



CONCHO

COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 27, T 25 S. , R 33 E

Rojo AE 7811 JV-P Federal Com 1H

Wellbore #1

Design: Wellbore #1

Survey Report - Geographic

12 January, 2017





Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Rojo AE 7811 JV-P Federal Com 1H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=27 @ 3370.40ft (Scandril Freedom)
Site:	Sec. 27, T 25 S., R 33 E	MD Reference:	KB=27 @ 3370.40ft (Scandril Freedom)
Well:	Rojo AE 7811 JV-P Federal Com 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Project	Lea 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	Sec. 27, T 25 S., R 33 E		
Site Position:		Northing:	403,912.5000 usft
From:	Map	Easting:	737,924.2000 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	32° 6' 29.306 N
		Longitude:	103° 33' 53.747 W
		Grid Convergence:	0.41 °

Well	Rojo AE 7811 JV-P Federal Com 1H		
Well Position	+N-S	0.00 ft	Northing: 403,912.5000 usft
	+E-W	0.00 ft	Easting: 737,924.2000 usft
Position Uncertainty	0.00 ft	Wellhead Elevation:	0.00 ft
		Ground Level:	3,343.40 ft

Wellbore	Wellbore #1		
Magnetics	Model Name	Sample Date	Declination (°)
	IGRF2015	6/28/2016	7.05
			Dip Angle (°)
			59.97
			Field Strength (nT)
			47,970

Design	Wellbore #1		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N-S (ft)	+E-W (ft)
	0.00	0.00	0.00
			Direction (°)
			184.06

Survey Program	Date 1/12/2017		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name
100.00	8,700.00	VES GYROS (Wellbore #1)	VESSI_GYROFLEX
8,754.00	18,118.00	IDS MWD Surveys (Wellbore #1)	MWD
			Description
			VESSI Gyroflex Gyro
			MWD - Standard

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	403,912.5000	737,924.2000	32° 6' 29.306 N	103° 33' 53.747 W
100.00	0.77	325.45	100.00	0.55	-0.38	403,913.0534	737,923.8190	32° 6' 29.311 N	103° 33' 53.751 W
200.00	0.75	331.07	199.99	1.68	-1.08	403,914.1797	737,923.1213	32° 6' 29.322 N	103° 33' 53.759 W
300.00	0.53	318.04	299.98	2.60	-1.70	403,915.0964	737,922.4955	32° 6' 29.331 N	103° 33' 53.766 W
400.00	0.40	305.76	399.98	3.14	-2.30	403,915.6443	737,921.9030	32° 6' 29.337 N	103° 33' 53.773 W
500.00	0.36	307.55	499.98	3.54	-2.83	403,916.0398	737,921.3707	32° 6' 29.341 N	103° 33' 53.779 W
600.00	0.30	308.72	599.97	3.89	-3.28	403,916.3950	737,920.9173	32° 6' 29.344 N	103° 33' 53.785 W
700.00	0.31	308.54	699.97	4.23	-3.70	403,916.7273	737,920.5015	32° 6' 29.348 N	103° 33' 53.789 W
800.00	0.25	288.20	799.97	4.46	-4.12	403,916.9640	737,920.0826	32° 6' 29.350 N	103° 33' 53.794 W
900.00	0.14	296.97	899.97	4.59	-4.43	403,917.0875	737,919.7665	32° 6' 29.351 N	103° 33' 53.798 W
1,000.00	0.26	256.20	999.97	4.59	-4.76	403,917.0888	737,919.4373	32° 6' 29.351 N	103° 33' 53.802 W



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Site:	Sec. 27, T 25 S. , R 33 E	MD Reference:	KB=27 @ 3370.40ft (Scandrell Freedom)
Well:	Rojo AE 7811 JV-P Federal Com 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,100.00	0.30	259.44	1,099.97	4.49	-5.24	403,916.9867	737,918.9595	32° 6' 29.350 N	103° 33' 53.807 W
1,200.00	0.08	257.13	1,199.97	4.42	-5.57	403,916.9232	737,918.6341	32° 6' 29.350 N	103° 33' 53.811 W
1,300.00	0.05	268.60	1,299.97	4.41	-5.68	403,916.9066	737,918.5224	32° 6' 29.350 N	103° 33' 53.812 W
1,400.00	0.22	262.59	1,399.97	4.38	-5.91	403,916.8808	737,918.2884	32° 6' 29.349 N	103° 33' 53.815 W
1,500.00	0.12	297.33	1,499.97	4.40	-6.20	403,916.9041	737,918.0050	32° 6' 29.350 N	103° 33' 53.818 W
1,600.00	0.36	270.07	1,599.97	4.45	-6.60	403,916.9525	737,917.5978	32° 6' 29.350 N	103° 33' 53.823 W
1,700.00	0.38	283.59	1,699.97	4.53	-7.24	403,917.0308	737,916.9614	32° 6' 29.351 N	103° 33' 53.830 W
1,800.00	0.44	240.19	1,799.96	4.42	-7.89	403,916.9179	737,916.3059	32° 6' 29.350 N	103° 33' 53.838 W
1,900.00	0.58	248.41	1,899.96	4.04	-8.70	403,916.5408	737,915.5021	32° 6' 29.346 N	103° 33' 53.847 W
2,000.00	0.42	246.53	1,999.96	3.71	-9.50	403,916.2085	737,914.6953	32° 6' 29.343 N	103° 33' 53.857 W
2,100.00	0.54	257.23	2,099.95	3.46	-10.30	403,915.9584	737,913.8995	32° 6' 29.341 N	103° 33' 53.866 W
2,200.00	0.54	255.34	2,199.95	3.23	-11.22	403,915.7350	737,912.9840	32° 6' 29.338 N	103° 33' 53.877 W
2,300.00	0.37	103.52	2,299.95	3.04	-11.36	403,915.5402	737,912.8421	32° 6' 29.336 N	103° 33' 53.878 W
2,400.00	0.73	89.78	2,399.94	2.97	-10.41	403,915.4672	737,913.7930	32° 6' 29.336 N	103° 33' 53.867 W
2,500.00	0.73	71.12	2,499.93	3.18	-9.17	403,915.6758	737,915.0328	32° 6' 29.338 N	103° 33' 53.853 W
2,600.00	0.90	64.91	2,599.92	3.71	-7.85	403,916.2149	737,916.3468	32° 6' 29.343 N	103° 33' 53.838 W
2,700.00	0.96	52.14	2,699.91	4.56	-6.48	403,917.0621	737,917.7195	32° 6' 29.351 N	103° 33' 53.822 W
2,800.00	0.82	45.34	2,799.90	5.58	-5.31	403,918.0792	737,918.8898	32° 6' 29.361 N	103° 33' 53.808 W
2,900.00	0.83	34.32	2,899.89	6.68	-4.39	403,919.1804	737,919.8072	32° 6' 29.372 N	103° 33' 53.797 W
3,000.00	0.76	39.37	2,999.88	7.79	-3.56	403,920.2913	737,920.6362	32° 6' 29.383 N	103° 33' 53.787 W
3,100.00	0.40	63.43	3,099.87	8.46	-2.83	403,920.9601	737,921.3691	32° 6' 29.390 N	103° 33' 53.779 W
3,200.00	1.22	47.77	3,199.86	9.33	-1.73	403,921.8317	737,922.4696	32° 6' 29.398 N	103° 33' 53.766 W
3,300.00	1.40	53.15	3,299.84	10.78	0.04	403,923.2799	737,924.2354	32° 6' 29.412 N	103° 33' 53.745 W
3,400.00	0.60	23.94	3,399.82	11.99	1.23	403,924.4911	737,925.4254	32° 6' 29.424 N	103° 33' 53.731 W
3,500.00	0.53	10.18	3,499.82	12.92	1.52	403,925.4248	737,925.7196	32° 6' 29.433 N	103° 33' 53.728 W
3,600.00	0.62	16.07	3,599.81	13.90	1.75	403,926.4000	737,925.9511	32° 6' 29.443 N	103° 33' 53.725 W
3,700.00	0.42	6.65	3,699.81	14.78	1.94	403,927.2839	737,926.1433	32° 6' 29.452 N	103° 33' 53.723 W
3,800.00	0.40	41.72	3,799.80	15.41	2.22	403,927.9085	737,926.4181	32° 6' 29.458 N	103° 33' 53.720 W
3,900.00	0.42	77.10	3,899.80	15.75	2.81	403,928.2509	737,927.0077	32° 6' 29.461 N	103° 33' 53.713 W
4,000.00	0.47	72.27	3,999.80	15.96	3.56	403,928.4576	737,927.7556	32° 6' 29.463 N	103° 33' 53.704 W
4,100.00	0.58	75.10	4,099.79	16.21	4.44	403,928.7126	737,928.6354	32° 6' 29.466 N	103° 33' 53.694 W
4,200.00	0.65	93.24	4,199.79	16.31	5.49	403,928.8107	737,929.6908	32° 6' 29.467 N	103° 33' 53.681 W
4,300.00	1.55	102.12	4,299.77	15.99	7.38	403,928.4947	737,931.5795	32° 6' 29.463 N	103° 33' 53.660 W
4,400.00	0.98	105.00	4,399.74	15.49	9.53	403,927.9894	737,933.7278	32° 6' 29.458 N	103° 33' 53.635 W
4,500.00	0.53	156.27	4,499.74	14.84	10.54	403,927.3447	737,934.7400	32° 6' 29.452 N	103° 33' 53.623 W
4,600.00	1.23	135.41	4,599.72	13.66	11.48	403,926.1569	737,935.6796	32° 6' 29.440 N	103° 33' 53.612 W
4,700.00	0.33	152.90	4,699.71	12.64	12.36	403,925.1362	737,936.5643	32° 6' 29.430 N	103° 33' 53.602 W
4,800.00	0.31	235.04	4,799.71	12.22	12.27	403,924.7248	737,936.4738	32° 6' 29.426 N	103° 33' 53.603 W
4,900.00	0.28	210.99	4,899.71	11.86	11.93	403,924.3603	737,936.1263	32° 6' 29.422 N	103° 33' 53.607 W
5,000.00	0.32	219.15	4,999.71	11.43	11.62	403,923.9343	737,935.8242	32° 6' 29.418 N	103° 33' 53.611 W
5,100.00	0.33	228.17	5,099.71	11.03	11.23	403,923.5257	737,935.4333	32° 6' 29.414 N	103° 33' 53.615 W
5,200.00	0.42	215.98	5,199.71	10.54	10.80	403,923.0370	737,935.0034	32° 6' 29.409 N	103° 33' 53.620 W
5,300.00	0.43	231.50	5,299.70	10.01	10.29	403,922.5068	737,934.4944	32° 6' 29.404 N	103° 33' 53.626 W
5,400.00	0.37	223.13	5,399.70	9.54	9.78	403,922.0376	737,933.9800	32° 6' 29.399 N	103° 33' 53.632 W
5,500.00	0.33	226.65	5,499.70	9.10	9.35	403,921.6043	737,933.5498	32° 6' 29.395 N	103° 33' 53.637 W
5,600.00	0.38	220.57	5,599.70	8.65	8.92	403,921.1547	737,933.1247	32° 6' 29.391 N	103° 33' 53.642 W
5,700.00	0.48	239.07	5,699.70	8.19	8.35	403,920.6875	737,932.5497	32° 6' 29.386 N	103° 33' 53.649 W
5,800.00	0.48	249.89	5,799.69	7.83	7.60	403,920.3282	737,931.7971	32° 6' 29.383 N	103° 33' 53.658 W
5,900.00	0.43	250.57	5,899.69	7.56	6.85	403,920.0594	737,931.0499	32° 6' 29.380 N	103° 33' 53.666 W
6,000.00	0.44	244.97	5,999.69	7.27	6.15	403,919.7721	737,930.3481	32° 6' 29.377 N	103° 33' 53.675 W
6,100.00	0.59	251.89	6,099.68	6.95	5.31	403,919.4496	737,929.5108	32° 6' 29.374 N	103° 33' 53.684 W
6,200.00	0.66	253.26	6,199.68	6.62	4.27	403,919.1236	737,928.4700	32° 6' 29.371 N	103° 33' 53.696 W
6,300.00	0.75	247.58	6,299.67	6.21	3.11	403,918.7081	737,927.3134	32° 6' 29.367 N	103° 33' 53.710 W
6,400.00	0.39	249.69	6,399.66	5.84	2.19	403,918.3404	737,926.3892	32° 6' 29.363 N	103° 33' 53.721 W
6,500.00	0.27	244.20	6,499.66	5.62	1.66	403,918.1197	737,925.8579	32° 6' 29.361 N	103° 33' 53.727 W



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Site:	Sec. 27, T 25 S., R 33 E	MD Reference:	KB=27 @ 3370.40ft (Scandill Freedom)
Well:	Rojo AE 7811 JV-P Federal Com 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,600.00	0.08	154.09	6,599.66	5.45	1.48	403,917.9544	737,925.6763	32° 6' 29.359 N	103° 33' 53.729 W
6,700.00	0.19	181.29	6,699.66	5.23	1.50	403,917.7258	737,925.7031	32° 6' 29.357 N	103° 33' 53.729 W
6,800.00	0.22	196.10	6,799.66	4.88	1.45	403,917.3756	737,925.6461	32° 6' 29.354 N	103° 33' 53.729 W
6,900.00	0.27	180.24	6,899.66	4.46	1.39	403,916.9555	737,925.5919	32° 6' 29.350 N	103° 33' 53.730 W
7,000.00	0.25	185.55	6,999.66	4.00	1.37	403,916.5028	737,925.5698	32° 6' 29.345 N	103° 33' 53.730 W
7,100.00	0.18	192.07	7,099.66	3.63	1.32	403,916.1320	737,925.5158	32° 6' 29.341 N	103° 33' 53.731 W
7,200.00	0.32	210.37	7,199.66	3.24	1.14	403,915.7375	737,925.3418	32° 6' 29.338 N	103° 33' 53.733 W
7,300.00	0.44	192.42	7,299.65	2.62	0.92	403,915.1216	737,925.1180	32° 6' 29.331 N	103° 33' 53.736 W
7,400.00	0.50	196.33	7,399.65	1.83	0.71	403,914.3279	737,924.9128	32° 6' 29.324 N	103° 33' 53.738 W
7,500.00	0.43	216.34	7,499.65	1.11	0.37	403,913.6069	737,924.5677	32° 6' 29.317 N	103° 33' 53.742 W
7,600.00	0.45	222.85	7,599.64	0.52	-0.12	403,913.0167	737,924.0783	32° 6' 29.311 N	103° 33' 53.748 W
7,700.00	0.33	193.27	7,699.64	-0.05	-0.45	403,912.4485	737,923.7451	32° 6' 29.305 N	103° 33' 53.752 W
7,800.00	0.17	113.43	7,799.64	-0.39	-0.38	403,912.1092	737,923.8152	32° 6' 29.302 N	103° 33' 53.751 W
7,900.00	0.21	112.37	7,899.64	-0.52	-0.08	403,911.9805	737,924.1207	32° 6' 29.300 N	103° 33' 53.748 W
8,000.00	0.19	156.33	7,999.64	-0.74	0.16	403,911.7589	737,924.3568	32° 6' 29.298 N	103° 33' 53.745 W
8,100.00	0.23	123.12	8,099.64	-1.00	0.39	403,911.4974	737,924.5914	32° 6' 29.296 N	103° 33' 53.742 W
8,200.00	0.50	115.04	8,199.64	-1.30	0.95	403,911.2030	737,925.1549	32° 6' 29.293 N	103° 33' 53.736 W
8,300.00	0.64	163.78	8,299.63	-2.02	1.51	403,910.4821	737,925.7062	32° 6' 29.286 N	103° 33' 53.729 W
8,400.00	0.53	157.50	8,399.63	-2.98	1.84	403,909.5185	737,926.0392	32° 6' 29.276 N	103° 33' 53.726 W
8,500.00	0.56	166.71	8,499.62	-3.88	2.13	403,908.6156	737,926.3285	32° 6' 29.267 N	103° 33' 53.722 W
8,600.00	0.37	183.26	8,599.62	-4.68	2.22	403,907.8177	737,926.4225	32° 6' 29.259 N	103° 33' 53.721 W
8,700.00	0.35	177.93	8,699.62	-5.31	2.22	403,907.1901	737,926.4152	32° 6' 29.253 N	103° 33' 53.721 W
8,754.00	0.40	180.70	8,753.62	-5.66	2.22	403,906.8368	737,926.4188	32° 6' 29.249 N	103° 33' 53.721 W
First IDS MWD Survey									
8,825.00	2.50	197.30	8,824.59	-7.39	1.76	403,905.1103	737,925.9552	32° 6' 29.232 N	103° 33' 53.727 W
8,856.00	9.00	186.10	8,855.50	-9.65	1.38	403,902.8531	737,925.5819	32° 6' 29.210 N	103° 33' 53.731 W
8,887.00	6.00	184.60	8,886.23	-13.68	1.02	403,898.8242	737,925.2152	32° 6' 29.170 N	103° 33' 53.736 W
8,918.00	12.30	185.00	8,916.69	-19.38	0.53	403,893.1163	737,924.7328	32° 6' 29.114 N	103° 33' 53.742 W
8,949.00	15.80	184.50	8,946.76	-26.88	-0.09	403,885.6173	737,924.1137	32° 6' 29.040 N	103° 33' 53.750 W
8,980.00	19.30	182.90	8,976.31	-36.21	-0.68	403,876.2906	737,923.5232	32° 6' 28.947 N	103° 33' 53.758 W
9,011.00	23.00	181.40	9,005.22	-47.38	-1.08	403,865.1157	737,923.1159	32° 6' 28.837 N	103° 33' 53.763 W
9,058.00	28.80	181.30	9,047.48	-67.90	-1.57	403,844.6005	737,922.6343	32° 6' 28.634 N	103° 33' 53.771 W
9,105.00	34.20	183.40	9,087.54	-92.42	-2.61	403,820.0776	737,921.5933	32° 6' 28.391 N	103° 33' 53.785 W
9,152.00	38.80	184.10	9,125.31	-120.31	-4.44	403,792.1894	737,919.7561	32° 6' 28.115 N	103° 33' 53.808 W
9,198.00	43.80	183.50	9,159.86	-150.59	-6.45	403,761.9055	737,917.7526	32° 6' 27.816 N	103° 33' 53.834 W
9,230.00	47.50	184.60	9,182.23	-173.42	-8.07	403,739.0852	737,916.1299	32° 6' 27.590 N	103° 33' 53.855 W
9,261.00	51.40	185.40	9,202.38	-196.88	-10.13	403,715.6251	737,914.0726	32° 6' 27.358 N	103° 33' 53.881 W
9,292.00	55.70	184.70	9,220.79	-221.71	-12.32	403,690.7920	737,911.8823	32° 6' 27.113 N	103° 33' 53.908 W
9,339.00	62.40	183.00	9,244.95	-261.90	-15.00	403,650.5989	737,909.1985	32° 6' 26.715 N	103° 33' 53.943 W
9,386.00	68.90	182.00	9,264.32	-304.66	-16.86	403,607.8439	737,907.3414	32° 6' 26.292 N	103° 33' 53.968 W
9,433.00	72.50	183.20	9,279.85	-348.96	-18.88	403,563.5395	737,905.3244	32° 6' 25.854 N	103° 33' 53.995 W
9,479.00	76.80	185.40	9,292.03	-393.18	-22.21	403,519.3196	737,901.9907	32° 6' 25.416 N	103° 33' 54.037 W
9,524.00	83.60	186.60	9,299.68	-437.25	-26.85	403,475.2465	737,897.3537	32° 6' 24.981 N	103° 33' 54.095 W
9,577.00	91.20	185.10	9,302.08	-489.88	-32.24	403,422.6167	737,891.9634	32° 6' 24.460 N	103° 33' 54.162 W
9,671.00	89.50	185.80	9,301.51	-583.45	-41.16	403,329.0476	737,883.0361	32° 6' 23.535 N	103° 33' 54.274 W
9,764.00	88.60	186.10	9,303.05	-675.94	-50.80	403,236.5626	737,873.3971	32° 6' 22.620 N	103° 33' 54.393 W
9,857.00	88.70	186.60	9,305.24	-768.34	-61.09	403,144.1593	737,863.1141	32° 6' 21.707 N	103° 33' 54.521 W
9,951.00	89.30	187.30	9,306.88	-861.64	-72.46	403,050.8654	737,851.7416	32° 6' 20.784 N	103° 33' 54.660 W
10,044.00	88.50	187.50	9,308.67	-953.84	-84.43	402,958.6580	737,839.7660	32° 6' 19.873 N	103° 33' 54.807 W
10,138.00	88.20	188.50	9,311.38	-1,046.89	-97.51	402,865.6128	737,826.6894	32° 6' 18.953 N	103° 33' 54.967 W
10,232.00	88.70	184.40	9,313.92	-1,140.24	-108.06	402,772.2624	737,816.1364	32° 6' 18.030 N	103° 33' 55.097 W
10,325.00	89.00	183.60	9,315.79	-1,232.99	-114.55	402,679.5087	737,809.6504	32° 6' 17.112 N	103° 33' 55.181 W
10,418.00	89.50	183.10	9,317.00	-1,325.83	-119.98	402,586.6763	737,804.2165	32° 6' 16.194 N	103° 33' 55.251 W
10,512.00	90.20	183.20	9,317.25	-1,419.68	-125.15	402,492.8194	737,799.0512	32° 6' 15.266 N	103° 33' 55.319 W
10,605.00	91.00	182.90	9,316.28	-1,512.55	-130.10	402,399.9573	737,794.1033	32° 6' 14.347 N	103° 33' 55.384 W



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Rojo AE 7811 JV-P Federal Com 1H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=27 @ 3370.40ft (Scandrift Freedom)
Site:	Sec. 27, T 25 S. , R 33 E	MD Reference:	KB=27 @ 3370.40ft (Scandrift Freedom)
Well:	Rojo AE 7811 JV-P Federal Com 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,700.00	91.30	183.40	9,314.37	-1,607.38	-135.32	402,305.1205	737,788.8841	32° 6' 13.409 N	103° 33' 55.453 W
10,793.00	89.70	181.90	9,313.56	-1,700.27	-139.62	402,212.2294	737,784.5849	32° 6' 12.490 N	103° 33' 55.511 W
10,887.00	89.90	181.50	9,313.89	-1,794.23	-142.40	402,118.2718	737,781.7963	32° 6' 11.561 N	103° 33' 55.551 W
10,981.00	90.90	181.50	9,313.23	-1,888.20	-144.86	402,024.3076	737,779.3357	32° 6' 10.631 N	103° 33' 55.587 W
11,074.00	91.80	181.20	9,311.04	-1,981.14	-147.06	401,931.3605	737,777.1453	32° 6' 9.711 N	103° 33' 55.620 W
11,168.00	89.80	182.40	9,309.73	-2,075.08	-150.01	401,837.4227	737,774.1929	32° 6' 8.782 N	103° 33' 55.662 W
11,262.00	89.10	184.30	9,310.63	-2,168.91	-155.50	401,743.5928	737,768.7006	32° 6' 7.854 N	103° 33' 55.734 W
11,356.00	88.80	183.70	9,312.35	-2,262.67	-162.06	401,649.8383	737,762.1447	32° 6' 6.926 N	103° 33' 55.818 W
11,450.00	88.80	185.90	9,314.32	-2,356.31	-169.92	401,556.1944	737,754.2812	32° 6' 6.000 N	103° 33' 55.917 W
11,543.00	89.30	184.90	9,315.86	-2,448.88	-178.67	401,463.6215	737,745.5305	32° 6' 5.085 N	103° 33' 56.027 W
11,636.00	88.60	182.50	9,317.57	-2,541.67	-184.67	401,370.8385	737,739.5303	32° 6' 4.167 N	103° 33' 56.104 W
11,730.00	89.60	183.00	9,319.04	-2,635.55	-189.18	401,276.9601	737,735.0209	32° 6' 3.238 N	103° 33' 56.164 W
11,823.00	88.70	182.80	9,320.42	-2,728.41	-193.88	401,184.0906	737,730.3163	32° 6' 2.320 N	103° 33' 56.227 W
11,916.00	89.20	182.90	9,322.13	-2,821.28	-198.51	401,091.2217	737,725.6930	32° 6' 1.401 N	103° 33' 56.288 W
12,010.00	88.40	185.10	9,324.10	-2,915.03	-205.06	400,997.4779	737,719.1381	32° 6' 0.474 N	103° 33' 56.372 W
12,104.00	88.60	183.90	9,326.56	-3,008.70	-212.43	400,903.8017	737,711.7657	32° 5' 59.547 N	103° 33' 56.465 W
12,197.00	89.10	184.10	9,328.42	-3,101.46	-218.92	400,811.0475	737,705.2797	32° 5' 58.630 N	103° 33' 56.549 W
12,291.00	88.90	186.30	9,330.06	-3,195.05	-227.44	400,717.4546	737,696.7621	32° 5' 57.704 N	103° 33' 56.655 W
12,384.00	89.30	184.90	9,331.52	-3,287.59	-236.51	400,624.9125	737,687.6883	32° 5' 56.789 N	103° 33' 56.768 W
12,477.00	89.80	184.80	9,332.25	-3,380.26	-244.37	400,532.2489	737,679.8257	32° 5' 55.873 N	103° 33' 56.868 W
12,570.00	90.70	186.20	9,331.85	-3,472.83	-253.29	400,439.6813	737,670.9125	32° 5' 54.958 N	103° 33' 56.979 W
12,665.00	89.70	185.90	9,331.52	-3,567.29	-263.30	400,345.2125	737,660.9001	32° 5' 54.023 N	103° 33' 57.103 W
12,759.00	89.20	185.80	9,332.42	-3,660.80	-272.88	400,251.7069	737,651.3197	32° 5' 53.099 N	103° 33' 57.222 W
12,853.00	87.90	184.30	9,334.80	-3,754.40	-281.15	400,158.1066	737,643.0480	32° 5' 52.173 N	103° 33' 57.326 W
12,946.00	88.60	184.30	9,337.64	-3,847.10	-288.12	400,065.4124	737,636.0783	32° 5' 51.256 N	103° 33' 57.415 W
13,040.00	89.00	181.90	9,339.61	-3,940.93	-293.20	399,971.5778	737,630.9966	32° 5' 50.328 N	103° 33' 57.482 W
13,133.00	89.60	182.20	9,340.74	-4,033.86	-296.53	399,878.6450	737,627.6701	32° 5' 49.409 N	103° 33' 57.528 W
13,227.00	90.10	184.20	9,340.99	-4,127.71	-301.78	399,784.7971	737,622.4231	32° 5' 48.480 N	103° 33' 57.597 W
13,321.00	90.80	184.00	9,340.25	-4,221.47	-308.50	399,691.0414	737,615.7026	32° 5' 47.553 N	103° 33' 57.682 W
13,414.00	91.30	185.20	9,338.55	-4,314.15	-315.96	399,598.3587	737,608.2456	32° 5' 46.636 N	103° 33' 57.777 W
13,509.00	92.70	186.20	9,335.23	-4,408.62	-325.38	399,503.8897	737,598.8167	32° 5' 45.702 N	103° 33' 57.894 W
13,602.00	92.60	185.50	9,330.93	-4,501.04	-334.85	399,411.4737	737,589.3480	32° 5' 44.788 N	103° 33' 58.012 W
13,696.00	91.90	185.10	9,327.24	-4,594.56	-343.53	399,317.9487	737,580.6720	32° 5' 43.864 N	103° 33' 58.121 W
13,789.00	90.30	186.30	9,325.46	-4,687.08	-352.76	399,225.4305	737,571.4372	32° 5' 42.949 N	103° 33' 58.236 W
13,883.00	90.00	183.80	9,325.21	-4,780.71	-361.04	399,131.8034	737,563.1636	32° 5' 42.023 N	103° 33' 58.339 W
13,977.00	90.40	183.70	9,324.88	-4,874.50	-367.19	399,038.0057	737,557.0158	32° 5' 41.095 N	103° 33' 58.419 W
14,069.00	91.00	182.70	9,323.76	-4,966.35	-372.32	398,946.1577	737,551.8806	32° 5' 40.186 N	103° 33' 58.486 W
14,163.00	90.50	182.90	9,322.53	-5,060.23	-376.91	398,852.2785	737,547.2891	32° 5' 39.258 N	103° 33' 58.547 W
14,256.00	88.70	183.70	9,323.18	-5,153.07	-382.26	398,759.4398	737,541.9362	32° 5' 38.339 N	103° 33' 58.617 W
14,350.00	88.70	183.30	9,325.31	-5,246.87	-388.00	398,665.6396	737,536.1991	32° 5' 37.412 N	103° 33' 58.691 W
14,443.00	88.50	185.70	9,327.58	-5,339.55	-395.30	398,572.9610	737,528.9052	32° 5' 36.495 N	103° 33' 58.784 W
14,537.00	86.50	183.70	9,331.68	-5,433.13	-402.99	398,479.3760	737,521.2099	32° 5' 35.569 N	103° 33' 58.881 W
14,632.00	86.10	185.80	9,337.81	-5,527.61	-410.84	398,384.9053	737,513.3604	32° 5' 34.635 N	103° 33' 58.980 W
14,725.00	86.50	183.70	9,343.82	-5,620.09	-418.52	398,292.4235	737,505.6761	32° 5' 33.721 N	103° 33' 59.077 W
14,818.00	88.00	186.60	9,348.28	-5,712.59	-426.86	398,199.9185	737,497.3374	32° 5' 32.806 N	103° 33' 59.182 W
14,912.00	89.10	185.20	9,350.66	-5,806.06	-436.52	398,106.4503	737,487.6787	32° 5' 31.881 N	103° 33' 59.302 W
15,005.00	90.60	188.10	9,350.90	-5,898.42	-447.29	398,014.0890	737,476.9103	32° 5' 30.968 N	103° 33' 59.434 W
15,099.00	91.30	187.00	9,349.34	-5,991.59	-459.64	397,920.9189	737,464.5614	32° 5' 30.047 N	103° 33' 59.586 W
15,193.00	90.80	184.80	9,347.62	-6,085.07	-469.30	397,827.4389	737,454.9014	32° 5' 29.123 N	103° 33' 59.706 W
15,286.00	91.20	183.60	9,346.00	-6,177.81	-476.11	397,734.7048	737,448.0913	32° 5' 28.206 N	103° 33' 59.793 W
15,380.00	91.20	179.30	9,344.03	-6,271.73	-478.49	397,640.7778	737,445.7138	32° 5' 27.276 N	103° 33' 59.828 W
15,474.00	91.00	178.60	9,342.22	-6,365.70	-476.76	397,546.8117	737,447.4360	32° 5' 26.346 N	103° 33' 59.816 W
15,568.00	89.50	179.30	9,341.81	-6,459.68	-475.04	397,452.8318	737,449.1584	32° 5' 25.416 N	103° 33' 59.803 W
15,661.00	89.40	178.90	9,342.70	-6,552.67	-473.58	397,359.8480	737,450.6192	32° 5' 24.496 N	103° 33' 59.794 W
15,756.00	89.20	180.90	9,343.86	-6,647.65	-473.42	397,264.8603	737,450.7850	32° 5' 23.556 N	103° 33' 59.800 W



Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Rojo AE 7811 JV-P Federal Com 1H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=27 @ 3370.40ft (Scandril Freedom)
Site:	Sec. 27, T 25 S., R 33 E	MD Reference:	KB=27 @ 3370.40ft (Scandril Freedom)
Well:	Rojo AE 7811 JV-P Federal Com 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
15,849.00	89.70	182.20	9,344.76	-6,740.61	-475.93	397,171.9010	737,448.2695	32° 5' 22.636 N	103° 33' 59.837 W
15,943.00	89.90	182.10	9,345.09	-6,834.55	-479.46	397,077.9680	737,444.7431	32° 5' 21.707 N	103° 33' 59.886 W
16,036.00	89.60	183.10	9,345.49	-6,927.45	-483.68	396,985.0661	737,440.5244	32° 5' 20.788 N	103° 33' 59.942 W
16,129.00	89.60	185.00	9,346.14	-7,020.21	-490.24	396,892.3051	737,433.9566	32° 5' 19.870 N	103° 34' 0.026 W
16,223.00	90.70	182.10	9,345.89	-7,114.02	-496.06	396,798.4974	737,428.1368	32° 5' 18.943 N	103° 34' 0.102 W
16,316.00	92.10	184.10	9,343.62	-7,206.85	-501.09	396,705.6684	737,423.1099	32° 5' 18.024 N	103° 34' 0.168 W
16,409.00	92.50	182.60	9,339.89	-7,299.61	-506.52	396,612.9051	737,417.6798	32° 5' 17.107 N	103° 34' 0.239 W
16,503.00	92.80	179.30	9,335.54	-7,393.48	-508.08	396,519.0319	737,416.1228	32° 5' 16.178 N	103° 34' 0.285 W
16,596.00	91.90	179.00	9,331.73	-7,486.39	-506.70	396,426.1216	737,417.5014	32° 5' 15.258 N	103° 34' 0.256 W
16,691.00	89.50	180.30	9,330.57	-7,581.38	-506.12	396,331.1396	737,418.0813	32° 5' 14.318 N	103° 34' 0.257 W
16,783.00	90.50	180.30	9,330.57	-7,673.37	-506.60	396,239.1422	737,417.5996	32° 5' 13.408 N	103° 34' 0.271 W
16,877.00	92.20	180.70	9,328.35	-7,767.34	-507.42	396,145.1757	737,416.7797	32° 5' 12.478 N	103° 34' 0.288 W
16,970.00	92.20	182.70	9,324.78	-7,860.23	-510.18	396,052.2901	737,414.0229	32° 5' 11.559 N	103° 34' 0.328 W
17,064.00	92.10	183.70	9,321.26	-7,954.01	-515.42	395,958.5041	737,408.7794	32° 5' 10.632 N	103° 34' 0.396 W
17,157.00	91.60	184.50	9,318.25	-8,046.72	-522.07	395,865.7917	737,402.1336	32° 5' 9.715 N	103° 34' 0.481 W
17,250.00	91.20	184.70	9,315.98	-8,139.40	-529.52	395,773.1194	737,394.6774	32° 5' 8.798 N	103° 34' 0.575 W
17,344.00	89.60	185.70	9,315.33	-8,233.00	-538.04	395,679.5129	737,386.1585	32° 5' 7.872 N	103° 34' 0.682 W
17,437.00	90.70	186.10	9,315.08	-8,325.51	-547.60	395,587.0077	737,376.5990	32° 5' 6.958 N	103° 34' 0.801 W
17,531.00	92.30	186.40	9,312.62	-8,418.92	-557.83	395,493.6017	737,366.3695	32° 5' 6.034 N	103° 34' 0.928 W
17,624.00	90.00	187.30	9,310.76	-8,511.23	-568.92	395,401.2915	737,355.2801	32° 5' 5.121 N	103° 34' 1.064 W
17,717.00	88.00	187.20	9,312.38	-8,603.46	-580.66	395,309.0540	737,343.5460	32° 5' 4.209 N	103° 34' 1.208 W
17,811.00	88.80	186.80	9,315.00	-8,696.73	-592.11	395,215.7922	737,332.0950	32° 5' 3.287 N	103° 34' 1.349 W
17,905.00	90.00	186.70	9,315.99	-8,790.07	-603.15	395,122.4508	737,321.0473	32° 5' 2.364 N	103° 34' 1.485 W
17,999.00	91.50	187.20	9,314.76	-8,883.37	-614.53	395,029.1526	737,309.6744	32° 5' 1.442 N	103° 34' 1.625 W
18,061.00	92.20	187.40	9,312.76	-8,944.83	-622.40	394,967.6877	737,301.8006	32° 5' 0.834 N	103° 34' 1.721 W
Final IDS MWD Survey									
18,118.00	92.20	187.40	9,310.57	-9,001.31	-629.74	394,911.2042	737,294.4647	32° 5' 0.276 N	103° 34' 1.811 W
Projection to TD									

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
8,754.00	8,753.62	-5.66	2.22	First IDS MWD Survey
18,061.00	9,312.76	-8,944.83	-622.40	Final IDS MWD Survey
18,118.00	9,310.57	-9,001.31	-629.74	Projection to TD

Checked By: _____ Approved By: _____ Date: _____