

# HALLIBURTON

## End of Well Report for Noble Energy

**Rig** : Ensign 136  
**Well** : 70 Ranch USX BB09-99HZ  
**Field** : DJ Basin  
**Country** : USA  
**Job Number** : CA-MJ-0006837724  
**Date** : 20-Nov-09  
**API Number** : 05-123-30639

**Sperry Drilling Services**

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**General Information**

Company:	Noble Energy
Rig:	Ensign 136
Well:	70 Ranch USX BB09-99HZ
Field:	DJ Basin
Lease Name:	70 Ranch
State:	Colorado
County:	Weld County
Country:	USA
API Number:	05-123-30639
Sperry Job Number:	CA-MJ-0006837724
Job start date:	20-Nov-09
Job end date:	04-Dec-09
North reference:	True
Declination:	8.861 deg
Dip angle:	67.194 deg
Total magnetic field:	53350 nT
Date of magnetic data:	20 November, 2009
Wellhead coordinates N:	40 deg. 25 min 14.27 sec North
Wellhead coordinates E:	104 deg. 26 min 54.24 sec West
Vertical section direction:	133.60 deg
Unit Number:	11210425
MWD Engineers:	William Keating, Dylan Whittum, Michael Gonzales, Donald Urbatsch
Company Representatives:	Jim Boyd, Martin Saurez
Company Geologist:	



## Bitrun Summary

## RUN TIME DATA

MWD Run : 100	Run Start : 20-Nov-09 03:00	BRT Hrs : 30.00 hr	Circ. Hrs : 18.17 hr
Rig Bit No : 0100	Run End : 21-Nov-09 09:00	Hole Size : 8.750 in	Oper. Hrs : 30.00 hr

## DRILLING DATA

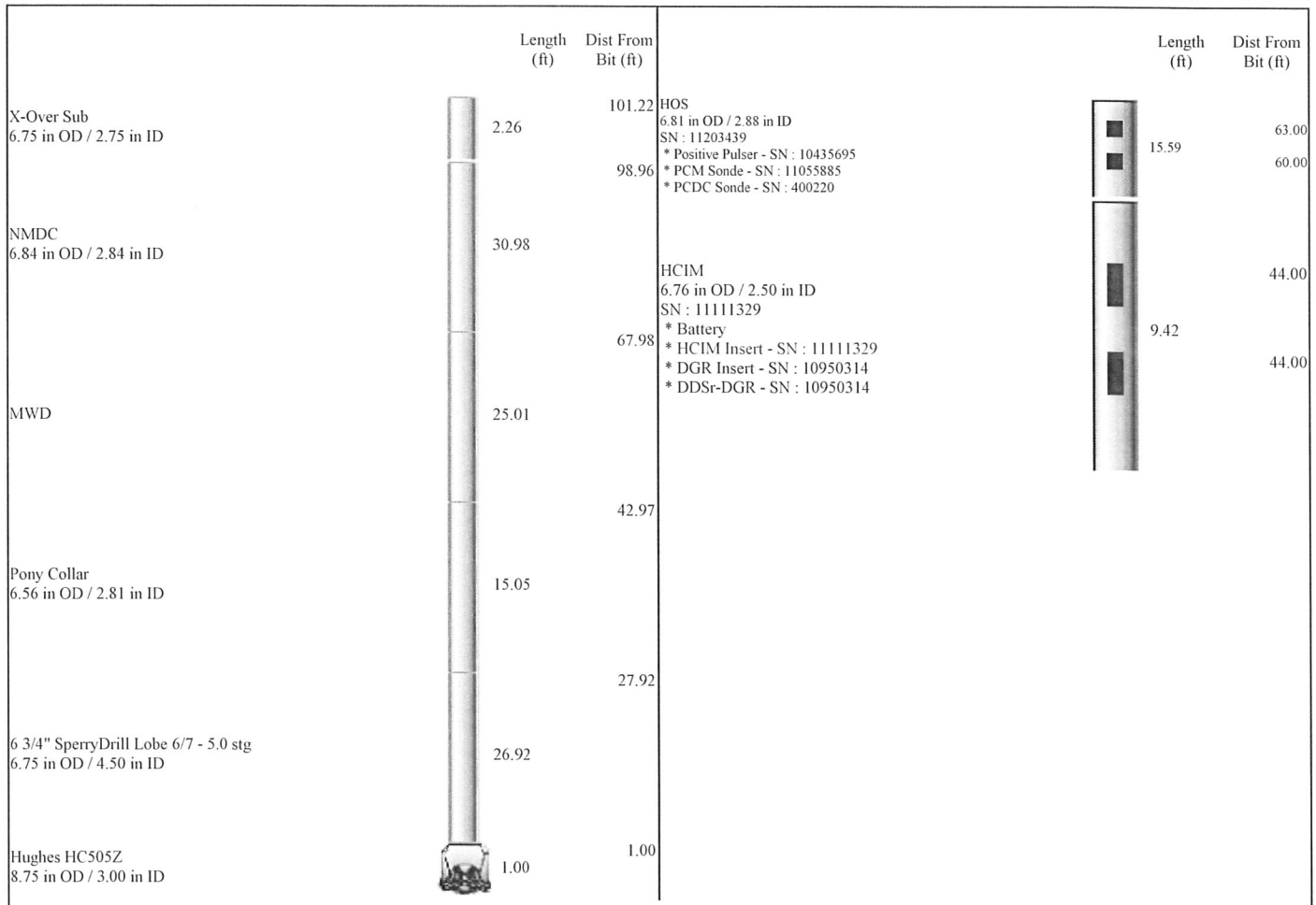
Start Depth : 665.00 ft	Footage : 5135.00 ft	Avg RPM : 95 rpm	Avg ROP : 426.00 fph
End Depth : 5800.00 ft	Avg Flow Rate : 503.00 gpm	Avg WOB : 17.0 klb	Avg SPP : 2427 psig
Drilling Hours : 12.050 hr			

## MUD DATA

Mud Type : Native/Spud Mud			
Weight : 8.40 ppg	Viscosity : 27.00 spqt	PV : 1 cP	YP : 2.00 lbf/ft <sup>2</sup>
Chlorides : 700.00 ppm	Max Temp. : 141.40 degF	% Solids : 0.50 %	% Sand : 0.01 %
pH : 9.30 pH	Fluid Loss : 0 mptm	% Oil : 0.00 %	O:W : 0:99.2

## MWD PERFORMANCE

Tool OD : 6.75 in	Type : PFE	Min. Inc. : 0.06 deg	Min. Inc. Depth : 5602.00 ft
Final Az. : 279.58 deg	Max Op. Press. : 2744 psig	Max Inc. : 2.50 deg	Max Inc. Depth : 3847.00 ft
MWD Real-time % : 95 %		MWD Recorded % : 0 %	



## COMMENTS

Run 100 was run with DGR, DGR-DDSr, and direction using P4M telemetry. DDSR-DGR and DGR on lower bus quit working @ 08:07 on 11-20-09 the pumps had been running off and on for about 1.5 hours. Since the customer was not requiring log data for this run we kept drilling as the Directional tool was still working. We tried to mode switch once and the switch did not take, instead of trying again we continued drilling because we didn't want to waist rig time.

## Bitrun Summary

## RUN TIME DATA

MWD Run	: 200	Run Start	: 21-Nov-09 14:00	BRT Hrs	: 23.00 hr	Circ. Hrs	: 8.89 hr
Rig Bit No	: 0200	Run End	: 22-Nov-09 13:00	Hole Size	: 8.750 in	Oper. Hrs	: 23.00 hr

## DRILLING DATA

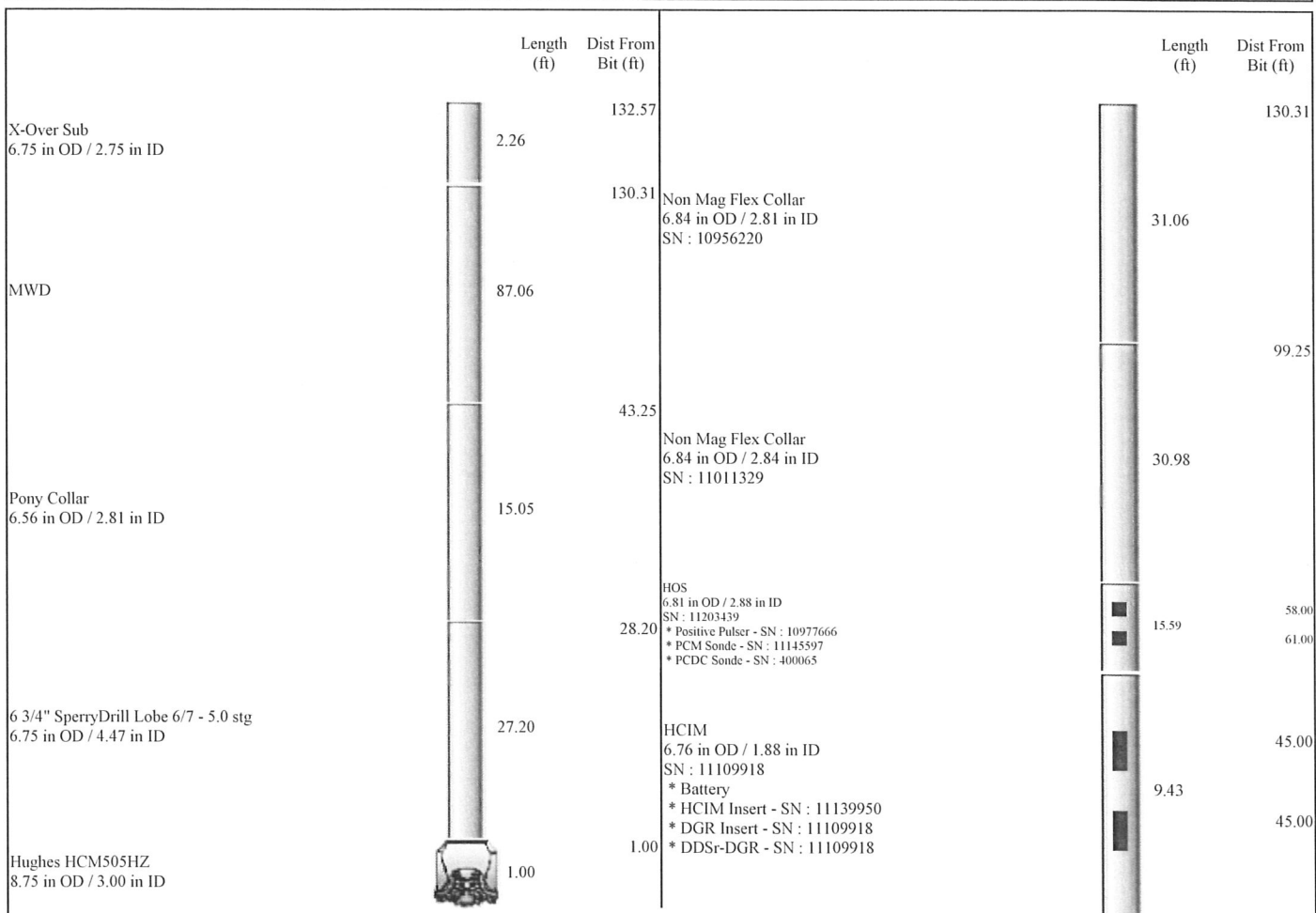
Start Depth	: 5800.00 ft	Footage	: 532.00 ft	Avg RPM	: 44 rpm	Avg ROP	: 91.00 fph
End Depth	: 6332.00 ft	Avg Flow Rate	: 546.00 gpm	Avg WOB	: 19.0 klb	Avg SPP	: 2769 psig
Drilling Hours	: 5.840 hr						

## MUD DATA

Mud Type	: Native/Spud Mud						
Weight	: 8.80 ppg	Viscosity	: 31.00 spqt	PV	: 4 cP	YP	: 6.00 lhf2
Chlorides	: 700.00 ppm	Max Temp.	: 173.00 degF	% Solids	: 3.70 %	% Sand	: 0.30 %
pH	: 9.30 pH	Fluid Loss	: 28 mptm	% Oil	: 0.00 %	O:W	: 0:96.0

## MWD PERFORMANCE

Tool OD	: 6.75 in	Type	: PFE	Min. Inc.	: 0.12 deg	Min. Inc. Depth	: 5801.00 ft
Final Az.	: 128.25 deg	Max Op. Press.	: 2963 psig	Max Inc.	: 23.37 deg	Max Inc. Depth	: 6272.00 ft
MWD Real-time %	: 97 %	MWD Recorded %	: 99 %				



## COMMENTS

Run 200 was run with DGR, DGR-DDSr, and direction using P4M telemetry.  
TD straight hole @ 6333' MD. Good run. No MWD issues. POOH to change bit.

## Bitrun Summary

## RUN TIME DATA

MWD Run	: 300	Run Start	: 22-Nov-09 15:00	BRT Hrs	: 52.50 hr	Circ. Hrs	: 36.71 hr
Rig Bit No	: 0300	Run End	: 24-Nov-09 19:30	Hole Size	: 8.750 in	Oper. Hrs	: 52.50 hr

## DRILLING DATA

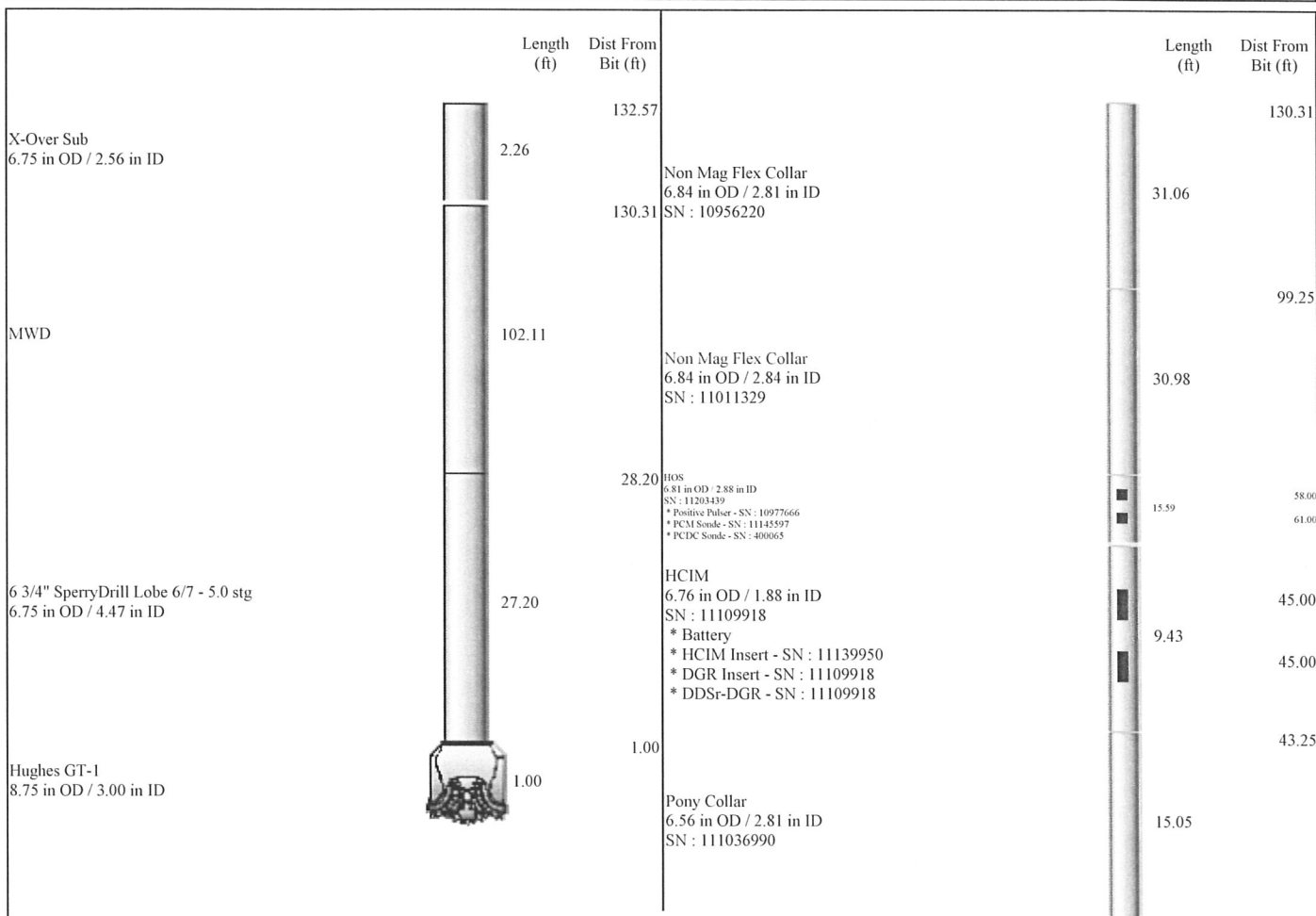
Start Depth	: 6332.00 ft	Footage	: 542.00 ft	Avg RPM	: 41 rpm	Avg ROP	: 20.00 fph
End Depth	: 6874.00 ft	Avg Flow Rate	: 495.00 gpm	Avg WOB	: 40.0 klb	Avg SPP	: 2827 psig
Drilling Hours	: 26.730 hr						

## MUD DATA

Mud Type	: Native/Spud Mud						
Weight	: 9.60 ppg	Viscosity	: 52.00 spqt	PV	: 20 cP	YP	: 18.00 lhf2
Chlorides	: 700.00 ppm	Max Temp.	: 176.00 degF	% Solids	: 5.70 %	% Sand	: 0.50 %
pH	: 9.80 pH	Fluid Loss	: 8 mptm	% Oil	: 0.00 %	O:W	: 0:94.0

## MWD PERFORMANCE

Tool OD	: 6.75 in	Type	: PFE	Min. Inc.	: 27.13 deg	Min. Inc. Depth	: 6314.00 ft
Final Az.	: 134.57 deg	Max Op. Press.	: 3347 psig	Max Inc.	: 76.04 deg	Max Inc. Depth	: 6813.00 ft
MWD Real-time % : 97 %				MWD Recorded % : 99 %			



## COMMENTS

Run 300 was run with DGR, DGR-DDSr, and direction using P4M telemetry.  
Land build @ 6874' MD. Problems in detection because of noise coming from pump one. This may be due to a problem with the pulsation dampener.

## Bitrun Summary

## RUN TIME DATA

MWD Run : 400	Run Start : 27-Nov-09 01:00	BRT Hrs : 131.50 hr	Circ. Hrs : 95.12 hr
Rig Bit No : 0400	Run End : 02-Dec-09 12:30	Hole Size : 6.125 in	Oper. Hrs : 131.50 hr

## DRILLING DATA

Start Depth : 6874.00 ft	Footage : 3419.00 ft	Avg RPM : 70 rpm	Avg ROP : 35.00 fph
End Depth : 10293.00 ft	Avg Flow Rate : 248.00 gpm	Avg WOB : 20.0 klb	Avg SPP : 2421 psig
Drilling Hours : 74.150 hr			

## MUD DATA

Mud Type : Native/Spud Mud			
Weight : 9.80 ppg	Viscosity : 44.00 spqt	PV : 12 cP	YP : 14.00 lbf2
Chlorides : 700.00 ppm	Max Temp. : 199.00 degF	% Solids : 6.70 %	% Sand : 0.40 %
pH : 9.20 pH	Fluid Loss : 8 mptm	% Oil : 0.00 %	O:W : 0:93

## MWD PERFORMANCE

Tool OD : 4.75 in	Type : PFE	Min. Inc. : 79.44 deg	Min. Inc. Depth : 6876.00 ft
Final Az. : 132.79 deg	Max Op. Press. : 3344 psig	Max Inc. : 96.69 deg	Max Inc. Depth : 10196.00 ft
MWD Real-time % : 93 %		MWD Recorded % : 99 %	

	Length (ft)	Dist From Bit (ft)		Length (ft)	Dist From Bit (ft)
		6521.21			131.32
30x HWDP 4.00 in OD / 2.56 in ID	916.54		Non Mag Flex Collar 4.65 in OD / 2.25 in ID SN : 11011047	31.07	
		5604.67			100.25
DP XT 39 4.00 in OD / 2.56 in ID	5466.24		Non Mag Flex Collar 4.75 in OD / 2.25 in ID SN : 113211161	30.71	
		138.43			69.54
Cross Over Sub 4.75 in OD / 2.50 in ID	2.84		HOC 4.72 in OD / 2.66 in ID SN : 11256442	16.82	
Float Sub 4.73 in OD / 2.25 in ID	4.27		* Positive Pulser - SN : 10485548		
		131.32	* PCD Sonde		
MWD	102.41		4 3/4" Slim Phase 4 Collar 4.75 in OD / 2.50 in ID SN : 11400566	22.50	45.24
		28.91	* DGR Insert - SN : 11261763		38.35
			* Slim P4 Insert - SN : 11261763		
			* DDS Insert		
4 3/4" SperryDrill Lobe 4/5 - 6.3 stg 4.75 in OD / 2.79 in ID	28.16				30.22
			Double Pin Cross Over 4.75 in OD / 2.56 in ID SN : 0738	1.31	
Hughes Roller cone 6.13 in OD / 3.00 in ID	0.75	0.75			

## COMMENTS

Run 400 was run with SP4, DGR, DGR-DDSr, and direction using P4M telemetry.  
TOH to change motor.  
Good MWD run.



## Bitrun Summary

## RUN TIME DATA

MWD Run : 500	Run Start : 02-Dec-09 15:15	BRT Hrs : 51.00 hr	Circ. Hrs : 25.29 hr
Rig Bit No : 0500	Run End : 04-Dec-09 18:15	Hole Size : 6.125 in	Oper. Hrs : 51.00 hr

## DRILLING DATA

Start Depth : 10293.00 ft	Footage : 528.00 ft	Avg RPM : 69 rpm	Avg ROP : 32.00 fph
End Depth : 10821.00 ft	Avg Flow Rate : 250.00 gpm	Avg WOB : 27.0 klb	Avg SPP : 2570 psig
Drilling Hours : 17.650 hr			

## MUD DATA

Mud Type : Native/Spud Mud			
Weight : 9.80 ppg	Viscosity : 44.00 spqt	PV : 12 cP	YP : 14.00 lhf2
Chlorides : 700.00 ppm	Max Temp. : 215.00 degF	% Solids : 6.70 %	% Sand : 0.40 %
pH : 9.20 pH	Fluid Loss : 8 mptm	% Oil : 0.00 %	O:W : 0:93

## MWD PERFORMANCE

Tool OD : 4.75 in	Type : PFE	Min. Inc. : 89.38 deg	Min. Inc. Depth : 10639.00 ft
Final Az. : 129.28 deg	Max Op. Press. : 3372 psig	Max Inc. : 96.31 deg	Max Inc. Depth : 10228.00 ft
MWD Real-time % : 98 %		MWD Recorded % : 99 %	

	Length (ft)	Dist From Bit (ft)		Length (ft)	Dist From Bit (ft)
		6521.17			131.28
30x HWDP 4.00 in OD / 2.56 in ID	916.54		Non Mag Flex Collar 4.65 in OD / 2.25 in ID SN : 11011047	31.07	
		5604.63			100.21
DP XT 39 4.00 in OD / 2.56 in ID	5466.24		Non Mag Flex Collar 4.75 in OD / 2.25 in ID SN : 113211161	30.71	
		138.39			69.50
Cross Over Sub 4.75 in OD / 2.50 in ID	2.84		HOC		
Float Sub 4.73 in OD / 2.25 in ID	4.27	135.55	4.72 in OD / 2.66 in ID SN : 11290255	16.84	
		131.28	* Positive Pulser - SN : 11050296		
			* PCD Sonde		
MWD	102.43		4 3/4" Slim Phase 4 Collar 4.75 in OD / 2.50 in ID SN : 11400566		45.18
		28.85	* DGR Insert - SN : 11261763	22.50	38.29
			* Slim P4 Insert - SN : 11261763		
			* DDS Insert		
4 3/4" SperryDrill Lobe 4/5 - 6.3 stg 4.75 in OD / 2.79 in ID	28.10				30.16
			Double Pin Cross Over 4.75 in OD / 2.56 in ID SN : 0738	1.31	
Hughes Roller cone 6.13 in OD / 3.00 in ID	0.75	0.75			

## COMMENTS

Run 500 was directional with DGR, SP4, and DGR-DDSr using P4M telemetry.  
TD well @ 10821' MD.  
No detection issues, good MWD run.

## Directional Survey Data

Tie-in

0.00	0.00	0.00	0.00	0.0000 N	0.0000 E	***	
Measured Depth (ft)	Inclination (deg)	Direction (deg)	Vertical Depth (ft)	Latitude (ft)	Departure (ft)	Vertical Section (ft)	Dogleg (°/100')
722.00	0.56	201.44	721.99	3.2586 S	1.2800 W	1.32	0.08
1235.00	0.75	205.07	1234.96	8.6020 S	3.6059 W	3.32	0.04
1449.00	0.53	201.56	1448.94	10.7824 S	4.5592 W	4.13	0.10
1577.00	0.56	229.47	1576.94	11.7372 S	5.2511 W	4.29	0.21
1706.00	0.61	219.53	1705.93	12.6751 S	6.1662 W	4.28	0.09
1834.00	0.32	198.25	1833.93	13.5338 S	6.7092 W	4.47	0.26
1963.00	0.36	291.79	1962.92	13.7202 S	7.1970 W	4.25	0.38
2134.00	0.77	40.54	2133.92	12.6423 S	6.9454 W	3.69	0.56
2263.00	0.81	64.61	2262.91	11.5909 S	5.5593 W	3.97	0.26
2391.00	1.11	77.63	2390.89	10.9385 S	3.5306 W	4.99	0.29
2520.00	1.00	89.37	2519.87	10.6576 S	1.1838 W	6.49	0.19
2648.00	0.81	92.10	2647.85	10.6783 S	0.8286 E	7.96	0.15
2776.00	0.51	71.99	2775.84	10.5353 S	2.2695 E	8.91	0.29
2948.00	0.25	60.38	2947.84	10.1153 S	3.3196 E	9.38	0.16
3076.00	0.74	333.72	3075.83	9.2360 S	3.1929 E	8.68	0.60
3205.00	0.48	35.81	3204.83	8.0467 S	3.1413 E	7.82	0.52
3333.00	1.05	74.18	3332.82	7.2895 S	4.5858 E	8.35	0.57
3462.00	0.51	86.21	3461.80	6.9292 S	6.2962 E	9.34	0.44
3590.00	1.53	77.74	3589.78	6.5290 S	8.5323 E	10.68	0.80
3719.00	2.10	83.40	3718.72	5.8918 S	12.5627 E	13.16	0.47
3847.00	2.50	88.78	3846.61	5.5625 S	17.6832 E	16.64	0.35
3975.00	0.94	136.80	3974.56	6.2684 S	21.1915 E	19.67	1.56
4061.00	1.63	116.91	4060.54	7.3371 S	22.7668 E	21.55	0.95
4147.00	1.49	127.29	4146.50	8.5710 S	24.7514 E	23.84	0.37
4232.00	1.33	155.13	4231.48	10.1354 S	26.0473 E	25.85	0.82
4318.00	1.17	125.51	4317.46	11.5498 S	27.1824 E	27.65	0.76
4404.00	0.33	158.77	4403.45	12.2937 S	27.9892 E	28.75	1.06
4489.00	0.93	237.93	4488.45	12.8901 S	27.4941 E	28.80	1.09
4575.00	1.23	251.41	4574.43	13.5553 S	26.0268 E	28.20	0.46
4661.00	1.06	240.15	4660.42	14.2443 S	24.4636 E	27.54	0.33
4746.00	0.53	241.29	4745.41	14.8224 S	23.4407 E	27.20	0.62
4832.00	0.88	63.88	4831.40	14.7204 S	23.6894 E	27.31	1.64
4917.00	0.94	72.90	4916.39	14.2261 S	24.9461 E	27.88	0.18
5003.00	0.31	96.61	5002.39	14.0450 S	25.8514 E	28.41	0.78
5089.00	0.19	215.86	5088.39	14.1843 S	26.0001 E	28.61	0.50
5174.00	0.61	227.24	5173.39	14.6035 S	25.5868 E	28.60	0.51
5260.00	1.15	260.31	5259.38	15.0607 S	24.3960 E	28.05	0.84
5346.00	0.20	142.22	5345.37	15.3223 S	23.6317 E	27.68	1.46
5431.00	0.48	80.79	5430.37	15.3798 S	24.0719 E	28.04	0.50
5516.00	0.19	65.29	5515.37	15.2639 S	24.5514 E	28.31	0.35
5602.00	0.06	85.59	5601.37	15.2009 S	24.7258 E	28.39	0.16
5688.00	0.17	282.80	5687.37	15.1691 S	24.6463 E	28.31	0.27
5740.00	0.20	279.58	5739.37	15.1369 S	24.4816 E	28.17	0.06
5801.00	0.12	224.93	5800.37	15.1658 S	24.3302 E	28.08	0.27
5844.00	1.96	141.56	5843.36	15.7750 S	24.7550 E	28.81	4.54

## Directional Survey Data

Measured Depth (ft)	Inclination (deg)	Direction (deg)	Vertical Depth (ft)	Latitude (ft)	Departure (ft)	Vertical Section (ft)	Dogleg (°/100')
5887.00	3.68	143.95	5886.30	17.4669 S	26.0243 E	30.89	4.00
5930.00	5.23	143.72	5929.17	20.1614 S	27.9953 E	34.18	3.60
5972.00	5.56	143.98	5970.99	23.3493 S	30.3239 E	38.06	0.80
6015.00	6.53	142.20	6013.75	26.9662 S	33.0475 E	42.53	2.30
6058.00	7.40	134.63	6056.43	30.8438 S	36.5169 E	47.71	2.94
6101.00	9.66	128.30	6098.95	35.0264 S	41.3205 E	54.08	5.69
6144.00	12.78	126.90	6141.13	40.1197 S	47.9581 E	62.40	7.28
6186.00	16.73	127.61	6181.73	46.6011 S	56.4654 E	73.03	9.41
6229.00	20.55	128.05	6222.47	55.0343 S	67.3164 E	86.70	8.90
6272.00	23.37	128.25	6262.34	64.9694 S	79.9623 E	102.71	6.56
6314.00	27.13	128.60	6300.32	76.1068 S	93.9950 E	120.55	8.96
6357.00	32.30	127.31	6337.66	89.1972 S	110.8065 E	141.76	12.10
6399.00	38.22	127.79	6371.93	103.9737 S	130.0168 E	165.86	14.12
6442.00	44.36	129.81	6404.23	121.7682 S	152.0998 E	194.12	14.61
6485.00	49.34	131.50	6433.63	142.2144 S	175.8787 E	225.44	11.92
6528.00	53.05	133.00	6460.57	164.7483 S	200.6685 E	258.93	9.04
6570.00	58.22	133.42	6484.27	188.4803 S	225.9249 E	293.59	12.34
6613.00	64.07	134.35	6505.01	214.5831 S	253.0502 E	331.23	13.74
6656.00	67.95	134.74	6522.49	242.1370 S	281.0433 E	370.51	9.06
6699.00	70.32	134.63	6537.80	270.3891 S	309.6103 E	410.68	5.51
6742.00	74.13	134.41	6550.93	299.0935 S	338.8007 E	451.61	8.86
6784.00	76.05	134.77	6561.74	327.5847 S	367.7023 E	492.19	4.66
6813.00	76.04	134.57	6568.73	347.3711 S	387.7173 E	520.33	0.66
6906.00	79.44	134.36	6588.48	411.0208 S	452.5647 E	611.18	3.66
6937.00	79.76	134.04	6594.07	432.2771 S	474.4245 E	641.67	1.48
6968.00	79.95	133.87	6599.53	453.4570 S	496.3929 E	672.19	0.80
7000.00	80.44	133.77	6604.98	475.2899 S	519.1442 E	703.72	1.56
7031.00	82.63	134.22	6609.54	496.5871 S	541.2007 E	734.38	7.22
7062.00	84.31	135.47	6613.07	518.3060 S	563.0355 E	765.17	6.73
7094.00	85.42	135.86	6615.93	541.1025 S	585.3084 E	797.02	3.67
7126.00	86.36	135.53	6618.23	563.9435 S	607.6020 E	828.91	3.11
7157.00	87.10	135.78	6619.99	586.0763 S	629.2352 E	859.84	2.51
7188.00	89.01	135.14	6621.05	608.1582 S	650.9650 E	890.81	6.50
7220.00	90.19	134.76	6621.27	630.7655 S	673.6105 E	922.80	3.86
7251.00	90.93	134.41	6620.97	652.5252 S	695.6879 E	953.79	2.65
7283.00	90.86	135.15	6620.47	675.0620 S	718.3997 E	985.78	2.31
7314.00	91.79	134.66	6619.75	696.9397 S	740.3502 E	1016.76	3.38
7346.00	92.16	134.57	6618.65	719.4012 S	763.1156 E	1048.74	1.19
7378.00	92.84	133.74	6617.25	741.6701 S	786.0527 E	1080.71	3.35
7410.00	93.52	133.15	6615.47	763.6417 S	809.2491 E	1112.66	2.80
7441.00	93.03	133.04	6613.70	784.7872 S	831.8483 E	1143.61	1.64
7473.00	91.24	133.18	6612.51	806.6401 S	855.1924 E	1175.58	5.62
7504.00	89.32	132.95	6612.36	827.8061 S	877.8394 E	1206.58	6.22
7536.00	88.89	132.60	6612.86	849.5343 S	901.3262 E	1238.57	1.73
7568.00	88.95	132.46	6613.47	871.1608 S	924.9043 E	1270.56	0.49
7600.00	89.26	132.14	6613.96	892.6942 S	948.5699 E	1302.55	1.38
7631.00	89.26	131.96	6614.37	913.4566 S	971.5864 E	1333.53	0.57
7663.00	88.77	132.89	6614.92	935.0420 S	995.2029 E	1365.52	3.28

## Directional Survey Data

Measured Depth (ft)	Inclination (deg)	Direction (deg)	Vertical Depth (ft)	Latitude (ft)	Departure (ft)	Vertical Section (ft)	Dogleg (°/100')
7695.00	88.46	133.39	6615.69	956.9158 S	1018.5466 E	1397.51	1.82
7726.00	89.07	133.75	6616.36	978.2754 S	1041.0034 E	1428.50	2.30
7758.00	89.38	134.10	6616.79	1000.4707 S	1064.0507 E	1460.50	1.46
7789.00	90.12	134.65	6616.92	1022.1494 S	1086.2091 E	1491.50	2.98
7821.00	90.49	134.84	6616.75	1044.6765 S	1108.9356 E	1523.49	1.31
7884.00	90.68	134.68	6616.11	1089.0371 S	1153.6650 E	1586.47	0.39
7947.00	90.68	134.71	6615.36	1133.3460 S	1198.4440 E	1649.46	0.05
8010.00	90.00	134.38	6614.99	1177.5398 S	1243.3407 E	1712.45	1.20
8074.00	90.62	134.16	6614.64	1222.2149 S	1289.1661 E	1776.44	1.02
8137.00	91.23	134.01	6613.62	1266.0409 S	1334.4122 E	1839.43	1.01
8200.00	91.42	133.32	6612.16	1309.5282 S	1379.9717 E	1902.41	1.13
8232.00	91.11	133.07	6611.46	1331.4260 S	1403.2951 E	1934.40	1.26
8295.00	90.68	132.72	6610.47	1374.3021 S	1449.4432 E	1997.39	0.88
8358.00	88.40	131.98	6610.98	1416.7390 S	1495.9971 E	2060.37	3.81
8421.00	88.33	132.18	6612.78	1458.9398 S	1542.7395 E	2123.32	0.33
8484.00	88.39	131.65	6614.58	1501.0076 S	1589.6014 E	2186.27	0.84
8547.00	88.58	131.51	6616.24	1542.8043 S	1636.7105 E	2249.21	0.37
8610.00	89.51	131.55	6617.29	1584.5658 S	1683.8675 E	2312.16	1.47
8673.00	90.56	132.67	6617.26	1626.8098 S	1730.6029 E	2375.13	2.44
8736.00	91.36	133.53	6616.21	1669.8517 S	1776.5937 E	2438.12	1.87
8799.00	92.16	135.87	6614.27	1714.1400 S	1821.3507 E	2501.08	3.91
8830.00	92.53	136.92	6613.00	1736.5673 S	1842.7136 E	2532.01	3.60
8893.00	91.98	138.25	6610.52	1783.0417 S	1885.1727 E	2594.81	2.28
8956.00	92.10	138.02	6608.28	1829.9291 S	1927.1909 E	2657.57	0.41
8988.00	92.59	137.88	6606.97	1853.6700 S	1948.6069 E	2689.45	1.61
9020.00	93.21	137.59	6605.35	1877.3199 S	1970.1022 E	2721.33	2.13
9053.00	93.15	137.11	6603.52	1901.5543 S	1992.4254 E	2754.21	1.46
9084.00	92.66	136.84	6601.95	1924.1878 S	2013.5501 E	2785.11	1.83
9115.00	92.53	136.43	6600.54	1946.7019 S	2034.8138 E	2816.04	1.36
9147.00	92.90	136.33	6599.03	1969.8415 S	2056.8649 E	2847.96	1.21
9178.00	92.16	136.00	6597.66	1992.1807 S	2078.3141 E	2878.90	2.61
9210.00	90.74	134.97	6596.85	2014.9909 S	2100.7407 E	2910.87	5.50
9242.00	90.25	134.46	6596.57	2037.5042 S	2123.4797 E	2942.87	2.22
9274.00	90.37	134.47	6596.40	2059.9189 S	2146.3173 E	2974.86	0.39
9337.00	90.43	134.16	6595.96	2103.9280 S	2191.3949 E	3037.86	0.51
9400.00	91.36	133.97	6594.97	2147.7353 S	2236.6592 E	3100.85	1.50
9463.00	91.05	134.03	6593.65	2191.4878 S	2281.9688 E	3163.83	0.49
9527.00	91.79	133.37	6592.06	2235.6886 S	2328.2253 E	3227.81	1.55
9559.00	91.24	133.20	6591.21	2257.6200 S	2351.5124 E	3259.80	1.82
9590.00	89.81	132.01	6590.93	2278.6023 S	2374.3286 E	3290.79	5.98
9622.00	89.75	132.42	6591.05	2300.1022 S	2398.0295 E	3322.78	1.30
9654.00	90.68	133.88	6590.93	2321.9856 S	2421.3753 E	3354.78	5.41
9686.00	91.11	135.13	6590.43	2344.4124 S	2444.1951 E	3386.77	4.12
9717.00	90.43	133.77	6590.01	2366.1175 S	2466.3234 E	3417.76	4.90
9750.00	89.57	132.50	6590.01	2388.6797 S	2490.4040 E	3450.76	4.64
9781.00	89.94	132.54	6590.14	2409.6306 S	2513.2522 E	3481.75	1.20
9813.00	91.17	133.43	6589.83	2431.4453 S	2536.6609 E	3513.75	4.76
9845.00	91.54	133.94	6589.08	2453.5412 S	2559.7949 E	3545.74	1.99

## Directional Survey Data

Measured Depth (ft)	Inclination (deg)	Direction (deg)	Vertical Depth (ft)	Latitude (ft)	Departure (ft)	Vertical Section (ft)	Dogleg (°/100')
9876.00	91.85	133.66	6588.16	2474.9882 S	2582.1595 E	3576.73	1.36
9939.00	90.19	131.67	6587.04	2517.6728 S	2628.4747 E	3639.70	4.11
10003.00	90.99	133.12	6586.38	2560.8223 S	2675.7336 E	3703.68	2.59
10067.00	93.65	133.12	6583.79	2604.5311 S	2722.4039 E	3767.62	4.15
10099.00	93.71	133.30	6581.74	2626.3961 S	2745.6785 E	3799.56	0.58
10130.00	94.64	133.20	6579.49	2647.5808 S	2768.1974 E	3830.47	3.01
10162.00	95.57	133.08	6576.64	2669.3757 S	2791.4538 E	3862.35	2.93
10193.00	96.37	132.91	6573.42	2690.4002 S	2814.0050 E	3893.18	2.66
10226.00	96.69	132.90	6569.66	2712.7191 S	2838.0212 E	3925.96	0.95
10237.00	96.56	132.79	6568.39	2720.1494 S	2846.0324 E	3936.88	1.49
10258.00	96.31	132.91	6566.04	2734.3417 S	2861.3308 E	3957.75	1.31
10289.00	95.01	132.30	6562.98	2755.2229 S	2884.0371 E	3988.59	4.63
10321.00	94.50	131.60	6560.33	2776.5403 S	2907.7542 E	4020.47	2.67
10353.00	93.64	131.29	6558.05	2797.6682 S	2931.6795 E	4052.37	2.87
10385.00	91.91	131.42	6556.50	2818.7863 S	2955.6700 E	4084.30	5.43
10416.00	90.37	130.92	6555.89	2839.1895 S	2978.9995 E	4115.27	5.23
10448.00	90.62	130.75	6555.61	2860.1128 S	3003.2098 E	4147.23	0.94
10511.00	91.29	130.57	6554.56	2901.1563 S	3050.9934 E	4210.14	1.11
10543.00	90.68	130.21	6554.01	2921.8903 S	3075.3611 E	4242.08	2.23
10575.00	90.31	129.48	6553.73	2942.3921 S	3099.9291 E	4274.01	2.58
10606.00	90.62	129.55	6553.48	2962.1146 S	3123.8447 E	4304.93	1.03
10638.00	90.25	129.50	6553.24	2982.4784 S	3148.5277 E	4336.85	1.17
10669.00	89.38	129.02	6553.34	3002.0951 S	3172.5309 E	4367.76	3.19
10701.00	89.75	128.80	6553.58	3022.1938 S	3197.4303 E	4399.65	1.34
10733.00	91.11	129.38	6553.34	3042.3698 S	3222.2661 E	4431.55	4.60
10765.00	91.42	129.28	6552.64	3062.6455 S	3247.0127 E	4463.46	1.02
10821.00	91.42	129.28	6551.25	3098.0896 S	3290.3461 E	4519.28	0.00

## 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 133.60 DEGREES(TRUE)  
A TOTAL CORRECTION OF 8.86 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10821.00 FEET  
IS 4519.35 FEET ALONG 133.28 DEGREES (TRUE)

Survey @ 10821' MD is a linear projection to bit.