1711.59	-32.74	-4.67	-1.95	0.30
19	1805.00	1.20	159.69	1804.56	-34.69	-3.72	-0.85	0.38
20	1898.00	1.01	156.90	1897.54	-36.35	-3.06	-0.05	0.21
21	1992.00	0.74	174.15	1991.53	-37.72	-2.68	0.44	0.40
22	2085.00	0.79	210.83	2084.52	-38.87	-2.94	0.27	0.52
23	2179.00	0.62	226.85	2178.52	-39.77	-3.65	-0.35	0.28
24	2272.00	0.69	202.51	2271.51	-40.63	-4.23	-0.86	0.31
25	2365.00	0.37	182.91	2364.51	-41.45	-4.46	-1.02	0.39
26	2459.00	0.33	126.44	2458.51	-41.91	-4.26	-0.78	0.35
27	2552.00	0.49	101.90	2551.50	-42.15	-3.65	-0.16	0.25
28	2646.00	0.90	99.95	2645.50	-42.36	-2.53	0.97	0.44
29	2739.00	0.97	112.26	2738.48	-42.79	-1.08	2.45	0.23
30	2832.00	0.57	114.81	2831.48	-43.28	0.07	3.63	0.43
31	2926.00	0.51	88.26	2925.47	-43.46	0.91	4.49	0.27
32	3019.00	0.64	123.49	3018.47	-43.74	1.76	5.36	0.40
33	3112.00	0.42	124.42	3111.46	-44.22	2.47	6.11	0.24
34	3205.00	1.14	162.25	3204.45	-45.29	3.03	6.76	0.91
35	3299.00	1.20	162.88	3298.43	-47.12	3.61	7.48	0.07

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A GEOLOGY SERVICE

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SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2019
Finish:	3/12/2019

Directional Supervision:
Scientific Drilling
RPM Consulting

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
36	3392.00	1.25	172.31	3391.41	-49.06	4.03	8.06	0.22
37	3485.00	1.39	167.10	3484.39	-51.16	4.42	8.62	0.20
38	3554.00	1.17	174.35	3553.37	-52.68	4.67	9.00	0.40
39	3638.00	1.94	184.08	3637.34	-54.95	4.66	9.17	0.97
40	3669.00	1.89	183.67	3668.32	-55.99	4.59	9.19	0.17
41	3762.00	3.22	177.90	3761.23	-60.13	4.58	9.53	1.45
42	3856.00	2.80	175.60	3855.10	-65.05	4.86	10.21	0.46
43	3949.00	3.06	180.75	3947.98	-69.80	5.00	10.74	0.40
44	4042.00	3.62	180.65	4040.82	-75.22	4.93	11.12	0.60
45	4136.00	3.53	198.07	4134.64	-80.94	4.00	10.66	1.16
46	4229.00	5.83	202.88	4227.32	-88.01	1.28	8.53	2.51
47	4323.00	7.95	202.30	4320.64	-98.43	-3.05	5.08	2.26
48	4416.00	9.26	204.28	4412.59	-111.20	-8.56	0.64	1.44
49	4509.00	10.91	201.98	4504.15	-126.18	-14.93	-4.48	1.83
50	4604.00	11.90	197.75	4597.27	-143.85	-21.29	-9.35	1.36
51	4699.00	11.59	193.02	4690.29	-162.47	-26.42	-12.93	1.06
52	4794.00	11.74	189.64	4783.33	-181.30	-30.19	-15.14	0.74
53	4889.00	10.74	184.06	4876.51	-199.66	-32.44	-15.86	1.55
54	4984.00	10.37	181.05	4969.90	-217.04	-33.22	-15.21	0.70
55	5079.00	10.31	178.57	5063.36	-234.08	-33.16	-13.75	0.47
56	5174.00	11.20	178.37	5156.69	-251.81	-32.69	-11.81	0.94
57	5269.00	12.50	179.71	5249.66	-271.31	-32.37	-9.89	1.40
58	5363.00	13.90	181.03	5341.18	-292.77	-32.53	-8.27	1.52
59	5458.00	15.23	182.02	5433.12	-316.65	-33.17	-6.95	1.42
60	5553.00	15.99	186.96	5524.62	-342.11	-35.20	-6.87	1.61
61	5621.00	15.33	191.70	5590.10	-360.21	-38.15	-8.32	2.12
62	5648.00	15.46	193.42	5616.13	-367.21	-39.71	-9.30	1.76
63	5743.00	16.38	193.82	5707.48	-392.53	-45.85	-13.33	0.98
64	5838.00	15.73	200.28	5798.79	-417.62	-53.52	-18.90	2.00
65	5932.00	15.06	200.61	5889.41	-441.00	-62.23	-25.65	0.72
66	6025.00	13.49	198.54	5979.54	-462.60	-69.93	-31.55	1.77
67	6093.00	13.07	196.44	6045.72	-477.49	-74.63	-35.00	0.94
68	6180.00	11.45	193.18	6130.73	-495.34	-79.38	-38.27	2.02
69	6212.00	10.24	188.81	6162.16	-501.24	-80.54	-38.94	4.57
70	6305.00	7.89	177.10	6254.00	-515.79	-81.49	-38.68	3.20
71	6398.00	7.12	169.48	6346.21	-527.83	-80.11	-36.31	1.35

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Kick-off:	3/3/2019
Finish:	3/12/2019

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Minimum Curvature Method (SPE-3362)
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Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
72	6491.00	6.90	166.57	6438.51	-538.93	-77.76	-33.06	0.45
73	6585.00	6.60	161.27	6531.86	-549.54	-74.72	-29.15	0.74
74	6678.00	5.81	164.32	6624.32	-559.13	-71.73	-25.38	0.92
75	6772.00	5.33	161.76	6717.87	-567.86	-69.08	-22.01	0.57
76	6865.00	5.72	185.65	6810.45	-576.58	-68.18	-20.40	2.49
77	6959.00	6.23	186.87	6903.94	-586.30	-69.25	-20.67	0.56
78	7052.00	6.03	189.11	6996.41	-596.13	-70.63	-21.23	0.34
79	7145.00	5.99	189.88	7088.90	-605.74	-72.23	-22.04	0.10
80	7239.00	6.00	188.50	7182.39	-615.43	-73.80	-22.80	0.15
81	7332.00	6.12	188.48	7274.87	-625.14	-75.25	-23.45	0.13
82	7426.00	5.95	189.62	7368.34	-634.90	-76.80	-24.19	0.22
83	7519.00	5.70	187.87	7460.86	-644.23	-78.24	-24.85	0.33
84	7613.00	5.41	188.92	7554.42	-653.23	-79.57	-25.43	0.33
85	7706.00	5.20	188.06	7647.02	-661.73	-80.84	-26.00	0.24
86	7800.00	5.25	189.73	7740.63	-670.19	-82.16	-26.62	0.17
87	7893.00	5.33	185.69	7833.24	-678.68	-83.31	-27.06	0.41
88	7986.00	4.69	183.85	7925.88	-686.77	-83.99	-27.08	0.71
89	8080.00	3.87	179.32	8019.62	-693.78	-84.22	-26.72	0.94
90	8173.00	3.23	177.34	8112.44	-699.53	-84.06	-26.09	0.70
91	8266.00	3.57	182.28	8205.28	-705.04	-84.05	-25.63	0.48
92	8360.00	3.65	184.99	8299.09	-710.95	-84.43	-25.51	0.20
93	8453.00	3.61	188.68	8391.90	-716.79	-85.13	-25.73	0.25
94	8546.00	3.44	189.97	8484.73	-722.43	-86.05	-26.19	0.20
95	8640.00	3.32	189.24	8578.56	-727.90	-86.98	-26.66	0.14
96	8733.00	3.34	191.49	8671.41	-733.21	-87.95	-27.19	0.14
97	8826.00	3.24	194.00	8764.25	-738.42	-89.12	-27.93	0.19
98	8920.00	2.93	196.02	8858.12	-743.30	-90.43	-28.83	0.35
99	9013.00	2.80	193.75	8951.00	-747.79	-91.63	-29.65	0.19
100	9107.00	2.27	191.39	9044.91	-751.85	-92.54	-30.23	0.57
101	9200.00	2.66	183.05	9137.82	-755.81	-93.02	-30.38	0.57
102	9294.00	2.69	183.23	9231.72	-760.19	-93.26	-30.25	0.03
103	9388.00	2.50	182.75	9325.62	-764.44	-93.48	-30.13	0.20
104	9483.00	2.14	190.02	9420.55	-768.26	-93.89	-30.22	0.49
105	9577.00	2.09	186.26	9514.48	-771.69	-94.38	-30.43	0.16
106	9672.00	1.98	186.18	9609.42	-775.04	-94.75	-30.51	0.12
107	9767.00	2.08	193.58	9704.36	-778.35	-95.33	-30.82	0.30

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	861.44' S & 5,884.69' E of surface location or 2,010' FNL & 896.12' FEL SW NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2019
Finish:	3/12/2019

Directional Supervision:
Scientific Drilling
RPM Consulting

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
108	9862.00	1.84	194.54	9799.31	-781.50	-96.12	-31.34	0.25
109	9956.00	1.92	188.87	9893.26	-784.52	-96.74	-31.72	0.22
110	10051.00	1.76	188.54	9988.21	-787.53	-97.20	-31.93	0.17
111	10145.00	1.54	194.39	10082.17	-790.18	-97.73	-32.24	0.29
112	10239.00	1.07	182.72	10176.15	-792.28	-98.08	-32.42	0.57
113	10302.00	1.45	182.19	10239.13	-793.67	-98.14	-32.36	0.60
114	10333.00	4.83	122.35	10270.08	-794.76	-97.05	-31.19	13.83
115	10364.00	10.21	110.03	10300.81	-796.40	-93.37	-27.38	18.02
116	10396.00	14.86	100.62	10332.04	-798.13	-86.66	-20.56	15.82
117	10427.00	19.15	92.23	10361.68	-799.06	-77.67	-11.52	15.91
118	10459.00	22.16	82.36	10391.63	-798.46	-66.44	-0.37	14.35
119	10491.00	24.20	76.06	10421.05	-796.08	-54.09	11.74	10.03
120	10522.00	26.57	78.52	10449.06	-793.17	-41.13	24.42	8.37
121	10554.00	31.08	77.83	10477.08	-790.00	-26.03	39.20	14.13
122	10585.00	35.46	79.50	10503.00	-786.67	-9.36	55.54	14.43
123	10617.00	39.27	81.18	10528.43	-783.43	9.78	74.35	12.32
124	10648.00	43.83	86.88	10551.63	-781.34	30.22	94.54	19.10
125	10680.00	46.99	87.20	10574.09	-780.16	52.97	117.12	9.90
126	10711.00	47.56	87.44	10595.12	-779.10	75.72	139.71	1.92
127	10743.00	48.71	88.94	10616.48	-778.35	99.54	163.38	5.01
128	10774.00	52.13	90.30	10636.23	-778.20	123.42	187.17	11.54
129	10805.00	54.64	93.71	10654.72	-779.08	148.28	212.02	11.98
130	10836.00	55.44	98.27	10672.49	-781.73	173.54	237.41	12.33
131	10868.00	59.03	99.47	10689.81	-785.89	200.12	264.24	11.65
132	10899.00	63.11	100.52	10704.80	-790.60	226.83	291.25	13.49
133	10930.00	65.67	100.15	10718.20	-795.61	254.33	319.07	8.33
134	10961.00	66.82	99.39	10730.69	-800.43	282.29	347.33	4.34
135	10992.00	68.21	98.56	10742.54	-804.89	310.58	375.90	5.12
136	11024.00	72.78	94.65	10753.23	-808.35	340.53	406.03	18.34
137	11055.00	76.21	93.50	10761.51	-810.47	370.33	435.90	11.63
138	11086.00	81.12	92.15	10767.60	-811.96	400.67	466.26	16.40
139	11105.00	79.24	93.54	10770.84	-812.89	419.37	484.97	12.24
140	11194.00	78.21	95.17	10788.25	-819.52	506.40	572.25	2.14
141	11224.00	78.63	93.80	10794.27	-821.81	535.70	601.64	4.69
142	11255.00	83.65	93.69	10799.04	-823.81	566.25	632.25	16.20
143	11286.00	88.86	92.48	10801.07	-825.48	597.13	663.16	17.25

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	861.44' S & 5,884.69' E of surface location or 2,010' FNL & 896.12' FEL SW NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2019
Finish:	3/12/2019

Directional Supervision:
Scientific Drilling
RPM Consulting

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
144	11317.00	94.19	91.86	10800.24	-826.65	628.08	694.11	17.31
145	11348.00	95.30	92.89	10797.68	-827.93	658.95	724.98	4.88
146	11378.00	95.44	92.59	10794.87	-829.36	688.79	754.83	1.10
147	11409.00	92.95	92.46	10792.60	-830.72	719.67	785.72	8.04
148	11440.00	93.01	92.45	10790.99	-832.05	750.60	816.65	0.20
149	11471.00	91.94	92.85	10789.65	-833.48	781.54	847.60	3.68
150	11502.00	91.00	91.73	10788.86	-834.72	812.50	878.56	4.72
151	11594.00	90.27	91.16	10787.84	-837.04	904.47	970.41	1.01
152	11686.00	90.94	91.62	10786.86	-839.27	996.43	1062.24	0.88
153	11778.00	91.14	92.26	10785.19	-842.38	1088.36	1154.12	0.73
154	11870.00	90.50	91.25	10783.88	-845.20	1180.31	1245.99	1.30
155	11962.00	88.46	90.12	10784.71	-846.30	1272.29	1337.75	2.53
156	12053.00	90.23	90.14	10785.75	-846.51	1363.28	1428.44	1.95
157	12146.00	92.31	89.14	10783.69	-845.92	1456.25	1521.05	2.48
158	12238.00	92.28	89.83	10780.01	-845.09	1548.17	1612.59	0.75
159	12330.00	92.35	90.30	10776.29	-845.20	1640.10	1704.21	0.52
160	12425.00	90.17	90.83	10774.20	-846.14	1735.06	1798.93	2.36
161	12520.00	88.09	89.19	10775.65	-846.15	1830.05	1893.59	2.79
162	12614.00	89.23	88.72	10777.84	-844.44	1924.00	1987.08	1.31
163	12710.00	90.60	89.82	10777.99	-843.22	2019.99	2082.64	1.83
164	12806.00	89.63	89.80	10777.79	-842.90	2115.99	2178.29	1.01
165	12901.00	88.76	89.92	10779.13	-842.67	2210.98	2272.93	0.92
166	12995.00	87.22	88.51	10782.42	-841.38	2304.91	2366.44	2.22
167	13090.00	85.88	89.88	10788.14	-840.05	2399.72	2460.82	2.02
168	13184.00	87.36	89.67	10793.68	-839.68	2493.55	2554.30	1.59
169	13280.00	88.43	90.65	10797.21	-839.95	2589.49	2649.93	1.51
170	13374.00	88.89	91.04	10799.41	-841.33	2683.45	2743.69	0.64
171	13470.00	90.17	91.68	10800.20	-843.61	2779.42	2839.52	1.49
172	13565.00	90.54	91.66	10799.61	-846.38	2874.37	2934.38	0.39
173	13659.00	89.80	90.87	10799.33	-848.45	2968.35	3028.20	1.15
174	13754.00	89.13	90.10	10800.22	-849.26	3063.34	3122.94	1.07
175	13848.00	90.37	90.06	10800.63	-849.39	3157.34	3216.63	1.32
176	13943.00	90.40	90.27	10799.99	-849.66	3252.34	3311.32	0.22
177	14037.00	90.17	89.59	10799.52	-849.55	3346.33	3404.99	0.76
178	14132.00	89.83	89.67	10799.52	-848.93	3441.33	3499.61	0.37
179	14227.00	88.90	89.12	10800.57	-847.93	3536.32	3594.20	1.14

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	861.44' S & 5,884.69' E of surface location or 2,010' FNL & 896.12' FEL SW NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2019
Finish:	3/12/2019

Directional Supervision:
Scientific Drilling
RPM Consulting

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
180	14322.00	87.52	88.69	10803.54	-846.12	3631.25	3688.66	1.52
181	14416.00	89.30	89.35	10806.15	-844.51	3725.20	3782.15	2.02
182	14511.00	89.26	89.40	10807.34	-843.47	3820.19	3876.73	0.07
183	14605.00	88.63	89.07	10809.07	-842.22	3914.16	3970.28	0.76
184	14700.00	89.63	88.80	10810.51	-840.45	4009.13	4064.78	1.09
185	14794.00	89.50	89.23	10811.23	-838.84	4103.11	4158.31	0.48
186	14889.00	88.79	88.94	10812.65	-837.32	4198.09	4252.84	0.81
187	14983.00	89.50	89.16	10814.05	-835.76	4292.07	4346.37	0.79
188	15078.00	89.43	89.73	10814.94	-834.84	4387.06	4440.96	0.60
189	15173.00	89.00	89.84	10816.24	-834.49	4482.05	4535.60	0.47
190	15268.00	88.53	88.64	10818.28	-833.23	4577.02	4630.14	1.36
191	15362.00	88.56	88.49	10820.67	-830.87	4670.96	4723.56	0.16
192	15456.00	89.26	87.91	10822.46	-827.92	4764.89	4816.93	0.97
193	15550.00	91.14	89.60	10822.13	-825.88	4858.86	4910.42	2.69
194	15644.00	91.41	90.89	10820.04	-826.28	4952.84	5004.10	1.40
195	15739.00	88.90	92.05	10819.78	-828.72	5047.79	5098.94	2.91
196	15834.00	89.63	93.46	10821.00	-833.28	5142.67	5193.87	1.67
197	15929.00	87.02	93.06	10823.78	-838.68	5237.47	5288.79	2.78
198	16024.00	87.52	91.49	10828.30	-842.45	5332.29	5383.59	1.73
199	16119.00	88.13	90.39	10831.91	-844.01	5427.20	5478.32	1.32
200	16214.00	90.74	91.93	10832.85	-845.93	5522.17	5573.12	3.19
201	16308.00	89.93	92.63	10832.30	-849.67	5616.09	5667.03	1.14
202	16348.00	90.03	92.77	10832.31	-851.55	5656.05	5707.00	0.43
203	16442.00	88.12	92.40	10833.83	-855.79	5749.93	5800.92	2.07
PTB	16577.00	87.00	92.40	10839.57	-861.44	5884.69	5935.68	0.83

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 1
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	Hole was reamed off, creating wellbore. Unsure of the actual depth sidetrack 1 started or ended.

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
Tie	11224.00	78.63	93.80	10794.28	-821.81	535.69	601.63	4.69
1	11255.00	83.55	95.51	10799.08	-824.30	566.20	632.24	16.78
2	11286.00	87.02	94.99	10801.63	-827.13	596.96	663.13	11.32
3	11317.00	90.13	94.35	10802.40	-829.65	627.84	694.12	10.24
4	11348.00	93.76	90.78	10801.34	-831.04	658.79	725.07	16.42
5	11378.00	97.80	92.32	10798.32	-831.84	688.61	754.86	14.40

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 2
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	765.94' S & 5,323.34' E of surface location or 1,914.94' FNL & 351.72' FWL SW NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/20/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
Tie	11105.00	79.23	93.54	10770.84	-812.96	419.37	484.98	12.28
1	11183.00	80.29	92.15	10784.71	-816.77	496.03	561.69	2.22
2	11198.00	83.60	89.46	10786.81	-816.98	510.88	576.51	28.32
3	11228.00	91.87	88.07	10787.99	-816.33	540.82	606.29	27.95
4	11259.00	97.49	88.01	10785.46	-815.27	571.69	636.97	18.13
5	11290.00	96.27	88.34	10781.75	-814.29	602.45	667.54	4.07
6	11321.00	94.45	87.61	10778.86	-813.20	633.29	698.19	6.32
7	11352.00	92.52	87.55	10776.97	-811.90	664.21	728.89	6.23
8	11413.00	89.43	88.50	10775.93	-809.79	725.15	789.46	5.30
9	11444.00	87.72	88.96	10776.70	-809.11	756.13	820.28	5.71
10	11475.00	87.53	88.99	10777.99	-808.55	787.10	851.10	0.62
11	11506.00	86.99	89.01	10779.47	-808.01	818.06	881.91	1.74
12	11536.00	86.61	88.81	10781.15	-807.44	848.01	911.70	1.43
13	11567.00	88.06	88.37	10782.59	-806.68	878.97	942.49	4.89
14	11598.00	88.73	88.83	10783.46	-805.92	909.94	973.30	2.62
15	11690.00	91.84	89.44	10783.00	-804.53	1001.92	1064.85	3.44
16	11782.00	89.40	89.22	10782.00	-803.46	1093.90	1156.43	2.66
17	11874.00	88.42	88.70	10783.75	-801.79	1185.87	1247.95	1.21
18	11966.00	89.20	89.09	10785.66	-800.02	1277.83	1339.45	0.95
19	12057.00	91.00	88.39	10785.50	-798.01	1368.80	1429.95	2.12
20	12150.00	90.40	87.20	10784.37	-794.44	1461.73	1522.26	1.43
21	12242.00	91.07	89.18	10783.19	-791.53	1553.67	1613.65	2.27
22	12334.00	92.28	91.13	10780.50	-791.78	1645.62	1705.31	2.49
23	12427.00	89.33	91.51	10779.19	-793.92	1738.58	1798.12	3.20
24	12518.00	90.10	90.96	10779.64	-795.88	1829.56	1888.95	1.04
25	12610.00	90.94	91.70	10778.81	-798.02	1921.53	1980.79	1.22
26	12702.00	90.60	93.22	10777.57	-801.97	2013.43	2072.70	1.69
27	12794.00	90.60	93.02	10776.61	-806.97	2105.29	2164.66	0.22
28	12886.00	86.88	90.55	10778.63	-809.84	2197.20	2256.49	4.85
29	12977.00	90.43	90.73	10780.77	-810.86	2288.15	2347.22	3.91
30	13069.00	90.27	89.74	10780.21	-811.23	2380.15	2438.94	1.09
31	13161.00	89.50	89.13	10780.39	-810.33	2472.14	2530.54	1.07
32	13253.00	87.69	88.17	10782.65	-808.16	2564.08	2621.99	2.23
33	13290.00	88.76	89.34	10783.79	-807.36	2601.06	2658.77	4.28
34	13345.00	90.70	90.02	10784.05	-807.05	2656.05	2713.56	3.74
35	13365.00	89.80	89.65	10783.96	-806.99	2676.05	2733.48	4.87
36	13437.00	88.09	88.50	10785.29	-805.83	2748.03	2805.12	2.86

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 2
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	765.94' S & 5,323.34' E of surface location or 1,914.94' FNL & 351.72' FWL SW NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/20/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
37	13528.00	87.76	88.13	10788.59	-803.16	2838.93	2895.49	0.54
38	13620.00	88.49	88.06	10791.60	-800.10	2930.83	2986.82	0.80
39	13712.00	89.00	87.46	10793.61	-796.50	3022.73	3078.12	0.86
40	13804.00	90.43	87.29	10794.07	-792.29	3114.63	3169.36	1.57
41	13896.00	87.86	87.18	10795.44	-787.85	3206.51	3260.55	2.80
42	13988.00	87.86	86.68	10798.88	-782.93	3298.31	3351.64	0.54
43	14080.00	89.40	87.43	10801.08	-778.20	3390.16	3442.79	1.86
44	14171.00	89.97	90.31	10801.58	-776.41	3481.13	3533.30	3.23
45	14266.00	89.50	91.04	10802.02	-777.53	3576.12	3628.06	0.91
46	14361.00	87.99	90.17	10804.10	-778.53	3671.09	3722.79	1.83
47	14455.00	90.13	89.90	10805.64	-778.59	3765.07	3816.45	2.29
48	14551.00	89.77	91.27	10805.72	-779.57	3861.07	3912.20	1.48
49	14647.00	89.43	90.28	10806.39	-780.87	3957.05	4007.97	1.09
50	14742.00	89.50	89.14	10807.28	-780.39	4052.05	4102.60	1.20
51	14836.00	88.73	90.90	10808.73	-780.42	4146.03	4196.26	2.04
52	14931.00	89.50	91.60	10810.20	-782.49	4241.00	4291.08	1.10
53	15025.00	90.37	91.79	10810.31	-785.27	4334.95	4384.94	0.95
54	15121.00	87.59	90.64	10812.01	-787.31	4430.91	4480.74	3.13
55	15215.00	88.36	89.68	10815.34	-787.57	4524.84	4574.38	1.31
56	15311.00	89.60	88.69	10817.04	-786.20	4620.82	4669.91	1.65
57	15406.00	89.93	89.08	10817.43	-784.36	4715.80	4764.42	0.54
58	15500.00	90.07	87.45	10817.43	-781.51	4809.75	4857.81	1.74
59	15595.00	88.26	87.35	10818.82	-777.20	4904.64	4952.02	1.91
60	15689.00	88.26	86.91	10821.67	-772.50	4998.48	5045.16	0.47
61	15784.00	89.10	88.76	10823.86	-768.91	5093.38	5139.44	2.14
62	15878.00	89.37	89.39	10825.12	-767.39	5187.36	5232.97	0.73
63	16014.00	89.37	89.39	10826.61	-765.94	5323.34	5368.37	0.00

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 3
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	750.77' S & 4,977.48' E of surface location or 1,899.77' FNL & 39.17' FEL SE NE Sec. 31, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/22/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
Tie	14931.00	89.50	91.60	10810.20	-782.49	4241.00	4291.08	1.10
1	14994.00	88.73	90.41	10811.17	-783.60	4303.98	4353.93	2.25
2	15025.00	87.01	88.30	10812.32	-783.25	4334.95	4384.77	8.78
3	15057.00	87.29	86.26	10813.92	-781.73	4366.87	4416.46	6.43
4	15089.00	88.96	84.69	10814.96	-779.21	4398.75	4448.03	7.16
5	15121.00	89.30	84.10	10815.45	-776.08	4430.60	4479.50	2.13
6	15152.00	90.60	83.40	10815.48	-772.71	4461.41	4509.94	4.76
7	15184.00	90.87	83.29	10815.06	-769.00	4493.19	4541.30	0.91
8	15215.00	90.77	83.92	10814.62	-765.55	4524.00	4571.72	2.06
9	15247.00	90.60	84.52	10814.24	-762.33	4555.83	4603.18	1.95
10	15279.00	91.21	86.67	10813.73	-759.87	4587.73	4634.77	6.98
11	15311.00	91.47	86.19	10812.98	-757.88	4619.66	4666.42	1.71
12	15374.00	91.41	89.42	10811.40	-755.46	4682.59	4728.94	5.13
13	15406.00	91.24	89.14	10810.66	-755.06	4714.58	4760.78	1.02
14	15468.00	89.16	89.80	10810.44	-754.49	4776.57	4822.52	3.52
15	15500.00	89.56	90.30	10810.80	-754.52	4808.57	4854.41	2.00
16	15595.00	90.17	89.04	10811.03	-753.97	4903.56	4949.04	1.47
17	15669.00	90.50	86.00	10810.59	-750.77	4977.48	5022.44	4.13

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 4
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	729.13' S & 6,383.41' E of surface location or 1,878.13' FNL & 1,366.76' FWL SE NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/24/2019

Directional Supervision:

Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)

[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
Tie	14455.00	90.13	89.90	10805.64	-778.59	3765.07	3816.45	2.29
1	14487.00	90.17	90.41	10805.55	-778.68	3797.07	3848.35	1.60
2	14519.00	87.15	89.41	10806.30	-778.63	3829.06	3880.23	9.94
3	14551.00	85.61	86.77	10808.32	-777.56	3860.97	3911.94	9.54
4	14583.00	84.94	84.69	10810.96	-775.19	3892.78	3943.44	6.81
5	14615.00	84.50	82.77	10813.90	-771.71	3924.45	3974.72	6.13
6	14647.00	86.41	82.52	10816.44	-767.63	3956.08	4005.91	6.02
7	14679.00	88.56	82.10	10817.84	-763.35	3987.76	4037.13	6.85
8	14710.00	89.26	82.25	10818.43	-759.13	4018.47	4067.38	2.31
9	14742.00	89.16	82.66	10818.88	-754.93	4050.19	4098.65	1.32
10	14773.00	88.46	83.97	10819.52	-751.32	4080.97	4129.03	4.79
11	14836.00	88.63	84.93	10821.12	-745.23	4143.65	4190.99	1.55
12	14931.00	88.66	85.90	10823.37	-737.64	4238.32	4284.71	1.02
13	15025.00	88.86	86.40	10825.40	-731.33	4332.09	4377.64	0.57
14	15121.00	89.46	86.59	10826.81	-725.46	4427.90	4472.64	0.66
15	15215.00	89.33	86.80	10827.80	-720.04	4521.74	4565.71	0.26
16	15311.00	89.36	86.34	10828.90	-714.29	4617.56	4660.73	0.48
17	15406.00	88.79	88.11	10830.43	-709.70	4712.43	4754.90	1.96
18	15468.00	87.19	88.22	10832.61	-707.71	4774.36	4816.46	2.59
19	15500.00	86.65	87.81	10834.32	-706.61	4806.29	4848.19	2.12
20	15595.00	86.82	87.28	10839.74	-702.54	4901.05	4942.29	0.59
21	15689.00	89.40	87.48	10842.84	-698.25	4994.89	5035.46	2.75
22	15721.00	90.97	87.43	10842.73	-696.83	5026.86	5067.20	4.91
23	15753.00	91.17	87.81	10842.13	-695.50	5058.83	5098.95	1.34
24	15784.00	91.21	87.20	10841.49	-694.15	5089.79	5129.70	1.97
25	15847.00	90.33	89.74	10840.64	-692.47	5152.76	5192.31	4.27
26	15878.00	89.90	89.80	10840.58	-692.34	5183.76	5223.19	1.40
27	15973.00	90.67	89.49	10840.11	-691.76	5278.75	5317.82	0.87
28	16068.00	89.26	89.78	10840.17	-691.15	5373.75	5412.44	1.52
29	16099.00	88.79	90.50	10840.69	-691.23	5404.74	5443.33	2.77
30	16163.00	89.03	90.28	10841.91	-691.66	5468.73	5507.14	0.51
31	16226.00	90.10	89.57	10842.39	-691.58	5531.73	5569.92	2.04
32	16257.00	91.31	89.85	10842.01	-691.42	5562.72	5600.79	4.01
33	16320.00	90.64	92.61	10840.94	-692.77	5625.69	5663.66	4.51
34	16352.00	90.44	92.82	10840.64	-694.29	5657.66	5695.64	0.91
35	16383.00	89.53	93.50	10840.64	-696.00	5688.61	5726.63	3.66
36	16415.00	87.45	93.72	10841.49	-698.01	5720.53	5758.61	6.54

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 4
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	729.13' S & 6,383.41' E of surface location or 1,878.13' FNL & 1,366.76' FWL SE NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/24/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
37	16446.00	87.55	93.74	10842.84	-700.03	5751.44	5789.57	0.33
38	16478.00	87.72	93.47	10844.16	-702.04	5783.35	5821.54	1.00
39	16509.00	87.82	93.69	10845.37	-703.97	5814.26	5852.51	0.78
40	16541.00	87.62	93.22	10846.64	-705.90	5846.18	5884.48	1.60
41	16572.00	87.45	92.96	10847.97	-707.57	5877.10	5915.44	1.00
42	16635.00	87.32	92.90	10850.85	-710.79	5939.96	5978.34	0.23
43	16666.00	87.09	93.31	10852.36	-712.46	5970.87	6009.29	1.52
44	16698.00	87.02	93.00	10854.00	-714.22	6002.78	6041.24	0.99
45	16730.00	88.32	92.34	10855.30	-715.71	6034.72	6073.19	4.56
46	16761.00	88.66	92.61	10856.12	-717.05	6065.68	6104.15	1.40
47	16793.00	88.76	92.22	10856.84	-718.40	6097.65	6136.12	1.26
48	16824.00	90.40	92.29	10857.07	-719.62	6128.62	6167.09	5.30
49	16856.00	90.84	92.54	10856.72	-720.97	6160.59	6199.06	1.58
50	16888.00	91.34	92.40	10856.11	-722.34	6192.55	6231.03	1.62
51	16919.00	90.90	92.82	10855.51	-723.76	6223.52	6262.00	1.96
52	16951.00	89.90	91.83	10855.28	-725.05	6255.49	6293.97	4.40
53	17014.00	89.77	91.99	10855.46	-727.15	6318.45	6356.89	0.33
54	17079.00	87.99	91.50	10856.73	-729.13	6383.41	6421.79	2.84

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 5
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	720.02' S & 6,138.61' E of surface location or 1,869.02' FNL & 1,121.96' FWL SW NW Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/25/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
Tie	16824.00	90.40	92.29	10857.07	-719.62	6128.62	6167.09	5.30
1	16834.00	88.89	92.29	10857.13	-720.02	6138.61	6177.08	15.10

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 6
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	860.57' S & 10,078' E of surface location or 2,009.57' FNL & 190.57' FEL Lot 4 Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/29/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
Tie	16226.00	90.10	89.57	10842.36	-691.56	5531.73	5569.91	2.03
1	16235.00	88.79	90.79	10842.45	-691.59	5540.73	5578.89	19.89
2	16267.00	86.88	88.42	10843.66	-691.37	5572.70	5610.73	9.51
3	16298.00	86.42	87.20	10845.47	-690.19	5603.63	5641.45	4.20
4	16330.00	86.25	85.99	10847.51	-688.29	5635.50	5673.07	3.81
5	16348.00	86.21	86.08	10848.70	-687.05	5653.42	5690.82	0.55
6	16361.00	86.31	85.97	10849.54	-686.15	5666.36	5703.64	1.14
7	16379.00	87.25	85.72	10850.56	-684.85	5684.29	5721.40	5.40
8	16393.00	88.63	85.60	10851.06	-683.79	5698.24	5735.22	9.89
9	16408.00	89.56	86.57	10851.30	-682.76	5713.20	5750.04	8.96
10	16425.00	90.47	86.63	10851.29	-681.75	5730.17	5766.87	5.36
11	16440.00	91.04	86.89	10851.09	-680.91	5745.14	5781.73	4.18
12	16457.00	91.27	86.70	10850.75	-679.96	5762.11	5798.56	1.75
13	16470.00	91.27	86.53	10850.46	-679.19	5775.09	5811.43	1.31
14	16488.00	91.34	86.01	10850.05	-678.02	5793.05	5829.23	2.91
15	16503.00	91.27	85.86	10849.71	-676.96	5808.00	5844.05	1.10
16	16520.00	90.57	85.70	10849.44	-675.70	5824.96	5860.84	4.22
17	16535.00	89.87	86.04	10849.38	-674.62	5839.92	5875.66	5.19
18	16552.00	89.80	86.22	10849.43	-673.48	5856.88	5892.47	1.14
19	16582.00	89.66	86.35	10849.57	-671.53	5886.81	5922.14	0.64
20	16613.00	89.67	86.16	10849.75	-669.51	5917.75	5952.80	0.61
21	16645.00	89.26	86.80	10850.05	-667.54	5949.69	5984.47	2.38
22	16676.00	89.03	87.83	10850.51	-666.09	5980.65	6015.21	3.40
23	16708.00	89.70	87.73	10850.87	-664.85	6012.62	6046.97	2.12
24	16739.00	90.43	89.08	10850.83	-663.99	6043.61	6077.78	4.95
25	16771.00	90.57	89.60	10850.55	-663.62	6075.60	6109.64	1.68
26	16802.00	90.80	89.98	10850.18	-663.51	6106.60	6140.52	1.43
27	16834.00	90.94	91.18	10849.70	-663.83	6138.60	6172.43	3.78
28	16865.00	91.10	90.48	10849.15	-664.28	6169.59	6203.35	2.32
29	16897.00	91.10	90.64	10848.53	-664.59	6201.58	6235.26	0.50
30	16929.00	91.21	90.41	10847.89	-664.89	6233.57	6267.17	0.80
31	16961.00	91.07	90.53	10847.25	-665.15	6265.57	6299.08	0.58
32	16992.00	91.14	90.17	10846.65	-665.34	6296.56	6329.98	1.18
33	17023.00	91.34	90.17	10845.98	-665.43	6327.55	6360.87	0.65
34	17055.00	91.34	89.94	10845.23	-665.46	6359.54	6392.76	0.72
35	17086.00	91.20	89.82	10844.55	-665.40	6390.53	6423.64	0.59
36	17118.00	90.94	92.04	10843.95	-665.92	6422.52	6455.56	6.98

SUNBURST CONSULTING
A GEOLOGY SERVICE

Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 6
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	860.57' S & 10,078' E of surface location or 2,009.57' FNL & 190.57' FEL Lot 4 Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/29/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
37	17150.00	90.94	92.02	10843.42	-667.05	6454.50	6487.52	0.06
38	17181.00	91.34	92.15	10842.81	-668.18	6485.47	6518.48	1.36
39	17198.00	91.68	93.27	10842.36	-668.98	6502.45	6535.47	6.88
40	17244.00	92.21	93.12	10840.80	-671.54	6548.35	6581.42	1.20
41	17275.00	92.89	94.00	10839.42	-673.46	6579.26	6612.39	3.59
42	17307.00	93.01	93.66	10837.77	-675.60	6611.14	6644.34	1.13
43	17338.00	93.28	92.84	10836.07	-677.35	6642.05	6675.28	2.78
44	17369.00	93.25	92.60	10834.30	-678.82	6672.96	6706.21	0.78
45	17401.00	92.38	93.22	10832.73	-680.45	6704.88	6738.16	3.34
46	17432.00	90.77	93.80	10831.88	-682.34	6735.81	6769.14	5.52
47	17464.00	90.87	94.21	10831.42	-684.58	6767.73	6801.13	1.32
48	17495.00	89.43	93.80	10831.34	-686.74	6798.65	6832.13	4.83
49	17527.00	89.36	94.30	10831.68	-689.00	6830.57	6864.12	1.58
50	17621.00	89.73	94.02	10832.43	-695.82	6924.32	6958.12	0.49
51	17716.00	90.23	93.79	10832.46	-702.29	7019.10	7053.11	0.58
52	17811.00	90.54	93.09	10831.82	-707.99	7113.92	7148.08	0.81
53	17906.00	92.18	94.05	10829.57	-713.90	7208.71	7243.03	2.00
54	17938.00	92.42	93.73	10828.28	-716.07	7240.61	7275.00	1.25
55	18001.00	91.91	93.81	10825.90	-720.21	7303.43	7337.94	0.82
56	18096.00	90.10	93.52	10824.24	-726.28	7398.22	7432.91	1.93
57	18190.00	89.23	93.84	10824.79	-732.32	7492.02	7526.89	0.99
58	18285.00	88.93	92.80	10826.31	-737.82	7586.85	7621.85	1.14
59	18379.00	89.56	93.56	10827.55	-743.03	7680.69	7715.81	1.05
60	18474.00	90.70	93.82	10827.33	-749.15	7775.49	7810.79	1.23
61	18568.00	90.94	93.45	10825.99	-755.11	7869.29	7904.76	0.47
62	18663.00	88.76	92.85	10826.24	-760.33	7964.14	7999.72	2.38
63	18757.00	88.16	91.66	10828.76	-764.02	8058.04	8093.59	1.42
64	18852.00	89.06	93.50	10831.07	-768.30	8152.91	8188.49	2.16
65	18946.00	88.59	92.66	10833.00	-773.35	8246.75	8282.43	1.02
66	19041.00	90.37	93.32	10833.86	-778.30	8341.61	8377.38	2.00
67	19136.00	89.80	93.21	10833.72	-783.71	8436.46	8472.35	0.61
68	19230.00	89.50	92.32	10834.29	-788.25	8530.34	8566.29	1.00
69	19325.00	89.06	92.14	10835.49	-791.94	8625.27	8661.19	0.50
70	19419.00	90.20	92.41	10836.09	-795.67	8719.19	8755.10	1.25
71	19514.00	91.64	93.01	10834.57	-800.17	8814.07	8850.03	1.64
72	19577.00	91.58	93.22	10832.80	-803.59	8876.95	8912.98	0.35
73	19608.00	89.46	92.81	10832.52	-805.22	8907.90	8943.96	6.97

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Operator:	Oasis Petroleum North America, LLC
Well:	Lewis Federal 5300 11-31 4BR ST 6
Surface Coordinates:	1,149' FNL & 257' FWL
Surface Location:	Lot 1 Sec. 31, T153N, R100W
County, State:	McKenzie County, ND
Bottom Hole Location:	860.57' S & 10,078' E of surface location or 2,009.57' FNL & 190.57' FEL Lot 4 Sec. 32, T153N, R100W

SUNBURST CONSULTING
A GEOLOGY SERVICE

Kick-off:	3/3/2018
Finish:	3/29/2019

Directional Supervision:
Scientific Drilling MWD
RPM Directional

GL:	2,110'
KB:	2,135'

Minimum Curvature Method (SPE-3362)
[North and East are positive and South and West are negative]

Vertical Section Azimuth: 94.73

No.	MD	INC	TRUE AZM	TVD	N-S	E-W	SECT	DLS/ 100
74	19640.00	88.59	92.79	10833.06	-806.78	8939.86	8975.94	2.72
75	19703.00	89.30	92.62	10834.22	-809.75	9002.78	9038.89	1.16
76	19798.00	88.26	92.38	10836.24	-813.90	9097.66	9133.80	1.12
77	19892.00	88.09	91.86	10839.24	-817.37	9191.55	9227.65	0.58
78	19986.00	89.46	92.72	10841.25	-821.13	9285.45	9321.54	1.72
79	20051.00	90.84	93.67	10841.08	-824.75	9350.35	9386.51	2.58
80	20148.00	90.50	93.63	10839.94	-830.92	9447.15	9483.49	0.35
81	20243.00	88.49	92.14	10840.78	-835.71	9542.01	9578.43	2.63
82	20337.00	88.12	92.74	10843.56	-839.71	9635.89	9672.31	0.75
83	20431.00	86.78	92.82	10847.74	-844.26	9729.68	9766.16	1.43
84	20525.00	87.11	92.63	10852.75	-848.72	9823.44	9859.97	0.40
85	20620.00	88.36	92.52	10856.51	-852.99	9918.27	9954.83	1.32
86	20715.00	87.99	92.80	10859.53	-857.39	10013.12	10049.72	0.49
87	20780.00	87.99	92.80	10861.81	-860.57	10078.00	10114.64	0.00

SUNBURST CONSULTING
A GEOLOGY SERVICE

FORMATION TOPS & STRUCTURAL RELATIONSHIPS

	Subject Well:								Offset Wells:		
Operator:	**Oasis Petroleum North America LLC**										
Well Name:	**Lewis Federal 5300 11-31 4BR**										
Location:	1,149' FNL & 257' FWL										
	Lot 1 Section 31, T153N, R100W										
Elevation:	GL: 2,110' Sub: 25' KB: 2,135'								**Dip To Lewis Federal 5300 11-31 3B**	**Dip To Lewis Federal 5300 11-31 2B**	**Dip To Wade Federal 5300 41-30 8T3**
Formation/ Marker	**Prog. Top**	**Prog. Datum (MSL)**	**Driller's Depth Top (MD)**	**Driller's Depth Top (TVD)**	**Datum (MSL)**	**Interval Thickness**	**Thickness to Target**	**Dip To Prog.**			
Pierre	1,985'	150'	-	-	-	-	-	-	-	-	-
Greenhorn	4,610'	-2,475'	4,619'	4,612'	-2,477'	409'	6,163'	-2'	8'	3'	17'
Mowry (Dakota Group)	5,021'	-2,886'	5,036'	5,021'	-2,886'	426'	5,754'	0'	6'	9'	13'
Inyan Kara (Dakota Group)	5,449'	-3,314'	5,472'	5,447'	-3,312'	444'	5,328'	2'	4'	9'	6'
Swift (Base Dakota Group)	5,904'	-3,769'	5,933'	5,891'	-3,756'	511'	4,884'	13'	17'	14'	33'
Rierdon	6,440'	-4,305'	6,454'	6,402'	-4,267'	471'	4,373'	38'	44'	57'	73'
Dunham Salt	6,920'	-4,785'	6,928'	6,873'	-4,738'	93'	3,902'	47'	53'	72'	86'
Dunham Salt Base	6,996'	-4,861'	7,021'	6,966'	-4,831'	300'	3,809'	30'	15'	36'	49'
Pine Salt	7,251'	-5,116'	7,323'	7,266'	-5,131'	54'	3,509'	-15'	-5'	-4'	2'
Pine Salt Base	7,310'	-5,175'	7,377'	7,320'	-5,185'	65'	3,455'	-10'	-6'	-17'	-20'
Opeche Salt	7,429'	-5,294'	7,443'	7,385'	-5,250'	31'	3,390'	44'	-9'	-15'	-21'
Opeche Salt Base	7,466'	-5,331'	7,474'	7,416'	-5,281'	280'	3,359'	50'	-6'	-14'	-22'
Amsden	7,682'	-5,547'	7,755'	7,696'	-5,561'	148'	3,079'	-14'	-7'	-12'	-19'
Tyler	7,832'	-5,697'	7,904'	7,844'	-5,709'	220'	2,931'	-12'	-8'	-15'	-11'
Otter/Base Minnelusa	8,055'	-5,920'	8,124'	8,064'	-5,929'	353'	2,711'	-9'	-1'	-7'	-8'
Kibbey "Lime"	8,403'	-6,268'	8,478'	8,417'	-6,282'	144'	2,358'	-14'	-8'	-16'	-10'
Charles Salt	8,551'	-6,416'	8,622'	8,561'	-6,426'	681'	2,214'	-10'	-2'	-13'	-12'
Base Last Salt	9,238'	-7,103'	9,304'	9,242'	-7,107'	206'	1,533'	-4'	0'	-7'	-8'
Mission Canyon	9,439'	-7,304'	9,510'	9,448'	-7,313'	568'	1,327'	-9'	-2'	-3'	0'
Lodgepole	10,010'	-7,875'	10,079'	10,016'	-7,881'	73'	759'	-6'	1'	-5'	1'
Lodgepole A	10,085'	-7,950'	10,152'	10,089'	-7,954'	93'	686'	-4'	2'	-5'	2'
Lodgepole B	10,140'	-8,005'	10,245'	10,182'	-8,047'	67'	593'	-42'	-16'	-2'	-29'
Lodgepole C	10,236'	-8,101'	10,312'	10,249'	-8,114'	165'	526'	-13'	4'	-7'	-36'
Lodgepole D	10,411'	-8,276'	10,483'	10,414'	-8,279'	140'	361'	-3'	-4'	-2'	-6'
Lodgepole E	10,556'	-8,421'	10,652'	10,554'	-8,419'	92'	221'	2'	-2'	-10'	-10'
Lodgepole F	10,647'	-8,512'	10,790'	10,646'	-8,511'	85'	129'	1'	5'	4'	-2'
False Bakken	10,729'	-8,594'	10,961'	10,731'	-8,596'	10'	44'	-2'	4'	1'	-5'
Upper Bakken Shale	10,739'	-8,604'	10,987'	10,741'	-8,606'	16'	34'	-2'	4'	2'	-7'
Middle Bakken	10,752'	-8,617'	11,037'	10,757'	-8,622'	10'	18'	-5'	1'	1'	-8'
Target Top	10,762'	-8,627'	11,088'	10,767'	-8,632'	8'	8'	-5'	1'	1'	-8'
Target Landing	10,771'	-8,636'	11,129'	10,775'	-8,640'	8'	0'	-4'	1'	1'	-8'
Target Base	10,781'	-8,646'	11,176'	10,783'	-8,648'	13'	-8'	-2'	1'	1'	-8'
Lower Bakken Shale	10,790'	-8,655'	11,231'	10,796'	-8,661'	-	-21'	-6'	-3'	-2'	-2'

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CONTROL DATA

Operator:	Oasis Petroleum North America, LLC				Oasis Petroleum North America, LLC				Oasis Petroleum North America, LLC			
Well Name:	Lewis Federal 5300 11-31 3B				Lewis Federal 5300 11-31 2B				Wade Federal 5300 41-30 8T3			
Location:	Lot 1 Section 31, T153N, R100W McKenzie County, ND Shares pad with subject well				Lot 1 Section 31, T153N, R100W McKenzie County, ND Shares pad with subject well				Lot 6 Sec. 30, T153N, R100W McKenzie County, ND 0.4 miles N of subject well			
Elevation:	KB: 2,135' NDIC: 30197				KB: 2,135' NDIC: 30189				KB: 2,077' NDIC: 28558			
Formation/ Zone	Driller's (TVD)	Datum (MSL)	Interval Thickness	Thickness to Target	Driller's (TVD)	Datum (MSL)	Interval Thickness	Thickness to Target	Driller's (TVD)	Datum (MSL)	Interval Thickness	Thickness to Target
Pierre	1,929'	206'	2,691'	8,847'	1,931'	204'	2,684'	8,845'	-	-	-	-
Greenhorn	4,620'	-2,485'	408'	6,156'	4,615'	-2,480'	415'	6,161'	4,571'	-2,494'	405'	6,138'
Mowry (Dakota Group)	5,027'	-2,892'	424'	5,748'	5,030'	-2,895'	426'	5,746'	4,976'	-2,899'	419'	5,733'
Inyan Kara (Dakota Group)	5,451'	-3,316'	457'	5,325'	5,456'	-3,321'	449'	5,320'	5,395'	-3,318'	471'	5,314'
Swift (Base Dakota Group)	5,908'	-3,773'	538'	4,868'	5,905'	-3,770'	555'	4,871'	5,866'	-3,789'	551'	4,843'
Rierdon	6,446'	-4,311'	480'	4,330'	6,459'	-4,324'	485'	4,317'	6,417'	-4,340'	485'	4,292'
Dunham Salt	6,926'	-4,791'	54'	3,850'	6,945'	-4,810'	57'	3,831'	6,901'	-4,824'	56'	3,808'
Dunham Salt Base	6,981'	-4,846'	280'	3,795'	7,002'	-4,867'	260'	3,774'	6,957'	-4,880'	253'	3,752'
Pine Salt	7,261'	-5,126'	53'	3,515'	7,262'	-5,127'	41'	3,514'	7,210'	-5,133'	32'	3,499'
Pine Salt Base	7,314'	-5,179'	62'	3,462'	7,303'	-5,168'	66'	3,473'	7,242'	-5,165'	65'	3,467'
Opeche Salt	7,376'	-5,241'	34'	3,400'	7,370'	-5,235'	32'	3,406'	7,306'	-5,229'	30'	3,403'
Opeche Salt Base	7,410'	-5,275'	278'	3,366'	7,402'	-5,267'	282'	3,374'	7,336'	-5,259'	282'	3,373'
Amsden	7,689'	-5,554'	147'	3,087'	7,684'	-5,549'	146'	3,092'	7,619'	-5,542'	157'	3,090'
Tyler	7,836'	-5,701'	227'	2,940'	7,829'	-5,694'	228'	2,946'	7,775'	-5,698'	222'	2,934'
Otter/Base Minnelusa	8,063'	-5,928'	347'	2,713'	8,057'	-5,922'	344'	2,719'	7,998'	-5,921'	351'	2,711'
Kibbey "Lime"	8,409'	-6,274'	150'	2,367'	8,401'	-6,266'	147'	2,375'	8,349'	-6,272'	143'	2,360'
Charles Salt	8,559'	-6,424'	682'	2,217'	8,548'	-6,413'	687'	2,228'	8,491'	-6,414'	685'	2,218'
Base Last Salt	9,242'	-7,107'	204'	1,534'	9,235'	-7,100'	210'	1,541'	9,176'	-7,099'	214'	1,533'
Mission Canyon	9,446'	-7,311'	570'	1,330'	9,445'	-7,310'	566'	1,331'	9,390'	-7,313'	569'	1,319'
Lodgepole	10,017'	-7,882'	75'	759'	10,011'	-7,876'	73'	765'	9,959'	-7,882'	74'	750'
Lodgepole A	10,091'	-7,956'	75'	685'	10,084'	-7,949'	96'	692'	10,033'	-7,956'	62'	676'
Lodgepole B	10,166'	-8,031'	87'	610'	10,180'	-8,045'	63'	596'	10,095'	-8,018'	60'	614'
Lodgepole C	10,253'	-8,118'	156'	523'	10,242'	-8,107'	170'	534'	10,155'	-8,078'	196'	554'
Lodgepole D	10,410'	-8,275'	142'	366'	10,412'	-8,277'	132'	364'	10,350'	-8,273'	136'	359'
Lodgepole E	10,552'	-8,417'	99'	224'	10,544'	-8,409'	106'	232'	10,486'	-8,409'	100'	223'
Lodgepole F	10,651'	-8,516'	84'	125'	10,650'	-8,515'	82'	126'	10,586'	-8,509'	82'	123'
False Bakken	10,735'	-8,600'	10'	41'	10,732'	-8,597'	10'	43'	10,668'	-8,591'	8'	41'
Upper Bakken Shale	10,745'	-8,610'	13'	31'	10,743'	-8,608'	15'	33'	10,676'	-8,599'	16'	33'
Middle Bakken	10,758'	-8,623'	10'	18'	10,758'	-8,623'	10'	18'	10,691'	-8,614'	10'	18'
Target Top	10,768'	-8,633'	8'	8'	10,768'	-8,633'	8'	8'	10,701'	-8,624'	8'	8'
Target Landing	10,776'	-8,641'	8'	0'	10,776'	-8,641'	8'	0'	10,709'	-8,632'	8'	0'
Target Base	10,784'	-8,649'	9'	-8'	10,784'	-8,649'	10'	-8'	10,717'	-8,640'	19'	-8'
Lower Bakken Shale	10,793'	-8,658'		-17'	10,794'	-8,659'		-18'	10,736'	-8,659'		-27'

Projected Depths

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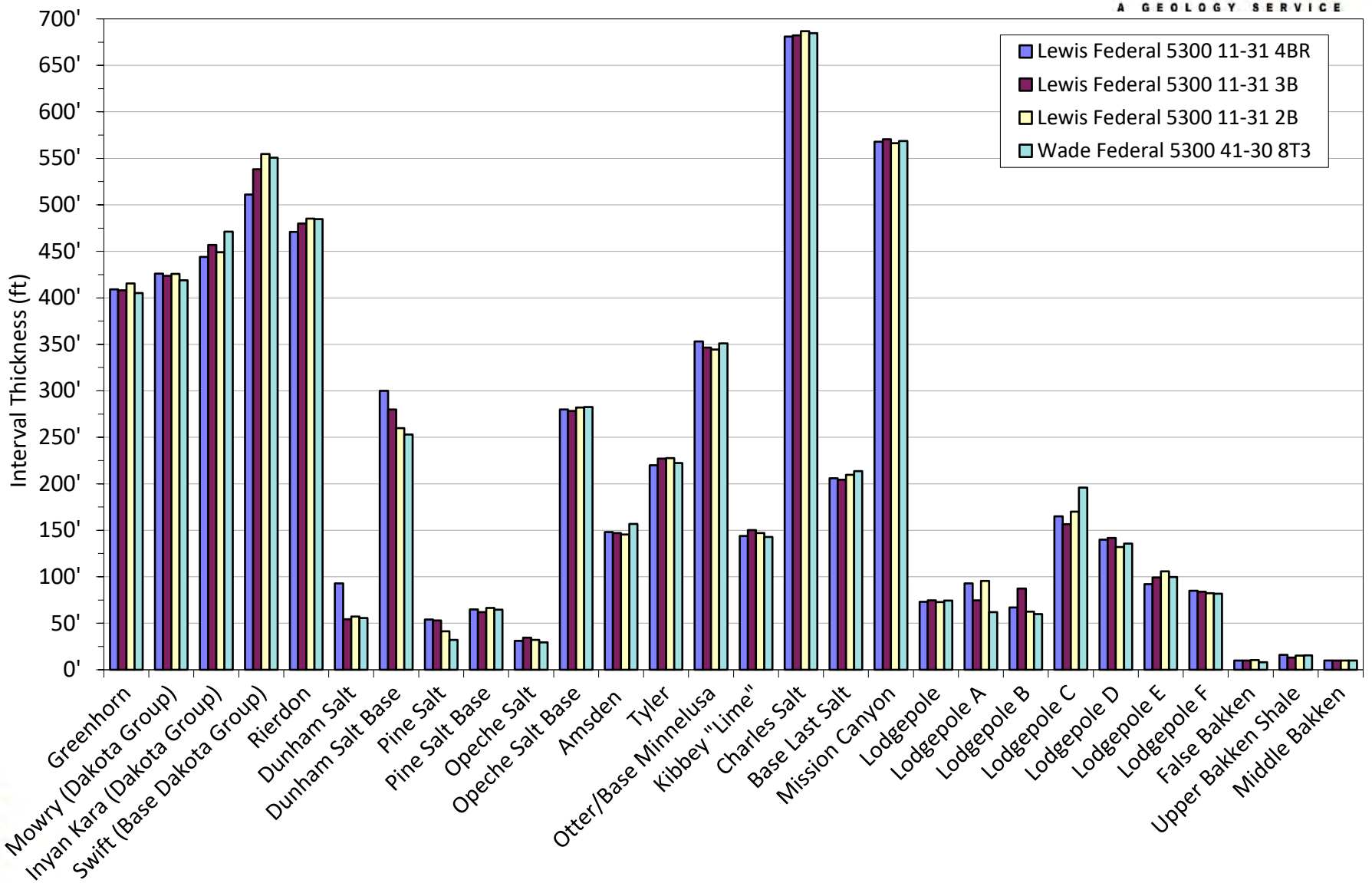
INTERVAL THICKNESS

Oasis Petroleum North America LLC - Lewis Federal 5300 11-31 4BR



LITHOLOGY

Oasis Petroleum North America, LLC

Lewis Federal 5300 11-31 4BR

Sunburst geologists caught 50' sample intervals from 3,650'-6,150'; 30' sample intervals from 8,260' to 11,152'; 1'-5' sample intervals while side-tracking/time drilling; and 50' sample intervals through the lateral to TD at 20,780'. Additional spot samples were caught through the vertical, curve, and lateral as needed. Side-track depths, formation tops, and lithologic markers have been inserted into the sample descriptions below for reference. Samples were examined wet and dry under a binocular microscope. Sample fluorescent cuts are masked by invert mud through 11,540', at which time the drilling fluid was displaced to Salt Water. Quantifiers in order of increasing abundance are trace, rare, occasional, common and abundant. One set of sample cuttings were packaged and mailed to the North Dakota Geological Survey Core Library, per state requirement, with the exception of side-track #1.

Vertical Log Descriptions: **MD / TVD (MSL Datum)**

Drilling in the Pierre Formation [Upper Montana Group]

3,650-3,700 SHALE: light-medium gray, very soft, platy, earthy texture, calcareous, very fine grained, sandy in part, no visible porosity, no visible oil stain

3,700-3,750 SHALE: medium gray, very soft, platy, earthy texture, calcareous, very fine grained, sandy in part, no visible porosity, no visible oil stain

3,750-3,800 SHALE: medium gray, very soft, platy, earthy texture, calcareous, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

3,800-3,850 SHALE: light-medium gray, soft-very soft, platy, earthy texture, calcareous, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

3,850-3,900 SHALE: light-medium gray, soft-very soft, platy, earthy texture, calcareous, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

3,900-3,950 SHALE: medium gray, very soft, platy, earthy texture, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

3,950-4,000 SHALE: light-medium gray, soft, platy, earthy texture, sandy in part, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain

4,000-4,050 SHALE: light-medium gray, soft, platy, earthy texture, sandy in part, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain

4,050-4,100 SHALE: light-medium gray, soft, platy, earthy texture, sandy in part, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain

4,100-4,150 SHALE: medium gray, trace dark gray, soft-very soft, platy, earthy texture, sandy in part, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain

4,150-4,200 SHALE: light-medium gray, soft, sub platy, rare sub blocky, earthy texture, sandy in part, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain; trace BENTONITE: white, firm, sub-platy, waxy, no visible porosity

4,200-4,250 SHALE: medium gray, trace dark gray, soft-very soft, platy, earthy texture, sandy in part, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain

4,250-4,300 SHALE: light-medium gray, very soft, platy, earthy texture, sandy in part, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain

4,300-4,350 SHALE: medium gray, very soft, platy, earthy texture, calcareous, very fine grained, sandy in part, no visible porosity, no visible oil stain

4,350-4,400 SHALE: medium gray, very soft, platy, earthy texture, calcareous, very fine grained, sandy in part, no visible porosity, no visible oil stain

4,400-4,450 SHALE: light-medium gray, very soft, platy, earthy texture, calcareous, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

4,450-4,500 SHALE: light-medium gray, very soft, platy, earthy texture, calcareous, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

4,500-4,550 SHALE: medium gray, very soft, platy, rare sub blocky, earthy texture, calcareous, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

4,550-4,600 SHALE: medium gray, very soft, platy, rare sub blocky, earthy texture, calcareous, trace carbonaceous flakes, very fine grained, sandy in part, no visible porosity, no visible oil stain

Greenhorn [Upper Colorado Group] ***4,619' MD / 4,612' TVD (-2,477')***

4,600-4,650 SHALE: light-medium gray, firm, sub-platy, earthy texture, slightly calcareous, slightly silty, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity, no visible oil stain; trace LIMESTONE: mudstone, cream, off white, trace light gray, microcrystalline, firm, rare friable, laminated, no visible porosity, no visible oil stain

4,650-4,700 SHALE: light gray, occasional medium gray, trace light brown gray, firm, sub platy to sub blocky, earthy texture, slightly calcareous, no visible porosity

4,700-4,750 SHALE: medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare disseminated pyrite, no visible porosity

4,750-4,800 SHALE: medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare disseminated pyrite, no visible porosity

4,800-4,850 SHALE: dark-medium gray, trace dark brown, firm, sub-platy to sub-blocky, earthy texture, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity

4,850-4,900 SHALE: dark-medium gray, trace dark brown, firm, sub-platy to sub-blocky, earthy texture, rare carbonaceous flakes, trace disseminated pyrite, no visible porosity

4,900-4,950 SHALE: medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare disseminated pyrite, no visible porosity

4,950-5,000 SHALE: medium-dark gray, firm, sub-platy to sub-blocky, earthy texture, sandy in part, rare carbonaceous flakes, rare disseminated pyrite, no visible porosity

5,000-5,050 SHALE: medium-dark gray, firm, sub-platy to sub-blocky, earthy texture, sandy in part, rare disseminated pyrite, no visible porosity

5,050-5,100 SHALE: dark-medium gray, rare light gray, firm, sub-platy to sub-blocky, earthy texture, sandy in part, rare disseminated pyrite, no visible porosity

5,100-5,150 SHALE: medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare disseminated pyrite, no visible porosity

5,150-5,200 SHALE: dark-medium gray, rare light gray, firm, sub-platy, earthy texture, sandy in part, no visible porosity;

5,200-5,250 SHALE: dark-medium gray, rare light gray, firm, sub-platy, earthy texture, sandy in part, no visible porosity;

5,250-5,300 SHALE: medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare disseminated pyrite, no visible porosity

5,300-5,350 SHALE: light-medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare disseminated pyrite, no visible porosity; rare SILTSTONE: gray, friable, sub-blocky, silica cement, possible porosity

5,350-5,400 SHALE: medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare disseminated pyrite, no visible porosity; trace SILTSTONE: gray, friable, sub-blocky, silica cement, possible porosity

5,400-5,450 SHALE: medium gray brown, firm, sub platy to sub blocky, earthy texture, slightly calcareous, trace carbonaceous flakes, rare disseminated pyrite, no visible porosity; rare SILTSTONE: light gray, friable, sub-blocky, calcareous cement, possible porosity

5,450-5,500 SHALE: medium gray brown, rare light gray, firm, sub platy to sub blocky, earthy texture, slightly calcareous, trace carbonaceous flakes, rare disseminated pyrite, no visible porosity; rare SILTSTONE: light gray, friable, sub-blocky, calcareous cement, possible porosity

5,500-5,550 SHALE: medium gray brown, rare light gray, firm, sub platy to sub blocky, earthy texture, slightly calcareous, rare carbonaceous flakes, rare disseminated pyrite, no visible porosity; rare SILTSTONE: light gray, friable, sub-blocky, calcareous cement, possible porosity

5,550-5,600 SHALE: light-medium gray, trace dark gray, firm, trace soft, sub platy, trace sub blocky, earthy texture, slightly calcareous, rare carbonaceous flakes, rare disseminated pyrite, no visible porosity, no visible oil stain; rare SILTSTONE: light gray, trace medium gray, trace cream, friable, trace friable, sub-blocky, calcareous cement, moderately cement, no visible porosity, no visible oil stain

5,600-5,650 SHALE: light-medium gray, trace dark gray, firm, trace soft, sub platy, trace sub blocky, earthy texture, slightly calcareous, no visible porosity, no visible oil stain; rare SILTSTONE: light gray, trace medium gray, trace cream, friable, trace friable, sub-blocky, calcareous cement, moderately cement, no visible porosity, no visible oil stain

5,650-5,700 SILTSTONE: light-medium gray, medium gray brown, rare cream, firm-friable, sub-blocky, earthy texture, sandy in part, silty in part, rare disseminated pyrite, no visible porosity, no visible oil stain; rare SANDSTONE: tan, off white, light gray, frosted, very fine-fine grained, firm, sub-rounded, moderately sorted, dolomitic cement, very poorly cemented, silty in part, possible intergranular porosity, no visible oil stain

5,700-5,750 SANDSTONE: tan, off white, trace light brown gray, frosted, very fine-fine grained, firm, sub-rounded, moderately sorted, dolomitic cement, very poorly cemented, silty in part, possible intergranular porosity, no visible oil stain

5,750-5,800 SANDSTONE: tan, off white, rare light gray, frosted, fine grained, firm, sub-rounded, moderately sorted, dolomitic cement, very poorly cemented, silty in part, possible intergranular porosity, no visible oil stain; trace SILTSTONE: light-medium gray, firm, sub-blocky, earthy texture, sandy in part, silty in part, no visible porosity, no visible oil stain; trace SHALE: light-medium gray, rare light brown gray, firm, sub platy to sub blocky, earthy texture, slightly calcareous, trace carbonaceous flakes, rare disseminated pyrite, no visible porosity

5,800-5,850 SILTSTONE: light-medium gray, medium gray brown, rare cream, firm-friable, sub-blocky, earthy texture, sandy in part, silty in part, rare disseminated pyrite, no visible porosity, no visible oil stain; trace SHALE: medium-light gray, trace dark gray, soft rare firm, sub platy, trace sub blocky, earthy texture, slightly calcareous, no visible porosity, no visible oil stain

5,850-5,900 No Sample

5,900-5,950 SILTSTONE: light-medium gray brown, occasional light gray, firm-friable, sub-blocky, earthy texture, sandy in part, silty in part, rare disseminated pyrite, no visible porosity, no visible stain; trace SANDSTONE: tan, cr, rare light gray, occasional light brown, fine grained, firm, sub rounded, moderately sorted, dolomitic cement, very poorly cemented, silty in part, possible intergranular porosity, no visible oil stain

5,950-6,000 SILTSTONE: light-medium gray, cream, firm-friable, sub-blocky, earthy texture, sandy in part, silty in part, rare disseminated pyrite, no visible porosity, no visible stain

6,000-6,050 SILTSTONE: light-medium gray, rare dark gray, trace light gray brown, firm, sub-blocky, earthy texture, sandy in part, silty in part, trace disseminated pyrite, no visible porosity, no visible stain

6,050-6,100 SILTSTONE: light-medium gray, cream, firm, occasional friable, sub-blocky, earthy texture, sandy in part, silty in part, rare disseminated pyrite, no visible porosity, no visible stain

6,100-6,150 No Sample

Drilling in the Otter Formation [Mississippian Big Snowy Group] 8,124' MD / 8,064' TVD (-5,929')

8,260-8,290 SILTSTONE: light red orange, gray, firm, sub blocky, calcareous cement, well cemented, no visible porosity, no visible oil stain; common SILTY SANDSTONE: light gray-gray, trace off white, very fine-fine grained, sub rounded, moderately sorted, calcite cement, poorly cemented, no visible porosity, no visible oil stain

8,290-8,320 SILTSTONE: light red orange, gray, firm, sub blocky, calcareous cement, well cemented, no visible porosity, no visible oil stain; common SILTY SANDSTONE: gray, trace off white, very fine-fine grained, sub rounded, moderately sorted, calcite cement, poorly cemented, no visible porosity, no visible oil stain

8,320-8,350 SILTSTONE: light red orange, gray, firm, sub blocky, calcareous cement, well cemented, no visible porosity, no visible oil stain; common SILTY SANDSTONE: gray, trace off white, very fine-fine grained, sub rounded, moderately sorted, calcite cement, poorly cemented, no visible porosity, no visible oil stain

8,350-8,380 SILTSTONE: light red orange, gray, firm, sub blocky, calcareous cement, well cemented, no visible porosity, no visible oil stain; common SILTY SANDSTONE: gray, trace off white, very fine-fine grained, sub rounded, moderately sorted, calcite cement, poorly cemented, no visible porosity, no visible oil stain

8,380-8,410 SILTSTONE: light red orange, gray, firm, sub blocky, calcareous cement, well cemented, no visible porosity, no visible oil stain; common SILTY SANDSTONE: gray, trace off white, very fine-fine grained, sub rounded, moderately sorted, calcite cement, poorly cemented, no visible porosity, no visible oil stain

8,410-8,440 SILTSTONE: light red orange, gray, firm, sub blocky, calcareous cement, well cemented, no visible porosity, no visible oil stain; common SILTY SANDSTONE: gray, trace off white, very fine-fine grained, sub rounded, moderately sorted, calcite cement, poorly cemented, no visible porosity, no visible oil stain

8,440-8,470 SILTSTONE: light red orange, gray, firm, sub blocky, calcareous cement, well cemented, no visible porosity, no visible oil stain; common SILTY SANDSTONE: gray, trace off white, very fine-fine grained, sub rounded, moderately sorted, calcite cement, poorly cemented, no visible porosity, no visible oil stain

Kibbey "Lime" [Mississippian Big Snowy Group] 8,478' MD / 8,417' TVD (-6,282')

8,470-8,500 SILTSTONE and SILTY SANDSTONE: as above; ANHYDRITE off white, microcrystalline, soft, chalky, massive, anhedral, amorphous; no visible porosity, no visible oil stain;

8,500-8,530 SILTSTONE: red brown, dark rounded, firm, sub blocky, calcareous cement, poorly-moderately cemented, no visible porosity; trace SILTY SANDSTONE: light-medium gray, very fine grained, friable, calcareous, poorly-moderately cemented, no visible porosity, no visible oil stain

8,530-8,560 SILTSTONE: orange brown, soft, blocky-sub platy, calcareous cement, well sorted, no visible porosity

8,560-8,590 SILTSTONE: red brown, dark rounded, firm, sub blocky, calcareous cement, poorly-moderately cemented, no visible porosity; trace SILTY SANDSTONE: light-medium gray, very fine grained, friable, calcareous, poorly-moderately cemented, no visible porosity, no visible oil stain

8,590-9,620 SILTSTONE: red brown, dark orange, firm, occasional friable, sub blocky, calcareous cement, poorly-moderately cemented, no visible porosity, no visible oil stain; rare LIMESTONE: mudstone, cream, common light-medium gray, rare tan, microcrystalline, firm, earthy texture, no visible porosity, no visible oil stain; rare SALT: translucent, common milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

Charles Formation [Mississippian Madison Group] 8,622' MD / 8,561' TVD (-6,426')

8,620-8,650 LIMESTONE: mudstone, cream, common light-medium gray, rare tan, microcrystalline, firm, earthy texture, no visible porosity, no visible oil stain; rare SALT: translucent, common milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

8,650-8,680 SALT: translucent, common milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

8,680-8,710 LIMESTONE: mudstone, light brown gray, medium-light gray, common cream, microcrystalline, firm, trace friable, earthy texture, no visible porosity, no visible oil stain; occasional SALT: translucent, common milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

8,710-8,740 SALT: translucent, common milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

8,740-8,770 SALT: translucent, common milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

8,770-8,800 SALT: translucent, common milky white, firm, hard, crystalline, massive, anhedral, no visible porosity; trace LIMESTONE: mudstone, medium-light gray, light brown gray, tan, earthy texture, friable, common firm, no visible porosity

8,800-8,830 LIMESTONE-ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, medium-light gray, light brown gray, tan, trace dark gray, earthy texture, friable, common firm, argillaceous in part, no visible porosity

8,830-8,860 LIMESTONE: mudstone, medium-light gray, light brown gray, tan, earthy texture, friable, common firm, no visible porosity; trace ANHYDRITE: milky white, cream, microcrystalline, soft, amorphous, no visible porosity

8,860-8,890 SALT: milky white, firm, hard, crystalline, massive, anhedral, no visible porosity; rare LIMESTONE: mudstone, medium-light gray, light brown gray, tan, earthy texture, friable, common firm, no visible porosity

8,890-8,920 DOLOMITIC LIMESTONE: mudstone, tan, light gray, rare cream, microcrystalline, firm, common friable, earthy-crystalline texture, no visible porosity; rare SALT: translucent, rare milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

8,920-8,950 DOLOMITIC LIMESTONE: mudstone, cream, tan, medium-light gray, earthy texture, friable, no visible porosity; rare ANHYDRITE: milky white, cream, rare light gray, microcrystalline, soft, amorphous, no visible porosity

8,950-8,980 SALT: milky white, firm, hard, crystalline, massive, anhedral, no visible porosity; rare ANHYDRITE: milky white, cream, rare light gray, microcrystalline, soft, amorphous, no visible porosity

8,980-9,010 SALT: milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

9,010-9,040 ARGILLACEOUS LIMESTONE: mudstone, light brown gray, medium-dark gray, cream, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, no visible porosity

9,040-9,070 DOLOMITE: mudstone, cream, tan, rare light gray, friable, common firm, crystalline texture, no visible porosity, no visible oil stain; trace ANHYDRITE: milky white, microcrystalline, soft, amorphous, no visible porosity, no visible oil stain

9,070-9,100 LIMESTONE: mudstone, light gray, tan, trace medium gray, earthy texture, friable, common firm, no visible porosity; trace ANHYDRITE: milky white, cream, rare light gray, microcrystalline, soft, amorphous, no visible porosity

9,100-9,130 LIMESTONE: mudstone, medium-light gray, light brown gray, tan, earthy texture, friable, common firm, no visible porosity; rare ANHYDRITE: milky white, cream, rare light gray, microcrystalline, soft, amorphous, no visible porosity

9,130-9,160 LIMESTONE: mudstone, cream, occasional medium-light gray, rare light brown gray, trace tan, earthy texture, friable, common firm, no visible porosity

9,160-9,190 DOLOMITE: mudstone, tan, light brown gray, microcrystalline, firm-hard, dense-banded, crystalline-sucrosic texture, argillaceous in part, no visible porosity

9,190-9,220 LIMESTONE: mudstone, tan, cream, light-medium gray, microcrystalline, firm-hard, dense-banded, crystalline-sucrosic texture, argillaceous in part, no visible porosity; occasional ANHYDRITE: off white, tan, microcrystalline, firm-soft, massive, amorphous, no visible porosity

9,220-9,250 LIMESTONE: mudstone, cream, light gray, microcrystalline, firm, rare friable, earthy texture, no visible porosity; common ARGILLACEOUS LIMESTONE: mudstone, occasional wackestone, light-medium gray, tan, off white, microcrystalline, firm-hard, dense, bedded, earthy texture, no visible porosity

9,250-9,280 LIMESTONE: mudstone, cream, light gray, microcrystalline, firm, rare friable, earthy texture, no visible porosity; common ARGILLACEOUS LIMESTONE: mudstone, occasional wackestone, light-medium gray, tan, off white, microcrystalline, firm-hard, dense, bedded, earthy texture, no visible porosity

9,280-9,310 SALT: translucent, rare milky white, firm, hard, crystalline, massive, anhedral, no visible porosity

Base of Last Salt [Charles Formation] ***9,304' MD / 9,242' TVD (-7,107')***

9,310-9,340 LIMESTONE-ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, tan, light-medium gray, rare dark gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, no visible porosity, no visible oil stain

9,340-9,370 LIMESTONE: mudstone, tan, cream, light-medium gray, microcrystalline, firm, trace friable, dense, earthy texture, common crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

9,370-9,400 LIMESTONE: mudstone, trace wackestone, light-medium gray, occasional cream, microcrystalline, firm, trace friable, dense, earthy texture, no visible porosity, no visible oil stain; ANHYDRITE: as above

9,400-9,430 LIMESTONE: mudstone, trace wackestone, light-medium gray, occasional cream, microcrystalline, firm, trace friable, dense, earthy texture, no visible porosity, no visible oil stain; ANHYDRITE: as above

9,430-9,460 LIMESTONE: mudstone, trace wackestone, light-medium gray, occasional cream, microcrystalline, firm, trace friable, dense, earthy texture, no visible porosity, no visible oil stain; ANHYDRITE: as above

9,460-9,490 LIMESTONE: mudstone, trace wackestone, light-medium gray, occasional cream, microcrystalline, firm, trace friable, dense, earthy texture, no visible porosity, no visible oil stain; ANHYDRITE: as above

Mission Canyon [Mississippian Madison Group] ***9,510' MD / 9,448' TVD (-7,313')***

9,490-9,520 LIMESTONE-ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, tan, light-medium gray, rare dark gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, no visible porosity, no visible oil stain

9,520-9,550 LIMESTONE: mudstone, tan, cream, light-medium gray, microcrystalline, firm, trace friable, dense, earthy texture, common crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

9,550-9,580 LIMESTONE: mudstone, trace wackestone, light-medium gray, occasional cream, microcrystalline, firm, trace friable, dense, earthy texture, no visible porosity, no visible oil stain; ANHYDRITE: as above

9,580-9,610 LIMESTONE: mudstone, gray, fine crystalline, friable, no visible porosity, no visible oil stain; ARGILLACEOUS LIMESTONE: tan-light gray, fine crystalline, friable, earthy texture, no visible porosity, no visible oil stain; trace ANHYDRITE: as above

9,610-9,640 LIMESTONE: mudstone, cream-gray, gray-brown, microcrystalline, firm-hard, dense-banded, crystalline-sucrosic texture, argillaceous in part, no visible porosity, no visible oil stain

9,640-9,670 LIMESTONE: mudstone, cream-gray, gray-brown, microcrystalline, firm-hard, dense-banded, crystalline-sucrosic texture, argillaceous in part, no visible porosity, no visible oil stain

9,670-9,700 LIMESTONE: mudstone, cream-gray, light brown, microcrystalline, firm, occasional hard, trace friable, dense-banded, earthy texture, argillaceous in part, no visible porosity, no visible oil stain

9,700-9,730 LIMESTONE: mudstone, gray, fine crystalline, friable, no visible porosity, no visible oil stain; ARGILLACEOUS LIMESTONE: tan-light gray, fine crystalline, friable, earthy texture, no visible porosity, no visible oil stain; trace ANHYDRITE: as above

9,730-9,760 LIMESTONE: mudstone, gray, fine crystalline, friable, no visible porosity, no visible oil stain; ARGILLACEOUS LIMESTONE: tan-light gray, fine crystalline, friable, earthy texture, no visible porosity, no visible oil stain; trace ANHYDRITE: as above

9,760-9,790 LIMESTONE: mudstone, cream, light gray, microcrystalline, firm-friable, trace friable, dense-banded, earthy texture. ARGILLACEOUS LIMESTONE: tan-light gray, fine crystalline, friable, earthy texture, no visible porosity, no visible oil stain; trace ANHYDRITE: as above

9,790-9,820 LIMESTONE: mudstone, brown, gray brown, occasional gray, trace dark gray, microcrystalline, firm, dense, earthy-crystalline texture, no visible porosity, no visible oil stain

9,820-9,850 LIMESTONE: mudstone, tan, rare light gray, occasional dark gray, microcrystalline, firm, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

9,850-9,880 LIMESTONE: mudstone, tan-brown, light brown gray, trace gray-dark gray, microcrystalline, firm, trace friable, dense, earthy texture, common crystalline texture, possible intercrystalline porosity, trace spotty light brown oil stain

9,880-9,910 LIMESTONE: mudstone, tan, cream, light gray-gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

9,910-9,940 LIMESTONE: mudstone, tan, cream, light gray-gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

9,940-9,970 LIMESTONE: mudstone, tan, cream, light gray-gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

9,970-10,000 LIMESTONE: mudstone, tan, cream, light gray-gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

10,000-10,030 LIMESTONE: mudstone, tan, cream, light gray-gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

10,030-10,060 LIMESTONE: mudstone, tan, cream, light gray-gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

Lodgepole Formation [Mississippian Madison Group] 10,079' MD / 10,016' TVD (-7,881')

10,060-10,090 LIMESTONE: mudstone, tan, cream, light gray-gray, microcrystalline, firm, trace friable, dense, earthy texture, rare crystalline texture, argillaceous in part, no visible porosity, no visible oil stain

10,090-10,120 ARGILLACEOUS LIMESTONE: mudstone, light-medium gray, light brown, microcrystalline, firm, dense, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,120-10,150 ARGILLACEOUS LIMESTONE: mudstone, medium-light gray, light brown, microcrystalline, firm, dense, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,150-10,180 ARGILLACEOUS LIMESTONE: mudstone, medium-light gray, light brown, microcrystalline, firm, dense, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,180-10,210 ARGILLACEOUS LIMESTONE: mudstone, medium-light gray, light brown, microcrystalline, firm, dense, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,210-10,240 ARGILLACEOUS LIMESTONE: mudstone, light-medium gray, light brown, microcrystalline, firm, dense, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,240-10,270 ARGILLACEOUS LIMESTONE: mudstone, light-medium gray, light brown, microcrystalline, firm, dense, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,270-10,300 ARGILLACEOUS LIMESTONE: mudstone, light-medium gray, light brown, microcrystalline, firm, dense, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

Horizontal Log Descriptions: MD / TVD (MSL Datum)

10,300-10,330 ARGILLACEOUS LIMESTONE: mudstone, dark brown, medium-light gray, rare cream, rare calcite fill, firm, trace hard, microcrystalline texture, earthy texture, no visible porosity, no visible oil stain

10,330-10,360 ARGILLACEOUS LIMESTONE: mudstone, dark brown, medium-light gray, rare cream, rare calcite fill, firm, trace hard, microcrystalline texture, earthy texture, no visible porosity, no visible oil stain

10,360-10,390 ARGILLACEOUS LIMESTONE: mudstone, dark brown, medium-light gray, rare cream, rare calcite fill, firm, trace hard, microcrystalline texture, earthy texture, no visible porosity, no visible oil stain

10,390-10,420 ARGILLACEOUS LIMESTONE: mudstone, medium-light gray, firm, earthy texture, no visible porosity, no visible oil stain

10,420-10,450 ARGILLACEOUS LIMESTONE: mudstone, medium-light gray, firm, earthy texture, no visible porosity, no visible oil stain

10,450-10,480 ARGILLACEOUS LIMESTONE: mudstone, medium-light gray, firm, earthy texture, no visible porosity, no visible oil stain

10,480-10,510 ARGILLACEOUS LIMESTONE: mudstone, medium-light gray, firm, earthy texture, no visible porosity, no visible oil stain

10,510-10,540 ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, medium-light gray, occasional light brown gray, rare dark gray, trace cream, firm, occasional friable, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,540-10,570 ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, medium-light gray, occasional light brown gray, rare dark gray, trace cream, firm, occasional friable, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,570-10,600 ARGILLACEOUS LIMESTONE: mudstone, common wackestone, light brown gray, medium-dark gray, rare light gray, firm, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,600-10,630 ARGILLACEOUS LIMESTONE: mudstone, common wackestone, light brown gray, medium-dark gray, rare light gray, firm, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,630-10,660 ARGILLACEOUS LIMESTONE: mudstone, trace wackestone, light brown gray, common tan, rare medium-dark gray, trace light gray, firm, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,660-10,690 ARGILLACEOUS LIMESTONE: mudstone, trace wackestone, light brown gray, common tan, rare medium-dark gray, trace light gray, firm, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,690-10,720 ARGILLACEOUS LIMESTONE: mudstone, common wackestone, dark-medium gray, common light brown gray, firm, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,720-10,750 ARGILLACEOUS LIMESTONE: mudstone, common wackestone, dark-medium gray, common light brown gray, firm, microcrystalline, earthy texture, trace disseminated pyrite, no visible porosity, no visible oil stain

10,750-10,780 ARGILLACEOUS LIMESTONE: mudstone, common wackestone, dark-medium gray, common light brown gray, rare light gray, trace cream, firm, microcrystalline, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,780-10,810 ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, tan, light brown gray, medium-light gray, firm, microcrystalline, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,810-10,840 ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, tan, light brown gray, medium-light gray, firm, microcrystalline, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,840-10,870 ARGILLACEOUS LIMESTONE: mudstone, occasional wackestone, light brown gray, medium-dark gray, rare light gray, firm, microcrystalline, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,870-10,900 ARGILLACEOUS LIMESTONE: mudstone, occasional wackestone, light brown gray, medium-dark gray, rare light gray, firm, microcrystalline, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,900-10,930 ARGILLACEOUS LIMESTONE: mudstone, rare wackestone, cream, light brown gray, light-medium gray, trace dark gray, firm, microcrystalline, earthy texture, rare disseminated pyrite, no visible porosity, no visible oil stain

10,930-10,960 ARGILLACEOUS LIMESTONE: mudstone, common wackestone, dark-medium gray, common light brown gray, firm, microcrystalline, earthy texture, no visible porosity, no visible oil stain

False Bakken [Lodgepole Formation] 10,961' MD / 10,731' TVD (-8,596')

10,960-10,990 LIMESTONE: mudstone, cream, tan, rare light gray, firm, microcrystalline, earthy texture, no visible porosity, no visible oil stain; SHALE: dark gray-black, hard, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain

Upper Bakken Shale Member [Mississippian-Bakken Formation] 10,987' MD / 10,741' TVD (-8,606')

10,990-11,020 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain

Middle Bakken Member [Mississippian-Devonian Bakken Formation] 11,037' MD / 10,757' TVD (-8,622')

11,020-11,050 SILTY SANDSTONE: light-medium gray, light brown gray-light brown, firm, friable, fine grained, sub-rounded, moderately poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; SHALE: as above

11,050-11,080 SILTY SANDSTONE: light-medium gray, light brown gray-light brown, firm, friable, fine grained, sub-rounded, moderately poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,080-11,170 No sample

11,170-11,200 SILTY SANDSTONE: light-medium gray, occasional off white, trace light brown gray, firm, fine grained, sub-rounded, trace sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence; rare CEMENT

Lower Bakken Shale [Devonian Bakken Formation] 11,231' MD / 10,796' TVD (-8,661')

11,200-11,250 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated cut fluorescence

11,250-11,300 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated cut fluorescence

11,300-11,350 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated cut fluorescence

Middle Bakken Member [Mississippian-Devonian Bakken Formation] 11,375' MD / 10,795' TVD (-8,660')

11,350-11,400 SILTY SANDSTONE: light-medium gray, trace dark gray, firm, fine grained, sub-rounded, occasional sub-angular moderately, poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,400-11,450 SILTY SANDSTONE: light-medium gray, trace dark gray, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,450-11,500 SILTY SANDSTONE: light-medium gray, occasional cream, rare light brown gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,500-11,550 SILTY SANDSTONE: light-medium gray, occasional cream, rare light brown gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,550-11,600 SILTY SANDSTONE: light gray, occasional light gray brown, rare medium-dark gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,600-11,650 SILTY SANDSTONE: light gray, occasional light gray brown, rare medium-dark gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,650-11,700 SILTY SANDSTONE: medium-dark gray, common light gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,700-11,750 SILTY SANDSTONE: medium-light gray, occasional light brown gray, trace light brown, trace tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,750-11,800 SILTY SANDSTONE: medium-light gray, occasional light brown gray, trace light brown, trace tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,800-11,850 SILTY SANDSTONE: light gray, occasional medium-dark gray, trace light brown, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,850-11,900 SILTY SANDSTONE: light gray, occasional medium-dark gray, trace light brown, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,900-11,950 SILTY SANDSTONE: medium-light gray, rare tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

11,950-12,000 SILTY SANDSTONE: medium-light gray, rare tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,000-12,050 SILTY SANDSTONE: light gray, off white, rare medium-dark gray, trace light gray brown, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,050-12,100 SILTY SANDSTONE: light gray, off white, rare medium-dark gray, trace light gray brown, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,100-12,150 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,150-12,200 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,200-12,250 SILTY SANDSTONE: light brown gray, medium-light gray, rare dark gray, trace off white, firm, fine grained, sub-rounded, trace sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,250-12,300 SILTY SANDSTONE: light brown gray, medium-light gray, rare dark gray, trace off white, firm, fine grained, sub-rounded, trace sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,300-12,350 SILTY SANDSTONE: light-medium gray, occasional cream, rare light brown gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,350-12,400 SILTY SANDSTONE: light-medium gray, occasional cream, rare light brown gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,400-12,450 SILTY SANDSTONE: light-medium gray, occasional cream, rare light brown gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,450-12,500 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,500-12,550 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,550-12,600 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,600-12,650 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,650-12,700 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

12,700-12,750 SILTY SANDSTONE: light-medium brown, brown gray, rare medium-light gray, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

12,750-12,800 SILTY SANDSTONE: medium-light brown, brown gray, rare medium-light gray, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

12,800-12,850 SILTY SANDSTONE: medium-light brown, brown gray, rare medium-light gray, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

12,850-12,900 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

12,900-12,950 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

12,950-13,000 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,000-13,050 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,050-13,100 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,100-13,150 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,150-13,200 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,200-13,250 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,250-13,300 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,300-13,350 SILTY SANDSTONE: light-medium brown, brown gray-gray, trace cream, firm, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, rare light-medium brown spotty oil stain; slightly pale yellow diffuse cut fluorescence

13,350-13,400 SILTY SANDSTONE: light brown-gray, medium-dark gray, rare light brown gray, firm, trace hard, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

13,400-13,450 SILTY SANDSTONE: medium-dark gray, rare light brown gray, firm, trace hard, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

13,450-13,500 SILTY SANDSTONE: medium-light gray, light brown gray, rare cream, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

13,500-13,550 SILTY SANDSTONE: medium-light gray, light brown gray, rare cream, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

13,550-13,600 SILTY SANDSTONE: medium-light gray, light brown gray, rare cream, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

13,600-13,650 SILTY SANDSTONE: cream, light gray, rare medium-dark gray, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

13,650-13,700 SILTY SANDSTONE: cream, light gray, rare medium-dark gray, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

13,700-13,750 SILTY SANDSTONE: light brown gray, common medium-light gray, trace dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

13,750-13,800 SILTY SANDSTONE: light brown gray, common medium-light gray, trace dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

13,800-13,850 SILTY SANDSTONE: cream, light gray, medium-light gray, trace off white, firm, fine grained, sub-rounded, common sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

13,850-13,900 SILTY SANDSTONE: cream, light gray, medium-light gray, trace off white, firm, fine grained, sub-rounded, common sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

13,900-13,950 SILTY SANDSTONE: cream, light gray, medium-light gray, trace off white, firm, fine grained, sub-rounded, common sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

13,950-14,000 SILTY SANDSTONE: medium-light gray, light brown gray, firm, fine grained, sub-rounded, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,000-14,050 SILTY SANDSTONE: medium-light gray, light brown gray, firm, fine grained, sub-rounded, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,050-14,100 SILTY SANDSTONE: medium-light gray, light brown gray, firm, fine grained, sub-rounded, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,100-14,150 SILTY SANDSTONE: medium-light gray, occasional light brown gray, rare dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,150-14,200 SILTY SANDSTONE: medium-light gray, occasional light brown gray, rare dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,200-14,250 SILTY SANDSTONE: medium-light gray, occasional light brown gray, rare dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,250-14,300 SILTY SANDSTONE: light brown gray, common medium-light gray, trace dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,300-14,350 SILTY SANDSTONE: light brown gray, common medium-light gray, trace dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, poorly-moderately cemented, trace disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,350-14,400 SILTY SANDSTONE: light-medium gray, occasional light brown gray, rare dark gray, firm, trace hard, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,400-14,450 SILTY SANDSTONE: light-medium gray, occasional light brown gray, rare dark gray, firm, trace hard, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,450-14,500 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

14,500-14,550 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

14,550-14,600 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

14,600-14,650 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

14,650-14,700 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

14,700-14,750 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

14,750-14,800 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

14,800-14,850 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,850-14,900 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,900-14,950 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

14,950-15,000 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,000-15,050 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,050-15,100 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,100-15,150 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,150-15,200 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,200-15,250 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,250-15,300 SILTY SANDSTONE: light brown, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,300-15,350 SILTY SANDSTONE: light brown, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,350-13,400 SILTY SANDSTONE: light brown, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,400-15,450 SILTY SANDSTONE: light brown, common light-medium gray, occasional tan, rare light brown gray, firm, trace friable, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,450-15,500 SILTY SANDSTONE: light brown, common light-medium gray, occasional tan, rare light brown gray, firm, trace friable, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,500-15,550 SILTY SANDSTONE: medium-light gray, occasional light brown gray, rare dark gray, trace tan, firm, fine grained, sub-rounded, rare sub-angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,550-15,600 SILTY SANDSTONE: light brown, common light-medium gray, occasional tan, rare light brown gray, firm, trace friable, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,600-15,650 SILTY SANDSTONE: light brown, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,650-15,700 SILTY SANDSTONE: light brown, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,700-15,750 SILTY SANDSTONE: light brown, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

15,750-15,800 SILTY SANDSTONE: light-medium brown, brown gray, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,800-15,850 SILTY SANDSTONE: light-medium brown, brown gray, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,850-15,900 SILTY SANDSTONE: light-medium brown, brown gray, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,900-15,950 SILTY SANDSTONE: medium-light brown, brown gray, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

15,950-16,000 SILTY SANDSTONE: medium-light brown, brown gray, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,000-16,050 SILTY SANDSTONE: light-medium gray brown, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,050-16,100 SILTY SANDSTONE: light-medium gray brown, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,100-16,150 SILTY SANDSTONE: light-medium gray brown, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,150-16,200 SILTY SANDSTONE: light-medium gray brown, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,200-16,250 SILTY SANDSTONE: medium-light brown, brown gray, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,250-16,300 SILTY SANDSTONE: medium-light brown, brown gray, rare gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,300-16,350 SILTY SANDSTONE: light-medium gray, common light brown, occasional light brown gray, rare cream, firm, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,350-16,400 SILTY SANDSTONE: light brown, light-medium gray, light brown gray, firm, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,400-16,450 SILTY SANDSTONE: light brown, light-medium gray, light brown gray, firm, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,450-16,500 SILTY SANDSTONE: light brown, cream, light brown gray, rare medium-light gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

16,500-16,550 SILTY SANDSTONE: light brown, cream, light brown gray, rare medium-light gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

Side-track #1 Drilling in the Middle Bakken

No samples were caught in this sidetrack; unaware the bit was being reamed away from the existing lateral creating an unintentional sidetrack

Side-track #2 Drilling in the Middle Bakken

11,152-11,172 COMMON CEMENT, HCl: Non-reactive, Phenolphthalein: 100% Reactive, instantly purple

11,172-11,173 COMMON CEMENT to 10% SILTY SANDSTONE

11,173-11,174 COMMON CEMENT to 20% SILTY SANDSTONE

11,174-11,184 COMMON CEMENT to 45% SILTY SANDSTONE

11,184-11,188 COMMON CEMENT to 50% SILTY SANDSTONE

11,188-11,191 SILTY SANDSTONE to 15% COMMON CEMENT

11,191-11,198 SILTY SANDSTONE: light gray-light brown gray, very fine grained, firm-friable, sub-rounded, coated, moderately poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; fist sample out of side-track that was non-reactive to Phenolphthalein

11,198-11,200 SILTY SANDSTONE: light gray-light brown gray, very fine grained, firm-friable, sub-rounded, coated, moderately poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,200-11,205 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,205-11,210 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,210-11,215 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,215-11,220 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,220-11,225 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,225-11,230 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,230-11,235 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,235-11,240 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,240-11,245 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,245-11,250 SILTY SANDSTONE: light gray, light brown gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,250-11,300 SILTY SANDSTONE: light gray-light brown gray, light brown, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,300-11,350 SILTY SANDSTONE: light gray-light brown gray, light brown, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,350-11,400 SILTY SANDSTONE: light brown-gray brown, rare gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,400-11,450 SILTY SANDSTONE: light brown-gray brown, rare gray, very fine grained, firm, sub-rounded, coated, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,450-11,500 SILTY SANDSTONE: light-medium gray, occasional cream, rare light brown gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,500-11,550 SILTY SANDSTONE: light-medium gray, occasional cream, rare light brown gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain

11,550-11,600 SILTY SANDSTONE: light gray, occasional light gray brown, rare medium-dark gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

11,600-11,650 SILTY SANDSTONE: light gray, occasional light gray brown, rare medium-dark gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

11,650-11,700 SILTY SANDSTONE: medium-dark gray, common light gray, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

11,700-11,750 SILTY SANDSTONE: medium-light gray, occasional light brown gray, trace light brown, trace tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

11,750-11,800 SILTY SANDSTONE: medium-light gray, occasional light brown gray, trace light brown, trace tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly-moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

11,800-11,850 SILTY SANDSTONE: light gray, occasional medium-dark gray, trace light brown, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

11,850-11,900 SILTY SANDSTONE: light gray, occasional medium-dark gray, trace light brown, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

11,900-11,950 SILTY SANDSTONE: medium-light gray, rare tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

11,950-12,000 SILTY SANDSTONE: medium-light gray, rare tan, firm, fine grained, sub-rounded, occasional sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

12,000-12,050 SILTY SANDSTONE: light gray, off white, rare medium-dark gray, trace light gray brown, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,050-12,100 SILTY SANDSTONE: light gray, off white, rare medium-dark gray, trace light gray brown, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,100-12,150 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,150-12,200 SILTY SANDSTONE: off white, light gray, tan, firm, fine grained, sub-rounded, rare sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,200-12,250 SILTY SANDSTONE: light brown gray, medium-light gray, rare dark gray, trace off white, firm, fine grained, sub-rounded, trace sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,250-12,300 SILTY SANDSTONE: light brown gray, medium-light gray, rare dark gray, trace off white, firm, fine grained, sub-rounded, trace sub-angular, moderately poorly sorted, calcareous cement, poorly cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,300-12,350 SILTY SANDSTONE: light brown gray, light brown, medium-light gray, cream, firm, hard, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

12,350-12,400 SILTY SANDSTONE: light brown gray, light brown, medium-light gray, cream, firm, hard, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace brown spotty oil stain; slow pale green-yellow diffuse cut fluorescence

12,400-12,450 SILTY SANDSTONE: light gray, medium-dark gray, rare light brown gray, firm, trace hard, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,450-12,500 SILTY SANDSTONE: light gray, medium-dark gray, rare light brown gray, firm, trace hard, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,500-12,550 SILTY SANDSTONE: light brown gray, rare light brown, firm, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; moderately pale yellow diffuse cut fluorescence

12,550-12,600 SILTY SANDSTONE: light brown gray, rare light brown, firm, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; moderately pale yellow diffuse cut fluorescence

12,600-12,650 SILTY SANDSTONE: light gray, tan gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,650-12,700 SILTY SANDSTONE: light tan gray, gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow-moderately pale yellow diffuse cut fluorescence

12,700-12,750 SILTY SANDSTONE: light gray, tan gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,750-12,800 SILTY SANDSTONE: light tan gray, gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow-moderately pale yellow diffuse cut fluorescence

12,800-12,850 SILTY SANDSTONE: light brown gray, rare light brown, firm, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; moderately pale yellow diffuse cut fluorescence

12,850-12,900 SILTY SANDSTONE: light gray, tan gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

12,900-12,950 SILTY SANDSTONE: light tan gray, gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow-moderately pale yellow diffuse cut fluorescence

12,950-13,000 SILTY SANDSTONE: light gray, tan gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

13,000-13,050 SILTY SANDSTONE: light brown gray, rare light brown, firm, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; moderately pale yellow diffuse cut fluorescence

13,050-13,100 SILTY SANDSTONE: light tan gray, gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow-moderately pale yellow diffuse cut fluorescence

13,100-13,150 SILTY SANDSTONE: light brown gray, rare light brown, firm, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; moderately pale yellow diffuse cut fluorescence

13,150-13,200 SILTY SANDSTONE: light gray, tan gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

13,200-13,250 SILTY SANDSTONE: light tan gray, gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow-moderately pale yellow diffuse cut fluorescence

13,250-13,300 SILTY SANDSTONE: light gray, tan gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

13,300-13,350 SILTY SANDSTONE: light brown gray, rare light brown, firm, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; moderately pale yellow diffuse cut fluorescence

13,350-13,400 SILTY SANDSTONE: light tan gray, gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow-moderately pale yellow diffuse cut fluorescence

13,400-13,450 SILTY SANDSTONE: light gray, tan gray, rare light brown, firm, very fine grained, sub rounded-sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; slow pale yellow diffuse cut fluorescence

13,450-13,500 SILTY SANDSTONE: light brown gray, rare light brown, firm, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,500-13,550 SILTY SANDSTONE: light gray brown, rare light brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,550-13,600 SILTY SANDSTONE: gray tan, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,600-13,650 SILTY SANDSTONE: light gray brown, rare light brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,650-13,700 SILTY SANDSTONE: light gray brown, rare light brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,700-13,750 SILTY SANDSTONE: light gray-gray brown, rare light brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,750-13,800 SILTY SANDSTONE: gray tan, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,800-13,850 SILTY SANDSTONE: light gray-gray brown, rare light brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,850-13,900 SILTY SANDSTONE: light gray brown, rare light brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

13,900-13,950 SILTY SANDSTONE: light brown-gray brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

13,950-14,000 SILTY SANDSTONE: light brown-gray brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,000-14,050 SILTY SANDSTONE: light gray brown, rare light brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; slightly yellow green diffuse cut fluorescence

14,050-14,100 SILTY SANDSTONE: light brown-gray brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,100-14,150 SILTY SANDSTONE: light brown-gray brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,150-14,200 SILTY SANDSTONE: light brown-gray brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,200-14,250 SILTY SANDSTONE: light brown-gray brown, trace medium gray, firm-friable, very fine grained, sub rounded, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,250-14,300 SILTY SANDSTONE: light brown gray, light brown, rare medium-light gray, trace off white, firm, fine-very fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately-poorly cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,300-14,350 SILTY SANDSTONE: light brown gray, light brown, rare medium-light gray, trace off white, firm, fine-very fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately-poorly cemented, trace disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,350-14,400 SILTY SANDSTONE: light-medium gray, occasional light brown gray, rare dark gray, firm, trace hard, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,400-14,450 SILTY SANDSTONE: light-medium gray, occasional light brown gray, rare dark gray, firm, trace hard, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,450-14,500 SILTY SANDSTONE: off white, light brown, rare light-medium gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,500-14,550 SILTY SANDSTONE: off white, light brown, rare light-medium gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,550-14,600 SILTY SANDSTONE: light brown, occasional light brown gray, rare medium-light gray, trace cream, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,600-14,650 SILTY SANDSTONE: light brown, occasional light brown gray, rare medium-light gray, trace cream, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately

cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,650-14,700 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,700-14,750 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,750-14,800 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, rare sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,800-14,850 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,850-14,900 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,900-14,950 SILTY SANDSTONE: off white, light gray, occasional light brown, trace medium-dark gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

14,950-15,000 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,000-15,050 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,050-15,100 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,100-15,150 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,150-15,200 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,200-15,250 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,250-15,300 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,300-15,350 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,350-15,400 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,400-15,450 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,450-15,500 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,500-15,550 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,550-15,600 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,600-15,650 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,650-15,700 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,700-15,750 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,750-15,800 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,800-15,850 SILTY SANDSTONE: light brown, tan, light-medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,850-15,900 SILTY SANDSTONE: light gray-gray brown, rare medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

15,900-15,950 SILTY SANDSTONE: light gray-gray brown, rare medium gray, rare off white, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

Upper Bakken Shale ***15,947' MD / 10,826' TVD (-8,691')***

15,950-16,000 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain

16,000-16,014 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain

Side-track #3 Drilling in the Middle Bakken

14,990-15,050 SILTY SANDSTONE: light brown, light gray-tan, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,050-15,100 SILTY SANDSTONE: light brown, gray-tan, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,100-15,150 SILTY SANDSTONE: light-medium gray, light brown gray, tan, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; slow diffuse pale yellow stain

15,150-15,200 SILTY SANDSTONE: light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,200-15,250 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,250-15,300 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,300-15,350 SILTY SANDSTONE: light-medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,350-15,400 SILTY SANDSTONE: light brown gray, medium gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,400-15,450 SILTY SANDSTONE: light brown gray, medium gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,450-15,500 SILTY SANDSTONE: light-medium brown gray, medium brown, medium gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,500-15,550 SILTY SANDSTONE: medium gray, rare medium brown, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,550-15,600 SILTY SANDSTONE: medium gray, rare medium brown, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

Upper Bakken Shale ***15,622' MD / 10,811' TVD (-8,676')***

15,600-15,650 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; SILTY SANDSTONE: medium gray, light brown gray, firm, fine grained, sub rounded, occasional sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, disseminated pyrite, nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain

15,650-15,669 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain

Side-track #4 Drilling in the Middle Bakken

14,500-14,550 SILTY SANDSTONE: light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,550-14,600 SILTY SANDSTONE: light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,600-14,650 SILTY SANDSTONE: light brown-light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,650-14,700 SILTY SANDSTONE: light brown-light brown gray, rare gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,700-14,750 SILTY SANDSTONE: light brown-light brown gray, rare gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,750-14,800 SILTY SANDSTONE: light brown-light brown gray, rare gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,800-14,850 SILTY SANDSTONE: light gray-gray brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,850-14,900 SILTY SANDSTONE: light gray-gray brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,900-14,950 SILTY SANDSTONE: medium gray-gray brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

14,950-15,000 SILTY SANDSTONE: medium gray- light gray brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,000-15,050 SILTY SANDSTONE: light gray-light gray brown, trace medium gray, trace medium brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,050-15,100 SILTY SANDSTONE: medium gray- light gray brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,100-15,150 SILTY SANDSTONE: light gray brown-gray, rare off white, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,150-15,200 SILTY SANDSTONE: medium gray- light gray brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,200-15,250 SILTY SANDSTONE: light gray brown-gray, rare off white, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,250-15,300 SILTY SANDSTONE: light gray-light gray brown, trace medium gray, trace medium brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,300-15,350 SILTY SANDSTONE: medium gray- light gray brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,350-15,400 SILTY SANDSTONE: light gray-light gray brown, trace medium gray, trace medium brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare

disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,400-154,500 SILTY SANDSTONE: light gray brown-gray, rare off white, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,450-15,500 SILTY SANDSTONE: medium gray- light gray brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,500-15,550 SILTY SANDSTONE: medium gray- light gray brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,550-15,600 SILTY SANDSTONE: medium gray- light gray brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,600-15,650 SILTY SANDSTONE: light gray-light gray brown, trace medium gray, trace medium brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,650-15,700 SILTY SANDSTONE: light gray-light gray brown, trace medium gray, trace medium brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,700-15,750 SILTY SANDSTONE: gray brown, light gray, trace medium gray, trace medium brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,550-15,800 SILTY SANDSTONE: gray brown, light gray, trace medium gray, trace medium brown, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,800-15,850 SILTY SANDSTONE: light gray brown-gray, rare off white, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,850-15,900 SILTY SANDSTONE: light gray brown-gray, rare off white, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,900-15,950 SILTY SANDSTONE: light gray brown-gray, rare off white, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

15,950-16,000 SILTY SANDSTONE: light gray brown-gray, rare off white, firm-friable, fine grained, sub rounded, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

16,000-16,050 SILTY SANDSTONE: light brown-light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,050-16,100 SILTY SANDSTONE: light brown-light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,100-16,150 SILTY SANDSTONE: light brown-light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,150-16,200 SILTY SANDSTONE: light brown-light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,200-16,250 SILTY SANDSTONE: light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,250-16,300 SILTY SANDSTONE: light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,300-16,350 SILTY SANDSTONE: light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,350-16,400 SILTY SANDSTONE: light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,400-16,450 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,450-16,500 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,500-16,550 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,550-16,600 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,600-16,650 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,650-16,700 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,700-16,750 SILTY SANDSTONE: light brown-light gray, tan gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,750-16,800 SILTY SANDSTONE: light brown-light gray, tan gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,800-16,850 SILTY SANDSTONE: light brown-light gray, tan gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,850-16,900 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,900-16,950 SILTY SANDSTONE: light gray, light brown gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,950-17,000 SILTY SANDSTONE: light brown gray-medium gray, trace light brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

Lower Bakken Shale ***17,030' MD / 10,856' TVD (-8,721')***

17,000-17,050 SILTY SANDSTONE: light brown gray-medium gray, trace light brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated

pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; common SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated with lubricant

17,050-17,079 SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain

Side-track #5 Drilling in the Middle Bakken

16825-16834 50% SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain (assumed to be up hole wash cuttings); 50% SILTY SANDSTONE: light brown-light gray, tan gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

Side-track #6 Drilling in the Middle Bakken

16,235-16,300 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated with lubricant

16,300-16,350 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated with lubricant

16,350-16,400 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated with lubricant

16,400-16,450 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; SHALE: black, hard, brittle, blocky, carbonaceous, petroliferous, pyritic, no visible porosity, possible fracture porosity, dark brown even oil stain; contaminated with lubricant

16,450-16,500 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,500-16,550 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,550-16,600 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,600-16,650 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,650-16,700 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,700-16,750 SILTY SANDSTONE: light gray, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

16,750-16,800 SILTY SANDSTONE: light gray brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

16,800-16,850 SILTY SANDSTONE: light gray brown-light gray, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

16,850-16,900 SILTY SANDSTONE: light gray brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

16,900-16,950 SILTY SANDSTONE: light gray brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

16,950-17,000 SILTY SANDSTONE: light gray brown-light gray, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,000-17,050 SILTY SANDSTONE: light gray brown-light gray, rare brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,050-17,100 SILTY SANDSTONE: light gray-light gray brown, rare brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,100-17,150 SILTY SANDSTONE: light gray brown-light gray, rare brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,150-17,200 SILTY SANDSTONE: light gray-light gray brown, rare brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,200-17,250 SILTY SANDSTONE: light gray-light gray brown, rare brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,250-17,300 SILTY SANDSTONE: light gray brown, rare medium brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,300-17,350 SILTY SANDSTONE: light gray brown, rare medium brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,350-17,400 SILTY SANDSTONE: light gray brown, rare medium brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,400-17,450 SILTY SANDSTONE: light gray-gray brown, rare medium brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

17,450-17,500 SILTY SANDSTONE: light gray brown, rare medium brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,500-17,550 SILTY SANDSTONE: light gray-gray brown, rare medium brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

17,550-17,600 SILTY SANDSTONE: light gray brown, rare medium brown, firm-friable, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,600-17,650 SILTY SANDSTONE: light gray-gray brown, rare medium brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

17,650-17,700 SILTY SANDSTONE: gray brown, rare medium brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

17,700-17,750 SILTY SANDSTONE: light gray-gray brown, rare medium brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated with lubricant

17,750-17,800 SILTY SANDSTONE: light gray-gray brown, firm, fine grained, sub rounded, trace sub angular, moderately-poorly sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated with lubricant

17,800-17,850 Sample moderately contaminated with lube; SILTY SANDSTONE: off white, light gray, rare light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

17,850-17,900 Sample moderately contaminated with lube; SILTY SANDSTONE: off white, light gray, rare light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

17,900-17,950 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, light brown gray, occasional light-medium gray, rare off white, trace dark gray, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

17,950-18,000 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, light brown gray, occasional light-medium gray, rare off white, trace dark gray, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,000-18,050 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, light brown gray, occasional light-medium gray, rare off white, trace dark gray, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,050-18,100 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, light brown, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,100-18,150 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, light brown, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,150-18,200 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, light brown, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,200-18,250 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, occasional light brown, rare medium-light gray, trace off white, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,250-18,300 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, occasional light brown, rare medium-light gray, trace off white, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,300-18,350 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, occasional light brown, rare medium-light gray, trace off white, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,350-18,400 Sample moderately contaminated with lube; SILTY SANDSTONE: medium-light gray, occasional light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,400-18,450 Sample moderately contaminated with lube; SILTY SANDSTONE: medium-light gray, occasional light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,450-18,500 Sample moderately contaminated with lube; SILTY SANDSTONE: medium-light gray, occasional light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately-poorly cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,500-18,550 Sample moderately contaminated with lube; SILTY SANDSTONE: off white, tan, light gray, rare light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,550-18,600 Sample moderately contaminated with lube; SILTY SANDSTONE: off white, tan, light gray, rare light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,600-18,650 Sample moderately contaminated with lube; SILTY SANDSTONE: off white, tan, light gray, rare light brown gray, trace dark gray, firm, fine-very fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,650-18,700 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, medium-light gray, rare off white, firm, fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,700-18,750 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, medium-light gray, rare off white, firm, fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,750-18,800 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, medium-light gray, rare off white, firm, fine grained, sub rounded, occasional sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,800-18,850 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, occasional light brown, rare medium-dark gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light brown spotty oil stain; contaminated cut fluorescence

18,850-18,900 Sample moderately contaminated with lube; SILTY SANDSTONE: medium-light gray, light brown, rare cream, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

18,900-18,950 Sample moderately contaminated with lube; SILTY SANDSTONE: medium-light gray, light brown, rare cream, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

18,950-19,000 Sample moderately contaminated with lube; SILTY SANDSTONE: medium-light gray, light brown, rare cream, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, rare nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,000-19,050 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, common light brown, rare medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,050-19,100 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, common light brown, rare medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, trace disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,100-19,150 Sample moderately contaminated with lube; SILTY SANDSTONE: light gray brown, common light brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,150-19,200 Sample moderately contaminated with lube; SILTY SANDSTONE: light gray brown, common light brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,200-19,250 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,250-19,300 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, brown gray, occasional medium brown, trace medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,300-19,350 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,350-19,400 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, gray, medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,400-19,450 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, brown gray, occasional medium brown, trace medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,450-19,500 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,500-19,550 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,550-19,600 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, brown gray, occasional medium brown, trace medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,600-19,650 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,650-19,700 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, gray, medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,700-19,750 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, brown gray, occasional medium brown, trace medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,750-19,800 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,800-19,850 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, brown gray, occasional medium brown, trace medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,850-19,900 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,900-19,950 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown, gray, medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

19,950-20,000 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,000-20,050 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,050-20,100 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,100-20,150 Sample moderately contaminated with lube; SILTY SANDSTONE: brown gray, rare medium brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,150-20,200 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,200-20,250 Sample moderately contaminated with lube; SILTY SANDSTONE: brown gray, rare medium brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,250-20,300 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,300-20,350 Sample moderately contaminated with lube; SILTY SANDSTONE: light gray brown, rare medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,350-20,400 Sample moderately contaminated with lube; SILTY SANDSTONE: light gray brown, rare medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,400-20,450 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown-gray brown, occasional medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, rare disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,450-20,500 Sample moderately contaminated with lube; SILTY SANDSTONE: brown gray, rare medium brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,500-20,550 Sample moderately contaminated with lube; SILTY SANDSTONE: brown gray, rare medium brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,550-20,600 Sample moderately contaminated with lube; SILTY SANDSTONE: brown gray, rare medium brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,600-20,650 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, rare medium brown, trace medium gray, firm, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,650-20,700 Sample moderately contaminated with lube; SILTY SANDSTONE: brown gray, rare medium brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,700-20,750 Sample moderately contaminated with lube; SILTY SANDSTONE: brown gray, rare medium brown, rare medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

20,750-20,780 Sample moderately contaminated with lube; SILTY SANDSTONE: light brown gray, rare medium brown, trace medium gray, firm-friable, fine grained, sub rounded, rare sub angular, moderately sorted, calcareous cement, moderately cemented, occasional disseminated pyrite, trace nodular pyrite, trace intergranular porosity, trace light-medium brown spotty oil stain; contaminated cut fluorescence

TD lateral at 20,780' in the Middle Bakken

NORTH DAKOTA
OIL AND GAS DIVISION

Oil and Gas Division

Lynn D. Helms - Director Bruce E. Hicks - Assistant Director
Department of Mineral Resources
Lynn D. Helms - Director
North Dakota Industrial Commission
www.dmr.nd.gov/oilgas/

36047

MICHAEL KUKUK
OASIS PETROLEUM NORTH AMERICA LLC
1001 FANNIN STE 1500
HOUSTON, TX 77002 USA

Date: **2/8/2019**

RE: CORES AND SAMPLES

Well Name: **LEWIS FEDERAL 5300 11-31 4BR** Well File No.: **36047**
Location: **LOT1 31-153-100** County: MCKENZIE
Permit Type: **Development - HORIZONTAL**
Field: **BAKER** Target Horizon: BAKKEN

Dear MICHAEL KUKUK:

North Dakota Century Code Section 38-08-04 provides for the preservation of cores and samples and their shipment to the State Geologist when requested. The following is required on the above referenced well:

1) All cores, core chips and samples must be submitted to the State Geologist as provided for under North Dakota Century Code: Section 38-08-04 and North Dakota Administrative Code: Section 43-02-03-38.1.

2) Samples: The Operator is to begin collecting sample drill cuttings no lower than the:
Base of the Last Charles Salt
   - Sample cuttings shall be collected at:
     - o 30' maximum intervals through all vertical and build sections.
     - o 200' maximum intervals through any horizontal sections.
   - Samples must be washed, dried, placed in standard sample envelopes (3" x 4.5"), packed in the correct order into standard sample boxes (3.5" x 5.25" x 15.25").
   - Samples boxes are to be carefully identified with a label that indicates the operator, well name, well file number, American Petroleum Institute (API) number, location and depth of samples; and forwarded in to the state core and sample library within 30 days of the completion of drilling operations.

3) Cores: Any cores cut shall be preserved in correct order, boxed in standard core boxes (4.5", 4.5", 35.75"), and the entire core forwarded to the state core and samples library within 180 days of completion of drilling operations. Any extension of time must have approval on a Form 4 Sundry Notice.

All cores, core chips, and samples must be shipped, prepaid, to the state core and samples library at the following address:

ND Geological Survey Core Library
2835 Campus Road
Grand Forks, ND 58202

North Dakota Century Code Section 38-08-16 allows for a civil penalty for any violation of Chapter 38 08 not to exceed $12,500 for each offense, and each day's violation is a separate offense.

Sincerely

Stephen Fried
Geologist

SUNDRY NOTICES AND REPORTS ON WELLS - FORM 4

INDUSTRIAL COMMISSION OF NORTH DAKOTA
OIL AND GAS DIVISION
600 EAST BOULEVARD DEPT 405
BISMARCK, ND 58505-0840
SFN 5749 (09-2006)

RECEIVED
JAN 2019
ND OIL & GAS DIVISION

Well File No. 36047

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.
PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

- [x] Notice of Intent — Approximate Start Date: January 14, 2019
- [ ] Report of Work Done — Date Work Completed:
- [ ] Notice of Intent to Begin a Workover Project that may Qualify for a Tax Exemption Pursuant to NDCC Section 57-51.1-03. — Approximate Start Date:

- [ ] Drilling Prognosis
- [ ] Redrilling or Repair
- [ ] Casing or Liner
- [ ] Plug Well
- [ ] Supplemental History
- [ ] Temporarily Abandon
- [ ] Spill Report
- [ ] Shooting
- [ ] Acidizing
- [ ] Fracture Treatment
- [ ] Change Production Method
- [ ] Reclamation
- [x] Other: Waiver to rule Rule 43-02-03-31

Well Name and Number: **Lewis Federal 5300 11-31 4BR**

Footages	Qtr-Qtr	Section	Township	Range
1149 F N L 257 F W L	LOT1	31	153 N	100 W

Field	Pool	County
Baker	Bakken	McKenzie

24-HOUR PRODUCTION RATE

	Before		After	
Oil	Bbls	Oil	Bbls	
Water	Bbls	Water	Bbls	
Gas	MCF	Gas	MCF	

Name of Contractor(s)

Address	City	State	Zip Code

DETAILS OF WORK

Oasis Petroleum respectfully requests a revised waiver to Rule 43-02-03-31 in regard to running open hole logs for the above-referenced well. Justification for this request is as follows:

The Oasis Petroleum's Lewis Federal 5300 31-31H (File No. 20314, API No. 33-053-03433-00-00). The proposed location is within a mile of the subject well.

If this exception is approved, Oasis Petroleum will run a CBL on the intermediate string, and we will also run GR to surface. Oasis Petroleum will also submit two digital copies of each cased hole log and a copy of the mud log containing MWD gamma ray.

Company	Telephone Number
Oasis Petroleum North America LLC	281-404-9436

Address		
1001 Fannin, Suite 1500		
City: Houston	State: TX	Zip Code: 77002
Signature	Printed Name: Jennifer Swenson	
Title: Regulatory Specialist II	Date: January 14, 2019	
Email Address: jswenson@oasispetroleum.com		

FOR STATE USE ONLY

- [ ] Received
- [x] Approved

Date: 2-5-2019
By:
Title: Stephen Fried Geologist

Oil and Gas Division

Lynn D. Helms - Director Bruce E. Hicks - Assistant Director

Department of Mineral Resources

Lynn D. Helms - Director

North Dakota Industrial Commission

www.oilgas.nd.gov

February 5, 2019

Jennifer Swenson
Regulatory Specialist II
OASIS PETROLEUM NORTH AMERICA LLC
1001 Fannin, Suite 1500
Houston , TX 77002

RE: HORIZONTAL WELL
LEWIS FEDERAL 5300 11-31 4BR
LOT1 Section 31-153N-100W
McKenzie County, North Dakota
Well File # 36047

Dear Jennifer:

Pursuant to Commission Order No. 29373, approval to drill the above captioned well is hereby given. The approval is granted on the condition that all portions of the well bore not isolated by cement, be no closer than the 500' setback from the north & south boundaries and 150' setback from the east & west boundaries within the 1280 acre spacing unit consisting of Sections 31 & 32 T153N-R100W. The east setback is based on a production liner cemented in the lateral with a wet shoe and the ability to frac out the shoe.

PERMIT STIPULATIONS:

- **Remote or automatic shut off devices required on all equipment.**
- **Pursuant to NDAC 43-02-03-48.1 (CPF-Comingling of Production) "The director shall have authority to approve requests to consolidate production equipment at a central location". Oasis must run a CBL on the 9-5/8" intermediate string which is proposed to isolate the Dakota Group prior to running 7" casing.**
- **Oasis must contact NDIC Field Inspector Richard Dunn at 701-770-3554 prior to location construction.**

SITE PROVISIONS:

Location Construction Commencement (Three Day Waiting Period)

Operators shall not commence operations on a drill site until the 3rd business day following publication of the approved drilling permit on the NDIC - OGD Daily Activity Report. If circumstances require operations to commence before the 3rd business day following publication on the Daily Activity Report, the waiting period may be waived by the Director. Application for a waiver must be by sworn affidavit providing the information necessary to evaluate the extenuating circumstances, the factors of NDAC 43-02-03-16.2 (1), (a)-(f), and any other information that would allow the Director to conclude that in the event another owner seeks revocation of the drilling permit, the applicant should retain the permit.

Perimeter Berm

A location perimeter berm is required surrounding the entire location.

Drilling pit

NDAC 43-02-03-19.4 states that "a pit may be utilized to bury drill cuttings and solids generated during well drilling and completion operations, providing the pit can be constructed, used and reclaimed in a manner that will prevent pollution of the land surface and freshwaters. Reserve and circulation of mud system through earthen pits are prohibited. All pits shall be inspected by an authorized representative of the director prior to lining and use. Drill cuttings and solids must be stabilized in a manner approved by the director prior to placement in a cuttings pit."

SPUDDING PROVISIONS:

Filter Socks

A covered leak-proof container (with placard) for filter sock disposal must be maintained on the well site beginning when the well is spud, and must remain on-site during clean-out, completion, and flow-back whenever filtration operations are conducted.

Conductors, Rat holes, and Mouse holes

To protect near surface groundwater any conductor, rat, or mouse hole drilled must be constructed with a string of casing and cemented to ground level. Any such string must be secured at the surface when not in use. In addition, all rat and mouse holes must be plugged with cement and cut off at least 4' below final grade within a reasonable timeframe after the rig completes drilling operations on the pad.

Permit Fee & Notification

Payment was received in the amount of $100 via credit card. It is requested that notification be given immediately upon the spudding of the well. This information should be relayed to the Oil & Gas Division, Bismarck, via telephone (701) 328-8020. The following information must be included: Well name, legal location, permit number, drilling contractor and rig number, company representative, date and time of spudding. Office hours are 8:00 a.m. to 12:00 p.m. and 1:00 p.m. to 5:00 p.m. Central Time. Please leave a message if after hours or on the weekend.

DRILLING PROVISIONS:

Casing Strings

Due to the possibility of severe casing wear during the drilling of the vertical and curve sections of the well, which could compromise isolation of the Fox Hills Formation, operators are not to deviate in the surface casing portion of the hole.

All strings of surface casing shall stand cemented under pressure for at least 12 hours before drilling the plug or initiating tests. Surface casing, production or intermediate casing strings must be allowed to stand under pressure until the tail cement has reached a compressive strength of at least 500 psi before drilling the plug or initiating tests.

Survey Requirements for Horizontal, Horizontal Re-entry, and Directional Wells

NDAC Section 43-02-03-25 (Deviation Tests and Directional Surveys) states in part (that) the survey contractor shall file a certified copy of all surveys with the director free of charge within thirty days of completion. Surveys must be submitted as one electronic copy, or in a form approved by the director. However, the director may require the directional survey to be filed immediately after completion if the survey is needed to conduct the operation of the director's office in a timely manner. Certified surveys must be submitted via email in one adobe document, with a certification cover page to certsurvey@nd.gov.

Survey points shall be of such frequency to accurately determine the entire location of the well bore.

Specifically, the Horizontal and Directional well survey frequency is 100 feet in the vertical, 30 feet in the curve (or when sliding) and 90 feet in the lateral.

Logs

NDAC Section 43-02-03-31 requires the running of (1) a suite of open hole logs from which formation tops and porosity zones can be determined, (2) a Gamma Ray Log run from total depth to ground level elevation of the well bore, and (3) a log from which the presence and quality of cement can be determined (Standard CBL or ultrasonic cement evaluation log) in every well in which production or intermediate casing has been set, this log must be run prior to completing the well. All logs run must be submitted free of charge, as one digital TIFF (tagged image file format) copy and one digital LAS (log ASCII) formatted copy. Digital logs may be submitted on a standard CD, DVD, or attached to an email sent to digitallogs@nd.gov Thank you for your cooperation.

Form 1 Changes & Hard Lines

Any changes, shortening of casing point or lengthening at Total Depth or change in completion technique within the Bakken-Three Forks Petroleum System must have prior approval by the NDIC. The proposed directional plan is at a legal location. **Based on the azimuth of the proposed lateral the maximum legal coordinate from the well head at Total Depth is: 10115' east.**

Sincerely,

Nathaniel Erbele
Petroleum Engineer - Permitting

APPLICATION FOR PERMIT TO DRILL HORIZONTAL WELL - FORM 1H

INDUSTRIAL COMMISSION OF NORTH DAKOTA
OIL AND GAS DIVISION
600 EAST BOULEVARD DEPT 405
BISMARCK, ND 58505-0840
SFN 54269 (08-2005)

PLEASE READ INSTRUCTIONS BEFORE FILLING OUT FORM.
PLEASE SUBMIT THE ORIGINAL AND ONE COPY.

Type of Work	Type of Well	Approximate Date Work Will Start	Confidential Status
New Location	**Oil & Gas**	**01 / 14 / 2019**	**No**

Operator	Telephone Number
OASIS PETROLEUM NORTH AMERICA LLC	**281-404-9500**

Address	City	State	Zip Code
1001 Fannin, Suite 1500	**Houston**	**TX**	**77002**

☑ Notice has been provided to the owner of any permanently occupied dwelling within 1,320 feet.

☑ This well is not located within five hundred feet of an occupied dwelling.

WELL INFORMATION **(If more than one lateral proposed, enter data for additional laterals on page 2)**

Well Name	Well Number
LEWIS FEDERAL	**5300 11-31 4BR**

Surface Footages	Qtr-Qtr	Section	Township	Range	County
1149 F **N** L **257** F **W** L	**LOT1**	**31**	**153 N**	**100 W**	**McKenzie**

Longstring Casing Point Footages	Qtr-Qtr	Section	Township	Range	County
1983 F **N** L **643** F **W** L	**LOT1**	**31**	**153 N**	**100 W**	**McKenzie**

Longstring Casing Point Coordinates From Well Head	Azimuth	Longstring Total Depth	
834 S From WH **386 E** From WH	**90 º**	**11083** Feet MD	**10765** Feet TVD

Bottom Hole Footages From Nearest Section Line	Qtr-Qtr	Section	Township	Range	County
1983 F **N** L **179** F **E** L	**LOT4**	**32**	**153 N**	**100 W**	**McKenzie**

Bottom Hole Coordinates From Well Head	KOP Lateral 1	Azimuth Lateral 1	Estimated Total Depth Lateral 1	
834 S From WH **10086 E** From WH	**10330** Feet MD	**90 º**	**20783** Feet MD	**10839** Feet TVD

Latitude of Well Head	Longitude of Well Head	NAD Reference	Description of (Subject to NDIC Approval)
48 ° 02 ' 8.33 "	**-103 ° 36 ' 11.19 "**	**NAD83**	**Spacing Unit: Sec 31&32-153N-100W**

Ground Elevation	Acres in Spacing/Drilling Unit	Spacing/Drilling Unit Setback Requirement	Industrial Commission Order
2127 Feet Above S.L.	**1280**	**500** Feet N/S **150** Feet E/W	**29373**

North Line of Spacing/Drilling Unit	South Line of Spacing/Drilling Unit	East Line of Spacing/Drilling Unit	West Line of Spacing/Drilling Unit
10522 Feet	**10535** Feet	**5280** Feet	**5248** Feet

Objective Horizons	Pierre Shale Top
Bakken	**1985**

Proposed	Size	Weight	Depth	Cement Volume	
Surface Casing	**13 - 3/8 "**	**54** Lb./Ft.	**3600** Feet	**1581** Sacks	**NOTE: Surface hole must be drilled with fresh water and surface casing must be cemented back to surface.**

Proposed	Size	Weight(s)	Longstring Total Depth		Cement Volume	Cement Top	Top Dakota Sand
Longstring Casing	**7 - "**	**32** Lb./Ft.	**11083** Feet MD	**10765** Feet TVD	**693** Sacks	**4810** Feet	**5010** Feet

Base Last Charles Salt (If Applicable)	
9233 Feet	**NOTE: Intermediate or longstring casing string must be cemented above the top Dakota Group Sand.**

Proposed Logs
Triple Combo KOP to Kibbey GR/Res to BSC GR to Surf CND through the Dakota

Drilling Mud Type (Vertical Hole - Below Surface Casing)	Drilling Mud Type (Lateral)
Invert	**Salt Water Gel**

Survey Type in Vertical Portion of Well	Survey Frequency: Build Section	Survey Frequency: Lateral	Survey Contractor
MWD Every 100 Feet	**30** Feet	**90** Feet	**Ryan**

NOTE: A Gamma Ray log must be run to ground surface and a CBL must be run on intermediate or longstring casing string if set.

Surveys are required at least every 30 feet in the build section and every 90 feet in the lateral section of a horizontal well. Measurement inaccuracies are not considered when determining compliance with the spacing/drilling unit boundary setback requirement except in the following scenarios: 1) When the angle between the well bore and the respective boundary is 10 degrees or less; or 2) If Industry standard methods and equipment are not utilized. Consult the applicable field order for exceptions.

If measurement inaccuracies are required to be considered, a 2° MWD measurement inaccuracy will be applied to the horizontal portion of the well bore. This measurement inaccuracy is applied to the well bore from KOP to TD.

REQUIRED ATTACHMENTS: Certified surveyor's plat, horizontal section plat, estimated geological tops, proposed mud/cementing plan, directional plot/plan, $100 fee.

See Page 2 for Comments section and signature block.

COMMENTS, ADDITIONAL INFORMATION, AND/OR LIST OF ATTACHMENTS

Attachments submitted via email to NDIC including drill plan, well summary, direction plan and plots, surveyor plats, and additional documents as required.

Lateral 2

KOP Lateral 2 Feet MD	Azimuth Lateral 2 °	Estimated Total Depth Lateral 2 Feet MD	Feet TVD	KOP Coordinates From Well Head From WH	From WH
Formation Entry Point Coordinates From Well Head From WH	From WH	Bottom Hole Coordinates From Well Head From WH	From WH		
KOP Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County
Bottom Hole Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County

Lateral 3

KOP Lateral 3 Feet MD	Azimuth Lateral 3 °	Estimated Total Depth Lateral 3 Feet MD	Feet TVD	KOP Coordinates From Well Head From WH	From WH
Formation Entry Point Coordinates From Well Head From WH	From WH	Bottom Hole Coordinates From Well Head From WH	From WH		
KOP Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County
Bottom Hole Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County

Lateral 4

KOP Lateral 4 Feet MD	Azimuth Lateral 4 °	Estimated Total Depth Lateral 4 Feet MD	Feet TVD	KOP Coordinates From Well Head From WH	From WH
Formation Entry Point Coordinates From Well Head From WH	From WH	Bottom Hole Coordinates From Well Head From WH	From WH		
KOP Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County
Bottom Hole Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County

Lateral 5

KOP Lateral 5 Feet MD	Azimuth Lateral 5 °	Estimated Total Depth Lateral 5 Feet MD	Feet TVD	KOP Coordinates From Well Head From WH	From WH
Formation Entry Point Coordinates From Well Head From WH	From WH	Bottom Hole Coordinates From Well Head From WH	From WH		
KOP Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County
Bottom Hole Footages From Nearest Section Line F L	F L	Qtr-Qtr	Section	Township N	Range W	County

I hereby swear or affirm the information provided is true, complete and correct as determined from all available records.	Date 01 / 14 / 2019
ePermit	Printed Name **Jennifer Swenson**	Title **Regulatory Specialist II**

FOR STATE USE ONLY

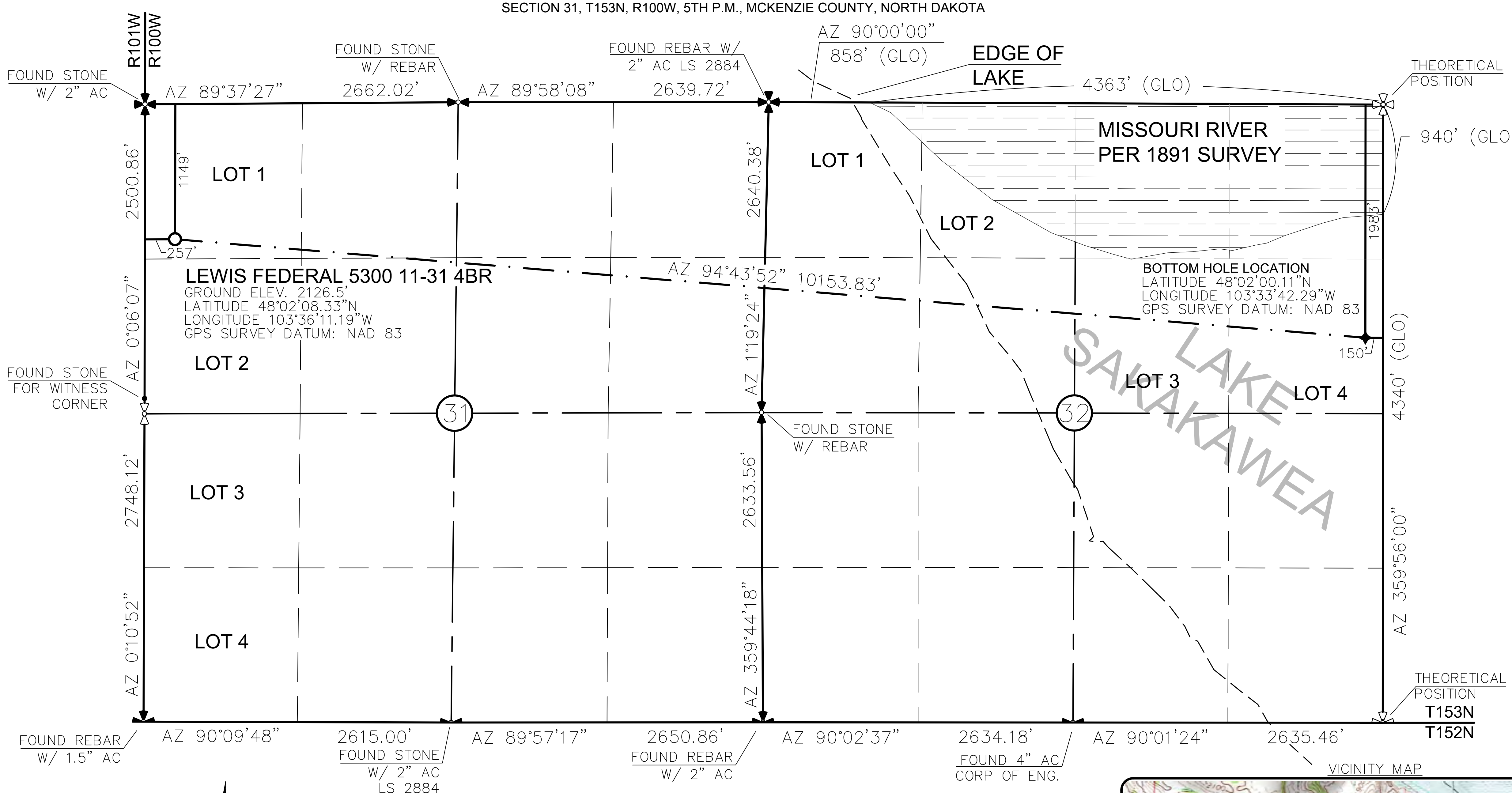
Permit and File Number	API Number
36047	**33 - 053 - 08946**
Field **BAKER**	
Pool **BAKKEN**	Permit Type **DEVELOPMENT**

FOR STATE USE ONLY

Date Approved
2 / 5 / 2019
By **Nathaniel Erbele**
Title **Petroleum Engineer - Permitting**

WELL LOCATION

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



THIS DOCUMENT WAS ORIGINALLY ISSUED AND SEALED BY JOSEPH L. KAUFFMAN, REGISTRATION NUMBER 9153 ON 1-7-19 AND THE ORIGINAL DOCUMENTS ARE STORED AT THE OFFICES OF INTERSTATE ENGINEERING, INC.

0 1000
1" = 1000'

MONUMENT – RECOVERED
MONUMENT – NOT RECOVERED

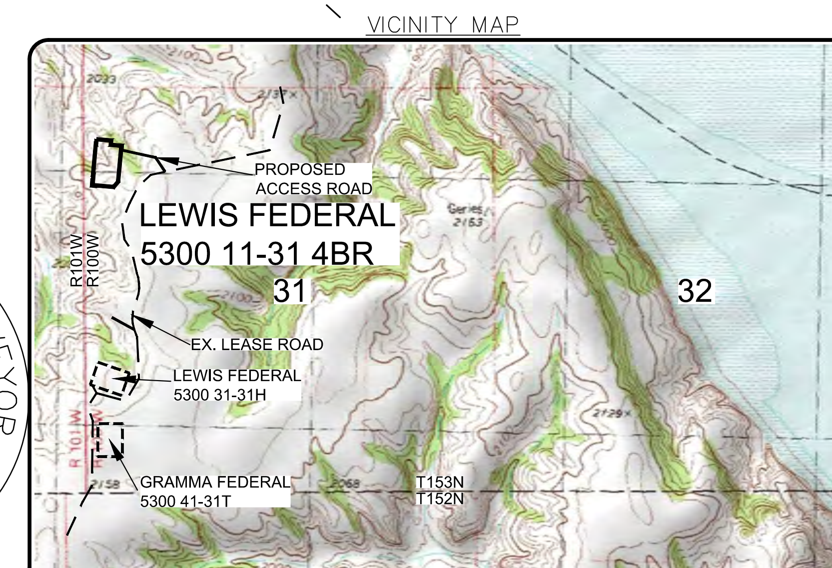
STAKED ON 3/26/18
VERTICAL CONTROL DATUM WAS BASED UPON CONTROL POINT 705 WITH AN ELEVATION OF 2158.3'

THIS SURVEY AND PLAT IS BEING PROVIDED AT THE REQUEST OF JOHN LEE OF OASIS PETROLEUM. I CERTIFY THAT THIS PLAT CORRECTLY REPRESENTS WORK PERFORMED BY ME OR UNDER MY SUPERVISION AND IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Joseph L. Kauffman
JOSEPH L. KAUFFMAN LS-9153

REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

VICINITY MAP



OASIS PETROLEUM NORTH AMERICA, LLC
WELL LOCATION
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. Project No.: S17-09-183
Checked By: J.L.K. Date: JAN 2019

Revision No.	Date	By	Description

Interstate Engineering, Inc.
P.O. Box 648
425 East Main Street
Sidney, Montana 59270
Ph (406) 433-5617
Fax (406) 433-5618
www.interstateeng.com
Other offices in Minnesota, North Dakota and South Dakota

INTERSTATE ENGINEERING
Professionals you need, people you trust

SHEET NO. 1/9

Oil and Gas Division

Lynn D. Helms - Director Bruce E. Hicks - Assistant Director

Department of Mineral Resources

Lynn D. Helms - Director

North Dakota Industrial Commission

www.oilgas.nd.gov

April 9, 2014

RE: **Filter Socks and Other Filter Media**
Leakproof Container Required
Oil and Gas Wells

Dear Operator,

North Dakota Administrative Code Section 43-02-03-19.2 states in part that all waste material associated with exploration or production of oil and gas must be properly disposed of in an authorized facility in accord with all applicable local, state, and federal laws and regulations.

Filtration systems are commonly used during oil and gas operations in North Dakota. The Commission is very concerned about the proper disposal of used filters (including filter socks) used by the oil and gas industry.

Effective June 1, 2014, a container must be maintained on each well drilled in North Dakota beginning when the well is spud and must remain on-site during clean-out, completion, and flow-back whenever filtration operations are conducted. The on-site container must be used to store filters until they can be properly disposed of in an authorized facility. Such containers must be:

- leakproof to prevent any fluids from escaping the container
- covered to prevent precipitation from entering the container
- placard to indicate only filters are to be placed in the container

If the operator will not utilize a filtration system, a waiver to the container requirement will be considered, but only upon the operator submitting a Sundry Notice (Form 4) justifying their request.

As previously stated in our March 13, 2014 letter, North Dakota Administrative Code Section 33-20-02.1-01 states in part that every person who transports solid waste (which includes oil and gas exploration and production wastes) is required to have a valid permit issued by the North Dakota Department of Health, Division of Waste Management. Please contact the Division of Waste Management at (701) 328-5166 with any questions on the solid waste program. Note oil and gas exploration and production wastes include produced water, drilling mud, invert mud, tank bottom sediment, pipe scale, filters, and fly ash.

Thank you for your cooperation.

Sincerely,

Bruce E. Hicks
Assistant Director

DRILLING PLAN

OPERATOR	Oasis Petroleum	**COUNTY/STATE**	McKenzie Co., ND
WELL NAME	Lewis Federal 5300 11-31 4BR	**RIG**	-
WELL TYPE	Middle Bakken		
LOCATION	T153N R100W S31 NWNW Surface Location (survey plat): 1149' FNL	257' FWL	
EST. T.D.	20,783'	**FINISH PAD ELEV:**	2,110' **Sub Height:** 25'
TOTAL LATERAL:	9,700'	**KB ELEV:**	2,135'

MARKER		TVD	Subsea TVD
Pierre	NDIC MAP	1,985	150'
Greenhorn		4,596	-2,461'
Mowry (Dakota Group)		5,010	-2,875'
Inyan Kara (Dakota Group)		5,432	-3,297'
Swift (Base Dakota Group)		5,855	-3,720'
Rierdon		6,371	-4,236'
Dunham Salt		6,898	-4,763'
Dunham Salt Base		6,955	-4,820'
Pine Salt		7,262	-5,127'
Pine Salt Base		7,323	-5,188'
Opeche Salt		7,441	-5,306'
Opeche Salt Base		7,467	-5,332'
Amsden		7,663	-5,528'
Tyler		7,851	-5,716'
Otter/Base Minnelusa		8,069	-5,934'
Kibbey Lime		8,416	-6,281'
Charles Salt		8,562	-6,427'
Base Last Salt		9,233	-7,098'
Mission Canyon		9,447	-7,312'
Lodgepole		10,006	-7,871'
False Bakken		10,720	-8,585'
Upper Bakken Shale		10,730	-8,595'
Middle Bakken		10,746	-8,611'
Target Top		10,756	-8,621'
Target Landing		10,765	-8,630'
Target Base		10,774	-8,639'
Lower Bakken		10,784	-8,649'
-		-	-
-		-	-
-		-	-
-		-	-
-		-	-
-		-	-
-		-	-
Est. Average Dip Rate:	89.59		
Max. Anticipated BHP:	4,697'		

LOGS:

	Type	Interval
OH Logs:	Triple Combo	KOP to Kibbey (or min run of 1800' whichever is greater)
	GR/Resistivity	Bottom of surface casing
	GR	To surface
	CND	Through Dakota Group (Inyan Kara Sands)
CBL/GR:		Above top of cement/GR to base of casing
MWD GR:		KOP to lateral TD

DEVIATION:

Surf:	3 deg. max., 1 deg / 100'; srvy every 500'
Prod:	5 deg. max., 1 deg / 100'; srvy every 100'

DST'S:

CORES:

Core Planned?	NO
Core Type:	-
Formations/Depths:	

MUDLOGGING:

Company:	TBD
Starting Depth:	Begin 200' above Kibbey
Sample Protocol:	30' samples in curve, 50' samples in lateral

BOP:

11" 5000 psi blind, pipe & annular

Surface Formation: *Glacial till*

MUD:	Interval		Type	WT	Vis	WL	Remarks
Surface:	0'	3,600'	FW/Gel Lime Sweeps	8.4-9.0	28-32	NC	Circ Mud Tanks
Intermediate:	3,600'	11,083'	Invert	9.5-10.4	40-50	30+HtHp	Circ Mud Tanks
Lateral:	11,083'	20,783'	Salt Water	9.8-10.2	28-32	NC	Circ Mud Tanks

CASING:	Size	Wt ppf	Hole	Depth	Cement	WOC	Remarks
Surface:	13-3/8"	54.5#	17-1/2"	3,600'	To Surface	12 hours	150' into Pierre
Intermediate: (Dakota)	9-5/8"	40#	12-1/4"	6,100'	To Surface	24 hours	Set Casing across Dakota
Intermediate:	7"	32#	8-3/4"	11,083'	4810	24 hours	200' above Mowry
Production Liner:	4.5"	13.5#	6"	20,783'	10280		50' above KOP

PROBABLE PLUGS, IF REQ'D:

OTHER:

	MD	TVD	FNL/FSL	FEL/FWL	S-T-R	AZI
Surface:	3,600'	3,600'	1149 FNL	257 FWL	**Sec 31 T153N R100W**	-
KOP:	10,330'	10,284'	1927 FNL	169 FWL	**Sec 31 T153N R100W**	-
EOC:	11,083'	10,765'	1983 FNL	643 FWL	**Sec 31 T153N R100W**	90.0
Casing Point:	11,083'	10,765'	1983 FNL	643 FWL	**Sec 31 T153N R100W**	90.0
TD:	20,783'	10,839'	1983 FNL	150 FWL	**Sec 32 T153N R100W**	90.0

Survey Company:

Build Rate: 12 deg /100'

Comments:

Request waiver of open hole logs. Justification well: Lewis Federal 5300 31-31H (33053034330000) ~0.54 miles S of SHL

The above open hole logs will be run if Oasis does not submit and receive an approved logging waiver from the NDIC.

Currently planned for 50 stages. No frac string planned. 4-1/2" cemented liner completed using plug & perf method

Oasis Petroleum does not use Diesel Fuel, as defined by the US EPA in the list below, in our hydraulic fracture operations.

68334-30-5 (Primary Name: Fuels, diesel) 68476-34-6 (Primary Name: Fuels, diesel, No. 2)68476-30-2 (Primary Name: Fuel oil No. 2)

68476-31-3 (Primary Name: Fuel oil, No. 4)8008-20-6 (Primary Name: Kerosene)

OASIS PETROLEUM	**Geology:**	LRH 4/3/2018	**Engineering:**	TR 4/12/18
	Revision:		**Revision:**	TR 10/29/18
	Revision 2:		**Revision 2:**	TR 1/10/19

Oasis Petroleum
Well Summary
Lewis Federal 5300 11-31 4BR
Section 31 T153N R100W
McKenzie County, ND

SURFACE CASING AND CEMENT DESIGN

Size	Interval	Weight	Grade	Coupling	I.D.	Drift
13-3/8"	0' - 3600'	54.5	J-55	STC	12.615"	12.459"

Interval	Description	Collapse	Burst	Tension
		(psi) / a	(psi) / b	(1000 lbs) / c
0' - 3600'	13-3/8", 54.5#, J-55, LTC, 8rd	1130 / 0.67	2730 / 1.12	514 / 1.90

API Rating & Safety Factor

a) Collapse based on full casing evacuation with 9 ppg fluid on backside (3600' setting depth).
b) Burst pressure based on 13 ppg fluid with no fluid on backside (3600' setting depth).
c) Based on string weight in 9 ppg fluid at 3600' TVD plus 100k# overpull. (Buoyed weight equals 169k lbs.)

Cement volumes are based on 13-3/8" casing set in 17-1/2 " hole with 60% excess to circulate cement back to surface.
Mix and pump the following slurry.

Pre-flush (Spacer): **20 bbls** fresh water

Lead Slurry: **1262 sks** (652 bbls), 11.5 lb/gal, 2.97 cu. Ft./sk Varicem Cement with 0.125 il/sk Lost Circulation Additive

Tail Slurry: **349 sks** (72 bbls), 13.0 lb/gal, 2.01 cu.ft./sk Varicem with .125 lb/sk Lost Circulation Agent

Oasis Petroleum
Well Summary
Lewis Federal 5300 11-31 4BR
Section 31 T153N R100W
McKenzie County, ND

Contingency INTERMEDIATE CASING AND CEMENT DESIGN

Size	Interval	Weight	Grade	Coupling	I.D.	Drift
9-5/8"	0' - 6100'	40	J-55	LTC	8.921"	8.765"

Interval	Description	Collapse	Burst	Tension
		(psi) / a	(psi) / b	(1000 lbs) / c
0' - 6100'	9-5/8", 40#, HCP110, BTC	3530 / 3.83	7870 / 3.02	1260 / 4.12

API Rating & Safety Factor

a) Collapse based on full casing evacuation with 10.4 ppg fluid on backside (6100' setting depth).

b) Burst pressure calculated from a gas kick coming from the production zone (Bakken Pool) at 9,000psi and a subsequent breakdown at the 9-5/8" shoe, based on a 15.2#/ft fracture gradient. Backup of 9 ppg fluid..

c) Tension based on string weight in 10.4 ppg fluid at 6100' TVD plus 100k# overpull. (Buoyed weight equals 205k lbs.)

Cement volumes are based on 9-5/8" casing set in 12-1/4 " hole with 10% excess to circulate cement back to surface.

Pre-flush (Spacer): **20 bbls** Chem wash

Lead Slurry: **545 sks** (281 bbls), 2.90 ft3/sk, 11.5 lb/gal Conventional system with 94 lb/sk cement, 4% D079 extender, 2% D053 expanding agent, 2% CaCl2 and 0.250 lb/sk D130 lost circulation control agent.

Tail Slurry: **637 sks** (132 bbls), 1.16 ft3/sk 15.8 lb/gal Conventional system with 94 lb/sk cement, 0.25% CaCl2, and 0.250 lb/sk lost circulation control agent

Oasis Petroleum
Well Summary
Lewis Federal 5300 11-31 4BR
Section 31 T153N R100W
McKenzie County, ND

INTERMEDIATE CASING AND CEMENT DESIGN

Size	Interval	Weight	Grade	Coupling	I.D.	Drift**
7"	0' - 11083'	32	HCP-110	BTC/LTC	6.094"	6.000"**

****Special Drift 7"32# to 6.0"**

Interval	Length	Description	Collapse	Burst	Tension
			(psi) a	(psi) b	(1000 lbs) / c
0' - 5000'	5000'	7", 32#, HCP-110, BTC, 8rd	11820 / 2.11*	12460 / 1.28	897 / 2.24
5000' - 11083'	6083'	7", 32#, HCP-110, LTC, 8rd	11820 / 1.06**	12460 / 1.30	

API Rating & Safety Factor

a) *Assume full casing evacuation with 10 ppg fluid on backside. **Assume full casing evacuation with 1.2 psi/ft equivalent fluid gradient across salt intervals.

b) Burst pressure based on 9000 psig max press for stimulation plus 10.2 ppg fluid in casing and 9 ppg fluid on backside-to 10765' TVD.

c) Based on string weight in 10 ppg fluid, (300k lbs buoyed weight) plus 100k lbs overpull.

Cement volumes are estimates based on 7" casing set in an 8-3/4" hole with 30% excess.
Mix and pump the following slurry

Pre-flush (Spacer): **100 bbls** Saltwater
20 bbls Tuned Spacer III

Lead Slurry: **218 sks** (101 bbls), 11.8 ppg, 2.55 cu. ft./sk Econocem Cement with .3% Fe-2 and .25 lb/sk Lost Circulation Additive

Tail Slurry: **573 sks** (167 bbls), 14.0 ppg, 1.55 cu. ft./sk Extendcem System with .2% HR-5 Retarder and .25 lb/sk Lost Circulation Additive

Oasis Petroleum
Well Summary
Lewis Federal 5300 11-31 4BR
Section 31 T153N R100W
McKenzie County, ND

PRODUCTION LINER

Size	**Interval**	**Weight**	**Grade**	**Coupling**	**I.D.**	**Drift**
4-1/2"	10280' - 20783'	13.5	P-110	GB CD BTC	3.920"	3.795"

Interval	**Length**	**Description**	**Collapse**	**Burst**	**Tension**
		4-1/2", 13.5 lb, P-110, GB CD BTC	(psi) a	(psi) b	(1000 lbs) c
10280' - 20783'	10503		10670 / 1.99	12410 / 1.28	443 / 2.0

API Rating & Safety Factor

a) Based on full casing evacuation with 9.5 ppg fluid on backside @ 10839' TVD.

b) Burst pressure based on 9000 psi treating pressure with 10.2 ppg internal fluid gradient and 9 ppg external fluid gradient @ 10839' TVD.

c) Based on string weight in 9.5 ppg fluid (Buoyed weight: 121k lbs.) plus 100k lbs overpull.

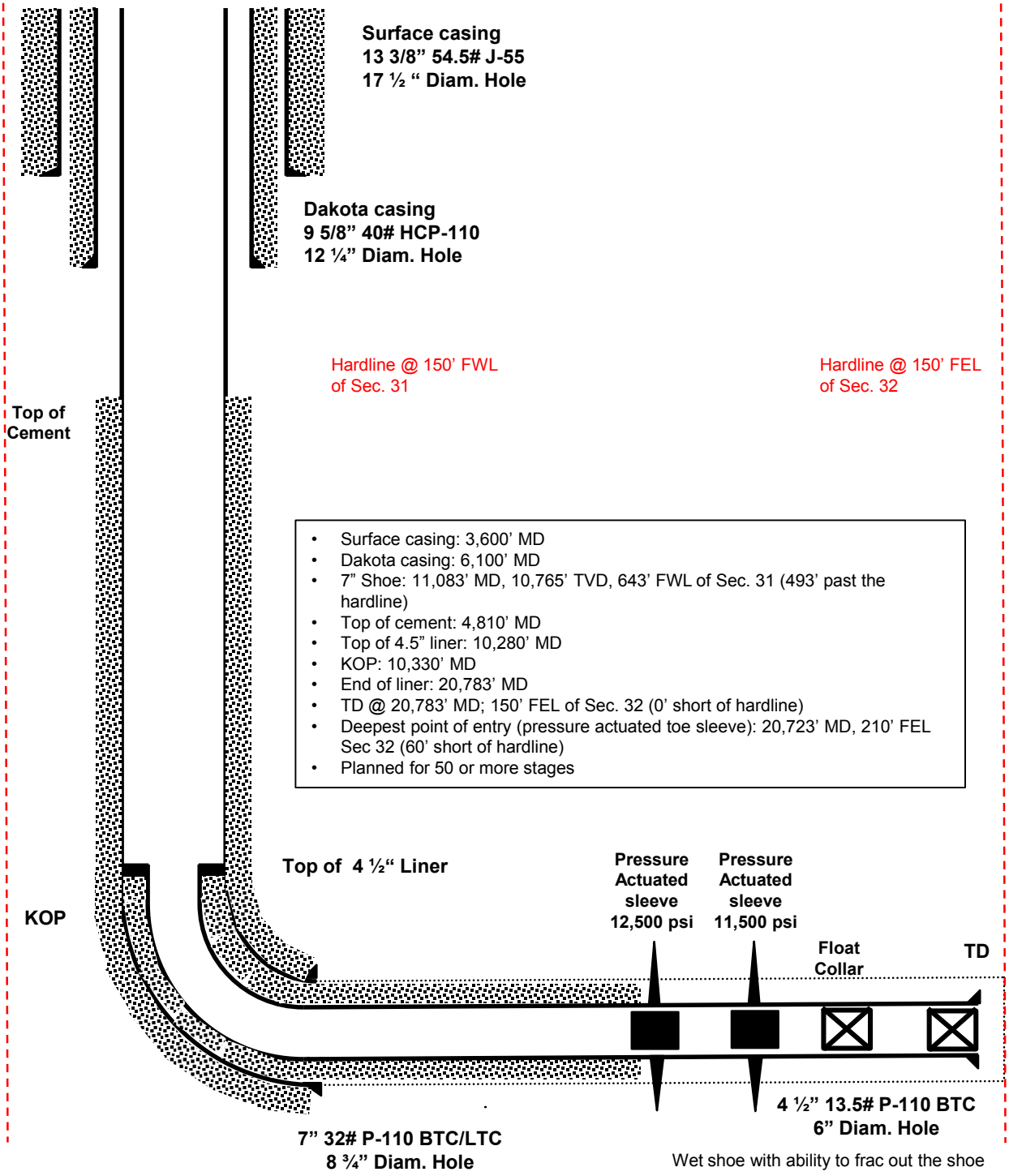
Cement volumes are estimates based on 4-1/2" casing hung from 7" casing, and into 6" OH. 20% excess.
Mix and pump the cement slurry. Follow cement with liner dart and then saltwater displacement

Pre-flush (Spacer):	**20 bbls**	Viscous spacer
Cement Slurry:	**715 sks**	(194 bbls), 14.3ppg, 1.52 cu/ft/sk conventional system with 20% silica flour
Displacement	**270 bbls**	Based on 53 ft shoe track and 4" drill pipe from surface to top of liner 4" DP: 0ft to 10280ft @ 0.011bbl/ft 4.5" casing: 10280ft to 20730ft; 0.0149bbl/ft

ELEVATION: 2,110' SL

Lewis Federal 5300 11-31 4BR
Proposed Wellbore Schematic

FORMATION: Bakken

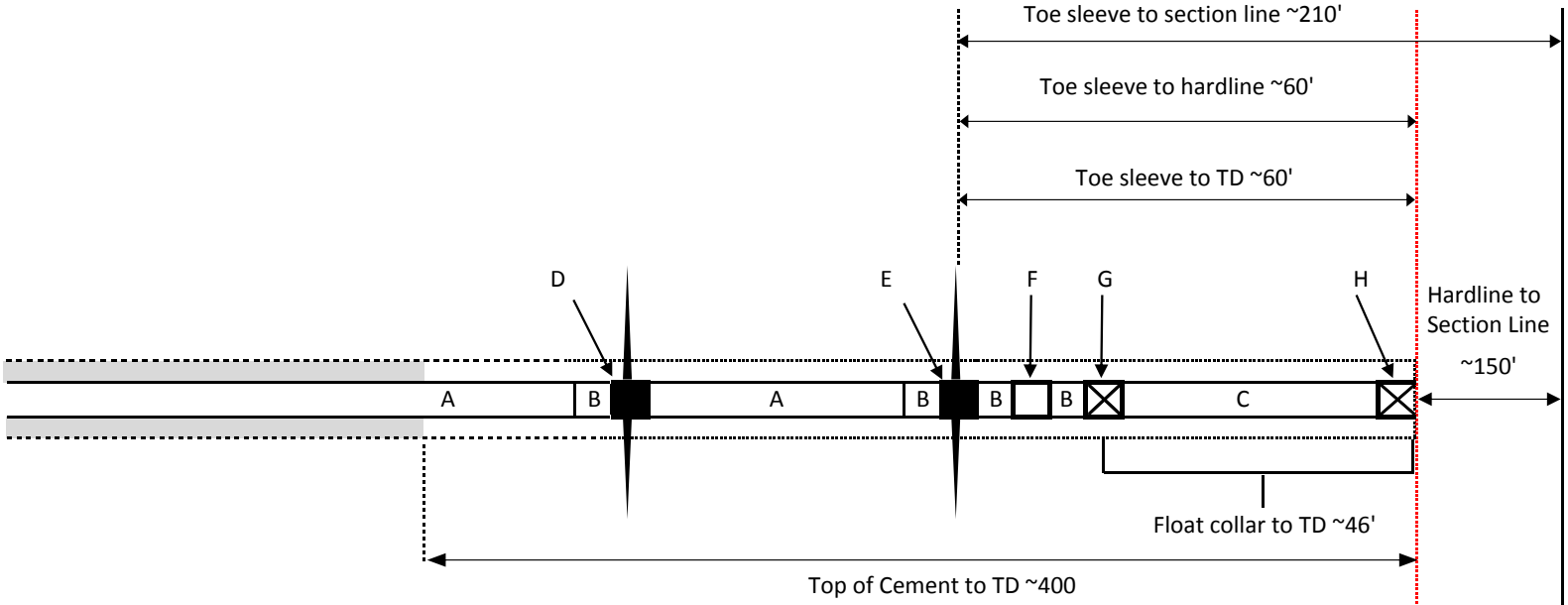


OASIS PETROLEUM NA LLC

Lewis Federal 5300 11-31 4BR
Wellbore: T153N-R100W Sec. 31 & 32
SHL: 1149' FNL & 257' FWL T153N-R100W Sec. 31

Williams County, North Dakota
Updated: 1-10-2018 TR

Lewis Federal 5300 11-31 4BR planned toe completion



	Description	Approx length, ft
A	Full 4.5" joint(s) of tubing	44
B	Pup joint of 4.5" tubing	5
C	Full 4.5" joint of tubing, with NO cement	44
D	Pressure actuated sleeve, 12,500psi absolute	7
E	Pressure actuated sleeve, 11,500psi absolute	5
F	Landing collar	2
G	Float collar	2
H	Float shoe	2

*First stage to be pumped out of sleeves labeled as "D" and "E." Acid used as necessary to break down formation

*Diagram not to scale

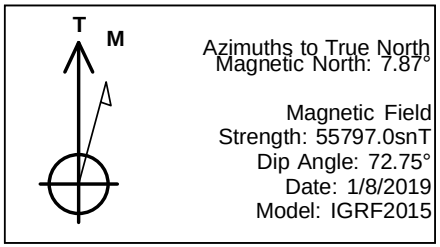
Project: Indian Hills
Site: 153N-100W-31/32
Well: Lewis Federal 5300 11-31 4BR
Wellbore: Lewis Federal 5300 11-31 4BR
Design: Design #1

OASIS PETROLEUM

WELL DETAILS: Lewis Federal 5300 11-31 4BR

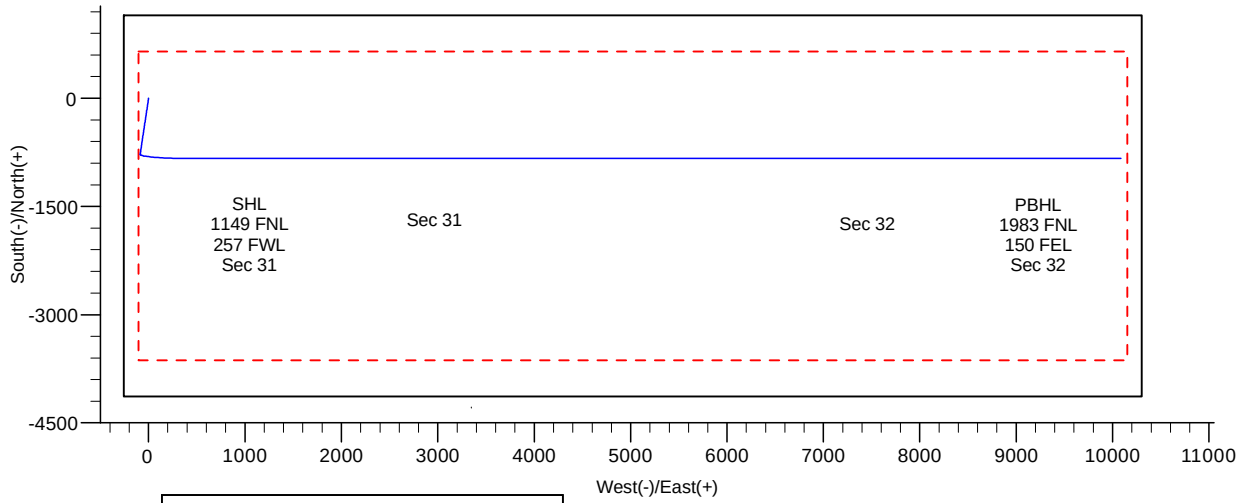
Ground Level: 2110.0

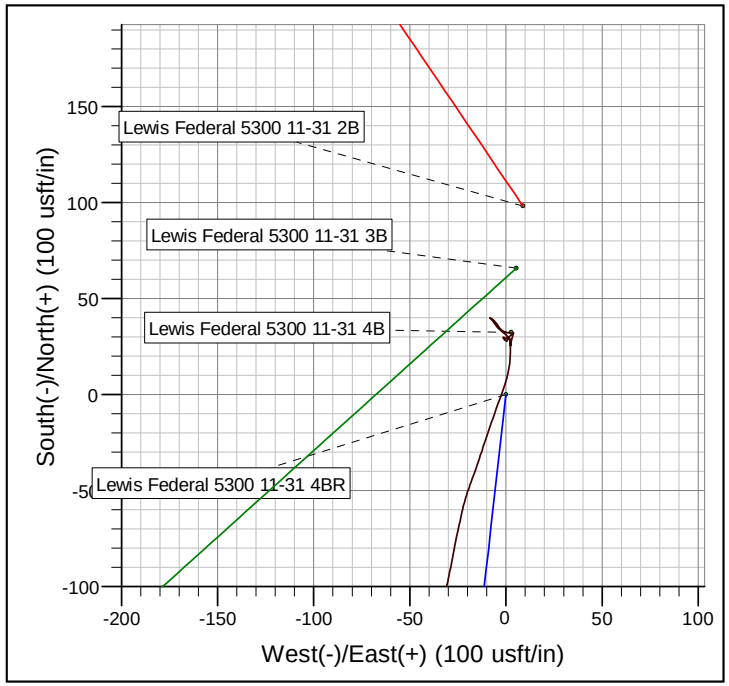
Northing	Easting	Latitude	Longitude
393064.17	1209533.07	48° 2' 8.330 N	103° 36' 11.190 W



Azimuths to True North
Magnetic North: 7.87°

Magnetic Field
Strength: 55797.0snT
Dip Angle: 72.75°
Date: 1/8/2019
Model: IGRF2015



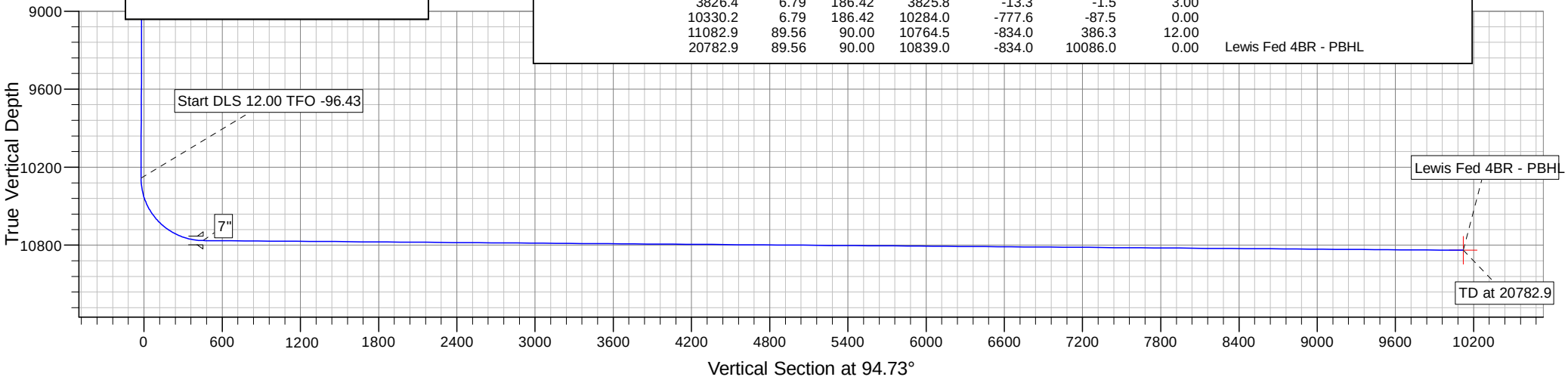


CASING DETAILS

TVD	MD	Name	Size
3600.0	3600.0	13 3/8"	13.375
6083.5	6100.0	9 5/8"	9.625
10764.5	11082.9	7"	7.000

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	
3600.0	0.00	0.00	3600.0	0.0	0.0	0.00	
3826.4	6.79	186.42	3825.8	-13.3	-1.5	3.00	
10330.2	6.79	186.42	10284.0	-777.6	-87.5	0.00	
11082.9	89.56	90.00	10764.5	-834.0	386.3	12.00	
20782.9	89.56	90.00	10839.0	-834.0	10086.0	0.00	Lewis Fed 4BR - PBHL



Oasis

Indian Hills
153N-100W-31/32
Lewis Federal 5300 11-31 4BR

Lewis Federal 5300 11-31 4BR

Plan: Design #1

Standard Planning Report

10 January, 2019

Database:	OpenWellsCompass - EDM Prod	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Company:	Oasis	**TVD Reference:**	WELL @ 2135.0usft
Project:	Indian Hills	**MD Reference:**	WELL @ 2135.0usft
Site:	153N-100W-31/32	**North Reference:**	True
Well:	Lewis Federal 5300 11-31 4BR	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Lewis Federal 5300 11-31 4BR		
Design:	Design #1		

Project Indian Hills

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	North Dakota Northern Zone		

Site 153N-100W-31/32

Site Position:		**Northing:**	390,397.86 usft	**Latitude:**	48° 1' 42.010 N
From:	Lat/Long	**Easting:**	1,209,464.32 usft	**Longitude:**	103° 36' 10.620 W
Position Uncertainty:	0.0 usft	**Slot Radius:**	13.200 in	**Grid Convergence:**	-2.31 °

Well Lewis Federal 5300 11-31 4BR

Well Position	**+N/-S**	2,666.9 usft	**Northing:**	393,064.17 usft	**Latitude:**	48° 2' 8.330 N
	+E/-W	-38.7 usft	**Easting:**	1,209,533.06 usft	**Longitude:**	103° 36' 11.190 W
Position Uncertainty		2.0 usft	**Wellhead Elevation:**	0.0 usft	**Ground Level:**	2,110.0 usft

Wellbore Lewis Federal 5300 11-31 4BR

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	1/8/2019	7.87	72.75	55,797

Design Design #1

Audit Notes:

Version:		**Phase:**	PROTOTYPE	**Tie On Depth:**	0.0

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	10,839.0	0.0	0.0	94.73

Plan Sections

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
3,600.0	0.00	0.00	3,600.0	0.0	0.0	0.00	0.00	0.00	0.00	
3,826.4	6.79	186.42	3,825.8	-13.3	-1.5	3.00	3.00	0.00	186.42	
10,330.2	6.79	186.42	10,284.0	-777.6	-87.5	0.00	0.00	0.00	0.00	
11,082.9	89.56	90.00	10,764.5	-834.0	386.3	12.00	11.00	-12.81	-96.43	
20,782.9	89.56	90.00	10,839.0	-834.0	10,086.0	0.00	0.00	0.00	0.00	Lewis Fed 4BR - PBH

Database:	OpenWellsCompass - EDM Prod	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Company:	Oasis	**TVD Reference:**	WELL @ 2135.0usft
Project:	Indian Hills	**MD Reference:**	WELL @ 2135.0usft
Site:	153N-100W-31/32	**North Reference:**	True
Well:	Lewis Federal 5300 11-31 4BR	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Lewis Federal 5300 11-31 4BR		
Design:	Design #1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,600.0	0.00	0.00	3,600.0	0.0	0.0	0.0	0.00	0.00	0.00
Start Build 3.00 - 13 3/8"									
3,700.0	3.00	186.42	3,700.0	-2.6	-0.3	-0.1	3.00	3.00	0.00
3,800.0	6.00	186.42	3,799.6	-10.4	-1.2	-0.3	3.00	3.00	0.00
3,826.4	6.79	186.42	3,825.8	-13.3	-1.5	-0.4	3.00	3.00	0.00
Start 6503.8 hold at 3826.4 MD									
3,900.0	6.79	186.42	3,899.0	-22.0	-2.5	-0.7	0.00	0.00	0.00
4,000.0	6.79	186.42	3,998.3	-33.7	-3.8	-1.0	0.00	0.00	0.00
4,100.0	6.79	186.42	4,097.6	-45.5	-5.1	-1.4	0.00	0.00	0.00
4,200.0	6.79	186.42	4,196.8	-57.2	-6.4	-1.7	0.00	0.00	0.00
4,300.0	6.79	186.42	4,296.1	-69.0	-7.8	-2.1	0.00	0.00	0.00
4,400.0	6.79	186.42	4,395.4	-80.7	-9.1	-2.4	0.00	0.00	0.00
4,500.0	6.79	186.42	4,494.7	-92.5	-10.4	-2.7	0.00	0.00	0.00
4,600.0	6.79	186.42	4,594.0	-104.2	-11.7	-3.1	0.00	0.00	0.00
4,700.0	6.79	186.42	4,693.3	-116.0	-13.0	-3.4	0.00	0.00	0.00
4,800.0	6.79	186.42	4,792.6	-127.7	-14.4	-3.8	0.00	0.00	0.00
4,900.0	6.79	186.42	4,891.9	-139.5	-15.7	-4.1	0.00	0.00	0.00
5,000.0	6.79	186.42	4,991.2	-151.2	-17.0	-4.5	0.00	0.00	0.00
5,100.0	6.79	186.42	5,090.5	-163.0	-18.3	-4.8	0.00	0.00	0.00
5,200.0	6.79	186.42	5,189.8	-174.7	-19.7	-5.2	0.00	0.00	0.00
5,300.0	6.79	186.42	5,289.1	-186.5	-21.0	-5.5	0.00	0.00	0.00
5,400.0	6.79	186.42	5,388.4	-198.2	-22.3	-5.9	0.00	0.00	0.00
5,500.0	6.79	186.42	5,487.7	-210.0	-23.6	-6.2	0.00	0.00	0.00
5,600.0	6.79	186.42	5,587.0	-221.7	-24.9	-6.6	0.00	0.00	0.00
5,700.0	6.79	186.42	5,686.3	-233.5	-26.3	-6.9	0.00	0.00	0.00
5,800.0	6.79	186.42	5,785.6	-245.2	-27.6	-7.3	0.00	0.00	0.00
5,900.0	6.79	186.42	5,884.9	-257.0	-28.9	-7.6	0.00	0.00	0.00
6,000.0	6.79	186.42	5,984.2	-268.7	-30.2	-8.0	0.00	0.00	0.00
6,100.0	6.79	186.42	6,083.5	-280.5	-31.6	-8.3	0.00	0.00	0.00
9 5/8"									
6,200.0	6.79	186.42	6,182.8	-292.2	-32.9	-8.7	0.00	0.00	0.00
6,300.0	6.79	186.42	6,282.1	-304.0	-34.2	-9.0	0.00	0.00	0.00
6,400.0	6.79	186.42	6,381.4	-315.7	-35.5	-9.4	0.00	0.00	0.00
6,500.0	6.79	186.42	6,480.7	-327.5	-36.9	-9.7	0.00	0.00	0.00
6,600.0	6.79	186.42	6,580.0	-339.2	-38.2	-10.1	0.00	0.00	0.00
6,700.0	6.79	186.42	6,679.3	-351.0	-39.5	-10.4	0.00	0.00	0.00
6,800.0	6.79	186.42	6,778.6	-362.7	-40.8	-10.8	0.00	0.00	0.00
6,900.0	6.79	186.42	6,877.9	-374.5	-42.1	-11.1	0.00	0.00	0.00
7,000.0	6.79	186.42	6,977.2	-386.2	-43.5	-11.5	0.00	0.00	0.00
7,100.0	6.79	186.42	7,076.5	-398.0	-44.8	-11.8	0.00	0.00	0.00
7,200.0	6.79	186.42	7,175.8	-409.7	-46.1	-12.2	0.00	0.00	0.00
7,300.0	6.79	186.42	7,275.1	-421.5	-47.4	-12.5	0.00	0.00	0.00
7,400.0	6.79	186.42	7,374.4	-433.3	-48.8	-12.9	0.00	0.00	0.00
7,500.0	6.79	186.42	7,473.7	-445.0	-50.1	-13.2	0.00	0.00	0.00
7,600.0	6.79	186.42	7,573.0	-456.8	-51.4	-13.6	0.00	0.00	0.00
7,700.0	6.79	186.42	7,672.3	-468.5	-52.7	-13.9	0.00	0.00	0.00
7,800.0	6.79	186.42	7,771.6	-480.3	-54.0	-14.3	0.00	0.00	0.00
7,900.0	6.79	186.42	7,870.9	-492.0	-55.4	-14.6	0.00	0.00	0.00
8,000.0	6.79	186.42	7,970.2	-503.8	-56.7	-15.0	0.00	0.00	0.00
8,100.0	6.79	186.42	8,069.5	-515.5	-58.0	-15.3	0.00	0.00	0.00
8,200.0	6.79	186.42	8,168.8	-527.3	-59.3	-15.7	0.00	0.00	0.00
8,300.0	6.79	186.42	8,268.1	-539.0	-60.7	-16.0	0.00	0.00	0.00
8,400.0	6.79	186.42	8,367.4	-550.8	-62.0	-16.4	0.00	0.00	0.00

Database:	OpenWellsCompass - EDM Prod	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Company:	Oasis	**TVD Reference:**	WELL @ 2135.0usft
Project:	Indian Hills	**MD Reference:**	WELL @ 2135.0usft
Site:	153N-100W-31/32	**North Reference:**	True
Well:	Lewis Federal 5300 11-31 4BR	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Lewis Federal 5300 11-31 4BR		
Design:	Design #1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,500.0	6.79	186.42	8,466.7	-562.5	-63.3	-16.7	0.00	0.00	0.00
8,600.0	6.79	186.42	8,566.0	-574.3	-64.6	-17.1	0.00	0.00	0.00
8,700.0	6.79	186.42	8,665.3	-586.0	-65.9	-17.4	0.00	0.00	0.00
8,800.0	6.79	186.42	8,764.6	-597.8	-67.3	-17.8	0.00	0.00	0.00
8,900.0	6.79	186.42	8,863.9	-609.5	-68.6	-18.1	0.00	0.00	0.00
9,000.0	6.79	186.42	8,963.2	-621.3	-69.9	-18.5	0.00	0.00	0.00
9,100.0	6.79	186.42	9,062.5	-633.0	-71.2	-18.8	0.00	0.00	0.00
9,200.0	6.79	186.42	9,161.8	-644.8	-72.6	-19.2	0.00	0.00	0.00
9,300.0	6.79	186.42	9,261.1	-656.5	-73.9	-19.5	0.00	0.00	0.00
9,400.0	6.79	186.42	9,360.4	-668.3	-75.2	-19.9	0.00	0.00	0.00
9,500.0	6.79	186.42	9,459.7	-680.0	-76.5	-20.2	0.00	0.00	0.00
9,600.0	6.79	186.42	9,559.0	-691.8	-77.8	-20.6	0.00	0.00	0.00
9,700.0	6.79	186.42	9,658.3	-703.5	-79.2	-20.9	0.00	0.00	0.00
9,800.0	6.79	186.42	9,757.6	-715.3	-80.5	-21.3	0.00	0.00	0.00
9,900.0	6.79	186.42	9,856.9	-727.0	-81.8	-21.6	0.00	0.00	0.00
10,000.0	6.79	186.42	9,956.2	-738.8	-83.1	-22.0	0.00	0.00	0.00
10,100.0	6.79	186.42	10,055.5	-750.5	-84.5	-22.3	0.00	0.00	0.00
10,200.0	6.79	186.42	10,154.8	-762.3	-85.8	-22.7	0.00	0.00	0.00
10,300.0	6.79	186.42	10,254.0	-774.0	-87.1	-23.0	0.00	0.00	0.00
10,330.2	6.79	186.42	10,284.0	-777.6	-87.5	-23.1	0.00	0.00	0.00
Start DLS 12.00 TFO -96.43									
10,400.0	10.16	131.28	10,353.2	-785.8	-83.3	-18.3	12.00	4.83	-79.01
10,500.0	20.70	108.20	10,449.5	-797.1	-59.8	6.1	12.00	10.54	-23.08
10,600.0	32.25	100.76	10,538.9	-807.7	-16.7	49.9	12.00	11.55	-7.44
10,700.0	44.03	96.98	10,617.4	-816.9	44.3	111.4	12.00	11.78	-3.78
10,800.0	55.88	94.55	10,681.7	-824.4	120.3	187.8	12.00	11.86	-2.43
10,900.0	67.77	92.72	10,728.8	-829.9	208.1	275.8	12.00	11.89	-1.83
11,000.0	79.68	91.18	10,756.8	-833.2	303.9	371.5	12.00	11.91	-1.54
11,082.9	89.56	90.00	10,764.5	-834.0	386.3	453.7	12.00	11.91	-1.43
Start 9700.0 hold at 11082.9 MD - 7"									
11,100.0	89.56	90.00	10,764.6	-834.0	403.4	470.8	0.00	0.00	0.00
11,200.0	89.56	90.00	10,765.4	-834.0	503.4	570.4	0.00	0.00	0.00
11,300.0	89.56	90.00	10,766.2	-834.0	603.4	670.1	0.00	0.00	0.00
11,400.0	89.56	90.00	10,766.9	-834.0	703.4	769.7	0.00	0.00	0.00
11,500.0	89.56	90.00	10,767.7	-834.0	803.4	869.4	0.00	0.00	0.00
11,600.0	89.56	90.00	10,768.5	-834.0	903.4	969.0	0.00	0.00	0.00
11,700.0	89.56	90.00	10,769.2	-834.0	1,003.4	1,068.7	0.00	0.00	0.00
11,800.0	89.56	90.00	10,770.0	-834.0	1,103.4	1,168.4	0.00	0.00	0.00
11,900.0	89.56	90.00	10,770.8	-834.0	1,203.4	1,268.0	0.00	0.00	0.00
12,000.0	89.56	90.00	10,771.6	-834.0	1,303.4	1,367.7	0.00	0.00	0.00
12,100.0	89.56	90.00	10,772.3	-834.0	1,403.4	1,467.3	0.00	0.00	0.00
12,200.0	89.56	90.00	10,773.1	-834.0	1,503.4	1,567.0	0.00	0.00	0.00
12,300.0	89.56	90.00	10,773.9	-834.0	1,603.4	1,666.6	0.00	0.00	0.00
12,400.0	89.56	90.00	10,774.6	-834.0	1,703.4	1,766.3	0.00	0.00	0.00
12,500.0	89.56	90.00	10,775.4	-834.0	1,803.4	1,866.0	0.00	0.00	0.00
12,600.0	89.56	90.00	10,776.2	-834.0	1,903.4	1,965.6	0.00	0.00	0.00
12,700.0	89.56	90.00	10,776.9	-834.0	2,003.4	2,065.3	0.00	0.00	0.00
12,800.0	89.56	90.00	10,777.7	-834.0	2,103.4	2,164.9	0.00	0.00	0.00
12,900.0	89.56	90.00	10,778.5	-834.0	2,203.4	2,264.6	0.00	0.00	0.00
13,000.0	89.56	90.00	10,779.2	-834.0	2,303.3	2,364.2	0.00	0.00	0.00
13,100.0	89.56	90.00	10,780.0	-834.0	2,403.3	2,463.9	0.00	0.00	0.00
13,200.0	89.56	90.00	10,780.8	-834.0	2,503.3	2,563.6	0.00	0.00	0.00
13,300.0	89.56	90.00	10,781.5	-834.0	2,603.3	2,663.2	0.00	0.00	0.00
13,400.0	89.56	90.00	10,782.3	-834.0	2,703.3	2,762.9	0.00	0.00	0.00

Database:	OpenWellsCompass - EDM Prod	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Company:	Oasis	**TVD Reference:**	WELL @ 2135.0usft
Project:	Indian Hills	**MD Reference:**	WELL @ 2135.0usft
Site:	153N-100W-31/32	**North Reference:**	True
Well:	Lewis Federal 5300 11-31 4BR	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Lewis Federal 5300 11-31 4BR		
Design:	Design #1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
13,500.0	89.56	90.00	10,783.1	-834.0	2,803.3	2,862.5	0.00	0.00	0.00
13,600.0	89.56	90.00	10,783.8	-834.0	2,903.3	2,962.2	0.00	0.00	0.00
13,700.0	89.56	90.00	10,784.6	-834.0	3,003.3	3,061.8	0.00	0.00	0.00
13,800.0	89.56	90.00	10,785.4	-834.0	3,103.3	3,161.5	0.00	0.00	0.00
13,900.0	89.56	90.00	10,786.1	-834.0	3,203.3	3,261.2	0.00	0.00	0.00
14,000.0	89.56	90.00	10,786.9	-834.0	3,303.3	3,360.8	0.00	0.00	0.00
14,100.0	89.56	90.00	10,787.7	-834.0	3,403.3	3,460.5	0.00	0.00	0.00
14,200.0	89.56	90.00	10,788.4	-834.0	3,503.3	3,560.1	0.00	0.00	0.00
14,300.0	89.56	90.00	10,789.2	-834.0	3,603.3	3,659.8	0.00	0.00	0.00
14,400.0	89.56	90.00	10,790.0	-834.0	3,703.3	3,759.4	0.00	0.00	0.00
14,500.0	89.56	90.00	10,790.8	-834.0	3,803.3	3,859.1	0.00	0.00	0.00
14,600.0	89.56	90.00	10,791.5	-834.0	3,903.3	3,958.8	0.00	0.00	0.00
14,700.0	89.56	90.00	10,792.3	-834.0	4,003.3	4,058.4	0.00	0.00	0.00
14,800.0	89.56	90.00	10,793.1	-834.0	4,103.3	4,158.1	0.00	0.00	0.00
14,900.0	89.56	90.00	10,793.8	-834.0	4,203.3	4,257.7	0.00	0.00	0.00
15,000.0	89.56	90.00	10,794.6	-834.0	4,303.3	4,357.4	0.00	0.00	0.00
15,100.0	89.56	90.00	10,795.4	-834.0	4,403.3	4,457.0	0.00	0.00	0.00
15,200.0	89.56	90.00	10,796.1	-834.0	4,503.3	4,556.7	0.00	0.00	0.00
15,300.0	89.56	90.00	10,796.9	-834.0	4,603.3	4,656.4	0.00	0.00	0.00
15,400.0	89.56	90.00	10,797.7	-834.0	4,703.3	4,756.0	0.00	0.00	0.00
15,500.0	89.56	90.00	10,798.4	-834.0	4,803.3	4,855.7	0.00	0.00	0.00
15,600.0	89.56	90.00	10,799.2	-834.0	4,903.3	4,955.3	0.00	0.00	0.00
15,700.0	89.56	90.00	10,800.0	-834.0	5,003.3	5,055.0	0.00	0.00	0.00
15,800.0	89.56	90.00	10,800.7	-834.0	5,103.3	5,154.6	0.00	0.00	0.00
15,900.0	89.56	90.00	10,801.5	-834.0	5,203.3	5,254.3	0.00	0.00	0.00
16,000.0	89.56	90.00	10,802.3	-834.0	5,303.3	5,353.9	0.00	0.00	0.00
16,100.0	89.56	90.00	10,803.0	-834.0	5,403.3	5,453.6	0.00	0.00	0.00
16,200.0	89.56	90.00	10,803.8	-834.0	5,503.3	5,553.3	0.00	0.00	0.00
16,300.0	89.56	90.00	10,804.6	-834.0	5,603.3	5,652.9	0.00	0.00	0.00
16,400.0	89.56	90.00	10,805.3	-834.0	5,703.2	5,752.6	0.00	0.00	0.00
16,500.0	89.56	90.00	10,806.1	-834.0	5,803.2	5,852.2	0.00	0.00	0.00
16,600.0	89.56	90.00	10,806.9	-834.0	5,903.2	5,951.9	0.00	0.00	0.00
16,700.0	89.56	90.00	10,807.6	-834.0	6,003.2	6,051.5	0.00	0.00	0.00
16,800.0	89.56	90.00	10,808.4	-834.0	6,103.2	6,151.2	0.00	0.00	0.00
16,900.0	89.56	90.00	10,809.2	-834.0	6,203.2	6,250.9	0.00	0.00	0.00
17,000.0	89.56	90.00	10,809.9	-834.0	6,303.2	6,350.5	0.00	0.00	0.00
17,100.0	89.56	90.00	10,810.7	-834.0	6,403.2	6,450.2	0.00	0.00	0.00
17,200.0	89.56	90.00	10,811.5	-834.0	6,503.2	6,549.8	0.00	0.00	0.00
17,300.0	89.56	90.00	10,812.3	-834.0	6,603.2	6,649.5	0.00	0.00	0.00
17,400.0	89.56	90.00	10,813.0	-834.0	6,703.2	6,749.1	0.00	0.00	0.00
17,500.0	89.56	90.00	10,813.8	-834.0	6,803.2	6,848.8	0.00	0.00	0.00
17,600.0	89.56	90.00	10,814.6	-834.0	6,903.2	6,948.5	0.00	0.00	0.00
17,700.0	89.56	90.00	10,815.3	-834.0	7,003.2	7,048.1	0.00	0.00	0.00
17,800.0	89.56	90.00	10,816.1	-834.0	7,103.2	7,147.8	0.00	0.00	0.00
17,900.0	89.56	90.00	10,816.9	-834.0	7,203.2	7,247.4	0.00	0.00	0.00
18,000.0	89.56	90.00	10,817.6	-834.0	7,303.2	7,347.1	0.00	0.00	0.00
18,100.0	89.56	90.00	10,818.4	-834.0	7,403.2	7,446.7	0.00	0.00	0.00
18,200.0	89.56	90.00	10,819.2	-834.0	7,503.2	7,546.4	0.00	0.00	0.00
18,300.0	89.56	90.00	10,819.9	-834.0	7,603.2	7,646.1	0.00	0.00	0.00
18,400.0	89.56	90.00	10,820.7	-834.0	7,703.2	7,745.7	0.00	0.00	0.00
18,500.0	89.56	90.00	10,821.5	-834.0	7,803.2	7,845.4	0.00	0.00	0.00
18,600.0	89.56	90.00	10,822.2	-834.0	7,903.2	7,945.0	0.00	0.00	0.00
18,700.0	89.56	90.00	10,823.0	-834.0	8,003.2	8,044.7	0.00	0.00	0.00
18,800.0	89.56	90.00	10,823.8	-834.0	8,103.2	8,144.3	0.00	0.00	0.00

Database:	OpenWellsCompass - EDM Prod	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Company:	Oasis	**TVD Reference:**	WELL @ 2135.0usft
Project:	Indian Hills	**MD Reference:**	WELL @ 2135.0usft
Site:	153N-100W-31/32	**North Reference:**	True
Well:	Lewis Federal 5300 11-31 4BR	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Lewis Federal 5300 11-31 4BR		
Design:	Design #1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
18,900.0	89.56	90.00	10,824.5	-834.0	8,203.2	8,244.0	0.00	0.00	0.00
19,000.0	89.56	90.00	10,825.3	-834.0	8,303.2	8,343.7	0.00	0.00	0.00
19,100.0	89.56	90.00	10,826.1	-834.0	8,403.2	8,443.3	0.00	0.00	0.00
19,200.0	89.56	90.00	10,826.8	-834.0	8,503.2	8,543.0	0.00	0.00	0.00
19,300.0	89.56	90.00	10,827.6	-834.0	8,603.2	8,642.6	0.00	0.00	0.00
19,400.0	89.56	90.00	10,828.4	-834.0	8,703.2	8,742.3	0.00	0.00	0.00
19,500.0	89.56	90.00	10,829.1	-834.0	8,803.2	8,841.9	0.00	0.00	0.00
19,600.0	89.56	90.00	10,829.9	-834.0	8,903.2	8,941.6	0.00	0.00	0.00
19,700.0	89.56	90.00	10,830.7	-834.0	9,003.2	9,041.3	0.00	0.00	0.00
19,800.0	89.56	90.00	10,831.5	-834.0	9,103.1	9,140.9	0.00	0.00	0.00
19,900.0	89.56	90.00	10,832.2	-834.0	9,203.1	9,240.6	0.00	0.00	0.00
20,000.0	89.56	90.00	10,833.0	-834.0	9,303.1	9,340.2	0.00	0.00	0.00
20,100.0	89.56	90.00	10,833.8	-834.0	9,403.1	9,439.9	0.00	0.00	0.00
20,200.0	89.56	90.00	10,834.5	-834.0	9,503.1	9,539.5	0.00	0.00	0.00
20,300.0	89.56	90.00	10,835.3	-834.0	9,603.1	9,639.2	0.00	0.00	0.00
20,400.0	89.56	90.00	10,836.1	-834.0	9,703.1	9,738.9	0.00	0.00	0.00
20,500.0	89.56	90.00	10,836.8	-834.0	9,803.1	9,838.5	0.00	0.00	0.00
20,600.0	89.56	90.00	10,837.6	-834.0	9,903.1	9,938.2	0.00	0.00	0.00
20,700.0	89.56	90.00	10,838.4	-834.0	10,003.1	10,037.8	0.00	0.00	0.00
20,782.9	89.56	90.00	10,839.0	-834.0	10,086.0	10,120.4	0.00	0.00	0.00
TD at 20782.9									

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Lewis Fed 4BR - PBHL - plan hits target center - Point	0.00	0.00	10,839.0	-834.0	10,086.0	391,824.47	1,219,577.27	48° 2' 0.072 N	103° 33' 42.782 W

Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (in)	Hole Diameter (in)
3,600.0	3,600.0	13 3/8"	13.375	17.500
6,100.0	6,083.5	9 5/8"	9.625	12.250
11,082.9	10,764.5	7"	7.000	8.750

Database:	OpenWellsCompass - EDM Prod	**Local Co-ordinate Reference:**	Well Lewis Federal 5300 11-31 4BR
Company:	Oasis	**TVD Reference:**	WELL @ 2135.0usft
Project:	Indian Hills	**MD Reference:**	WELL @ 2135.0usft
Site:	153N-100W-31/32	**North Reference:**	True
Well:	Lewis Federal 5300 11-31 4BR	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Lewis Federal 5300 11-31 4BR		
Design:	Design #1		

Formations

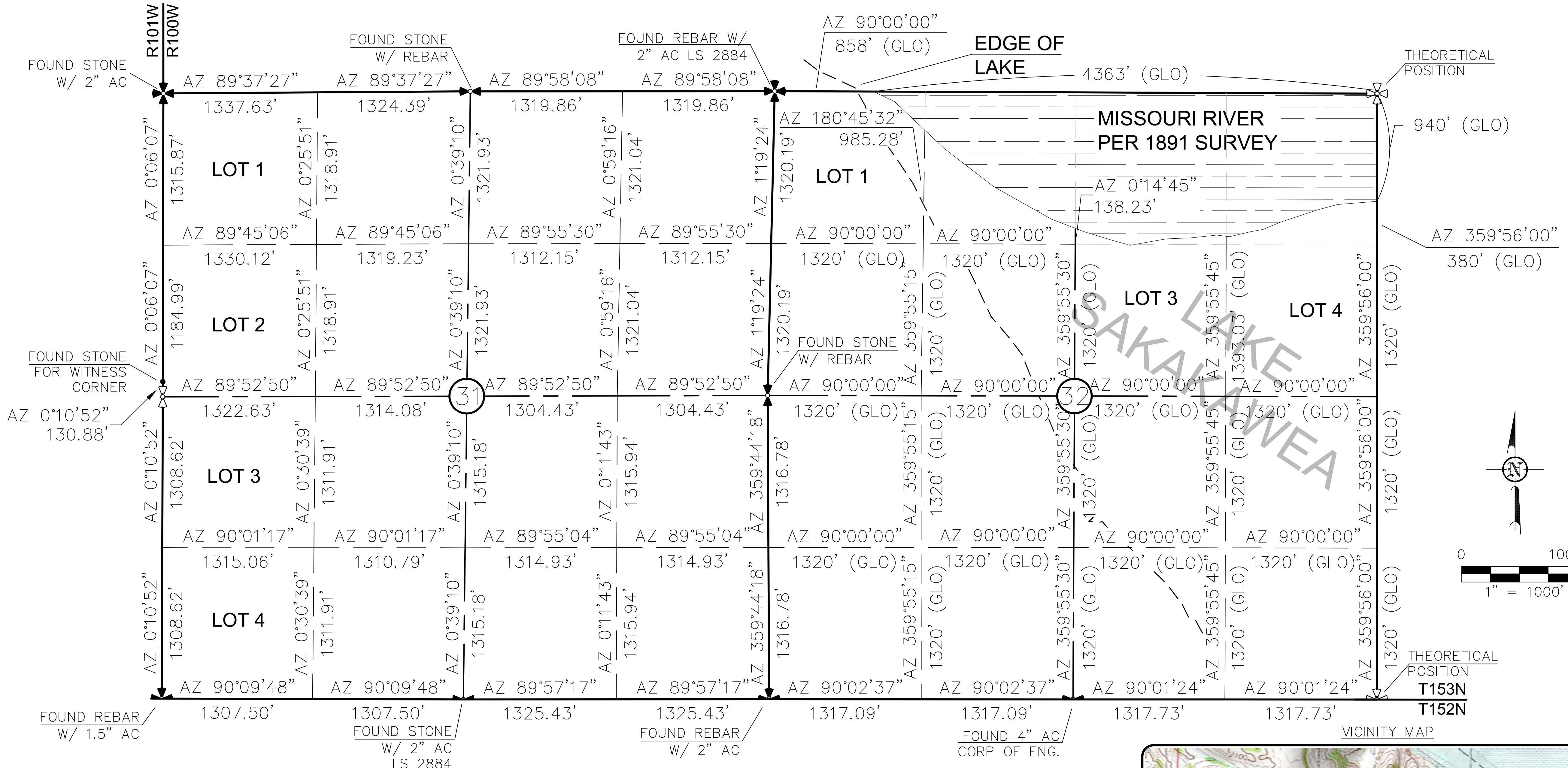
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,985.0	1,985.0	Pierre			
4,602.0	4,596.0	Greenhorn			
5,018.9	5,010.0	Mowry (Dakota Group)			
5,443.9	5,432.0	Inyan Kara (Dakota Group)			
5,869.9	5,855.0	Swift (Base Dakota Group)			
6,389.5	6,371.0	Rierdon			
6,920.2	6,898.0	Dunham Salt			
6,977.6	6,955.0	Dunham Salt Base			
7,286.8	7,262.0	Pine Salt			
7,348.2	7,323.0	Pine Salt Base			
7,467.1	7,441.0	Opeche Salt			
7,493.3	7,467.0	Opeche Salt Base			
7,690.6	7,663.0	Amsden			
7,880.0	7,851.0	Tyler			
8,099.5	8,069.0	Otter/Base Minnelusa			
8,449.0	8,416.0	Kibbey Lime			
8,596.0	8,562.0	Charles Salt			
9,271.7	9,233.0	Base Last Salt			
9,487.2	9,447.0	Mission Canyon			
10,050.2	10,006.0	Lodgepole			
10,878.0	10,720.0	False Bakken			
10,903.2	10,730.0	Upper Bakken Shale			
10,952.7	10,746.0	Middle Bakken			
10,995.9	10,756.0	Target Top			
11,146.7	10,765.0	Target Landing			
12,318.6	10,774.0	Target Base			
13,620.8	10,784.0	Lower Bakken			

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
3,600.0	3,600.0	0.0	0.0	Start Build 3.00
3,826.4	3,825.8	-13.3	-1.5	Start 6503.8 hold at 3826.4 MD
10,330.2	10,284.0	-777.6	-87.5	Start DLS 12.00 TFO -96.43
11,082.9	10,764.5	-834.0	386.3	Start 9700.0 hold at 11082.9 MD
20,782.9	10,839.0	-834.0	10,086.0	TD at 20782.9

SECTION BREAKDOWN

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



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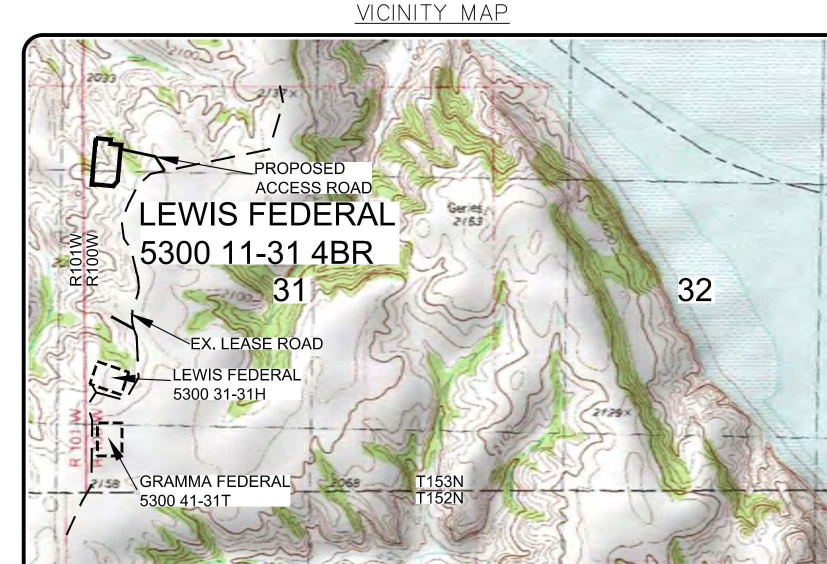
ALL AZIMUTHS ARE BASED ON G.P.S. OBSERVATIONS. THE ORIGINAL SURVEY OF THIS AREA FOR THE GENERAL LAND OFFICE (G.L.O.) WAS 1897. THE CORNERS FOUND ARE AS INDICATED AND ALL OTHERS ARE COMPUTED FROM THOSE CORNERS FOUND AND BASED ON G.L.O. DATA. THE MAPPING ANGLE FOR THIS AREA IS APPROXIMATELY -0°03'.

REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

MONUMENT – RECOVERED
MONUMENT – NOT RECOVERED

VICINITY MAP



OASIS PETROLEUM NORTH AMERICA, LLC
SECTION BREAKDOWN
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

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SHEET NO. 2/9

PAD LAYOUT

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA

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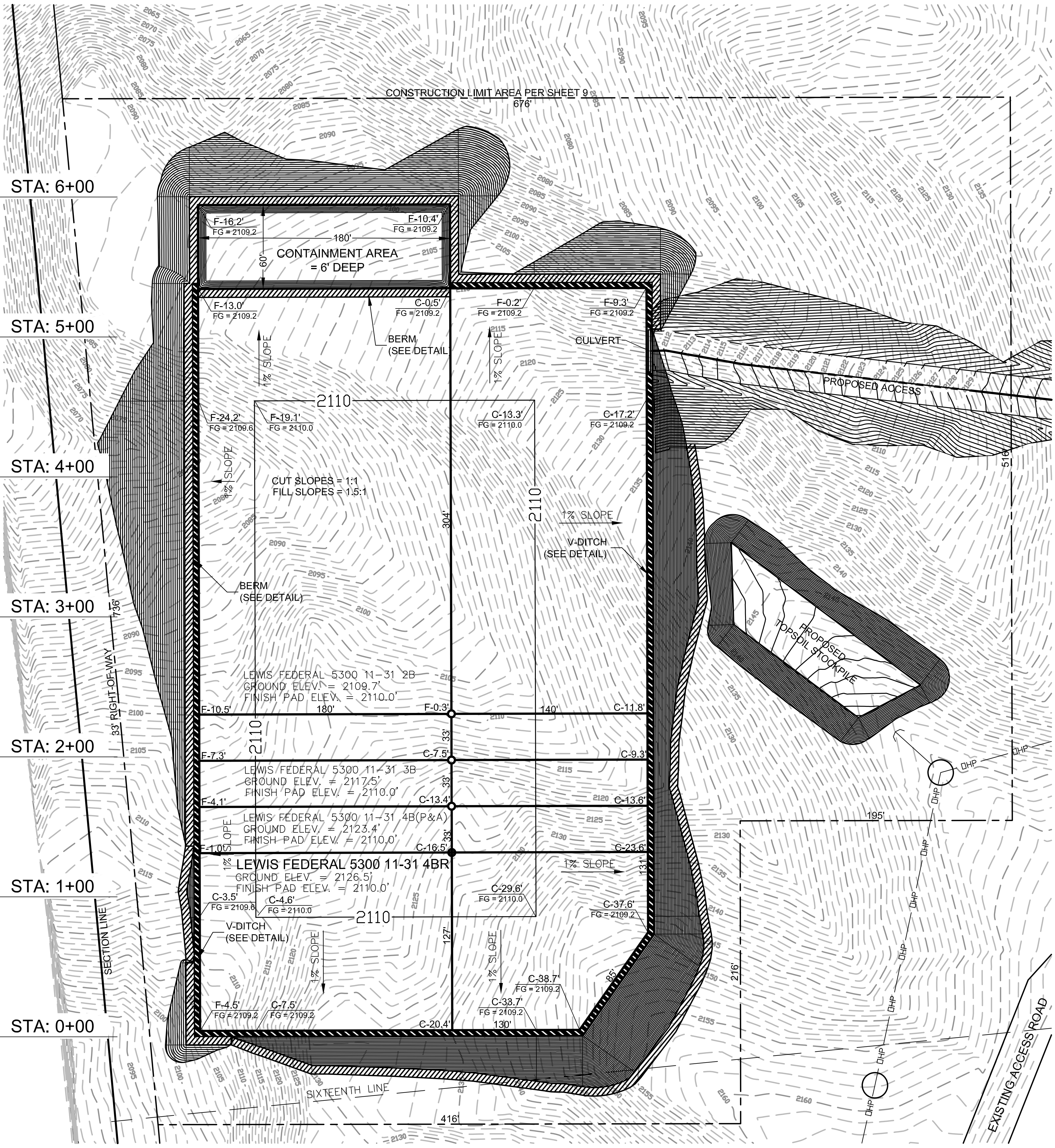
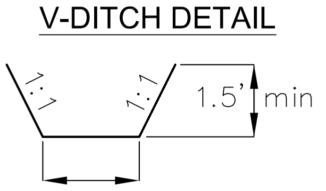


NOTE: Pad dimensions shown are to usable area, the v-ditch and berm areas shall be built to the outside of the pad dimensions.

V-DITCH DETAIL



— BERM

— DITCH

Proposed Contours

Original Contours

REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

0 80
1" = 80'

NOTE: All utilities shown are preliminary only, a complete utilities location is recommended before construction.

3/9
SHEET NO.

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OASIS PETROLEUM NORTH AMERICA, LLC
PAD LAYOUT
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By:	J.D.M.	Project No.:	S17-09-183
Checked By:	J.L.K.	Date:	JAN 2019

Revision No.	Date	By	Description

Q:\2017\S17-09-183 - Oasis Petroleum - Update Well Designs on the Lewis Federal 5300 11-31 Quad Pad to New Standards\CADD\LEWIS FEDERAL 5300 11-31 4BR\LEWIS FEDERAL 5300 11-31 4BR.dwg - 1/11/2019 8:19 AM josh.schmierer

QUANTITIES

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA

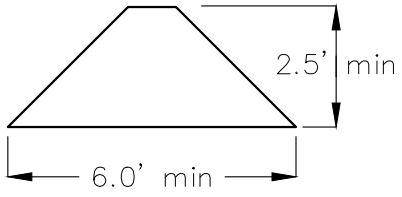
WELL SITE ELEVATION	2126.5
WELL PAD ELEVATION	2110.0

EXCAVATION	61,049
ACCESS ROAD EXCAVATION	8,138
	69,187
EMBANKMENT	42,745
PLUS SHRINKAGE (30%)	14,681
ACCESS ROAD EMBANKMENT	6,192
	63,618
STOCKPILE TOP SOIL (6")	4,414
BERMS	2,076 LF = 673 CY
DITCHES	1,513 LF = 231 CY
CONTAINMENT AREA	2,068 CY
STOCKPILE MATERIAL	2,781
DISTURBED AREA FROM PAD	9.86 ACRES

NOTE: ALL QUANTITIES ARE IN CUBIC YARDS (UNLESS NOTED)
CUT END SLOPES AT 1:1
FILL END SLOPES AT 1.5:1

WELL SITE LOCATION
1149' FNL
257' FWL

BERM DETAIL



DIVERSION DITCH DETAIL

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OASIS PETROLEUM NORTH AMERICA, LLC
QUANTITIES
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

Revision No.	Date	By	Description

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PRODUCTION LAYOUT

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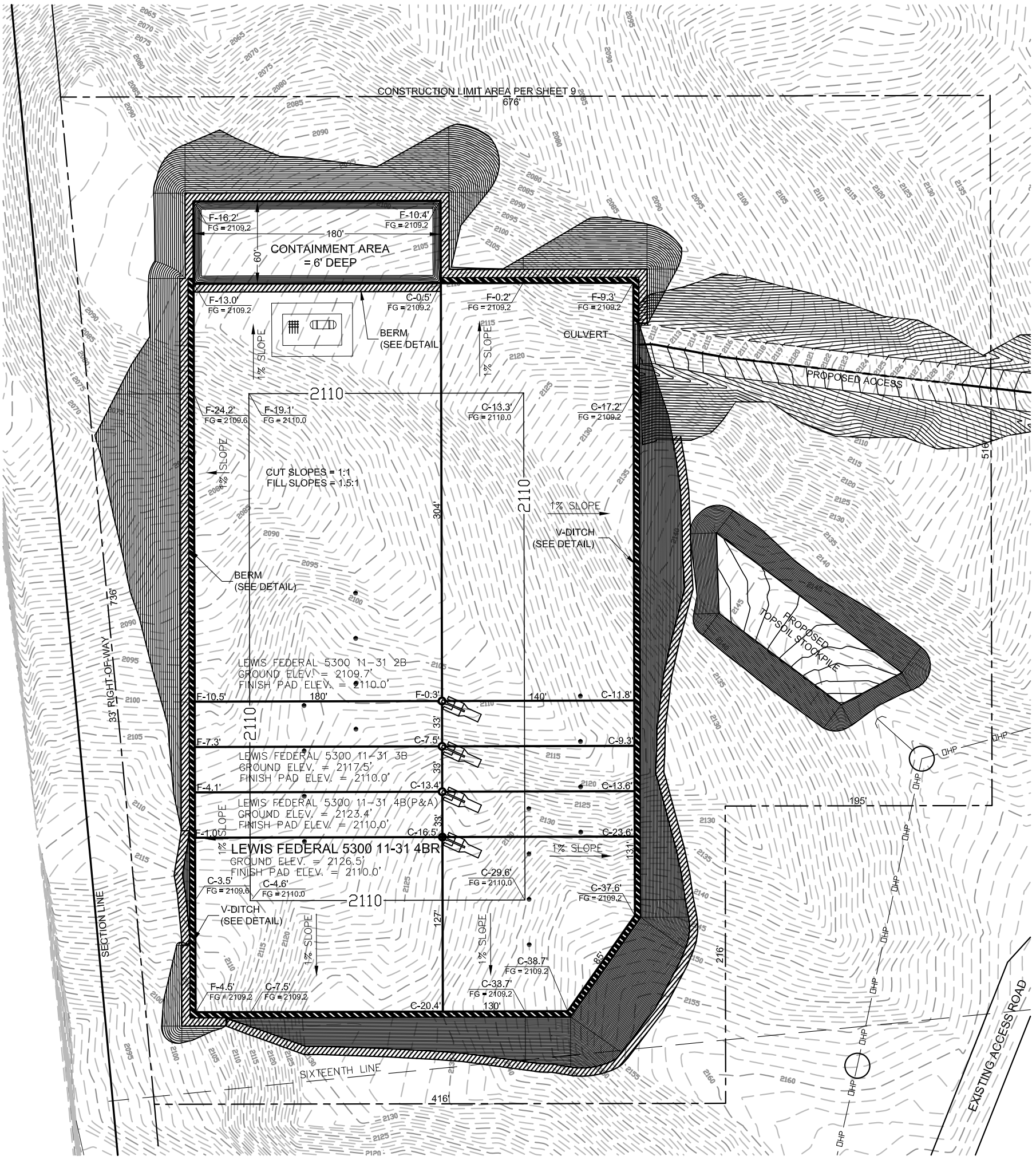
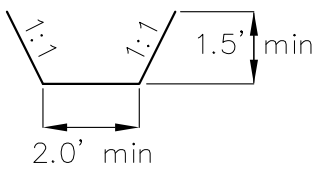


V-DITCH DETAIL



— BERM

— DITCH

Proposed Contours

Original Contours

REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

NOTE: Pad dimensions shown are to usable area, the v-ditch and berm areas shall be built to the outside of the pad dimensions.

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0 80
1" = 80'

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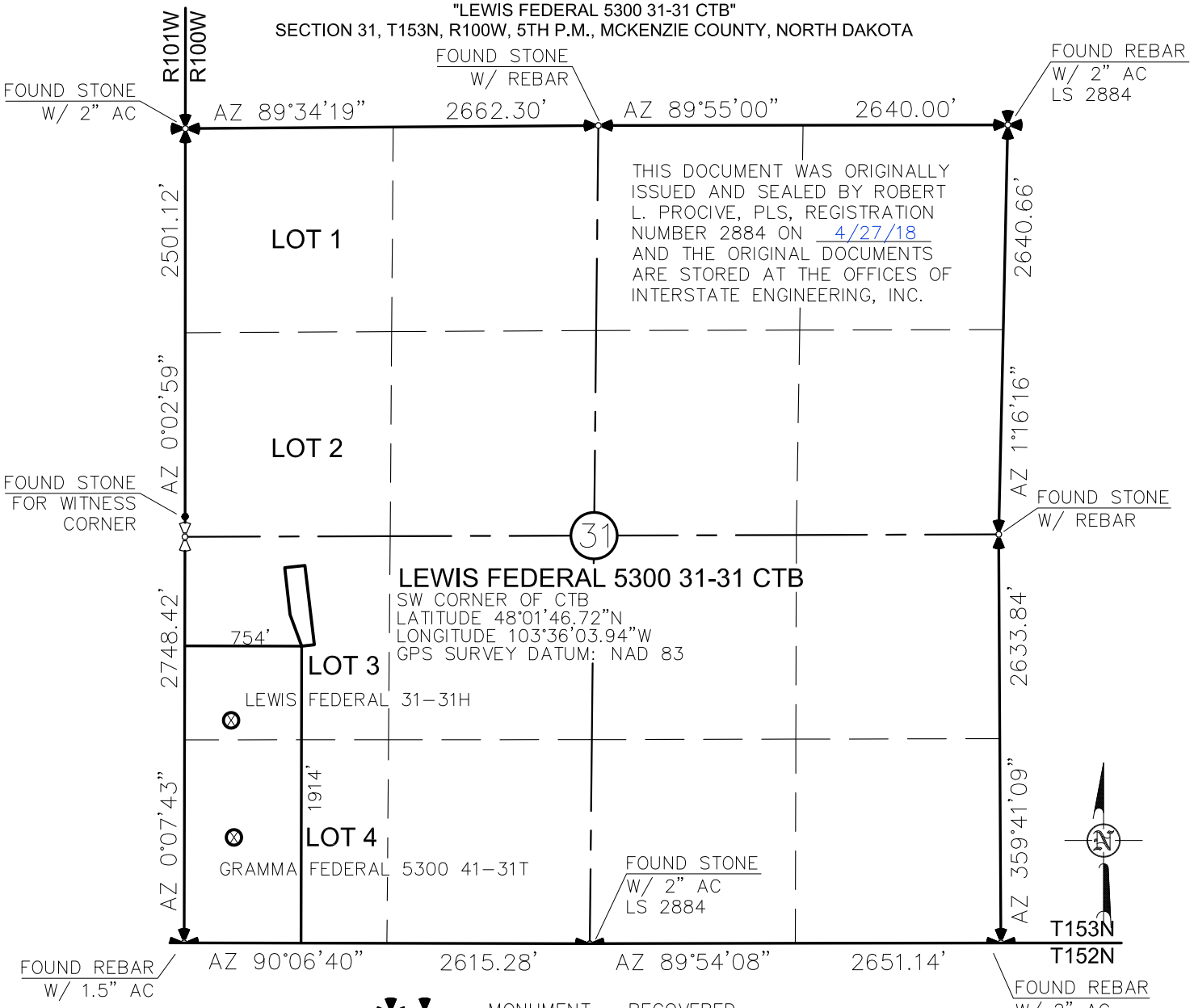
Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

Revision No.	Date	By	Description

5300 11-31 Quad Pad to New Standards\CADD\LEWIS FEDERAL 5300 11-31 4BR\LEWIS FEDERAL 5300 11-31 4BR.dwg — 1/11/2019 8:18 AM josh schmierer

BATTERY LOCATION PLAT

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
"LEWIS FEDERAL 5300 31-31 CTB"
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



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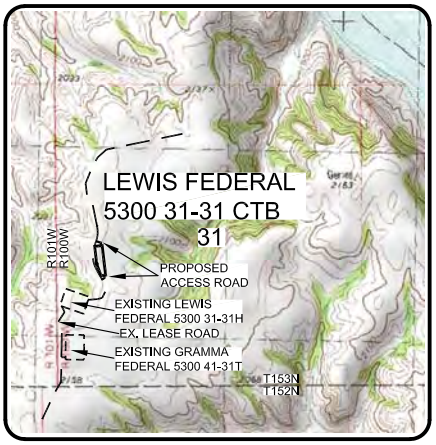
– MONUMENT – RECOVERED

– MONUMENT – NOT RECOVERED

VICINITY MAP



STAKED ON 4/25/14
VERTICAL CONTROL DATUM WAS BASED UPON CONTROL POINT 705 WITH AN ELEVATION OF 2158.3'

THIS SURVEY AND PLAT IS BEING PROVIDED AT THE REQUEST OF ERIC BAYES OF OASIS PETROLEUM. I CERTIFY THAT THIS PLAT CORRECTLY REPRESENTS WORK PERFORMED BY ME OR UNDER MY SUPERVISION AND IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

ROBERT L. PROCIVE LS–2884

REGISTERED LAND SURVEYOR
ROBERT L. PROCIVE
LS 4
DATE: 4/27/18
NORTH DAKOTA

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OASIS PETROLEUM NORTH AMERICA, LLC
BATTERY LOCATION PLAT
SECTION 31, T153N, R100W
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.J.S. | Project No.: S17-09-185
Checked By: D.D.K. | Date: APRIL 2018

Revision No.	Date	By	Description

PRODUCTION LAYOUT

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
"LEWIS FEDERAL 5300 31-31 CTB"
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA

REGISTERED LAND SURVEYOR
ROBERT L. PROCIVE
LS-2884
DATE: 4/27/18
NORTH DAKOTA

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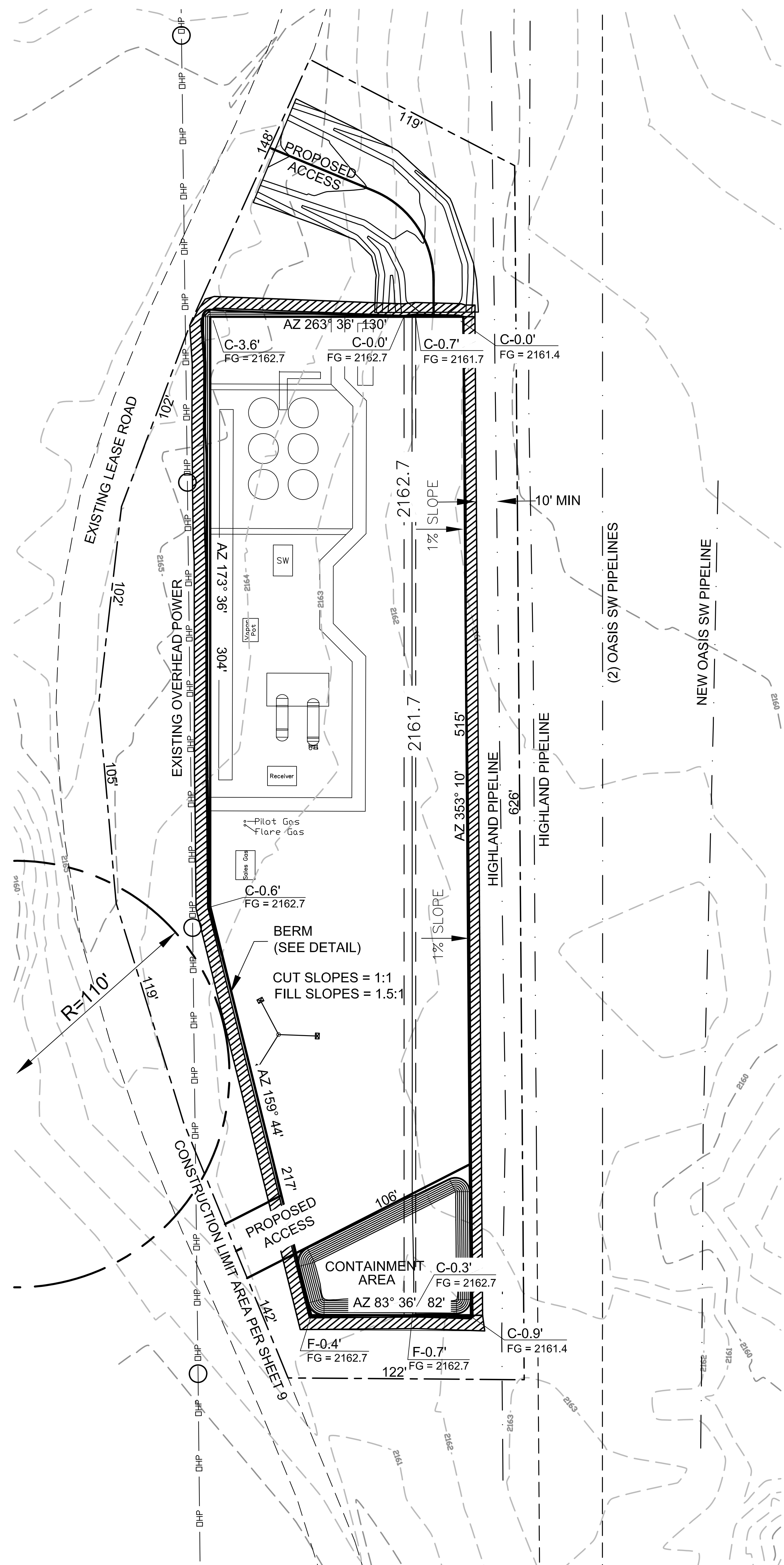

Proposed Contours

Original Contours

BERM

V–DITCH

0 60

1" = 60'

NOTE: All utilities shown are preliminary only, a complete utilities location is recommended before construction.

3/9
SHEET NO.

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OASIS PETROLEUM NORTH AMERICA, LLC
PRODUCTION LAYOUT
SECTION 31, T153N, R100W
MCKENZIE COUNTY, NORTH DAKOTA

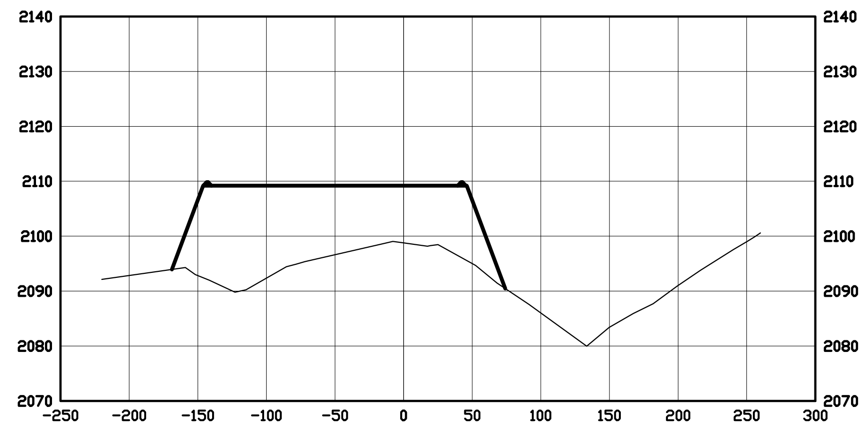
Drawn By:	J.J.S.	Project No.:	S17-09-185
Checked By:	D.D.K.	Date:	APRIL 2018

Revision No.	Date	By	Description

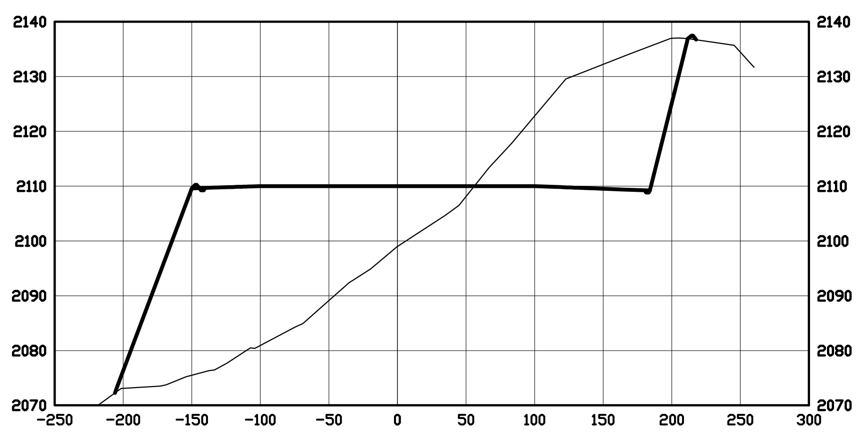
Q:\2017\S17-09-185 Oasis Petroleum - Update Well Designs on the 5300 31-32 CTB to New Standards\CADD\UPDATED LEWIS CTB 4-27-18.dwg – 4/27/2018 2:21 PM spencer vanwichen

CROSS SECTIONS

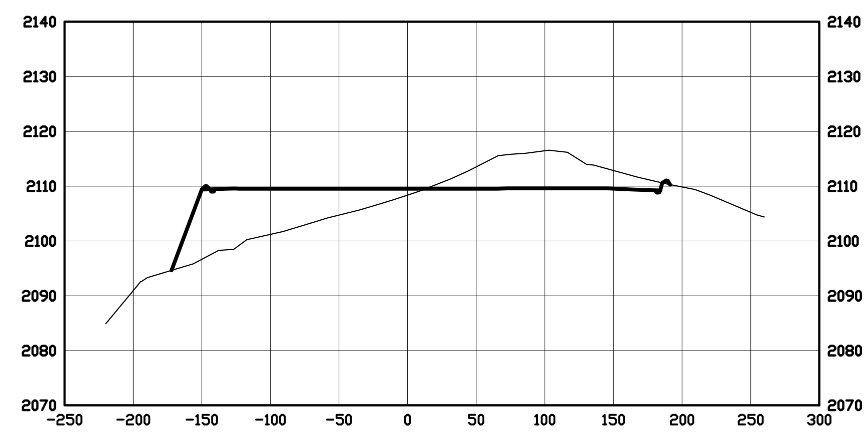
OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



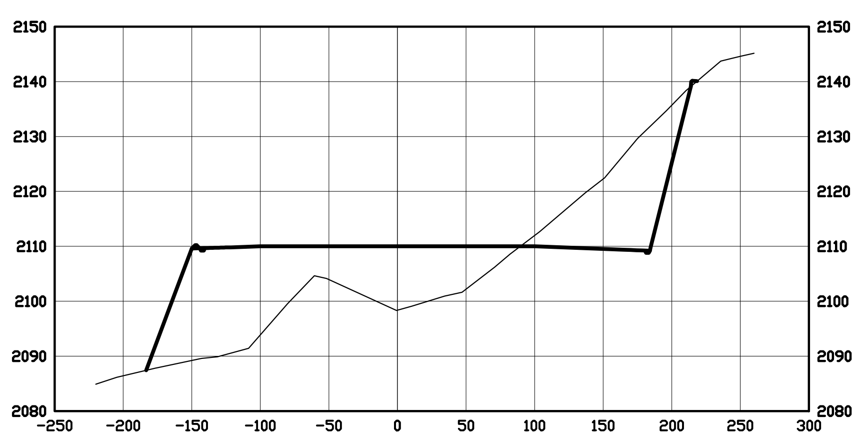
STA. 6+00



STA. 4+00



STA. 5+00



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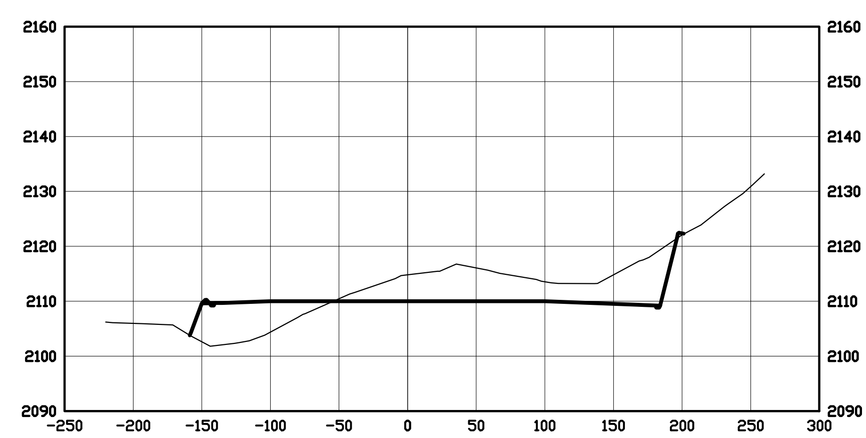

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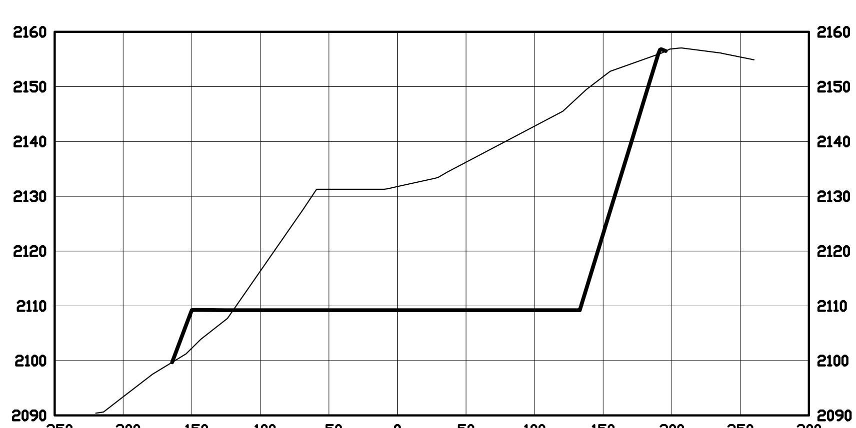

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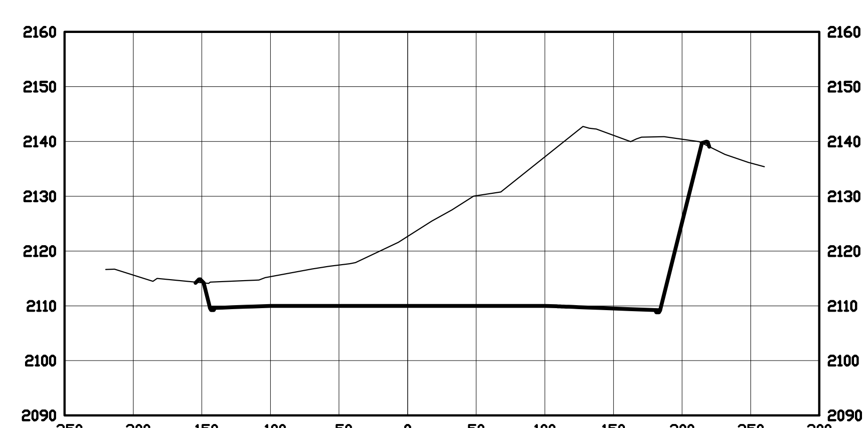

STA. 1+00

SCALE
HORIZ 1"=140'
VERT 1"=35'

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REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

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CROSS SECTIONS
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

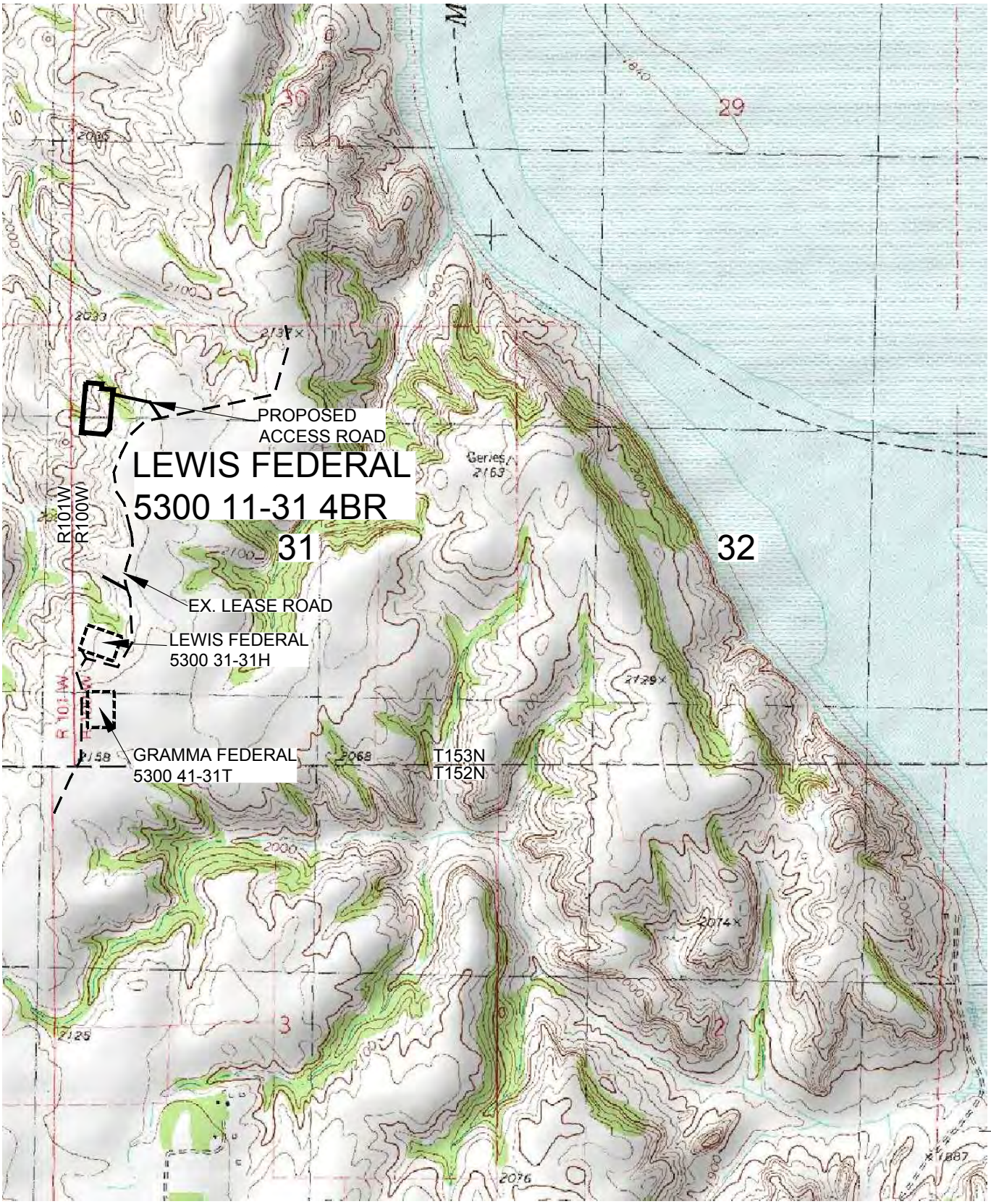
Drawn By:	J.D.M.	Project No.:	S17-09-183
Checked By:	J.L.K.	Date:	JAN 2019

Revision No.	Date	By	Description

Q:\2017\S17-09-183 Oasis Petroleum Update Well Designs on the Lewis Federal 5300 11-31 Quad Pad to New Standards\CADD\LEWIS FEDERAL 5300 11-31 4BR\LEWIS FEDERAL 5300 11-31 4BR.dwg — 1/7/2019 11:45 AM josh schmierer

QUAD MAP

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



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OASIS PETROLEUM NORTH AMERICA, LLC
QUAD MAP
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

Revision No.	Date	By	Description

COUNTY ROAD MAP

OASIS PETROLEUM NORTH AMERICA, LLC
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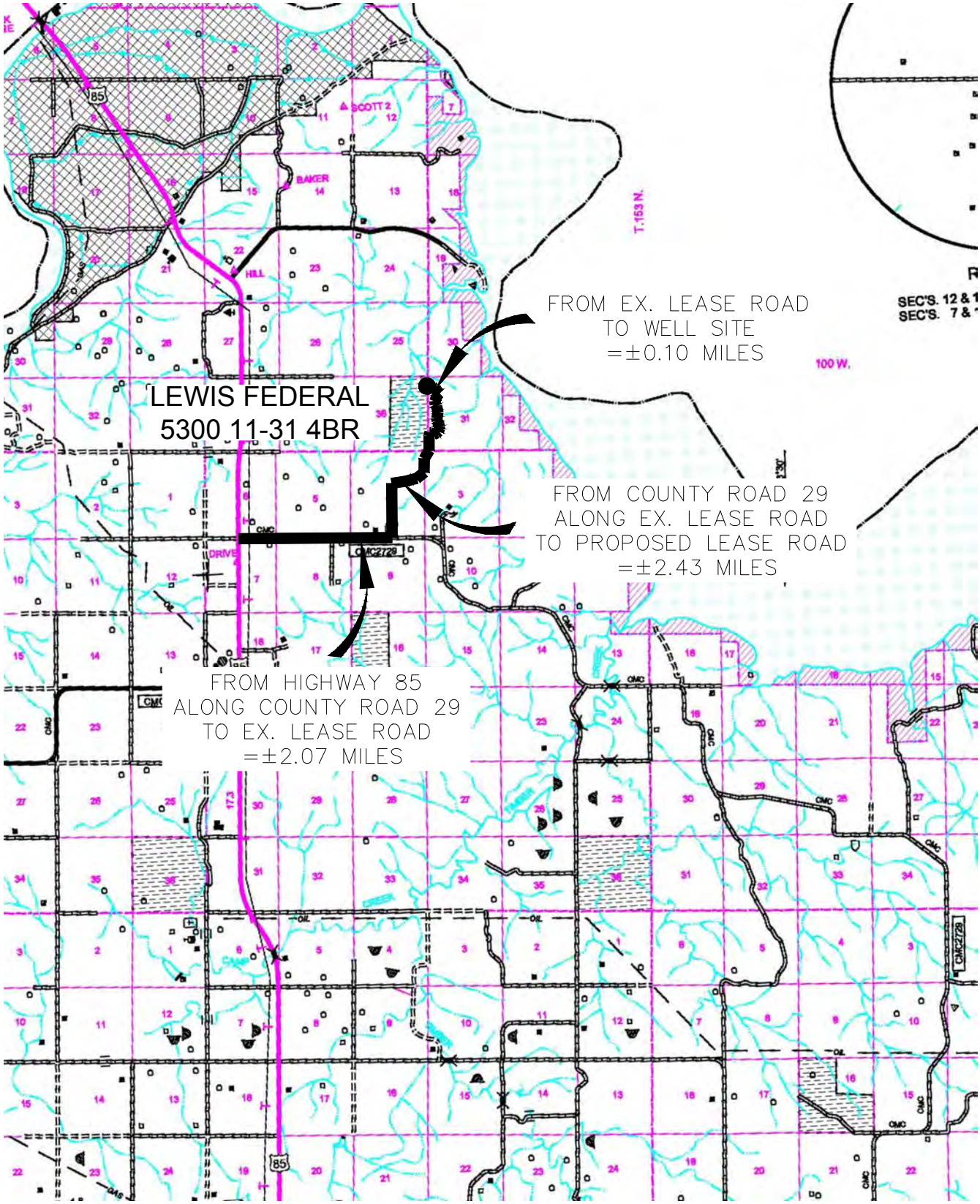
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



SCALE: 1" = 2 MILE

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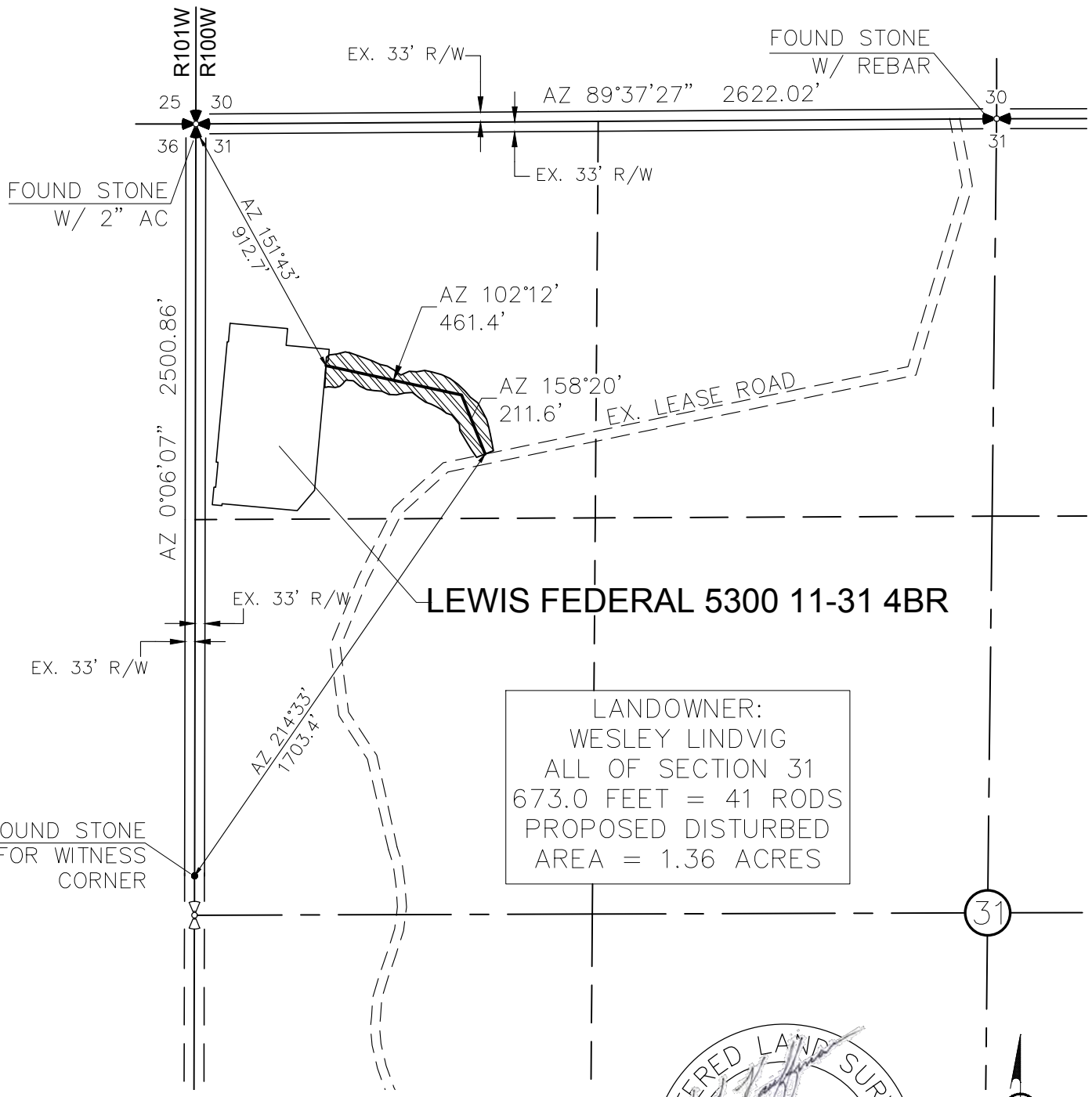
OASIS PETROLEUM NORTH AMERICA, LLC
COUNTY ROAD MAP
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

Revision No.	Date	By	Description

ACCESS APPROACH

OASIS PETROLEUM NORTH AMERICA, LLC
1001 FANNIN, SUITE 1500, HOUSTON, TX 77002
LEWIS FEDERAL 5300 11-31 4BR
1149 FEET FROM NORTH LINE AND 257 FEET FROM WEST LINE
SECTION 31, T153N, R100W, 5TH P.M., MCKENZIE COUNTY, NORTH DAKOTA



REGISTERED LAND SURVEYOR
JOSEPH L. KAUFFMAN
LS-9153
DATE: 1-7-19
NORTH DAKOTA

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OASIS PETROLEUM NORTH AMERICA, LLC
ACCESS APPROACH
SECTION 31, T153N, R100W, 5TH P.M.,
MCKENZIE COUNTY, NORTH DAKOTA

Drawn By: J.D.M. | Project No.: S17-09-183
Checked By: J.L.K. | Date: JAN 2019

Revision No.	Date	By	Description

1/14/2019

Oasis Petroleum
1001 Fannin Street
Suite 1500
Houston, TX 77002

North Dakota Industrial Commission
600 East Boulevard Avenue Dept. 405
Bismarck, ND 58505-0840

Re: Lewis Federal 5300 11-31 4BR

To Whom It May Concern:

Pursuant to NDAC 43-02-03-16, Oasis respectfully submits the Lewis Federal 5300 11-31 4BR well APD for your consideration. Included with the application are all necessary attachments; an itemized list is included on the following page.

This well is located in Section 31 of Township 153N, Range 100W. This location is part of Baker field and is in a generally rural area. An aerial overview has been provided with this application. Additionally, this well is federal and a separate APD has been submitted.

The landowner, Wesley Lindvig, has been fully apprised of Oasis' development plans. Pursuant to safety regulation NDAC 43-02-03-28, there are no occupied dwellings within 500 feet of the well. Drill cuttings and solids will be disposed at the Secure Energy Disposal located at 5807 W. Front Street, Williston, ND 58801. Liquids from the drilling process will be taken to an authorized disposal facility.

Please do not hesitate to contact me should you have any additional questions or concerns regarding this well. Thank you for your consideration.

Respectfully,

Jennifer Swenson
Regulatory Specialist II
Oasis Petroleum
281-404-9436

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From:	Jennifer Swenson
To:	APD
Cc:	Holweger, Todd L.; Regulatory; Nestor Natareno
Subject:	Lewis Federal 5300 11-31 4BR
Date:	Tuesday, January 15, 2019 1:16:15 PM
Attachments:	SUBMITTED_NDIC_APD PACKAGE_Lewis Federal 5300 11-31 4BR.PDF

Hello all,

Please find attached the APD submission for the Lewis Federal redrill as discussed.

You're welcome to contact me at your convenience if you have any questions or concerns.

Thanks,

Jennifer Swenson
Regulatory Specialist II
Oasis Petroleum NA LLC
1001 Fannin, Suite 1500
Houston, TX 77002
281-404-9436