

HALLIBURTON

6360 EAST YELLOWSTONE HWY • EVANSVILLE, WY 82636

TEL: 307-472-5757 • FAX: 307-232-2097

Certified Survey Sheet

Customer: **Extraction Oil & Gas**

Well: **NORTHWEST A S20-25-13N – Original Wellbore**

API: 05-014-20784

Legal: Sec. 09-T01S-R68W

County: Broomfield

State: Colorado

RKB (Patterson 901): 29', 5,343.0' MSL

Tie-On (Atlas Surveys): 1,555' MD

First Sperry MWD Survey: 1,643' MD

Last Sperry MWD Survey: 21,481' MD

Straight Line Projection to TD: 21,517' MD

I certify that the attached survey is true and correct to the best of my knowledge.



01-10-19

Kansa Becker
Well Design Senior Technical Professional

HALLIBURTON SPERRY DRILLING SERVICES

CERTIFIED SURVEY WORK SHEET

OPERATOR:	Extraction Oil & Gas
WELL:	NORTHWEST A S20-25-13N
FIELD:	Wattenberg
RIG:	Patterson 901
LEGALS:	Sec. 9-T01S-R68W
COUNTY:	Broomfield
STATE:	Colorado
CAL. METHOD:	Minimum Curvature
MAG. DECL. APPLIED:	8.257
VERTICAL SEC. DIR. :	192.90

SSDS Job Number :	CA-XX-0906084150
Start Date of Job :	01/04/20
End Date of Job :	01/09/20
Lead Directional Drillers	Roland Hall
Other SDS DD's :	
SDS MWD Engineers :	Sean Maingot

	Main Hole =====>	1st Side Track =====>	2nd Side Track =====>	3rd Side Track =====>	4th Side Track =====>
First Surface Survey Depth	1555	Tie On	Tie On	Tie On	Tie On
Last Surface Survey Depth					
First Intermediate Survey	1643.00				
KOP Depth/Sidetrack MD	8422.00	KOP	KOP-ST1	KOP-ST2	KOP-ST3
Last Intermediate Survey	9309.00				
First Lateral Survey Depth	9450.00	MWD	MWD	MWD	MWD
Last Lateral Survey Depth	21481.00	MWD	MWD	MWD	MWD
Bit Extrapolation to TD	21517.00	T.D.	T.D.	T.D.	T.D.

The following Halliburton Sperry Drilling Services personnel listed below, do certify the above survey information to be accurate :

Print Name :	Roland Hall	Print Name :		Print Name :	
Sign Name :	<i>Roland Hall</i>	Sign Name :		Sign Name :	
Print Name :		Print Name :	Sean Maingot	Print Name :	
Sign Name :		Sign Name :	<i>Sean Maingot</i>	Sign Name :	

Examples of	TieOn	Tie On to Surface Casing (Assumed Vertical), Tie On to existing MWD Survey (prior drilled hole)
Survey Types:	MWD	Sperry Drilling Services (SDS) Measurement While Drilling (MWD) Survey's
	ESS	Sperry Drilling Services (SDS) Electronic Survey System (ESS) Survey's
	Gyro	Gyro Survey's ; Provided by third party vendor, or by Sperry Drilling Services (SDS)
	SS	Single Shot (SS) Survey's ; Provided by Sperry Drilling Services (SDS) or third party vendor.

Job# 906084150
Patterson 901

Extraction Oil & Gas

Broomfield County, CO Sec. 09-T01S-R68W (NORTHWEST A S20-25 Pad)

API# 05-014-20784

NORTHWEST A S20-25-13N

SHL: 1277' FNL 867' FWL

OWB_20784

Design: Final Surveys

Sperry Drilling Services

Combo Report

16 January, 2020

Well Coordinates: 39.983191
-105.012730

North American Datum 1983
Colorado Northern Zone
1,237,098.89 N
3,136,543.40 E

Ground Level: 5,314.00 usft

Geodetic Scale Factor Applied

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.15 Build: 91E

Report Version: Midcon Combo v1.15

Centered on Well NORTHWEST A S20-25-13N
KB = 29' @ 5343.00usft (Patterson 901)
N

True

Dec-Deg - API - US Survey Feet - Cust (6 dec)

HALLIBURTON

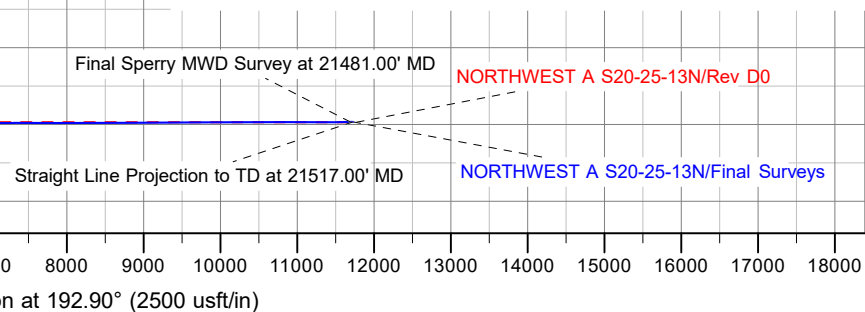
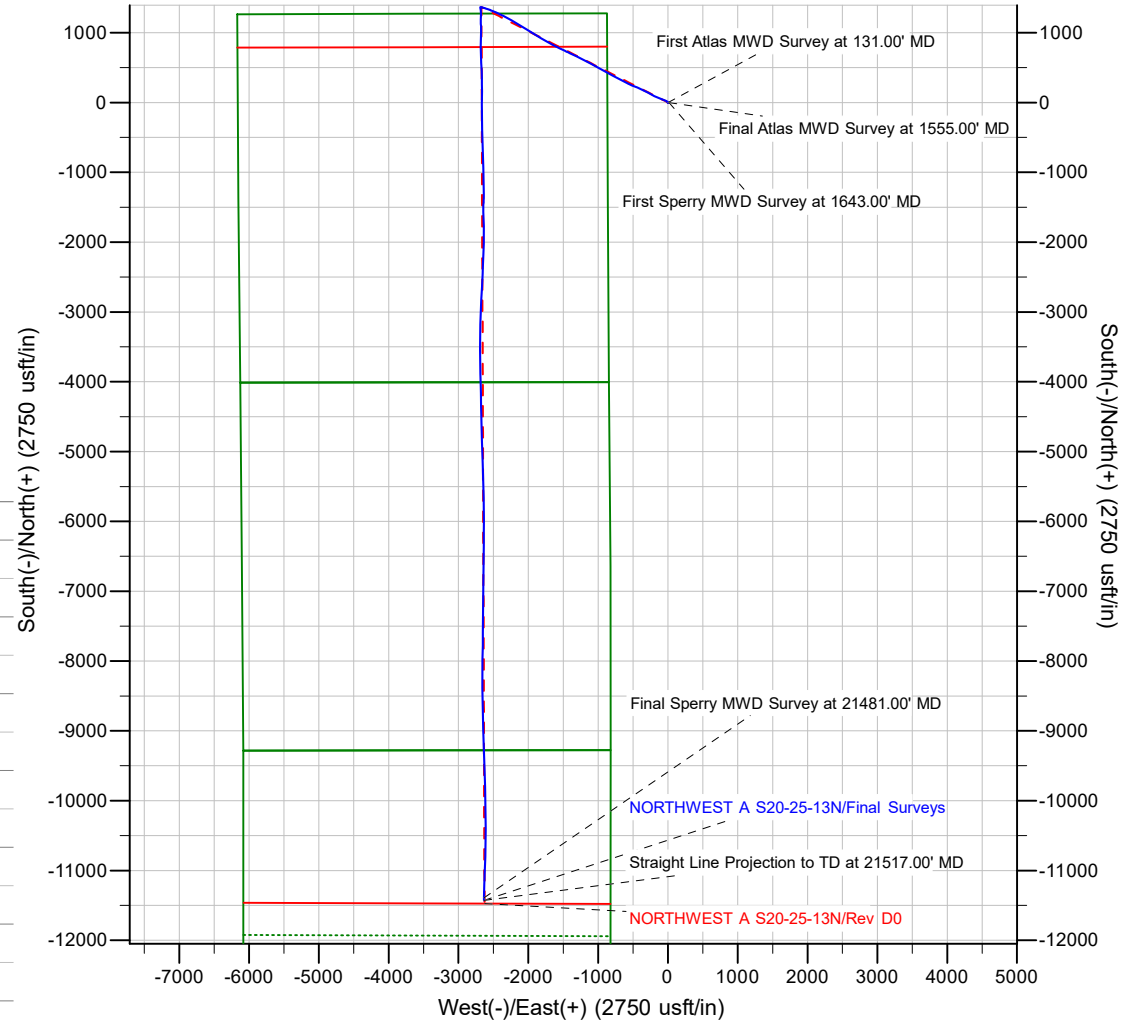
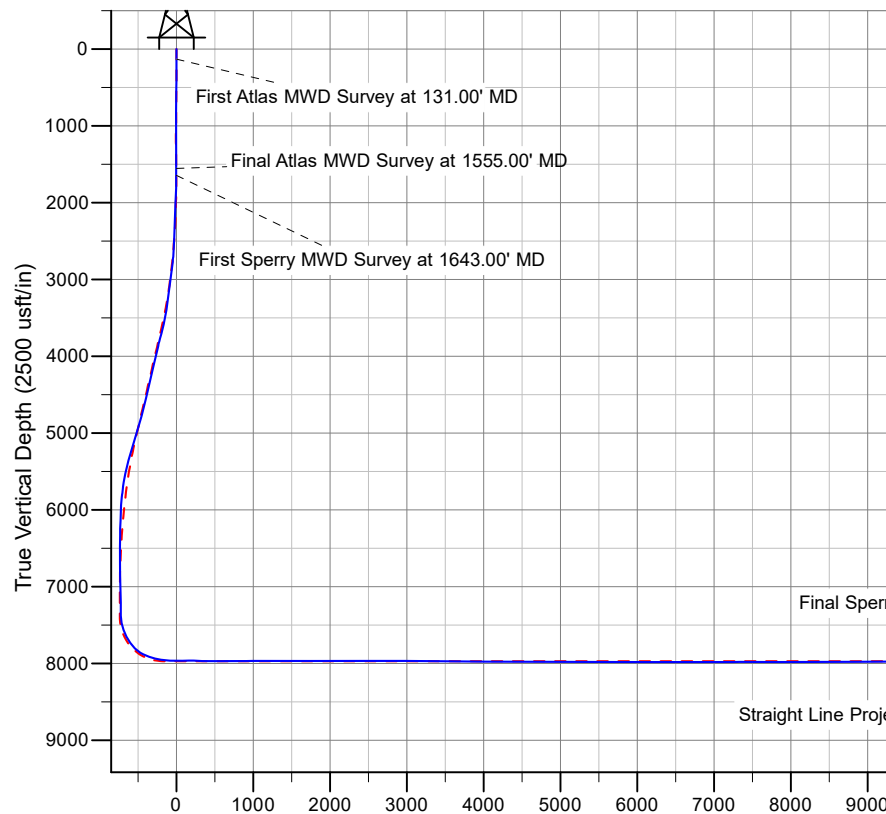
Project: Broomfield County, CO
Site: Sec. 09-T01S-R68W (NORTHWEST A S20-25 Pad)
Well: NORTHWEST A S20-25-13N
Wellbore: OWB_20784
Design: Final Surveys

Extraction Oil & Gas Patterson 901

HALLIBURTON
Sperry Drilling

LEGEND

- NORTHWEST A S20-25-13N, OWB_20784, Rev D0 V0
- Final Surveys



Design Report for NORTHWEST A S20-25-13N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
				Northing (usft)	Easting (usft)	Northing (usft)	Easting (usft)				
0.00	0.00	0.00	0.00	0.00 N	0.00 E	1,237,098.89	3,136,543.40	0.00	0.00	0.00	
131.00	0.66	270.58	131.00	0.01 N	0.75 W	1,237,098.89	3,136,542.65	0.50	0.16	270.58	First Atlas MWD Survey at 131.00' MD
223.00	0.80	276.00	222.99	0.08 N	1.92 W	1,237,098.96	3,136,541.48	0.17	0.35	28.98	
314.00	0.75	283.09	313.98	0.28 N	3.13 W	1,237,099.15	3,136,540.26	0.12	0.43	121.05	
403.00	0.71	274.02	402.97	0.45 N	4.25 W	1,237,099.32	3,136,539.15	0.14	0.51	-113.59	
492.00	1.33	60.47	491.97	1.00 N	3.90 W	1,237,099.87	3,136,539.49	2.20	-0.10	157.99	
582.00	1.37	74.57	581.94	1.80 N	1.96 W	1,237,100.68	3,136,541.43	0.37	-1.32	90.22	
672.00	0.97	82.94	671.92	2.18 N	0.16 W	1,237,101.07	3,136,543.22	0.48	-2.09	161.01	
761.00	1.64	90.43	760.90	2.26 N	1.86 E	1,237,101.16	3,136,545.24	0.78	-2.62	18.05	
851.00	1.81	84.70	850.86	2.39 N	4.56 E	1,237,101.30	3,136,547.95	0.27	-3.34	-48.30	
940.00	1.55	89.99	939.82	2.52 N	7.16 E	1,237,101.45	3,136,550.55	0.34	-4.05	151.81	
1,029.00	1.33	87.88	1,028.79	2.55 N	9.40 E	1,237,101.50	3,136,552.78	0.25	-4.59	-167.50	
1,118.00	1.46	81.88	1,117.77	2.75 N	11.55 E	1,237,101.71	3,136,554.94	0.22	-5.26	-51.36	
1,208.00	1.10	128.99	1,207.75	2.37 N	13.36 E	1,237,101.33	3,136,556.75	1.19	-5.29	131.43	
1,297.00	0.62	154.20	1,296.74	1.40 N	14.23 E	1,237,100.37	3,136,557.63	0.67	-4.54	153.90	
1,386.00	0.84	141.94	1,385.73	0.45 N	14.85 E	1,237,099.42	3,136,558.24	0.30	-3.75	-41.61	
1,477.00	0.53	158.78	1,476.72	0.47 S	15.41 E	1,237,098.51	3,136,558.81	0.40	-2.99	155.23	
1,555.00	0.44	176.23	1,554.72	1.10 S	15.56 E	1,237,097.88	3,136,558.96	0.22	-2.40	129.88	Final Atlas MWD Survey at 1555.00' MD
1,643.00	0.65	189.96	1,642.72	1.93 S	15.50 E	1,237,097.05	3,136,558.90	0.28	-1.58	38.87	First Sperry MWD Survey at 1643.00' MD
1,737.00	2.25	317.14	1,736.69	1.10 S	14.15 E	1,237,097.87	3,136,557.55	2.86	-2.08	138.26	
1,832.00	6.93	303.39	1,831.37	3.42 N	8.09 E	1,237,102.36	3,136,551.47	5.03	-5.14	-20.15	
1,927.00	9.05	296.61	1,925.44	9.92 N	3.38 W	1,237,108.80	3,136,539.97	2.44	-8.92	-27.35	
2,022.00	8.67	296.98	2,019.31	16.52 N	16.44 W	1,237,115.32	3,136,526.87	0.40	-12.43	171.65	
2,117.00	10.56	294.03	2,112.97	23.31 N	30.77 W	1,237,122.03	3,136,512.50	2.06	-15.86	-16.07	
2,211.00	11.72	291.59	2,205.20	30.33 N	47.52 W	1,237,128.96	3,136,495.72	1.33	-18.96	-23.32	
2,307.00	13.30	290.20	2,298.91	37.73 N	66.95 W	1,237,136.26	3,136,476.25	1.68	-21.84	-11.47	
2,402.00	15.04	293.56	2,391.02	46.44 N	88.50 W	1,237,144.84	3,136,454.65	2.03	-25.51	26.94	
2,496.00	16.51	292.21	2,481.48	56.36 N	112.05 W	1,237,154.63	3,136,431.05	1.61	-29.93	-14.67	
2,591.00	18.11	292.77	2,572.17	67.18 N	138.16 W	1,237,165.31	3,136,404.88	1.69	-34.65	6.21	
2,705.00	18.70	292.94	2,680.34	81.16 N	171.33 W	1,237,179.10	3,136,371.63	0.52	-40.87	5.28	
2,800.00	22.08	295.62	2,769.38	94.82 N	201.46 W	1,237,192.60	3,136,341.43	3.69	-47.46	16.70	
2,893.00	24.84	298.52	2,854.68	111.71 N	234.39 W	1,237,209.30	3,136,308.40	3.22	-56.58	24.04	
2,987.00	25.63	298.66	2,939.71	130.89 N	269.58 W	1,237,228.29	3,136,273.11	0.84	-67.42	4.38	
3,083.00	28.41	298.89	3,025.23	151.88 N	307.80 W	1,237,249.07	3,136,234.78	2.90	-79.35	2.26	
3,177.00	30.53	298.25	3,107.06	173.99 N	348.42 W	1,237,270.96	3,136,194.04	2.28	-91.84	-8.73	
3,272.00	32.30	290.72	3,188.16	194.40 N	393.44 W	1,237,291.12	3,136,148.91	4.53	-101.69	-68.97	

Design Report for NORTHWEST A S20-25-13N - Final Surveys

Measured		True	Vertical	Local Coordinates		Map Coordinates		Dogleg	Vertical	Toolface	Comments
Depth	Inclination	Azimuth	Depth	Northing	Easting	Northing	Easting	Rate	Section	Angle	
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)	(°/100usft)	(usft)	(°)	
3,366.00	35.11	292.45	3,266.36	213.61 N	441.92 W	1,237,310.06	3,136,100.33	3.16	-109.59	19.59	
3,461.00	37.99	293.43	3,342.67	235.67 N	494.01 W	1,237,331.84	3,136,048.12	3.09	-119.48	11.85	
3,556.00	39.09	294.97	3,416.97	259.95 N	547.99 W	1,237,355.81	3,135,994.01	1.54	-131.09	41.70	
3,651.00	41.52	297.02	3,489.42	286.90 N	603.20 W	1,237,382.46	3,135,938.65	2.91	-145.04	29.41	
3,747.00	43.68	297.06	3,560.08	316.44 N	661.07 W	1,237,411.68	3,135,880.62	2.25	-160.91	0.73	
3,842.00	40.74	297.19	3,630.44	345.53 N	717.87 W	1,237,440.46	3,135,823.66	3.10	-176.60	178.35	
3,937.00	45.01	300.07	3,700.05	376.55 N	774.55 W	1,237,471.16	3,135,766.82	4.94	-194.18	25.72	
4,032.00	42.01	299.42	3,768.94	409.00 N	831.33 W	1,237,503.31	3,135,709.86	3.19	-213.15	-171.75	
4,128.00	43.06	298.04	3,839.68	440.19 N	888.24 W	1,237,534.18	3,135,652.78	1.46	-230.85	-42.13	
4,224.00	38.49	297.03	3,912.36	469.19 N	943.81 W	1,237,562.87	3,135,597.06	4.81	-246.71	-172.17	
4,319.00	40.55	298.47	3,985.64	497.35 N	997.29 W	1,237,590.73	3,135,543.42	2.37	-262.22	24.54	
4,414.00	43.02	297.55	4,056.47	527.06 N	1,053.18 W	1,237,620.14	3,135,487.37	2.68	-278.71	-14.28	
4,509.00	44.06	297.75	4,125.34	557.43 N	1,111.15 W	1,237,650.19	3,135,429.24	1.10	-295.38	7.62	
4,604.00	45.88	299.90	4,192.55	589.82 N	1,169.95 W	1,237,682.25	3,135,370.27	2.50	-313.82	40.62	
4,700.00	42.62	296.06	4,261.32	621.29 N	1,229.04 W	1,237,713.39	3,135,311.00	4.39	-331.31	-141.94	
4,795.00	45.12	297.02	4,329.80	650.71 N	1,287.93 W	1,237,742.49	3,135,251.95	2.72	-346.85	15.25	
4,890.00	45.18	295.11	4,396.80	680.30 N	1,348.43 W	1,237,771.75	3,135,191.30	1.43	-362.19	-88.14	
4,985.00	46.42	294.17	4,463.03	708.69 N	1,410.33 W	1,237,799.80	3,135,129.24	1.49	-376.05	-28.85	
5,080.00	48.01	296.28	4,527.56	738.41 N	1,473.39 W	1,237,829.17	3,135,066.02	2.34	-390.95	44.96	
5,175.00	45.35	294.05	4,592.74	767.82 N	1,535.92 W	1,237,858.24	3,135,003.33	3.28	-405.66	-149.38	
5,269.00	46.52	298.59	4,658.13	797.78 N	1,596.42 W	1,237,887.86	3,134,942.67	3.69	-421.36	71.86	
5,364.00	44.76	297.14	4,724.55	829.53 N	1,656.45 W	1,237,919.28	3,134,882.47	2.15	-438.92	-150.01	
5,458.00	45.84	300.00	4,790.67	861.49 N	1,715.11 W	1,237,950.92	3,134,823.64	2.45	-456.98	63.03	
5,553.00	42.74	299.12	4,858.67	894.23 N	1,772.80 W	1,237,983.33	3,134,765.77	3.33	-476.01	-169.10	
5,648.00	45.28	301.63	4,926.99	927.62 N	1,829.71 W	1,238,016.42	3,134,708.68	3.24	-495.86	35.38	
5,743.00	42.59	301.19	4,995.40	961.98 N	1,885.96 W	1,238,050.46	3,134,652.24	2.85	-516.80	-173.68	
5,838.00	44.81	301.52	5,064.08	996.13 N	1,942.00 W	1,238,084.30	3,134,596.02	2.35	-537.58	5.98	
5,932.00	42.35	301.48	5,132.17	1,029.99 N	1,997.25 W	1,238,117.85	3,134,540.59	2.62	-558.25	-179.37	
6,027.00	44.62	301.33	5,201.09	1,064.05 N	2,053.05 W	1,238,151.61	3,134,484.61	2.39	-579.00	-2.66	
6,122.00	41.91	301.09	5,270.26	1,097.79 N	2,108.73 W	1,238,185.04	3,134,428.74	2.86	-599.46	-176.61	
6,218.00	42.70	301.34	5,341.26	1,131.28 N	2,163.99 W	1,238,218.22	3,134,373.30	0.84	-619.77	12.12	
6,313.00	39.43	300.66	5,412.88	1,163.42 N	2,217.46 W	1,238,250.07	3,134,319.65	3.47	-639.17	-172.48	
6,407.00	36.24	299.80	5,487.11	1,192.46 N	2,267.27 W	1,238,278.84	3,134,269.69	3.44	-656.36	-170.95	
6,502.00	32.92	298.24	5,565.31	1,218.64 N	2,314.39 W	1,238,304.75	3,134,222.42	3.62	-671.37	-165.71	
6,598.00	36.20	296.12	5,644.37	1,243.47 N	2,362.84 W	1,238,329.32	3,134,173.84	3.64	-684.76	-21.01	
6,692.00	34.23	294.95	5,721.16	1,266.85 N	2,411.74 W	1,238,352.42	3,134,124.81	2.22	-696.63	-161.57	
6,788.00	30.38	293.87	5,802.29	1,288.07 N	2,458.44 W	1,238,373.39	3,134,078.00	4.06	-706.89	-171.93	

Design Report for NORTHWEST A S20-25-13N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
6,883.00	26.31	292.62	5,885.88	1,305.89 N	2,499.86 W	1,238,390.99	3,134,036.49	4.33	-715.03	-172.25	
6,977.00	22.35	291.02	5,971.51	1,320.32 N	2,535.78 W	1,238,405.22	3,134,000.48	4.27	-721.07	-171.28	
7,073.00	19.31	289.13	6,061.23	1,332.07 N	2,567.83 W	1,238,416.79	3,133,968.38	3.24	-725.38	-168.41	
7,263.00	13.33	287.69	6,243.49	1,349.04 N	2,618.42 W	1,238,433.48	3,133,917.69	3.15	-730.62	-176.82	
7,358.00	10.68	286.52	6,336.41	1,354.87 N	2,637.30 W	1,238,439.21	3,133,898.78	2.80	-732.09	-175.32	
7,454.00	8.49	285.57	6,431.06	1,359.30 N	2,652.65 W	1,238,443.55	3,133,883.40	2.29	-732.99	-176.34	
7,549.00	6.59	284.21	6,525.24	1,362.52 N	2,664.69 W	1,238,446.71	3,133,871.35	2.01	-733.44	-175.31	
7,644.00	5.27	283.34	6,619.72	1,364.87 N	2,674.22 W	1,238,449.00	3,133,861.80	1.39	-733.60	-176.54	
7,739.00	2.60	303.12	6,714.50	1,367.05 N	2,680.28 W	1,238,451.15	3,133,855.74	3.11	-734.38	162.69	
7,834.00	1.86	230.31	6,809.44	1,367.25 N	2,683.27 W	1,238,451.33	3,133,852.75	2.86	-733.90	-139.07	
7,929.00	1.65	220.22	6,904.40	1,365.22 N	2,685.34 W	1,238,449.29	3,133,850.69	0.39	-731.46	-129.17	
8,024.00	1.25	208.92	6,999.37	1,363.27 N	2,686.72 W	1,238,447.33	3,133,849.32	0.52	-729.25	-150.00	
8,119.00	1.13	191.30	7,094.34	1,361.44 N	2,687.41 W	1,238,445.50	3,133,848.64	0.40	-727.31	-116.83	
8,214.00	0.83	182.02	7,189.33	1,359.83 N	2,687.61 W	1,238,443.89	3,133,848.44	0.36	-725.70	-156.71	
8,309.00	0.75	168.27	7,284.32	1,358.54 N	2,687.51 W	1,238,442.60	3,133,848.55	0.22	-724.46	-119.65	
8,404.00	0.75	143.61	7,379.31	1,357.43 N	2,687.02 W	1,238,441.49	3,133,849.05	0.34	-723.49	-102.33	
8,499.00	11.28	173.13	7,473.66	1,347.68 N	2,685.53 W	1,238,431.75	3,133,850.59	11.19	-714.31	31.49	
8,594.00	21.36	171.57	7,564.72	1,321.27 N	2,681.87 W	1,238,405.36	3,133,854.39	10.62	-689.39	-3.24	
8,689.00	28.07	177.82	7,650.98	1,281.77 N	2,678.48 W	1,238,365.88	3,133,858.00	7.57	-651.64	24.15	
8,784.00	36.26	185.00	7,731.36	1,231.34 N	2,680.08 W	1,238,315.45	3,133,856.68	9.50	-602.13	28.11	
8,879.00	45.37	179.00	7,803.21	1,169.40 N	2,681.95 W	1,238,253.50	3,133,855.15	10.43	-541.34	-25.61	
8,974.00	60.09	174.93	7,860.60	1,094.16 N	2,677.69 W	1,238,178.28	3,133,859.82	15.86	-468.94	-13.69	
9,069.00	67.97	183.24	7,902.23	1,008.93 N	2,676.54 W	1,238,093.06	3,133,861.44	11.42	-386.12	45.37	
9,165.00	75.78	181.99	7,932.07	917.86 N	2,680.68 W	1,238,001.98	3,133,857.81	8.23	-296.42	-8.85	
9,259.00	79.55	180.89	7,952.15	826.08 N	2,682.98 W	1,237,910.18	3,133,856.01	4.17	-206.44	-16.03	
9,354.00	87.65	177.67	7,962.73	731.77 N	2,681.77 W	1,237,815.89	3,133,857.73	9.17	-114.78	-21.76	
9,450.00	90.00	176.52	7,964.70	635.92 N	2,676.91 W	1,237,720.07	3,133,863.12	2.73	-22.43	-26.08	
9,544.00	89.46	178.33	7,965.14	542.02 N	2,672.69 W	1,237,626.20	3,133,867.86	2.01	68.15	106.62	
9,640.00	90.77	177.69	7,964.95	446.08 N	2,669.35 W	1,237,530.28	3,133,871.72	1.52	160.93	-26.04	
9,736.00	88.39	178.96	7,965.65	350.13 N	2,666.55 W	1,237,434.35	3,133,875.06	2.81	253.83	151.92	
9,829.00	89.06	178.97	7,967.72	257.17 N	2,664.87 W	1,237,341.41	3,133,877.25	0.72	344.07	0.86	
9,924.00	89.83	178.81	7,968.64	162.19 N	2,663.03 W	1,237,246.44	3,133,879.61	0.83	436.24	-11.74	
10,020.00	88.89	180.58	7,969.71	66.21 N	2,662.52 W	1,237,150.46	3,133,880.65	2.09	529.70	117.98	
10,115.00	90.03	179.94	7,970.61	28.79 S	2,662.95 W	1,237,055.47	3,133,880.74	1.38	622.39	-29.31	
10,210.00	91.48	180.10	7,969.36	123.78 S	2,662.98 W	1,236,960.49	3,133,881.23	1.54	714.99	6.30	
10,306.00	89.29	180.59	7,968.71	219.77 S	2,663.56 W	1,236,864.50	3,133,881.18	2.34	808.69	167.39	
10,400.00	90.30	179.30	7,969.05	313.76 S	2,663.47 W	1,236,770.51	3,133,881.78	1.74	900.29	-51.94	

Design Report for NORTHWEST A S20-25-13N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
10,495.00	91.75	178.61	7,967.35	408.73 S	2,661.74 W	1,236,675.56	3,133,884.04	1.69	992.48	-25.44	
10,590.00	89.22	178.78	7,966.55	503.69 S	2,659.57 W	1,236,580.61	3,133,886.72	2.67	1,084.56	176.15	
10,685.00	90.13	178.43	7,967.08	598.66 S	2,657.26 W	1,236,485.66	3,133,889.56	1.03	1,176.62	-21.04	
10,781.00	88.22	177.70	7,968.47	694.59 S	2,654.02 W	1,236,389.75	3,133,893.32	2.13	1,269.41	-159.09	
10,875.00	90.10	177.74	7,969.84	788.50 S	2,650.28 W	1,236,295.86	3,133,897.58	2.00	1,360.11	1.22	
10,970.00	92.26	176.93	7,967.89	883.37 S	2,645.86 W	1,236,201.02	3,133,902.52	2.43	1,451.61	-20.55	
11,107.00	90.00	178.38	7,965.19	1,020.22 S	2,640.26 W	1,236,064.21	3,133,908.87	1.96	1,583.75	147.30	
11,202.00	89.94	179.07	7,965.24	1,115.20 S	2,638.15 W	1,235,969.25	3,133,911.51	0.73	1,675.86	94.97	
11,298.00	89.94	179.89	7,965.34	1,211.19 S	2,637.28 W	1,235,873.27	3,133,912.90	0.85	1,769.24	90.00	
11,392.00	89.94	180.53	7,965.44	1,305.19 S	2,637.62 W	1,235,779.27	3,133,913.08	0.68	1,860.94	90.00	
11,488.00	90.25	182.71	7,965.28	1,401.15 S	2,640.33 W	1,235,683.30	3,133,910.89	2.29	1,955.08	81.91	
11,583.00	89.94	180.35	7,965.12	1,496.10 S	2,642.87 W	1,235,588.34	3,133,908.88	2.51	2,048.21	-97.48	
11,678.00	89.88	179.41	7,965.27	1,591.10 S	2,642.67 W	1,235,493.34	3,133,909.60	0.99	2,140.77	-93.65	
11,774.00	89.88	178.71	7,965.47	1,687.09 S	2,641.10 W	1,235,397.37	3,133,911.70	0.73	2,233.99	-90.00	
11,869.00	90.18	179.14	7,965.42	1,782.07 S	2,639.31 W	1,235,302.40	3,133,914.00	0.55	2,326.17	55.10	
11,965.00	89.94	179.72	7,965.32	1,878.07 S	2,638.36 W	1,235,206.42	3,133,915.49	0.65	2,419.53	112.48	
12,060.00	89.69	180.14	7,965.63	1,973.07 S	2,638.24 W	1,235,111.42	3,133,916.12	0.51	2,512.11	120.76	
12,155.00	89.57	181.40	7,966.24	2,068.05 S	2,639.52 W	1,235,016.43	3,133,915.37	1.33	2,604.99	95.44	
12,251.00	89.94	182.65	7,966.65	2,163.99 S	2,642.91 W	1,234,920.48	3,133,912.50	1.36	2,699.26	73.51	
12,346.00	90.00	182.61	7,966.70	2,258.89 S	2,647.27 W	1,234,825.56	3,133,908.67	0.08	2,792.74	-33.69	
12,441.00	89.82	181.90	7,966.85	2,353.82 S	2,651.01 W	1,234,730.62	3,133,905.45	0.77	2,886.11	-104.23	
12,536.00	89.81	182.34	7,967.16	2,448.75 S	2,654.52 W	1,234,635.67	3,133,902.46	0.46	2,979.43	91.30	
12,632.00	89.81	182.00	7,967.47	2,544.68 S	2,658.16 W	1,234,539.72	3,133,899.35	0.35	3,073.75	-90.00	
12,727.00	89.57	182.59	7,967.99	2,639.60 S	2,661.96 W	1,234,444.79	3,133,896.07	0.67	3,167.13	112.14	
12,917.00	89.07	182.96	7,970.24	2,829.37 S	2,671.16 W	1,234,254.98	3,133,887.91	0.33	3,354.16	143.50	
13,013.00	89.07	184.19	7,971.80	2,925.16 S	2,677.15 W	1,234,159.15	3,133,882.45	1.28	3,448.88	90.01	
13,108.00	89.44	182.59	7,973.04	3,019.99 S	2,682.76 W	1,234,064.31	3,133,877.36	1.73	3,542.56	-76.99	
13,203.00	89.63	181.92	7,973.81	3,114.91 S	2,686.50 W	1,233,969.37	3,133,874.14	0.73	3,635.92	-74.17	
13,298.00	89.32	181.74	7,974.68	3,209.86 S	2,689.53 W	1,233,874.41	3,133,871.63	0.38	3,729.15	-149.86	
13,394.00	89.38	180.81	7,975.77	3,305.83 S	2,691.67 W	1,233,778.43	3,133,870.02	0.97	3,823.18	-86.31	
13,489.00	90.00	180.11	7,976.28	3,400.82 S	2,692.43 W	1,233,683.44	3,133,869.78	0.98	3,915.95	-48.47	
13,585.00	90.12	179.37	7,976.18	3,496.82 S	2,692.00 W	1,233,587.45	3,133,870.75	0.78	4,009.43	-80.79	
13,680.00	89.75	179.41	7,976.29	3,591.81 S	2,690.99 W	1,233,492.46	3,133,872.28	0.39	4,101.80	173.83	
13,775.00	89.81	177.37	7,976.65	3,686.77 S	2,688.32 W	1,233,397.52	3,133,875.47	2.15	4,193.77	-88.32	
13,871.00	89.75	179.17	7,977.02	3,782.72 S	2,685.42 W	1,233,301.59	3,133,878.89	1.88	4,286.65	91.91	
13,966.00	89.81	179.30	7,977.39	3,877.71 S	2,684.15 W	1,233,206.61	3,133,880.68	0.15	4,378.96	65.22	

Design Report for NORTHWEST A S20-25-13N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
Northing (usft)	Easting (usft)	Northing (usft)	Easting (usft)								
14,156.00	89.38	179.32	7,978.73	4,067.69 S	2,681.86 W	1,233,016.65	3,133,884.02	0.23	4,563.64	177.34	
14,251.00	89.44	179.07	7,979.71	4,162.68 S	2,680.53 W	1,232,921.68	3,133,885.87	0.27	4,655.93	-76.50	
14,441.00	89.69	178.60	7,981.15	4,352.63 S	2,676.66 W	1,232,731.76	3,133,890.78	0.28	4,840.23	-61.99	
14,536.00	89.57	178.60	7,981.76	4,447.60 S	2,674.34 W	1,232,636.80	3,133,893.62	0.13	4,932.29	180.00	
14,631.00	89.81	178.90	7,982.28	4,542.58 S	2,672.27 W	1,232,541.84	3,133,896.22	0.40	5,024.41	51.34	
14,822.00	90.74	178.67	7,981.36	4,733.53 S	2,668.22 W	1,232,350.92	3,133,901.32	0.50	5,209.64	-13.89	
14,917.00	90.00	178.07	7,980.75	4,828.49 S	2,665.52 W	1,232,255.98	3,133,904.54	1.00	5,301.60	-140.96	
15,013.00	90.00	178.19	7,980.75	4,924.44 S	2,662.39 W	1,232,160.06	3,133,908.20	0.12	5,394.43	90.00	
15,109.00	89.69	177.71	7,981.01	5,020.38 S	2,658.95 W	1,232,064.14	3,133,912.16	0.60	5,487.18	-122.86	
15,204.00	89.88	177.90	7,981.36	5,115.31 S	2,655.31 W	1,231,969.24	3,133,916.32	0.28	5,578.90	45.00	
15,299.00	89.81	178.19	7,981.62	5,210.25 S	2,652.07 W	1,231,874.31	3,133,920.08	0.31	5,670.73	103.57	
15,394.00	89.88	178.08	7,981.88	5,305.20 S	2,648.98 W	1,231,779.39	3,133,923.70	0.14	5,762.59	-57.53	
15,490.00	89.69	178.17	7,982.24	5,401.15 S	2,645.84 W	1,231,683.46	3,133,927.36	0.22	5,855.42	154.65	
15,585.00	90.00	178.50	7,982.49	5,496.11 S	2,643.08 W	1,231,588.52	3,133,930.65	0.48	5,947.37	46.79	
15,680.00	90.86	178.67	7,981.78	5,591.07 S	2,640.73 W	1,231,493.57	3,133,933.51	0.92	6,039.42	11.18	
15,775.00	90.37	179.04	7,980.76	5,686.05 S	2,638.84 W	1,231,398.61	3,133,935.93	0.65	6,131.57	142.94	
15,869.00	90.68	179.36	7,979.90	5,780.04 S	2,637.52 W	1,231,304.64	3,133,937.76	0.47	6,222.90	45.91	
15,964.00	89.94	179.85	7,979.39	5,875.03 S	2,636.87 W	1,231,209.65	3,133,938.94	0.93	6,315.35	146.49	
16,060.00	89.63	180.66	7,979.75	5,971.03 S	2,637.30 W	1,231,113.65	3,133,939.04	0.90	6,409.02	110.94	
16,155.00	89.69	180.36	7,980.31	6,066.02 S	2,638.14 W	1,231,018.66	3,133,938.72	0.32	6,501.81	-78.69	
16,251.00	89.57	179.79	7,980.93	6,162.02 S	2,638.27 W	1,230,922.66	3,133,939.12	0.61	6,595.41	-101.89	
16,346.00	89.44	179.98	7,981.75	6,257.02 S	2,638.08 W	1,230,827.67	3,133,939.83	0.24	6,687.97	124.38	
16,442.00	89.38	180.18	7,982.74	6,353.01 S	2,638.21 W	1,230,731.68	3,133,940.22	0.22	6,781.57	106.70	
16,537.00	89.75	180.14	7,983.46	6,448.01 S	2,638.48 W	1,230,636.69	3,133,940.48	0.39	6,874.23	-6.17	
16,632.00	90.00	180.45	7,983.67	6,543.01 S	2,638.96 W	1,230,541.69	3,133,940.51	0.42	6,966.94	51.12	
16,727.00	90.49	181.66	7,983.26	6,637.99 S	2,640.71 W	1,230,446.71	3,133,939.29	1.37	7,059.92	67.95	
16,823.00	91.05	180.29	7,981.97	6,733.96 S	2,642.35 W	1,230,350.73	3,133,938.18	1.54	7,153.84	-67.76	
16,918.00	91.17	180.16	7,980.13	6,828.94 S	2,642.72 W	1,230,255.75	3,133,938.33	0.19	7,246.51	-47.28	
17,013.00	90.43	180.49	7,978.80	6,923.93 S	2,643.26 W	1,230,160.76	3,133,938.31	0.85	7,339.22	155.97	
17,109.00	90.12	180.86	7,978.34	7,019.92 S	2,644.39 W	1,230,064.77	3,133,937.71	0.50	7,433.04	129.96	
17,204.00	90.12	180.92	7,978.15	7,114.91 S	2,645.87 W	1,229,969.78	3,133,936.76	0.06	7,525.96	90.00	
17,394.00	89.81	180.37	7,978.26	7,304.90 S	2,648.00 W	1,229,779.79	3,133,935.66	0.33	7,711.64	-119.41	
17,489.00	89.81	180.86	7,978.58	7,399.89 S	2,649.02 W	1,229,684.79	3,133,935.16	0.52	7,804.46	90.00	
17,585.00	89.57	181.07	7,979.10	7,495.88 S	2,650.64 W	1,229,588.80	3,133,934.07	0.33	7,898.39	138.82	
17,680.00	89.38	179.68	7,979.97	7,590.87 S	2,651.26 W	1,229,493.81	3,133,933.97	1.48	7,991.12	-97.79	
17,775.00	89.32	180.94	7,981.04	7,685.86 S	2,651.78 W	1,229,398.82	3,133,933.98	1.33	8,083.83	92.73	
17,870.00	89.57	180.51	7,981.96	7,780.85 S	2,652.98 W	1,229,303.83	3,133,933.30	0.52	8,176.69	-59.83	

Design Report for NORTHWEST A S20-25-13N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
				Northing (usft)	Easting (usft)	Northing (usft)	Easting (usft)				
17,964.00	89.51	180.49	7,982.72	7,874.84 S	2,653.80 W	1,229,209.84	3,133,933.00	0.07	8,268.49	-161.57	
18,060.00	89.94	180.48	7,983.18	7,970.84 S	2,654.61 W	1,229,113.84	3,133,932.71	0.45	8,362.25	-1.33	
18,154.00	90.56	180.40	7,982.77	8,064.83 S	2,655.33 W	1,229,019.85	3,133,932.51	0.67	8,454.04	-7.35	
18,248.00	90.43	180.79	7,981.96	8,158.82 S	2,656.31 W	1,228,925.86	3,133,932.05	0.44	8,545.87	108.43	
18,343.00	90.49	180.29	7,981.19	8,253.82 S	2,657.20 W	1,228,830.86	3,133,931.67	0.53	8,638.67	-83.16	
18,438.00	90.74	179.80	7,980.17	8,348.81 S	2,657.28 W	1,228,735.87	3,133,932.12	0.58	8,731.29	-62.97	
18,532.00	90.62	179.60	7,979.06	8,442.80 S	2,656.79 W	1,228,641.89	3,133,933.13	0.25	8,822.80	-120.96	
18,627.00	90.68	179.33	7,977.98	8,537.79 S	2,655.90 W	1,228,546.91	3,133,934.54	0.29	8,915.19	-77.47	
18,722.00	90.56	178.68	7,976.95	8,632.77 S	2,654.25 W	1,228,451.94	3,133,936.71	0.70	9,007.41	-100.46	
18,816.00	90.74	178.65	7,975.89	8,726.74 S	2,652.06 W	1,228,357.99	3,133,939.42	0.19	9,098.52	-9.46	
18,912.00	90.31	178.52	7,975.01	8,822.71 S	2,649.69 W	1,228,262.04	3,133,942.31	0.47	9,191.53	-163.18	
19,006.00	90.12	178.14	7,974.65	8,916.67 S	2,646.95 W	1,228,168.10	3,133,945.57	0.45	9,282.51	-116.56	
19,101.00	91.11	178.27	7,973.64	9,011.61 S	2,643.98 W	1,228,073.18	3,133,949.07	1.05	9,374.40	7.48	
19,196.00	90.80	179.84	7,972.05	9,106.58 S	2,642.41 W	1,227,978.22	3,133,951.16	1.68	9,466.63	101.16	
19,291.00	90.12	178.21	7,971.29	9,201.56 S	2,640.79 W	1,227,883.25	3,133,953.29	1.86	9,558.85	-112.64	
19,387.00	89.88	178.23	7,971.29	9,297.52 S	2,637.81 W	1,227,787.32	3,133,956.80	0.25	9,651.72	175.24	
19,482.00	89.75	178.31	7,971.60	9,392.47 S	2,634.94 W	1,227,692.38	3,133,960.19	0.16	9,743.64	148.39	
19,577.00	89.69	177.71	7,972.06	9,487.41 S	2,631.64 W	1,227,597.47	3,133,964.01	0.63	9,835.45	-95.71	
19,673.00	89.75	177.90	7,972.53	9,583.34 S	2,627.97 W	1,227,501.56	3,133,968.22	0.21	9,928.14	72.47	
19,768.00	89.88	177.56	7,972.84	9,678.27 S	2,624.20 W	1,227,406.66	3,133,972.50	0.38	10,019.83	-69.08	
19,863.00	89.94	178.15	7,972.99	9,773.20 S	2,620.65 W	1,227,311.75	3,133,976.58	0.62	10,111.57	84.19	
19,957.00	90.00	176.33	7,973.03	9,867.09 S	2,616.12 W	1,227,217.90	3,133,981.62	1.94	10,202.08	-88.11	
20,052.00	90.43	179.07	7,972.68	9,962.00 S	2,612.31 W	1,227,123.01	3,133,985.95	2.92	10,293.75	81.08	
20,147.00	90.37	179.16	7,972.01	10,056.99 S	2,610.84 W	1,227,028.03	3,133,987.94	0.11	10,386.01	123.69	
20,243.00	90.25	179.30	7,971.50	10,152.98 S	2,609.55 W	1,226,932.06	3,133,989.76	0.19	10,479.29	130.60	
20,434.00	89.94	180.30	7,971.18	10,343.97 S	2,608.89 W	1,226,741.07	3,133,991.48	0.55	10,665.32	107.22	
20,528.00	90.12	180.85	7,971.13	10,437.97 S	2,609.83 W	1,226,647.08	3,133,991.05	0.62	10,757.16	71.88	
20,624.00	90.19	181.32	7,970.87	10,533.95 S	2,611.65 W	1,226,551.09	3,133,989.76	0.49	10,851.12	81.53	
20,719.00	90.12	181.31	7,970.61	10,628.92 S	2,613.83 W	1,226,456.11	3,133,988.10	0.07	10,944.19	-171.87	
20,815.00	90.06	181.70	7,970.46	10,724.89 S	2,616.35 W	1,226,360.13	3,133,986.11	0.41	11,038.30	98.75	
20,909.00	90.00	181.74	7,970.41	10,818.85 S	2,619.17 W	1,226,266.16	3,133,983.80	0.08	11,130.51	146.31	
21,005.00	89.75	181.70	7,970.62	10,914.80 S	2,622.05 W	1,226,170.20	3,133,981.45	0.26	11,224.69	-170.91	
21,099.00	90.12	181.70	7,970.73	11,008.76 S	2,624.84 W	1,226,076.23	3,133,979.18	0.39	11,316.90	0.00	
21,290.00	90.19	181.77	7,970.21	11,199.67 S	2,630.62 W	1,225,885.29	3,133,974.44	0.05	11,504.29	45.00	
21,385.00	91.05	181.25	7,969.18	11,294.63 S	2,633.13 W	1,225,790.32	3,133,972.46	1.06	11,597.41	-31.16	
21,481.00	91.23	180.61	7,967.27	11,390.60 S	2,634.68 W	1,225,694.35	3,133,971.43	0.69	11,691.31	-74.28	Final Sperry MWD Survey at 21481.00' MD
21,517.00	91.23	180.61	7,966.50	11,426.59 S	2,635.07 W	1,225,658.36	3,133,971.24	0.00	11,726.48	0.00	Straight Line Projection to TD at 21517.00' MD

Design Report for NORTHWEST A S20-25-13N - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Map Coordinates		Dogleg Rate (°/100usft)	Vertical Section (usft)	Toolface Angle (°)	Comments
				Northing (usft)	Easting (usft)	Northing (usft)	Easting (usft)				

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
131.00	131.00	0.01	-0.75	First Atlas MWD Survey at 131.00' MD
1,555.00	1,554.72	-1.10	15.56	Final Atlas MWD Survey at 1555.00' MD
1,643.00	1,642.72	-1.93	15.50	First Sperry MWD Survey at 1643.00' MD
21,481.00	7,967.27	-11,390.60	-2,634.68	Final Sperry MWD Survey at 21481.00' MD
21,517.00	7,966.50	-11,426.59	-2,635.07	Straight Line Projection to TD at 21517.00' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	NORTHWEST A S20-25-13N_Plat BHL	192.90	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
131.00	1,555.00	Atlas MWD Surveys	3_MWD
1,643.00	21,481.00	Sperry MWD Surveys	3_MWD
24,517.00	21,517.00	PTB - No Survey	3_Blind

Design Targets

Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	()	()	()	()	()	()	()		
- Shape									
()									

Design Report for NORTHWEST A S20-25-13N - Final Surveys

Directional Difficulty Index

Average Dogleg over Survey: 1.73 °/100usft

Maximum Dogleg over Survey: 15.86 °/100usft at 8,974.00
usft

Net Tortosity applicable to Plans: 0.86 °/100usft

Directional Difficulty Index: 7.201

Audit Info

North Reference Sheet for Sec. 09-T01S-R68W (NORTHWEST A S20-25 Pad) - NORTHWEST A S20-25-13N - OWB_20784

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to KB = 29' @ 5343.00usft (Patterson 901). Northing and Easting are relative to NORTHWEST A S20-25-13N

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996769

Grid Coordinates of Well: 1,237,098.89 usft N, 3,136,543.40 usft E

Geographical Coordinates of Well: 39.983191, -105.012730

Grid Convergence at Surface is: 0.31°

Based upon Minimum Curvature type calculations, at a Measured Depth of 21,517.00usft
the Bottom Hole Displacement is 11,726.49usft in the Direction of 192.99° (True).

Magnetic Convergence at surface is: -7.94° (1 November 2019, , BGGM2018)

