

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

David Martin
Cabinet Secretary

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 3160-4 or 3160-5 form.

Operator Signature Date: 7/15/14

Well information:

API WELL #	Well Name	Well #	Operator Name	Type	Stat	County	Surf. Owner	UL	Sec	Twp	N/S	Rng	W/E
30-045-35538-00-00	HEROS	003H	LOGOS OPERATING, LLC	G	N	San Juan	F	L	3	23	N	8	W

Application Type:

☐ P&A ☒ Drilling/Casing Change ☐ Recomplete/DHC
☒ Location Change ☐ Other:

Conditions of Approval:

Notify NMOCD 24hrs prior to beginning operations

Hold C-14 for an amended NSL, directional survey, and as drilled plat

NMOCD Approved by Signature

7/18/14
Date

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENTFORM APPROVED
OMB No. 1004-0137
Expires: October 31, 2014

JUL 16 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.5. Lease Serial No.
NM 109398

6. If Indian, Allottee or Tribe Name

SUBMIT IN TRIPLICATE - Other instructions on page 2.

1. Type of Well

☒ Oil Well ☐ Gas Well ☐ Other2. Name of Operator
Logos Operating, LLC3a. Address
4001 North Butler Avenue, Building 7101
Farmington, NM 87401

3b. Phone No. (include area code)

505-330-9333

4. Location of Well (Footage, Sec., T., R., M., or Survey Description)
2216' FSL, 74' FWL NW/SW BHL: 2216' FSL & 330' FWL
Section 3, T23N, R8W, UL L Section 4, T23N, R8W, UL L

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

OIL CONS. DIV DIST. 3

8. Well Name and No.
Heros 3H9. API Well No.
30-045-35538

JUL 18 2014

10. Field and Pool or Exploratory Area
Basin Mancos11. 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
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other _____
	☒ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ 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 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 proposes to change the setback and TD for the Heros 3H. 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. The intermediate cement job will be changed from a two stage to a one stage cement job and cement will be adjusted accordingly. Please see below:

Original Well Information:

LP in Sec 4, 2216' FSL, 826' FEL
BHL in Sec 4, 2216' FSL, 330' FWL7" - 5570' MD / 5312' TVD - 2216' FSL, 823' FEL
LP - 5681' MD / 5316' TVD
BHL (TD) - 9703' MD / 5280' TVD - 2216' FNL, 330 FWL

New Well Information:

7" - 5495' MD / 5260' TVD - 1858' FSL, 132' FEL
LP - 5798' MD / 5299' TVD - 1886' FSL, 430 FEL
BHL (TD) - 10432' MD / 5284' TVD - 2262' FSL, 250' FWLRecieved verbal approval from Troy Salyers (BLM) and Bill Hoppe (OCD) to preceed with new plans. An NSL amendment ~~may~~ ^{will} be required.

14. I hereby certify that the foregoing is true and correct. Name (Printed/Typed)

Tamra Sessions

Title Operations Technician

Signature

Date 07/15/2014

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by

Title

Petroleum Engineer

Date

7/16/2014

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 #3H

Horizontal Gallup Oil and Gas Well
Surface Location: 2216' FSL – 74' FWL
Section 3, T23N, R8W
Ungraded GL Elev = 6881'
Estimate KB Elev = 6896' (15' KB)
Lat. = 36.2550465 deg N
Long. = 107.6777705 deg W
NAD83
San Juan County, New Mexico

Proposed Bottom Hole Location: 2262' FSL – 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

1. ESTIMATED TOPS FOR IMPORTANT GEOLOGICAL FORMATIONS

<u>Formation Tops</u>	<u>Surface (TVD)</u>
Ojo Alamo	935
Kirtland	1081
Fruitland	1402
Pictured Cliffs	1609
Chacra	2011
Cliffs House	3087
Menefee	3126
Point Lookout	3996
Mancos	4144
Gallup	5046
Lower Gallup	5286
Landing Point	5299
Total Depth	5284

Drilling Plan

Drill 12 ¼" hole to 318' then set 9 5/8" casing. Drill 8 3/4" hole with fresh water mud from 318' MD to kick off point #1 2158' MD and build 2 degrees per 100' to 10 degrees, 145.18 degrees azimuth and hold to approximately 4679' MD.

Trip out of hole and pick up 8 ¾" kick off assembly at 4679' MD. Build angle at 10 deg/100' to 75 degrees inclination and 275 degrees azimuth in the Gallup formation at 5107' MD/ 5046' TVD where 7" intermediate casing will be set at 5495' MD / 5260' TVD.

7" casing will be set in a legal position 1858' FSL & 132' 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 90.19 degrees inclination and 275 degree azimuth to 5798' MD / 5299' TVD. Hold 90.19 degrees, 275 degrees azimuth and drill to a total depth at 10432' MD / 5284' TVD. Adjustments may be made to the directional program based on geology. Total depth will be 10432' MD / 5284' TVD - 90.19 degrees, 275 degrees Azimuth.

The Bottom hole location will be in a legal location at 10432' at 2262' FSL & 250' FWL of section 4.

A total of 4937' of horizontal hole will be drilled.

2. ANTICIPATED DEPTHS OF PROSPECTIVE OIL GAS AND OTHER HYDROCARBONS

Primary objective is the Gallup formation encountered first at 5046' TVD

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

3. 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 1928 psig (0.364 psi/ft @ 5299' 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 1170 psi (5316' 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.

4. PROPOSED BIT AND CASING PROGRAM

A. Bit Program

12 1/4" Surface Hole = Surface to 318'

8 3/4" = 318' to 5495' = 7" Casing point @ 75 degrees

8 3/4" Landing point = 5798' @ 90.19 degrees

6-1/8" Lateral = 5495' MD to 10432' MD = Gallup Pay Zone Horizontal

B. Casing Program – all casing strings 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' - 318'	New casing. Cement to surface.
7" (8 3/4")	23 ppf	J or K-55	LT&C	0' - 5495' MD	New Casing. Cement to surface with two stages- DV Tool 100' below Mancos Top at 4330'
4 1/2" (6 1/8")	11.6 ppf	P-110	LT&C	5350' - 10432' 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.

5. 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.

a) 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 – (0-318'):

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 – One Stage Job – (0-5495' MD):

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

Top of Cement – Surface

Stage 1**Fluid 1: Water Spacer**

Fresh Water

Fluid Density: 8.33 lbm/gal

Volume : 10 bbl

Fluid 2: Reactive Spacer

Chemical Wash

Fluid Density: 8.4 lbm/gal

1000 gal/Mgal FRESH WATER

Volume : 40 bbl

Fluid 3: Water Spacer

Fresh Water

Fluid Density: 8.33 lbm/gal

Volume : 10 bbl

Fluid 4: Foamed

ELASTISEAL (TM) SYSTEM

Fluid Weight: 13 lbm/gal

1.50 % CHEM - FOAMER 760, TOTETANK

Volume: 193.5 bbl

6.73 Gal FRESH WATER

Slurry Yield: 1.438 ft³/sack

Total Mixing Fluid: 6.83 Gal/sack

Top Of Fluid: 0 ft

Calculated Fill: 5267 ft

Calculated sack: 42.26 sack

Proposed sack: 560 sack

Fluid 5: Tail Slurry

HALCEM (TM) SYSTEM

Fluid Weight: 13.5 lbm/gal

5.70 Gal FRESH WATER

Volume: 18.7 bbl

Slurry Yield: 1.291 ft³/sack

Total Mixing Fluid: 5.7 Gal/sack

Top Of Fluid: 5267 ft

Calculated Fill: 500 ft

Calculated sack: 81.33 sack

Proposed sack: 85 sack

Fluid 6: Water Based Spacer

Displacement

Fluid Density: 8.4 lbm/gal

Volume : 227 bbl

Fluid 7: Top Off Annulus

HALCEM (TM) SYSTEM

Fluid Weight: 15.8 lbm/gal

2 % Calcium Chloride

Volume: 20.9 bbl

5.15 Gal FRESH WATER

Slurry Yield: 1.174 ft³/sack

Total Mixing Fluid: 5.15 Gal/sack

Calculated sack: 0 sack

Proposed sack: 100 sack

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

Production Casing – Single Stage Job (5350' - 10432' 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 ft³/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 ft³/sk
 Total Mixing Fluid: 6.75 Gal/sk
 Top of Fluid: 5000 ft
 Calculated Fill: 3634 ft
 Volume: 92 bbl
 Calculated Sacks: 359 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 ft³/sk
 Total Mixing Fluid: 5.64 Gal/sk
 Top of Fluid: 8634 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		359 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.

6. PROPOSED DRILLING FLUIDS PROGRAM

a) 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'-4645'	Fresh Water LSND	8.5-8.8	40-50	8-10

b) 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"	4679' (KOP)-5798'	Fresh Water LSND	8.5-8.8	40-50	8-10
6 1/8"	5798' - 10432'	Synthetic Oil Based Mud	7.0-9.0	15-25	<1

- c) 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.
- d) 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.

7. TESTING, CORING and LOGGING

- a) Drill Stem Testing - None anticipated
- b) Coring - None anticipated.
- c) Mud Logging - Mud loggers will be on location from intermediate casing point to TD.
- d) Logging - See Below
- e) Gamma Ray from surface casing point to TD

Cased Hole:

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

8. 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.

Based on the following rulings we are going to TD the well at 250' from the FEL, but due to the length of the RSI sleeve the first perf will be greater than 330' FEL. Although this horizontal well will be drilled past the applicable setbacks, an unorthodox location application is not required because the completed interval in this well, as defined by 19.15.16.7 B(1) NMAC, will be entirely within the applicable setbacks. This approach complies with all applicable rules, including 19.15.16.14 A(3) NMAC, 19.15.16.14 B(2) NMAC, 19.15.16.15 B(2) NMAC, and 19.15.16.15 B(4) NMAC.

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:

1. The closed-loop system will be signed in accordance with 19.15.17.11 NMAC.
2. 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.
3. Topsoil will be salvaged and stored for use in reclamation activities.
4. 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:

1. Fluid levels will be maintained to provide sufficient freeboard to prevent over-topping.
2. 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.
3. 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.
4. 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:

1. Drilling fluids will be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse, as practical.
2. 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.
3. 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.
4. Storage tanks will be removed from the well location during the rig move.
5. The well pad will be reclaimed and seeded in accordance with subsections G, Hand I of 19.15.17.13NMAC.

Well Control Equipment Schematic for 2M Service

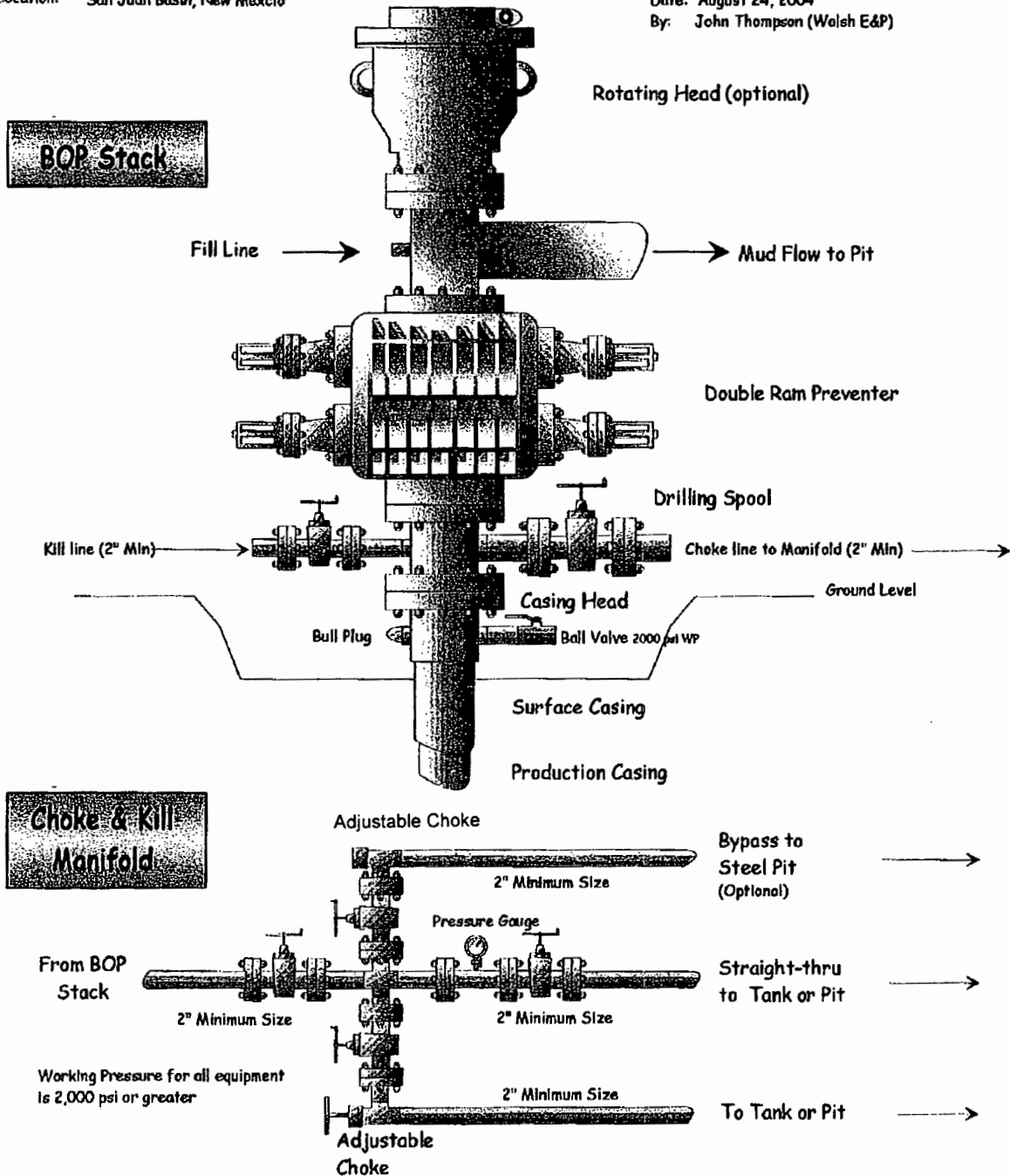
Attachment to Drilling Technical Program

Exhibit #1 Typical BOP setup

Location: San Juan Basin, New Mexico

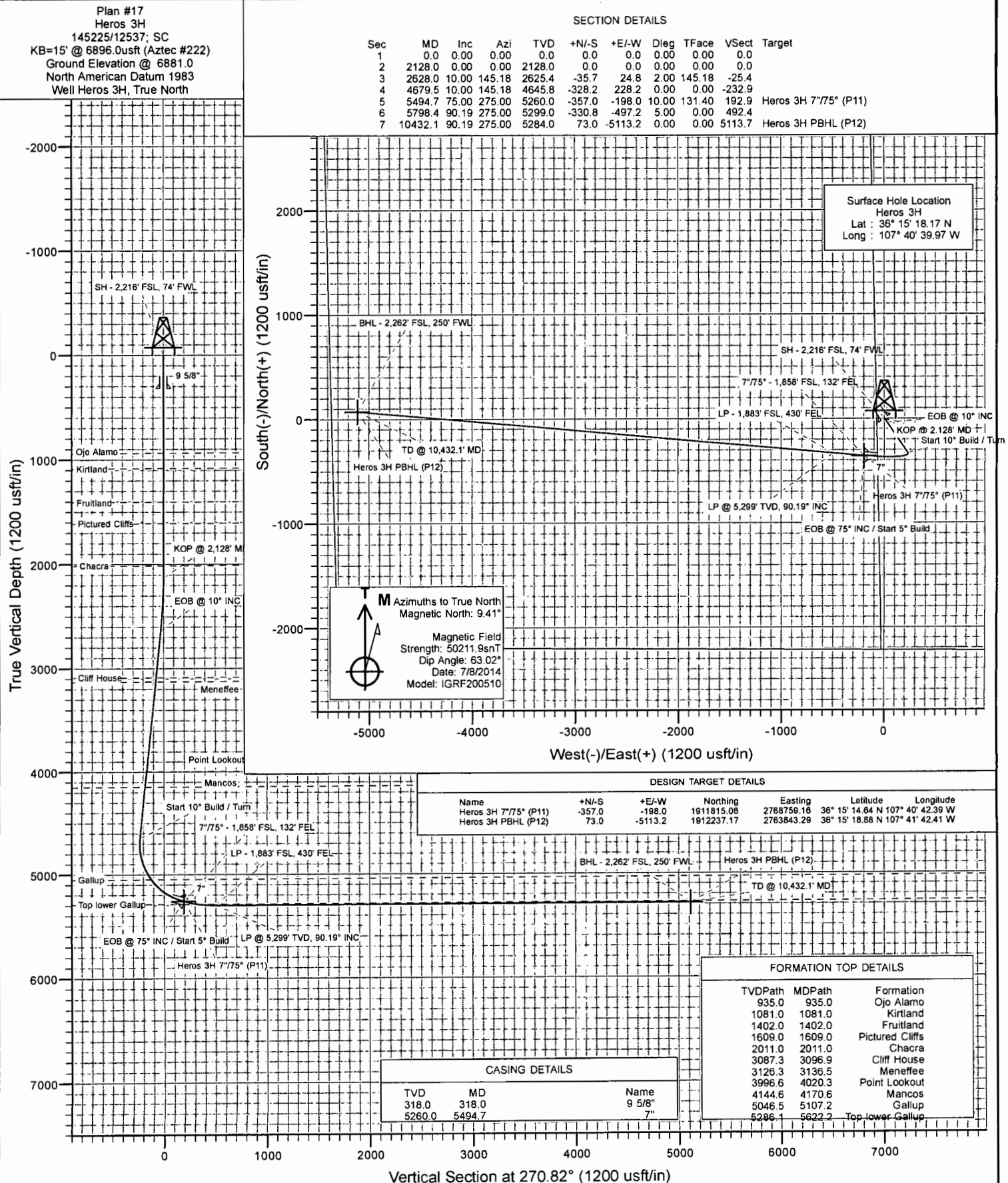
Date: August 24, 2004

By: John Thompson (Walsh E&P)





Project: San Juan County, NM
Site: S3-T23N-R8W (Heros Pad)
Well: Heros 3H
Wellbore: HZ
Design: Plan #17



Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros 3H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #17		

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
From:	Lat/Long	Easting:	2,769,670.19 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"
		Latitude:	36° 15' 29.48 N
		Longitude:	107° 40' 31.24 W
		Grid Convergence:	0.09 °

Well	Heros 3H		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	36° 15' 18.17 N
		Longitude:	107° 40' 39.97 W
		Ground Level:	6,881.0 usft

Wellbore	HZ		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF200510	7/8/2014	9.41
			Dip Angle
			(°)
			Field Strength
			(nT)
			63.02
			50,212

Design	Plan #17		
Audit Notes:			
Version:	Phase:	PLAN	Tie On Depth:
			0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			Direction
			(°)
			270.82

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	
2,128.0	0.00	0.00	2,128.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,628.0	10.00	145.18	2,625.4	-35.7	24.8	2.00	2.00	0.00	145.18	
4,679.5	10.00	145.18	4,645.8	-328.2	228.2	0.00	0.00	0.00	0.00	
5,494.7	75.00	275.00	5,260.0	-357.0	-198.0	10.00	7.97	15.93	131.40	Heros 3H 7°/75° (P11)
5,798.4	90.19	275.00	5,299.0	-330.8	-497.2	5.00	5.00	0.00	0.00	
10,432.1	90.19	275.00	5,284.0	73.0	-5,113.2	0.00	0.00	0.00	0.00	Heros 3H PBHL (P12)

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros 3H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #17		

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 - 2,216' FSL, 74' 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	
318.0	0.00	0.00	318.0	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	
935.0	0.00	0.00	935.0	0.0	0.0	0.0	0.00	0.00	Ojo Alamo
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	
1,081.0	0.00	0.00	1,081.0	0.0	0.0	0.0	0.00	0.00	Kirtland
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	
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	
1,402.0	0.00	0.00	1,402.0	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	
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	
1,609.0	0.00	0.00	1,609.0	0.0	0.0	0.0	0.00	0.00	Pictured Cliffs
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	
2,011.0	0.00	0.00	2,011.0	0.0	0.0	0.0	0.00	0.00	Chacra
2,100.0	0.00	0.00	2,100.0	0.0	0.0	0.0	0.00	0.00	
2,128.0	0.00	0.00	2,128.0	0.0	0.0	0.0	0.00	0.00	KOP @ 2,128' MD
2,200.0	1.44	145.18	2,200.0	-0.7	0.5	-0.5	2.00	2.00	
2,300.0	3.44	145.18	2,299.9	-4.2	2.9	-3.0	2.00	2.00	
2,400.0	5.44	145.18	2,399.6	-10.6	7.4	-7.5	2.00	2.00	
2,500.0	7.44	145.18	2,499.0	-19.8	13.8	-14.1	2.00	2.00	
2,600.0	9.44	145.18	2,597.9	-31.9	22.2	-22.6	2.00	2.00	
2,628.0	10.00	145.18	2,625.5	-35.7	24.9	-25.4	2.00	2.00	EOB @ 10° INC
2,700.0	10.00	145.18	2,696.4	-46.0	32.0	-32.6	0.00	0.00	
2,800.0	10.00	145.18	2,794.9	-60.2	41.9	-42.8	0.00	0.00	
2,900.0	10.00	145.18	2,893.3	-74.5	51.8	-52.9	0.00	0.00	
3,000.0	10.00	145.18	2,991.8	-88.8	61.7	-63.0	0.00	0.00	
3,096.9	10.00	145.18	3,087.3	-102.6	71.3	-72.8	0.00	0.00	Cliff House
3,100.0	10.00	145.18	3,090.3	-103.0	71.6	-73.1	0.00	0.00	
3,136.5	10.00	145.18	3,126.3	-108.2	75.3	-76.8	0.00	0.00	Meneffee
3,200.0	10.00	145.18	3,188.8	-117.3	81.6	-83.2	0.00	0.00	
3,300.0	10.00	145.18	3,287.3	-131.5	91.5	-93.3	0.00	0.00	
3,400.0	10.00	145.18	3,385.7	-145.8	101.4	-103.5	0.00	0.00	
3,500.0	10.00	145.18	3,484.2	-160.0	111.3	-113.6	0.00	0.00	
3,600.0	10.00	145.18	3,582.7	-174.3	121.2	-123.7	0.00	0.00	
3,700.0	10.00	145.18	3,681.2	-188.5	131.1	-133.8	0.00	0.00	
3,800.0	10.00	145.18	3,779.7	-202.8	141.0	-143.9	0.00	0.00	
3,900.0	10.00	145.18	3,878.1	-217.1	151.0	-154.0	0.00	0.00	
4,000.0	10.00	145.18	3,976.6	-231.3	160.9	-164.2	0.00	0.00	

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros 3H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #17		

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
4,020.3	10.00	145.18	3,996.6	-234.2	162.9	-166.2	0.00	0.00	Point Lookout
4,100.0	10.00	145.18	4,075.1	-245.6	170.8	-174.3	0.00	0.00	
4,170.6	10.00	145.18	4,144.6	-255.6	177.8	-181.4	0.00	0.00	Mancos
4,200.0	10.00	145.18	4,173.6	-259.8	180.7	-184.4	0.00	0.00	
4,300.0	10.00	145.18	4,272.1	-274.1	190.6	-194.5	0.00	0.00	
4,400.0	10.00	145.18	4,370.5	-288.3	200.5	-204.6	0.00	0.00	
4,500.0	10.00	145.18	4,469.0	-302.6	210.5	-214.7	0.00	0.00	
4,600.0	10.00	145.18	4,567.5	-316.8	220.4	-224.9	0.00	0.00	
4,679.5	10.00	145.18	4,645.8	-328.2	228.2	-232.9	0.00	0.00	Start 10° Build / Turn
4,700.0	8.78	155.29	4,666.0	-331.1	229.9	-234.6	9.99	-5.95	
4,750.0	7.49	190.06	4,715.6	-337.7	230.9	-235.7	10.00	-2.57	
4,800.0	9.22	222.97	4,765.0	-343.9	227.6	-232.5	10.00	3.45	
4,850.0	12.79	241.65	4,814.1	-349.4	220.0	-225.0	10.00	7.14	
4,900.0	17.08	251.70	4,862.4	-354.4	208.2	-213.2	10.00	8.59	
4,950.0	21.67	257.71	4,909.6	-358.7	192.2	-197.3	10.00	9.18	
5,000.0	26.41	261.68	4,955.3	-362.2	172.2	-177.3	10.00	9.47	
5,050.0	31.22	264.50	4,999.1	-365.1	148.2	-153.4	10.00	9.63	
5,100.0	36.08	266.63	5,040.7	-367.2	120.6	-125.9	10.00	9.72	
5,107.2	36.78	266.90	5,046.5	-367.4	116.4	-121.6	10.00	9.76	Gallup
5,150.0	40.97	268.32	5,079.8	-368.5	89.5	-94.8	10.00	9.78	
5,200.0	45.88	269.70	5,116.1	-369.1	55.2	-60.4	10.00	9.82	
5,250.0	50.80	270.87	5,149.3	-368.9	17.8	-23.1	10.00	9.85	
5,300.0	55.73	271.88	5,179.2	-367.9	-22.2	17.0	10.00	9.87	
5,350.0	60.67	272.79	5,205.5	-366.2	-64.7	59.4	10.00	9.88	
5,400.0	65.62	273.60	5,228.1	-363.7	-109.2	104.0	10.00	9.89	
5,450.0	70.57	274.36	5,246.8	-360.5	-155.4	150.3	10.00	9.90	
5,494.7	75.00	275.00	5,260.0	-357.0	-198.0	192.9	10.00	9.91	EOB @ 75° INC / Start 5° Build - 7" / 75° - 1,858'
5,500.0	75.26	275.00	5,261.4	-356.6	-203.1	198.0	5.01	5.01	
5,600.0	80.26	275.00	5,282.5	-348.0	-300.4	295.4	5.00	5.00	
5,622.2	81.37	275.00	5,286.1	-346.1	-322.3	317.3	5.00	5.00	Top lower Gallup
5,700.0	85.26	275.00	5,295.1	-339.4	-399.2	394.3	5.00	5.00	
5,798.4	90.18	275.00	5,299.0	-330.8	-497.1	492.4	5.00	5.00	LP @ 5,299' TVD, 90.19° INC - LP - 1,883' FSL
5,800.0	90.19	275.00	5,299.0	-330.7	-498.7	494.0	0.10	0.10	
5,900.0	90.19	275.00	5,298.7	-322.0	-598.3	593.7	0.00	0.00	
6,000.0	90.19	275.00	5,298.4	-313.3	-698.0	693.4	0.00	0.00	
6,100.0	90.19	275.00	5,298.1	-304.5	-797.6	793.2	0.00	0.00	
6,200.0	90.19	275.00	5,297.7	-295.8	-897.2	892.9	0.00	0.00	
6,300.0	90.19	275.00	5,297.4	-287.1	-996.8	992.6	0.00	0.00	
6,400.0	90.19	275.00	5,297.1	-278.4	-1,096.4	1,092.4	0.00	0.00	
6,500.0	90.19	275.00	5,296.8	-269.7	-1,196.1	1,192.1	0.00	0.00	
6,600.0	90.19	275.00	5,296.4	-261.0	-1,295.7	1,291.8	0.00	0.00	
6,700.0	90.19	275.00	5,296.1	-252.3	-1,395.3	1,391.6	0.00	0.00	
6,800.0	90.19	275.00	5,295.8	-243.5	-1,494.9	1,491.3	0.00	0.00	
6,900.0	90.19	275.00	5,295.5	-234.8	-1,594.5	1,591.0	0.00	0.00	
7,000.0	90.19	275.00	5,295.1	-226.1	-1,694.2	1,690.8	0.00	0.00	
7,100.0	90.19	275.00	5,294.8	-217.4	-1,793.8	1,790.5	0.00	0.00	
7,200.0	90.19	275.00	5,294.5	-208.7	-1,893.4	1,890.2	0.00	0.00	
7,300.0	90.19	275.00	5,294.2	-200.0	-1,993.0	1,990.0	0.00	0.00	
7,400.0	90.19	275.00	5,293.8	-191.2	-2,092.6	2,089.7	0.00	0.00	
7,500.0	90.19	275.00	5,293.5	-182.5	-2,192.2	2,189.4	0.00	0.00	
7,600.0	90.19	275.00	5,293.2	-173.8	-2,291.9	2,289.1	0.00	0.00	
7,700.0	90.19	275.00	5,292.9	-165.1	-2,391.5	2,388.9	0.00	0.00	

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros 3H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Project:	San Juan County NM	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #17		

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
7,800.0	90.19	275.00	5,292.5	-156.4	-2,491.1	2,488.6	0.00	0.00	
7,900.0	90.19	275.00	5,292.2	-147.7	-2,590.7	2,588.3	0.00	0.00	
8,000.0	90.19	275.00	5,291.9	-139.0	-2,690.3	2,688.1	0.00	0.00	
8,100.0	90.19	275.00	5,291.6	-130.2	-2,790.0	2,787.8	0.00	0.00	
8,200.0	90.19	275.00	5,291.2	-121.5	-2,889.6	2,887.5	0.00	0.00	
8,300.0	90.19	275.00	5,290.9	-112.8	-2,989.2	2,987.3	0.00	0.00	
8,400.0	90.19	275.00	5,290.6	-104.1	-3,088.8	3,087.0	0.00	0.00	
8,500.0	90.19	275.00	5,290.3	-95.4	-3,188.4	3,186.7	0.00	0.00	
8,600.0	90.19	275.00	5,289.9	-86.7	-3,288.1	3,286.5	0.00	0.00	
8,700.0	90.19	275.00	5,289.6	-78.0	-3,387.7	3,386.2	0.00	0.00	
8,800.0	90.19	275.00	5,289.3	-69.2	-3,487.3	3,485.9	0.00	0.00	
8,900.0	90.19	275.00	5,289.0	-60.5	-3,586.9	3,585.7	0.00	0.00	
9,000.0	90.19	275.00	5,288.6	-51.8	-3,686.5	3,685.4	0.00	0.00	
9,100.0	90.19	275.00	5,288.3	-43.1	-3,786.1	3,785.1	0.00	0.00	
9,200.0	90.19	275.00	5,288.0	-34.4	-3,885.8	3,884.9	0.00	0.00	
9,300.0	90.19	275.00	5,287.7	-25.7	-3,985.4	3,984.6	0.00	0.00	
9,400.0	90.19	275.00	5,287.4	-16.9	-4,085.0	4,084.3	0.00	0.00	
9,500.0	90.19	275.00	5,287.0	-8.2	-4,184.6	4,184.1	0.00	0.00	
9,600.0	90.19	275.00	5,286.7	0.5	-4,284.2	4,283.8	0.00	0.00	
9,700.0	90.19	275.00	5,286.4	9.2	-4,383.9	4,383.5	0.00	0.00	
9,800.0	90.19	275.00	5,286.1	17.9	-4,483.5	4,483.3	0.00	0.00	
9,900.0	90.19	275.00	5,285.7	26.6	-4,583.1	4,583.0	0.00	0.00	
10,000.0	90.19	275.00	5,285.4	35.3	-4,682.7	4,682.7	0.00	0.00	
10,100.0	90.19	275.00	5,285.1	44.1	-4,782.3	4,782.5	0.00	0.00	
10,200.0	90.19	275.00	5,284.8	52.8	-4,882.0	4,882.2	0.00	0.00	
10,300.0	90.19	275.00	5,284.4	61.5	-4,981.6	4,981.9	0.00	0.00	
10,400.0	90.19	275.00	5,284.1	70.2	-5,081.2	5,081.7	0.00	0.00	
10,432.1	90.19	275.00	5,284.0	73.0	-5,113.2	5,113.7	0.00	0.00	TD @ 10,432.1' MD

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB.	Local Co-ordinate Reference:	Well Heros 3H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #17		

Targets										
Target Name										
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	
- Shape	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(usft)			
Heros 3H 7°/85° (P7)	0.00	0.00	5,301.7	-360.5	-159.1	1,911,811.62	2,768,798.07	36° 15' 14.60 N	107° 40' 41.92 W	
- plan misses target center by 51.0usft at 5469.7usft MD (5253.0 TVD, -359.0 N, -174.1 E)										
- Point										
Heros 3H PBHL (P5)	0.00	0.00	5,270.0	66.0	-5,033.5	1,912,230.29	2,763,923.00	36° 15' 18.82 N	107° 41' 41.43 W	
- plan misses target center by 14.3usft at 10352.2usft MD (5284.3 TVD, 66.0 N, -5033.5 E)										
- Point										
Heros 3H 7°/85° (P10)	0.00	0.00	5,284.6	-349.0	-292.9	1,911,822.91	2,768,664.25	36° 15' 14.72 N	107° 40' 43.55 W	
- plan misses target center by 3.3usft at 5593.0usft MD (5281.3 TVD, -348.6 N, -293.6 E)										
- Point										
Heros 3H 7°/85° (P4)	0.00	0.00	5,301.7	-255.6	-785.8	1,911,915.52	2,768,171.20	36° 15' 15.64 N	107° 40' 49.57 W	
- plan misses target center by 49.9usft at 6092.5usft MD (5298.1 TVD, -305.2 N, -790.1 E)										
- Point										
Heros 3H 7°/85° (P8)	0.00	0.00	5,301.7	-369.0	-59.1	1,911,803.28	2,768,898.08	36° 15' 14.52 N	107° 40' 40.70 W	
- plan misses target center by 88.0usft at 5388.4usft MD (5223.2 TVD, -364.4 N, -98.6 E)										
- Point										
Heros 3H 7°/85° (P5)	0.00	0.00	5,301.7	-349.0	-289.1	1,911,822.91	2,768,668.08	36° 15' 14.72 N	107° 40' 43.50 W	
- plan misses target center by 20.8usft at 5592.9usft MD (5281.3 TVD, -348.6 N, -293.5 E)										
- Point										
Heros 3H 7°/85° (P9)	0.00	0.00	5,301.7	-377.0	30.9	1,911,795.43	2,768,988.10	36° 15' 14.44 N	107° 40' 39.60 W	
- plan misses target center by 131.9usft at 5319.1usft MD (5189.7 TVD, -367.4 N, -38.2 E)										
- Point										
Heros 3H PBHL	0.00	0.00	5,270.0	27.1	-5,032.4	1,912,191.39	2,763,924.12	36° 15' 18.43 N	107° 41' 41.42 W	
- plan misses target center by 41.2usft at 10347.7usft MD (5284.3 TVD, 65.6 N, -5029.1 E)										
- Point										
Heros 3H 7°/75° (P11)	0.00	0.00	5,260.0	-357.0	-198.0	1,911,815.06	2,768,759.16	36° 15' 14.64 N	107° 40' 42.39 W	
- plan hits target center										
- Point										
Heros 3H PBHL (P12)	0.00	0.00	5,284.0	73.0	-5,113.2	1,912,237.17	2,763,843.29	36° 15' 18.88 N	107° 41' 42.41 W	
- plan hits target center										
- Point										
Heros #2H 7°/85° P6	0.00	0.00	5,333.7	952.7	-423.9	1,913,124.41	2,768,531.12	36° 15' 27.59 N	107° 40' 45.15 W	
- plan misses target center by 1285.5usft at 5837.2usft MD (5298.9 TVD, -327.4 N, -535.8 E)										
- Point										
Heros 3H 7°/85°	0.00	0.00	5,301.7	4.8	-900.2	1,912,175.75	2,768,056.37	36° 15' 18.21 N	107° 40' 50.97 W	
- plan misses target center by 299.3usft at 6229.2usft MD (5297.6 TVD, -293.3 N, -926.3 E)										
- Point										
Heros 3H 7°/85° (P3)	0.00	0.00	5,301.7	-246.0	-895.2	1,911,924.94	2,768,061.79	36° 15' 15.73 N	107° 40' 50.90 W	
- plan misses target center by 50.0usft at 6202.3usft MD (5297.7 TVD, -295.6 N, -899.5 E)										
- Point										
Heros 3H PBHL (P10)	0.00	0.00	5,274.0	66.0	-5,033.5	1,912,230.29	2,763,923.00	36° 15' 18.82 N	107° 41' 41.43 W	
- plan misses target center by 10.3usft at 10352.1usft MD (5284.3 TVD, 66.0 N, -5033.5 E)										
- Point										
Heros 3H 7°/85° (P6)	0.00	0.00	5,301.7	-352.0	-259.1	1,911,819.96	2,768,698.06	36° 15' 14.69 N	107° 40' 43.14 W	
- plan misses target center by 26.5usft at 5563.5usft MD (5275.8 TVD, -351.2 N, -264.7 E)										
- Point										
Heros 3H PBHL (P3)	0.00	0.00	5,270.0	117.0	-5,041.0	1,912,281.28	2,763,915.41	36° 15' 19.32 N	107° 41' 41.53 W	
- plan misses target center by 52.1usft at 10364.1usft MD (5284.2 TVD, 67.1 N, -5045.4 E)										
- Point										

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	Local Co-ordinate Reference:	Well Heros 3H
Company:	LOGOS Operating LLC	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Project:	San Juan County, NM	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site:	S3-T23N-R8W (Heros Pad)	North Reference:	True
Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #17		

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")	
318.0	318.0	9 5/8"	0	0	
5,494.7	5,260.0	7"	0	0	

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
935.0	935.0	Ojo Alamo		-0.18	275.00	
1,081.0	1,081.0	Kirtland		-0.18	275.00	
1,402.0	1,402.0	Fruitland		-0.18	275.00	
1,609.0	1,609.0	Pictured Cliffs		-0.18	275.00	
2,011.0	2,011.0	Chacra		-0.18	275.00	
3,096.9	3,087.0	Cliff House		-0.18	275.00	
3,136.5	3,126.0	Meneffee		-0.18	275.00	
4,020.3	3,996.0	Point Lookout		-0.18	275.00	
4,170.6	4,144.0	Mancos		-0.18	275.00	
5,107.2	5,046.0	Gallup		-0.18	275.00	
5,622.2	5,287.0	Top lower Gallup		-0.18	275.00	

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
0.5	0.5	0.0	0.0	SH - 2,216' FSL, 74' FWL	
2,128.0	2,128.0	0.0	0.0	KOP @ 2,128' MD	
2,628.0	2,625.5	-35.7	24.9	EOB @ 10° INC	
4,679.5	4,645.8	-328.2	228.2	Start 10° Build / Turn	
5,494.7	5,260.0	-357.0	-198.0	EOB @ 75° INC / Start 5° Build	
5,494.7	5,260.0	-357.0	-198.0	7°/75° - 1,858' FSL, 132' FEL	
5,798.4	5,299.0	-330.8	-497.1	LP @ 5,299' TVD, 90.19° INC	
5,798.4	5,299.0	-330.8	-497.1	LP - 1,883' FSL, 430' FEL	
10,432.1	5,284.0	73.0	-5,113.2	TD @ 10,432.1' MD	
10,432.1	5,284.0	73.0	-5,113.2	BHL - 2,262' FSL, 250' FWL	

LOGOS Operating LLC

San Juan County, NM

S3-T23N-R8W (Heros Pad)

Heros 3H

HZ

Plan #17

Anticollision Report

15 July, 2014

Cathedral Energy Services

Anticollision Report

Company:	LOGOS Operating LLC	Local Co-ordinate Reference:	Well Heros 3H
Project:	San Juan County, NM	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Reference Site:	S3-T23N-R8W (Heros Pad)	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site Error:	0.0usft	North Reference:	True
Reference Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0usft	Output errors are at	2.00 sigma
Reference Wellbore	HZ	Database:	USA EDM 5000 Multi Users DB
Reference Design:	Plan #17	Offset TVD Reference:	Offset Datum

Reference	Plan #17		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD Interval 100.0usft	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 500.0usft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma		

Survey Tool Program	Date 7/15/2014			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.0	10,432.1	Plan #17 (HZ)	Geolink MWD	Geolink MWD

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
S3-T23N-R8W (Heros Pad)						
Heros #2H - HZ - SURVEYS	679.4	683.5	41.3	39.1	18.707	CC
Heros #2H - HZ - SURVEYS	700.0	704.0	41.4	39.1	18.095	ES
Heros #2H - HZ - SURVEYS	1,700.0	1,702.1	62.1	56.0	10.193	SF

Cathedral Energy Services

Anticollision Report

Company:	LOGOS Operating LLC	Local Co-ordinate Reference:	Well Heros 3H
Project:	Sani Juan County, NM	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Reference Site:	S3-T23N-R8W (Heros Pad)	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site Error:	0.0usft	North Reference:	True
Reference Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0usft	Output errors are at:	2.00 sigma
Reference Wellbore:	HZ	Database:	USA EDM 5000 Multi Users DB
Reference Design:	Plan #17	Offset TVD Reference:	Offset Datum

Offset Design S3-T23N-R8W (Heros Pad) - Heros #2H - HZ - SURVEYS													Offset Site Error:
Survey Program: 386-ISCWSA MWD													Offset Well Error:
Reference	Offset	Semi Major Axis		Distance		Warning							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Total Uncertainty Axis	Separation Factor	Warning
0.0	0.0	4.0	4.0	0.0	0.0	-5.54	52.0	-5.0	52.3				
100.0	100.0	104.5	104.5	0.1	0.1	-5.89	51.5	-5.3	51.7	51.5	0.27	188.181	
200.0	200.0	205.0	205.0	0.3	0.2	-6.94	49.9	-6.1	50.3	49.7	0.57	87.988	
300.0	300.0	305.4	305.4	0.5	0.4	-8.80	47.3	-7.3	47.8	47.0	0.87	55.170	
400.0	400.0	405.4	405.3	0.7	0.5	-11.61	43.7	-9.0	44.7	43.5	1.17	38.047	
500.0	500.0	504.6	504.5	0.8	0.7	-11.93	42.1	-8.9	43.1	41.5	1.53	28.162	
600.0	600.0	604.7	604.5	1.0	0.9	-10.99	41.1	-8.0	41.9	40.0	1.91	21.947	
679.4	679.4	683.5	683.4	1.2	1.0	-10.18	40.7	-7.3	41.3	39.1	2.21	18.707 CC	
700.0	700.0	704.0	703.9	1.2	1.1	-9.79	40.8	-7.0	41.4	39.1	2.29	18.095 ES	
800.0	800.0	803.9	803.8	1.4	1.3	-7.56	41.5	-5.5	41.9	39.2	2.66	15.743	
900.0	900.0	903.5	903.2	1.5	1.5	-4.50	42.8	-3.4	42.9	39.9	3.04	14.098	
1,000.0	1,000.0	1,003.0	1,002.7	1.7	1.7	-1.31	45.3	-1.0	45.4	41.9	3.42	13.245	
1,100.0	1,100.0	1,101.8	1,101.4	1.9	1.9	0.18	49.6	0.2	49.6	45.8	3.80	13.051	
1,200.0	1,200.0	1,203.0	1,202.5	2.1	2.1	0.59	54.1	0.6	54.1	49.9	4.18	12.930	
1,300.0	1,300.0	1,303.8	1,303.3	2.2	2.3	0.18	55.6	0.2	55.6	51.1	4.56	12.188	
1,400.0	1,400.0	1,404.0	1,403.5	2.4	2.5	-0.38	56.7	-0.4	56.7	51.7	4.95	11.457	
1,500.0	1,500.0	1,503.9	1,503.4	2.6	2.7	-1.24	57.4	-1.2	57.4	52.1	5.33	10.772	
1,600.0	1,600.0	1,603.4	1,602.8	2.8	2.9	-1.20	59.1	-1.2	59.1	53.4	5.71	10.353	
1,700.0	1,700.0	1,702.1	1,701.5	2.9	3.2	-0.05	62.1	-0.1	62.1	56.0	6.09	10.193 SF	
1,800.0	1,800.0	1,801.0	1,800.3	3.1	3.4	2.11	66.9	2.5	67.0	60.6	6.48	10.350	
1,900.0	1,900.0	1,899.2	1,898.2	3.3	3.6	3.68	73.3	4.7	73.7	66.9	6.86	10.740	
2,000.0	2,000.0	1,995.8	1,994.4	3.5	3.8	5.84	82.4	8.4	83.4	76.1	7.25	11.494	
2,100.0	2,100.0	2,091.3	2,088.8	3.6	4.1	8.86	94.5	14.7	96.8	89.2	7.65	12.662	
2,200.0	2,200.0	2,184.9	2,180.8	3.8	4.3	-133.75	110.1	22.5	115.4	107.3	8.08	14.275	
2,300.0	2,299.9	2,277.1	2,270.6	4.0	4.6	-132.79	129.2	30.6	140.3	131.7	8.51	16.472	
2,400.0	2,399.6	2,366.7	2,357.2	4.2	4.9	-133.39	151.0	37.4	170.8	161.9	8.94	19.102	
2,500.0	2,499.0	2,458.8	2,445.7	4.4	5.3	-134.50	175.7	44.4	206.0	196.6	9.38	21.965	
2,600.0	2,597.9	2,549.3	2,532.5	4.6	5.7	-135.65	200.2	51.4	243.9	234.1	9.81	24.876	
2,700.0	2,696.4	2,642.0	2,621.3	4.8	6.1	-137.19	226.0	58.6	284.5	274.3	10.24	27.775	
2,800.0	2,794.9	2,737.0	2,712.7	5.1	6.5	-138.53	250.8	65.7	323.7	313.0	10.68	30.317	
2,900.0	2,893.3	2,835.8	2,808.0	5.3	6.9	-139.59	275.8	73.3	362.1	351.0	11.13	32.547	
3,000.0	2,991.8	2,929.0	2,898.2	5.6	7.3	-140.36	297.9	80.5	399.3	387.7	11.57	34.513	
3,100.0	3,090.3	3,023.1	2,989.2	5.9	7.7	-140.92	320.5	88.4	436.7	424.7	12.03	36.300	
3,200.0	3,188.8	3,116.0	3,079.2	6.2	8.1	-141.36	342.4	96.4	473.8	461.3	12.49	37.938	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Cathedral Energy Services

Anticollision Report

Company:	LOGOS Operating LLC	Local Co-ordinate Reference:	Well Heros 3H
Project:	San Juan County, NM	TVD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Reference Site:	S3-T23N-R8W (Heros-Pad)	MD Reference:	KB=15' @ 6896.0usft (Aztec #222)
Site Error:	0.0usft	North Reference:	True
Reference Well:	Heros 3H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0usft	Output errors are at	2.00 sigma
Reference Wellbore:	HZ	Database:	USA EDM 5000 Multi Users DB
Reference Design:	Plan #17	Offset TVD Reference:	Offset Datum

Reference Depths are relative to KB=15' @ 6896.0usft (Aztec #222)

Offset Depths are relative to Offset Datum

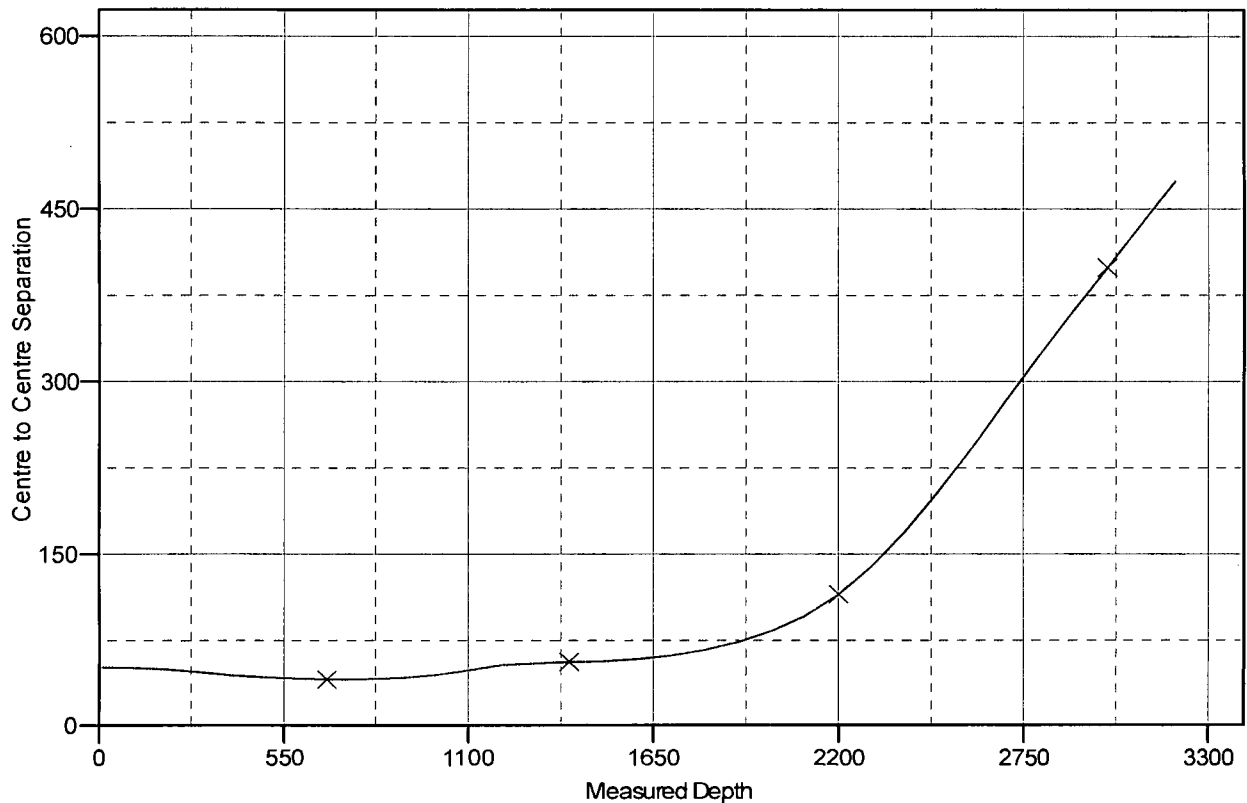
Central Meridian is 107° 50' 0.00 W °

Coordinates are relative to: Heros 3H

Coordinate System is US State Plane 1983, New Mexico Western Zone

Grid Convergence at Surface is: 0.09°

Ladder Plot



LEGEND

✕ Heros#2H, HZ, SURVEYS V0