Form 3160-5
(March 2012)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RECEIVED
JUN 27 2014
Bureau of Land Mgmt.

FORM APPROVED
OMB No. 1004-0137
Expires: October 31, 2014

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.

SUBMIT IN TRIPLICATE *– Other instructions on page 2.*

1. Type of Well ☑ Oil Well ☐ Gas Well ☐ Other	5. Lease Serial No. NM-109398
	6. If Indian, Allottee or Tribe Name
	7. If Unit of CA/Agreement, Name and/or No.
	8. Well Name and No. Heros 2H
2. Name of Operator Logos Operating, LLC	9. API Well No. 30-045-35539
3a. Address 4001 North Butler Avenue, Building 7101 Farmington, NM 87401 3b. Phone No. *(include area code)* 505-330-9333	10. Field and Pool or Exploratory Area Basin Mancos
4. Location of Well *(Footage, Sec., T.,R.,M., or Survey Description)* 2268' FSL, 70' FWL NW/SW Section 3, T23N, R8W, UL L	11. County 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			
☑ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Subsequent Report	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other _____
	☑ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
☐ Final Abandonment Notice	☐ Convert to Injection	☐ Plug Back	☐ 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 recomplete 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 recompletion 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 proposes to change the setback and TD for the Heros 2H. The reason for the change is to minimize the drilling risk with reduced tangent and directional build due to issues experienced with the Logos 702H and for reservoir optimization. There will be no changes with the cement operations or complexities. Please see below:

OIL CONS. DIV DIST. 3

JUL 01 2014

Original Well Information:
LP in Sec 4, 100' FEL, 2150' FNL
BHL in Sec 4, 250' FWL, 2150' FNL

7" - 5667' MD / 5338' TVD - 2150' FNL, 100' FEL
LP - 5775' MD / 5342' TVD - 2150' FNL, 208' FEL
BHL (TD) - 10609' MD / 5308' TVD - 2150' FNL, 250 FWL

New Well Information:
7" - 5767' MD / 5338' TVD - 2148' FNL, 227' FEL
LP - 5869' MD / 5342' TVD - 2142' FNL, 330 FEL
BHL (TD) - 10596' MD / 5308' TVD - 1734' FNL, 250' FWL

CONDITIONS OF APPROVAL
Adhere to previously issued stipulations.

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

On 06/27/14 received verbal approval from Troy Saylers-BLM and Bill Hoppe-NMOCD to proceed with the new setback and TD plans.

14. I hereby certify that the foregoing is true and correct. Name *(Printed/Typed)* Kristy Graham	Title Production Engineer
Signature	Date 06/27/2014

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by Troy Salyers	Title Petroleum Eng.	Date 6/30/2014
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)

NMOCD

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: 1734' FNL – 250' FWL
Section 4, T23N, R8W
San Juan County, New Mexico

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

- **ESTIMATED TOPS FOR IMPORTANT GEOLOGICAL FORMATIONS**

Formation Tops	Surface (TVD)
Ojo Alamo	1031
Kirtland	1177
Fruitland	1498
Pictured Cliff's	1705
Chacra	2107
Cliffs House	3183
Menefee	3222
Point Lookout	4092
Mancos	4240
Gallup	5139
Lower Gallup	5328
Landing Point	5342
Total Depth	5308

Drilling Plan

Drill 12 ¼" hole to 320' then set 9 5/8" casing. Drill 8 3/4" hole with fresh water mud from 320' MD to kick off point #1 1547' MD and build 2 degrees per 100' to 12 degrees, 19.88 degrees azimuth until approximately 2297' MD. Hold 15 degree inclination and 19.88 degrees azimuth from 2297' MD to 4772' MD.

Trip out of hole and pick up 8 ¾" kick off assembly at 4772' MD. Build angle at 9 deg/100' to 85 degrees inclination and 275 degrees azimuth in the Gallup formation at 5289' MD / 5139' TVD where 7" intermediate casing will be set at 5767' MD / 5338' TVD.
7" casing will be set in a legal position 2148' FNL & 227' 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 90.41 degrees inclination and 275 degree azimuth to 5869' MD / 5342' TVD. Hold 90.41 degrees, 275 degrees azimuth and drill to a total depth at 10596' MD / 5308' TVD. Adjustments may be made to the directional program based on geology. Total depth will be 10596' MD / 5308' TVD - 90.41 degrees, 275 degrees Azimuth.
The Bottom hole location will be in a legal location at 10596' MD at 1734' FNL & 250' FWL of section 4.
A total of 4727' of horizontal hole will be drilled.

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

  Primary objective is the Gallup formation encountered first at 5139' 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 nippled-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 320'
8 3/4" = 500' to 5767' = 7" Casing point @ 85 degrees – DV 100' below top of Mancos
8 ¾" Landing point = 5869' @ 90.40 degrees
6-1/8" Lateral = 5869' MD to 10596' 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' - 320'	New casing. Cement to surface.
7" (8 ¾")	23 ppf	J or K-55	LT&C	0' - 5767' MD	New Casing. Cement to surface with two stages- DV Tool 100' below Mancos Top at 4318' MD / 4240 TVD
4 ½" (6 1/8")	11.6 ppf	P-110	LT&C	5475 - 10596' MD	New Casing - Horizontal Hole Cemented full length with foam cement - TOL at 60 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 – (0-320'):
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

Intermediate Casing – Two Stage Job – DV@ 4418' - (0-5767'MD):
Excess – 50% over gauge hole – 8-3/4" hole and 7" casing (0.1503 ft3/ft)
Top of Cement – Surface

Stage #1:
Lead - (5152' – 4418'): 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 WBWOB
Poly - E – Flake – 0.125 lbs/sx WBWOB
Yield – 1.951 ft3/sx
Water requirement – 10.10 gal/sx.

Tail - (5767' – 5152'): 86 sx – 13.5. ppg, lightweight conventional cement containing:
HALCEM ™ SYSTEM – Cement
Kol - Seal – Lost Circulation Control Agent – 5 lbs/sx WBWOB
Poly - E – Flake – 0.125 lbs/sx WBWOB

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 - (4418' – 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 (5475' - 10596' 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
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)
0.2 % Halad(R)-344 (Low Fluid Loss Control)

Fluid Weight	13 lbm/gal
Slurry Yield:	1.43 ft^3/sk
Total Mixing Fluid:	6.75 Gal/sk
Top of Fluid:	4700 ft
Calculated Fill:	300 ft
Volume:	7.15 bbl
Calculated Sacks:	30 sks

Foamed Lead Cement
ELASTISEAL (TM) SYSTEM
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)
2.5 % CHEM - FOAMER 760, TOTETANK (Foamer)
0.2 % Halad(R)-344 (Low Fluid Loss Control)

Fluid Weight	13 lbm/gal
Slurry Yield:	1.43 ft^3/sk
Total Mixing Fluid:	6.75 Gal/sk
Top of Fluid:	5000 ft
Calculated Fill:	4618 ft
Volume:	93 bbl
Calculated Sacks:	270 sks

Tail Cement
ELASTISEAL (TM) SYSTEM
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)
0.05 % SA-1015 (Suspension Agent)

Fluid Weight	13.50 lbm/gal
Slurry Yield:	1.28 ft^3/sk
Total Mixing Fluid:	5.64 Gal/sk
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

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

Production liner clarification: Utilizing foam cement for zonal isolation in the production liner.

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"	0-320'	Fresh Water	8.4-8.6	60-70	NC
8 3/4"	320'-4679'	Fresh Water 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"	4772' (KOP)-5800' MD	Fresh Water LSND	8.5-8.8	40-50	8-10
6 1/8"	5800' - 10596'	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 +/- 2500 psi based on a 9.0 ppg at 5342' TVD of the landing point of the horizontal. No abnormal pressure or temperatures are anticipated.

  No hydrogen sulfide gas is anticipated, however, if H_2S is encountered, the guidelines in Onshore Order No. 6 will be followed.

9. ANTICIPATED START DATE AND DURATION OF OPERATIONS

Drilling commenced on June 26, 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.

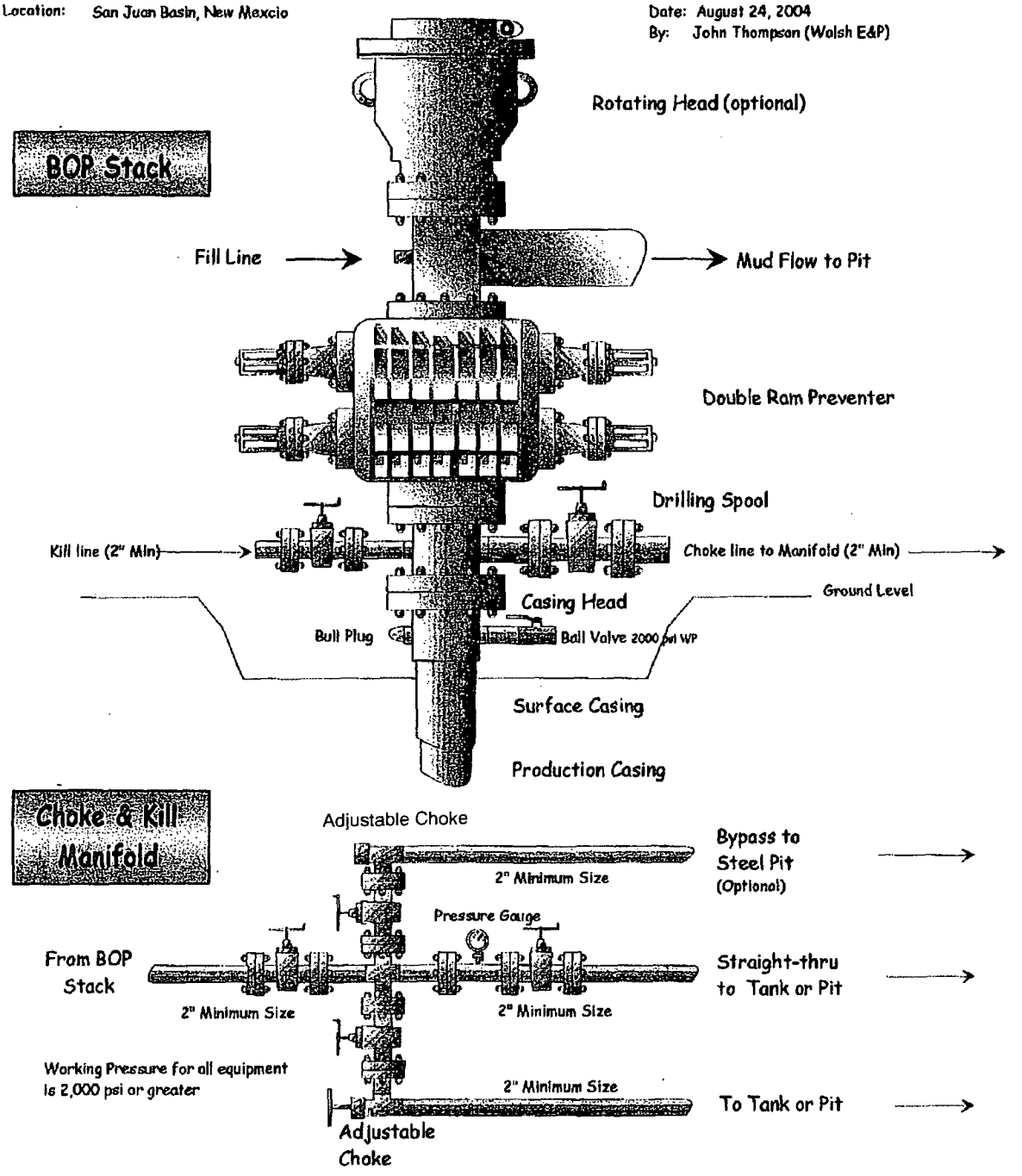
Well Control Equipment Schematic for 2M Service

Attachment to Drilling Technical Program

Exhibit #1
Typical BOP setup

Location: San Juan Basin, New Mexcio

Date: August 24, 2004
By: John Thompson (Walsh E&P)



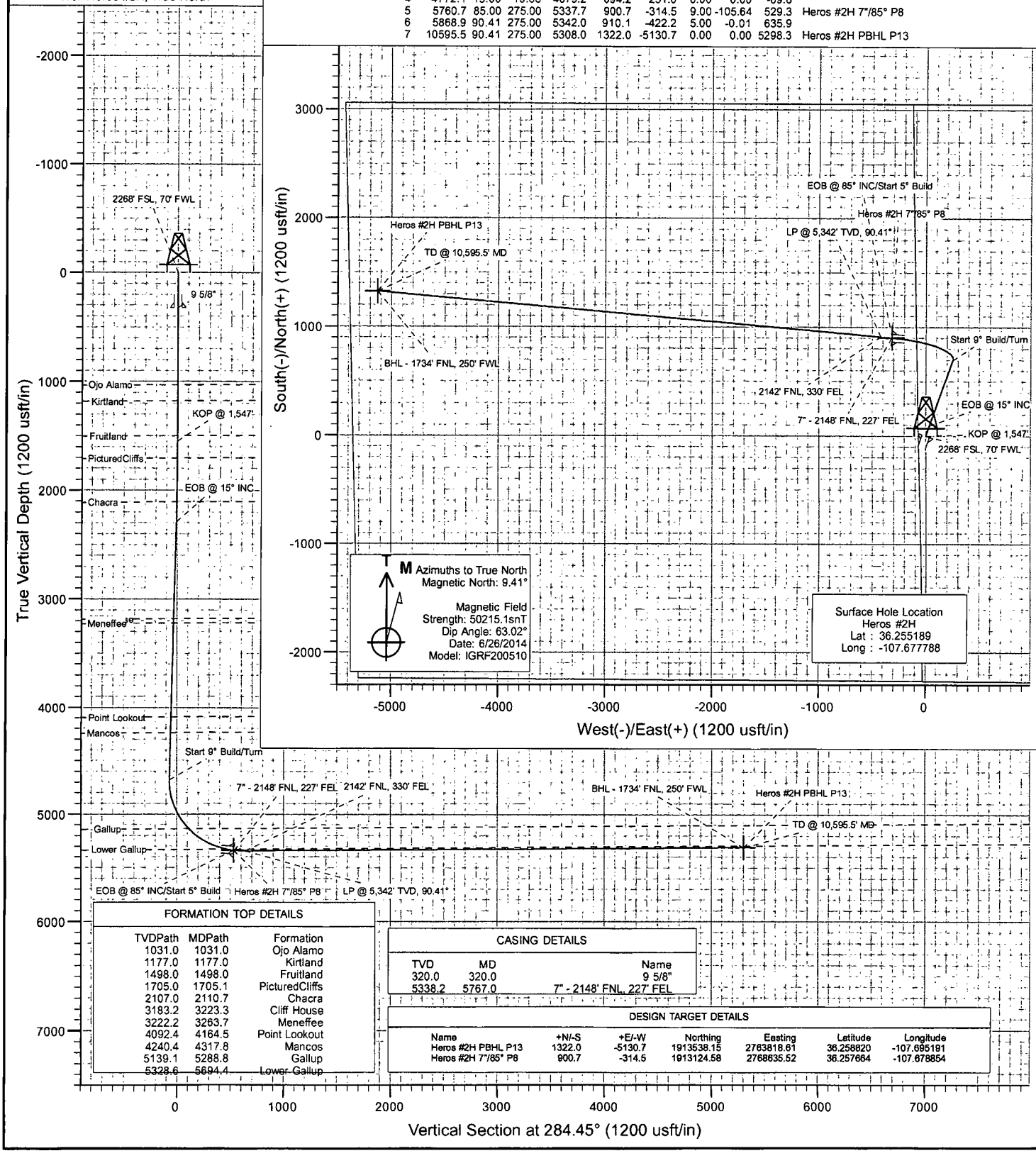
Project: San Juan County, NM
Site: S3-T23N-R8W (Heros Pad)
Well: Heros #2H
Wellbore: HZ
Design: Plan #13 (330'-275°)

CATHEDRAL

Plan #13 (330'-275°)
Heros #2H
145201/12737; 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	1547.0	0.00	0.00	1547.0	0.0	0.0	0.00	0.00	0.0	
3	2297.0	15.00	19.88	2288.4	91.8	33.2	2.00	19.88	-9.2	
4	4772.1	15.00	19.88	4679.2	694.2	251.0	0.00	0.00	-69.8	
5	5760.7	85.00	275.00	5337.7	900.7	-314.5	9.00	-105.64	529.3	Heros #2H 7"/85° P8
6	5868.9	90.41	275.00	5342.0	910.1	-422.2	5.00	-0.01	635.9	
7	10595.5	90.41	275.00	5308.0	1322.0	-5130.7	0.00	0.00	5298.3	Heros #2H PBHL P13



FORMATION TOP DETAILS

TVDPath	MDPath	Formation
1031.0	1031.0	Ojo Alamo
1177.0	1177.0	Kirtland
1498.0	1498.0	Fruitland
1705.0	1705.1	PicturedCliffs
2107.0	2110.7	Chacra
3183.2	3223.3	Cliff House
3222.2	3263.7	Meneffee
4092.4	4164.5	Point Lookout
4240.4	4317.8	Mancos
5139.1	5288.8	Gallup
5328.6	5694.4	Lower Gallup

CASING DETAILS

TVD	MD	Name
320.0	320.0	9 5/8"
5338.2	5767.0	7" - 2148' FNL, 227' FEL

DESIGN TARGET DETAILS

Name	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Heros #2H PBHL P13	1322.0	-5130.7	1913538.15	2763818.61	36.258820	-107.695191
Heros #2H 7"/85° P8	900.7	-314.5	1913124.58	2768635.52	36.257664	-107.678854

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 #13 (330'-275°)		

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	6/26/2014	9.42	63.02	50,215

Design	Plan #13 (330'-275°)				
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	284.45	

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	
1,547.0	0.00	0.00	1,547.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,297.0	15.00	19.88	2,288.4	91.8	33.2	2.00	2.00	0.00	19.88	
4,772.1	15.00	19.88	4,679.2	694.2	251.0	0.00	0.00	0.00	0.00	
5,760.7	85.00	275.00	5,337.7	900.7	-314.5	9.00	7.08	-10.61	-105.64	Heros #2H 7"/85° P8
5,868.9	90.41	275.00	5,342.0	910.1	-422.2	5.00	5.00	0.00	-0.01	
10,595.5	90.41	275.00	5,308.0	1,322.0	-5,130.7	0.00	0.00	0.00	0.00	Heros #2H PBHL P13

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 #13 (330'-275°)		

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	2268' 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	
320.0	0.00	0.00	320.0	0.0	0.0	0.0	0.00	0.00	9 5/8"
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	
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	
1,031.0	0.00	0.00	1,031.0	0.0	0.0	0.0	0.00	0.00	Ojo Alamo
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	
1,177.0	0.00	0.00	1,177.0	0.0	0.0	0.0	0.00	0.00	Kirtland
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	
1,498.0	0.00	0.00	1,498.0	0.0	0.0	0.0	0.00	0.00	Fruitland
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	
1,547.0	0.00	0.00	1,547.0	0.0	0.0	0.0	0.00	0.00	KOP @ 1,547'
1,600.0	1.06	19.88	1,600.0	0.5	0.2	0.0	2.00	2.00	
1,700.0	3.06	19.88	1,699.9	3.8	1.4	-0.4	2.00	2.00	
1,705.1	3.16	19.88	1,705.0	4.1	1.5	-0.4	2.00	2.00	PicturedCliffs
1,800.0	5.06	19.88	1,799.7	10.5	3.8	-1.1	2.00	2.00	
1,900.0	7.06	19.88	1,899.1	20.4	7.4	-2.1	2.00	2.00	
2,000.0	9.06	19.88	1,998.1	33.6	12.2	-3.4	2.00	2.00	
2,100.0	11.06	19.88	2,096.6	50.0	18.1	-5.0	2.00	2.00	
2,110.7	11.27	19.88	2,107.0	52.0	18.8	-5.2	2.00	2.00	Chacra
2,200.0	13.06	19.88	2,194.4	69.7	25.2	-7.0	2.00	2.00	
2,297.0	15.00	19.88	2,288.5	91.8	33.2	-9.2	2.00	2.00	EOB @ 15° INC
2,300.0	15.00	19.88	2,291.4	92.5	33.5	-9.3	0.00	0.00	
2,400.0	15.00	19.88	2,388.0	116.9	42.3	-11.8	0.00	0.00	
2,500.0	15.00	19.88	2,484.5	141.2	51.1	-14.2	0.00	0.00	
2,600.0	15.00	19.88	2,581.1	165.5	59.9	-16.7	0.00	0.00	
2,700.0	15.00	19.88	2,677.7	189.9	68.7	-19.1	0.00	0.00	
2,800.0	15.00	19.88	2,774.3	214.2	77.5	-21.6	0.00	0.00	
2,900.0	15.00	19.88	2,870.9	238.6	86.3	-24.0	0.00	0.00	
3,000.0	15.00	19.88	2,967.5	262.9	95.1	-26.4	0.00	0.00	
3,100.0	15.00	19.88	3,064.1	287.2	103.9	-28.9	0.00	0.00	
3,200.0	15.00	19.88	3,160.7	311.6	112.7	-31.3	0.00	0.00	
3,223.3	15.00	19.88	3,183.2	317.3	114.7	-31.9	0.00	0.00	Cliff House
3,263.7	15.00	19.88	3,222.2	327.1	118.3	-32.9	0.00	0.00	Meneffee
3,300.0	15.00	19.88	3,257.3	335.9	121.5	-33.8	0.00	0.00	
3,400.0	15.00	19.88	3,353.9	360.3	130.3	-36.2	0.00	0.00	
3,500.0	15.00	19.88	3,450.5	384.6	139.1	-38.7	0.00	0.00	
3,600.0	15.00	19.88	3,547.1	408.9	147.9	-41.1	0.00	0.00	
3,700.0	15.00	19.88	3,643.7	433.3	156.7	-43.6	0.00	0.00	
3,800.0	15.00	19.88	3,740.3	457.6	165.5	-46.0	0.00	0.00	
3,900.0	15.00	19.88	3,836.8	482.0	174.3	-48.5	0.00	0.00	
4,000.0	15.00	19.88	3,933.4	506.3	183.1	-50.9	0.00	0.00	

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 #13 (330'-275°)		

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
4,100.0	15.00	19.88	4,030.0	530.6	191.9	-53.4	0.00	0.00	
4,164.5	15.00	19.88	4,092.4	546.3	197.5	-55.0	0.00	0.00	Point Lookout
4,200.0	15.00	19.88	4,126.6	555.0	200.7	-55.8	0.00	0.00	
4,300.0	15.00	19.88	4,223.2	579.3	209.5	-58.3	0.00	0.00	
4,317.8	15.00	19.88	4,240.4	583.6	211.0	-58.7	0.00	0.00	Mancos
4,400.0	15.00	19.88	4,319.8	603.7	218.3	-60.7	0.00	0.00	
4,500.0	15.00	19.88	4,416.4	628.0	227.1	-63.2	0.00	0.00	
4,600.0	15.00	19.88	4,513.0	652.3	235.9	-65.6	0.00	0.00	
4,700.0	15.00	19.88	4,609.6	676.7	244.7	-68.1	0.00	0.00	
4,772.1	15.00	19.88	4,679.2	694.2	251.0	-69.8	0.00	0.00	Start 9° Build/Turn
4,800.0	14.52	10.19	4,706.2	701.1	252.8	-69.9	9.00	-1.72	
4,850.0	14.71	352.31	4,754.6	713.5	253.1	-67.1	9.00	0.38	
4,900.0	16.17	336.26	4,802.8	726.2	249.4	-60.4	9.00	2.93	
4,950.0	18.61	323.55	4,850.6	739.0	241.9	-49.9	9.00	4.88	
5,000.0	21.70	314.01	4,897.5	751.8	230.5	-35.6	9.00	6.17	
5,050.0	25.20	306.87	4,943.4	764.7	215.3	-17.7	9.00	7.00	
5,100.0	28.96	301.43	4,987.9	777.4	196.5	3.7	9.00	7.52	
5,150.0	32.89	297.16	5,030.8	789.9	174.1	28.5	9.00	7.86	
5,200.0	36.94	293.73	5,071.8	802.1	148.2	56.6	9.00	8.10	
5,250.0	41.07	290.89	5,110.6	814.0	119.1	87.8	9.00	8.26	
5,288.8	44.31	288.99	5,139.1	823.0	94.4	113.9	9.00	8.37	Gallup
5,300.0	45.26	288.49	5,147.1	825.5	86.9	121.8	9.00	8.42	
5,350.0	49.49	286.41	5,181.0	836.5	51.8	158.5	9.00	8.47	
5,400.0	53.76	284.58	5,212.0	847.0	14.0	197.7	9.00	8.53	
5,450.0	58.05	282.95	5,240.0	856.8	-26.2	239.1	9.00	8.58	
5,500.0	62.36	281.46	5,264.9	866.0	-68.6	282.5	9.00	8.62	
5,550.0	66.68	280.08	5,286.4	874.4	-112.9	327.5	9.00	8.65	
5,600.0	71.02	278.79	5,304.4	882.0	-158.9	373.9	9.00	8.67	
5,650.0	75.37	277.56	5,318.9	888.8	-206.2	421.5	9.00	8.69	
5,694.4	79.23	276.52	5,328.6	894.1	-249.3	464.5	9.00	8.70	Lower Gallup
5,700.0	79.72	276.39	5,329.6	894.7	-254.7	469.9	9.00	8.71	
5,750.0	84.07	275.24	5,336.7	899.8	-303.9	518.8	9.00	8.71	
5,760.7	85.00	275.00	5,337.7	900.7	-314.5	529.3	8.97	8.68	EOB @ 85° INC/Start 5° Build
5,767.0	85.32	275.00	5,338.2	901.3	-320.8	535.5	5.03	5.03	7" - 2148' FNL, 227' FEL
5,800.0	86.97	275.00	5,340.5	904.1	-353.6	568.0	5.00	5.00	
5,868.9	90.41	275.00	5,342.0	910.1	-422.2	635.9	5.00	5.00	LP @ 5,342' TVD, 90.41° - 2142' FNL, 330' FEL
5,900.0	90.41	275.00	5,341.8	912.8	-453.2	666.6	0.00	0.00	
6,000.0	90.41	275.00	5,341.1	921.5	-552.8	765.3	0.00	0.00	
6,100.0	90.41	275.00	5,340.4	930.3	-652.4	863.9	0.00	0.00	
6,200.0	90.41	275.00	5,339.6	939.0	-752.0	962.5	0.00	0.00	
6,300.0	90.41	275.00	5,338.9	947.7	-851.7	1,061.2	0.00	0.00	
6,400.0	90.41	275.00	5,338.2	956.4	-951.3	1,159.8	0.00	0.00	
6,500.0	90.41	275.00	5,337.5	965.1	-1,050.9	1,258.5	0.00	0.00	
6,600.0	90.41	275.00	5,336.8	973.8	-1,150.5	1,357.1	0.00	0.00	
6,700.0	90.41	275.00	5,336.0	982.5	-1,250.1	1,455.7	0.00	0.00	
6,800.0	90.41	275.00	5,335.3	991.3	-1,349.7	1,554.4	0.00	0.00	
6,900.0	90.41	275.00	5,334.6	1,000.0	-1,449.4	1,653.0	0.00	0.00	
7,000.0	90.41	275.00	5,333.9	1,008.7	-1,549.0	1,751.7	0.00	0.00	
7,100.0	90.41	275.00	5,333.2	1,017.4	-1,648.6	1,850.3	0.00	0.00	
7,200.0	90.41	275.00	5,332.4	1,026.1	-1,748.2	1,948.9	0.00	0.00	
7,300.0	90.41	275.00	5,331.7	1,034.8	-1,847.8	2,047.6	0.00	0.00	
7,400.0	90.41	275.00	5,331.0	1,043.5	-1,947.4	2,146.2	0.00	0.00	

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 #13 (330'-275°)		

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
7,500.0	90.41	275.00	5,330.3	1,052.3	-2,047.1	2,244.9	0.00	0.00	
7,600.0	90.41	275.00	5,329.6	1,061.0	-2,146.7	2,343.5	0.00	0.00	
7,700.0	90.41	275.00	5,328.8	1,069.7	-2,246.3	2,442.1	0.00	0.00	
7,800.0	90.41	275.00	5,328.1	1,078.4	-2,345.9	2,540.8	0.00	0.00	
7,900.0	90.41	275.00	5,327.4	1,087.1	-2,445.5	2,639.4	0.00	0.00	
8,000.0	90.41	275.00	5,326.7	1,095.8	-2,545.1	2,738.1	0.00	0.00	
8,100.0	90.41	275.00	5,326.0	1,104.5	-2,644.8	2,836.7	0.00	0.00	
8,200.0	90.41	275.00	5,325.2	1,113.3	-2,744.4	2,935.3	0.00	0.00	
8,300.0	90.41	275.00	5,324.5	1,122.0	-2,844.0	3,034.0	0.00	0.00	
8,400.0	90.41	275.00	5,323.8	1,130.7	-2,943.6	3,132.6	0.00	0.00	
8,500.0	90.41	275.00	5,323.1	1,139.4	-3,043.2	3,231.3	0.00	0.00	
8,600.0	90.41	275.00	5,322.4	1,148.1	-3,142.8	3,329.9	0.00	0.00	
8,700.0	90.41	275.00	5,321.6	1,156.8	-3,242.5	3,428.5	0.00	0.00	
8,800.0	90.41	275.00	5,320.9	1,165.5	-3,342.1	3,527.2	0.00	0.00	
8,900.0	90.41	275.00	5,320.2	1,174.3	-3,441.7	3,625.8	0.00	0.00	
9,000.0	90.41	275.00	5,319.5	1,183.0	-3,541.3	3,724.5	0.00	0.00	
9,100.0	90.41	275.00	5,318.8	1,191.7	-3,640.9	3,823.1	0.00	0.00	
9,200.0	90.41	275.00	5,318.0	1,200.4	-3,740.5	3,921.8	0.00	0.00	
9,300.0	90.41	275.00	5,317.3	1,209.1	-3,840.2	4,020.4	0.00	0.00	
9,400.0	90.41	275.00	5,316.6	1,217.8	-3,939.8	4,119.0	0.00	0.00	
9,500.0	90.41	275.00	5,315.9	1,226.5	-4,039.4	4,217.7	0.00	0.00	
9,600.0	90.41	275.00	5,315.2	1,235.2	-4,139.0	4,316.3	0.00	0.00	
9,700.0	90.41	275.00	5,314.4	1,244.0	-4,238.6	4,415.0	0.00	0.00	
9,800.0	90.41	275.00	5,313.7	1,252.7	-4,338.2	4,513.6	0.00	0.00	
9,900.0	90.41	275.00	5,313.0	1,261.4	-4,437.9	4,612.2	0.00	0.00	
10,000.0	90.41	275.00	5,312.3	1,270.1	-4,537.5	4,710.9	0.00	0.00	
10,100.0	90.41	275.00	5,311.6	1,278.8	-4,637.1	4,809.5	0.00	0.00	
10,200.0	90.41	275.00	5,310.8	1,287.5	-4,736.7	4,908.2	0.00	0.00	
10,300.0	90.41	275.00	5,310.1	1,296.2	-4,836.3	5,006.8	0.00	0.00	
10,400.0	90.41	275.00	5,309.4	1,305.0	-4,935.9	5,105.4	0.00	0.00	
10,500.0	90.41	275.00	5,308.7	1,313.7	-5,035.6	5,204.1	0.00	0.00	
10,595.5	90.41	275.00	5,308.0	1,322.0	-5,130.7	5,298.3	0.00	0.00	TD @ 10,595.5' MD - BHL - 1734' FNL, 250' FV

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 #13 (330'-275°)		

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 #2H 7"/85° P9	0.00	0.00	5,337.7	900.7	-384.4	1,913,124.47	2,768,565.62	36.257664	-107.679091
- plan misses target center by 7.3usft at 5830.3usft MD (5341.7 TVD, 906.8 N, -383.8 E)									
- Point									
Heros #2H PBHL P12	0.00	0.00	5,308.0	907.1	-5,130.7	1,913,123.28	2,763,819.27	36.257680	-107.695190
- plan misses target center by 413.3usft at 10559.4usft MD (5308.3 TVD, 1318.8 N, -5094.7 E)									
- Point									
Heros #2H 7"/85° P8	0.00	0.00	5,337.7	900.7	-314.5	1,913,124.58	2,768,635.52	36.257664	-107.678854
- plan hits target center									
- Point									
Heros #2H 7"/85° P7	0.00	0.00	5,337.7	900.7	-488.9	1,913,124.30	2,768,461.12	36.257664	-107.679446
- plan misses target center by 15.7usft at 5934.6usft MD (5341.6 TVD, 915.8 N, -487.6 E)									
- Point									
Heros #2H PBHL P10	0.00	0.00	5,308.0	907.1	-5,130.7	1,913,123.28	2,763,819.27	36.257680	-107.695190
- plan misses target center by 413.3usft at 10559.4usft MD (5308.3 TVD, 1318.8 N, -5094.7 E)									
- Point									
Heros #2H 7"/85°	0.00	0.00	5,337.7	900.7	-188.9	1,913,124.82	2,768,761.13	36.257664	-107.678428
- plan misses target center by 26.4usft at 5640.6usft MD (5316.4 TVD, 887.6 N, -197.3 E)									
- Point									
Heros #2H PBHL P8	0.00	0.00	5,308.0	2,199.0	-5,160.7	1,914,415.10	2,763,787.24	36.261229	-107.695293
- plan misses target center by 877.5usft at 10595.5usft MD (5308.0 TVD, 1322.0 N, -5130.7 E)									
- Point									
Heros #2H PBHL P7	0.00	0.00	5,308.0	2,152.5	-5,160.7	1,914,368.60	2,763,787.32	36.261101	-107.695293
- plan misses target center by 831.0usft at 10595.5usft MD (5308.0 TVD, 1322.0 N, -5130.7 E)									
- Point									
Heros #2H PBHL P9	0.00	0.00	5,308.0	2,180.5	-5,160.7	1,914,396.60	2,763,787.27	36.261178	-107.695293
- plan misses target center by 859.0usft at 10595.5usft MD (5308.0 TVD, 1322.0 N, -5130.7 E)									
- Point									
Heros #2H POE	0.00	0.00	5,337.7	1,092.9	-179.8	1,913,317.01	2,768,769.87	36.258192	-107.678398
- plan misses target center by 206.6usft at 5653.0usft MD (5319.6 TVD, 889.2 N, -209.1 E)									
- Point									
Heros #2H PBHL P13	0.00	0.00	5,308.0	1,322.0	-5,130.7	1,913,538.15	2,763,818.61	36.258820	-107.695191
- plan hits target center									
- Point									
Heros #2H 7"/85° P6	0.00	0.00	5,337.7	900.7	-418.9	1,913,124.41	2,768,531.12	36.257664	-107.679208
- plan misses target center by 10.1usft at 5864.7usft MD (5342.1 TVD, 909.8 N, -418.0 E)									
- Point									
Heros #2H PBHL P11	0.00	0.00	5,308.0	1,316.0	-5,130.7	1,913,532.15	2,763,818.62	36.258803	-107.695191
- plan misses target center by 6.0usft at 10595.0usft MD (5308.0 TVD, 1322.0 N, -5130.2 E)									
- Point									
Heros #2H PBHL P6	0.00	0.00	5,308.0	2,171.0	-5,160.7	1,914,387.10	2,763,787.29	36.261152	-107.695293
- plan misses target center by 849.5usft at 10595.5usft MD (5308.0 TVD, 1322.0 N, -5130.7 E)									
- Point									
Heros #2H PBHL P2	0.00	0.00	5,308.0	907.1	-5,130.7	1,913,123.28	2,763,819.27	36.257680	-107.695190
- plan misses target center by 413.3usft at 10559.4usft MD (5308.3 TVD, 1318.8 N, -5094.7 E)									
- Point									
Heros #2H PBHL	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
- plan misses target center by 220.3usft at 10500.0usft MD (5308.7 TVD, 1313.7 N, -5035.6 E)									
- Point									

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 #13 (330'-275°)		

Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
5,767.0	5,338.2	7" - 2148' FNL, 227' FEL	0	0
320.0	320.0	9 5/8"	0	0

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,031.0	1,031.0	Ojo Alamo		-0.41	285.00
1,177.0	1,177.0	Kirtland		-0.41	285.00
1,498.0	1,498.0	Fruitland		-0.41	285.00
1,705.1	1,705.0	PicturedCliffs		-0.41	285.00
2,110.7	2,107.0	Chacra		-0.41	285.00
3,223.3	3,183.0	Cliff House		-0.41	285.00
3,263.7	3,222.0	Meneffee		-0.41	285.00
4,164.5	4,092.0	Point Lookout		-0.41	285.00
4,317.8	4,240.0	Mancos		-0.41	285.00
5,288.8	5,140.0	Gallup		-0.41	285.00
5,694.4	5,332.0	Lower Gallup		-0.41	285.00

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
0.5	0.5	0.0	0.0	2268' FSL, 70' FWL
1,547.0	1,547.0	0.0	0.0	KOP @ 1,547'
2,297.0	2,288.5	91.8	33.2	EOB @ 15° INC
4,772.1	4,679.2	694.2	251.0	Start 9° Build/Turn
5,760.7	5,337.7	900.7	-314.5	EOB @ 85° INC/Start 5° Build
5,868.9	5,342.0	910.1	-422.2	LP @ 5,342' TVD, 90.41°
5,868.9	5,342.0	910.1	-422.2	2142' FNL, 330' FEL
10,595.5	5,308.0	1,322.0	-5,130.7	TD @ 10,595.5' MD
10,595.5	5,308.0	1,322.0	-5,130.7	BHL - 1734' FNL, 250' FWL