

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

David Martin
Cabinet Secretary-Designate

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey, Division Director
Oil Conservation Division



New Mexico Oil Conservation Division approval and conditions listed below are made in accordance with OCD Rule 19.15.7.11 and are in addition to the actions approved by BLM on the following 3160-3 APD form.

Operator Signature Date: 4/17/14
Well information;
Operator Logan, Well Name and Number HEROS 2H
API# 30-045-35529, Section 3, Township 23 (NS), Range 8 (E/W)

Conditions of Approval:

(See the below checked and handwritten conditions)

- Notify Aztec OCD 24hrs prior to casing & cement.
- Hold C-104 for directional survey & "As Drilled" Plat
- Hold C-104 for (NSL, NSP) DHC NSL 7085, NSP 1983
- Spacing rule violation. Operator must follow up with change of status notification on other well to be shut in or abandoned
- Regarding the use of a pit, closed loop system or below grade tank, the operator must comply with the following as applicable:
 - A pit requires a complete C-144 be submitted and approved prior to the construction or use of the pit, pursuant to 19.15.17.8.A
 - A closed loop system requires notification prior to use, pursuant to 19.15.17.9.A
 - A below grade tank requires a registration be filed prior to the construction or use of the below grade tank, pursuant to 19.15.17.8.C
- Once the well is spud, to prevent ground water contamination through whole or partial conduits from the surface, the operator shall drill without interruption through the fresh water zone or zones and shall immediately set in cement the water protection string
- Oil base muds are not to be used until fresh water zones are cased and cemented providing isolation from the oil or diesel. This includes synthetic oils. Oil based mud, drilling fluids and solids must be contained in a steel closed loop system.

[Signature]
NMOCD Approved by Signature

6-20-2014
Date

RECEIVED

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APR 17 2014

APPLICATION FOR PERMIT TO DRILL OR REENTER

Farmington Field Office
Bureau of Land Management

5. Lease Serial No.
NM 109398

6. If Indian, Allottee or Tribe Name

7. If Unit or CA Agreement, Name and No.

8. Lease Name and Well No.
HEROS 002H

1a. Type of work: DRILL REENTER

1b. Type of Well: Oil Well Gas Well Other Single Zone Multiple Zone

2. Name of Operator Logos Operating, LLC

9. API Well No.
30-045-35539

3a. Address 4001 North Butler Ave, Building 7101
Farmington, NM 87401

3b. Phone No. (include area code)
505-330-9333

10. Field and Pool, or Exploratory
Basin Mancos

4. Location of Well (Report location clearly and in accordance with any State requirements.)*
At surface 2268' FSL & 70' FWL (NW/SW)
At proposed prod. zone 2150' FNL & 250' FWL (SW/NW)

OIL CONS. DIV DIST. 3

11. Sec., T. R. M. or Blk. and Survey or Area
SHL: Sec 3, T23N R08W, UL L
BHL: Sec 4, T23N R08W, UL E

14. Distance in miles and direction from nearest town or post office*
5 miles southeast of Nageezi

12. County or Parish
San Juan

13. State
NM

JUN 17 2014

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)
70' from eastern edge of Sec 4

16. No. of acres in lease
640.35 acres 639.60

17. Spacing Unit dedicated to this well
S2/N2 = 160 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.
1750' from Logos 5 (UL P, Sec 4, T23N R08W)

19. Proposed Depth
10609' MD, 5308' VD

20. BLM/BIA Bond No. on file
BLM 1062415
NM B000917

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
6885' GL

22. Approximate date work will start*
05/15/2014

23. Estimated duration
45 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

- Well plat certified by a registered surveyor.
- A Drilling Plan.
- A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
- Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
- Operator certification
- Such other site specific information and/or plans as may be required by the BLM.

25. Signature *Tamra Sessions* Name (Printed/Typed) Tamra Sessions Date 04/17/2014

Title Operations Technician

Approved by (Signature) *JM* Name (Printed/Typed) Date 6/17/14

Title AFM Office PFO

Application approval 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.
Conditions of approval, if any, are attached.

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.

This action is subject to technical and procedural review pursuant to 43 CFR 3165.3 and appeal pursuant to 43 CFR 3165.4

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

~~DRILLING OPERATIONS~~
AUTHORIZED ARE SUBJECT TO COMPLIANCE WITH ATTACHED "GENERAL REQUIREMENTS" OIL CONS. DIV DIST. 3

JUN 17 2014

NMOCD AV

CONFIDENTIAL

DISTRICT I
1625 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) 334-6178 Fax: (505) 334-8170

DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, N.M. 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department

RECEIVED
Revised August 1, 2011

Form C-102

Submit one copy to appropriate

APR 17 2014

District Office

OIL CONSERVATION DIVISION

1220 South St. Francis Dr.
Santa Fe, N.M. 87505

Farrington Field Office
Bureau of Land Management

AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number 30-045-35539		Pool Code 97232	Pool Name Basin Mancos
Property Code 313147	Property Name HEROS		Well Number 002H
OGRID No. 289408	Operator Name LOGOS OPERATING, LLC		Elevation 6885

¹⁰ 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	3	23 N	8 W		2268	SOUTH	70	WEST	SAN JUAN

¹¹ 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	4	23 N	8 W		2150	NORTH	250	WEST	SAN JUAN

Dedicated Acres 160 acres 50/1/2 Sec 4	Joint or Infill	Consolidation Code	Order No.
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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

16

BOTTOM HOLE	LANDING POINT	SURFACE
LAT: 36.2576801° N LONG: 107.6951904° W NAD 83 LAT: 36°15.46005' N LONG: 107°41.67472' W NAD 27	LAT: 36.2576638° N LONG: 107.6784283° W NAD 83 LAT: 36°15.45907' N LONG: 107°40.66903' W NAD 27	LAT: 36.2551894° N LONG: 107.6777876° W NAD 83 LAT: 36°15.31060' N LONG: 107°40.63059' W NAD 27

LEGEND:
○ = SURFACE LOCATION
● = BOTTOM HOLE LOCATION
⊙ = FOUND 1947 U.S.G.L.O. BRASS CAP
△ = LANDING POINT

BEARINGS & DISTANCES SHOWN ARE REFERENCED TO THE NEW MEXICO COORDINATE SYSTEM, WEST ZONE, NAD 83, UNLESS OTHERWISE NOTED.

17 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 working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Tamra Sessions 4-17-14
Signature Date
Tamra Sessions
Printed Name
t.sessions@logosresourcesllc.com
E-mail Address

18 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.

03/27/14
Date of Survey
Signature and Seal of Professional Surveyor
MARSHALL W. LINDEEN
NEW MEXICO
17078
PROFESSIONAL SURVEYOR

17078
Certificate Number
United Field Services, Inc.

**Attachment To Application For Permit To Drill.
Drilling program**

LOGOS OPERATING, LLC
4001 N. Butler, Bldg 7101
Farmington, NM 87401
U.S.A

HEROS #2H

Horizontal Gallup Oil and Gas Well
Surface Location: 2268' FSL – 70' FWL
Section 3, T23N, R8W
Ungraded GL Elev = 6885'
Estimate KB Elev = 6900' (15'KB)
Lat. = 36.2551894 deg N
Long. = 107.6777876 deg W
NAD83
San Juan County, New Mexico

Proposed Bottom Hole Location: 2150' FNL – 250' FWL
Section 4, T23N, R8W
Lat. = 36.2576801 deg N
Long. = 107.6951904 deg W
San Juan County, New Mexico

Drilling program written in compliance with onshore Oil and Gas Order No. 1
(001 Ill.D.3, effective May 2007) and Onshore Order No. 2 Dated November 18, 1988

• **ESTIMATED TOPS FOR IMPORTANT GEOLOGICAL FORMATIONS**

<u>Formation Tops</u>	<u>Surface (TVD)</u>
Ojo Alamo	1031
Kirtland	1177
Fruitland	1498
Pictured Cliff's	1705
Chacra	2107
Cliffs House	3183
Menefee	3222
Point Lookout	4092
Mancos	4240
Gallup	5140
Lower Gallup	5332
Landing Point	5342
Total Depth	5308

Drilling Plan

Drill 12 ¼" hole to 500' then set 9 5/8" casing. Drill 8 3/4" hole with fresh water mud from 500' MD to kick off point #1 600' MD and build 2 degrees per 100' to 12 degrees, 17 degrees azimuth and hold to approximately 4929' MD.

Trip out of hole and pick up 8 ¾" kick off assembly at 4929' MD. Build angle at 12 deg/100' to 85 degrees inclination and 270.07 degrees azimuth in the Gallup formation at 5667' MD / 5338' TVD where 7" intermediate casing will be set.

7" casing will be set in a legal position 2150' FNL & 100' FEL in Section 4.

The 7" casing will be drilled out with a 6 1/8" drilling assembly building angle at 5 deg/100' to 90.40 degrees inclination and 270.07 degree azimuth to 5775 'MD / 5342' TVD. Hold 90.40 degrees, 270.07 degrees azimuth and drill to a total depth at 10609' MD / 5308' TVD. Adjustments may be made to the directional program based on geology. Total depth will be 10609' MD / 5308' TVD - 90.40 degrees, 270.07 degrees Azimuth.

The Bottom hole location will be in a legal location at 10609' MD at 2150' FNL & 250' FWL of section 4.

A total of 4834' of horizontal hole will be drilled.

- **ANTICIPATED DEPTHS OF PROSPECTIVE OIL GAS AND OTHER HYDROCARBONS**

Primary objective is the Gallup formation encountered first at 5338' TVD at 7" casing point

See formation listings in #1 above for additional zones of interest.

- **MINIMUM SPECIFICATIONS FOR 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 1944 psig (0.364 psi/ft @ 5342' 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 1175 psi (5342' 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.

1. PROPOSED BIT AND CASING PROGRAM

A. Bit Program

- 12 1/4" Surface Hole = Surface to 500'
- 8 3/4" = 500' to 5667' = 7" Casing point @ 85 degrees – DV 100' below top of Mancos
- 8 3/4" Landing point = 5775' @ 90.40 degrees
- 6-1/8" Lateral = 5775' MD to 10609' MD = Gallup Pay Zone Horizontal

A. Casing Program – all casing stings are new casing

Casing & Hole Size	Weight	Grade	Coupling	Setting Depth (MD)	Comments
9-5/8" (12 1/4")	36 ppf	J or K-55	LT&C	0' - 500'	New casing. Cement to surface.
7" (8 3/4")	23 ppf	J or K-55	LT&C	0' - 5667' MD	New Casing. Cement to surface with two stages- DV Tool 100' below Mancos Top at 4362'
4 1/2" (6 1/8")	11.6 ppf	P-110	LT&C	5000' - 10609' MD	New Casing - Horizontal Hole Cemented full length with foam cement - TOL at 15 degrees.

Casing strings below the conductor casing will be tested to .22 psi per foot of casing string length or 1500 psi, whichever is greater, but not to exceed 70% of the minimum internal yield.

Minimum casing design factors used:

Collapse -	1.125
Burst -	1.0
Jt. Strength -	1.60

Surface casing shall have a minimum of 1 centralizer per joint on the bottom three (3) joints, starting with the shoe joint for a total of (4) minimum centralizers. Centralizers will be placed 10' above the shoe on the shoe joint, on the 1st, 2nd and 3rd casing collars.

The intermediate casing will be centralized using 1 centralizer the first 6 jts and spaced appropriately through the curve section of the well-bore and then spaced +/- 1 centralizer / 4 jts through the remainder of the cement column, using approximately 40 centralizers.

1. PROPOSED CEMENTING PROGRAM

The proposed cementing program has been designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use. The casing setting depth shall be calculated to position the casing seat opposite a competent formation which will contain the maximum pressure to which it will be exposed during normal drilling operations. All indications of useable water shall be reported.

- The proposed cementing program is as follows:

Top plugs shall be used to reduce contamination of cement by displacement fluid. A bottom plug or other acceptable technique, such as a pre-flush fluid, inner string cement method, etc. shall be utilized to help isolate the cement from contamination by the mud fluid being displaced ahead of the cement slurry.

Surface Casing Single Stage Job – (0-500’):

Excess – 100% over gauge hole – 12-1/4” hole and 9-5/8” casing (0.3132ft3/ft)

Top of Cement - Surface

Primary Cement

HALCEM (TM) SYSTEM

0.125 lbm/sk Poly-E-Flake (Lost Circulation Additive)

Fluid Weight	15.80 lbm/gal
Slurry Yield:	1.174 ft ³ /sk
Total Mixing Fluid:	5.13 Gal/sk
Top of Fluid:	0 ft
Calculated Fill:	500 ft
Volume:	55.8 bbls
Calculated Sacks:	270 sks

5667

Intermediate Casing – Two Stage Job – DV@ 4362’ - (0-5596’MD):

Excess – 50% over gauge hole – 8-3/4” hole and 7” casing (0.1503 ft3/ft)

Top of Cement – Surface

Stage #1:

Lead - (5096’ – 4362’): 564 sx - 12.3 ppg, lightweight conventional cement containing:

HALCEM™ SYSTEM – Cement

HR-5 – Retarder – 0.30% BWOB

Kol - Seal – Lost Circulation Control Agent – 5 lbs/sx BWOB

Poly - E – Flake – 0.125 lbs/sx BWOB

Yield – 1.951 ft³/sx

Water requirement – 10.10 gal/sx.

5667

Tail - (5596’ – 5096’): 86 sx – 13.5. ppg, lightweight conventional cement containing:

HALCEM™ SYSTEM – Cement

Kol - Seal – Lost Circulation Control Agent – 5 lbs/sx BWOB

Poly - E – Flake – 0.125 lbs/sx BWOB

Yield – 1.314 ft³/sx
Water requirement – 5.45 gal/sx.

Stage #2:

Lead - (3862' – 0'): 450 sx - 12.3 ppg, lightweight conventional cement containing:
HALCEM™ SYSTEM – Cement
Kol - Seal – Lost Circulation Control Agent – 3 lbs/sx WBWOB
Poly - E – Flake – 0.125 lbs/sx WBWOB
Yield – 1.933 ft³/sx
Water requirement – 10.17 gal/sx.

Tail - (4362' – 3862'): 98 sx – 15.8. ppg, conventional cement containing:
HALCEM™ SYSTEM – Cement
Yield – 1.148 ft³/sx
Water requirement – 4.97 gal/sx.

Total sacks of cement pumped = 1198

Cement volumes are minimums and may be adjusted based on caliper log results.

Production Casing – Single Stage Job (5000' - 10502'MD):

**Excess – 50% over gauge hole – 6-1/8" hole and 4-1/2" casing (0.0942 ft³/ft)
Top of Cement – Top of Liner.**

Lead Cement - Cap Cement		
ELASTISEAL (TM) SYSTEM	Fluid Weight	13 lbm/gal
0.2 % Versaset (Thixotropic Additive)	Slurry Yield:	1.43 ft ³ /sk
0.15 % HALAD-766 (Low Fluid Loss Control)	Total Mixing Fluid:	6.75 Gal/sk
0.2 % Halad(R)-344 (Low Fluid Loss Control)	Top of Fluid:	4700 ft
	Calculated Fill:	300 ft
	Volume:	7.15 bbl
	Calculated Sacks:	30 sks

Foamed Lead Cement		
ELASTISEAL (TM) SYSTEM	Fluid Weight	13 lbm/gal
0.2 % Versaset (Thixotropic Additive)	Slurry Yield:	1.43 ft ³ /sk
0.15 % HALAD-766 (Low Fluid Loss Control)	Total Mixing Fluid:	6.75 Gal/sk
2.5 % CHEM - FOAMER 760, TOTETANK (Foamer)	Top of Fluid:	5000 ft
0.2 % Halad(R)-344 (Low Fluid Loss Control)	Calculated Fill:	4618 ft
	Volume:	93 bbl
	Calculated Sacks:	270 sks

Tail Cement		
ELASTISEAL (TM) SYSTEM	Fluid Weight	13.50 lbm/gal
0.2 % Versaset (Thixotropic Additive)	Slurry Yield:	1.28 ft ³ /sk
0.15 % HALAD-766 (Low Fluid Loss Control)	Total Mixing Fluid:	5.64 Gal/sk
0.05 % SA-1015 (Suspension Agent)	Top of Fluid:	9618 ft
	Calculated Fill:	1069 ft
	Volume:	20.85 bbl
	Calculated Sacks:	100 sks

Detailed Pumping Schedule

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	Fresh Water Spacer	8.3		10 bbl
2	Spacer	CHEMICAL WASH	8.4		40 bbl
3	Spacer	Fresh Water Spacer	8.3		10 bbl
4	Cement	Cap Cement	13.0		30 sks
5	Cement	Foamed Lead Cement	13.0		270 sks
6	Cement	Tail Cement	13.5		100 sks
7	Spacer	MMCR Spacer	8.3		20 bbl
8	Spacer	Fresh Water Displacement	8.3		

Foam Output Parameter Summary:

Fluid #	Fluid Name	Unfoamed Liquid Volume	Beginning Density lbm/gal	Ending Density lbm/gal	Beginning Rate scf/bbl	Ending Rate scf/bbl
Stage 1						
5	Foamed Lead Cement	50.98bbl	10.0	10.0	303.8	509.4

Foam Design Specifications:

Foam Calculation Method: Constant Density
 Backpressure: 14 psig
 Bottom Hole Circulating Temp: 158 degF
 Mud Outlet Temperature: 100 degF
 Production liner clarification: Utilizing foam cement for zonal isolation in the production liner.

Calculated Gas = 20792.1 scf
 Additional Gas = 50000 scf
 Total Gas = 70792.1 scf

Actual volumes will be calculated and determined by conditions onsite. All cement slurries will meet or exceed minimum BLM and New Mexico Oil Conservation Division requirements. Slurries used will be the slurries listed above or equivalent slurries depending on service provider selected. Cement yields may change depending on slurries selected.

All waiting on cement times shall be a minimum of 8 hours or adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drilling out.

- **PROPOSED DRILLING FLUIDS PROGRAM**
 - Vertical Portion

Hole Size (in)	TVD (ft)	Mud Type	Density (lb/gal)	Viscosity (sec/qt)	Fluid Loss (cc)
12 1/4"	0-500'	FreshWater	8.4-8.6	60-70	NC
8 3/4"	500'-4941'	FreshWater LSND	8.5-8.8	40-50	8-10

- Kick off to Horizontal Lateral:

Hole Size (in)	TVD/MD (ft)	Mud Type	Density (lb/gal)	Viscosity (sec/qt)	Fluid Loss (CC)
8 3/4"	4941' (KOP)- 5704'	Fresh Water LSND	8.5-8.8	40-50	8-10
6 1/8"	5704' - 10502'	Synthetic Oil Based Mud	7.0-9.0	15-25	<1

- There will be sufficient mud on location to control a blowout should one occur. Mud flow and volume will be monitored both visually and with electronic pit volume totalizers. Mud tests shall be performed every 24 hours after mudding up to determine, as applicable: density, viscosity, gel strength, filtration, and pH.
- A closed-loop system will be used to recover drilling fluid and dry cuttings in both phases of the well and on all hole intervals, including fresh water and oil-based operations. Above-ground tanks will be utilized to hold cuttings and fluids for rig operations. A frac tank will be on location to store fresh water. Waste will be disposed of properly at an EPA-approved hazardous waste facility. Fresh water cuttings will be disposed of at Basin Disposal, Inc. and/or Industrial Ecosystems, Inc. The location will be lined in accordance with the Surface Use Plan of Operations.
- **TESTING, CORING and LOGGING**
 - Drill Stem Testing - None anticipated
 - Coring - None anticipated.
 - Mud Logging - Mud loggers will be on location from intermediate casing point to TD.
 - Logging - See Below
 - Gamma Ray from surface casing point to TD

Cased Hole:

CBL/CCL/GRNDL will be run as needed for perforating control

- **ABNORMAL PRESSURES & HYDROGEN SULFIDE**

The anticipated bottom hole pressure is +/- 2537 psi based on a 9.0 ppg at 5420' TVD of the landing point of the horizontal. No abnormal pressure or temperatures are anticipated.

No hydrogen sulfide gas is anticipated, however, if H₂S is encountered, the guidelines in Onshore Order No. 6 will be followed.

9. ANTICIPATED START DATE AND DURATION OF OPERATIONS

Drilling is estimated to commence on May 15, 2014. It is anticipated that completion operations will begin within 30 days after the well has been drilled depending on fracture treatment schedules with various pumping service companies.

It is anticipated that the drilling of this well will take approximately 25 days.

CLOSED-LOOP SYSTEM DESIGN PLAN

The closed-loop system will consist of a series of temporary above-ground storage tanks and/or haul-off bins suitable for holding the cuttings and fluids from drilling operations. The closed-loop system will not entail temporary pits, below-grade storage tanks, below-grade sumps, or drying pads.

Design considerations include:

- The closed-loop system will be signed in accordance with 19.15.17.11 NMAC.
- The closed-loop system storage tanks will be of adequate volume to ensure confinement of all fluids and provide sufficient freeboard to prevent uncontrolled releases.
- Topsoil will be salvaged and stored for use in reclamation activities.
- The closed-loop system storage tanks will be placed in bermed secondary containment sized to contain a minimum of 110 percent of the volume of the largest storage tank.

CLOSED-LOOP SYSTEM OPERATING & MAINTENANCE PLAN

The closed-loop system will be operated and maintained to contain liquids and solids; minimize the amount of drilling fluids and cuttings that require disposal; maximize the amount of drilling fluid recycled and reused in the drilling process; isolate drilling wastes from the environment; prevent contamination of fresh water; and protect public health and the environment.

Operation and maintenance considerations include:

- Fluid levels will be maintained to provide sufficient freeboard to prevent over-topping.
- Visual inspections will be conducted on a daily basis to identify any potential leaks and to ensure that the closed-loop system storage tanks have sufficient freeboard to prevent over-topping.
- Only drilling fluids or cuttings intrinsic to, used by, or generated from, drilling operations will be stored in the closed-loop system storage tanks. Hazardous waste, miscellaneous solid waste, and/or debris will not be stored in the storage tanks.
- The OCD District Office will be notified within 48 hours of discovery of a leak in the closed-loop drilling system. If a leak is discovered, all liquid will be removed within 48 hours and the damage repaired.

CLOSED-LOOP SYSTEM CLOSURE PLAN

The closed-loop system will be closed in accordance with 19.15.17.13 NMAC. Closure considerations include:

- Drilling fluids will be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse, as practical.
- Residual fluids will be pulled from the storage tanks, mixed with saw dust or similar absorbent material, and disposed of at Industrial Ecosystem, Inc. waste disposal facilities.
- Remaining cuttings or sludges will be vacuumed from the storage tanks and disposed of at the Envirotech, Inc and/or Industrial Ecosystem, Inc. waste disposal facilities.
- Storage tanks will be removed from the well location during the rig move.
- The well pad will be reclaimed and seeded in accordance with subsections G, Hand I of 19.15.17.13 NMAC.



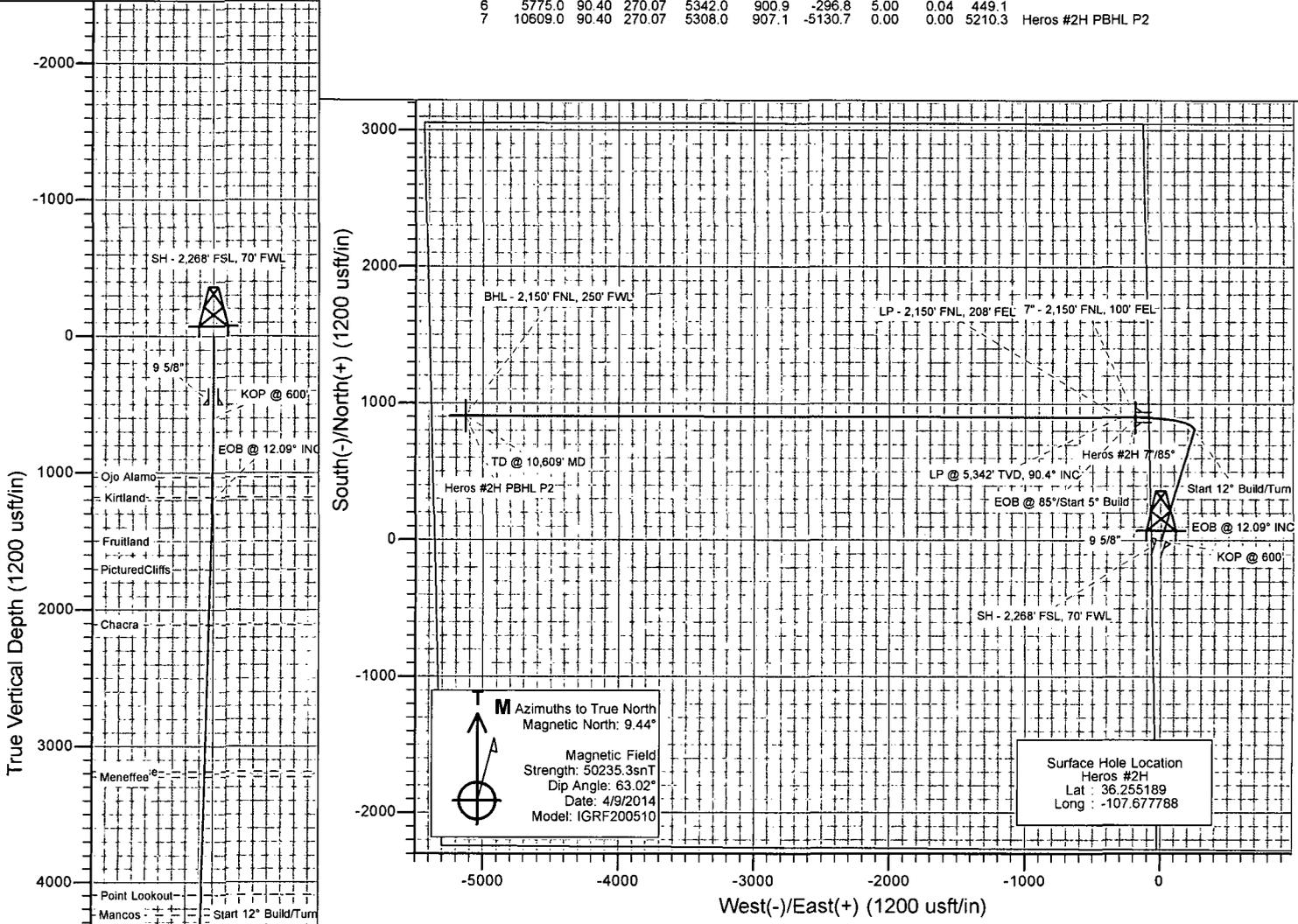
Project: San Juan County, NM
 Site: S3-T23N-R8W (Heros Pad)
 Well: Heros #2H
 Wellbore: HZ
 Design: Plan #2



Plan #2
 Heros #2H
 145XXX, SC
 KB=15' @ 6900.0usft
 Ground Elevation @ 6885.0
 North American Datum 1983
 Well Heros #2H, True North

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	800.0	0.00	0.00	600.0	0.0	0.0	0.00	0.00	0.0	
3	1204.6	12.09	17.00	1200.2	60.8	18.6	2.00	17.00	-7.7	
4	4928.6	12.09	17.00	4841.5	866.9	246.7	0.00	0.00	-102.5	
5	5666.9	85.00	270.07	5337.7	900.7	-188.9	12.00	-107.58	342.8	Heros #2H 7"/85°
6	5775.0	90.40	270.07	5342.0	900.9	-296.8	5.00	0.04	449.1	
7	10609.0	90.40	270.07	5308.0	907.1	-5130.7	0.00	0.00	5210.3	Heros #2H PBHL P2



M Azimuths to True North
 Magnetic North: 9.44°
 Magnetic Field
 Strength: 50235.3snT
 Dip Angle: 63.02°
 Date: 4/9/2014
 Model: IGRF200510

Surface Hole Location
 Heros #2H
 Lat : 36.255189
 Long : -107.677788

FORMATION TOP DETAILS

TVDPPath	MDPath	Formation
1031.0	1032.6	Ojo Alamo
1177.0	1181.0	Kirtland
1498.0	1509.2	Fruitland
1705.0	1720.9	PicturedCliffs
2107.0	2132.1	Chacra
3183.0	3232.5	Cliff House
3222.0	3272.4	Menefee
4092.0	4162.1	Point Lookout
4240.0	4313.5	Mancos
5140.0	5251.1	Gallup
5332.0	5623.5	Lower Gallup

CASING DETAILS

TVD	MD	Name
500.0	500.0	9 5/8"
5337.7	5666.9	7" - 2,150' FNL, 100' FEL

DESIGN TARGET DETAILS

Name	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Heros #2H PBHL P2	907.1	-5130.7	1913123.28	2763819.27	36.257680	-107.695190
Heros #2H 7"/85°	900.7	-188.9	1913124.82	2768761.13	36.257664	-107.678428

Vertical Section at 280.03° (1200 usft/in)

Cathedral Energy Services

Planning Report

Database: USA EDM 5000 Multi Users DB	Local Co-ordinate Reference: Well Heros #2H	
Company: LOGOS Operating LLC	TVD Reference: KB=15' @ 6900.0usft	
Project: San Juan County, NM	MD Reference: KB=15' @ 6900.0usft	
Site: S3-T23N-R8W (Heros Pad)	North Reference: True	
Well: Heros #2H	Survey Calculation Method: Minimum Curvature	
Wellbore: HZ		
Design: Plan #2		

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

Site	S3-T23N-R8W (Heros Pad)				
Site Position:		Northing:	1,913,317.33 usft	Latitude:	36.258189
From:	Lat/Long	Easting:	2,769,670.19 usft	Longitude:	-107.675344
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0.09 °

Well	Heros #2H					
Well Position	+N/-S	0.0 usft	Northing:	1,912,224.39 usft	Latitude:	36.255189
	+E/-W	0.0 usft	Easting:	2,768,951.46 usft	Longitude:	-107.677788
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	6,885.0 usft

Wellbore	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	4/9/2014	9.44	63.02	50,235

Design	Plan #2			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	280.03

Plan Sections										
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
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
600.0	0.00	0.00	600.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,204.6	12.09	17.00	1,200.2	60.8	18.6	2.00	2.00	0.00	17.00	
4,928.6	12.09	17.00	4,841.5	806.8	246.7	0.00	0.00	0.00	0.00	
5,666.9	85.00	270.07	5,337.7	900.7	-188.9	12.00	9.87	-14.48	-107.58	Heros #2H 7"/85°
5,775.0	90.40	270.07	5,342.0	900.9	-296.8	5.00	5.00	0.00	0.04	
10,609.0	90.40	270.07	5,308.0	907.1	-5,130.7	0.00	0.00	0.00	0.00	Heros #2H PBHL P2

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros #2H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6900.0usft
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6900.0usft
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros #2H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

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
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
0.5	0.00	0.00	0.5	0.0	0.0	0.0	0.00	0.00	SH - 2,268' FSL, 70' FWL
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	9 5/8"
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	KOP @ 600'
700.0	2.00	17.00	700.0	1.7	0.5	-0.2	2.00	2.00	
800.0	4.00	17.00	799.8	6.7	2.0	-0.8	2.00	2.00	
900.0	6.00	17.00	899.5	15.0	4.6	-1.9	2.00	2.00	
1,000.0	8.00	17.00	998.7	26.7	8.2	-3.4	2.00	2.00	
1,032.6	8.65	17.00	1,031.0	31.2	9.5	-4.0	2.00	2.00	Ojo Alamo
1,100.0	10.00	17.00	1,097.5	41.6	12.7	-5.3	2.00	2.00	
1,181.0	11.62	17.00	1,177.0	56.1	17.2	-7.1	2.00	2.00	Kirtland
1,204.6	12.09	17.00	1,200.2	60.8	18.6	-7.7	2.00	2.00	EOB @ 12.09° INC
1,300.0	12.09	17.00	1,293.4	79.9	24.4	-10.1	0.00	0.00	
1,400.0	12.09	17.00	1,391.2	99.9	30.6	-12.7	0.00	0.00	
1,500.0	12.09	17.00	1,489.0	120.0	36.7	-15.2	0.00	0.00	
1,509.2	12.09	17.00	1,498.0	121.8	37.3	-15.5	0.00	0.00	Fruitland
1,600.0	12.09	17.00	1,586.7	140.0	42.8	-17.8	0.00	0.00	
1,700.0	12.09	17.00	1,684.5	160.0	48.9	-20.3	0.00	0.00	
1,720.9	12.09	17.00	1,705.0	164.2	50.2	-20.9	0.00	0.00	PicturedCliffs
1,800.0	12.09	17.00	1,782.3	180.1	55.1	-22.9	0.00	0.00	
1,900.0	12.09	17.00	1,880.1	200.1	61.2	-25.4	0.00	0.00	
2,000.0	12.09	17.00	1,977.9	220.1	67.3	-28.0	0.00	0.00	
2,100.0	12.09	17.00	2,075.7	240.2	73.4	-30.5	0.00	0.00	
2,132.1	12.09	17.00	2,107.0	246.6	75.4	-31.3	0.00	0.00	Chacra
2,200.0	12.09	17.00	2,173.4	260.2	79.6	-33.1	0.00	0.00	
2,300.0	12.09	17.00	2,271.2	280.2	85.7	-35.6	0.00	0.00	
2,400.0	12.09	17.00	2,369.0	300.3	91.8	-38.1	0.00	0.00	
2,500.0	12.09	17.00	2,466.8	320.3	97.9	-40.7	0.00	0.00	
2,600.0	12.09	17.00	2,564.6	340.3	104.1	-43.2	0.00	0.00	
2,700.0	12.09	17.00	2,662.3	360.4	110.2	-45.8	0.00	0.00	
2,800.0	12.09	17.00	2,760.1	380.4	116.3	-48.3	0.00	0.00	
2,900.0	12.09	17.00	2,857.9	400.4	122.5	-50.9	0.00	0.00	
3,000.0	12.09	17.00	2,955.7	420.5	128.6	-53.4	0.00	0.00	
3,100.0	12.09	17.00	3,053.5	440.5	134.7	-56.0	0.00	0.00	
3,200.0	12.09	17.00	3,151.2	460.5	140.8	-58.5	0.00	0.00	
3,232.5	12.09	17.00	3,183.0	467.0	142.8	-59.3	0.00	0.00	Cliff House
3,272.4	12.09	17.00	3,222.0	475.0	145.3	-60.3	0.00	0.00	Meneffee
3,300.0	12.09	17.00	3,249.0	480.6	147.0	-61.0	0.00	0.00	
3,400.0	12.09	17.00	3,346.8	500.6	153.1	-63.6	0.00	0.00	
3,500.0	12.09	17.00	3,444.6	520.6	159.2	-66.1	0.00	0.00	
3,600.0	12.09	17.00	3,542.4	540.7	165.3	-68.7	0.00	0.00	
3,700.0	12.09	17.00	3,640.1	560.7	171.5	-71.2	0.00	0.00	
3,800.0	12.09	17.00	3,737.9	580.7	177.6	-73.8	0.00	0.00	
3,900.0	12.09	17.00	3,835.7	600.8	183.7	-76.3	0.00	0.00	
4,000.0	12.09	17.00	3,933.5	620.8	189.8	-78.9	0.00	0.00	
4,100.0	12.09	17.00	4,031.3	640.8	196.0	-81.4	0.00	0.00	
4,162.1	12.09	17.00	4,092.0	653.3	199.8	-83.0	0.00	0.00	Point Lookout
4,200.0	12.09	17.00	4,129.1	660.9	202.1	-83.9	0.00	0.00	

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros #2H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6900.0usft
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6900.0usft
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros #2H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

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
4,300.0	12.09	17.00	4,226.8	680.9	208.2	-86.5	0.00	0.00	
4,313.5	12.09	17.00	4,240.0	683.6	209.0	-86.8	0.00	0.00	Mancos
4,400.0	12.09	17.00	4,324.6	700.9	214.3	-89.0	0.00	0.00	
4,500.0	12.09	17.00	4,422.4	721.0	220.5	-91.6	0.00	0.00	
4,600.0	12.09	17.00	4,520.2	741.0	226.6	-94.1	0.00	0.00	
4,700.0	12.09	17.00	4,618.0	761.0	232.7	-96.7	0.00	0.00	
4,800.0	12.09	17.00	4,715.7	781.1	238.8	-99.2	0.00	0.00	
4,900.0	12.09	17.00	4,813.5	801.1	245.0	-101.8	0.00	0.00	
4,928.6	12.09	17.00	4,841.5	806.8	246.7	-102.5	0.00	0.00	Start 12° Build/Turn
4,950.0	11.57	4.72	4,862.4	811.1	247.6	-102.6	12.00	-2.42	
4,975.0	11.67	349.79	4,886.9	816.1	247.3	-101.5	12.00	0.37	
5,000.0	12.49	335.97	4,911.4	821.1	245.8	-99.1	12.00	3.30	
5,025.0	13.92	324.38	4,935.7	826.0	242.9	-95.4	12.00	5.71	
5,050.0	15.78	315.19	4,959.9	830.8	238.8	-90.5	12.00	7.46	
5,075.0	17.95	308.03	4,983.8	835.6	233.3	-84.3	12.00	8.68	
5,100.0	20.33	302.42	5,007.4	840.3	226.6	-76.9	12.00	9.50	
5,125.0	22.85	297.98	5,030.7	844.9	218.7	-68.2	12.00	10.07	
5,150.0	25.46	294.39	5,053.5	849.4	209.5	-58.4	12.00	10.47	
5,175.0	28.15	291.44	5,075.8	853.8	199.1	-47.4	12.00	10.76	
5,200.0	30.89	288.96	5,097.6	858.0	187.5	-35.3	12.00	10.97	
5,225.0	33.68	286.86	5,118.7	862.1	174.8	-22.1	12.00	11.13	
5,250.0	36.49	285.04	5,139.1	866.1	161.0	-7.8	12.00	11.25	
5,251.1	36.61	284.97	5,140.0	866.2	160.4	-7.1	12.00	11.31	Gallup
5,275.0	39.33	283.45	5,158.9	869.9	146.1	7.5	12.00	11.35	
5,300.0	42.18	282.05	5,177.8	873.5	130.2	23.8	12.00	11.42	
5,325.0	45.05	280.79	5,195.9	876.9	113.3	41.1	12.00	11.49	
5,350.0	47.94	279.65	5,213.1	880.1	95.5	59.2	12.00	11.54	
5,375.0	50.83	278.61	5,229.4	883.1	76.7	78.2	12.00	11.58	
5,400.0	53.73	277.65	5,244.7	885.9	57.2	97.9	12.00	11.61	
5,425.0	56.64	276.76	5,259.0	888.4	36.8	118.4	12.00	11.64	
5,450.0	59.56	275.93	5,272.2	890.8	15.7	139.6	12.00	11.66	
5,475.0	62.48	275.14	5,284.3	892.9	-6.1	161.4	12.00	11.68	
5,500.0	65.40	274.40	5,295.3	894.8	-28.4	183.8	12.00	11.70	
5,525.0	68.33	273.69	5,305.1	896.4	-51.4	206.6	12.00	11.71	
5,550.0	71.26	273.01	5,313.7	897.7	-74.8	229.9	12.00	11.73	
5,575.0	74.20	272.35	5,321.1	898.9	-98.6	253.6	12.00	11.73	
5,600.0	77.13	271.72	5,327.3	899.7	-122.8	277.6	12.00	11.74	
5,623.5	79.90	271.13	5,332.0	900.3	-145.9	300.4	12.00	11.75	Lower Gallup
5,625.0	80.07	271.09	5,332.3	900.3	-147.3	301.8	12.00	11.75	
5,650.0	83.01	270.48	5,335.9	900.7	-172.0	326.2	12.00	11.75	
5,666.9	85.00	270.07	5,337.7	900.7	-188.9	342.8	12.00	11.76	EOB @ 85°/Start 5° Build - 7" - 2,150' FNL, 100
5,700.0	86.65	270.07	5,340.1	900.8	-221.9	375.3	5.01	5.01	
5,775.0	90.40	270.07	5,342.0	900.9	-296.8	449.1	5.00	5.00	LP - 2,150' FNL, 208' FEL - LP @ 5,342' TVD, 9
5,800.0	90.40	270.07	5,341.9	900.9	-321.8	473.8	0.00	0.00	
5,900.0	90.40	270.07	5,341.2	901.0	-421.8	572.3	0.00	0.00	
6,000.0	90.40	270.07	5,340.4	901.2	-521.8	670.7	0.00	0.00	
6,100.0	90.40	270.07	5,339.7	901.3	-621.8	769.2	0.00	0.00	
6,200.0	90.40	270.07	5,339.0	901.4	-721.8	867.7	0.00	0.00	
6,300.0	90.40	270.07	5,338.3	901.6	-821.8	966.2	0.00	0.00	
6,400.0	90.40	270.07	5,337.6	901.7	-921.8	1,064.7	0.00	0.00	
6,500.0	90.40	270.07	5,336.9	901.8	-1,021.8	1,163.2	0.00	0.00	
6,600.0	90.40	270.07	5,336.2	901.9	-1,121.8	1,261.7	0.00	0.00	

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros #2H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6900.0usft
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6900.0usft
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros #2H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

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
6,700.0	90.40	270.07	5,335.5	902.1	-1,221.8	1,360.2	0.00	0.00	
6,800.0	90.40	270.07	5,334.8	902.2	-1,321.8	1,458.7	0.00	0.00	
6,900.0	90.40	270.07	5,334.1	902.3	-1,421.8	1,557.2	0.00	0.00	
7,000.0	90.40	270.07	5,333.4	902.5	-1,521.8	1,655.7	0.00	0.00	
7,100.0	90.40	270.07	5,332.7	902.6	-1,621.8	1,754.2	0.00	0.00	
7,200.0	90.40	270.07	5,332.0	902.7	-1,721.8	1,852.7	0.00	0.00	
7,300.0	90.40	270.07	5,331.3	902.9	-1,821.8	1,951.2	0.00	0.00	
7,400.0	90.40	270.07	5,330.6	903.0	-1,921.8	2,049.6	0.00	0.00	
7,500.0	90.40	270.07	5,329.9	903.1	-2,021.8	2,148.1	0.00	0.00	
7,600.0	90.40	270.07	5,329.2	903.2	-2,121.8	2,246.6	0.00	0.00	
7,700.0	90.40	270.07	5,328.5	903.4	-2,221.8	2,345.1	0.00	0.00	
7,800.0	90.40	270.07	5,327.8	903.5	-2,321.8	2,443.6	0.00	0.00	
7,900.0	90.40	270.07	5,327.1	903.6	-2,421.8	2,542.1	0.00	0.00	
8,000.0	90.40	270.07	5,326.4	903.8	-2,521.8	2,640.6	0.00	0.00	
8,100.0	90.40	270.07	5,325.7	903.9	-2,621.8	2,739.1	0.00	0.00	
8,200.0	90.40	270.07	5,325.0	904.0	-2,721.8	2,837.6	0.00	0.00	
8,300.0	90.40	270.07	5,324.3	904.1	-2,821.8	2,936.1	0.00	0.00	
8,400.0	90.40	270.07	5,323.6	904.3	-2,921.8	3,034.6	0.00	0.00	
8,500.0	90.40	270.07	5,322.8	904.4	-3,021.8	3,133.1	0.00	0.00	
8,600.0	90.40	270.07	5,322.1	904.5	-3,121.8	3,231.6	0.00	0.00	
8,700.0	90.40	270.07	5,321.4	904.7	-3,221.8	3,330.1	0.00	0.00	
8,800.0	90.40	270.07	5,320.7	904.8	-3,321.8	3,428.5	0.00	0.00	
8,900.0	90.40	270.07	5,320.0	904.9	-3,421.7	3,527.0	0.00	0.00	
9,000.0	90.40	270.07	5,319.3	905.1	-3,521.7	3,625.5	0.00	0.00	
9,100.0	90.40	270.07	5,318.6	905.2	-3,621.7	3,724.0	0.00	0.00	
9,200.0	90.40	270.07	5,317.9	905.3	-3,721.7	3,822.5	0.00	0.00	
9,300.0	90.40	270.07	5,317.2	905.4	-3,821.7	3,921.0	0.00	0.00	
9,400.0	90.40	270.07	5,316.5	905.6	-3,921.7	4,019.5	0.00	0.00	
9,500.0	90.40	270.07	5,315.8	905.7	-4,021.7	4,118.0	0.00	0.00	
9,600.0	90.40	270.07	5,315.1	905.8	-4,121.7	4,216.5	0.00	0.00	
9,700.0	90.40	270.07	5,314.4	906.0	-4,221.7	4,315.0	0.00	0.00	
9,800.0	90.40	270.07	5,313.7	906.1	-4,321.7	4,413.5	0.00	0.00	
9,900.0	90.40	270.07	5,313.0	906.2	-4,421.7	4,512.0	0.00	0.00	
10,000.0	90.40	270.07	5,312.3	906.3	-4,521.7	4,610.5	0.00	0.00	
10,100.0	90.40	270.07	5,311.6	906.5	-4,621.7	4,709.0	0.00	0.00	
10,200.0	90.40	270.07	5,310.9	906.6	-4,721.7	4,807.4	0.00	0.00	
10,300.0	90.40	270.07	5,310.2	906.7	-4,821.7	4,905.9	0.00	0.00	
10,400.0	90.40	270.07	5,309.5	906.9	-4,921.7	5,004.4	0.00	0.00	
10,500.0	90.40	270.07	5,308.8	907.0	-5,021.7	5,102.9	0.00	0.00	
10,609.0	90.40	270.07	5,308.0	907.1	-5,130.7	5,210.3	0.00	0.00	BHL - 2,150' FNL, 250' FWL

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB.	Local Co-ordinate Reference:	Well Heros #2H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6900.0usft
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6900.0usft
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros #2H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

Targets									
Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)		
- Shape									
Heros #2H 7"/85° - plan hits target center - Point	0.00	0.00	5,337.7	900.7	-188.9	1,913,124.82	2,768,761.13	36.257664	-107.678428
Heros #2H POE - plan misses target center by 192.2usft at 5658.9usft MD (5336.9 TVD, 900.7 N, -180.8 E) - Point	0.00	0.00	5,337.7	1,092.9	-179.8	1,913,317.01	2,768,769.87	36.258192	-107.678398
Heros #2H PBHL P2 - plan hits target center - Point	0.00	0.00	5,308.0	907.1	-5,130.7	1,913,123.28	2,763,819.27	36.257680	-107.695190
Heros #2H PBHL - plan misses target center by 192.0usft at 10564.1usft MD (5308.3 TVD, 907.1 N, -5085.8 E) - Point	0.00	0.00	5,308.0	1,099.1	-5,085.5	1,913,315.30	2,763,864.20	36.258207	-107.695037

Casing Points					
Measured Depth	Vertical Depth	Name	Casing Diameter	Hole Diameter	
(usft)	(usft)		(")	(")	
500.0	500.0	9 5/8"	0	0	
5,666.9	5,337.7	7" - 2,150' FNL, 100' FEL	0	0	

Formations						
Measured Depth	Vertical Depth	Name	Lithology	Dip	Dip Direction	
(usft)	(usft)			(°)	(°)	
1,032.6	1,031.0	Ojo Alamo		0.00		
1,181.0	1,177.0	Kirtland		0.00		
1,509.2	1,498.0	Fruitland		0.00		
1,720.9	1,705.0	PicturedCliffs		0.00		
2,132.1	2,107.0	Chacra		0.00		
3,232.5	3,183.0	Cliff House		0.00		
3,272.4	3,222.0	Meneffee		0.00		
4,162.1	4,092.0	Point Lookout		0.00		
4,313.5	4,240.0	Mancos		0.00		
5,251.1	5,140.0	Gallup		0.00		
5,623.5	5,332.0	Lower Gallup		0.00		

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB.	Local Co-ordinate Reference:	Well Heros #2H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6900.0usft
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6900.0usft
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros #2H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #2		

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
0.5	0.5	0.0	0.0	SH - 2,268' FSL, 70' FWL
600.0	600.0	0.0	0.0	KOP @ 600'
1,204.6	1,200.2	60.8	18.6	EOB @ 12.09° INC
4,928.6	4,841.5	806.8	246.7	Start 12° Build/Turn
5,666.9	5,337.7	900.7	-188.9	EOB @ 85°/Start 5° Build
5,775.0	5,342.0	900.9	-296.8	LP - 2,150' FNL, 208' FEL
5,775.0	5,342.0	900.9	-296.8	LP @ 5,342' TVD, 90.4° INC
10,609.0	5,308.0	907.1	-5,130.7	BHL - 2,150' FNL, 250' FWL
10,609.0	5,308.0	907.1	-5,130.7	TD @ 10,609' MD

LOGOS OPERATING, LLC

HEROS #002H

2268' FSL, 70' FWL (SURFACE) SECTION 3

2150' FNL, 250' FWL (BOTTOM HOLE) SECTION 4

LATITUDE: 36.2551894° N

LONGITUDE: 107.6777876° W

NAD 83

T-23-N, R-8-W, N.M.P.M

SAN JUAN COUNTY, NEW MEXICO

FROM THE INTERSECTION OF U.S. HIGHWAY 550
AND U.S. HIGHWAY 64 IN BLOOMFIELD, NEW MEXICO.

TRAVEL SOUTHERLY ON U.S. HIGHWAY 550 FOR 40.5 MILES.

TURN LEFT OFF THE HIGHWAY GOING THROUGH THE CATTLE GUARD ONTO THE
SIDE ROAD; TRAVEL 0.08 MILE TO THE PROPOSED ACCESS ROAD LEADING TO
THE PROPOSED HEROS #002H WELL LOCATION.

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 E&P)

