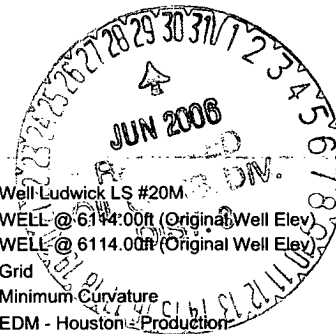




Scientific Drilling

Survey Report

30-045-32920



Company: North America - Onshore US - BP
 Project: Western - San Juan South
 Site: SEC 29-T30N-R10W
 Well: Ludwick LS #20M
 Wellbore: OH
 Design: OH

Local Co-ordinate Reference:
 TVD Reference:
 MD Reference:
 North Reference:
 Survey Calculation Method:
 Database:

Well Ludwick LS #20M
 WELL @ 6114.00ft (Original Well Elev)
 WELL @ 6114.00ft (Original Well Elev)
 Grid
 Minimum Curvature
 EDM - Houston - Production

Project Western - San Juan South

Map System: US State Plane 1983
 Geo Datum: North American Datum 1983
 Map Zone: New Mexico Western Zone

System Datum: *Surface 1640/N 1800/W* Mean Sea Level
BHL 1678/N 1833/W Using geodetic scale factor

TVD 7175
 MD 7241

Site SEC 29-T30N-R10W

Site Position: Northing: 2,105,312.182 ft Latitude: 36° 47' 08.381" N
 From: Lat/Long Easting: 2,748,917.352 ft Longitude: 107° 44' 42.499" W
 Position Uncertainty: 0.00 ft Slot Radius: in Grid Convergence: 0.05 °

Well Ludwick LS #20M

Well Position +N/-S 0.00 ft Northing: 2,105,312.182 ft Latitude: 36° 47' 08.381" N
 +E/-W 0.00 ft Easting: 2,748,917.352 ft Longitude: 107° 44' 42.499" W
 Position Uncertainty 0.00 ft Wellhead Elevation: ft Ground Level: 6,100.00 ft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2005	5/9/2006	10.55	63.66	51,295

Design OH

Audit Notes:

Version: 1.0 Phase: ACTUAL Tie On Depth:

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	95.270

Survey Program Date 6/14/2006

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
426.00	4,560.00	MWD Survey (OH)	MWD ISCWSA	MWD - Standard
4,661.50	7,241.00	projected Survey (OH)	BLIND	Blind drilling

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	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
426.00	2.950	329.370	425.81	9.43	-5.59	-6.43	0.69	0.69	0.00
457.00	2.890	327.740	456.77	10.78	-6.41	-7.37	0.33	-0.19	-5.26
487.00	2.100	332.760	486.74	11.91	-7.07	-8.13	2.73	-2.63	16.73
518.00	0.800	27.180	517.73	12.61	-7.23	-8.35	5.67	-4.19	175.55
549.00	1.450	95.950	548.73	12.76	-6.74	-7.88	4.45	2.10	221.84
580.00	3.020	104.810	579.70	12.51	-5.56	-6.68	5.17	5.06	28.58
609.00	4.380	104.780	608.64	12.03	-3.75	-4.84	4.69	4.69	-0.10
640.00	5.780	110.110	639.52	11.19	-1.14	-2.16	4.76	4.52	17.19
670.00	7.100	109.960	669.33	10.04	2.02	1.09	4.40	4.40	-0.50
701.00	8.460	107.230	700.04	8.71	6.00	5.18	4.54	4.39	-8.81
731.00	9.710	103.550	729.67	7.47	10.57	9.84	4.59	4.17	-12.27

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TVD Reference: WELL @ 6114.00ft (Original Well Elev)
MD Reference: WELL @ 6114.00ft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM - Houston - Production

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)
762.00	10.890	99.610	760.17	6.36	16.00	15.35	4.43	3.81	-12.71
793.00	11.840	93.530	790.56	5.68	22.06	21.45	4.93	3.06	-19.61
823.00	13.170	93.350	819.85	5.29	28.54	27.94	4.44	4.43	-0.60
858.00	13.210	91.820	853.93	4.93	36.52	35.92	1.00	0.11	-4.37
890.00	13.770	86.080	885.04	5.07	43.98	43.32	4.53	1.75	-17.94
922.00	14.830	84.440	916.05	5.73	51.85	51.11	3.55	3.31	-5.12
954.00	14.510	83.120	947.01	6.61	59.91	59.05	1.45	-1.00	-4.12
986.00	14.750	86.020	977.97	7.37	67.95	66.99	2.41	0.75	9.06
1,017.00	15.380	84.990	1,007.91	8.00	75.98	74.93	2.21	2.03	-3.32
1,049.00	16.010	83.560	1,038.71	8.87	84.60	83.42	2.31	1.97	-4.47
1,111.00	16.570	83.820	1,098.22	10.78	101.88	100.46	0.91	0.90	0.42
1,175.00	16.180	84.240	1,159.63	12.66	119.83	118.16	0.64	-0.61	0.66
1,239.00	16.390	84.300	1,221.06	14.45	137.68	135.78	0.33	0.33	0.09
1,303.00	16.450	83.020	1,282.45	16.45	155.66	153.50	0.57	0.09	-2.00
1,366.00	16.210	83.530	1,342.91	18.52	173.26	170.82	0.44	-0.38	0.81
1,430.00	15.660	84.910	1,404.45	20.30	190.74	188.06	1.04	-0.86	2.16
1,493.00	15.580	88.750	1,465.12	21.23	207.66	204.84	1.65	-0.13	6.10
1,557.00	15.630	91.580	1,526.77	21.18	224.87	221.98	1.19	0.08	4.42
1,619.00	15.690	95.210	1,586.47	20.19	241.57	238.70	1.58	0.10	5.85
1,684.00	15.690	92.570	1,649.04	19.00	259.11	256.27	1.10	0.00	-4.06
1,745.00	15.810	93.760	1,707.75	18.09	275.64	272.81	0.56	0.20	1.95
1,809.00	14.830	97.880	1,769.48	16.39	292.45	289.71	2.29	-1.53	6.44
1,872.00	13.550	98.650	1,830.56	14.18	307.73	305.13	2.05	-2.03	1.22
1,937.00	13.500	97.960	1,893.76	11.98	322.78	320.31	0.26	-0.08	-1.06
2,000.00	13.290	97.360	1,955.04	10.03	337.24	334.89	0.40	-0.33	-0.95
2,064.00	13.090	100.010	2,017.35	7.83	351.67	349.47	1.00	-0.31	4.14
2,127.00	13.320	100.320	2,078.69	5.29	365.84	363.81	0.38	0.37	0.49
2,191.00	13.120	101.670	2,140.99	2.50	380.21	378.37	0.57	-0.31	2.11
2,253.00	11.740	104.540	2,201.54	-0.51	393.20	391.59	2.44	-2.23	4.63
2,318.00	11.330	104.620	2,265.22	-3.78	405.78	404.41	0.63	-0.63	0.12
2,382.00	11.180	104.030	2,327.99	-6.87	417.89	416.75	0.30	-0.23	-0.92
2,445.00	10.690	104.300	2,389.85	-9.79	429.47	428.56	0.78	-0.78	0.43
2,510.00	9.050	100.490	2,453.89	-12.21	440.34	439.60	2.71	-2.52	-5.86
2,574.00	8.420	98.030	2,517.14	-13.78	449.93	449.30	1.14	-0.98	-3.84
2,637.00	8.450	97.010	2,579.46	-14.99	459.09	458.53	0.24	0.05	-1.62
2,700.00	7.450	99.890	2,641.86	-16.26	467.71	467.23	1.71	-1.59	4.57
2,763.00	6.960	102.300	2,704.36	-17.77	475.46	475.09	0.91	-0.78	3.83
2,795.00	6.970	99.990	2,736.12	-18.52	479.27	478.95	0.88	0.03	-7.22
2,826.00	7.460	92.580	2,766.88	-18.94	483.13	482.83	3.39	1.58	-23.90
2,890.00	7.550	87.500	2,830.33	-18.94	491.48	491.15	1.05	0.14	-7.94
2,921.00	7.450	87.930	2,861.07	-18.78	495.53	495.16	0.37	-0.32	1.39
2,953.00	7.290	88.940	2,892.80	-18.67	499.63	499.23	0.64	-0.50	3.16
2,985.00	7.120	91.710	2,924.55	-18.69	503.64	503.23	1.21	-0.53	8.66
3,017.00	6.930	92.080	2,956.31	-18.82	507.55	507.14	0.61	-0.59	1.16
3,080.00	6.340	95.360	3,018.89	-19.28	514.82	514.41	1.11	-0.94	5.21
3,144.00	6.070	98.100	3,082.51	-20.09	521.68	521.32	0.63	-0.42	4.28
3,175.00	5.720	97.460	3,113.35	-20.52	524.84	524.51	1.15	-1.13	-2.06
3,207.00	5.620	99.350	3,145.19	-20.98	527.97	527.66	0.66	-0.31	5.91
3,239.00	5.170	102.040	3,177.05	-21.54	530.92	530.66	1.61	-1.41	8.41
3,270.00	5.310	100.880	3,207.92	-22.10	533.70	533.47	0.57	0.45	-3.74
3,301.00	5.730	100.510	3,238.78	-22.65	536.63	536.44	1.36	1.35	-1.19
3,333.00	5.770	98.170	3,270.61	-23.17	539.79	539.64	0.74	0.12	-7.31
3,364.00	5.870	97.930	3,301.45	-23.61	542.90	542.78	0.33	0.32	-0.77
3,396.00	5.640	95.510	3,333.29	-23.99	546.09	545.98	1.04	-0.72	-7.56

Company:	North America - Onshore US - BP	Local Co-ordinate Reference:	Well Ludwick LS #20M
Project:	Western - San Juan South	TVD Reference:	WELL @ 6114.00ft (Original Well Elev)
Site:	SEC 29-T30N-R10W	MD Reference:	WELL @ 6114.00ft (Original Well Elev)
Well:	Ludwick LS #20M	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM - Houston - Production

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)
3,427.00	5.460	96.840	3,364.15	-24.31	549.07	548.98	0.71	-0.58	4.29
3,458.00	5.290	96.000	3,395.01	-24.64	551.95	551.88	0.60	-0.55	-2.71
3,489.00	4.850	99.170	3,425.89	-25.00	554.67	554.62	1.68	-1.42	10.23
3,521.00	4.630	98.650	3,457.78	-25.41	557.28	557.26	0.70	-0.69	-1.62
3,552.00	4.380	102.500	3,488.69	-25.85	559.67	559.68	1.27	-0.81	12.42
3,585.00	4.080	99.680	3,521.60	-26.32	562.06	562.10	1.11	-0.91	-8.55
3,616.00	3.900	104.320	3,552.52	-26.77	564.17	564.24	1.19	-0.58	14.97
3,648.00	4.010	104.990	3,584.44	-27.33	566.31	566.42	0.37	0.34	2.09
3,679.00	4.770	99.610	3,615.35	-27.82	568.62	568.78	2.79	2.45	-17.35
3,711.00	5.120	99.490	3,647.23	-28.28	571.34	571.53	1.09	1.09	-0.37
3,742.00	5.660	101.840	3,678.10	-28.82	574.20	574.42	1.88	1.74	7.58
3,774.00	5.160	97.760	3,709.95	-29.34	577.17	577.43	1.97	-1.56	-12.75
3,806.00	4.950	102.700	3,741.83	-29.84	579.95	580.24	1.51	-0.66	15.44
3,838.00	4.750	99.740	3,773.72	-30.36	582.60	582.93	1.00	-0.62	-9.25
3,870.00	4.760	99.210	3,805.61	-30.80	585.22	585.57	0.14	0.03	-1.66
3,902.00	4.430	100.300	3,837.50	-31.23	587.74	588.13	1.07	-1.03	3.41
3,934.00	4.140	99.500	3,869.41	-31.65	590.10	590.51	0.93	-0.91	-2.50
3,964.00	4.570	99.300	3,899.33	-32.02	592.35	592.78	1.43	1.43	-0.67
3,997.00	4.620	99.150	3,932.22	-32.44	594.96	595.42	0.16	0.15	-0.45
4,028.00	4.620	95.070	3,963.12	-32.75	597.43	597.91	1.06	0.00	-13.16
4,061.00	4.210	97.910	3,996.02	-33.03	599.95	600.45	1.41	-1.24	8.61
4,092.00	3.990	101.200	4,026.94	-33.40	602.14	602.66	1.04	-0.71	10.61
4,156.00	3.740	99.920	4,090.80	-34.19	606.38	606.96	0.41	-0.39	-2.00
4,219.00	3.820	96.800	4,153.66	-34.80	610.49	611.10	0.35	0.13	-4.95
4,283.00	3.520	96.530	4,217.53	-35.27	614.56	615.20	0.47	-0.47	-0.42
4,347.00	3.250	99.790	4,281.42	-35.80	618.30	618.97	0.52	-0.42	5.09
4,411.00	3.330	96.480	4,345.31	-36.32	621.93	622.64	0.32	0.12	-5.17
4,474.00	3.100	96.480	4,408.21	-36.72	625.44	626.17	0.37	-0.37	0.00
4,495.00	3.050	96.520	4,429.18	-36.85	626.56	627.30	0.24	-0.24	0.19
4,550.90	3.050	96.520	4,485.00	-37.19	629.52	630.27	0.00	0.00	0.00
CSG.PT.-20M									
4,554.00	3.050	96.520	4,488.10	-37.20	629.68	630.44	0.00	0.00	0.00
7"									
4,560.00	3.050	96.520	4,494.09	-37.24	630.00	630.75	0.00	0.00	0.00
4,661.50	0.000	96.520	4,595.54	-37.55	632.68	633.46	3.00	-3.00	0.00
7,241.00	0.000	0.000	7,175.04	-37.55	632.68	633.46	0.00	0.00	0.00



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Survey Report



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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM - Houston - Production

Targets

Target Name

- hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S ft	+E/-W ft	Northing (ft)	Easting (ft)	Latitude	Longitude
PBHL-20M - actual wellpath misses by 41.25ft at 7241.00ft MD (7175.04 TVD, -37.55 N, 632.68 E) - Circle (radius 100.00)	0.00	0.00	7,205.00	-60.00	650.00	2,105,252.187	2,749,567.298	36° 47' 07.782" N	107° 44' 34.509" W
CSG.PT.-20M - actual wellpath misses by 30.66ft at 4550.90ft MD (4485.00 TVD, -37.19 N, 629.52 E) - Point	0.00	0.00	4,485.00	-60.00	650.00	2,105,252.187	2,749,567.298	36° 47' 07.782" N	107° 44' 34.509" W

Casing Points

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (in)	Hole Diameter (in)
4,554.00	4,488.10	7"	7.000	7.500

Checked By: _____ Approved By: _____ Date: _____