



**HALLIBURTON**

**Sperry Drilling Services**

**End of Well Report**

**for**

**Woodside Energy Ltd**

**Halladale-1 DW2**

**Rig: Ocean Patriot**

**Field:**

**Country: Australia**

**Job No: AU-FE-0003325468**

**Date: 10<sup>th</sup> April 2005**

**HALLIBURTON**

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## General Information

Company:	Woodside Energy Ltd	
Rig:	Ocean Patriot	
Well:	Halladale-1 DW2	
Field:		
Country:	Australia	
API Number:		
Sperry Job Number:	AU-FE-0003325468	
Job start date:	10-Apr-05	
Job end date:	18-Apr-05	
North reference:	Grid	
Declination:	10.895	deg
Dip angle:	-69.813	deg
Total magnetic field:	60816.250	nT
Date of magnetic data:	08-Apr-05	
Wellhead coordinates N:	38 deg. 34 min 45.54 sec South	GDA94
Wellhead coordinates E:	142 deg. 43 min 50.92 sec East	GDA94
Vertical section direction:	20.900	deg
MWD Engineers:	T.Oborne	M.Saunders
	C.Forster	A.Mullineux
Company Representatives:	D.Thorpe	
Company Geologist:	M.Ortiz	S.Billeau
Lease Name:	Vic P37	
Unit Number:	197	
State:	VIC	
County:		

## Operational Overview

Sperry Drilling Services were contracted by Woodside Energy Ltd to provide Logging While Drilling (LWD) services for the drilling of the exploration well Halladale-1 DW2 from the Ocean Patriot. Halladale-1 DW2 was kicked off from the well bore of Halladale-1 DW1 (Location Black Watch) at 853.0 mMDRT.

### 216 mm Hole Section:

This hole section was drilled to well TD at 1941.0 mMDRT in 4 bit runs (one of which was a coring run with no LWD tools) using Sperry's Formation Evaluation tool suite (FEWD) comprising Dual Gamma Ray (DGR), Electromagnetic Wave Resistivity (EWR-P4), Pressure while Drilling (PWD), Stabilized Litho-Density (SLD), Compensated Thermal Neutron (CTN), and Bi-Modal Acoustic Tool (BAT Sonic) for logging purposes and a Directional Motor (DM) for directional control. The first and second run utilised Sperry's Rotary Steerable tool Geo-Pilot with At Bit Inclination (ABI).

TOTALS	====>	1088.00	147.46	147.45	93.21	1	1
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## Bitrun Summary

Run Time Data		Drilling Data			Mud Data				
MWD Run :	0100	Start Depth :	853.00	m	Mud Type :	AQUA-DRILL			
Rig Bit No:	1	End Depth :	1514.00	m	Weight / Visc :	1.25	sg /	60.20	spl
Hole Size :	216.00	Footage :	661.00	m	Chlorides :	39000	ppm		
Run Start :	10-Apr-05 11:20	Avg. Flow Rate :	715	gpm	PV / YP :	37.00	cp /	13.90	pa
Run End :	13-Apr-05 04:00	Avg. RPM :	135	rpm	Solids/Sand :	7.8	% /	1	%
BRT Hrs :	64.66	Avg. WOB :	13.00	klb	%Oil / O:W :	N/A	% /	NA:100	
Circ. Hrs :	47.90	Avg. ROP :	18.80	m/hr	pH/Fluid Loss:	11.10	pH /	4.00	cptm
Oper. Hrs :	64.66	Avg. SPP :	3100	psig	Max. Temp. :	75.00	degC		
MWD Schematics		BHA Schematics							
<div><div>(10)</div><div>(9)</div><div>(8)</div><div>(7)</div><div>(6)</div><div>(5)</div><div>(4)</div><div>(3)</div><div>(2)</div><div>(1)</div></div> <div><div>10. Positive Pulser SN : 8301</div><div>9. TM SN : 76442</div><div>8. BAT SN : 134954 101.38 m From Bit</div><div>7. CTN SN : 173972 26.13 m From Bit</div><div>6. SLD SN : 182726 22.05 m From Bit</div><div>5. HCIM SN : 76442</div><div>4. PWD SN : 146538 16.37 m From Bit</div><div>3. EWR-P4 SN : 61101 13.85 m From Bit</div><div>2. DGR SN : 10505416 11.53 m From Bit</div><div>1. GeoPilot SN : N/A 4.33 m From Bit</div></div>		<div><div>(12)</div><div>(11)</div><div>(10)</div><div>(9)</div><div>(8)</div><div>(7)</div><div>(6)</div><div>(5)</div><div>(4)</div><div>(3)</div><div>(2)</div><div>(1)</div></div> <div><div>12. Drill Pipe (E) 853.44 127.000 108.610</div><div>11. HWDP 138.71 127.000 76.200</div><div>10. Spiral Drill collar 18.69 171.450 71.450</div><div>09. Drilling Jars 9.80 163.000 76.000</div><div>08. Spiral Drill collar 83.88 171.450 71.450</div><div>07. Circulating Sub 2.28 171.450 73.150</div><div>06. 3-Point String Reamer 2.02 171.450 73.150</div><div>05. Float Sub 0.62 171.450 73.150</div><div>04. Integral Blade Stabilizer 0.68 171.450 114.300</div><div>03. Flex Collar 2.80 171.450 57.150</div><div>02. MWD 26.37 171.450 73.151</div><div>01. Smith MA89BVCTPX 0.42 216.000 63.500</div></div>							
Comments					MWD Performance				
Drill from kick off point at 853.0 mMDRT to 1514.0 mMDRT.					Tool OD / Type : 171.45 mm / DIR-QUAD				
					MWD Real-time%: 95.00 %				
					MWD Recorded%: 100.00 %				
					Min. Inc. : 2.36 deg / 909.54 m				
					Max. Inc. : 23.70 deg / 1397.82 m				
					Final Az. : 347.81 deg				
					Max Op. Press. : 3100 psig				

## Bitrun Summary

Run Time Data		Drilling Data		Mud Data				
MWD Run :	0200	Start Depth :	1514.00 m	Mud Type :	AQUA-DRILL			
Rig Bit No:	2	End Depth :	1808.00 m	Weight / Visc :	1.25 sg /	67.50 spl		
Hole Size :	216.00 mm	Footage :	294.00 m	Chlorides :	47000 ppm			
Run Start :	13-Apr-05 07:43	Avg. Flow Rate :	700 gpm	PV / YP :	38.00 cp /	16.00 pa		
Run End :	15-Apr-05 11:25	Avg. RPM :	135 rpm	Solids/Sand :	8.29 % /	0.75 %		
BRT Hrs :	51.71	Avg. WOB :	18.20 klb	%Oil / O:W :	N/A % /	N/A:100		
Circ. Hrs :	32.00	Avg. ROP :	11.40 m/hr	pH/Fluid Loss:	9.50 pH /	4.00 cptm		
Oper. Hrs :	51.71	Avg. SPP :	3400 psig	Max. Temp. :	75.00 degC			
MWD Schematics		BHA Schematics						
<div><div><div>(10)</div><div></div></div><div><div>(9)</div><div></div></div><div><div>(8)</div><div></div></div><div><div>(7)</div><div></div></div><div><div>(6)</div><div></div></div><div><div>(5)</div><div></div></div><div><div>(4)</div><div></div></div><div><div>(3)</div><div></div></div><div><div>(2)</div><div></div></div><div><div>(1)</div><div></div></div></div> <div><div>10. Positive Pulser SN : 8530</div><div>9. TM SN : 76442</div><div>8. BAT SN : 145079 101.41 m From Bit</div><div>7. CTN SN : 173972 26.14 m From Bit</div><div>6. SLD SN : 182726 22.06 m From Bit</div><div>5. HCIM SN : 76442</div><div>4. PWD SN : 146538 16.37 m From Bit</div><div>3. EWR-P4 SN : 61101 13.86 m From Bit</div><div>2. DGR SN : 10505416 11.54 m From Bit</div><div>1. GeoPilot SN : N/A 4.36 m From Bit</div></div>		<div><div><div>(12)</div><div></div></div><div><div>(11)</div><div></div></div><div><div>(10)</div><div></div></div><div><div>(9)</div><div></div></div><div><div>(8)</div><div></div></div><div><div>(7)</div><div></div></div><div><div>(6)</div><div></div></div><div><div>(5)</div><div></div></div><div><div>(4)</div><div></div></div><div><div>(3)</div><div></div></div><div><div>(2)</div><div></div></div><div><div>(1)</div><div></div></div></div> <div><div>12. Drill Pipe (E) 853.44 127.000 108.610</div><div>11. HWDP 138.71 127.000 76.200</div><div>10. Spiral Drill collar 18.69 171.450 71.450</div><div>09. Drilling Jars 9.73 163.000 76.000</div><div>08. Spiral Drill collar 111.84 171.450 71.450</div><div>07. Circulating Sub 2.28 171.450 73.150</div><div>06. 3-Point String Reamer 1.61 171.450 73.150</div><div>05. Float Sub 0.62 171.450 73.150</div><div>04. Integral Blade Stabilizer 0.68 171.450 114.300</div><div>03. Flex Collar 2.80 171.450 57.150</div><div>02. MWD 26.37 171.450 73.151</div><div>01. DBS FMF3553 0.43 216.000 63.500</div></div>						
Comments				MWD Performance				
Drilled to core point at 1808.0 mMDRT. All recorded data was recovered at surface.				Tool OD / Type : 171.45 mm / DIR-QUAD				
				MWD Real-time%: 95.00 %				
				MWD Recorded%: 100.00 %				
				Min. Inc. : 21.26 deg / 1771.45 m				
				Max. Inc. : 22.06 deg / 1625.95 m				
				Final Az. : 343.64 deg				
				Max Op. Press. : 3100 psig				

## Bitrun Summary

Run Time Data		Drilling Data		Mud Data			
MWD Run :	0400	Start Depth :	1808.00 m	Mud Type :	AQUA-DRILL		
Rig Bit No:	4	End Depth :	1941.00 m	Weight / Visc :	1.25 sg /	91.80	spl
Hole Size :	216.00 mm	Footage :	133.00 m	Chlorides :	52000 ppm		
Run Start :	16-Apr-05 21:50	Avg. Flow Rate :	680 gpm	PV / YP :	41.00 cp /	19.63	pa
Run End :	18-Apr-05 04:55	Avg. RPM :	110 rpm	Solids/Sand :	8.75 % /	0.5	%
BRT Hrs :	31.08	Avg. WOB :	16.00 klb	%Oil / O:W :	N/A % /	N/A:100	
Circ. Hrs :	12.60	Avg. ROP :	18.00 m/hr	pH/Fluid Loss:	9.00 pH /	3.70	cptm
Oper. Hrs :	31.08	Avg. SPP :	3200 psig	Max. Temp. :	73.00 degC		
MWD Schematics		BHA Schematics					
<div><div><div>(10)</div><div>(9)</div><div>(8)</div><div>(7)</div><div>(6)</div><div>(5)</div><div>(4)</div><div>(3)</div><div>(2)</div><div>(1)</div></div><div><div>10. Positive Pulser SN : 8530</div><div>9. TM SN : 160772</div><div>8. BAT SN : 145079 81.56 m From Bit</div><div>7. CTN SN : 173972 20.06 m From Bit</div><div>6. SLD SN : 182726 16.01 m From Bit</div><div>5. HCIM SN : 160772</div><div>4. PWD SN : 121626 10.40 m From Bit</div><div>3. EWR-P4 SN : 74703 7.87 m From Bit</div><div>2. DGR SN : 176691 5.57 m From Bit</div><div>1. PM SN : 581139 3.14 m From Bit</div></div></div>		<div><div><div>(11)</div><div>(10)</div><div>(9)</div><div>(8)</div><div>(7)</div><div>(6)</div><div>(5)</div><div>(4)</div><div>(3)</div><div>(2)</div><div>(1)</div></div><div><div>Component</div><div>Length</div><div>O.D.</div><div>I.D.</div></div><div><div>(m)</div><div>(mm)</div><div>(mm)</div></div><div><div>11. Drill Pipe (E)</div><div>2500.00</div><div>127.000</div><div>108.610</div></div><div><div>10. HWDP</div><div>138.71</div><div>127.000</div><div>76.200</div></div><div><div>09. Spiral Drill collar</div><div>18.69</div><div>171.450</div><div>71.450</div></div><div><div>08. Drilling Jars</div><div>9.73</div><div>163.000</div><div>76.000</div></div><div><div>07. Spiral Drill collar</div><div>111.84</div><div>171.450</div><div>71.450</div></div><div><div>06. Circulating Sub</div><div>2.28</div><div>171.450</div><div>73.150</div></div><div><div>05. Float Sub</div><div>0.62</div><div>171.450</div><div>73.150</div></div><div><div>04. Integral Blade Stabilizer</div><div>0.67</div><div>171.450</div><div>114.300</div></div><div><div>03. MWD</div><div>26.27</div><div>171.450</div><div>73.151</div></div><div><div>02. Integral Blade Stabilizer</div><div>1.37</div><div>200.000</div><div>73.000</div></div><div><div>01. DBS FM3653</div><div>0.30</div><div>216.000</div><div>63.500</div></div></div>					
Comments				MWD Performance			
Drilled to TD at 1941.0 mMDRT. All recorded data was recovered at surface.				Tool OD / Type :	171.45 mm /	DIR-QUAD	
				MWD Real-time%:	95.00 %		
				MWD Recorded%:	100.00 %		
				Min. Inc. :	19.03 deg /	1936.36	m
				Max. Inc. :	20.58 deg /	1855.71	m
				Final Az. :	343.20 deg		
				Max Op. Press. :	3360 psig		



## Directional Survey Data

Measured Depth (metres)	Inclination (degrees)	Direction (degrees)	Vertical Depth (metres)	Latitude (metres)	Departure (metres)	Vertical Section (metres)	Dogleg (deg/30m)
810.51	4.59	213.32	810.22	1.72 S	9.64 W	-5.04	TIE-IN
852.56	4.74	218.31	852.13	4.49 S	11.64 W	-8.34	0.31
881.04	3.38	227.57	880.54	5.98 S	12.99 W	-10.22	1.59
909.54	2.36	275.21	909.01	6.49 S	14.19 W	-11.13	2.63
938.46	2.99	330.60	937.90	5.78 S	15.16 W	-10.80	2.64
967.34	4.38	356.47	966.72	4.02 S	15.60 W	-9.32	2.22
996.06	7.12	4.58	995.29	1.15 S	15.52 W	-6.61	2.98
1024.96	9.29	0.02	1023.90	2.97 N	15.38 W	-2.71	2.35
1055.56	12.32	353.37	1053.95	8.68 N	15.75 W	2.49	3.21
1084.42	14.52	350.57	1082.02	15.31 N	16.70 W	8.34	2.38
1112.89	16.05	349.61	1109.48	22.70 N	18.00 W	14.79	1.63
1141.34	17.92	346.59	1136.69	30.83 N	19.72 W	21.77	2.18
1169.86	20.36	343.90	1163.64	39.87 N	22.11 W	29.35	2.73
1198.20	21.57	340.05	1190.10	49.50 N	25.26 W	37.23	1.94
1226.91	21.90	339.02	1216.77	59.46 N	28.98 W	45.21	0.53
1256.08	22.21	337.21	1243.80	69.62 N	33.06 W	53.25	0.77
1284.96	21.89	340.96	1270.57	79.74 N	36.93 W	61.32	1.50
1311.61	23.12	342.06	1295.19	89.42 N	40.16 W	69.21	1.46
1340.28	23.01	345.53	1321.57	100.20 N	43.30 W	78.16	1.43
1368.83	22.99	346.35	1347.85	111.02 N	46.01 W	87.30	0.34
1397.82	23.70	346.53	1374.47	122.19 N	48.70 W	96.78	0.74
1426.75	22.93	345.84	1401.04	133.31 N	51.43 W	106.19	0.85
1454.77	22.79	347.81	1426.86	143.90 N	53.91 W	115.20	0.83
1503.00	21.72	346.50	1471.49	161.71 N	57.97 W	130.39	0.73
1510.75	21.22	346.89	1478.71	164.47 N	58.62 W	132.74	2.01
1539.56	21.91	348.03	1505.50	174.81 N	60.92 W	141.58	0.84
1568.70	21.37	347.26	1532.59	185.31 N	63.22 W	150.56	0.63
1597.38	21.89	344.99	1559.25	195.57 N	65.76 W	159.24	1.03
1625.95	22.06	342.29	1585.74	205.82 N	68.77 W	167.75	1.08
1654.30	21.72	343.30	1612.05	215.92 N	71.89 W	176.07	0.54
1683.20	21.55	344.71	1638.91	226.16 N	74.83 W	184.59	0.57
1714.56	21.72	343.34	1668.06	237.28 N	78.01 W	193.83	0.51
1742.32	21.67	344.05	1693.86	247.12 N	80.89 W	202.01	0.29
1771.45	21.26	343.64	1720.97	257.36 N	83.86 W	210.51	0.45
1795.60	21.51	343.38	1743.45	265.81 N	86.36 W	217.51	0.33
1855.71	20.58	343.78	1799.55	286.51 N	92.46 W	234.68	0.47
1884.13	19.43	342.64	1826.26	295.82 N	95.27 W	242.37	1.28
1912.69	19.24	343.45	1853.21	304.86 N	98.03 W	249.84	0.35
1936.36	19.03	343.20	1875.57	312.30 N	100.25 W	255.99	0.29
1941.00	19.03	343.20	1879.96	313.75 N	100.69 W	257.18	0.00

## Directional Survey Data

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 20.90 DEGREES (GRID)

A TOTAL CORRECTION OF 11.98 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.

HORIZONTAL DISPLACEMENT(CLOSURE) AT 1941.00 METRES

IS 329.51 METRES ALONG 342.21 DEGREES (GRID)

RT-LAT = 21.5m

All surveys SUCOP axial corrected

DW2 was sidetracked from the well bore of DW1 at 853.0 mMDRT

Final survey is projected to TD

## Service Interrupt Report

MWD run number :	0100	Time/Date of Failure :	12-Apr-05 12:48
Rig Bit Number :	1	Depth at time of Failure :	1473.00 m
MWD Run start time/date :	10-Apr-05 11:16	Lost Rig Hours :	1.00
MWD Run end time/date :	13-Apr-05 03:00		

### Rig Activity

Drilling AHD

### Description of Failure

Pulser stopped pulsing, no detection.

### Action Taken

Cycled pumps and changed out pressure transducers.

### Operation Impact

Down time to change out pressure transducers. Drilled ahead to a change in formation and then POOH.

### Reason for Failure

Preliminary cause determined at rig site to be hydraulic failure of pulser.

