

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: 10/23/13

Well information;

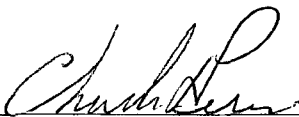
Operator Logos, Well Name and Number Logos 601H

API# 30-043-21182, Section 5, Township 22 NS, Range 5 EW

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
- ☐ 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


NMOCD Approved by Signature

1-6-2014 ca
Date

RECEIVED

CONFIDENTIAL

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

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Farmington Field Office

OCT 24 2013

APPLICATION FOR PERMIT TO DRILL OR REENTER

1a. Type of work: ☒ DRILL ☐ REENTER		5. Lease Serial No. Jicarilla 424
1b. Type of Well: ☒ Oil Well ☐ Gas Well ☐ Other ☒ Single Zone ☐ Multiple Zone		6. If Indian, Allottee or Tribe Name Jicarilla Apache Nation
2. Name of Operator Logos Operating, LLC		7. If Unit or CA Agreement, Name and No.
3a. Address 4001 North Butler Ave, Bldg 7101 Farmington, NM 87401		8. Lease Name and Well No. Logos 601H
3b. Phone No. (include area code) 505-330-9333		9. API Well No. 30-043-21182
4. Location of Well (Report location clearly and in accordance with any State requirements.)* At surface 440' FNL 560' FWL, UL D, Section 5, T22N, R5W, Lot 4 At proposed prod. zone 440' FNL 330' FWL, UL D, Section 6, T22N, R5W, Lot 4		10. Field and Pool, or Exploratory Gallup
14. Distance in miles and direction from nearest town or post office* South on Hwy 550 for 58.7 miles, turn right for 1.4 miles, new access on right		11. Sec., T. R. M. or Blk. and Survey or Area Surface: Sec 5, T22N R5W, UL D Bottom Hole: Sec 6, T22N R5W UL D
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) BHL is 440' from the NORTH line and 330' from WEST line	16. No. of acres in lease 2561.6 acres	17. Spacing Unit dedicated to this well 161.00 acres NW1/4 (Lots 1-4, Section 6, T22N, R5W, NMPM)
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. Logos 10 is 2974' south of BHL	19. Proposed Depth 5455' TVD/10409' MD	20. BLM/BIA Bond No. on file 1062402 RCUD DEC 31 '13 OIL CONS. DIV.
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 6891' GL	22. Approximate date work will start* 11/20/2013	23. Estimated duration 45 days DIST. 3

24. Attachments

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

- | | |
|--|---|
| 1. Well plat certified by a registered surveyor. | 4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above). |
| 2. A Drilling Plan. | 5. Operator certification |
| 3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office). | 6. Such other site specific information and/or plans as may be required by the BLM. |

25. Signature <i>Kristy Graham</i>	Name (Printed/Typed) Kristy Graham	Date 10/23/2013
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Title Production Engineer		
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Approved by (Signature) <i>[Signature]</i>	Name (Printed/Typed) AFM	Date 12/31/13
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Title AFM	Office FE	
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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.

(Continued on page 2)

*(Instructions on page 2)

DRILLING OPERATIONS AUTHORIZED ARE
SUBJECT TO COMPLIANCE WITH ATTACHED
"GENERAL REQUIREMENTS".

NMOC
PV

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

DISTRICT I
1626 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) 748-8720

DISTRICT III
1000 Rio Brueco Rd., Aztec, N.M. 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87605
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

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

OCT 24 2013

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

Farmington Field Office

*API Number 30-043-21182		*Pool Code 97989	*Pool Name WC 22NSW6; Gallup
*Property Code 311963	*Property Name LOGOS		*Well Number 601H
*OGRID No. 289408	*Operator Name LOGOS OPERATING, LLC		*Elevation 6891

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
D	5	22-N	5-W	4	440	NORTH	560	WEST	SANDOVAL

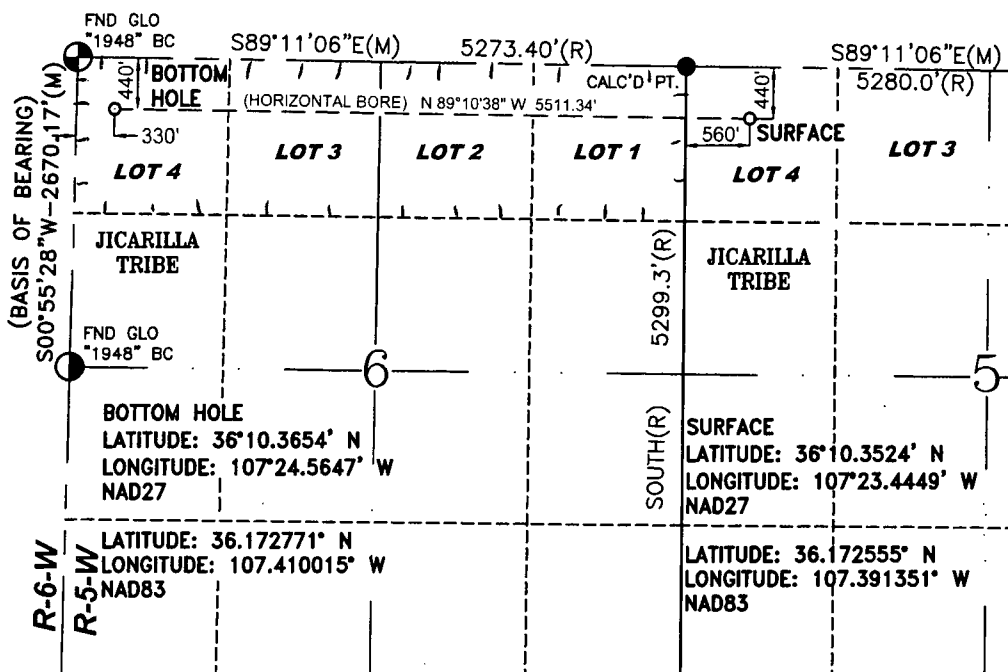
¹¹ Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
D	6	22-N	5-W	4	440	NORTH	330	WEST	SANDOVAL

¹² Dedicated Acres 161 ACRES N/2, N/2 Sect. 6	¹³ Joint or Infill	¹⁴ Consolidation Code	¹⁵ 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



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

Kristy Graham 10/22/13
Signature Date
Kristy Graham
Printed Name
Kgraham@logosresourcesllc.com
E-mail Address

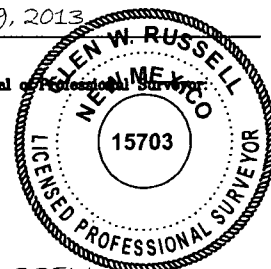
18 SURVEYOR CERTIFICATION

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.

OCTOBER 9, 2013

Date of Survey

Signature and Seal of Professional Surveyor



GLEN W. RUSSELL

Certificate Number

15703

BASIS OF BEARING:

BETWEEN FOUND MONUMENTS AT THE NORTHWEST CORNER AND THE WEST QUARTER CORNER OF SECTION 6, TOWNSHIP 22 NORTH, RANGE 5 WEST, N.M.P.M. SANDOVAL COUNTY, NEW MEXICO.

LINE BEARS: S 00°55'28" W A DISTANCE OF 2670.17 FEET AS MEASURED BY G.P.S. LOCAL GRID NAD83.

**Directions from the Intersection of Highway 550 and Highway
64 in Bloomfield, NM**

to

LOGOS OPERATING, LLC

LOGOS #601H

440' FNL 560' FWL,

**Section 5, T22N, R5W, N.M.P.M., SANDOVAL County,
New Mexico**

Latitude: 36° 10' 21.199" N

Longitude: 107° 23' 28.864" W

Nad 1983

From the Intersection of Highway 550 & Highway 64

Go South on Hwy 550 for 58.7 miles

turn right (southerly) on for 1.4 miles,

to the beginning of new access on the rt (west) of the field road

From which the new access begins and continues (westerly) for

1198.63 feet to the new location.

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

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

LOGOS #601H

Horizontal Gallup Oil and Gas Well
Surface Location: 440' FNL – 560' FEL
Section 5, T22N, R6W
Ungraded GL Elev = 6891'
Lat. = 36.17248885 deg N
Long. = 107.39161336 deg W
NAD83
Sandoval County, New Mexico

Proposed Bottom Hole Location: 440' FNL – 330' FWL
Section 6, T22N, R6W
Sandoval 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	1330
Kirtland	1460
Fruitland	1890
Pictured Cliffs	1900
Cliffs House	3370
Menefee	3400
Point Lookout	4200
Mancos	4330
Gallup	5180
Greenhorn Member of Mancos	6230
Dakota	6256

Drilling Plan

Drill 12 1/4" hole to 500' then set 9 5/8" casing. Drill 8 3/4" vertical hole with fresh water mud. At 1300'MD, build 2 degrees per 100' to 7 degrees to 1650'MD. Hold 7 degrees to 3927'MD, then drop at 2 degrees per 100' to vertical by 4277'MD. Drill vertical from 4277' MD to kick off point at 4900'MD. Trip out of hole and pick up 8 3/4" kick off assembly. Kick well off at 4900'MD and build angle at 10 deg/100' to 90 degrees inclination and at 270 degrees Azimuth and land in the Gallup formation at 5800'MD/5455'TVD.

7" casing will be set in a legal position 428' FNL & 333' FEL at 5800' MD in Section 6.

The 7" casing will be drilled out with a 6 1/8" drilling assembly holding 90 degrees, 270 degrees Azimuth. Adjustments may be made to the directional program based on geology. Total depth will be 10412'MD/5455' TVD- 90 degrees, 270 degrees Azimuth.

The Bottom hole location will be in a legal location at 10412' MD at 440'FNL & 330' FWL of section 6.

A total of 4519' 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 5455' TVD at 7" casing point

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

3. MINIMUM SPECIFICATIONS FOR PRESSURE CONTROL EQUIPMENT

A. Wellhead Equipment 3,000 PSI System (See Exhibit A)

1. 9 5/8" slip-on / welded x 11" 3,000 psi casing head.
2. One 11" 3,000 psi WP double-ram preventer with one (1) set of blind rams on top & one (1) set of pipe rams on bottom complete with hand wheels and extension arms.
3. The choke and kill lines will be connected to outlets between the bottom and top rams, utilizing either the ram body outlet or a drilling spool with side outlets for 2" kill line and minimum 3" choke line
4. One 11" x 3,000 psi WP Hydril GK (or equivalent) annular preventer.

5. Accumulator - Four Station Koomey (or equivalent) 120 gallon closing unit with remote, backup. The accumulator shall have sufficient capacity to open the hydraulically-controlled gate valve and close all rams plus the annular preventer, with a 50% safety factor and retain a minimum of 200 psi above the precharge on the closing manifold without the use of the closing unit pumps. The reservoir capacity shall be double the usable accumulator capacity, and the fluid level shall be maintained at the manufacturer's recommendations.
6. The BOP system shall have two (2) independent power sources (electric and air) available for powering the closing unit pumps. Sufficient nitrogen bottles are suitable as a backup power source only, and shall be recharged when the pressure falls below manufacturer's specification.
7. A valve shall be installed in the closing line as close as possible to the annular preventer to act as a locking device. This valve shall be maintained in the open position and shall be closed only when the power source for the accumulator system is inoperative.

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" 3,000 psi WP casing head prior to drilling out from under surface casing. All ram preventers and related equipment will be tested to 3,000 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 500'

8 3/4" = 500' to 5800' = 7" Casing point

6-1/8" Lateral = 5800' MD to 10412' MD = Gallup Pay Zone Horizontal

B. Casing Program – all casing strings are new casing

Casing & Hole Size	Weight	Grade	Coupling	Setting Depth (MD)	Comments
16" Conductor				0' - 60-ft BGL	New casing.
9-5/8" (12 1/4")	36 ppf	K-55	LT&C	0' - 500'	New casing. Cement to surface.
7" (8 3/4")	26 ppf	K-55	LT&C	0' - 5800' MD	New Casing. Cement to surface.
4 1/2" (6 1/8")	11.5 ppf	K-55	LT&C	4800' - 10412' MD	New Casing - Horizontal Hole Fresh water swell packers - TOL 100' above KOP, no cement

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 – (0-500'):

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

Top of Cement - Surface

Tail - (0'-500'): 227 sx – 14.5 ppg, conventional cement containing:

Cement - Type III

CaCl₂ – Accelerator - 1% WBWOB

Cello Flake – Lost Circulation Control Agent – 0.25 lbs/sx WBWOB

Yield – 1.38 ft³/sx,

Compressive strength: 24 hr – 1000+ psi

Total sacks of cement pumped = 227

Intermediate Casing – Single Stage Job (0-5800'MD):

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

Top of Cement – Surface.

Lead - (0' – 5300'): 568 sx - 12.1 ppg, conventional cement containing:

Cement – Premium Lite (35:65)

CaCl₂ – Accelerator - 3% WBWOB

Cello Flake – Lost Circulation Control Agent – 0.25 lbs/sx WBWOB

Kolite - Lost Circulation Control Agent – 5 lbs/sx WBWOB

Yield – 2.13 ft³/sx,

Compressive strength: 24 hr – 1000+ psi

Tail - (5300' – 5800'): 82 sx – 14.5 ppg, conventional cement containing:

Cement - Type III

CaCl₂ – Accelerator - 1% WBWOB

Cello Flake – Lost Circulation Control Agent – 0.25 lbs/sx WBWOB

Yield – 1.38 ft³/sx,

Compressive strength: 24 hr – 1500+ psi

Total sacks of cement pumped = 650

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

Production liner clarification: Utilizing external swell casing packer system for zonal isolation will not use cement 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.

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"	0-500'	Fresh Water	8.4-8.6	60-70	NC
8 3/4"	500-4900'	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"	4900' (KOP)-5800'	Fresh Water LSND	8.5-8.8	40-50	8-10
6 1/8"	5800' - 10412'	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

Cased Hole:

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

8. ABNORMAL PRESSURES & HYDROGEN SULFIDE

The anticipated bottom hole pressure is +/- 2552 psi based on a 9.0 ppg at 5455' 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 December 1, 2013. 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 45 days.



Company: LOGOS Operating LLC
 Field: Sandoval County, NM
 Location: Sec.05 - T22N-R5W
 Well: LOGOS #601H
 Wellbore: OH
 Plan: Rev 0
 Rig: TBD

PATHFINDER
 A Schlumberger Company

WELL DETAILS: LOGOS #601H

+N/-S	+E/-W	KB 14.5 ft @ 6905.50ft (TBD)		Ground Level: 6891.00	
0.00	0.00	Northing	Easting	Latitude	Longitude
		1884055.003	1303555.142	36° 10' 21.188 N	107° 23' 28.864 W

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	1300.00	0.00	0.00	1300.00	0.00	0.00	0.00	0.00	0.00	Build 2°/100' DLS
3	1649.82	7.00	270.76	1648.96	0.28	-21.33	2.00	270.76	21.33	Hold Inc
4	3926.87	7.00	270.76	3909.04	3.97	-298.67	0.00	0.00	298.70	Drop 2°/100' DLS
5	4276.69	0.00	0.00	4258.00	4.25	-320.00	2.00	180.00	320.03	Vertical Point
6	4900.73	0.00	0.00	4882.04	4.25	-320.00	0.00	0.00	320.03	KOP, Build 10°/100' DLS
7	5800.73	90.00	270.76	5455.00	11.85	-892.91	10.00	270.76	892.99	Landing Point
8	10408.77	90.00	270.76	5455.00	72.85	-5500.54	0.00	-91.04	5501.02	PBHL/TD

WELLBORE TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
PBHL Logos #601H	5455.00	72.85	-5500.54	36° 10' 21.263 N	107° 24' 35.955 W

FORMATION TOP DETAILS

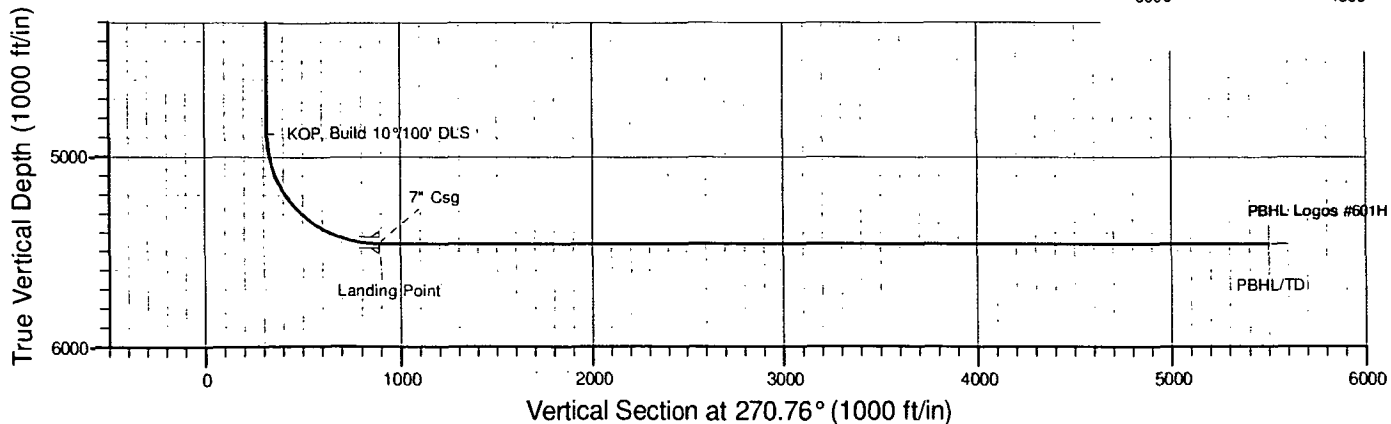
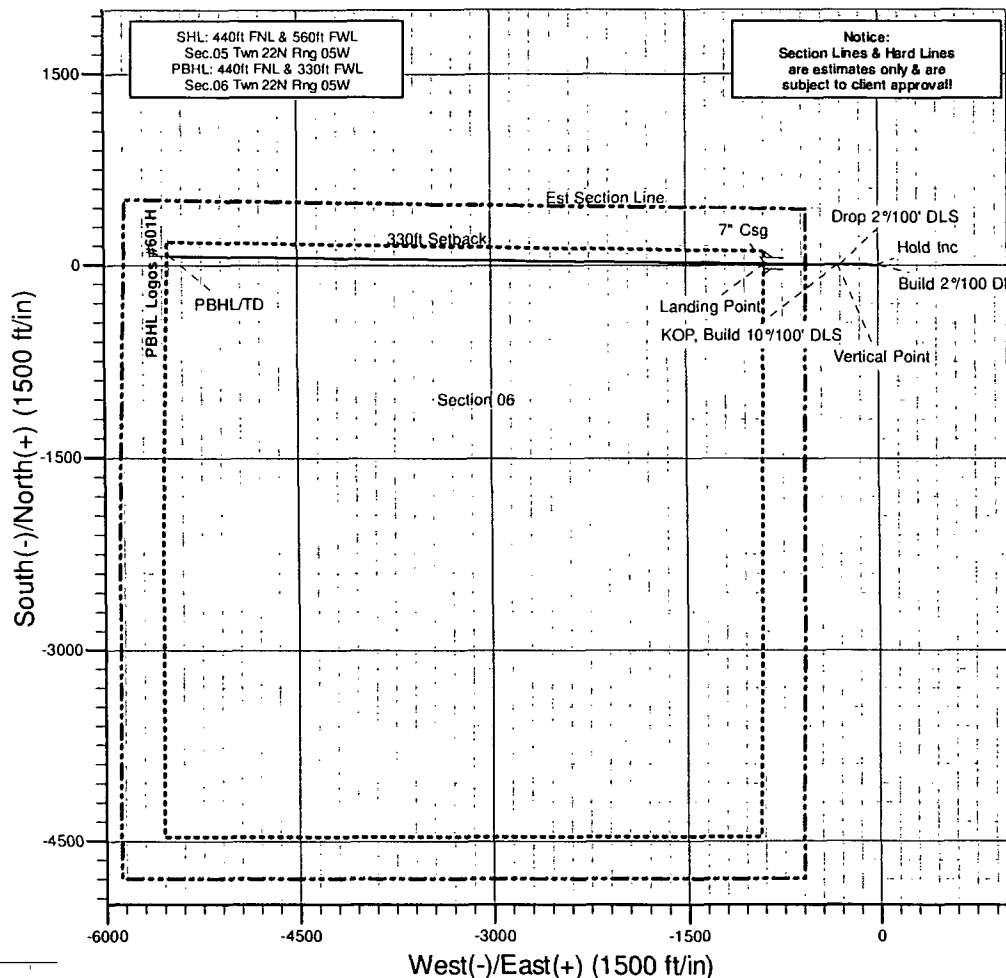
TVDPath	MDPath	Formation
1330.00	1330.00	Ojo Alamo
1460.00	1460.08	Kirtland
1890.00	1892.68	Fruitland
1900.00	1902.75	Pictured Cliffs
3370.00	3383.78	Cliffs House
3400.00	3414.01	Menefee
4200.00	4218.69	Point Lookout
4330.00	4348.69	Mancos
5180.00	5214.08	Gallup

CASING DETAILS

TVD	MD	Name	Size
5455.00	5800.73	7" Csg	7.000



Azimuths to Grid North
 True North: 0.67°
 Magnetic North: 10.11°
 Magnetic Field
 Strength: 50173.6snT
 Dip Angle: 63.00°
 Date: 09/25/2013
 Model: BGGM2013



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well LOGOS #601H
Company:	LOGOS Operating LLC	TVD Reference:	KB 14.5 ft @ 6905.50ft (TBD)
Project:	Sandoval County, NM	MD Reference:	KB 14.5 ft @ 6905.50ft (TBD)
Site:	Sec.05 - T22N-R5W	North Reference:	Grid
Well:	LOGOS #601H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Rev 0		

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

Site	Sec.05 - T22N-R5W		
Site Position:	From:	Lat/Long	
Position Uncertainty:	0.00 ft	Slot Radius:	13.200 in
Northing:	1,882,832.857 usft	Latitude:	36° 10' 9.228 N
Easting:	1,304,627.500 usft	Longitude:	107° 23' 15.612 W
Grid Convergence:			-0.67 °

Well	LOGOS #601H		
Well Position	+N/-S	0.00 ft	Northing: 1,884,055.003 usft
	+E/-W	0.00 ft	Easting: 1,303,555.143 usft
Position Uncertainty	0.00 ft	Wellhead Elevation:	Ground Level: 6,891.00 ft
			Latitude: 36° 10' 21.188 N
			Longitude: 107° 23' 28.864 W

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination
	BGGM2013	09/25/13	9.43
			Dip Angle
			63.00
			Field Strength
			50,174

Design	Rev 0		
Audit Notes:			
Version:	Phase:	PROTOTYPE	Tie On Depth: 0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(ft)	(ft)	(ft)
	0.00	0.00	0.00
			Direction
			(°)
			270.76

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,649.82	7.00	270.76	1,648.96	0.28	-21.33	2.00	2.00	0.00	270.76	
3,926.87	7.00	270.76	3,909.04	3.97	-298.67	0.00	0.00	0.00	0.00	
4,276.69	0.00	0.00	4,258.00	4.25	-320.00	2.00	-2.00	0.00	180.00	
4,900.73	0.00	0.00	4,882.04	4.25	-320.00	0.00	0.00	0.00	0.00	
5,800.73	90.00	270.76	5,455.00	11.85	-892.91	10.00	10.00	0.00	270.76	
10,408.77	90.00	270.76	5,455.00	72.85	-5,500.54	0.00	0.00	0.00	-91.04	PBHL Logos #601H

$$PBHL \left\{ \begin{array}{l} Y \rightarrow (440 - 72.85)_{ft} = 365.15 \times 365 ft/N \quad (Sec. 6) \\ X \rightarrow (560 + 5273.40 - 5500.54)_{ft} = 333.4 \times 333 ft/W \quad (Sec. 6) \end{array} \right.$$

William Tambekou
10/25/2013



PathFinder
Planning Report - Geographic



A Schlumberger Company

Database: EDM 5000.1 Single User Db
Company: LOGOS Operating LLC
Project: Sandoval County, NM
Site: Sec.05 - T22N-R5W
Well: LOGOS #601H
Wellbore: OH
Design: Rev 0

Local Co-ordinate Reference: Well LOGOS #601H
TVD Reference: KB 14.5 ft @ 6905.50ft (TBD)
MD Reference: KB 14.5 ft @ 6905.50ft (TBD)
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	1,884,055.003	1,303,555.143	36° 10' 21.188 N	107° 23' 28.864 W
1,300.00	0.00	0.00	1,300.00	0.00	0.00	1,884,055.003	1,303,555.143	36° 10' 21.188 N	107° 23' 28.864 W
1,400.00	2.00	270.76	1,399.98	0.02	-1.74	1,884,055.026	1,303,553.398	36° 10' 21.188 N	107° 23' 28.886 W
1,500.00	4.00	270.76	1,499.84	0.09	-6.98	1,884,055.096	1,303,548.165	36° 10' 21.188 N	107° 23' 28.950 W
1,600.00	6.00	270.76	1,599.45	0.21	-15.69	1,884,055.211	1,303,539.450	36° 10' 21.188 N	107° 23' 29.056 W
1,649.82	7.00	270.76	1,648.96	0.28	-21.33	1,884,055.286	1,303,533.812	36° 10' 21.188 N	107° 23' 29.125 W
1,700.00	7.00	270.76	1,698.76	0.36	-27.44	1,884,055.367	1,303,527.701	36° 10' 21.188 N	107° 23' 29.199 W
1,800.00	7.00	270.76	1,798.01	0.53	-39.62	1,884,055.529	1,303,515.521	36° 10' 21.188 N	107° 23' 29.348 W
1,900.00	7.00	270.76	1,897.27	0.69	-51.80	1,884,055.691	1,303,503.341	36° 10' 21.189 N	107° 23' 29.496 W
2,000.00	7.00	270.76	1,996.52	0.85	-63.98	1,884,055.853	1,303,491.162	36° 10' 21.189 N	107° 23' 29.645 W
2,100.00	7.00	270.76	2,095.78	1.01	-76.16	1,884,056.014	1,303,478.982	36° 10' 21.189 N	107° 23' 29.793 W
2,200.00	7.00	270.76	2,195.03	1.17	-88.34	1,884,056.176	1,303,466.802	36° 10' 21.189 N	107° 23' 29.942 W
2,300.00	7.00	270.76	2,294.29	1.34	-100.52	1,884,056.338	1,303,454.622	36° 10' 21.189 N	107° 23' 30.090 W
2,400.00	7.00	270.76	2,393.55	1.50	-112.70	1,884,056.500	1,303,442.443	36° 10' 21.190 N	107° 23' 30.239 W
2,500.00	7.00	270.76	2,492.80	1.66	-124.88	1,884,056.662	1,303,430.263	36° 10' 21.190 N	107° 23' 30.388 W
2,600.00	7.00	270.76	2,592.06	1.82	-137.06	1,884,056.823	1,303,418.083	36° 10' 21.190 N	107° 23' 30.536 W
2,700.00	7.00	270.76	2,691.31	1.98	-149.24	1,884,056.985	1,303,405.903	36° 10' 21.190 N	107° 23' 30.685 W
2,800.00	7.00	270.76	2,790.57	2.14	-161.42	1,884,057.147	1,303,393.724	36° 10' 21.190 N	107° 23' 30.833 W
2,900.00	7.00	270.76	2,889.82	2.31	-173.60	1,884,057.309	1,303,381.544	36° 10' 21.190 N	107° 23' 30.982 W
3,000.00	7.00	270.76	2,989.08	2.47	-185.78	1,884,057.470	1,303,369.364	36° 10' 21.191 N	107° 23' 31.130 W
3,100.00	7.00	270.76	3,088.33	2.63	-197.96	1,884,057.632	1,303,357.184	36° 10' 21.191 N	107° 23' 31.279 W
3,200.00	7.00	270.76	3,187.59	2.79	-210.14	1,884,057.794	1,303,345.004	36° 10' 21.191 N	107° 23' 31.428 W
3,300.00	7.00	270.76	3,286.84	2.95	-222.32	1,884,057.956	1,303,332.825	36° 10' 21.191 N	107° 23' 31.576 W
3,400.00	7.00	270.76	3,386.10	3.11	-234.50	1,884,058.117	1,303,320.645	36° 10' 21.191 N	107° 23' 31.725 W
3,500.00	7.00	270.76	3,485.35	3.28	-246.68	1,884,058.279	1,303,308.465	36° 10' 21.192 N	107° 23' 31.873 W
3,600.00	7.00	270.76	3,584.61	3.44	-258.86	1,884,058.441	1,303,296.285	36° 10' 21.192 N	107° 23' 32.022 W
3,700.00	7.00	270.76	3,683.86	3.60	-271.04	1,884,058.603	1,303,284.106	36° 10' 21.192 N	107° 23' 32.170 W
3,800.00	7.00	270.76	3,783.12	3.76	-283.22	1,884,058.764	1,303,271.926	36° 10' 21.192 N	107° 23' 32.319 W
3,900.00	7.00	270.76	3,882.38	3.92	-295.40	1,884,058.926	1,303,259.746	36° 10' 21.192 N	107° 23' 32.467 W
3,926.87	7.00	270.76	3,909.04	3.97	-298.67	1,884,058.970	1,303,256.474	36° 10' 21.192 N	107° 23' 32.507 W
4,000.00	5.53	270.76	3,981.74	4.07	-306.65	1,884,059.076	1,303,248.494	36° 10' 21.192 N	107° 23' 32.605 W
4,100.00	3.53	270.76	4,081.42	4.18	-314.55	1,884,059.181	1,303,240.590	36° 10' 21.193 N	107° 23' 32.701 W
4,200.00	1.53	270.76	4,181.32	4.24	-318.97	1,884,059.239	1,303,236.170	36° 10' 21.193 N	107° 23' 32.755 W
4,276.69	0.00	0.00	4,258.00	4.25	-320.00	1,884,059.253	1,303,235.143	36° 10' 21.193 N	107° 23' 32.768 W
4,900.73	0.00	0.00	4,882.04	4.25	-320.00	1,884,059.253	1,303,235.143	36° 10' 21.193 N	107° 23' 32.768 W
5,000.00	9.93	270.76	4,980.81	4.36	-328.58	1,884,059.367	1,303,226.566	36° 10' 21.193 N	107° 23' 32.872 W
5,100.00	19.93	270.76	5,077.31	4.71	-354.30	1,884,059.708	1,303,200.843	36° 10' 21.193 N	107° 23' 33.186 W
5,200.00	29.93	270.76	5,167.88	5.26	-396.39	1,884,060.266	1,303,158.755	36° 10' 21.194 N	107° 23' 33.699 W
5,300.00	39.93	270.76	5,249.77	6.02	-453.56	1,884,061.025	1,303,101.580	36° 10' 21.195 N	107° 23' 34.397 W
5,400.00	49.93	270.76	5,320.48	6.96	-524.09	1,884,061.960	1,303,031.055	36° 10' 21.196 N	107° 23' 35.257 W
5,500.00	59.93	270.76	5,377.87	8.04	-605.82	1,884,063.044	1,302,949.325	36° 10' 21.197 N	107° 23' 36.254 W
5,600.00	69.93	270.76	5,420.19	9.24	-696.27	1,884,064.244	1,302,858.871	36° 10' 21.198 N	107° 23' 37.357 W
5,700.00	79.93	270.76	5,446.17	10.52	-792.70	1,884,065.523	1,302,762.443	36° 10' 21.200 N	107° 23' 38.533 W
5,800.00	89.93	270.76	5,455.00	11.84	-892.17	1,884,066.843	1,302,662.970	36° 10' 21.201 N	107° 23' 39.746 W
5,800.73	90.00	270.76	5,455.00	11.85	-892.91	1,884,066.853	1,302,662.237	36° 10' 21.201 N	107° 23' 39.755 W
5,900.00	90.00	270.76	5,455.00	13.17	-992.17	1,884,068.169	1,302,562.979	36° 10' 21.203 N	107° 23' 40.966 W
6,000.00	90.00	270.76	5,455.00	14.49	-1,092.16	1,884,069.496	1,302,462.988	36° 10' 21.204 N	107° 23' 42.186 W
6,100.00	90.00	270.76	5,455.00	15.82	-1,192.15	1,884,070.822	1,302,362.997	36° 10' 21.205 N	107° 23' 43.405 W
6,200.00	90.00	270.76	5,455.00	17.14	-1,292.14	1,884,072.148	1,302,263.006	36° 10' 21.207 N	107° 23' 44.625 W
6,300.00	90.00	270.76	5,455.00	18.47	-1,392.13	1,884,073.474	1,302,163.015	36° 10' 21.208 N	107° 23' 45.844 W
6,400.00	90.00	270.76	5,455.00	19.80	-1,492.12	1,884,074.799	1,302,063.024	36° 10' 21.210 N	107° 23' 47.064 W
6,500.00	90.00	270.76	5,455.00	21.12	-1,592.11	1,884,076.125	1,301,963.033	36° 10' 21.211 N	107° 23' 48.284 W
6,600.00	90.00	270.76	5,455.00	22.45	-1,692.10	1,884,077.451	1,301,863.042	36° 10' 21.213 N	107° 23' 49.503 W
6,700.00	90.00	270.76	5,455.00	23.77	-1,792.10	1,884,078.776	1,301,763.051	36° 10' 21.214 N	107° 23' 50.723 W
6,800.00	90.00	270.76	5,455.00	25.10	-1,892.09	1,884,080.101	1,301,663.060	36° 10' 21.215 N	107° 23' 51.943 W



PathFinder
Planning Report - Geographic



A Schlumberger Company

Database: EDM 5000.1 Single User Db
Company: LOGOS Operating LLC
Project: Sandoval County, NM
Site: Sec.05 - T22N-R5W
Well: LOGOS #601H
Wellbore: OH
Design: Rev 0

Local Co-ordinate Reference: Well LOGOS #601H
TVD Reference: KB 14.5 ft @ 6905.50ft (TBD)
MD Reference: KB 14.5 ft @ 6905.50ft (TBD)
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,900.00	90.00	270.76	5,455.00	26.42	-1,992.08	1,884,081.427	1,301,563.069	36° 10' 21.217 N	107° 23' 53.162 W
7,000.00	90.00	270.76	5,455.00	27.75	-2,092.07	1,884,082.752	1,301,463.078	36° 10' 21.218 N	107° 23' 54.382 W
7,100.00	90.00	270.76	5,455.00	29.07	-2,192.06	1,884,084.077	1,301,363.087	36° 10' 21.220 N	107° 23' 55.601 W
7,200.00	90.00	270.76	5,455.00	30.40	-2,292.05	1,884,085.402	1,301,263.096	36° 10' 21.221 N	107° 23' 56.821 W
7,300.00	90.00	270.76	5,455.00	31.72	-2,392.04	1,884,086.726	1,301,163.105	36° 10' 21.222 N	107° 23' 58.041 W
7,400.00	90.00	270.76	5,455.00	33.05	-2,492.03	1,884,088.051	1,301,063.114	36° 10' 21.224 N	107° 23' 59.260 W
7,500.00	90.00	270.76	5,455.00	34.37	-2,592.02	1,884,089.375	1,300,963.123	36° 10' 21.225 N	107° 24' 0.480 W
7,600.00	90.00	270.76	5,455.00	35.70	-2,692.02	1,884,090.700	1,300,863.132	36° 10' 21.227 N	107° 24' 1.699 W
7,700.00	90.00	270.76	5,455.00	37.02	-2,792.01	1,884,092.024	1,300,763.141	36° 10' 21.228 N	107° 24' 2.919 W
7,800.00	90.00	270.76	5,455.00	38.35	-2,892.00	1,884,093.348	1,300,663.150	36° 10' 21.229 N	107° 24' 4.139 W
7,900.00	90.00	270.76	5,455.00	39.67	-2,991.99	1,884,094.672	1,300,563.159	36° 10' 21.231 N	107° 24' 5.358 W
8,000.00	90.00	270.76	5,455.00	40.99	-3,091.98	1,884,095.996	1,300,463.168	36° 10' 21.232 N	107° 24' 6.578 W
8,100.00	90.00	270.76	5,455.00	42.32	-3,191.97	1,884,097.320	1,300,363.177	36° 10' 21.233 N	107° 24' 7.797 W
8,200.00	90.00	270.76	5,455.00	43.64	-3,291.96	1,884,098.644	1,300,263.186	36° 10' 21.235 N	107° 24' 9.017 W
8,300.00	90.00	270.76	5,455.00	44.96	-3,391.95	1,884,099.968	1,300,163.195	36° 10' 21.236 N	107° 24' 10.237 W
8,400.00	90.00	270.76	5,455.00	46.29	-3,491.95	1,884,101.291	1,300,063.204	36° 10' 21.237 N	107° 24' 11.456 W
8,500.00	90.00	270.76	5,455.00	47.61	-3,591.94	1,884,102.614	1,299,963.213	36° 10' 21.239 N	107° 24' 12.676 W
8,600.00	90.00	270.76	5,455.00	48.93	-3,691.93	1,884,103.938	1,299,863.222	36° 10' 21.240 N	107° 24' 13.896 W
8,700.00	90.00	270.76	5,455.00	50.26	-3,791.92	1,884,105.261	1,299,763.231	36° 10' 21.241 N	107° 24' 15.115 W
8,800.00	90.00	270.76	5,455.00	51.58	-3,891.91	1,884,106.584	1,299,663.240	36° 10' 21.243 N	107° 24' 16.335 W
8,900.00	90.00	270.76	5,455.00	52.90	-3,991.90	1,884,107.907	1,299,563.249	36° 10' 21.244 N	107° 24' 17.554 W
9,000.00	90.00	270.76	5,455.00	54.23	-4,091.89	1,884,109.230	1,299,463.257	36° 10' 21.245 N	107° 24' 18.774 W
9,100.00	90.00	270.76	5,455.00	55.55	-4,191.88	1,884,110.552	1,299,363.266	36° 10' 21.247 N	107° 24' 19.994 W
9,200.00	90.00	270.76	5,455.00	56.87	-4,291.88	1,884,111.875	1,299,263.275	36° 10' 21.248 N	107° 24' 21.213 W
9,300.00	90.00	270.76	5,455.00	58.19	-4,391.87	1,884,113.197	1,299,163.284	36° 10' 21.249 N	107° 24' 22.433 W
9,400.00	90.00	270.76	5,455.00	59.52	-4,491.86	1,884,114.520	1,299,063.293	36° 10' 21.251 N	107° 24' 23.652 W
9,500.00	90.00	270.76	5,455.00	60.84	-4,591.85	1,884,115.842	1,298,963.302	36° 10' 21.252 N	107° 24' 24.872 W
9,600.00	90.00	270.76	5,455.00	62.16	-4,691.84	1,884,117.164	1,298,863.311	36° 10' 21.253 N	107° 24' 26.092 W
9,700.00	90.00	270.76	5,455.00	63.48	-4,791.83	1,884,118.486	1,298,763.320	36° 10' 21.254 N	107° 24' 27.311 W
9,800.00	90.00	270.76	5,455.00	64.81	-4,891.82	1,884,119.808	1,298,663.329	36° 10' 21.256 N	107° 24' 28.531 W
9,900.00	90.00	270.76	5,455.00	66.13	-4,991.81	1,884,121.130	1,298,563.338	36° 10' 21.257 N	107° 24' 29.750 W
10,000.00	90.00	270.76	5,455.00	67.45	-5,091.81	1,884,122.451	1,298,463.347	36° 10' 21.258 N	107° 24' 30.970 W
10,100.00	90.00	270.76	5,455.00	68.77	-5,191.80	1,884,123.773	1,298,363.356	36° 10' 21.260 N	107° 24' 32.190 W
10,200.00	90.00	270.76	5,455.00	70.09	-5,291.79	1,884,125.094	1,298,263.365	36° 10' 21.261 N	107° 24' 33.409 W
10,300.00	90.00	270.76	5,455.00	71.41	-5,391.78	1,884,126.416	1,298,163.374	36° 10' 21.262 N	107° 24' 34.629 W
10,400.00	90.00	270.76	5,455.00	72.73	-5,491.77	1,884,127.737	1,298,063.383	36° 10' 21.263 N	107° 24' 35.848 W
10,408.77	90.00	270.76	5,455.00	72.85	-5,500.54	1,884,127.853	1,298,054.614	36° 10' 21.263 N	107° 24' 35.955 W

Design Targets

Target Name

- hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
PBHL Logos #601H - plan hits target center - Point	0.00	360.00	5,455.00	72.85	-5,500.54	1,884,127.853	1,298,054.614	36° 10' 21.263 N	107° 24' 35.955 W

Casing Points

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (in)	Hole Diameter (in)
5,800.73	5,455.00	7" Csg	7.000	8.750



PathFinder
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Design: Rev 0

Local Co-ordinate Reference: Well LOGOS #601H
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MD Reference: KB 14.5 ft @ 6905.50ft (TBD)
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Formations

Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,330.00	1,330.00	Ojo Alamo		0.00	
1,460.08	1,460.00	Kirtland		0.00	
1,892.68	1,890.00	Fruitland		0.00	
1,902.75	1,900.00	Pictured Cliff's		0.00	
3,383.78	3,370.00	Cliffs House		0.00	
3,414.01	3,400.00	Menefee		0.00	
4,218.69	4,200.00	Point Lookout		0.00	
4,348.69	4,330.00	Mancos		0.00	
5,214.08	5,180.00	Gallup		0.00	

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
1,300.00	1,300.00	0.00	0.00	Build 2°/100 DLS
1,649.83	1,648.96	0.28	-21.33	Hold Inc
3,926.87	3,909.05	3.97	-298.67	Drop 2°/100' DLS
4,276.69	4,258.00	4.25	-320.00	Vertical Point
4,900.73	4,882.04	4.25	-320.00	KOP, Build 10°/100' DLS
5,800.73	5,455.00	11.85	-892.90	Landing Point
10,408.20	5,455.00	72.84	-5,499.97	PBHL/TD

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North Reference: Grid
Survey Calculation Method: Minimum Curvature

Project Sandoval County, NM

Map System: US State Plane 1983
Geo Datum: North American Datum 1983
Map Zone: New Mexico Central Zone

System Datum: Mean Sea Level

Site Sec.05 - T22N-R5W

Site Position: Northing: 1,882,832.857 usft Latitude: 36° 10' 9.228 N
From: Lat/Long Easting: 1,304,627.500 usft Longitude: 107° 23' 15.612 W
Position Uncertainty: 0.00 ft Slot Radius: 13.200 in Grid Convergence: -0.67 °

Well LOGOS #601H

Well Position +N/-S 0.00 ft Northing: 1,884,055.003 usft Latitude: 36° 10' 21.188 N
+E/-W 0.00 ft Easting: 1,303,555.143 usft Longitude: 107° 23' 28.864 W
Position Uncertainty 0.00 ft Wellhead Elevation: Ground Level: 6,891.00 ft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2013	9/25/2013	9.43	63.00	50,174

Design Rev 0

Audit Notes:

Version: Phase: PROTOTYPE Tie On Depth: 0.00

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	270.76

Plan Sections

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,649.82	7.00	270.76	1,648.96	0.28	-21.33	2.00	2.00	0.00	270.76	
3,926.87	7.00	270.76	3,909.04	3.97	-298.67	0.00	0.00	0.00	0.00	
4,276.69	0.00	0.00	4,258.00	4.25	-320.00	2.00	-2.00	0.00	180.00	
4,900.73	0.00	0.00	4,882.04	4.25	-320.00	0.00	0.00	0.00	0.00	
5,800.73	90.00	270.76	5,455.00	11.85	-892.91	10.00	10.00	0.00	270.76	
10,408.77	90.00	270.76	5,455.00	72.85	-5,500.54	0.00	0.00	0.00	-91.04	PBHL Logos #601H

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	1,884,055.003	1,303,555.143	36° 10' 21.188 N	107° 23' 28.864 W
1,300.00	0.00	0.00	1,300.00	0.00	0.00	1,884,055.003	1,303,555.143	36° 10' 21.188 N	107° 23' 28.864 W
1,400.00	2.00	270.76	1,399.98	0.02	-1.74	1,884,055.026	1,303,553.398	36° 10' 21.188 N	107° 23' 28.886 W
1,500.00	4.00	270.76	1,499.84	0.09	-6.98	1,884,055.096	1,303,548.165	36° 10' 21.188 N	107° 23' 28.950 W
1,600.00	6.00	270.76	1,599.45	0.21	-15.69	1,884,055.211	1,303,539.450	36° 10' 21.188 N	107° 23' 29.056 W
1,649.82	7.00	270.76	1,648.96	0.28	-21.33	1,884,055.286	1,303,533.812	36° 10' 21.188 N	107° 23' 29.125 W
1,700.00	7.00	270.76	1,698.76	0.36	-27.44	1,884,055.367	1,303,527.701	36° 10' 21.188 N	107° 23' 29.199 W
1,800.00	7.00	270.76	1,798.01	0.53	-39.62	1,884,055.529	1,303,515.521	36° 10' 21.188 N	107° 23' 29.348 W
1,900.00	7.00	270.76	1,897.27	0.69	-51.80	1,884,055.691	1,303,503.341	36° 10' 21.189 N	107° 23' 29.496 W
2,000.00	7.00	270.76	1,996.52	0.85	-63.98	1,884,055.853	1,303,491.162	36° 10' 21.189 N	107° 23' 29.645 W
2,100.00	7.00	270.76	2,095.78	1.01	-76.16	1,884,056.014	1,303,478.982	36° 10' 21.189 N	107° 23' 29.793 W
2,200.00	7.00	270.76	2,195.03	1.17	-88.34	1,884,056.176	1,303,466.802	36° 10' 21.189 N	107° 23' 29.942 W
2,300.00	7.00	270.76	2,294.29	1.34	-100.52	1,884,056.338	1,303,454.622	36° 10' 21.189 N	107° 23' 30.090 W
2,400.00	7.00	270.76	2,393.55	1.50	-112.70	1,884,056.500	1,303,442.443	36° 10' 21.190 N	107° 23' 30.239 W
2,500.00	7.00	270.76	2,492.80	1.66	-124.88	1,884,056.662	1,303,430.263	36° 10' 21.190 N	107° 23' 30.388 W
2,600.00	7.00	270.76	2,592.06	1.82	-137.06	1,884,056.823	1,303,418.083	36° 10' 21.190 N	107° 23' 30.536 W
2,700.00	7.00	270.76	2,691.31	1.98	-149.24	1,884,056.985	1,303,405.903	36° 10' 21.190 N	107° 23' 30.685 W
2,800.00	7.00	270.76	2,790.57	2.14	-161.42	1,884,057.147	1,303,393.724	36° 10' 21.190 N	107° 23' 30.833 W
2,900.00	7.00	270.76	2,889.82	2.31	-173.60	1,884,057.309	1,303,381.544	36° 10' 21.190 N	107° 23' 30.982 W
3,000.00	7.00	270.76	2,989.08	2.47	-185.78	1,884,057.470	1,303,369.364	36° 10' 21.191 N	107° 23' 31.130 W
3,100.00	7.00	270.76	3,088.33	2.63	-197.96	1,884,057.632	1,303,357.184	36° 10' 21.191 N	107° 23' 31.279 W
3,200.00	7.00	270.76	3,187.59	2.79	-210.14	1,884,057.794	1,303,345.004	36° 10' 21.191 N	107° 23' 31.428 W
3,300.00	7.00	270.76	3,286.84	2.95	-222.32	1,884,057.956	1,303,332.825	36° 10' 21.191 N	107° 23' 31.576 W
3,400.00	7.00	270.76	3,386.10	3.11	-234.50	1,884,058.117	1,303,320.645	36° 10' 21.191 N	107° 23' 31.725 W
3,500.00	7.00	270.76	3,485.35	3.28	-246.68	1,884,058.279	1,303,308.465	36° 10' 21.192 N	107° 23' 31.873 W
3,600.00	7.00	270.76	3,584.61	3.44	-258.86	1,884,058.441	1,303,296.285	36° 10' 21.192 N	107° 23' 32.022 W
3,700.00	7.00	270.76	3,683.86	3.60	-271.04	1,884,058.603	1,303,284.106	36° 10' 21.192 N	107° 23' 32.170 W
3,800.00	7.00	270.76	3,783.12	3.76	-283.22	1,884,058.764	1,303,271.926	36° 10' 21.192 N	107° 23' 32.319 W
3,900.00	7.00	270.76	3,882.38	3.92	-295.40	1,884,058.926	1,303,259.746	36° 10' 21.192 N	107° 23' 32.467 W
3,926.87	7.00	270.76	3,909.04	3.97	-298.67	1,884,058.970	1,303,256.474	36° 10' 21.192 N	107° 23' 32.507 W
4,000.00	5.53	270.76	3,981.74	4.07	-306.65	1,884,059.076	1,303,248.494	36° 10' 21.192 N	107° 23' 32.605 W
4,100.00	3.53	270.76	4,081.42	4.18	-314.55	1,884,059.181	1,303,240.590	36° 10' 21.193 N	107° 23' 32.701 W

4,200.00	1.53	270.76	4,181.32	4.24	-318.97	1,884,059.239	1,303,236.170	36° 10' 21.193 N	107° 23' 32.755 W
4,276.69	0.00	0.00	4,258.00	4.25	-320.00	1,884,059.253	1,303,235.143	36° 10' 21.193 N	107° 23' 32.768 W
4,900.73	0.00	0.00	4,882.04	4.25	-320.00	1,884,059.253	1,303,235.143	36° 10' 21.193 N	107° 23' 32.768 W
5,000.00	9.93	270.76	4,980.81	4.36	-328.58	1,884,059.367	1,303,226.566	36° 10' 21.193 N	107° 23' 32.872 W
5,100.00	19.93	270.76	5,077.31	4.71	-354.30	1,884,059.708	1,303,200.843	36° 10' 21.193 N	107° 23' 33.186 W
5,200.00	29.93	270.76	5,167.88	5.26	-396.39	1,884,060.266	1,303,158.755	36° 10' 21.194 N	107° 23' 33.699 W
5,300.00	39.93	270.76	5,249.77	6.02	-453.56	1,884,061.025	1,303,101.580	36° 10' 21.195 N	107° 23' 34.397 W
5,400.00	49.93	270.76	5,320.48	6.96	-524.09	1,884,061.960	1,303,031.055	36° 10' 21.196 N	107° 23' 35.257 W
5,500.00	59.93	270.76	5,377.87	8.04	-605.82	1,884,063.044	1,302,949.325	36° 10' 21.197 N	107° 23' 36.254 W
5,600.00	69.93	270.76	5,420.19	9.24	-696.27	1,884,064.244	1,302,858.871	36° 10' 21.198 N	107° 23' 37.357 W
5,700.00	79.93	270.76	5,446.17	10.52	-792.70	1,884,065.523	1,302,762.443	36° 10' 21.200 N	107° 23' 38.533 W
5,800.00	89.93	270.76	5,455.00	11.84	-892.17	1,884,066.843	1,302,662.970	36° 10' 21.201 N	107° 23' 39.746 W
5,800.73	90.00	270.76	5,455.00	11.85	-892.91	1,884,066.85	1,302,662.24	36° 10' 21.201 N	107° 23' 39.755 W
5,900.00	90.00	270.76	5,455.00	13.17	-992.17	1,884,068.169	1,302,562.979	36° 10' 21.203 N	107° 23' 40.966 W
6,000.00	90.00	270.76	5,455.00	14.49	-1,092.16	1,884,069.496	1,302,462.988	36° 10' 21.204 N	107° 23' 42.186 W
6,100.00	90.00	270.76	5,455.00	15.82	-1,192.15	1,884,070.822	1,302,362.997	36° 10' 21.205 N	107° 23' 43.405 W
6,200.00	90.00	270.76	5,455.00	17.14	-1,292.14	1,884,072.148	1,302,263.006	36° 10' 21.207 N	107° 23' 44.625 W
6,300.00	90.00	270.76	5,455.00	18.47	-1,392.13	1,884,073.474	1,302,163.015	36° 10' 21.208 N	107° 23' 45.844 W
6,400.00	90.00	270.76	5,455.00	19.80	-1,492.12	1,884,074.799	1,302,063.024	36° 10' 21.210 N	107° 23' 47.064 W
6,500.00	90.00	270.76	5,455.00	21.12	-1,592.11	1,884,076.125	1,301,963.033	36° 10' 21.211 N	107° 23' 48.284 W
6,600.00	90.00	270.76	5,455.00	22.45	-1,692.10	1,884,077.451	1,301,863.042	36° 10' 21.213 N	107° 23' 49.503 W
6,700.00	90.00	270.76	5,455.00	23.77	-1,792.10	1,884,078.776	1,301,763.051	36° 10' 21.214 N	107° 23' 50.723 W
6,800.00	90.00	270.76	5,455.00	25.10	-1,892.09	1,884,080.101	1,301,663.060	36° 10' 21.215 N	107° 23' 51.943 W
6,900.00	90.00	270.76	5,455.00	26.42	-1,992.08	1,884,081.427	1,301,563.069	36° 10' 21.217 N	107° 23' 53.162 W
7,000.00	90.00	270.76	5,455.00	27.75	-2,092.07	1,884,082.752	1,301,463.078	36° 10' 21.218 N	107° 23' 54.382 W
7,100.00	90.00	270.76	5,455.00	29.07	-2,192.06	1,884,084.077	1,301,363.087	36° 10' 21.220 N	107° 23' 55.601 W
7,200.00	90.00	270.76	5,455.00	30.40	-2,292.05	1,884,085.402	1,301,263.096	36° 10' 21.221 N	107° 23' 56.821 W
7,300.00	90.00	270.76	5,455.00	31.72	-2,392.04	1,884,086.726	1,301,163.105	36° 10' 21.222 N	107° 23' 58.041 W
7,400.00	90.00	270.76	5,455.00	33.05	-2,492.03	1,884,088.051	1,301,063.114	36° 10' 21.224 N	107° 23' 59.260 W
7,500.00	90.00	270.76	5,455.00	34.37	-2,592.02	1,884,089.375	1,300,963.123	36° 10' 21.225 N	107° 24' 0.480 W
7,600.00	90.00	270.76	5,455.00	35.70	-2,692.02	1,884,090.700	1,300,863.132	36° 10' 21.227 N	107° 24' 1.699 W
7,700.00	90.00	270.76	5,455.00	37.02	-2,792.01	1,884,092.024	1,300,763.141	36° 10' 21.228 N	107° 24' 2.919 W
7,800.00	90.00	270.76	5,455.00	38.35	-2,892.00	1,884,093.348	1,300,663.150	36° 10' 21.229 N	107° 24' 4.139 W
7,900.00	90.00	270.76	5,455.00	39.67	-2,991.99	1,884,094.672	1,300,563.159	36° 10' 21.231 N	107° 24' 5.358 W
8,000.00	90.00	270.76	5,455.00	40.99	-3,091.98	1,884,095.996	1,300,463.168	36° 10' 21.232 N	107° 24' 6.578 W
8,100.00	90.00	270.76	5,455.00	42.32	-3,191.97	1,884,097.320	1,300,363.177	36° 10' 21.233 N	107° 24' 7.797 W
8,200.00	90.00	270.76	5,455.00	43.64	-3,291.96	1,884,098.644	1,300,263.186	36° 10' 21.235 N	107° 24' 9.017 W
8,300.00	90.00	270.76	5,455.00	44.96	-3,391.95	1,884,099.968	1,300,163.195	36° 10' 21.236 N	107° 24' 10.237 W
8,400.00	90.00	270.76	5,455.00	46.29	-3,491.95	1,884,101.291	1,300,063.204	36° 10' 21.237 N	107° 24' 11.456 W
8,500.00	90.00	270.76	5,455.00	47.61	-3,591.94	1,884,102.614	1,299,963.213	36° 10' 21.239 N	107° 24' 12.676 W
8,600.00	90.00	270.76	5,455.00	48.93	-3,691.93	1,884,103.938	1,299,863.222	36° 10' 21.240 N	107° 24' 13.896 W
8,700.00	90.00	270.76	5,455.00	50.26	-3,791.92	1,884,105.261	1,299,763.231	36° 10' 21.241 N	107° 24' 15.115 W
8,800.00	90.00	270.76	5,455.00	51.58	-3,891.91	1,884,106.584	1,299,663.240	36° 10' 21.243 N	107° 24' 16.335 W
8,900.00	90.00	270.76	5,455.00	52.90	-3,991.90	1,884,107.907	1,299,563.249	36° 10' 21.244 N	107° 24' 17.554 W
9,000.00	90.00	270.76	5,455.00	54.23	-4,091.89	1,884,109.230	1,299,463.257	36° 10' 21.245 N	107° 24' 18.774 W
9,100.00	90.00	270.76	5,455.00	55.55	-4,191.88	1,884,110.552	1,299,363.266	36° 10' 21.247 N	107° 24' 19.994 W
9,200.00	90.00	270.76	5,455.00	56.87	-4,291.88	1,884,111.875	1,299,263.275	36° 10' 21.248 N	107° 24' 21.213 W
9,300.00	90.00	270.76	5,455.00	58.19	-4,391.87	1,884,113.197	1,299,163.284	36° 10' 21.249 N	107° 24' 22.433 W
9,400.00	90.00	270.76	5,455.00	59.52	-4,491.86	1,884,114.520	1,299,063.293	36° 10' 21.251 N	107° 24' 23.652 W
9,500.00	90.00	270.76	5,455.00	60.84	-4,591.85	1,884,115.842	1,298,963.302	36° 10' 21.252 N	107° 24' 24.872 W
9,600.00	90.00	270.76	5,455.00	62.16	-4,691.84	1,884,117.164	1,298,863.311	36° 10' 21.253 N	107° 24' 26.092 W
9,700.00	90.00	270.76	5,455.00	63.48	-4,791.83	1,884,118.486	1,298,763.320	36° 10' 21.254 N	107° 24' 27.311 W
9,800.00	90.00	270.76	5,455.00	64.81	-4,891.82	1,884,119.808	1,298,663.329	36° 10' 21.256 N	107° 24' 28.531 W
9,900.00	90.00	270.76	5,455.00	66.13	-4,991.81	1,884,121.130	1,298,563.338	36° 10' 21.257 N	107° 24' 29.750 W
10,000.00	90.00	270.76	5,455.00	67.45	-5,091.81	1,884,122.451	1,298,463.347	36° 10' 21.258 N	107° 24' 30.970 W
10,100.00	90.00	270.76	5,455.00	68.77	-5,191.80	1,884,123.773	1,298,363.356	36° 10' 21.260 N	107° 24' 32.190 W
10,200.00	90.00	270.76	5,455.00	70.09	-5,291.79	1,884,125.094	1,298,263.365	36° 10' 21.261 N	107° 24' 33.409 W
10,300.00	90.00	270.76	5,455.00	71.41	-5,391.78	1,884,126.416	1,298,163.374	36° 10' 21.262 N	107° 24' 34.629 W
10,400.00	90.00	270.76	5,455.00	72.73	-5,491.77	1,884,127.737	1,298,063.383	36° 10' 21.263 N	107° 24' 35.848 W
10,408.77	90.00	270.76	5,455.00	72.85	-5,500.54	1,884,127.853	1,298,054.614	36° 10' 21.263 N	107° 24' 35.955 W

Design Targets

Target Name	Dip	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	Angle	(°)	(ft)	(ft)	(ft)	(usft)	(usft)		
- Shape	...								
PBHL Logos #601H	0.00	360.00	5,455.00	72.85	-5,500.54	1,884,127.853	1,298,054.614	36° 10' 21.263 N	107° 24' 35.955 W
- plan hits target center									
- Point									

Casing Points

Measured Depth	Vertical Depth	Name	Casing Diameter	Hole Diameter
(ft)	(ft)		(in)	(in)
5,800.73	5,455.00	7" Csg	7.000	8.750

Formations

Measured Depth	Vertical Depth	Name	Lithology	Dip	Dip Direction
(ft)	(ft)			(°)	(°)
1,330.00	1,330.00	Ojo Alamo	0.00		
1,460.08	1,460.00	Kirtland	0.00		
1,892.68	1,890.00	Fruitland	0.00		
1,902.75	1,900.00	Pictured Cliffs	0.00		
3,383.78	3,370.00	Cliffs House	0.00		

3,414.01	3,400.00	Menefoo	0.00
4,218.69	4,200.00	Point Lookout	0.00
4,348.69	4,330.00	Mancos	0.00
5,214.08	5,180.00	Gallup	0.00

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
1,300.00	1,300.00	0.00	0.00	Build 2"/100' DLS
1,649.83	1,648.96	0.28	-21.33	Hold Inc
3,926.87	3,909.05	3.97	-298.67	Drop 2"/100' DLS
4,276.69	4,258.00	4.25	-320.00	Vertical Point
4,900.73	4,882.04	4.25	-320.00	KOP, Build 10"/100' DLS
5,800.73	5,455.00	11.85	-892.90	Landing Point
10,408.20	5,455.00	72.84	-5,499.97	PBHL/TD

RECEIVED

**MULTI-POINT SURFACE USE PLAN
Logos #601H**

OCT 25 2013

**Bureau of Land Management
Farmington Field Office**

1. Existing Roads:

All existing roads used to access the proposed location are shown on attached Plat #1 and shall be maintained in the same or better condition than presently found.

Directions: Go South on HWY 550 for 58.7 miles, turn right, go for 1.4 miles

2. Planned Access Roads:

Per the on-site inspection with a Jicarilla representative performed on October 11, 2013, the new access road is being re-directed and a subsequent plat will be submitted reflecting the changes. The existing access road will be maintained in at least the current condition and will be upgraded where necessary to provide uninterrupted access to the proposed well.

3. Location of Existing Wells:

Attached map (Plat #1) shows existing wells within a one mile radius of the proposed well. There is one P&A well, four producing wells, and seven permitted wells (including the Logos #601H) within one mile. All producing wells and permitted wells are Logos Operating, LLC.

4. Location of Production Facilities:

In the event of production, production facilities will be located on the drill pad. The actual placement of this equipment will be determined when the well's production characteristics can be evaluated after completion.

Upon completion of drilling, the location and surrounding area will be cleared of all debris.

5. Water Supply:

Water for drilling and completion operations will be hauled by truck from various permitted water sources within the area through the water haulers association.

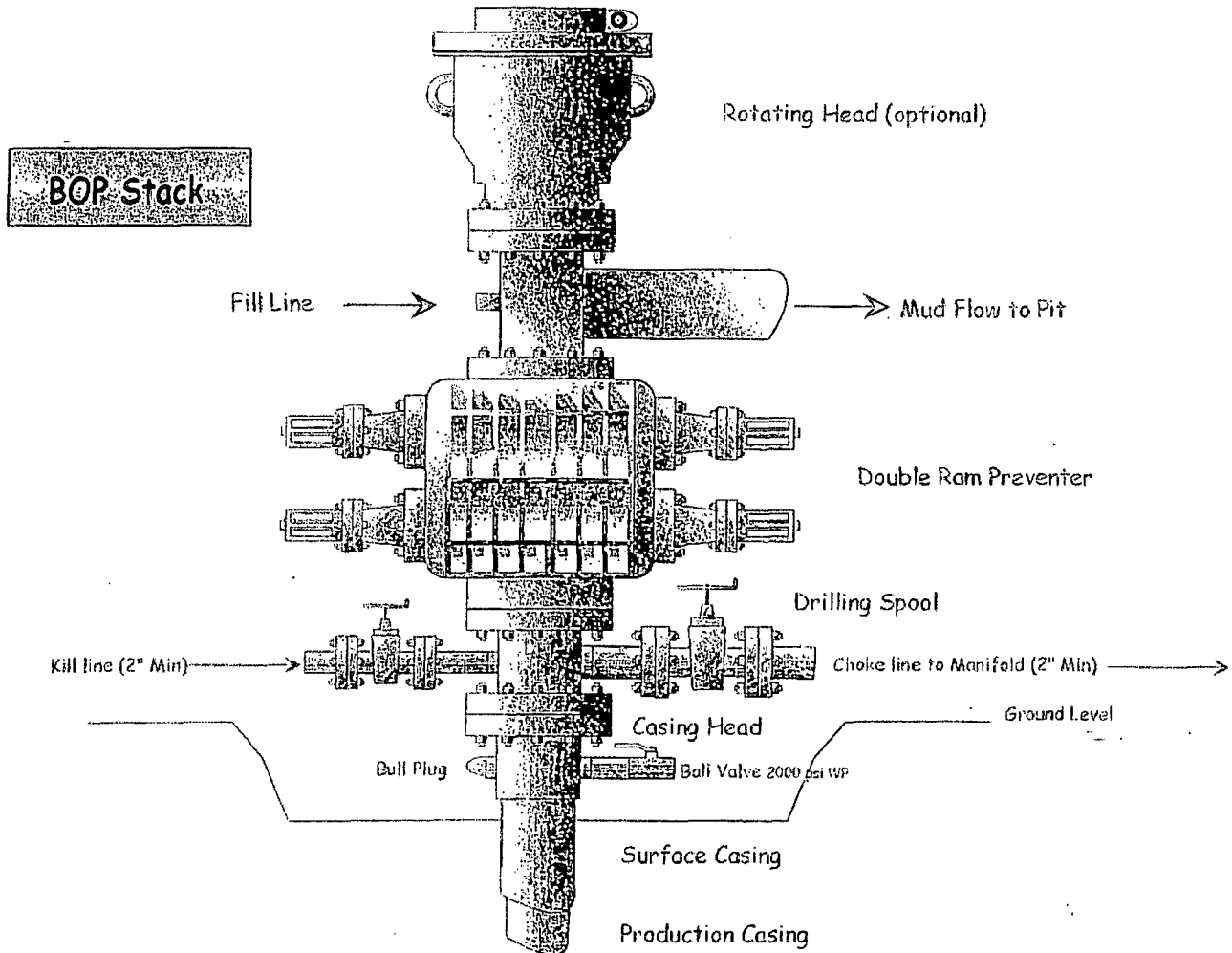
6. Source of Construction Materials:

No additional construction materials will be required to build the proposed location.

7. Methods for Handling Waste Disposal:

a. The drill cuttings, fluids and completion fluids will be placed in a reserve pit and a closed loop system. The drill cuttings, fluids and completion fluids from the

Typical BOP setup



Choke & Kill Manifold

