PCDC - Pressure Case Directional
PCGK - Pressure Case Gamma

HALLIBURTON | Sperry Drilling

1 : 240

Country	: USA
Field	: Wattenberg
Location	: Lat: 40° 45' 34.84" North Long: 103° 49' 9.65" West
Well	: Castor LD12-78HN
Company	: Noble Energy
Rig	: H&P 322

Company : **Noble Energy**
Rig : **H&P 322**
Well : **Castor LD12-78HN**
Field : **Wattenberg**
Country : **USA**
API Number : **05-123-37096**

LOCATION

Latitude : **40° 45' 34.84" North**
Longitude : **103° 49' 9.65" West**
UTM Easting = 3465567.815 ft
UTM Northing = 1524007.987 ft

Other Services
Directional Drilling

Permanent Datum : **Ground Level** Elevation : **4630.00 ft**
Log Measured From : **Drill Floor** **24.00 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

TVD LOG

Elev. KB **N/A**
DF **4654.00 ft**
GL **4630.00 ft**
WD **N/A**

Depth Logged : **1,228.99 ft** To **5,860.00 ft**
Date Logged : **16-May-13** To **19-May-13**
Total Depth MD : **5,860.00 ft** TVD: **5,491.96 ft**
Spud Date : **16-May-13**

Unit No. : **11210425**
Job No. : **CA-XX-0900392418**
Plot Type : **Final**
Plot Date : **20-May-13**

Borehole Record (TVD)

Run No.	Size	From	To
2	8.750 in	1,228.99 ft	4,746.94 ft
3	8.750 in	4,746.94 ft	5,491.21 ft

Borehole Record (TVD)

Run No.	Size	From	To

Casing Record (TVD)

Size	Weight	From	To
9.625 in	36.00 lbpf	SURFACE	1,215.99 ft

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	18-May-13	19-May-13			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (TVD, ft)	1,228.99	4,746.94			
Log End Depth (TVD, ft)	4,746.94	5,491.21			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	17-May-13 20:59	18-May-13 13:25			
Drill/Wipe End Date and Time	18-May-13 05:27	19-May-13 03:45			
Min Inc (deg) @ Depth (TVD, ft)	.10 @ 749.99	2.17 @ 4,780.92			
Max Inc (deg) @ Depth (TVD, ft)	2.68 @ 4,218.06	79.79 @ 5,483.69			
Bit TFA(in2) / Bit Type	.75 / PDC	.86 / PDC			
Flow Rate (gpm)	587.00	532.00			
Max AV (fpm) / CV (fpm) @ MWD	427.3 / 427.3	427.3 / 427.3			
Fluid Type	Fresh Water Gel	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	9.30 / 36.00	9.30 / 36.00			
Filtrate CL (ppm)	1,800.00	1,800.00			
pH / Fluid Loss (mptm)	9.90 / N/A	9.90 / N/A			
PV (cP) / YP (lhf2)	11 / 7.00	11 / 7.00			
% Solids / % Sand	6.50 / 0.35	6.50 / 0.35			
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
[illegible]	[illegible]	[illegible]			

Max Tool Temp (degF) / Source	137.50 / PCM	160.83 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Robert Ley	Robert Ley			
Customer Representative	Charles Collver	Charles Collver			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	161211	161211			
Insert Serial Number	11145581	11145581			
Date and Time Initialized	16-May-13 21:20	16-May-13 21:20			
Date and Time Read	19-May-13 10:00	19-May-13 09:54			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	57.00	55.00			
Software Version	6.21	6.21			
Sub Serial Number	161211	161211			
Sonde Serial Number	11833052	11833052			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	338.28	12.96			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	50.18	48.59			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	161211	161211			
Insert/Sonde Serial Number	11579768	11579768			

REMARKS

1. All depths are measured depths and are calibrated to the driller' pipe tally and are measured from the drill floor.

2. No depth corrections have been made for pipe stretch or compression.

3. All data presented is recorded (memory data) unless otherwise stated.

4. The Following smoothing parameters have been applied to the data"

PGRC (Gamma Ray):
Interval Resolution: 0.5 feet
Coercion Distance: 0.6 feet
Gap Fill: 3.0 feet

ROPA (Rate of Penetration):
Interval Resolution: 0.5 feet
Coercion Distance: 1.2 feet

WARRANTY

HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS

HALLIBURTON

TVD Detail Log 1:240

Gamma Ray
(PGRC)
(Api)
0 300

Avg Rate of Penetration
feet per hr
600 0

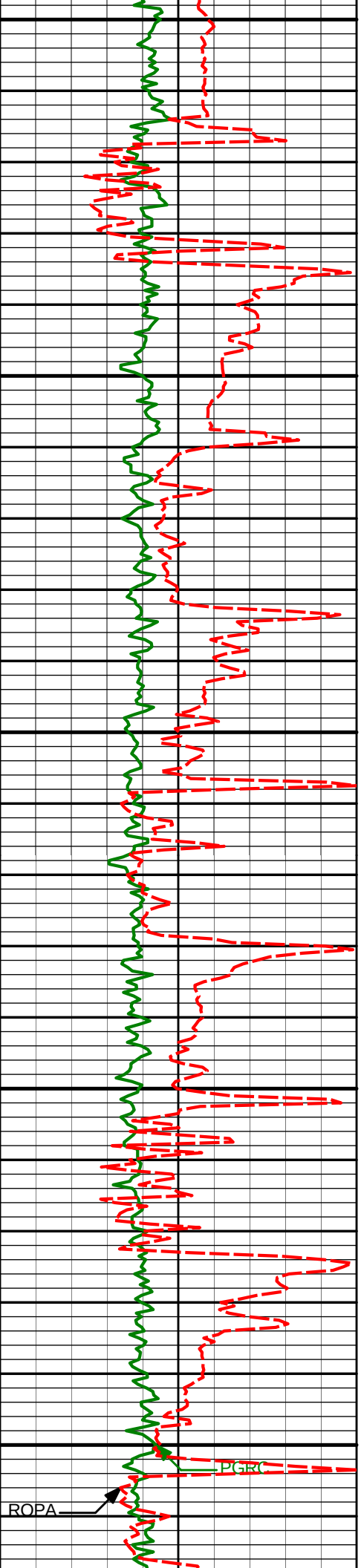
Feet

4700'

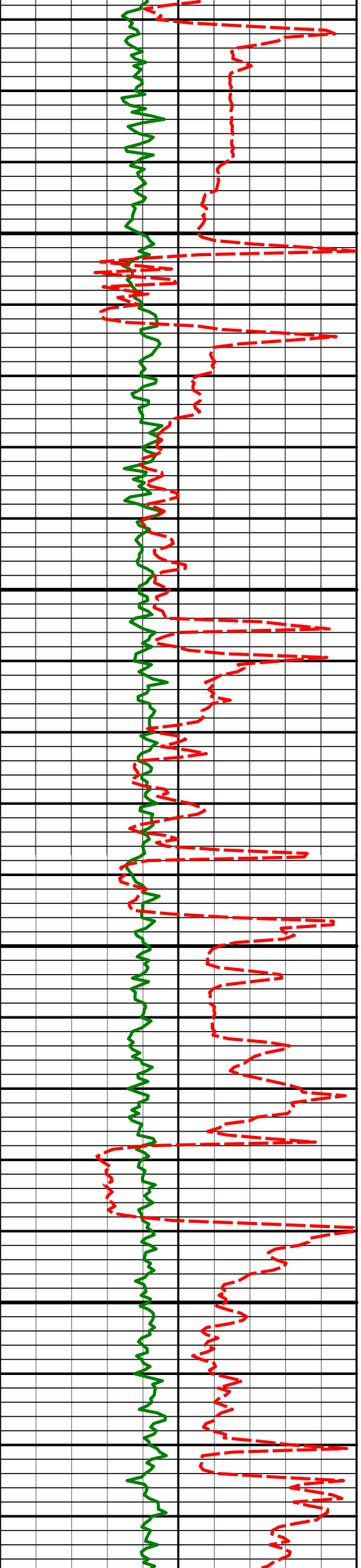
Run 200
4750'

KOP

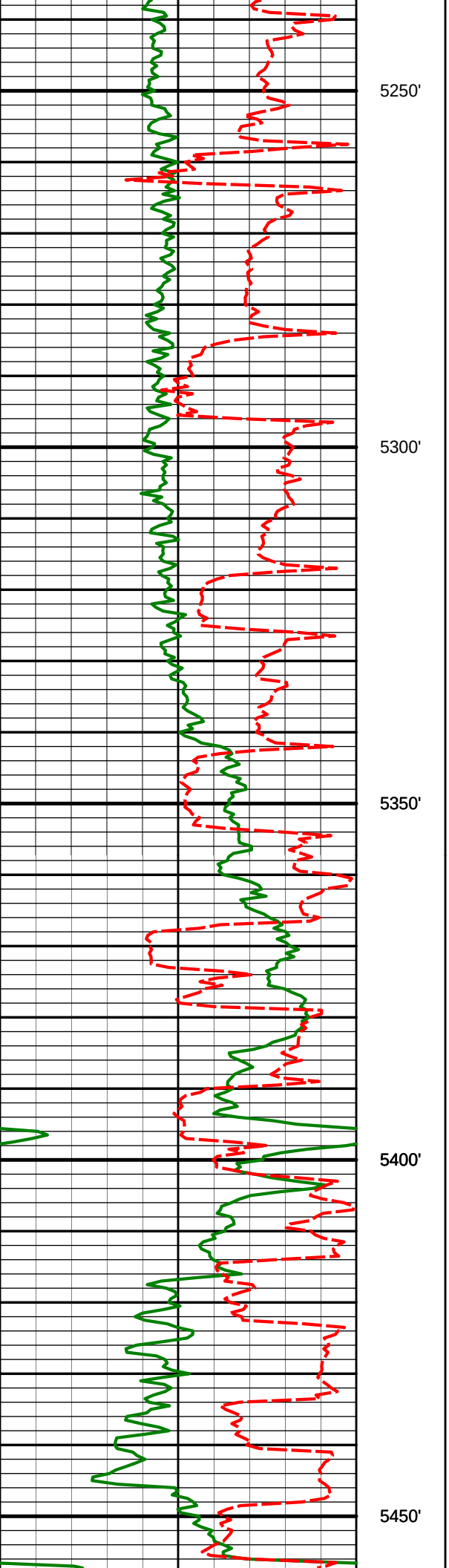
Depth	Inc	Azm	TVD	Vsec
4782'	2.17°	5.28°	4780.92'	-19.18'



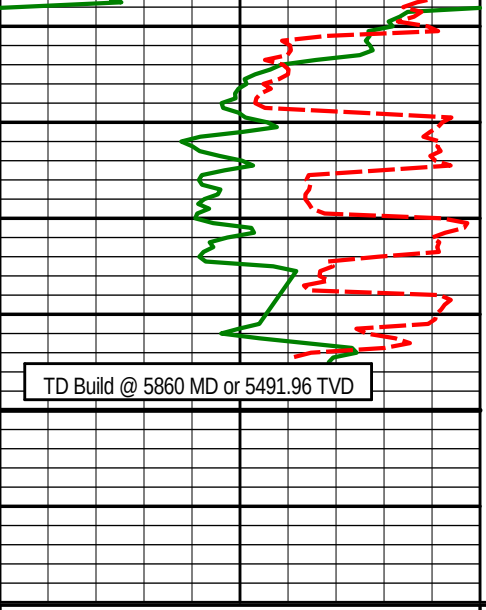
4829'	6.87°	357.24°	4827.76'	-15.49'
4876'	10.24°	356.11°	4874.23'	-8.50'
4923'	12.96°	356.03°	4920.27'	0.93'
4971'	15.23°	357.46°	4966.82'	12.61'
5018'	17.93°	359.89°	5011.86'	26.02'



5066'	21.96°	2.56°	5056.98'	42.37'	
5113'	26.83°	3.60°	5099.77'	61.73'	
5161'	31.02°	0.44°	5141.78'	84.90'	
5208'	33.78°	359.93°	5181.46'	110.08'	
5256'	38.25°	359.66°	5220.27'	138.29'	



5303'	42.78°	359.90°	5255.99'	168.82'
5351'	47.04°	359.17°	5289.98'	202.69'
5398'	51.90°	358.43°	5320.52'	238.41'
5446'	55.83°	357.33°	5348.82'	277.15'
5493'	58.26°	356.71°	5374.38'	316.56'
5540'	61.23°	357.71°	5398.06'	357.12'
5587'	64.73°	357.32°	5419.41'	398.96'
5635'	69.08°	357.10°	5438.24'	443.08'
5682'	72.21°	357.16°	5453.81'	487.39'



		5730'	74.88°	357.47°	5467.41'	533.39'
		5777'	78.19°	358.16°	5478.35'	579.08'
		5805'	79.79°	357.80°	5483.69'	606.55'
	5500'					
Avg Rate of Penetration feet per hr 600 0	Feet	Depth	Inc	Azm	TVD	Vsec
Gamma Ray (PGRC) (Api) 0 300						

HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Castor LD12-78HN
Wattenberg
Weld Colorado
USA
CA-XX-0900392418

Measured Depth (feet)	*Inclination (degrees)*	*Direction (degrees)*	*Vertical Depth (feet)*	*Latitude (feet)*	*Departure (feet)*	*Vertical Section (feet)*	*Dogleg (deg/100ft)*
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
250.00	0.20	304.70	250.00	0.25 N	0.36 W	0.25	0.08
530.00	0.60	264.10	529.99	0.38 N	2.22 W	0.40	0.17
750.00	0.10	233.00	749.99	0.14 N	3.52 W	0.19	0.23
1006.00	0.30	152.80	1005.99	0.59 S	3.39 W	-0.54	0.12
1225.00	0.10	258.40	1224.99	1.14 S	3.32 W	-1.09	0.16
1279.00	0.66	218.02	1278.98	1.39 S	3.55 W	-1.35	1.09
1372.00	0.52	228.41	1371.98	2.10 S	4.20 W	-2.04	0.19
1560.00	0.88	184.04	1559.97	4.11 S	4.95 W	-4.05	0.33
1655.00	0.96	148.69	1654.95	5.52 S	4.59 W	-5.46	0.59
1750.00	1.49	151.54	1749.93	7.28 S	3.59 W	-7.23	0.56
1845.00	1.97	131.94	1844.89	9.45 S	1.79 W	-9.43	0.79
1940.00	1.31	73.74	1939.86	10.24 S	0.47 E	-10.25	1.78
2034.00	1.62	85.64	2033.83	9.84 S	2.82 E	-9.87	0.46
2129.00	2.06	79.04	2128.78	9.41 S	5.83 E	-9.49	0.52
2224.00	1.27	343.50	2223.75	8.08 S	7.21 E	-8.17	2.66
2319.00	1.09	14.60	2318.73	6.20 S	7.14 E	-6.29	0.69
2414.00	1.13	23.63	2413.71	4.46 S	7.74 E	-4.56	0.19
2509.00	1.33	28.66	2508.69	2.64 S	8.64 E	-2.75	0.24
2604.00	0.90	328.31	2603.68	1.04 S	8.78 E	-1.16	1.24
2699.00	0.65	350.73	2698.67	0.12 N	8.30 E	0.01	0.40
2794.00	0.22	336.94	2793.66	0.82 N	8.15 E	0.72	0.47
2889.00	0.37	341.59	2888.66	1.28 N	7.98 E	1.18	0.16
2984.00	0.75	345.20	2983.66	2.17 N	7.72 E	2.07	0.40
3079.00	1.00	335.41	3078.65	3.53 N	7.22 E	3.43	0.30

3174.00	1.23	287.51	3173.63	4.58 N	5.90 E	4.51	0.98
3364.00	1.68	253.86	3363.57	4.42 N	1.28 E	4.40	0.50
3459.00	2.22	216.66	3458.52	2.56 N	1.16 W	2.57	1.42
3554.00	1.70	217.58	3553.47	0.04 S	3.11 W	0.00	0.55
3649.00	1.50	229.98	3648.43	1.95 S	4.93 W	-1.89	0.42
3744.00	1.17	212.99	3743.40	3.57 S	6.41 W	-3.49	0.54
3839.00	2.00	167.91	3838.37	6.01 S	6.59 W	-5.92	1.51
3934.00	2.28	165.91	3933.30	9.46 S	5.79 W	-9.38	0.31
4029.00	2.19	167.71	4028.23	13.06 S	4.94 W	-13.00	0.12
4219.00	2.68	175.61	4218.06	21.03 S	3.83 W	-20.98	0.31
4313.00	1.16	187.40	4312.00	24.16 S	3.78 W	-24.11	1.66
4408.00	0.35	343.72	4407.00	24.83 S	3.99 W	-24.78	1.56
4503.00	1.03	35.81	4501.99	23.85 S	3.57 W	-23.81	0.91
4598.00	1.27	53.41	4596.97	22.53 S	2.22 W	-22.50	0.44
4691.00	1.02	51.54	4689.95	21.40 S	0.75 W	-21.39	0.27
4782.00	2.17	5.28	4780.92	19.18 S	0.05 E	-19.18	1.80
4829.00	6.87	357.24	4827.76	15.49 S	0.01 W	-15.49	10.08
4876.00	10.24	356.11	4874.23	8.51 S	0.43 W	-8.50	7.18
4923.00	12.96	356.03	4920.27	0.92 N	1.08 W	0.93	5.78
4971.00	15.23	357.46	4966.82	12.59 N	1.73 W	12.61	4.79
5018.00	17.93	359.89	5011.86	25.99 N	2.02 W	26.02	5.93

CALCULATION BASED ON MINIMUM CURVATURE METHOD

SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT

VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 359.26 DEGREES (GRID)
A TOTAL CORRECTION OF 7.09 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 5018.00 FEET
IS 26.07 FEET ALONG 355.57 DEGREES (GRID)

Surveys at 250 ft, 530 ft, 750 ft, 1006 ft and 1225 ft were taken and provided by HP 322 while they were drilling the surface hole.

Date Printed:20 May 2013