

COG Operating LLC

Eddy County, NM (NAD27 NME)

Submarine 10 Federal Com #4H

#4H

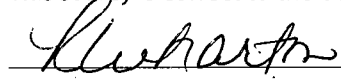
OH - Job #32H11121415

15-40545

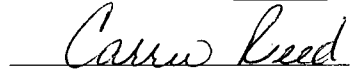
Survey: MWD

SDI Standard Survey Report

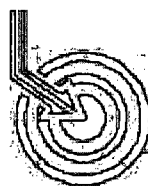
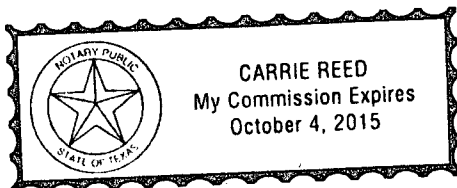
This survey is correct to the best of my knowledge and is supported by actual field data.



Notarized this date 31st of December, 2012.



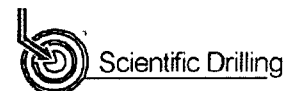
Notary Signature
County of Midland
State of Texas



Scientific Drilling



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #4H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3640.00usft (UDI #40)
Site:	Submarine 10 Federal Com #4H	MD Reference:	RF @ 3640.00usft (UDI #40)
Well:	#4H	North Reference:	Grid
Wellbore:	OH - Job #32H11121415	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM-Regulatory

Project	Eddy County, NM (NAD27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Submarine 10 Federal Com #4H		
Site Position:	Map	Northing:	673,045.30 usft
From:		Easting:	585,878.80 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16"
		Latitude:	32° 50' 59.905 N
		Longitude:	104° 3' 13.285 W
		Grid Convergence:	0.15 °

Well	#4H		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft
		Latitude:	32° 50' 59.905 N
		Longitude:	104° 3' 13.285 W
		Ground Level:	3,626.00 usft

Wellbore	OH - Job #32H11121415				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	BGGM2012	11/13/12			

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0.00	0.00	0.00	269.62	

Survey Program	Date 12/02/12				
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100.00	4,550.00	VES Gyro (OH - Job #32H11121415)	UNKNOWN	Unknown survey	
4,600.00	9,941.00	MWD (OH - Job #32H11121415)	MWD	MWD - Standard	

Survey								
Measured Depth	Inclination	Azimuth	True Vertical	North/South	East/West	Closure Azimuth	Closure Distance	
(usft)	(°)	(°)	Depth	(usft)	(usft)	(°)	(usft)	
4,550.00	0.31	289.17	4,549.36	39.17	32.89	40.02	51.15	
4,600.00	0.31	289.17	4,599.36	39.26	32.64	39.74	51.06	
4,607.00	0.26	291.52	4,606.36	39.27	32.61	39.70	51.04	
4,639.00	0.18	295.39	4,638.36	39.32	32.49	39.57	51.01	
4,671.00	0.44	249.07	4,670.36	39.30	32.33	39.45	50.89	
4,702.00	2.29	243.82	4,701.35	38.98	31.67	39.09	50.22	
4,734.00	4.39	246.52	4,733.30	38.21	29.97	38.11	48.56	
4,766.00	6.69	253.74	4,765.15	37.20	27.06	36.03	46.00	
4,798.00	9.32	259.09	4,796.83	36.19	22.72	32.12	42.73	
4,829.00	12.31	258.92	4,827.28	35.08	17.01	25.87	38.99	
4,861.00	15.65	257.86	4,858.33	33.52	9.44	15.73	34.82	



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Site:	Submarine 10 Federal Com #4H	MD Reference:	RF @ 3640.00usft (UDI #40)
Well:	#4H	North Reference:	Grid
Wellbore:	OH - Job #32H11121415	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
4,893.00	18.99	257.60	4,888.87	31.49	0.13	0.25	31.49
4,925.00	22.86	258.48	4,918.75	29.13	-11.04	339.23	31.15
4,957.00	27.15	260.48	4,947.75	26.68	-24.34	317.62	36.12
4,988.00	31.22	261.64	4,974.81	24.34	-39.27	301.79	46.20
5,020.00	35.09	263.04	5,001.59	22.02	-56.62	291.25	60.75
5,052.00	39.14	265.39	5,027.11	20.09	-75.82	284.84	78.44
5,083.00	43.41	267.55	5,050.40	18.85	-96.23	281.08	98.05
5,115.00	47.61	269.93	5,072.82	18.36	-119.04	278.77	120.45
5,147.00	51.19	272.15	5,093.65	18.82	-143.33	277.48	144.56
5,179.00	54.34	272.71	5,113.01	19.90	-168.78	276.72	169.95
5,210.00	58.48	273.59	5,130.15	21.32	-194.55	276.25	195.72
5,242.00	63.20	274.92	5,145.74	23.40	-222.41	276.01	223.64
5,274.00	67.36	274.65	5,159.12	25.83	-251.37	275.87	252.70
5,305.00	69.91	275.79	5,170.41	28.46	-280.12	275.80	281.56
5,313.19	70.74	275.68	5,173.17	29.23	-287.80	275.80	289.28
PP-330' FEL Submarine 10 #4H							
5,315.83	71.01	275.64	5,174.04	29.47	-290.28	275.80	291.77
PP-330' FEL Submarine 10 #4H							
5,337.00	73.16	275.35	5,180.55	31.40	-310.32	275.78	311.91
5,369.00	77.38	273.33	5,188.68	33.74	-341.18	275.65	342.84
5,401.00	82.04	273.73	5,194.40	35.68	-372.59	275.47	374.30
5,433.00	85.91	276.49	5,197.76	38.51	-404.28	275.44	406.11
5,463.00	89.08	275.70	5,199.07	41.69	-434.08	275.49	436.08
5,494.00	89.52	274.00	5,199.45	44.31	-464.96	275.44	467.07
5,558.00	89.69	273.24	5,199.89	48.35	-528.83	275.22	531.04
5,590.00	89.78	272.54	5,200.03	49.97	-560.79	275.09	563.01
5,685.00	91.28	271.40	5,199.16	53.23	-655.73	274.64	657.89
5,780.00	91.80	270.34	5,196.60	54.68	-750.68	274.17	752.67
5,875.00	91.71	269.55	5,193.69	54.58	-845.64	273.69	847.40
5,970.00	91.36	269.55	5,191.15	53.84	-940.60	273.28	942.14
6,065.00	91.45	268.76	5,188.82	52.44	-1,035.56	272.90	1,036.89
6,160.00	91.10	268.14	5,186.70	49.87	-1,130.50	272.53	1,131.60
6,255.00	90.48	267.53	5,185.40	46.28	-1,225.42	272.16	1,226.30
6,350.00	91.19	266.91	5,184.01	41.67	-1,320.30	271.81	1,320.96
6,446.00	90.75	267.70	5,182.39	37.16	-1,416.18	271.50	1,416.67
6,541.00	91.92	267.68	5,180.17	33.33	-1,511.07	271.26	1,511.44
6,604.00	91.98	267.27	5,178.03	30.56	-1,573.98	271.11	1,574.27
6,667.00	91.71	266.63	5,176.00	27.21	-1,636.85	270.95	1,637.08
6,731.00	90.75	266.65	5,174.63	23.46	-1,700.73	270.79	1,700.89
6,794.00	90.84	267.00	5,173.75	19.97	-1,763.63	270.65	1,763.74
6,858.00	90.48	266.91	5,173.01	16.57	-1,827.53	270.52	1,827.61
6,921.00	90.22	267.70	5,172.63	13.61	-1,890.46	270.41	1,890.51
6,984.00	89.69	268.50	5,172.68	11.52	-1,953.42	270.34	1,953.46
7,048.00	90.13	269.02	5,172.78	10.13	-2,017.41	270.29	2,017.43
7,143.00	90.40	268.64	5,172.34	8.19	-2,112.39	270.22	2,112.40



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Site:	Submarine 10 Federal Com #4H	MD Reference:	RF @ 3640.00usft (UDI #40)
Well:	#4H	North Reference:	Grid
Wellbore:	OH - Job #32H11121415	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
7,238.00	91.36	268.50	5,170.88	5.82	-2,207.35	270.15	2,207.35
7,321.00	91.71	268.93	5,168.66	3.96	-2,290.29	270.10	2,290.30
7,396.00	90.92	270.08	5,166.94	3.32	-2,365.27	270.08	2,365.27
7,492.00	91.71	269.81	5,164.73	3.22	-2,461.24	270.08	2,461.25
7,587.00	91.28	269.99	5,162.26	3.06	-2,556.21	270.07	2,556.21
7,682.00	90.57	269.90	5,160.72	2.97	-2,651.20	270.06	2,651.20
7,777.00	91.80	270.08	5,158.76	2.95	-2,746.18	270.06	2,746.18
7,872.00	90.66	268.67	5,156.72	1.91	-2,841.14	270.04	2,841.15
7,968.00	91.63	268.67	5,154.80	-0.31	-2,937.10	269.99	2,937.10
8,063.00	91.19	268.58	5,152.46	-2.59	-3,032.04	269.95	3,032.04
8,126.00	91.28	268.14	5,151.10	-4.40	-3,095.00	269.92	3,095.00
8,190.00	91.41	268.44	5,149.60	-6.30	-3,158.96	269.89	3,158.96
8,253.00	91.10	269.02	5,148.22	-7.70	-3,221.92	269.86	3,221.93
8,316.00	90.75	269.46	5,147.20	-8.54	-3,284.91	269.85	3,284.92
8,412.00	90.84	269.64	5,145.87	-9.29	-3,380.90	269.84	3,380.91
8,507.00	91.98	269.46	5,143.54	-10.04	-3,475.86	269.83	3,475.88
8,570.00	91.54	269.20	5,141.60	-10.77	-3,538.83	269.83	3,538.85
8,665.00	88.90	268.14	5,141.24	-12.98	-3,633.79	269.80	3,633.82
8,729.00	87.58	268.58	5,143.20	-14.81	-3,697.74	269.77	3,697.77
8,792.00	89.08	268.76	5,145.04	-16.27	-3,760.69	269.75	3,760.73
8,888.00	91.28	268.67	5,144.74	-18.42	-3,856.66	269.73	3,856.70
8,951.00	91.98	268.23	5,142.94	-20.13	-3,919.61	269.71	3,919.66
9,021.00	91.63	267.79	5,140.74	-22.56	-3,989.53	269.68	3,989.60
9,078.00	91.80	268.23	5,139.03	-24.53	-4,046.47	269.65	4,046.55
9,141.00	92.24	268.85	5,136.81	-26.14	-4,109.41	269.64	4,109.50
9,205.00	91.14	268.50	5,134.92	-27.62	-4,173.37	269.62	4,173.46
9,268.00	90.57	268.76	5,133.98	-29.12	-4,236.34	269.61	4,236.44
9,332.00	90.75	269.55	5,133.25	-30.07	-4,300.33	269.60	4,300.44
9,427.00	91.36	271.57	5,131.50	-29.14	-4,395.30	269.62	4,395.40
9,510.00	92.77	271.40	5,128.51	-26.99	-4,478.22	269.65	4,478.30
9,554.00	92.33	271.48	5,126.55	-25.88	-4,522.16	269.67	4,522.24
9,617.00	90.92	271.57	5,124.76	-24.21	-4,585.11	269.70	4,585.18
9,680.00	90.13	270.96	5,124.19	-22.82	-4,648.10	269.72	4,648.15
9,775.00	91.89	270.78	5,122.51	-21.38	-4,743.07	269.74	4,743.11
9,839.00	91.63	269.81	5,120.55	-21.05	-4,807.03	269.75	4,807.08
9,883.00	91.36	269.29	5,119.40	-21.39	-4,851.02	269.75	4,851.06
Last MWD Survey							
9,941.00	91.00	269.16	5,118.20	-22.18	-4,909.00	269.74	4,909.05
Projection to Bit - PBHL-Submarine 10 #4H.							



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #4H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3640.00usft (UDI #40)
Site:	Submarine 10 Federal Com #4H	MD Reference:	RF @ 3640.00usft (UDI #40)
Well:	#4H	North Reference:	Grid
Wellbore:	OH - Job #32H11121415	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	EDM-Regulatory

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
9,883.00	5,119.40	-21.39	-4,851.02	Last MWD Survey
9,941.00	5,118.20	-22.18	-4,909.00	Projection to Bit



Submarine 10 Federal Com#4H
Eddy County, NM (NAN27 NME)
Northing: (Y) 673045.30
Easting: (X) 585878.80
Plan #5 vs Actual 8-3/4" Hole



Azimuths to Grid North
True North: -0.15°
Magnetic North: 7.64°

Magnetic Field
Strength: 48780.45nT
Dip Angle: 60.61°
Date: 11/13/2012
Model: BGGM2012

To convert a Magnetic Direction to a Grid Direction, Add 7.64°
To convert a True Direction to a Grid Direction, Subtract 0.15°

WELL DETAILS:

+N/-S	+E/-W	Ground Level:	3626.00	Latitude	Longitude
0.00	0.00	Northing	673045.30	Easting	585878.80
				32° 50' 59.905 N	104° 3' 13.285 W

SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	V Sect	Target
4550.00	0.31	289.17	4549.36	39.17	32.89	0.00	0.00	-33.15	
4722.54	0.31	289.17	4721.90	39.48	32.01	0.00	0.00	-32.27	
5483.38	90.99	289.16	5200.00	33.17	-456.90	11.92	-20.01	456.67	
9947.25	90.99	269.16	5122.50	-32.60	-4919.61	0.00	0.00	4919.71	PBHL

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting
PBHL	5122.50	-32.60	-4919.61	673012.70	580959.60
PP-330' FEL	5173.16	35.58	-290.00	673080.87	585588.82

SITE DETAILS:

Submarine 10 Federal Com
Site Centre Northing: 673045.30
Easting: 585878.80

Positional Uncertainty: 0.00
Convergence: 0.15
Local North: Grid

PROJECT DETAILS:

Eddy County, NM (NAN27 NME)
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001

System Datum: Mean Sea Level

Map System: US State Plane 1927 (Exact solution)

Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone Name: New Mexico East 3001

Local Origin: Well #4H, Grid North

Latitude: 32° 50' 59.905 N
Longitude: 104° 3' 13.285 W

Grid East: 585878.80
Grid North: 673045.30
Scale Factor: 1.000

Geomagnetic Model: BGGM2012

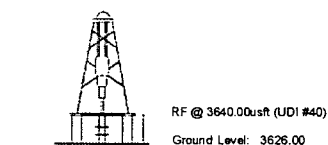
Sample Date: 13-Nov-12

Magnetic Declination: 7.79°

Dip Angle from Horizontal: 60.61°

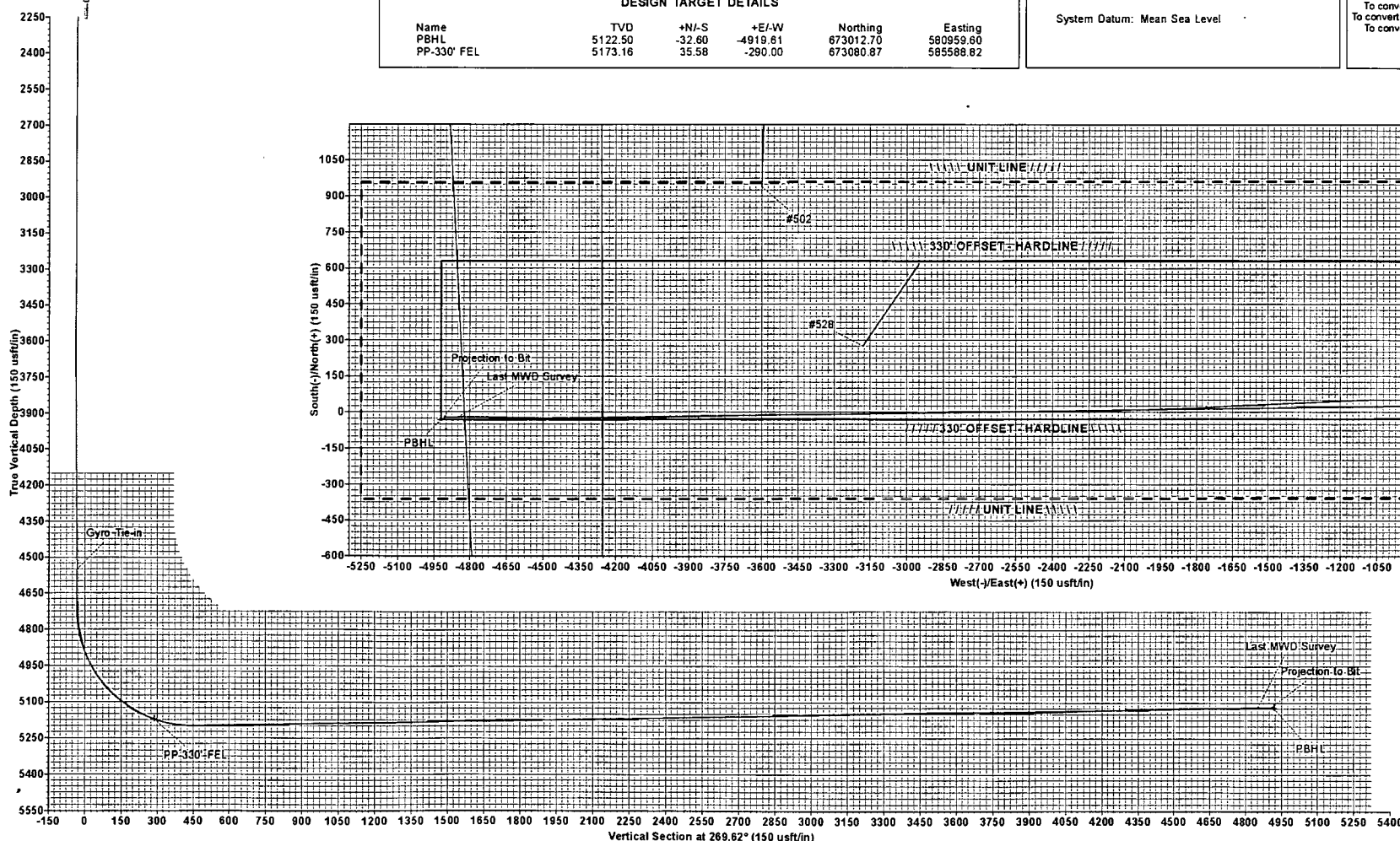
Magnetic Field Strength: 48780

To convert a Magnetic Direction to a Grid Direction, Add 7.64°
To convert a Magnetic Direction to a True Direction, Add 7.79° East
To convert a True Direction to a Grid Direction, Subtract 0.15°



RF @ 3640.00usft (UDI #40)

Ground Level: 3626.00



WELL NAME AND NUMBER Submarine 10 Federal Com 4H
LOCATION Section 10, T17S, R29E, Lot H, 2285 FNL, 40 FEL, Eddy County
OPERATOR COG Operating LLC
DRILLING CONTRACTOR United Drilling, Inc.

The undersigned hereby certifies that he is an authorized representative of the drilling contractor who drilled the above described well and had conducted deviation test and obtained the following results:

Degrees @ Depth	Degrees @ Depth	Degrees @ Depth
.2° @ 131'		
1.1° @ 378'		
1.9° @ 702'		
2.3° @ 1040'		
1.5° @ 1350'		
1.0° @ 1594'		
1.0° @ 2062'		
.7° @ 2474'		
.4° @ 2918'		
.8° @ 3361'		
.3° @ 3773'		
.7° @ 4218'		
.7° @ 4598'		

Drilling Contractor- UNITED DRILLING, INC.

By: Luisa Noriega
(Luisa Noriega)

Title: Asst. Office Manager

Subscribed and sworn to before me this 5th day of December, 2012.



Carlos Martin
Notary Public
Chaves New Mexico
County State

My Commission Expires: 10/8/16

Company: COG Operating, LLC (Concho)
Lease/Well: Submarine 10 Federal Com / No. 004H



Rig Name: UDI 40
State/County: New Mexico / Eddy
Latitude: 32.85, Longitude: -104.05
GRID North is 0.15 Degrees East of True North
VS-Azi: 0.00 Degrees



Depth Reference : RKB = 14'

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: final survey .ut
Minimum Curvature Method
Report Date/Time: 11/29/2012 / 13:49

Vaughn Energy Services
Fort Worth, Texas
817-741-3610

Surveyor: Tim Kaczor
Submarine 10 Federal Com No. 004H / API 30-015-40545

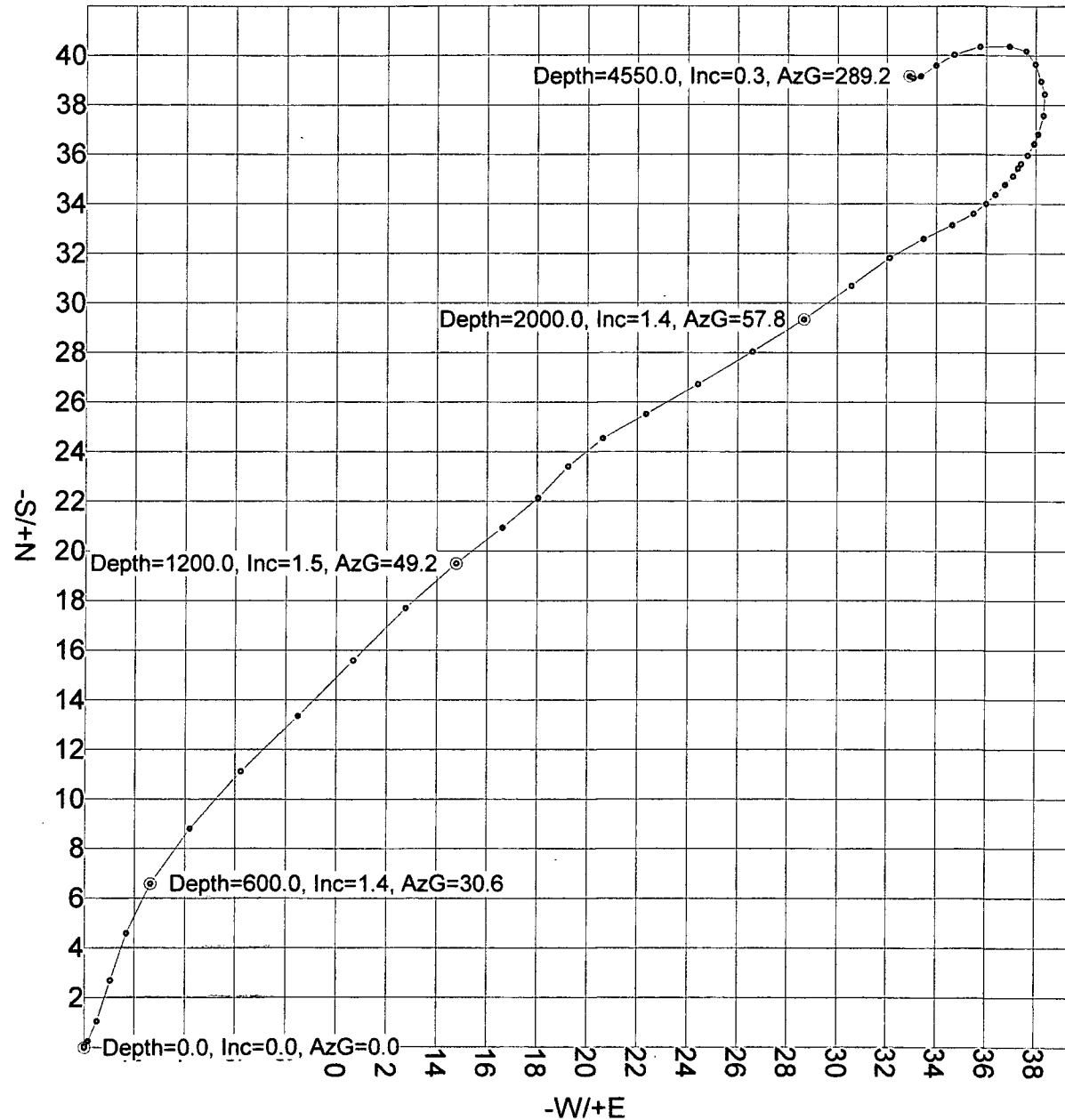
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.08	0.44	100.00	0.07	0.00	0.07	0.07	0.44	0.08
200.00	0.21	50.30	200.00	0.26	0.14	0.26	0.29	28.41	0.17
300.00	0.83	17.82	300.00	1.06	0.50	1.06	1.17	25.22	0.66
400.00	1.14	18.22	399.98	2.69	1.03	2.69	2.88	20.97	0.31
500.00	1.15	19.08	499.96	4.58	1.67	4.58	4.87	20.02	0.02
600.00	1.41	30.65	599.94	6.58	2.62	6.58	7.09	21.72	0.37
700.00	1.72	38.85	699.90	8.81	4.19	8.81	9.75	25.44	0.38
800.00	1.82	43.55	799.85	11.13	6.23	11.13	12.75	29.23	0.18
900.00	1.80	46.87	899.80	13.36	8.47	13.36	15.82	32.38	0.11
1000.00	1.79	42.30	999.75	15.59	10.67	15.59	18.89	34.39	0.14
1100.00	1.61	47.19	1099.71	17.70	12.75	17.70	21.81	35.77	0.23
1200.00	1.49	49.23	1199.67	19.50	14.77	19.50	24.46	37.13	0.13
1300.00	1.19	55.51	1299.64	20.94	16.61	20.94	26.73	38.42	0.33
1400.00	0.95	43.07	1399.63	22.14	18.04	22.14	28.55	39.17	0.34
1500.00	1.07	43.18	1499.61	23.42	19.24	23.42	30.31	39.40	0.12
1600.00	0.99	59.76	1599.59	24.54	20.62	24.54	32.05	40.05	0.31
1700.00	1.27	60.72	1699.57	25.52	22.34	25.52	33.92	41.21	0.28
1800.00	1.47	59.14	1799.55	26.72	24.41	26.72	36.19	42.42	0.20

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	1.45	58.21	1899.51	28.04	26.59	28.04	38.64	43.48	0.03
2000.00	1.36	57.76	1999.48	29.34	28.66	29.34	41.02	44.33	0.08
2100.00	1.30	50.10	2099.46	30.70	30.54	30.70	43.31	44.85	0.19
2200.00	0.93	60.75	2199.44	31.83	32.12	31.83	45.22	45.26	0.43
2300.00	0.86	60.87	2299.43	32.59	33.48	32.59	46.72	45.78	0.07
2400.00	0.61	68.99	2399.42	33.14	34.63	33.14	47.93	46.26	0.27
2500.00	0.51	53.34	2499.41	33.60	35.48	33.60	48.86	46.56	0.18
2600.00	0.24	46.06	2599.41	34.00	35.99	34.00	49.51	46.62	0.27
2700.00	0.38	44.09	2699.41	34.39	36.37	34.39	50.05	46.60	0.14
2800.00	0.26	43.24	2799.41	34.78	36.75	34.78	50.60	46.57	0.12
2900.00	0.27	42.72	2899.41	35.12	37.06	35.12	51.06	46.54	0.02
3000.00	0.17	12.42	2999.41	35.44	37.26	35.44	51.42	46.43	0.15
3100.00	0.12	71.68	3099.41	35.62	37.39	35.62	51.64	46.39	0.15
3200.00	0.40	29.83	3199.40	35.96	37.66	35.96	52.07	46.33	0.32
3300.00	0.22	27.62	3299.40	36.43	37.92	36.43	52.59	46.15	0.18
3400.00	0.26	20.13	3399.40	36.81	38.09	36.81	52.97	45.98	0.05
3500.00	0.64	14.07	3499.40	37.57	38.30	37.57	53.65	45.55	0.39
3600.00	0.38	345.24	3599.39	38.44	38.36	38.44	54.30	44.94	0.36
3700.00	0.25	342.50	3699.39	38.96	38.21	38.96	54.57	44.44	0.13
3800.00	0.59	339.64	3799.39	39.65	37.97	39.65	54.89	43.76	0.34
3900.00	0.23	286.59	3899.39	40.18	37.60	40.18	55.03	43.09	0.49
4000.00	0.57	285.14	3999.39	40.37	36.92	40.37	54.71	42.44	0.35
4100.00	0.83	257.51	4099.38	40.35	35.73	40.35	53.89	41.53	0.42
4200.00	0.42	242.84	4199.37	40.02	34.70	40.02	52.97	40.93	0.43
4300.00	0.55	236.47	4299.37	39.59	33.97	39.59	52.16	40.63	0.14
4400.00	0.31	232.36	4399.37	39.16	33.36	39.16	51.44	40.43	0.24
4500.00	0.13	311.31	4499.37	39.07	33.06	39.07	51.18	40.24	0.31
4550.00	0.31	289.17	4549.36	39.15	32.89	39.15	51.14	40.03	0.38



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Submarine 10 Federal Com No. 004H / API 30-015-40545



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