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APR 25 2017

Form 3160-5  
(June 2015)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
FOR Farmington Field Office  
Bureau of Land Management

FORM APPROVED  
OMB No. 1004-0137  
Expires: January 31, 2018

**SUNDRY NOTICES AND REPORTS ON WELLS**  
**Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.**

<b>SUBMIT IN TRIPLICATE - Other instructions on page 2</b>		7. If Unit of CA/Agreement, Name and/or No. NMNM136868
1. Type of Well <input checked="" type="checkbox"/> Oil Well <input type="checkbox"/> Gas Well <input type="checkbox"/> Other	2. Name of Operator LOGOS Operating, LLC	8. Well Name and No. HEROS 2308 09L COM 1H
3a. Address 2010 Afton Place Farmington, NM 87401	3b. Phone No. (include area code) (505) 324-4145	9. API Well No. 30-045-35688
4. Location of Well (Footage, Sec., T., R., M., or Survey Description) 1476 FSL & 210 FWL, NW/SW, L Sec 9 T23N R08W		10. Field and Pool or Exploratory Area Nageezi Gallup
		11. Country or Parish, State San Juan County, NM

## 12. CHECK THE APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION				
<input checked="" type="checkbox"/> Notice of Intent	<input type="checkbox"/> Acidize	<input type="checkbox"/> Deepen	<input type="checkbox"/> Production (Start/Resume)	<input type="checkbox"/> Water Shut-Off	
<input type="checkbox"/> Subsequent Report	<input type="checkbox"/> Alter Casing	<input type="checkbox"/> Hydraulic Fracturing	<input type="checkbox"/> Reclamation	<input type="checkbox"/> Well Integrity	
<input type="checkbox"/> Final Abandonment Notice	<input type="checkbox"/> Casing Repair	<input type="checkbox"/> New Construction	<input type="checkbox"/> Recomplete	<input type="checkbox"/> Other	
	<input checked="" type="checkbox"/> Change Plans	<input type="checkbox"/> Plug and Abandon	<input type="checkbox"/> Temporarily Abandon		
	<input type="checkbox"/> Convert to Injection	<input type="checkbox"/> Plug Back	<input type="checkbox"/> Water Disposal		

13. Describe Proposed or Completed Operation: Clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recompleat horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompleat in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed and the operator has determined that the site is ready for final inspection.)

LOGOS is revising the directional drill plan to help with the build rates which will make the rates less severe in the dog leg. Extend the TD south, 50' closer to the qtr line in section 16 to accommodate extra length for RSI tool, first perf will be within the legal setbacks. Changes are reflected in the attached Plat, Directional Drill Plan and Drilling Plan.

LOGOS proposes to make the following changes:

Revise BHL f/2274' FNL & 380' FWL to 2325' FNL & 381' FWL.

Change the 7" Intermediate casing depth from 5843' MD/5262' TVD to 5909' MD/5261' TVD.

Change the 4-1/2" Production casing depth from 5693'-10390' MD/5262'-5156' TVD to 5759'-10507' MD/5240'-5154' TVD.

Cement volumes will be adjusted accordingly.

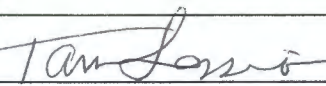
Estimated formation tops have also been adjusted after further analysis.

4/21/17 Received verbal approval from William Tambekou/BLM.


OIL CONS. DIV DIST. 3

APR 27 2017

**BLM'S APPROVAL OR ACCEPTANCE OF THIS ACTION DOES NOT RELIEVE THE LESSEE AND OPERATOR FROM OBTAINING ANY OTHER AUTHORIZATION REQUIRED FOR OPERATIONS ON FEDERAL AND INDIAN LANDS**

14. I hereby certify that the foregoing is true and correct. Name (Printed/Typed) Tamra Sessions	Regulatory Specialist Title
Signature 	Date 04/24/2017

## THE SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by 	Title Petroleum Engineer	Date 4/27/2017
Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.	Office FFO	

Title 18 U.S.C Section 1001 and Title 43 U.S.C Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

NMOCDAV

DISTRICT I  
1585 N. French Dr., Hobbs, N.M. 88240  
Phone: (575) 393-6161 Fax: (575) 393-0720

DISTRICT II  
811 S. First St., Artesia, N.M. 88210  
Phone: (575) 748-1283 Fax: (575) 748-9720

DISTRICT III  
1000 Rio Brazos Rd., Aztec, N.M. 87410  
Phone: (505) 334-6176 Fax: (505) 334-6170

DISTRICT IV  
1220 S. St. Francis Dr., Santa Fe, NM 87505  
Phone: (505) 476-3480 Fax: (505) 476-3482

State of New Mexico  
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION

1220 South St. Francis Dr.  
Santa Fe, NM 87505

Form C-102  
Revised August 1, 2011  
Submit one copy to appropriate  
District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

<sup>1</sup> API Number 30-045-35688	<sup>2</sup> Pool Code 47540	<sup>3</sup> Pool Name NAGEEZI GALLUP
<sup>4</sup> Property Code 317282	<sup>5</sup> Property Name HEROS 2308 09L COM	<sup>6</sup> Well Number #1H
<sup>7</sup> GRID No. 289408	<sup>8</sup> Operator Name LOGOS OPERATING, LLC	<sup>9</sup> Elevation 6916

<sup>10</sup> Surface Location

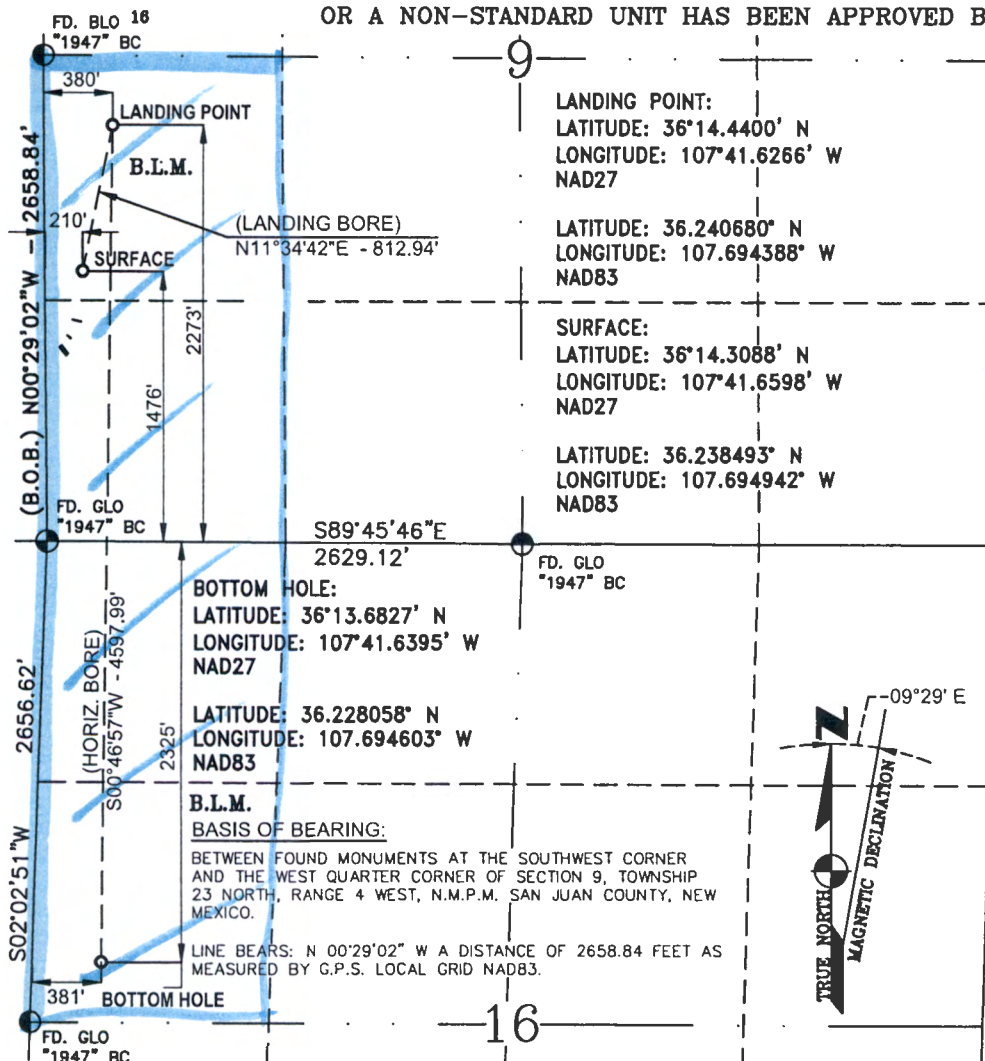
UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
L	9	23-N	8-W		1476	SOUTH	210	WEST	SAN JUAN

<sup>11</sup> Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
E	16	23-N	8-W		2325	NORTH	381	WEST	SAN JUAN

<sup>12</sup> Dedicated Acres 160 Acres Sec 9 W2SW Sec 16 W2NW	<sup>13</sup> Joint or Infill	<sup>14</sup> Consolidation Code	<sup>15</sup> Order No.
--	-------------------------------	----------------------------------	-------------------------

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED  
OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



<sup>17</sup> OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or a working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

*Tamra Sessions* 4/24/17  
Signature Date

Tamra Sessions

Printed Name

tsessions@logosresourcesllc.com

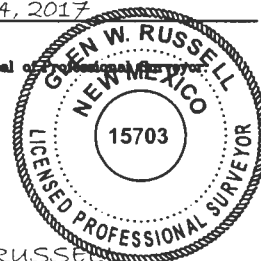
E-mail Address

<sup>18</sup> SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

APRIL 24, 2017  
Date of Survey

Signature and Seal of Professional Surveyor



GLEN W. RUSSELL  
Certificate Number

15703

**HEROS 2308 09L COM 1H  
API # 30-045-35688  
Lease Serial # NMNM18463**

Surface Location: 1476 FSL, 210 FWL

Legal Description: Sec 9, T23N, R8W (36.238493° N, 107.694942° W –NAD83)

Pay Zone Entry Point Location: 2273 FSL, 380 FWL

Legal Description: Sec 9, T23N, R8W (36.240680° N, 107.694388° W –NAD83)

Permitted Bottom Hole Location(PBHL): 2274 FNL, 380 FWL (adjusted to 2325' FNL & 381' FWL)

Legal Description: Sec 16, T23N, R8W (36.228195° N, 107.694601° W –NAD83)

San Juan County, NM

1. The elevation of the unprepared ground is 6,916 feet above sea level. Estimated KB Elev = 6930' (14'KB)
2. The geological name of the surface formation is the Nacimiento.
3. A rotary rig will be used to drill the well to a Proposed Total measured Depth of 5,154' TVD/10,507' MD with the first perforation at the PBHL 10457'MD/5,155'TVD 2274 FNL, 380 FWL.
4. Estimated top of important geological markers:

<u>Formation</u>	<u>Depth TVD (ft)</u>	<u>Depth MD (ft)</u>
Nacimiento	Surface	Surface
Ojo Alamo	850	850
Kirtland	1,056	1,057
Fruitland	1,186	1,189
Pictured Cliffs	1,538	1,553
Huerfanito Bentonite		
Chacra	1,647	1,668
Cliff House	3,019	3,168
Menefee	3,056	3,208
Point Lookout	3,878	4,108
Mancos	4,180	4,438
Gallup	4,888	5,180

5. Estimated depth at which anticipated water, oil, gas or other mineral bearing formations are expected to be encountered:

<u>Formation</u>	<u>Depth TVD (ft)</u>	<u>Water/Hydrocarbon</u>
Fruitland	1,186	Gas
Pictured Cliffs	1,538	Gas
Cliff House	3,019	Gas
Point Lookout	3,878	Gas
Mancos	4,180	Oil/Gas

6. All proposed casing is new and the program is as follows:

Casing	Size	Depth		Grade	Weight	Connection	PSI		
		MD	TVD				Burst	Collapse	x1000lbs Tension
Surface	9-5/8"	0-320'	0-320'	J-55	36.00	STC	3520	2020	394
Intermediate	7"	0-5,909'	0-5,261'	J-55	23.00	LTC	4360	3270	313
Production	4-1/2 "	5,759'-10,507'	5,240'-5,154'	P-110	11.60	LTC	10690	7560	278



## 7. Cementing Program:

- a. **12-1/4" hole x 9-5/8" casing at 320'** will have cement circulated to surface with 190 sks (100% excess true hole) Class II Cement with 1/4 ppsx seal, 2% CaCL 15.8 ppg, 1.15 ft<sup>3</sup>/sk. Note: CEMENT MUST BE CIRCULATED TO SURFACE. STANDARD BOW SPRING CENTRALIZERS SHALL BE PLACED ON THE FIRST 3 (BOTTOM 3) JOINTS OF CASING (1 PER JOINT) AND EVERY 3RD JOINT TO SURFACE. 20 BBLs OF WATER FOLLOWED BY 20 BBLs OF MUDFLUSH AHEAD OF CEMENT AS SPACER. Test Surface Casing to 1500 psi.
- b. **8-3/4" hole x 7" casing at 5,909' MD.** Cement will be circulated to surface in a single stage with 594 sks (70% excess true hole) of HALCEM with 1.0 % CaC2. 1/4 #/sk Poly-E-Flake, 5 #/sk Kol-Seal (Gilsonite) – 12.3 ppg, 1.95 ft<sup>3</sup>/sk followed by 256 sks (70% excess true hole) VARICEM with 0.15% Versaset, 0.30% HALAD-9, 1/4 #/sk Poly-E-Flake, 5 #/sk Kol-Seal – 13.5 ppg, 1.3 ft<sup>3</sup>/sk. ONE CENTRALIZER PER JOINT FOR THE FIRST 3 JOINTS, THEN EVERY OTHER JOINT TO KOP, THEN ONE EVERY 3RD JOINT TO SURFACE. 20 BBLs OF WATER FOLLOWED BY 30 BBLs OF MUDFLUSH AHEAD OF CEMENT AS SPACER. Test Intermediate Casing to 1500 psi. Cement additives subject to change based on wellbore conditions and cement design criteria.
- c. **6-1/8" hole x 4-1/2" liner at 10,507' MD.** It will be a conventional liner job using 30% excess for TOC at 5759' MD liner top. Cement slurry consist of 432 sks EXTENDACEM cement, -13.3 ppg, 1.36 ft<sup>3</sup>/sk. CENTRALIZERS TO BE USED AT DISCRETION IN LATERAL TO ACHIEVE 70% STAND OFF. CENTRALIZERS TO BE USED TO THE BACK DEPTH OF 6000' TO ACHIEVE 70% STAND OFF. PACKOFF SEAL ASSEMBLY TO BE USED FOR LINER TOP ISOLATION. Cement additives subject to change based on wellbore conditions and cement design criteria. Liner to be pressure tested during completion operations.

## 8. Pressure Control Equipment

BOP equipment and accessories will meet or exceed BLM requirements outlined in 43 CFR Part 3160.

A 2000 psig double ram hydraulic BOP will be used (see attached diagram). Since maximum anticipated formation pressure is 1915 psig (0.364 psi/ft @ 5261' TVD), accessories to the BOP will meet BLM requirements for a 2000 psig system. In accordance with Onshore Order #2 (111.A well requirements) the anticipated surface pressure assuming a partially evacuated hole with normal pressure gradient of 0.22 psi/ft will be 1157 psi (5261' TVD x 0.22 psi/ft).

The accumulator system capacity will be sufficient to close all BOPE with a 50% safety factor. Fill line, kill line and line to the choke manifold will be 2".

BOPs will be function tested every 24 hours and will be recorded on an IADC log. Accessories to the BOPE will include upper and lower Kelly cocks with handles with a stabbing valve to fit drill pipe on the floor at all times, string float at bit, 3000 psig choke manifold with 2" adjustable and 2" positive chokes, and pressure gauge.

All BOP equipment will be hydraulically operated with controls accessible both on the rig floor.

The wellhead BOP equipment will be nipped-up on the 9-5/8" x 11" 2,000 psi WP casing head prior to drilling out from under surface casing. All ram preventers and related equipment will be tested to 2,000 psi for 10 minutes. Annular preventers will be tested to 50% of rated working pressure for 10 minutes. Surface casing will be tested to 70% of internal yield pressure. All preventers and surface casing will be tested before drilling out of surface casing. BOP equipment will be tested every 14 days, after any repairs are made to the BOP equipment, and after the BOP equipment is subjected to pressure. Annular preventers will be functionally operated at least once per week. Pipe rams will be activated daily and blind rams shall be activated each trip or at least weekly. The New Mexico Oil & Gas Conservation Commission and the BLM will be notified 24 hours in advance of testing of BOPE.

#### 9. Mud Program:

0' - 320'	Fresh water/Spud Mud. Paper for losses and seepage. 8.4 to 9.0 ppg, 27 to 35 vis, PV <10, YP 1 to 10, FLNC, LGS < 4%
320' - 5909'	LSND WBM. As needed LCM for losses and seepage. 8.5 to 9.4 ppg, pH 8-9, 50 to 65 vis, PV 10-15 YP 15-25 FL < 5mls LGS < 3%
5909' - 10,507'	LSND WBM. As needed LCM for losses and seepage. 8.5 to 9.5 ppg, PH 8-9, 40 to 45 vis, PV 10-15 YP 10-15, FL < 4mls, LGS < 3%

\*\*During drilling operations, all necessary products will be sufficiently stored on location for abnormal situations. The characteristics, use, testing of drilling mud and the implementation of related drilling procedures shall be designed to prevent the loss of well control. Sufficient quantities of mud materials shall be maintained or readily accessible for the purpose of assuring well control.

\*\*A pH of 8.0-9.0 in the fresh water base mud system shall be maintained to control the effects corrosion has on metallurgy of equipment used.

#### Operating and Maintenance

LOGOS Operating will be using all above ground steel pits for fluid and cuttings while drilling. If any tank develops a leak we will have immediate visual discovery, we would then transfer the fluid to another tank then remove any contaminated soil and dispose of it in the cuttings bins for transportation. Any leaks, spills or other undesirable events will be reported in accordance with BLM NTL 3A. Rig crews will monitor the tanks at all times. A trip/surge tank will be used to monitor returns for any "kicks" of formation fluids.

#### Equipment:

2-Mongoose Shale Shakers

2-3400 High Speed Centrifuges with stands and pumps

2- three- high sided cuttings catch tank

2-Roll off bins with track

2-200 bbl Open top Frac tanks

1-Mud/Gas Separator and Degasser

1-Trip/Surge Tank

Electronic or Visual monitoring system to indicate lost returns and gas detection sensors

#### 10. Testing, Logging and Coring Program:

- a. Testing Program: No drillstem tests are anticipated
- b. Electric Logging Program: TBD
- c. LWD Program: TBD
- d. Coring Program: None anticipated.
- e. CBL's and/or Temperature Surveys Will Be Performed as Needed or Required.
- f. MudLogging: On location from 4000'TVD to TD.
- g. Gamma Ray from surface casing point to TD
- h. Cased Hole: CBL/CCL/GRNDL will be run as needed for perforating control.

11. Bottom Hole Pressure expected to be 2,500 +/- psi

12. Bottom Hole Temperature expected to be 160 deg F.

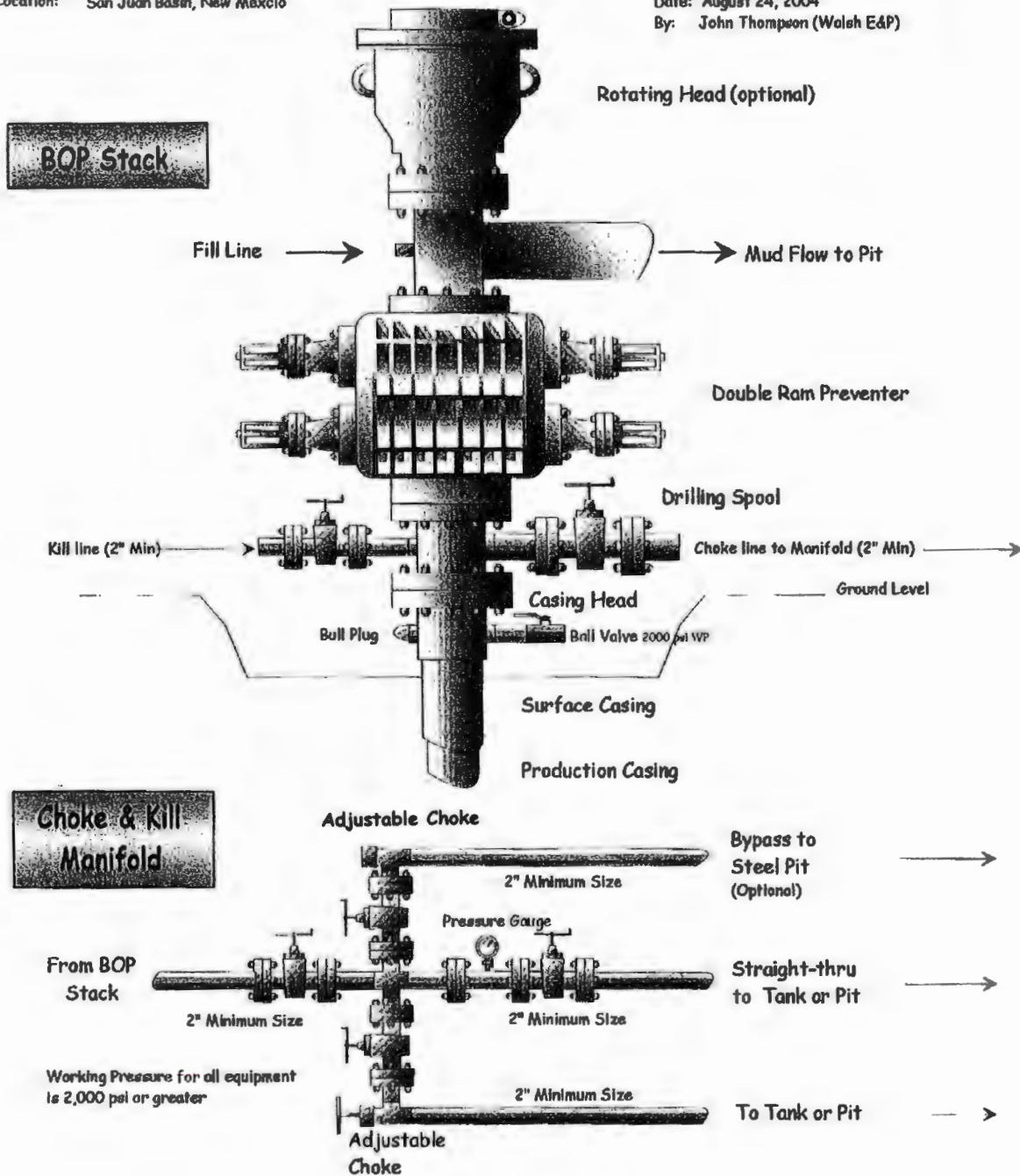
# Well Control Equipment Schematic for 2M Service

Attachment to Drilling Technical Program

## Exhibit #1 Typical BOP setup

Location: San Juan Basin, New Mexico

Date: August 24, 2004  
By: John Thompson (Walsh EdP)





# Cathedral Energy Services

## Planning Report

<b>Database:</b>	USA EDM 5000 Multi Users DB	<b>Local Co-ordinate Reference:</b>	Well HEROS 2308 09L COM #1H
<b>Company:</b>	LOGOS Operating LLC	<b>TVD Reference:</b>	14' KB @ 6930.00usft (AZTEC 920)
<b>Project:</b>	San Juan County, NM	<b>MD Reference:</b>	14' KB @ 6930.00usft (AZTEC 920)
<b>Site:</b>	S9-T23N-R8W	<b>North Reference:</b>	True
<b>Well:</b>	HEROS 2308 09L COM #1H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	OH		
<b>Design:</b>	PLAN #3		

<b>Project</b>	San Juan County, NM		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	New Mexico Western Zone		

<b>Site</b>	S9-T23N-R8W		
<b>Site Position:</b>		<b>Northing:</b>	1,906,138.83 usft
<b>From:</b>	Map	<b>Easting:</b>	2,763,902.48 usft
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16"
		<b>Latitude:</b>	36° 14' 16.57 N
		<b>Longitude:</b>	107° 41' 41.79 W
		<b>Grid Convergence:</b>	0.08 °

<b>Well</b>	HEROS 2308 09L COM #1H		
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b> 1,906,138.82 usft
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b> 2,763,902.48 usft
<b>Position Uncertainty</b>	0.00 usft	<b>Wellhead Elevation:</b>	0.00 usft
		<b>Latitude:</b>	36° 14' 18.57 N
		<b>Longitude:</b>	107° 41' 41.79 W
		<b>Ground Level:</b>	8,916.00 usft

<b>Wellbore</b>	OH		
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>
	HDGM	4/7/2017	9.00
			<b>Dip Angle (°)</b>
			62.90
			<b>Field Strength (nT)</b>
			49,688

<b>Design</b>	PLAN #3		
<b>Audit Notes:</b>			
<b>Version:</b>	<b>Phase:</b>	PLAN	<b>Tie On Depth:</b> 0.00
<b>Vertical Section:</b>	<b>Depth From (TVD)</b>	<b>+N/-S</b>	<b>+E/-W</b>
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			<b>Direction (°)</b>
			178.46

<b>Plan Sections</b>										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
650.00	0.00	0.00	650.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,848.96	23.98	4.87	1,814.28	246.36	20.99	2.00	2.00	0.00	4.87	
4,643.56	23.98	4.87	4,367.67	1,378.00	117.41	0.00	0.00	0.00	0.00	
5,908.68	90.00	179.35	5,261.00	796.26	162.23	9.00	5.22	13.79	173.96	
6,008.68	90.00	179.35	5,261.00	696.27	163.36	0.00	0.00	0.00	0.00	
6,077.90	91.38	179.35	5,260.16	627.06	164.15	2.00	2.00	0.00	0.01	
8,176.25	91.38	179.35	5,209.47	-1,470.54	187.94	0.00	0.00	0.00	0.00	
8,323.24	91.37	182.29	5,205.94	-1,617.46	185.84	2.00	-0.01	2.00	90.28	
10,456.78	91.37	182.29	5,155.00	-3,748.69	100.58	0.00	0.00	0.00	0.00	HEROS 2308 09L PB
10,506.78	91.37	182.29	5,153.81	-3,798.63	98.58	0.00	0.00	0.00	0.00	

# Cathedral Energy Services

## Planning Report

**Database:** USA EDM 5000 Multi Users DB  
**Company:** LOGOS Operating LLC  
**Project:** San Juan County, NM  
**Site:** S9-T23N-R8W  
**Well:** HEROS 2308 09L COM #1H  
**Wellbore:** OH  
**Design:** PLAN #3

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

Well HEROS 2308 09L COM #1H  
 14' KB @ 6930.00usft (AZTEC 920)  
 14' KB @ 6930.00usft (AZTEC 920)  
 True  
 Minimum Curvature

### Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Comments / Formations
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	
320.00	0.00	0.00	320.00	0.00	0.00	0.00	0.00	0.00	9 5/8"
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	
650.00	0.00	0.00	650.00	0.00	0.00	0.00	0.00	0.00	KOP #1 @ 650'
700.00	1.00	4.87	700.00	0.43	0.04	-0.43	2.00	2.00	
800.00	3.00	4.87	799.93	3.91	0.33	-3.90	2.00	2.00	
850.16	4.00	4.87	850.00	6.96	0.59	-8.95	2.00	2.00	Ojo Alamo
900.00	5.00	4.87	899.88	10.86	0.93	-10.83	2.00	2.00	
1,000.00	7.00	4.87	999.13	21.28	1.81	-21.22	2.00	2.00	
1,057.37	8.15	4.87	1,056.00	28.81	2.45	-28.73	2.00	2.00	Kirkland
1,100.00	9.00	4.87	1,098.15	35.14	2.99	-35.05	2.00	2.00	
1,189.18	10.78	4.87	1,186.00	50.41	4.29	-50.27	2.00	2.00	Fruitland
1,200.00	11.00	4.87	1,196.63	52.44	4.47	-52.31	2.00	2.00	
1,300.00	13.00	4.87	1,294.44	73.16	6.23	-72.97	2.00	2.00	
1,400.00	15.00	4.87	1,391.46	97.26	8.29	-97.01	2.00	2.00	
1,500.00	17.00	4.87	1,487.58	124.73	10.63	-124.40	2.00	2.00	
1,552.87	18.06	4.87	1,538.00	140.59	11.98	-140.22	2.00	2.00	Pictured Cliffs
1,600.00	19.00	4.87	1,582.68	155.51	13.25	-155.10	2.00	2.00	
1,668.31	20.37	4.87	1,647.00	178.44	15.20	-177.97	2.00	2.00	Chacra
1,700.00	21.00	4.87	1,676.65	189.59	16.15	-189.09	2.00	2.00	
1,800.00	23.00	4.87	1,769.36	226.91	19.33	-226.31	2.00	2.00	
1,848.96	23.98	4.87	1,814.26	246.36	20.99	-245.71	2.00	2.00	EOB; INC=23.98°
1,900.00	23.98	4.87	1,860.90	267.03	22.75	-266.32	0.00	0.00	
2,000.00	23.98	4.87	1,952.27	307.52	26.20	-306.71	0.00	0.00	
2,100.00	23.98	4.87	2,043.64	348.01	29.65	-347.09	0.00	0.00	
2,200.00	23.98	4.87	2,135.01	388.51	33.10	-387.48	0.00	0.00	
2,300.00	23.98	4.87	2,226.38	429.00	36.55	-427.87	0.00	0.00	
2,400.00	23.98	4.87	2,317.75	469.50	40.00	-468.25	0.00	0.00	
2,500.00	23.98	4.87	2,409.12	509.99	43.45	-508.64	0.00	0.00	
2,600.00	23.98	4.87	2,500.48	550.48	46.90	-549.03	0.00	0.00	
2,700.00	23.98	4.87	2,591.85	590.98	50.35	-589.41	0.00	0.00	
2,800.00	23.98	4.87	2,683.22	631.47	53.80	-629.80	0.00	0.00	
2,900.00	23.98	4.87	2,774.59	671.96	57.25	-670.18	0.00	0.00	
3,000.00	23.98	4.87	2,865.96	712.46	60.70	-710.57	0.00	0.00	
3,100.00	23.98	4.87	2,957.33	752.95	64.15	-750.96	0.00	0.00	
3,167.49	23.98	4.87	3,019.00	780.28	66.48	-778.22	0.00	0.00	Cliff House
3,200.00	23.98	4.87	3,048.70	793.45	67.60	-791.34	0.00	0.00	
3,207.99	23.98	4.87	3,056.00	796.68	67.88	-794.57	0.00	0.00	Meneffee
3,300.00	23.98	4.87	3,140.07	833.94	71.05	-831.73	0.00	0.00	
3,400.00	23.98	4.67	3,231.44	874.43	74.50	-872.12	0.00	0.00	
3,500.00	23.96	4.87	3,322.81	914.93	77.95	-912.50	0.00	0.00	
3,600.00	23.98	4.87	3,414.18	955.42	81.40	-952.89	0.00	0.00	
3,700.00	23.98	4.87	3,505.55	995.91	84.85	-993.28	0.00	0.00	
3,800.00	23.98	4.87	3,596.92	1,036.41	88.30	-1,033.66	0.00	0.00	
3,900.00	23.98	4.87	3,688.29	1,076.90	91.75	-1,074.05	0.00	0.00	
4,000.00	23.98	4.87	3,779.66	1,117.39	95.20	-1,114.44	0.00	0.00	
4,100.00	23.98	4.87	3,871.02	1,157.89	98.65	-1,154.82	0.00	0.00	



# Cathedral Energy Services

## Planning Report

**Database:** USA EDM 5000 Multi Users DB  
**Company:** LOGOS Operating LLC  
**Project:** San Juan County, NM  
**Site:** S9-T23N-R8W  
**Well:** HEROS 2308 09L COM #1H  
**Wellbore:** OH  
**Design:** PLAN #3

**Local Co-ordinate Reference:** Well HEROS 2308 09L COM #1H  
**TVD Reference:** 14' KB @ 6930.00usft (AZTEC 920)  
**MD Reference:** 14' KB @ 8930.00usft (AZTEC 920)  
**North Reference:** True  
**Survey Calculation Method:** Minimum Curvature

### Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Comments / Formations
4,107.63	23.98	4.87	3,878.00	1,160.98	98.92	-1,157.91	0.00	0.00	Point Lookout
4,200.00	23.98	4.87	3,962.39	1,198.38	102.10	-1,195.21	0.00	0.00	
4,300.00	23.98	4.87	4,053.76	1,238.88	105.55	-1,235.60	0.00	0.00	
4,400.00	23.98	4.87	4,145.13	1,279.37	109.00	-1,275.98	0.00	0.00	
4,438.16	23.98	4.87	4,180.00	1,294.82	110.32	-1,291.39	0.00	0.00	Mancos
4,500.00	23.98	4.67	4,236.50	1,319.86	112.45	-1,316.37	0.00	0.00	
4,600.00	23.98	4.87	4,327.87	1,360.36	115.90	-1,356.76	0.00	0.00	
4,643.56	23.98	4.87	4,367.67	1,378.00	117.41	-1,374.35	0.00	0.00	KOP #2 @ 4644' MD/4368' TVD
4,700.00	18.93	6.51	4,420.18	1,398.54	119.42	-1,394.83	9.00	-8.94	
4,800.00	10.08	13.28	4,516.91	1,423.22	123.28	-1,419.40	9.00	-8.85	
4,900.00	2.57	71.65	4,616.29	1,432.47	127.43	-1,428.53	9.00	-7.51	
5,000.00	8.57	162.86	4,715.88	1,426.04	131.76	-1,421.99	9.00	6.00	
5,100.00	17.39	171.50	4,813.24	1,404.09	138.18	-1,399.93	9.00	8.81	
5,180.11	24.54	173.97	4,888.00	1,375.67	139.70	-1,371.42	9.00	8.93	Gallup
5,200.00	26.32	174.39	4,905.96	1,367.17	140.56	-1,362.91	9.00	8.96	
5,300.00	35.29	175.88	4,991.76	1,316.19	144.81	-1,311.83	9.00	8.97	
5,400.00	44.27	176.83	5,068.53	1,252.39	148.82	-1,247.95	9.00	8.98	
5,500.00	53.26	177.52	5,134.38	1,177.36	152.49	-1,172.84	9.00	8.99	
5,569.81	59.53	177.91	5,173.00	1,119.29	154.80	-1,114.73	9.00	8.99	Top Target Zone
5,600.00	62.25	178.06	5,187.69	1,092.93	155.73	-1,088.36	9.00	8.99	
5,700.00	71.24	178.52	5,227.13	1,001.20	158.46	-996.58	9.00	8.99	
5,800.00	80.23	178.93	5,251.75	904.40	160.61	-899.77	9.00	8.99	
5,900.00	89.22	179.32	5,260.94	804.94	162.13	-800.30	9.00	8.99	
5,908.68	90.00	179.35	5,261.00	796.26	162.23	-791.62	9.00	8.99	LP @ 5909' MD/5261' TVD; 90° - 7" (2273' FSL
6,000.00	90.00	179.35	5,261.00	704.95	163.27	-700.31	0.00	0.00	
6,008.68	90.00	179.35	5,261.00	696.27	163.36	-691.63	0.00	0.00	START BUILD
6,077.90	91.38	179.35	5,260.16	627.06	164.15	-622.43	2.00	2.00	EOB; INC=91.38°
6,100.00	91.38	179.35	5,259.63	604.97	164.40	-600.34	0.00	0.00	
6,200.00	91.38	179.35	5,257.21	505.00	165.53	-500.38	0.00	0.00	
6,300.00	91.38	179.35	5,254.80	405.04	166.67	-400.42	0.00	0.00	
6,400.00	91.38	179.35	5,252.36	305.08	167.80	-300.46	0.00	0.00	
6,500.00	91.38	179.35	5,249.97	205.11	168.94	-200.50	0.00	0.00	
6,600.00	91.38	179.35	5,247.55	105.15	170.07	-100.54	0.00	0.00	
6,700.00	91.38	179.35	5,245.13	5.18	171.20	-0.58	0.00	0.00	
6,800.00	91.38	179.35	5,242.72	-94.78	172.34	99.37	0.00	0.00	
6,900.00	91.38	179.35	5,240.30	-194.75	173.47	199.33	0.00	0.00	
7,000.00	91.38	179.35	5,237.89	-294.71	174.60	299.29	0.00	0.00	
7,100.00	91.38	179.35	5,235.47	-394.68	175.74	399.25	0.00	0.00	
7,200.00	91.38	179.35	5,233.06	-494.64	176.87	499.21	0.00	0.00	
7,300.00	91.38	179.35	5,230.64	-594.60	178.01	599.17	0.00	0.00	
7,400.00	91.38	179.35	5,228.22	-694.57	179.14	699.13	0.00	0.00	
7,500.00	91.38	179.35	5,225.81	-794.53	180.27	799.09	0.00	0.00	
7,600.00	91.38	179.35	5,223.39	-894.50	181.41	899.04	0.00	0.00	
7,700.00	91.38	179.35	5,220.98	-994.46	182.54	999.00	0.00	0.00	
7,800.00	91.38	179.35	5,218.56	-1,094.43	183.67	1,098.96	0.00	0.00	
7,900.00	91.38	179.35	5,216.14	-1,194.39	184.81	1,198.92	0.00	0.00	
8,000.00	91.38	179.35	5,213.73	-1,294.35	185.94	1,298.88	0.00	0.00	
8,100.00	91.38	179.35	5,211.31	-1,394.32	187.08	1,398.84	0.00	0.00	
8,176.25	91.38	179.35	5,209.47	-1,470.54	187.94	1,475.06	0.00	0.00	START TURN
8,200.00	91.38	179.83	5,208.90	-1,494.28	188.11	1,498.80	2.00	-0.01	
8,300.00	91.37	181.83	5,206.49	-1,594.24	188.67	1,598.68	2.00	-0.01	
8,323.24	91.37	182.29	5,205.94	-1,617.46	185.84	1,621.86	2.00	-0.01	END OF TURN

# Cathedral Energy Services

## Planning Report

Database: USA EDM 5000 Multi Users DB  
Company: LOGOS Operating LLC  
Project: San Juan County, NM  
Site: S9-T23N-R8W  
Well: HEROS 2308 09L COM #1H  
Wellbore: OH  
Design: PLAN #3

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

Well HEROS 2308 09L COM #1H  
14' KB @ 6930.00usft (AZTEC 920)  
14' KB @ 6930.00usft (AZTEC 920)  
True  
Minimum Curvature

### Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Comments / Formations
8,400.00	91.37	182.29	5,204.11	-1,694.14	182.77	1,698.43	0.00	0.00	
8,500.00	91.37	182.29	5,201.72	-1,794.03	178.77	1,798.18	0.00	0.00	
8,600.00	91.37	182.29	5,199.33	-1,893.92	174.78	1,897.93	0.00	0.00	
8,700.00	91.37	182.29	5,196.94	-1,993.81	170.78	1,997.68	0.00	0.00	
8,800.00	91.37	182.29	5,194.56	-2,093.70	166.78	2,097.42	0.00	0.00	
8,900.00	91.37	182.29	5,192.17	-2,193.59	162.79	2,197.17	0.00	0.00	
9,000.00	91.37	182.29	5,189.78	-2,293.48	158.79	2,296.92	0.00	0.00	
9,100.00	91.37	182.29	5,187.39	-2,393.38	154.80	2,396.87	0.00	0.00	
9,200.00	91.37	182.29	5,185.01	-2,493.27	150.80	2,496.42	0.00	0.00	
9,300.00	91.37	182.29	5,182.62	-2,593.16	146.80	2,596.17	0.00	0.00	
9,400.00	91.37	182.29	5,180.23	-2,693.05	142.81	2,695.91	0.00	0.00	
9,500.00	91.37	182.29	5,177.84	-2,792.94	138.81	2,795.66	0.00	0.00	
9,600.00	91.37	182.29	5,175.46	-2,892.83	134.82	2,895.41	0.00	0.00	
9,700.00	91.37	182.29	5,173.07	-2,992.73	130.82	2,995.16	0.00	0.00	
9,800.00	91.37	182.29	5,170.68	-3,092.62	126.82	3,094.91	0.00	0.00	
9,900.00	91.37	182.29	5,168.29	-3,192.51	122.83	3,194.66	0.00	0.00	
10,000.00	91.37	182.29	5,165.91	-3,292.40	118.83	3,294.40	0.00	0.00	
10,100.00	91.37	182.29	5,163.52	-3,392.29	114.83	3,394.15	0.00	0.00	
10,200.00	91.37	182.29	5,161.13	-3,492.18	110.84	3,493.90	0.00	0.00	
10,300.00	91.37	182.29	5,158.74	-3,592.08	106.84	3,593.85	0.00	0.00	
10,400.00	91.37	182.29	5,156.36	-3,691.97	102.85	3,693.40	0.00	0.00	
10,456.78	91.37	182.29	5,155.00	-3,748.69	100.58	3,750.03	0.00	0.00	PBHL - 4 1/2" Liner (2274' FNL,380' FWL)
10,500.00	91.37	182.29	5,153.97	-3,791.86	98.85	3,793.15	0.00	0.00	
10,506.78	91.37	182.29	5,153.81	-3,798.63	98.58	3,799.91	0.00	0.00	50' HOLD

### Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
HEROS 2308 09L TGT - plan hits target center - Point	0.00	0.08	5,209.47	-1,470.54	187.94	1,904,668.55	2,764,092.52	36° 14' 4.03 N	107° 41' 39.50 W
HEROS 2308 09L LP - plan misses target center by 1.14usft at 5908.82usft MD (5261.00 TVD, 796.12 N, 162.23 E) - Point	0.00	0.08	5,261.00	796.14	163.37	1,906,935.19	2,784,064.71	36° 14' 26.45 N	107° 41' 39.80 W
HEROS 2308 09L PBHL - plan hits target center - Point	0.00	0.08	5,155.00	-3,748.69	100.58	1,902,390.28	2,764,008.41	36° 13' 41.50 N	107° 41' 40.56 W

### Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
320.00	320.00	9 5/8"	9-5/8	12-1/4
5,908.68	5,261.00	7" (2273' FSL, 380' FWL)	7	7
10,456.78	5,155.00	4 1/2" Liner (2274' FNL,380' FWL)	4-1/2	4-1/2



# Cathedral Energy Services

## Planning Report

**Database:** USA EDM 5000 Multi Users DB  
**Company:** LOGOS Operating LLC  
**Project:** San Juan County, NM  
**Site:** S9-T23N-R8W  
**Well:** HEROS 2308 09L COM #1H  
**Wellbore:** OH  
**Design:** PLAN #3

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

Well HEROS 2308 09L COM #1H  
 14' KB @ 6930.00usft (AZTEC 920)  
 14' KB @ 6930.00usft (AZTEC 920)  
 True  
 Minimum Curvature

### Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
850.16	850.00	Ojo Alamo		0.00	180.08
1,057.37	1,056.00	Kirkland		0.00	180.08
1,189.18	1,186.00	Fruitland		0.00	180.08
1,552.87	1,538.00	Pictured Cliffs		0.00	180.08
1,688.31	1,647.00	Chacra		0.00	180.08
3,167.49	3,019.00	Cliff House		0.00	180.08
3,207.99	3,056.00	Meneffee		0.00	180.08
4,107.63	3,878.00	Point Lookout		0.00	180.08
4,438.16	4,180.00	Mancos		0.00	180.08
5,180.11	4,888.00	Gallup		0.00	180.08
5,569.81	5,173.00	Top Target Zone		0.00	180.08

### Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
650.00	650.00	0.00	0.00	KOP #1 @ 650'
1,848.96	1,814.26	246.36	20.99	EOB; INC=23.98°
4,843.56	4,367.67	1,378.00	117.41	KOP #2 @ 4644' MD/4368' TVD
5,908.68	5,261.00	796.26	162.23	LP @ 5909' MD/5261' TVD; 90°
6,008.68	5,261.00	696.27	163.36	START BUILD
6,077.90	5,260.16	627.06	164.15	EOB; INC=91.38°
8,176.25	5,209.47	-1,470.54	187.94	START TURN
8,323.24	5,205.94	-1,617.46	185.64	END OF TURN
10,456.78	5,155.00	-3,748.69	100.58	PBHL
10,506.78	5,153.81	-3,798.63	98.58	50' HOLD