

State of New Mexico
Energy, Minerals and Natural Resources Department

Michelle Lujan Grisham
Governor

Sarah Cottrell Propst
Cabinet Secretary

Todd E. Leahy, JD, PhD
Deputy Secretary

Adrienne Sandoval, 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: 3/18/2019

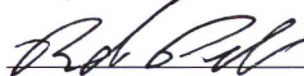
Well information;

Operator LOGOS, Well Name and Number Federal 240728m 2H

API# 30-039-31382, Section 28, Township 24 N/S, Range 7 E/W

Conditions of Approval: (See the below checked and handwritten conditions)

- ☒ Notify Aztec OCD 24hrs prior to casing & cement.
- ☒ Hold C-104 for directional survey & "As Drilled" Plat - 5.9 compliance
- ☒ 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
 - ☐ Submit Gas Capture Plan form prior to spudding or initiating recompletion operations
 - ☒ Regarding Hydraulic Fracturing, review EPA Underground Injection Control Guidance 84
 - ☒ Oil base muds are not to be used until fresh water zones are cased and cemented providing isolation from the oil or diesel. This includes synthetic oils. Oil based mud, drilling fluids and solids must be contained in a steel closed loop system.
 - ☒ Well-bore communication is regulated under 19.15.29 NMAC. This requires well-bore Communication to be reported in accordance with 19.15.29.8.
 - ☒ If cement doesn't circulate on any string notify regulatory agencies before proceeding



NMOCD Approved by Signature

12-12-19

Date

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

MMOCD

NOV 12 2019

DISTRICT III

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

1a. Type of work: ☒ DRILL ☐ REENTER
1b. Type of Well: ☒ Oil Well ☐ Gas Well ☐ Other
1c. Type of Completion: ☐ Hydraulic Fracturing ☒ Single Zone ☐ Multiple Zone

2. Name of Operator
LOGOS OPERATING LLC

3a. Address
2010 Afton Place FARMINGTON NM 87401

3b. Phone No. (include area code)
(505)324-4145

4. Location of Well (Report location clearly and in accordance with any State requirements. *)

At surface SWSW / 5 FSL / 893 FWL / LAT 36.277374 / LONG -107.586193

At proposed prod. zone SWSW / 195 FSL / 1055 FWL / LAT 36.292583 / LONG -107.603143

14. Distance in miles and direction from nearest town or post office*
46.9 miles

12. County or Parish
RIO ARRIBA

13. State
NM

15. Distance from proposed*
location to nearest
property or lease line, ft.
(Also to nearest drig. unit line, if any)
5 feet

16. No of acres in lease
1520

17. Spacing Unit dedicated to this well
360

18. Distance from proposed location*
to nearest well, drilling, completed,
applied for, on this lease, ft.
30 feet

19. Proposed Depth
6198 feet / 13122 feet

20. BLM/BIA Bond No. in file
FED: NMB001387

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
7389 feet

22. Approximate date work will start*
04/01/2019

23. Estimated duration
45 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
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).

4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification.
6. Such other site specific information and/or plans as may be requested by the BLM.

25. Signature
(Electronic Submission)

Name (Printed/Typed)
Marie Florez / Ph: (505)324-4145

Date
03/18/2019

Title
Regulatory Specialist

Approved by (Signature)
(Electronic Submission)

Name (Printed/Typed)
Mellisa Reeves-Wientjes / Ph: (505)564-7738

Date
11/07/2019

Title
Land Law Examiner

Office
FARMINGTON

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.

APPROVED WITH CONDITIONS

Approval Date: 11/07/2019

MMOCD

DISTRICT I
1625 N. French Dr., Hobbs, N.M. 88240
Phone: (575) 393-6161 Fax: (575) 393-0720

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

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

DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3482

State of New Mexico
Energy, Minerals & Natural Resources Department

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

NMOC

NOV 12 2019

DISTRICT III

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

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

¹ API Number 30-039-31382	² Pool Code 22619	³ Pool Name ESCRITO GALLUP
⁴ Property Code 326486	⁵ Property Name FEDERAL 2407 28M COM	⁶ Well Number 2H
⁷ OGRID No. 289408	⁸ Operator Name LOGOS OPERATING, LLC	⁹ Elevation 7389

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
M	28	24-N	7-W		5'	SOUTH	893'	WEST	RIO ARriba

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
M	20	24-N	7-W		195'	SOUTH	1055'	WEST	RIO ARriba

¹² Dedicated Acres EC-SW/SW SEC 28, SW/SW SEC 20, E2/SE, NW/SE, SW/NE, E2/NW, NW/NW SEC 29 TOTAL 360 ACRES	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 BOTTOM HOLE

195' FSL, 1055' FWL SEC.20
LATITUDE: 36°17.5542' N
LONGITUDE: 107°36.1521' W
NAD27
LATITUDE: 36.292583' N
LONGITUDE: 107.603143' W
NAD83

POINT OF ENTRY

126' FSL, 334' FWL SEC. 28
LATITUDE: 36°16.6622' N
LONGITUDE: 107°35.2484' W
NAD27
LATITUDE: 36.277717' N
LONGITUDE: 107.588081' W
NAD83

FIRST PERFERATION

129' FSL, 1097' FWL SEC.20
LATITUDE: 36°17.5433' N
LONGITUDE: 107°36.1431' W
NAD27
LATITUDE: 36.292400' N
LONGITUDE: 107.602994' W
NAD83

SURFACE

5' FSL, 893' FWL SEC. 28
LATITUDE: 36°16.6417' N
LONGITUDE: 107°35.1351' W
NAD27
LATITUDE: 36.277374' N
LONGITUDE: 107.586193' W
NAD83

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.

Signature: [Signature] Date: _____

Printed Name: _____

E-mail Address: _____

¹⁸ SURVEYOR CERTIFICATION

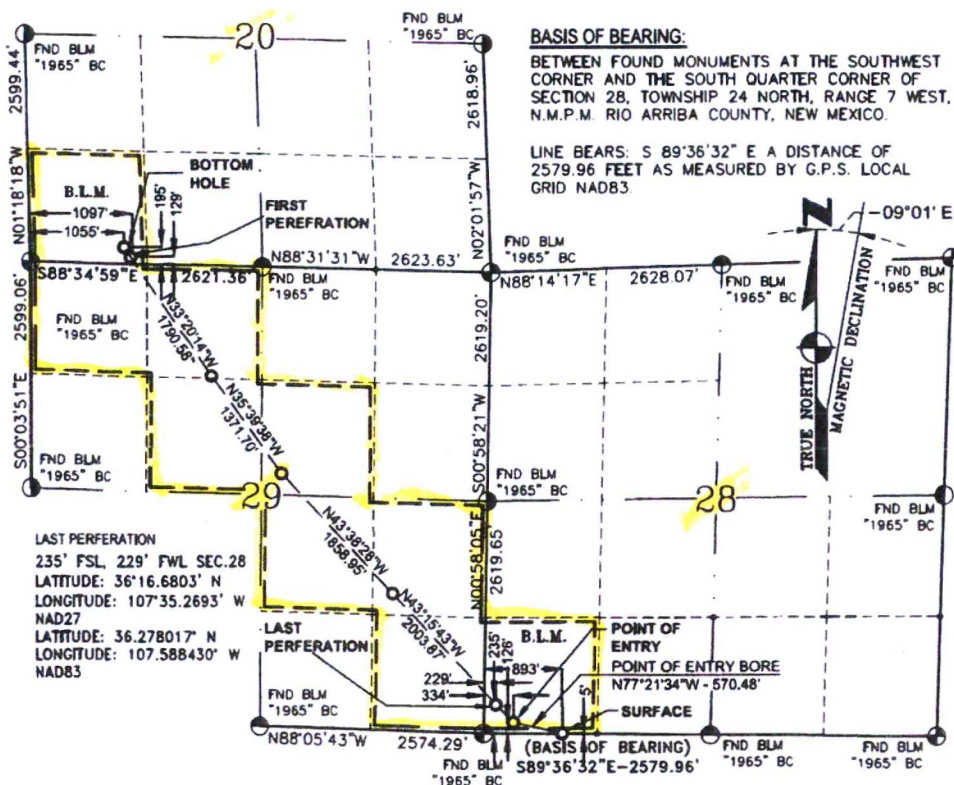
I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

FEBRUARY 14, 2019

Date of Survey

Signature and Seal of Professional Surveyor

GLEN W. RUSSELL
Certificate Number 15703





LOGOS Operating, LLC Operations Plan

Note: This procedure will be adjusted onsite based upon actual conditions

Date:	February 8, 2019	Pool:	Escrito Gallup
Well Name:	Federal 2407 28M Com 2H	Elevation:	7,389'
Surface Location:	Sec 28, T24N, R7W 5 FNL, 893 FWL (36.277374° N, 107.586193° W – NAD83)	Measured Depth:	13,122'
Bottom Hole Location:	Sec 20, T24N, R7W 195 FSL, 1055 FWL (36.292583° N, 107.603143° W – NAD83)	County:	Rio Arriba

Lease Serial #NMSF-0078924, NMNM-0557388

I. GEOLOGY

A. Formation Tops (KB): Estimated top of important geological markers:

SURFACE FORMATION - NACIMIENTO

NAME	MD	TVD	NAME	MD	TVD
OJO ALAMO	1873	1873	MENEFEE	4177	4172
KIRTLAND	2013	2013	*POINT LOOKOUT	4815	4808
*FRUITLAND	2393	2392	*MANCOS	5108	5101
*PICTURED CLIFFS	2525	2524	GALLUP	6063	6053
LEWIS	2667	2666	KICKOFF POINT	5499	5481
CHACRA	2981	2979	LANDING POINT	6578	6153
*CLIFF HOUSE	4124	4119	TD	13122	6198

* indicates depth at which anticipated water, oil, gas or other mineral bearing formations are expected to be encountered.

B. **MUD LOGGING PROGRAM:** Mudlogger on location from KOP to TD.

C. **LOGGING PROGRAM:** LWD GR from surface casing to TD.

D. **NATURAL GAUGES:** Gauge any noticeable increases in gas flow. Record all gauges in Tour book and on morning reports.

II. DRILLING

A. **MUD PROGRAM:** LSND mud (WBM) will be used to drill the 12-1/4" Surface hole, the 8 3/4" Directional Vertical hole, and the curve portion of the wellbore. A LSND (WBM) or (OBM) will be used to drill the lateral portion of well. Treat for lost circulation as necessary. Obtain 100% returns prior to cementing. Notify Engineering of any mud losses.

B. **BOP TESTING:** While drill pipe is in use, the pipe rams and the blindrams will be function tested once each trip. The BOPE will be tested to **250 psi (Low) for 5 minutes** and **1500 psi (High) for 10 minutes**. Pressure test surface casing to **600 psi for 30 minutes** and intermediate casing to **1500 psi for 30 minutes**. Utilize a BOPE Testing Unit with a recording chart and appropriate test plug for testing. The drum brakes will be



inspected and tested each tour. All tests and inspections will be recorded and logged with time and results.

III. MATERIALS

A. CASING EQUIPMENT:

CASING TYPE	OH SIZE (IN)	DEPTH (MD)	CSG SIZE	WEIGHT	GRADE	CON N
SURFACE	12.25"	320'	9.625"	36 LBS	J-55 or equiv	STC
INTERMEDIATE	8.75"	6,578'	7"	23 LBS	J-55 or equiv	LTC
PRODUCTION	6.125"	6,428' – 13,122'	4.5"	11.6 LBS	P-110 or equiv	LTC
TIE BACK	6.125"	Surf. – 6,428'	4.5"	11.6 LBS	P-110 or equiv	LTC

B. FLOAT EQUIPMENT:

1. SURFACE CASING: 9-5/8" notched regular pattern guide shoe. Run (1) standard centralizer on each of the bottom (4) joints of Surface Casing.
2. INTERMEDIATE CASING: 7" cement nose guide shoe with a self-fill insert float. Place float collar one joint above the shoe. Install (1) centralizer on each of the bottom (3) joints and one standard centralizer every (3) joints to 2,500 ft. Run (1) centralizer at 2,500 ft., 2,300ft., 2,000ft., 1,500 ft., and 1,000 ft.
3. PRODUCTION LINER: Run 4-1/2" Liner with cement nose guide Float Shoe+ 2jts. of 4-1/2" casing+ Landing Collar+ 4-1/2" pup joint+ 1 RSI (Sliding Sleeve) positioned inside the 100 ft Hard line. Centralizer program will be determined by wellbore condition. Set seals on Liner Hanger. Liner to be pressure tested during completion operations.

C. CEMENTING:

(Note: Volumes may be adjusted onsite due to actual conditions)

1. SURFACE: 5 bbl Fresh Water Spacer, 100 sx (161 cu.ft.) of 14.5 ppg Type 1-11 (Neat G) + 20% Fly Ash cement w/ 7.41 gal/sack mix water ratio @ 1.61 cu ft/sx yield. Calculated @volume+ 50% excess. WOC 12 hours. Test csg to 600 psi. Total Volume: (160cu-ft/100 sx/ Bbbs). TOC at Surface.
2. INTERMEDIATE: Stage 1: Spacer #1: 20 bbl (112 cuft) Chemwash. Lead Cement: 231 bbls, 667 sks (1299 cu.ft.), 12.3 ppg@ 1.95 cuft/sk yield. Tail Cement: 47.9 bbls, 207 sks, (269 cuft), 13.5 ppg@ 1.3 cu'ft/sk yield. Displacement: Displace w/ +/- 257 bbl Drilling mud or water. Total Cement: 279 bbls, 873 sks, (1568 cuft)
3. PRODUCTION LINER: Spacer #1: 10 bbl (56 cu-ft) Water Spacer. Spacer #2: 40 bbl 9.5 ppg (224.6 cu-ft) Tuned Spacer III. Spacer #3: 10 bbl Water Spacer. Lead Cement: Extencem TM System. Yield 1.36 cuft/sk 13.3 ppg (604 sx / 822 cuft /146 bbls). Tail Spacer: 40 BBL of MMCR. Displacement: Displace w/ +/- 173 bbl.



IV. COMPLETION

A. CBL

CBLs and/or Temperature Surveys Will Be Performed as Needed or Required

B. PRESSURE TEST

Pressure test 4-1/2" casing to 4000 psi max, hold at 1500 psi for 30 minutes. Increase pressure to Open RSI sleeves.

C. STIMULATION

Stimulate with sand, water and N2. Isolate stages with flow through frac plugs. Drill out frac plugs and flowback lateral.

D. PRODUCTION TUBING

Run 2-7/8", 6.5#, J-55, EUE tubing

Liner Casing Design - Evacuation/Max Mud Wt (collapse), Max Frac Pres (burst) & 100k overpull (tension)

Federal 2407 28M Com 2H

Liner	Size	Weight	Grade	Conn	Collapse	Burst	Tension	Notes
Interval 1	4.5	11.6	P-110	LTC	7,560 1.125	10,690 1.000	278,000 1.200	TD 13122', TVD 6198'
Collapse	Casing Depth (TVD) 6198	MW in 0.00	MW out 9.00	Pres in 0	Pres out 2901	SF 2.61		
Burst	6198	9.00	0.00	2901 9401	0	1.14	6500	6500 psi frac pressure + no backup Burst pressure = Hyd + frac pressure
Tension	6198	Mud Wt 8.80 BF 0.8656	Air Wt 71,897	Bouy Wt 62,237	BW +100k 162,237	1.71		100k over pull BF= 1- (MW)/65.5

Surface Casing Design - Evacuated/Max SICP (collapse & burst), 100k overpull (tension)

Federal 2407 28M Com 2H

	Size	Weight	Grade	Conn	Collapse	Burst	Tension	Notes
Surface	9.625	36	J55	STC	2,020	3,520	394,000	0' - 320'
					1.125	1.000	1.200	

341 psi (Maximum Estimated SIP)

36 ppf K55 STC

Collapse	Casing Depth	MW in	MW out	Pres in	Pres out	SF	
	320	0	9	0	146	13.79	
Burst	320	9	0	146	0	24.04	
Tension	320	Mud Wt 9 BF 0.8626	Air Wt 11,520	Bouy Wt 9,937	BW +100k 109,937	SF 3.58	100k over pull BF= 1- (MW)/65.5

Intermediate Casing Design - Evacuated/Max Mud Wt (collapse & burst), 100k overpull (tension)

Federal 2407 28M Com 2H										
Intermediate	Top Interval	Btm Interval	Size	Weight	Grade	Conn	Collapse	Burst	Tension	Notes
Interval 1	0	6578	7	23	J55	LTC	3,270 1.125	4,360 1.000	313,000 1.200	0'-6578'

Collapse

Interval 1	Top Interval	Btm Interval	Depth TVD	MW in	MW out	Pres in	Pres out	SF - 1.125
23	J55	6578	6153	0	9	0	2880	1.14

Burst

Interval 1	Top Interval	Btm Interval	Depth TVD	MW in	MW out	Pres in	Pres out	SF - 1.0	Frac Pres
23	J55	6578	6153	9	0	2880 2880	0	1.51	0

Tension

Interval 1	Top Interval	Btm Interval	Depth TVD	Mud Wt	Air Wt	Bouy Wt	BW +100k	SF - 1.2
23	J55	6578	6153	9 BF 0.8626	141,519	122,074	222,074	1.41

$$BF = 1 - (MW)/65.5$$



Company: Logos Operating LLC
 Project: Rio Arriba, NM NAD83
 Site: Federal 2407-28M
 Well: Federal 2407-28M 2H
 Wellbore: OH
 Design: Plan #2

PROJECT DETAILS: Rio Arriba, NM NAD83

Geodetic System: US State Plane 1983
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980
 Zone: New Mexico Western Zone
 System Datum: Mean Sea Level
 Local North: True



Azimuths to True North
 Magnetic North: 8.75°

Magnetic Field
 Strength: 49492.9snT
 Dip Angle: 62.87°
 Date: 12/17/2018
 Model: HDGM

WELL DETAILS: Federal 2407-28M 2H

GL 7389' & RKB 14' @ 7403.00usft

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	1920356.26	2795935.88	36.2773740	-107.5861930

Plan: Plan #2 (Federal 2407-28M 2H/OH)

Created By: Janie Collins Date: 13:11, January 03 2019

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Fed 28M 2H LP Rev	6153.00	476.84	-845.15	1920830.94	2795089.52	36.2786839	-107.5890604
Fed 28M 2H BHL	6198.00	5536.92	-4995.04	1925880.41	2790926.73	36.2925830	-107.6031430

SECTION DETAILS

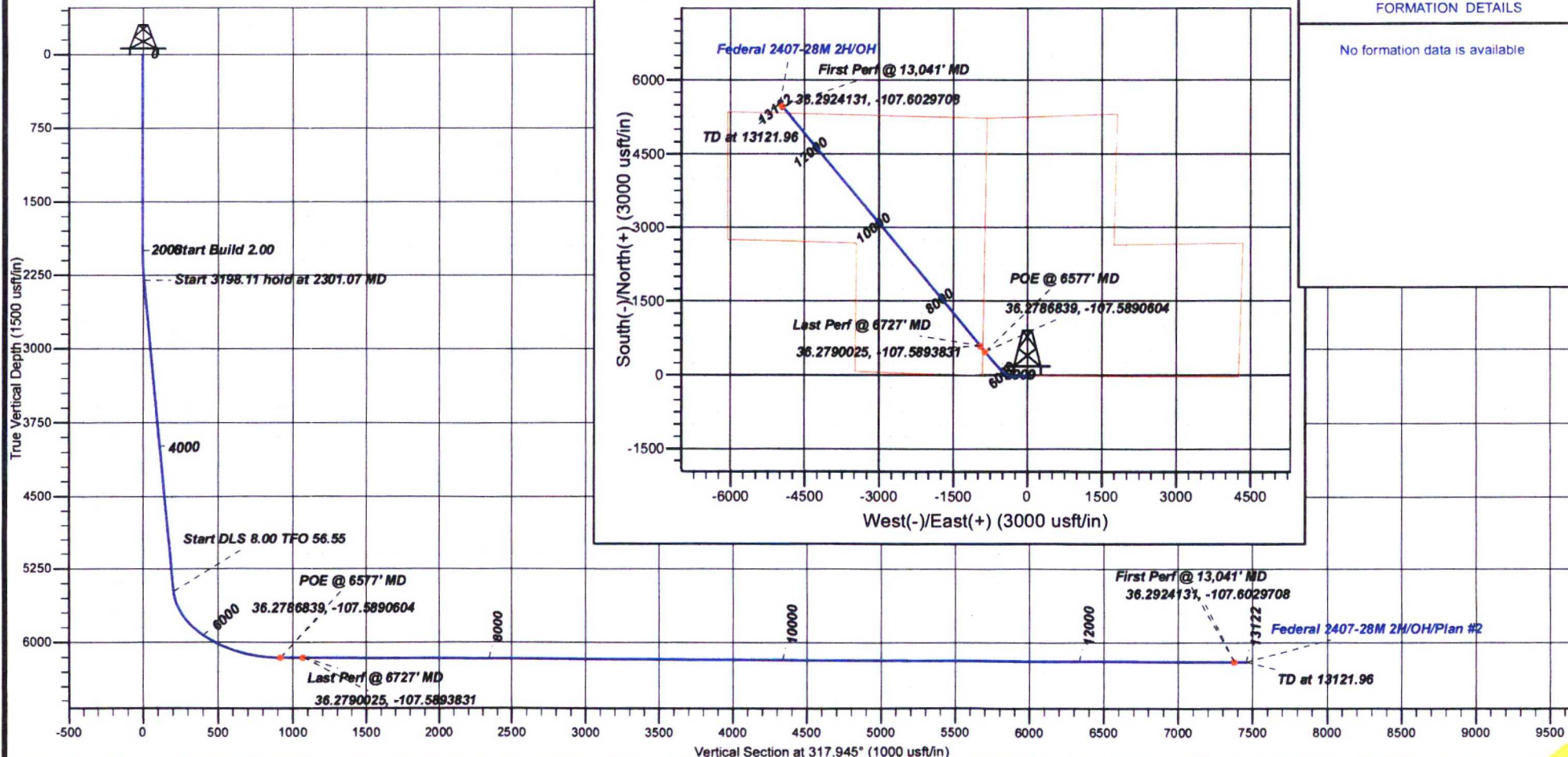
MD	Inc	Azi	TVD	+N/-S	+E/-W	Diag	TFace	VSec	Target
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
2000.00	0.00	0.000	2000.00	0.00	0.00	0.00	0.00	0.00	
2301.07	6.02	264.275	2300.52	-1.58	-15.73	2.00	264.28	9.36	
5496.18	6.02	264.275	5480.98	-35.04	-349.54	0.00	0.00	208.12	
6577.64	89.61	320.644	6153.00	476.84	-845.15	8.00	56.55	920.17	Fed 28M 2H LP Rev
13121.96	89.61	320.644	6198.00	5536.92	-4995.04	0.00	0.00	7457.07	Fed 28M 2H BHL

CASING DETAILS

No casing data is available

FORMATION DETAILS

No formation data is available





Logos Operating LLC

Rio Arriba, NM NAD83

Federal 2407-28M

Federal 2407-28M 2H

OH

Plan: Plan #2

Standard Planning Report

03 January, 2019



www.scientificdrilling.com



Database: Grand Junction District
Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Federal 2407-28M
Well: Federal 2407-28M 2H
Wellbore: OH
Design: Plan #2

Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature

Project	Rio Arriba, NM NAD83		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Western Zone		

Site	Federal 2407-28M			
Site Position:		Northing:	1,920,350.72 usft	Latitude: 36.2773590
From:	Lat/Long	Easting:	2,795,906.42 usft	Longitude: -107.5862930
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence: 0.15 °

Well	Federal 2407-28M 2H			
Well Position	+N/-S	5.46 usft	Northing:	1,920,356.26 usft
	+E/-W	29.47 usft	Easting:	2,795,935.89 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft	Latitude: 36.2773740
				Longitude: -107.5861930
				Ground Level: 7,389.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	HDGM	12/17/2018	8.75	62.87	49,493

Design	Plan #2			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction
	(usft)	(usft)	(usft)	(°)
	0.00	0.00	0.00	317.945

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
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,000.00	0.00	0.000	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,301.07	6.02	264.275	2,300.52	-1.58	-15.73	2.00	2.00	0.00	264.28	
5,499.18	6.02	264.275	5,480.98	-35.04	-349.54	0.00	0.00	0.00	0.00	
6,577.64	89.61	320.644	6,153.00	476.84	-845.15	8.00	7.75	5.23	56.55	Fed 28M 2H LP Rev
13,121.96	89.61	320.644	6,198.00	5,536.92	-4,995.04	0.00	0.00	0.00	0.00	Fed 28M 2H BHL



Scientific Drilling, Intl
Planning Report



Database: Grand Junction District
Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Federal 2407-28M
Well: Federal 2407-28M 2H
Wellbore: OH
Design: Plan #2

Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.000	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.000	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.000	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.000	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.000	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.000	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.000	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.000	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.000	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.000	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.000	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.000	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.000	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.000	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.000	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.000	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.000	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.000	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.000	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.000	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 2.00									
2,100.00	2.00	264.275	2,099.98	-0.17	-1.74	1.03	2.00	2.00	0.00
2,200.00	4.00	264.275	2,199.84	-0.70	-6.94	4.13	2.00	2.00	0.00
2,300.00	6.00	264.275	2,299.45	-1.57	-15.62	9.30	2.00	2.00	0.00
2,301.07	6.02	264.275	2,300.52	-1.58	-15.73	9.36	2.00	2.00	0.00
Start 3198.11 hold at 2301.07 MD									
2,400.00	6.02	264.275	2,398.90	-2.61	-26.05	15.51	0.00	0.00	0.00
2,500.00	6.02	264.275	2,498.35	-3.66	-36.49	21.73	0.00	0.00	0.00
2,600.00	6.02	264.275	2,597.80	-4.70	-46.93	27.94	0.00	0.00	0.00
2,700.00	6.02	264.275	2,697.25	-5.75	-57.37	34.16	0.00	0.00	0.00
2,800.00	6.02	264.275	2,796.69	-6.80	-67.80	40.37	0.00	0.00	0.00
2,900.00	6.02	264.275	2,896.14	-7.84	-78.24	46.59	0.00	0.00	0.00
3,000.00	6.02	264.275	2,995.59	-8.89	-88.68	52.80	0.00	0.00	0.00
3,100.00	6.02	264.275	3,095.04	-9.94	-99.12	59.02	0.00	0.00	0.00
3,200.00	6.02	264.275	3,194.49	-10.98	-109.56	65.23	0.00	0.00	0.00
3,300.00	6.02	264.275	3,293.93	-12.03	-119.99	71.44	0.00	0.00	0.00
3,400.00	6.02	264.275	3,393.38	-13.08	-130.43	77.66	0.00	0.00	0.00
3,500.00	6.02	264.275	3,492.83	-14.12	-140.87	83.87	0.00	0.00	0.00
3,600.00	6.02	264.275	3,592.28	-15.17	-151.31	90.09	0.00	0.00	0.00
3,700.00	6.02	264.275	3,691.73	-16.21	-161.74	96.30	0.00	0.00	0.00
3,800.00	6.02	264.275	3,791.18	-17.26	-172.18	102.52	0.00	0.00	0.00
3,900.00	6.02	264.275	3,890.62	-18.31	-182.62	108.73	0.00	0.00	0.00
4,000.00	6.02	264.275	3,990.07	-19.35	-193.06	114.95	0.00	0.00	0.00
4,100.00	6.02	264.275	4,089.52	-20.40	-203.50	121.16	0.00	0.00	0.00
4,200.00	6.02	264.275	4,188.97	-21.45	-213.93	127.38	0.00	0.00	0.00
4,300.00	6.02	264.275	4,288.42	-22.49	-224.37	133.59	0.00	0.00	0.00
4,400.00	6.02	264.275	4,387.87	-23.54	-234.81	139.81	0.00	0.00	0.00
4,500.00	6.02	264.275	4,487.31	-24.58	-245.25	146.02	0.00	0.00	0.00
4,600.00	6.02	264.275	4,586.76	-25.63	-255.68	152.24	0.00	0.00	0.00
4,700.00	6.02	264.275	4,686.21	-26.68	-266.12	158.45	0.00	0.00	0.00
4,800.00	6.02	264.275	4,785.66	-27.72	-276.56	164.67	0.00	0.00	0.00
4,900.00	6.02	264.275	4,885.11	-28.77	-287.00	170.88	0.00	0.00	0.00
5,000.00	6.02	264.275	4,984.56	-29.82	-297.44	177.09	0.00	0.00	0.00



Scientific Drilling, Intl
Planning Report



Database: Grand Junction District
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Project: Rio Arriba, NM NAD83
Site: Federal 2407-28M
Well: Federal 2407-28M 2H
Wellbore: OH
Design: Plan #2

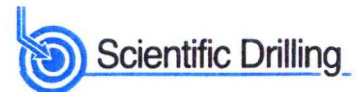
Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,100.00	6.02	264.275	5,084.00	-30.86	-307.87	183.31	0.00	0.00	0.00
5,200.00	6.02	264.275	5,183.45	-31.91	-318.31	189.52	0.00	0.00	0.00
5,300.00	6.02	264.275	5,282.90	-32.96	-328.75	195.74	0.00	0.00	0.00
5,400.00	6.02	264.275	5,382.35	-34.00	-339.19	201.95	0.00	0.00	0.00
5,499.18	6.02	264.275	5,480.98	-35.04	-349.54	208.12	0.00	0.00	0.00
Start DLS 8.00 TFO 56.55									
5,500.00	6.06	264.794	5,481.80	-35.05	-349.62	208.17	8.00	4.44	63.25
5,600.00	12.44	297.201	5,580.50	-30.60	-364.48	221.43	8.00	6.38	32.41
5,700.00	20.01	306.716	5,676.47	-15.42	-387.81	248.32	8.00	7.57	9.51
5,800.00	27.81	311.092	5,767.82	10.18	-419.16	288.33	8.00	7.81	4.38
5,900.00	35.70	313.656	5,852.79	45.72	-457.91	340.67	8.00	7.89	2.56
6,000.00	43.63	315.389	5,929.71	90.49	-503.33	404.34	8.00	7.92	1.73
6,100.00	51.57	316.681	5,997.09	143.63	-554.51	478.08	8.00	7.94	1.29
6,200.00	59.52	317.715	6,053.62	204.11	-610.46	560.46	8.00	7.95	1.03
6,300.00	67.48	318.591	6,098.20	270.74	-670.10	649.88	8.00	7.96	0.88
6,400.00	75.45	319.372	6,129.96	342.22	-732.27	744.61	8.00	7.97	0.78
6,500.00	83.42	320.098	6,148.28	417.18	-795.75	842.78	8.00	7.97	0.73
6,577.64	89.61	320.644	6,153.00	476.84	-845.15	920.17	8.00	7.97	0.70
36.2786839, -107.5890604 - POE @ 6577' MD									
6,600.00	89.61	320.644	6,153.15	494.13	-859.33	942.51	0.00	0.00	0.00
6,700.00	89.61	320.644	6,153.84	571.45	-922.74	1,042.39	0.00	0.00	0.00
6,727.64	89.61	320.644	6,154.03	592.82	-940.27	1,070.00	0.00	0.00	0.00
Last Perf @ 6727' MD - 36.2790025, -107.5893831									
6,800.00	89.61	320.644	6,154.53	648.77	-986.15	1,142.28	0.00	0.00	0.00
6,900.00	89.61	320.644	6,155.22	726.09	-1,049.57	1,242.17	0.00	0.00	0.00
7,000.00	89.61	320.644	6,155.90	803.41	-1,112.98	1,342.05	0.00	0.00	0.00
7,100.00	89.61	320.644	6,156.59	880.73	-1,176.39	1,441.94	0.00	0.00	0.00
7,200.00	89.61	320.644	6,157.28	958.05	-1,239.80	1,541.83	0.00	0.00	0.00
7,300.00	89.61	320.644	6,157.97	1,035.37	-1,303.21	1,641.71	0.00	0.00	0.00
7,400.00	89.61	320.644	6,158.65	1,112.69	-1,366.63	1,741.60	0.00	0.00	0.00
7,500.00	89.61	320.644	6,159.34	1,190.01	-1,430.04	1,841.49	0.00	0.00	0.00
7,600.00	89.61	320.644	6,160.03	1,267.33	-1,493.45	1,941.37	0.00	0.00	0.00
7,700.00	89.61	320.644	6,160.72	1,344.65	-1,556.86	2,041.26	0.00	0.00	0.00
7,800.00	89.61	320.644	6,161.41	1,421.97	-1,620.27	2,141.15	0.00	0.00	0.00
7,900.00	89.61	320.644	6,162.09	1,499.29	-1,683.69	2,241.03	0.00	0.00	0.00
8,000.00	89.61	320.644	6,162.78	1,576.61	-1,747.10	2,340.92	0.00	0.00	0.00
8,100.00	89.61	320.644	6,163.47	1,653.93	-1,810.51	2,440.81	0.00	0.00	0.00
8,200.00	89.61	320.644	6,164.16	1,731.25	-1,873.92	2,540.69	0.00	0.00	0.00
8,300.00	89.61	320.644	6,164.84	1,808.57	-1,937.34	2,640.58	0.00	0.00	0.00
8,400.00	89.61	320.644	6,165.53	1,885.89	-2,000.75	2,740.47	0.00	0.00	0.00
8,500.00	89.61	320.644	6,166.22	1,963.21	-2,064.16	2,840.35	0.00	0.00	0.00
8,600.00	89.61	320.644	6,166.91	2,040.53	-2,127.57	2,940.24	0.00	0.00	0.00
8,700.00	89.61	320.644	6,167.59	2,117.85	-2,190.98	3,040.13	0.00	0.00	0.00
8,800.00	89.61	320.644	6,168.28	2,195.17	-2,254.40	3,140.01	0.00	0.00	0.00
8,900.00	89.61	320.644	6,168.97	2,272.50	-2,317.81	3,239.90	0.00	0.00	0.00
9,000.00	89.61	320.644	6,169.66	2,349.82	-2,381.22	3,339.79	0.00	0.00	0.00
9,100.00	89.61	320.644	6,170.34	2,427.14	-2,444.63	3,439.67	0.00	0.00	0.00
9,200.00	89.61	320.644	6,171.03	2,504.46	-2,508.04	3,539.56	0.00	0.00	0.00
9,300.00	89.61	320.644	6,171.72	2,581.78	-2,571.46	3,639.45	0.00	0.00	0.00
9,400.00	89.61	320.644	6,172.41	2,659.10	-2,634.87	3,739.33	0.00	0.00	0.00
9,500.00	89.61	320.644	6,173.09	2,736.42	-2,698.28	3,839.22	0.00	0.00	0.00
9,600.00	89.61	320.644	6,173.78	2,813.74	-2,761.69	3,939.11	0.00	0.00	0.00
9,700.00	89.61	320.644	6,174.47	2,891.06	-2,825.11	4,038.99	0.00	0.00	0.00



Scientific Drilling, Intl
Planning Report



Database: Grand Junction District
Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Federal 2407-28M
Well: Federal 2407-28M 2H
Wellbore: OH
Design: Plan #2

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

Well Federal 2407-28M 2H
GL 7389' & RKB 14' @ 7403.00usft
GL 7389' & RKB 14' @ 7403.00usft
True
Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,800.00	89.61	320.644	6,175.16	2,968.38	-2,888.52	4,138.88	0.00	0.00	0.00
9,900.00	89.61	320.644	6,175.85	3,045.70	-2,951.93	4,238.77	0.00	0.00	0.00
10,000.00	89.61	320.644	6,176.53	3,123.02	-3,015.34	4,338.65	0.00	0.00	0.00
10,100.00	89.61	320.644	6,177.22	3,200.34	-3,078.75	4,438.54	0.00	0.00	0.00
10,200.00	89.61	320.644	6,177.91	3,277.66	-3,142.17	4,538.43	0.00	0.00	0.00
10,300.00	89.61	320.644	6,178.60	3,354.98	-3,205.58	4,638.31	0.00	0.00	0.00
10,400.00	89.61	320.644	6,179.28	3,432.30	-3,268.99	4,738.20	0.00	0.00	0.00
10,500.00	89.61	320.644	6,179.97	3,509.62	-3,332.40	4,838.09	0.00	0.00	0.00
10,600.00	89.61	320.644	6,180.66	3,586.94	-3,395.81	4,937.97	0.00	0.00	0.00
10,700.00	89.61	320.644	6,181.35	3,664.26	-3,459.23	5,037.86	0.00	0.00	0.00
10,800.00	89.61	320.644	6,182.03	3,741.58	-3,522.64	5,137.75	0.00	0.00	0.00
10,900.00	89.61	320.644	6,182.72	3,818.90	-3,586.05	5,237.64	0.00	0.00	0.00
11,000.00	89.61	320.644	6,183.41	3,896.22	-3,649.46	5,337.52	0.00	0.00	0.00
11,100.00	89.61	320.644	6,184.10	3,973.54	-3,712.88	5,437.41	0.00	0.00	0.00
11,200.00	89.61	320.644	6,184.78	4,050.86	-3,776.29	5,537.30	0.00	0.00	0.00
11,300.00	89.61	320.644	6,185.47	4,128.18	-3,839.70	5,637.18	0.00	0.00	0.00
11,400.00	89.61	320.644	6,186.16	4,205.50	-3,903.11	5,737.07	0.00	0.00	0.00
11,500.00	89.61	320.644	6,186.85	4,282.82	-3,966.52	5,836.96	0.00	0.00	0.00
11,600.00	89.61	320.644	6,187.53	4,360.14	-4,029.94	5,936.84	0.00	0.00	0.00
11,700.00	89.61	320.644	6,188.22	4,437.46	-4,093.35	6,036.73	0.00	0.00	0.00
11,800.00	89.61	320.644	6,188.91	4,514.78	-4,156.76	6,136.62	0.00	0.00	0.00
11,900.00	89.61	320.644	6,189.60	4,592.10	-4,220.17	6,236.50	0.00	0.00	0.00
12,000.00	89.61	320.644	6,190.29	4,669.42	-4,283.58	6,336.39	0.00	0.00	0.00
12,100.00	89.61	320.644	6,190.97	4,746.74	-4,347.00	6,436.28	0.00	0.00	0.00
12,200.00	89.61	320.644	6,191.66	4,824.06	-4,410.41	6,536.16	0.00	0.00	0.00
12,300.00	89.61	320.644	6,192.35	4,901.38	-4,473.82	6,636.05	0.00	0.00	0.00
12,400.00	89.61	320.644	6,193.04	4,978.71	-4,537.23	6,735.94	0.00	0.00	0.00
12,500.00	89.61	320.644	6,193.72	5,056.03	-4,600.65	6,835.82	0.00	0.00	0.00
12,600.00	89.61	320.644	6,194.41	5,133.35	-4,664.06	6,935.71	0.00	0.00	0.00
12,700.00	89.61	320.644	6,195.10	5,210.67	-4,727.47	7,035.60	0.00	0.00	0.00
12,800.00	89.61	320.644	6,195.79	5,287.99	-4,790.88	7,135.48	0.00	0.00	0.00
12,900.00	89.61	320.644	6,196.47	5,365.31	-4,854.29	7,235.37	0.00	0.00	0.00
13,000.00	89.61	320.644	6,197.16	5,442.63	-4,917.71	7,335.26	0.00	0.00	0.00
13,041.96	89.61	320.644	6,197.45	5,475.07	-4,944.31	7,377.17	0.00	0.00	0.00
First Perf @ 13,041' MD - 38.2924131, -107.6029708									
13,100.00	89.61	320.644	6,197.85	5,519.95	-4,981.12	7,435.14	0.00	0.00	0.00
13,121.96	89.61	320.644	6,198.00	5,536.92	-4,995.04	7,457.07	0.00	0.00	0.00
TD at 13121.96									



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Wellbore: OH
Design: Plan #2

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

Well Federal 2407-28M 2H
GL 7389' & RKB 14' @ 7403.00usft
GL 7389' & RKB 14' @ 7403.00usft
True
Minimum Curvature

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Fed 28M 2H LP - plan misses target center by 135.13usft at 6178.02usft MD (6042.19 TVD, 190.24 N, -597.81 E) - Point	0.00	0.000	6,153.00	124.87	-556.49	1,920,479.70	2,795,379.08	36.2777170	-107.5880810
Fed 28M 2H LP Rev - plan hits target center - Point	0.00	0.000	6,153.00	476.84	-845.15	1,920,830.94	2,795,089.52	36.2786838	-107.5890604
Fed 28M 2H BHL - plan hits target center - Point	0.00	0.000	6,198.00	5,536.92	-4,995.04	1,925,880.41	2,790,926.73	36.2925830	-107.6031430

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,000.00	2,000.00	0.00	0.00	Start Build 2.00
2,301.07	2,300.52	-1.58	-15.73	Start 3198.11 hold at 2301.07 MD
5,499.18	5,480.98	-35.04	-349.54	Start DLS 8.00 TFO 56.55
6,577.64	6,153.00	476.84	-845.15	36.2786839, -107.5890604
6,577.64	6,153.00	476.84	-845.15	POE @ 6577' MD
6,727.64	6,154.03	592.82	-940.27	Last Perf @ 6727' MD
6,727.64	6,154.03	592.82	-940.27	36.2790025, -107.5893831
13,041.96	6,197.45	5,475.07	-4,944.31	First Perf @ 13,041' MD
13,041.96	6,197.45	5,475.07	-4,944.31	36.2924131, -107.6029708
13,121.96	6,198.00	5,536.92	-4,995.04	TD at 13121.96



Logos Operating LLC

Rio Arriba, NM NAD83

Federal 2407-28M

Federal 2407-28M 2H

OH

Plan #2

Anticollision Report

03 January, 2019



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Scientific Drilling, Intl
Anticollision Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Federal 2407-28M
Site Error: 0.00 usft
Reference Well: Federal 2407-28M 2H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #2

Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Reference	Plan #2		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD Interval 100.00usft	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 15,000.00 usft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	1/3/2019		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.00	13,121.96	Plan #2 (OH)	MWD+HDGM	OWSG MWD + HDGM	

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						
Federal 2407-28M						
Federal 2407-28M 1H - OH - Plan #2	1,800.00	1,799.00	29.98	17.48	2.400	CC
Federal 2407-28M 1H - OH - Plan #2	1,900.00	1,898.63	30.57	17.36	2.314	ES, SF
Federal 2407-28M 3H - OH - Plan #2	1,500.00	1,500.00	29.91	19.57	2.891	CC, ES
Federal 2407-28M 3H - OH - Plan #2	1,600.00	1,599.24	31.14	20.08	2.815	SF

Offset Design Federal 2407-28M - Federal 2407-28M 1H - OH - Plan #2												Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM												Offset Well Error:	0.00 usft
Reference	Offset	Semi Major Axis		Distance		Minimum Separation		Separation Factor		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)	Minimum Separation (usft)	Separation Factor	Warning
0.00	0.00	0.00	0.00	0.00	0.00	-100.50	-5.46	-29.47	29.98				
100.00	100.00	99.00	99.00	0.15	0.15	-100.50	-5.46	-29.47	29.98	29.67	0.31	97.725	
200.00	200.00	199.00	199.00	0.51	0.51	-100.50	-5.46	-29.47	29.98	28.95	1.02	29.341	
300.00	300.00	299.00	299.00	0.87	0.87	-100.50	-5.46	-29.47	29.98	28.24	1.74	17.242	
400.00	400.00	399.00	399.00	1.23	1.23	-100.50	-5.46	-29.47	29.98	27.52	2.46	12.208	
500.00	500.00	499.00	499.00	1.59	1.58	-100.50	-5.46	-29.47	29.98	26.80	3.17	9.449	
600.00	600.00	599.00	599.00	1.95	1.94	-100.50	-5.46	-29.47	29.98	26.09	3.89	7.707	
700.00	700.00	699.00	699.00	2.30	2.30	-100.50	-5.46	-29.47	29.98	25.37	4.61	6.508	
800.00	800.00	799.00	799.00	2.66	2.66	-100.50	-5.46	-29.47	29.98	24.65	5.32	5.631	
900.00	900.00	899.00	899.00	3.02	3.02	-100.50	-5.46	-29.47	29.98	23.94	6.04	4.963	
1,000.00	1,000.00	999.00	999.00	3.38	3.38	-100.50	-5.46	-29.47	29.98	23.22	6.76	4.436	
1,100.00	1,100.00	1,099.00	1,099.00	3.74	3.74	-100.50	-5.46	-29.47	29.98	22.50	7.47	4.011	
1,200.00	1,200.00	1,199.00	1,199.00	4.10	4.09	-100.50	-5.46	-29.47	29.98	21.79	8.19	3.660	
1,300.00	1,300.00	1,299.00	1,299.00	4.46	4.45	-100.50	-5.46	-29.47	29.98	21.07	8.91	3.365	
1,400.00	1,400.00	1,399.00	1,399.00	4.81	4.81	-100.50	-5.46	-29.47	29.98	20.35	9.62	3.114	
1,500.00	1,500.00	1,499.00	1,499.00	5.17	5.17	-100.50	-5.46	-29.47	29.98	19.63	10.34	2.899	
1,600.00	1,600.00	1,599.00	1,599.00	5.53	5.53	-100.50	-5.46	-29.47	29.98	18.92	11.06	2.711	
1,700.00	1,700.00	1,699.00	1,699.00	5.89	5.89	-100.50	-5.46	-29.47	29.98	18.20	11.78	2.546	
1,800.00	1,800.00	1,799.00	1,799.00	6.25	6.24	-100.50	-5.46	-29.47	29.98	17.48	12.49	2.400	CC
1,900.00	1,900.00	1,898.63	1,898.61	6.61	6.60	-97.48	-3.98	-30.30	30.57	17.36	13.21	2.314	ES, SF
2,000.00	2,000.00	1,998.02	1,997.86	6.97	6.96	-89.11	0.51	-32.81	32.84	18.92	13.92	2.359	
2,100.00	2,099.98	2,096.98	2,096.45	7.31	7.31	18.69	7.96	-36.98	36.26	21.65	14.61	2.482	
2,200.00	2,199.84	2,195.36	2,194.11	7.66	7.66	33.49	18.31	-42.77	40.83	25.55	15.28	2.672	

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



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Offset TVD Reference: Offset Datum

Offset Design Federal 2407-28M - Federal 2407-28M 1H - OH - Plan #2													Offset Site Error: 0.00 usft
Survey Program: O-MWD+HDGM													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N-S (usft)	+E-W (usft)					
2,300.00	2,299.45	2,292.94	2,290.52	8.00	8.02	48.88	31.47	-50.12	48.42	32.48	15.94	3.038	
2,400.00	2,398.90	2,389.60	2,385.45	8.35	8.38	61.35	47.31	-58.98	61.09	44.51	16.58	3.684	
2,500.00	2,498.35	2,485.20	2,478.68	8.70	8.74	69.17	65.72	-69.27	78.87	61.76	17.21	4.589	
2,600.00	2,597.80	2,579.53	2,569.95	9.06	9.11	73.78	86.54	-80.91	101.00	83.18	17.83	5.666	
2,700.00	2,697.25	2,675.72	2,662.46	9.42	9.50	76.63	109.54	-83.77	125.53	107.03	18.51	6.783	
2,800.00	2,796.69	2,772.50	2,755.53	9.78	9.91	78.56	132.72	-106.72	150.31	131.10	19.21	7.825	
2,900.00	2,896.14	2,869.28	2,848.59	10.14	10.33	79.94	155.90	-119.68	175.20	155.29	19.92	8.797	
3,000.00	2,995.59	2,966.06	2,941.65	10.51	10.75	80.97	179.08	-132.64	200.17	179.53	20.63	9.702	
3,100.00	3,095.04	3,062.84	3,034.72	10.87	11.19	81.78	202.26	-145.60	225.18	203.83	21.35	10.546	
3,200.00	3,194.49	3,158.62	3,127.78	11.24	11.63	82.43	225.44	-158.55	250.22	228.15	22.08	11.334	
3,300.00	3,293.93	3,256.39	3,220.85	11.61	12.07	82.95	248.61	-171.51	275.29	252.48	22.81	12.070	
3,400.00	3,393.38	3,353.17	3,313.91	11.98	12.52	83.39	271.79	-184.47	300.38	276.84	23.54	12.760	
3,500.00	3,492.83	3,449.95	3,408.97	12.35	12.98	83.77	294.97	-197.43	325.48	301.20	24.28	13.406	
3,600.00	3,592.28	3,546.73	3,500.04	12.73	13.44	84.09	318.15	-210.38	350.59	325.57	25.02	14.013	
3,700.00	3,691.73	3,643.51	3,593.10	13.10	13.90	84.36	341.33	-223.34	375.72	349.95	25.76	14.583	
3,800.00	3,791.18	3,740.29	3,686.16	13.47	14.37	84.60	364.51	-236.30	400.84	374.33	26.51	15.120	
3,900.00	3,890.62	3,837.06	3,779.23	13.85	14.84	84.82	387.69	-249.26	425.98	398.72	27.26	15.626	
4,000.00	3,990.07	3,933.84	3,872.29	14.23	15.31	85.01	410.86	-262.22	451.12	423.11	28.01	16.104	
4,100.00	4,089.52	4,030.62	3,965.36	14.60	15.79	85.18	434.04	-275.17	476.26	447.49	28.77	16.556	
4,200.00	4,188.97	4,127.40	4,058.42	14.98	16.27	85.33	457.22	-288.13	501.41	471.89	29.52	16.983	
4,300.00	4,288.42	4,224.18	4,151.48	15.36	16.75	85.47	480.40	-301.09	526.56	496.28	30.28	17.388	
4,400.00	4,387.87	4,320.96	4,244.55	15.74	17.23	85.59	503.58	-314.05	551.71	520.67	31.04	17.773	
4,500.00	4,487.31	4,417.73	4,337.61	16.12	17.72	85.71	526.76	-327.00	576.87	545.06	31.80	18.138	
4,600.00	4,586.76	4,514.51	4,430.68	16.50	18.20	85.81	549.94	-339.96	602.02	569.46	32.57	18.485	
4,700.00	4,686.21	4,611.29	4,523.74	16.88	18.69	85.91	573.12	-352.92	627.18	593.85	33.33	18.816	
4,800.00	4,785.66	4,708.07	4,616.80	17.26	19.18	86.00	596.29	-365.88	652.34	618.25	34.10	19.131	
4,900.00	4,885.11	4,804.85	4,709.87	17.64	19.67	86.08	619.47	-378.84	677.51	642.64	34.87	19.432	
5,000.00	4,984.56	4,901.63	4,802.93	18.02	20.17	86.15	642.65	-391.79	702.67	667.03	35.63	19.719	
5,100.00	5,084.00	4,998.40	4,895.99	18.40	20.66	86.23	665.83	-404.75	727.83	691.43	36.40	19.993	
5,200.00	5,183.45	5,095.18	4,989.06	18.78	21.15	86.29	689.01	-417.71	753.00	715.82	37.17	20.256	
5,300.00	5,282.90	5,191.96	5,082.12	19.16	21.65	86.35	712.19	-430.67	778.16	740.22	37.95	20.507	
5,400.00	5,382.35	5,289.32	5,178.13	19.55	22.14	1.51	-52.54	-561.59	798.60	784.85	13.75	58.062	
5,500.00	5,481.80	5,379.33	5,266.15	19.93	22.64	1.14	-51.54	-561.61	700.41	686.03	14.38	48.717	
5,600.00	5,580.50	5,469.76	5,354.27	20.33	23.14	-67.61	-44.98	-561.74	602.17	587.11	15.06	39.981	
5,700.00	5,679.47	5,566.36	5,449.59	20.74	23.64	-108.20	-27.58	-562.08	504.34	488.84	15.51	32.525	
5,800.00	5,778.42	5,663.46	5,546.11	21.16	24.14	-131.02	0.30	-562.62	408.44	392.94	15.50	26.349	
5,900.00	5,877.39	5,760.61	5,641.81	21.55	24.64	-146.04	38.14	-563.36	316.22	301.57	14.65	21.590	
6,000.00	5,976.36	5,857.45	5,736.99	21.94	25.14	-162.98	102.27	-564.34	228.88	217.26	11.62	19.705	
6,100.00	6,075.33	5,954.62	5,832.75	22.33	25.64	-175.93	164.77	-564.56	148.52	139.14	9.38	15.833	
6,200.00	6,174.30	6,052.89	5,930.25	22.72	26.14	-189.44	221.52	-564.11	93.77	65.20	28.57	3.282	
6,300.00	6,273.27	6,150.85	6,028.34	23.11	26.64	-203.30	273.90	-563.86	89.73	52.48	37.25	2.409	
6,400.00	6,372.24	6,249.99	6,126.10	23.50	27.14	-217.70	326.49	-563.10	109.10	62.96	46.14	2.364	
6,500.00	6,471.21	6,348.53	6,223.50	23.89	27.64	-232.10	379.98	-561.58	173.91	129.48	44.43	3.914	
6,600.00	6,570.18	6,446.80	6,321.44	24.28	28.14	-247.50	433.47	-559.56	249.59	206.94	42.65	5.851	
6,700.00	6,669.15	6,545.68	6,420.90	24.67	28.64	-262.90	486.96	-557.04	326.02	283.90	42.11	7.741	
6,800.00	6,768.12	6,643.80	6,519.08	25.06	29.14	-278.30	540.45	-554.26	403.80	361.87	41.93	9.630	
6,900.00	6,867.09	6,742.41	6,617.60	25.45	29.64	-293.70	593.94	-551.43	483.97	442.15	41.82	11.572	
7,000.00	6,966.06	6,841.13	6,716.50	25.84	30.14	-309.10	647.43	-548.63	566.28	524.50	41.78	13.555	
7,100.00	7,065.03	6,939.90	6,815.50	26.23	30.64	-324.50	700.92	-546.49	650.53	608.69	41.83	15.550	
7,200.00	7,164.00	7,038.87	6,914.50	26.62	31.14	-340.90	754.41	-543.34	736.32	694.51	41.81	17.611	
7,300.00	7,263.00	7,137.84	7,013.18	27.01	31.64	-357.30	807.90	-540.90	823.62	781.76	41.86	19.674	
7,400.00	7,362.00	7,236.81	7,113.18	27.40	32.14	-373.70	861.39	-537.89	912.24	870.37	41.88	21.784	

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Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
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)	Minimum Separation (usft)	Separation Factor	
7,400.00	6,158.65	6,034.72	5,876.38	43.38	24.08	50.54	627.47	-536.46	1,001.87	959.86	42.01	23.851	
7,500.00	6,159.34	6,013.96	5,859.97	45.50	24.08	49.70	640.02	-534.45	1,092.51	1,050.43	42.09	25.959	
7,600.00	6,160.03	6,000.00	5,848.73	47.66	24.08	49.13	648.19	-533.07	1,184.04	1,141.84	42.20	28.061	
7,700.00	6,160.72	5,977.95	5,830.67	49.84	24.07	48.25	660.63	-530.85	1,276.27	1,234.02	42.25	30.207	
7,800.00	6,161.41	5,950.00	5,807.24	52.04	24.06	47.15	675.60	-527.94	1,369.31	1,327.03	42.27	32.391	
7,900.00	6,162.09	5,950.00	5,807.24	54.27	24.06	47.15	675.60	-527.94	1,462.68	1,420.26	42.42	34.479	
8,000.00	6,162.78	5,934.72	5,794.20	56.51	24.05	46.56	683.38	-526.31	1,556.70	1,514.21	42.49	36.637	
8,100.00	6,163.47	5,922.56	5,783.70	58.78	24.04	46.09	689.38	-525.00	1,651.18	1,608.61	42.57	38.792	
8,200.00	6,164.16	5,900.00	5,763.96	61.06	24.03	45.23	700.02	-522.51	1,746.17	1,703.57	42.60	40.994	
8,300.00	6,164.84	5,900.00	5,763.96	63.35	24.03	45.23	700.02	-522.51	1,841.33	1,798.63	42.71	43.116	
8,400.00	6,165.53	5,900.00	5,763.96	65.65	24.03	45.23	700.02	-522.51	1,936.99	1,894.18	42.81	45.250	
8,500.00	6,166.22	5,882.28	5,748.24	67.97	24.01	44.57	707.94	-520.52	2,032.83	1,989.99	42.84	47.448	
8,600.00	6,166.91	5,873.90	5,740.73	70.29	24.00	44.26	711.55	-519.57	2,129.00	2,086.09	42.91	49.618	
8,700.00	6,167.59	5,850.00	5,719.11	72.62	23.98	43.38	721.35	-516.82	2,225.60	2,182.68	42.92	51.851	
8,800.00	6,168.28	5,850.00	5,719.11	74.97	23.98	43.38	721.35	-516.82	2,322.11	2,279.10	43.01	53.993	
8,900.00	6,168.97	5,850.00	5,719.11	77.31	23.98	43.38	721.35	-516.82	2,418.90	2,375.82	43.09	56.139	
9,000.00	6,169.66	5,850.00	5,719.11	79.67	23.98	43.38	721.35	-516.82	2,515.95	2,472.78	43.16	58.290	
9,100.00	6,170.34	5,850.00	5,719.11	82.03	23.98	43.38	721.35	-516.82	2,613.21	2,569.98	43.23	60.443	
9,200.00	6,171.03	5,850.00	5,719.11	84.40	23.98	43.38	721.35	-516.82	2,710.68	2,667.38	43.30	62.598	
9,300.00	6,171.72	5,828.11	5,699.03	86.77	23.96	42.58	729.68	-514.25	2,808.00	2,764.68	43.32	64.820	
9,400.00	6,172.41	5,822.97	5,694.29	89.15	23.95	42.40	731.55	-513.64	2,905.63	2,862.26	43.38	66.988	
9,500.00	6,173.09	5,800.00	5,672.90	91.53	23.92	41.58	739.47	-510.89	3,003.61	2,960.22	43.39	69.225	
9,600.00	6,173.78	5,800.00	5,672.90	93.91	23.92	41.58	739.47	-510.89	3,101.39	3,057.93	43.46	71.370	
9,700.00	6,174.47	5,800.00	5,672.90	96.30	23.92	41.58	739.47	-510.89	3,199.30	3,155.78	43.52	73.514	
9,800.00	6,175.16	5,800.00	5,672.90	98.69	23.92	41.58	739.47	-510.89	3,297.34	3,253.75	43.58	75.658	
9,900.00	6,175.85	5,800.00	5,672.90	101.09	23.92	41.58	739.47	-510.89	3,395.49	3,351.84	43.64	77.800	
10,000.00	6,176.53	5,800.00	5,672.90	103.49	23.92	41.58	739.47	-510.89	3,493.74	3,450.04	43.70	79.940	
10,100.00	6,177.22	5,800.00	5,672.90	105.89	23.92	41.58	739.47	-510.89	3,592.10	3,548.33	43.76	82.078	
10,200.00	6,177.91	5,800.00	5,672.90	108.29	23.92	41.58	739.47	-510.89	3,690.54	3,646.71	43.82	84.214	
10,300.00	6,178.60	5,800.00	5,672.90	110.70	23.92	41.58	739.47	-510.89	3,789.06	3,745.18	43.88	86.346	
10,400.00	6,179.28	5,800.00	5,672.90	113.10	23.92	41.58	739.47	-510.89	3,887.66	3,843.72	43.94	88.476	
10,500.00	6,179.97	5,800.00	5,672.90	115.51	23.92	41.58	739.47	-510.89	3,986.33	3,942.33	44.00	90.601	
10,600.00	6,180.66	5,777.82	5,652.03	117.93	23.89	40.80	746.45	-508.19	4,084.74	4,040.73	44.02	92.797	
10,700.00	6,181.35	5,775.05	5,649.40	120.34	23.89	40.70	747.28	-507.85	4,183.45	4,139.38	44.07	94.923	
10,800.00	6,182.03	5,772.39	5,646.88	122.76	23.88	40.61	748.07	-507.52	4,282.22	4,238.09	44.13	97.044	
10,900.00	6,182.72	5,750.00	5,625.56	125.17	23.85	39.84	754.29	-504.75	4,381.27	4,337.13	44.15	99.245	
11,000.00	6,183.41	5,750.00	5,625.56	127.59	23.85	39.84	754.29	-504.75	4,480.07	4,435.86	44.21	101.345	
11,100.00	6,184.10	5,750.00	5,625.56	130.01	23.85	39.84	754.29	-504.75	4,578.92	4,534.85	44.27	103.441	
11,200.00	6,184.78	5,750.00	5,625.56	132.43	23.85	39.84	754.29	-504.75	4,677.81	4,633.49	44.33	105.533	
11,300.00	6,185.47	5,750.00	5,625.56	134.86	23.85	39.84	754.29	-504.75	4,776.76	4,732.37	44.39	107.619	
11,400.00	6,186.16	5,750.00	5,625.56	137.28	23.85	39.84	754.29	-504.75	4,875.74	4,831.30	44.45	109.700	
11,500.00	6,186.85	5,750.00	5,625.56	139.71	23.85	39.84	754.29	-504.75	4,974.77	4,930.26	44.51	111.776	
11,600.00	6,187.53	5,750.00	5,625.56	142.13	23.85	39.84	754.29	-504.75	5,073.83	5,029.27	44.57	113.846	
11,700.00	6,188.22	5,750.00	5,625.56	144.56	23.85	39.84	754.29	-504.75	5,172.94	5,128.31	44.63	115.911	
11,800.00	6,188.91	5,750.00	5,625.56	146.99	23.85	39.84	754.29	-504.75	5,272.07	5,227.38	44.69	117.970	
11,900.00	6,189.60	5,750.00	5,625.56	149.42	23.85	39.84	754.29	-504.75	5,371.24	5,326.49	44.75	120.024	
12,000.00	6,190.29	5,750.00	5,625.56	151.85	23.85	39.84	754.29	-504.75	5,470.43	5,425.62	44.81	122.071	
12,100.00	6,190.97	5,750.00	5,625.56	154.28	23.85	39.84	754.29	-504.75	5,569.66	5,524.78	44.88	124.112	
12,200.00	6,191.66	5,750.00	5,625.56	156.71	23.85	39.84	754.29	-504.75	5,668.91	5,623.97	44.94	126.148	
12,300.00	6,192.35	5,750.00	5,625.56	159.15	23.85	39.84	754.29	-504.75	5,768.19	5,723.19	45.00	128.176	
12,400.00	6,193.04	5,750.00	5,625.56	161.58	23.85	39.84	754.29	-504.75	5,867.49	5,822.43	45.07	130.199	
12,500.00	6,193.72	5,750.00	5,625.56	164.02	23.85	39.84	754.29	-504.75	5,966.82	5,921.89	45.13	132.215	

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



Scientific Drilling, Intl
Anticollision Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Federal 2407-28M
Site Error: 0.00 usft
Reference Well: Federal 2407-28M 2H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #2

Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Offset Design Federal 2407-28M - Federal 2407-28M 1H - OH - Plan #2												Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)			
12,600.00	6,194.41	5,750.00	5,625.56	166.45	23.85	39.84	754.29	-504.75	6,066.17	6,020.98	45.19	134.224	
12,700.00	6,195.10	5,750.00	5,625.56	168.89	23.85	39.84	754.29	-504.75	6,165.54	6,120.28	45.26	136.226	
12,800.00	6,195.79	5,750.00	5,625.56	171.32	23.85	39.84	754.29	-504.75	6,264.93	6,219.80	45.33	138.222	
12,900.00	6,196.47	5,750.00	5,625.56	173.76	23.85	39.84	754.29	-504.75	6,364.34	6,318.95	45.39	140.211	
13,000.00	6,197.16	5,750.00	5,625.56	176.20	23.85	39.84	754.29	-504.75	6,463.77	6,418.31	45.46	142.193	
13,100.00	6,197.85	5,750.00	5,625.56	178.64	23.85	39.84	754.29	-504.75	6,563.21	6,517.68	45.52	144.168	
13,121.96	6,198.00	5,750.00	5,625.56	179.17	23.85	39.84	754.29	-504.75	6,565.05	6,539.51	45.54	144.600	



Scientific Drilling, Intl
Anticollision Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Federal 2407-28M
Site Error: 0.00 usft
Reference Well: Federal 2407-28M 2H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #2

Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Offset Design Federal 2407-28M - Federal 2407-28M 3H - OH - Plan #2														Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM														Offset Well Error: 0.00 usft
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)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
0.00	0.00	0.00	0.00	0.00	0.00	80.19	5.10	29.47	29.91					
100.00	100.00	100.00	100.00	0.15	0.15	80.19	5.10	29.47	29.91	29.60	0.31	97.026		
200.00	200.00	200.00	200.00	0.51	0.51	80.19	5.10	29.47	29.91	28.89	1.03	29.176		
300.00	300.00	300.00	300.00	0.87	0.87	80.19	5.10	29.47	29.91	28.17	1.74	17.170		
400.00	400.00	400.00	400.00	1.23	1.23	80.19	5.10	29.47	29.91	27.45	2.46	12.164		
500.00	500.00	500.00	500.00	1.59	1.59	80.19	5.10	29.47	29.91	26.74	3.18	9.418		
600.00	600.00	600.00	600.00	1.95	1.95	80.19	5.10	29.47	29.91	26.02	3.89	7.684		
700.00	700.00	700.00	700.00	2.30	2.30	80.19	5.10	29.47	29.91	25.30	4.61	6.489		
800.00	800.00	800.00	800.00	2.66	2.66	80.19	5.10	29.47	29.91	24.59	5.33	5.615		
900.00	900.00	900.00	900.00	3.02	3.02	80.19	5.10	29.47	29.91	23.87	6.04	4.949		
1,000.00	1,000.00	1,000.00	1,000.00	3.38	3.38	80.19	5.10	29.47	29.91	23.15	6.76	4.424		
1,100.00	1,100.00	1,100.00	1,100.00	3.74	3.74	80.19	5.10	29.47	29.91	22.43	7.48	4.000		
1,200.00	1,200.00	1,200.00	1,200.00	4.10	4.10	80.19	5.10	29.47	29.91	21.72	8.19	3.650		
1,300.00	1,300.00	1,300.00	1,300.00	4.46	4.46	80.19	5.10	29.47	29.91	21.00	8.91	3.357		
1,400.00	1,400.00	1,400.00	1,400.00	4.81	4.81	80.19	5.10	29.47	29.91	20.28	9.63	3.107		
1,500.00	1,500.00	1,500.00	1,500.00	5.17	5.17	80.19	5.10	29.47	29.91	19.57	10.35	2.891 CC, ES		
1,600.00	1,600.00	1,599.24	1,599.22	5.53	5.53	77.91	6.52	30.44	31.14	20.08	11.06	2.815 SF		
1,700.00	1,700.00	1,698.25	1,698.09	5.89	5.88	72.08	10.78	33.32	35.07	23.29	11.77	2.978		
1,800.00	1,800.00	1,796.78	1,796.25	6.25	6.23	64.92	17.82	38.08	42.21	29.72	12.49	3.380		
1,900.00	1,900.00	1,894.61	1,893.36	6.61	6.58	58.32	27.57	44.67	52.92	39.72	13.19	4.011		
2,000.00	2,000.00	1,991.53	1,989.12	6.97	6.94	53.02	39.94	53.04	67.28	53.40	13.88	4.846		
2,100.00	2,099.98	2,087.08	2,082.98	7.31	7.29	145.19	54.75	63.05	86.62	72.07	14.55	5.953		
2,200.00	2,199.84	2,180.63	2,174.25	7.66	7.65	143.46	71.76	74.55	112.01	96.82	15.19	7.375		
2,300.00	2,299.45	2,275.77	2,266.65	8.00	8.02	142.88	90.51	87.23	141.88	126.03	15.85	8.953		
2,400.00	2,398.90	2,370.76	2,358.92	8.35	8.41	143.11	109.23	99.89	173.11	156.61	16.51	10.486		
2,500.00	2,498.35	2,465.76	2,451.18	8.70	8.80	143.27	127.96	112.55	204.35	187.18	17.18	11.898		
2,600.00	2,597.80	2,560.75	2,543.45	9.06	9.19	143.39	146.68	125.21	235.59	217.74	17.85	13.200		
2,700.00	2,697.25	2,655.75	2,635.72	9.42	9.60	143.48	165.41	137.87	266.83	248.31	18.52	14.404		
2,800.00	2,796.69	2,750.74	2,727.98	9.78	10.01	143.56	184.13	150.54	298.07	278.87	19.21	15.520		
2,900.00	2,896.14	2,845.73	2,820.25	10.14	10.42	143.62	202.86	163.20	329.31	309.42	19.89	16.556		
3,000.00	2,995.59	2,940.73	2,912.51	10.51	10.84	143.67	221.58	175.86	360.55	339.97	20.58	17.520		
3,100.00	3,095.04	3,035.72	3,004.78	10.87	11.26	143.71	240.31	188.52	391.80	370.52	21.27	18.419		
3,200.00	3,194.49	3,130.72	3,097.05	11.24	11.68	143.74	259.03	201.18	423.04	401.07	21.97	19.259		
3,300.00	3,293.93	3,225.71	3,189.31	11.61	12.10	143.77	277.76	213.84	454.28	431.61	22.66	20.045		
3,400.00	3,393.38	3,320.71	3,281.58	11.98	12.53	143.80	296.48	226.51	485.52	462.16	23.36	20.781		
3,500.00	3,492.83	3,415.70	3,373.84	12.35	12.96	143.82	315.21	239.17	516.76	492.70	24.07	21.473		
3,600.00	3,592.28	3,510.70	3,466.11	12.73	13.40	143.84	333.93	251.83	548.00	523.23	24.77	22.124		
3,700.00	3,691.73	3,605.69	3,558.37	13.10	13.83	143.86	352.66	264.49	579.24	553.77	25.48	22.738		
3,800.00	3,791.18	3,700.68	3,650.64	13.47	14.27	143.88	371.38	277.15	610.49	584.30	26.18	23.316		
3,900.00	3,890.62	3,795.68	3,742.91	13.85	14.71	143.89	390.11	289.81	641.73	614.84	26.89	23.863		
4,000.00	3,990.07	3,890.67	3,835.17	14.23	15.15	143.90	408.83	302.48	672.97	645.37	27.60	24.381		
4,100.00	4,089.52	3,985.67	3,927.44	14.60	15.59	143.92	427.56	315.14	704.21	675.90	28.31	24.871		
4,200.00	4,188.97	4,080.66	4,019.70	14.98	16.03	143.93	446.28	327.80	735.45	706.43	29.03	25.336		
4,300.00	4,288.42	4,175.66	4,111.97	15.36	16.47	143.94	465.01	340.46	766.70	736.95	29.74	25.778		
4,400.00	4,387.87	4,270.65	4,204.24	15.74	16.92	143.95	483.73	353.12	797.94	767.48	30.46	26.198		
4,500.00	4,487.31	4,365.64	4,296.50	16.12	17.36	143.96	502.46	365.79	829.18	798.01	31.17	26.598		
4,600.00	4,586.76	4,460.64	4,388.77	16.50	17.81	143.96	521.18	378.45	860.42	828.53	31.89	26.980		
4,700.00	4,686.21	4,555.63	4,481.03	16.88	18.25	143.97	539.91	391.11	891.66	859.06	32.61	27.344		
4,800.00	4,785.66	4,650.63	4,573.30	17.26	18.70	143.98	558.63	403.77	922.91	889.58	33.33	27.691		
4,900.00	4,885.11	4,745.62	4,665.56	17.64	19.15	143.99	577.36	416.43	954.15	920.10	34.05	28.023		
5,000.00	4,984.56	4,840.62	4,757.83	18.02	19.60	143.99	596.08	429.09	985.39	950.62	34.77	28.341		
5,100.00	5,084.00	4,935.61	4,850.10	18.40	20.04	144.00	614.81	441.76	1,016.63	981.14	35.49	28.646		

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



Scientific Drilling, Intl
Anticollision Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Federal 2407-28M
Site Error: 0.00 usft
Reference Well: Federal 2407-28M 2H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #2

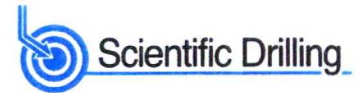
Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Offset Design Federal 2407-28M - Federal 2407-28M 3H - OH - Plan #2													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
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)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
5,200.00	5,183.45	5,030.60	4,942.36	18.78	20.49	144.00	633.53	454.42	1,047.88	1,011.66	36.21	28.938	
5,300.00	5,282.90	5,125.60	5,034.63	19.16	20.94	144.01	652.26	467.08	1,079.12	1,042.18	36.93	29.217	
5,400.00	5,382.35	5,220.59	5,126.89	19.55	21.40	144.01	670.98	479.74	1,110.36	1,072.70	37.66	29.486	
5,500.00	5,481.80	5,315.59	5,219.16	19.93	21.85	143.48	689.71	492.40	1,141.60	1,103.22	38.38	29.744	
5,600.00	5,580.50	5,410.36	5,311.21	20.33	22.30	109.20	708.39	505.03	1,172.46	1,133.34	39.12	29.971	
5,700.00	5,676.47	5,512.88	5,291.85	20.74	23.74	109.95	647.31	592.61	1,189.01	1,147.81	41.20	28.860	
5,800.00	5,767.82	5,139.90	5,968.60	21.18	23.83	115.20	514.52	639.86	1,190.03	1,148.42	41.61	28.598	
5,900.00	5,852.79	6,201.87	6,008.58	21.65	23.82	115.26	468.96	652.66	1,198.66	1,156.12	42.54	28.177	
6,000.00	5,929.71	6,208.90	6,012.86	22.19	23.81	112.67	463.57	654.10	1,218.91	1,175.48	43.42	28.070	
6,100.00	5,997.09	6,192.06	6,002.52	22.83	23.82	108.40	476.40	650.65	1,250.27	1,206.13	44.13	28.331	
6,200.00	6,053.62	6,162.54	5,983.67	23.62	23.83	102.88	498.29	644.55	1,290.93	1,246.24	44.69	28.885	
6,300.00	6,098.20	6,125.26	5,958.58	24.58	23.83	96.41	524.75	636.81	1,338.67	1,293.49	45.18	29.631	
6,400.00	6,129.96	6,082.78	5,928.34	25.73	23.84	89.37	553.22	627.94	1,391.17	1,345.52	45.65	30.476	
6,500.00	6,148.28	6,036.56	5,893.54	27.05	23.83	82.18	582.05	618.28	1,446.21	1,400.07	46.15	31.341	
6,600.00	6,153.15	5,987.82	5,854.86	28.49	23.80	76.39	609.89	608.10	1,501.91	1,455.23	46.68	32.176	
6,700.00	6,153.84	5,943.55	5,818.12	30.05	23.77	74.84	632.81	598.92	1,559.46	1,512.22	47.24	33.010	
6,800.00	6,154.53	5,900.00	5,780.62	31.72	23.73	73.27	653.05	589.98	1,619.88	1,572.10	47.79	33.898	
6,900.00	6,155.22	5,873.07	5,756.82	33.50	23.70	72.29	664.40	584.51	1,683.07	1,634.69	48.38	34.786	
7,000.00	6,155.90	5,850.00	5,736.09	35.35	23.67	71.44	673.39	579.86	1,748.96	1,699.99	48.97	35.717	
7,100.00	6,156.59	5,820.18	5,708.87	37.28	23.62	70.34	684.00	573.93	1,817.35	1,767.89	49.47	36.740	
7,200.00	6,157.28	5,800.00	5,690.19	39.27	23.59	69.58	690.53	569.96	1,888.11	1,838.14	49.98	37.779	
7,300.00	6,157.97	5,779.44	5,670.96	41.30	23.55	68.81	696.62	565.96	1,961.05	1,910.61	50.44	38.879	
7,400.00	6,158.65	5,762.46	5,654.95	43.38	23.51	68.17	701.24	562.69	2,035.99	1,985.11	50.88	40.013	
7,500.00	6,159.34	5,750.00	5,643.13	45.50	23.49	67.70	704.38	560.31	2,112.77	2,061.46	51.31	41.174	
7,600.00	6,160.03	5,733.66	5,627.54	47.66	23.45	67.08	708.18	557.22	2,191.22	2,139.55	51.68	42.404	
7,700.00	6,160.72	5,721.36	5,615.75	49.84	23.42	66.61	710.81	554.92	2,271.21	2,219.18	52.03	43.653	
7,800.00	6,161.41	5,700.00	5,595.16	52.04	23.37	65.80	714.88	550.97	2,352.64	2,300.35	52.29	44.994	
7,900.00	6,162.09	5,700.00	5,595.16	54.27	23.37	65.80	714.88	550.97	2,435.24	2,382.58	52.66	46.245	
8,000.00	6,162.78	5,700.00	5,595.16	56.51	23.37	65.80	714.88	550.97	2,519.11	2,466.11	53.00	47.531	
8,100.00	6,163.47	5,682.28	5,577.98	58.78	23.32	65.12	717.78	547.74	2,603.94	2,550.75	53.20	48.951	
8,200.00	6,164.16	5,674.46	5,570.37	61.06	23.30	64.83	718.93	546.33	2,689.80	2,636.36	53.43	50.339	
8,300.00	6,164.84	5,667.24	5,563.34	63.35	23.28	64.55	719.92	545.04	2,776.54	2,722.88	53.66	51.747	
8,400.00	6,165.53	5,650.00	5,546.50	65.65	23.24	63.89	721.98	541.98	2,864.15	2,810.36	53.79	53.246	
8,500.00	6,166.22	5,650.00	5,546.50	67.97	23.24	63.89	721.98	541.98	2,952.40	2,898.38	54.03	54.649	
8,600.00	6,166.91	5,650.00	5,546.50	70.29	23.24	63.89	721.98	541.98	3,041.38	2,987.14	54.24	56.070	
8,700.00	6,167.59	5,650.00	5,546.50	72.62	23.24	63.89	721.98	541.98	3,131.03	3,076.58	54.44	57.508	
8,800.00	6,168.28	5,650.00	5,546.50	74.97	23.24	63.89	721.98	541.98	3,221.28	3,166.65	54.63	58.962	
8,900.00	6,168.97	5,650.00	5,546.50	77.31	23.24	63.89	721.98	541.98	3,312.09	3,257.29	54.81	60.430	
9,000.00	6,169.66	5,629.02	5,525.93	79.67	23.17	63.10	723.93	538.32	3,403.18	3,348.34	54.83	62.062	
9,100.00	6,170.34	5,624.86	5,521.85	82.03	23.16	62.94	724.25	537.61	3,494.87	3,439.91	54.96	63.585	
9,200.00	6,171.03	5,620.94	5,518.00	84.40	23.15	62.79	724.52	536.93	3,586.99	3,531.91	55.09	65.117	
9,300.00	6,171.72	5,600.00	5,497.39	86.77	23.08	61.99	725.63	533.38	3,679.68	3,624.59	55.08	66.805	
9,400.00	6,172.41	5,600.00	5,497.39	89.15	23.08	61.99	725.63	533.38	3,772.50	3,717.28	55.22	68.324	
9,500.00	6,173.09	5,600.00	5,497.39	91.53	23.08	61.99	725.63	533.38	3,865.68	3,810.34	55.34	69.850	
9,600.00	6,173.78	5,600.00	5,497.39	93.91	23.08	61.99	725.63	533.38	3,959.19	3,903.73	55.46	71.384	
9,700.00	6,174.47	5,600.00	5,497.39	96.30	23.08	61.99	725.63	533.38	4,053.02	3,997.44	55.58	72.925	
9,800.00	6,175.16	5,600.00	5,497.39	98.69	23.08	61.99	725.63	533.38	4,147.13	4,091.44	55.69	74.471	
9,900.00	6,175.85	5,600.00	5,497.39	101.09	23.08	61.99	725.63	533.38	4,241.51	4,185.72	55.79	76.023	
10,000.00	6,176.53	5,600.00	5,497.39	103.49	23.08	61.99	725.63	533.38	4,336.14	4,280.25	55.89	77.579	
10,100.00	6,177.22	5,600.00	5,497.39	105.89	23.08	61.99	725.63	533.38	4,431.01	4,375.02	55.99	79.140	
10,200.00	6,177.91	5,600.00	5,497.39	108.29	23.08	61.99	725.63	533.38	4,526.10	4,470.02	56.08	80.704	
10,300.00	6,178.60	5,600.00	5,497.39	110.70	23.08	61.99	725.63	533.38	4,621.40	4,565.23	56.17	82.272	

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



Scientific Drilling, Intl
Anticollision Report



Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Federal 2407-28M
Site Error: 0.00 usft
Reference Well: Federal 2407-28M 2H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #2

Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Offset Design Federal 2407-28M - Federal 2407-28M 3H - OH - Plan #2													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)					
10,400.00	6,179.28	5,600.00	5,497.39	113.10	23.08	61.99	725.63	533.38	4,716.89	4,660.63	56.26	83.843	
10,500.00	6,179.97	5,600.00	5,497.39	115.51	23.08	61.99	725.63	533.38	4,812.57	4,756.22	56.34	85.416	
10,600.00	6,180.66	5,600.00	5,497.39	117.93	23.08	61.99	725.63	533.38	4,908.41	4,851.99	56.42	86.991	
10,700.00	6,181.35	5,600.00	5,497.39	120.34	23.08	61.99	725.63	533.38	5,004.42	4,947.92	56.50	88.569	
10,800.00	6,182.03	5,600.00	5,497.39	122.76	23.08	61.99	725.63	533.38	5,100.59	5,044.01	56.58	90.148	
10,900.00	6,182.72	5,577.66	5,475.36	125.17	23.00	61.14	726.15	529.68	5,196.60	5,140.10	56.51	91.966	
11,000.00	6,183.41	5,575.99	5,473.72	127.59	23.00	61.08	726.16	529.41	5,293.00	5,236.44	56.57	93.588	
11,100.00	6,184.10	5,574.38	5,472.13	130.01	22.99	61.02	726.17	529.15	5,389.53	5,332.90	56.63	95.171	
11,200.00	6,184.78	5,572.84	5,470.61	132.43	22.99	60.96	726.17	528.89	5,486.18	5,429.49	56.69	96.774	
11,300.00	6,185.47	5,571.35	5,469.14	134.86	22.98	60.90	726.17	528.65	5,582.95	5,526.19	56.75	98.377	
11,400.00	6,186.16	5,550.00	5,448.07	137.28	22.91	60.09	725.84	525.22	5,680.05	5,623.38	56.67	100.231	
11,500.00	6,186.85	5,550.00	5,448.07	139.71	22.91	60.09	725.84	525.22	5,777.00	5,720.26	56.74	101.819	
11,600.00	6,187.53	5,550.00	5,448.07	142.13	22.91	60.09	725.84	525.22	5,874.05	5,817.24	56.81	103.406	
11,700.00	6,188.22	5,550.00	5,448.07	144.56	22.91	60.09	725.84	525.22	5,971.20	5,914.32	56.87	104.993	
11,800.00	6,188.91	5,550.00	5,448.07	146.99	22.91	60.09	725.84	525.22	6,068.44	6,011.50	56.94	106.580	
11,900.00	6,189.60	5,550.00	5,448.07	149.42	22.91	60.09	725.84	525.22	6,165.76	6,108.76	57.00	108.166	
12,000.00	6,190.29	5,550.00	5,448.07	151.85	22.91	60.09	725.84	525.22	6,263.18	6,206.11	57.07	109.751	
12,100.00	6,190.97	5,550.00	5,448.07	154.28	22.91	60.09	725.84	525.22	6,360.67	6,303.54	57.13	111.335	
12,200.00	6,191.66	5,550.00	5,448.07	156.71	22.91	60.09	725.84	525.22	6,458.24	6,401.04	57.19	112.918	
12,300.00	6,192.35	5,550.00	5,448.07	159.15	22.91	60.09	725.84	525.22	6,555.88	6,498.62	57.26	114.499	
12,400.00	6,193.04	5,550.00	5,448.07	161.58	22.91	60.09	725.84	525.22	6,653.59	6,596.28	57.32	116.080	
12,500.00	6,193.72	5,550.00	5,448.07	164.02	22.91	60.09	725.84	525.22	6,751.37	6,693.99	57.38	117.658	
12,600.00	6,194.41	5,550.00	5,448.07	166.45	22.91	60.09	725.84	525.22	6,849.22	6,791.77	57.44	119.236	
12,700.00	6,195.10	5,550.00	5,448.07	168.89	22.91	60.09	725.84	525.22	6,947.12	6,889.62	57.50	120.811	
12,800.00	6,195.79	5,550.00	5,448.07	171.32	22.91	60.09	725.84	525.22	7,045.09	6,987.52	57.57	122.385	
12,900.00	6,196.47	5,550.00	5,448.07	173.76	22.91	60.09	725.84	525.22	7,143.11	7,085.48	57.63	123.956	
13,000.00	6,197.16	5,550.00	5,448.07	176.20	22.91	60.09	725.84	525.22	7,241.18	7,183.49	57.69	125.526	
13,100.00	6,197.85	5,550.00	5,448.07	178.64	22.91	60.09	725.84	525.22	7,339.31	7,281.56	57.75	127.093	
13,121.96	6,198.00	5,550.00	5,448.07	179.17	22.91	60.09	725.84	525.22	7,360.86	7,303.10	57.76	127.437	

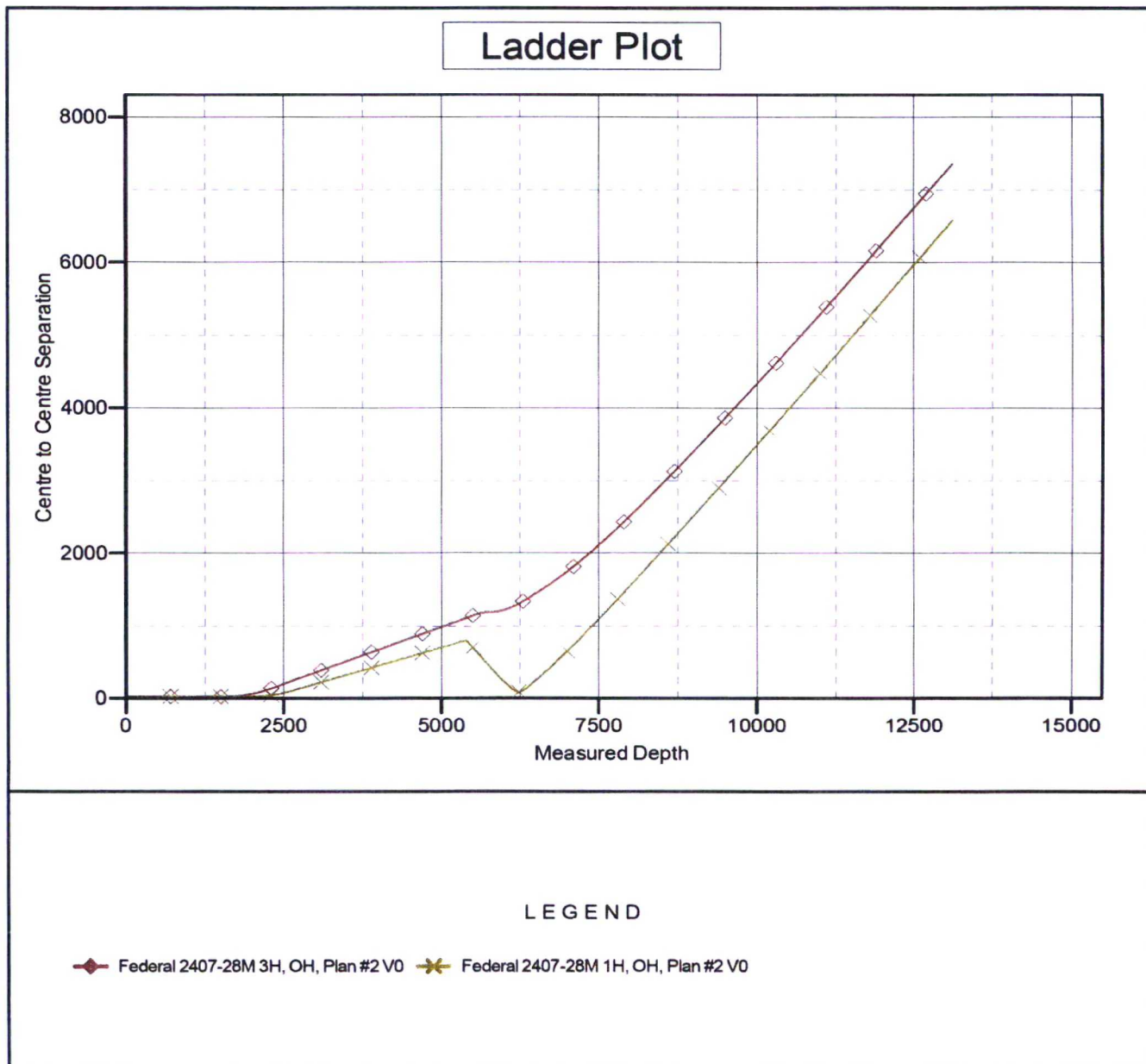
CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation

Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Federal 2407-28M
Site Error: 0.00 usft
Reference Well: Federal 2407-28M 2H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #2

Local Co-ordinate Reference: Well Federal 2407-28M 2H
TVD Reference: GL 7389' & RKB 14' @ 7403.00usft
MD Reference: GL 7389' & RKB 14' @ 7403.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Reference Depths are relative to GL 7389' & RKB 14' @ 7403.00usft
Offset Depths are relative to Offset Datum
Central Meridian is -107.833334

Coordinates are relative to: Federal 2407-28M 2H
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.15°





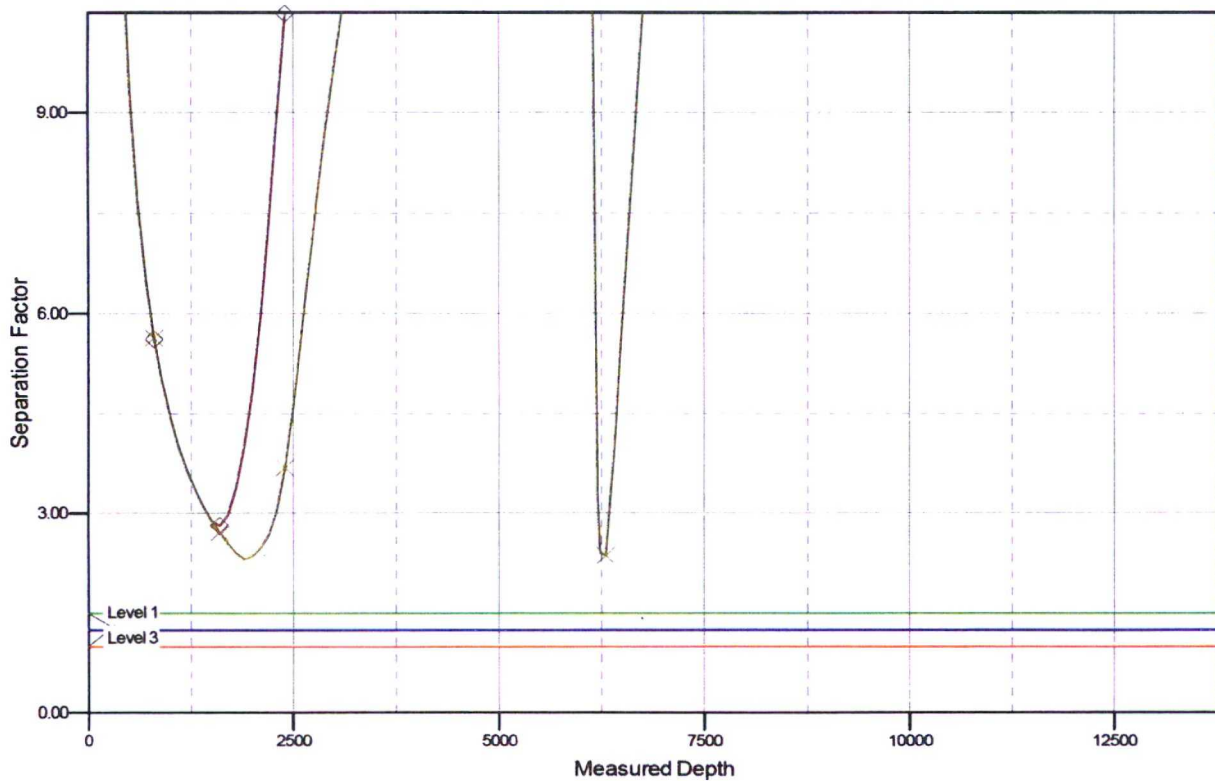
Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Federal 2407-28M
Site Error: 0.00 usft
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Well Error: 0.00 usft
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Local Co-ordinate Reference: Well Federal 2407-28M 2H
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North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Reference Depths are relative to GL 7389' & RKB 14' @ 7403.00usft
Offset Depths are relative to Offset Datum
Central Meridian is -107.8333334

Coordinates are relative to: Federal 2407-28M 2H
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.15°

Separation Factor Plot



LEGEND

◆ Federal 2407-28M 3H, OH, Plan #2 V0 ✕ Federal 2407-28M 1H, OH, Plan #2 V0

6 Construction Materials

Construction material would consist of native borrow material at the site locations. Topsoil at each site would be stripped and placed as a berm along the outer edge of the pad within EOD or as a windrow along the edge of the access and/or pipeline corridor. Topsoil would be stored separately and protected for use during interim reclamation. All pads and roads would be built with a balanced cut and fill, such that all material would be native. Subsoil horizons from cuts would be used as fill material to establish a level working surface, and to construct earthen berms where necessary. If the proposed projects cannot be constructed from the earthen materials present on-site, materials would be imported from a borrow pit or other location approved by the BLM-FFO. Imported fill material would be weed-free, and no concrete or other foreign materials would be brought in for use as fill. Vegetation removed during construction, including small trees and slash/brush, would be chipped or mulched and incorporated into the topsoil as additional organic matter. Trees with trunks that are 3 inches in diameter or greater would be cut, delimbed, and delivered to Navajo Chapter Houses in the area. The subsurface portion of trees (tree stumps) would be hauled to an approved disposal facility.

Whiptail may need to acquire material for use in padding pipelines and backfilling trenches in areas that are extremely rocky. No source for material has yet been identified because the volume that would be needed is unknown. If necessary, Whiptail would pursue permitting a quarry as a separate action.

Construction and maintenance activities would cease if soil or road surfaces become saturated to the extent that construction equipment is unable to stay within the permitted area and/or when activities cause irreparable harm to roads, soils, or streams.

7 Methods for Handling Waste

✓ Drilling operations would utilize a closed-loop mud system. Either water-based or oil-based mud may be used. All cuttings would be stored in metal containment bins until hauled to a commercial disposal facility. No reserve pit would be needed. The drilling operations area would be enclosed by a containment berm and ditches, and the containment berm would be ramped to allow access to the solids control area. The contained operations area would drain gradually to one area of the pad which would be contoured for spill prevention and control.

LOGOS would follow New Mexico Oil Conservation Division Pit Rule and Onshore Orders No. 1 and No. 7 regarding placement, operation, and closure of the closed-loop system. No blow pit would be used. All refuse would be placed in metal trash basket and would be hauled off site and properly disposed in an approved landfill. Portable toilets would be provided and maintained during all construction, drilling and completion operations.

Whiptail is considering development of a fluid transfer facility at the upper boring location (TUA #2). This location could assist operators in testing, treating, and storing water for reuse. All testing, treatment, and storage would be permitted as appropriate through the New Mexico Oil Conservation Division (NMOCD). Development of the site would depend on demand from operators and Whiptail's own needs in the area.

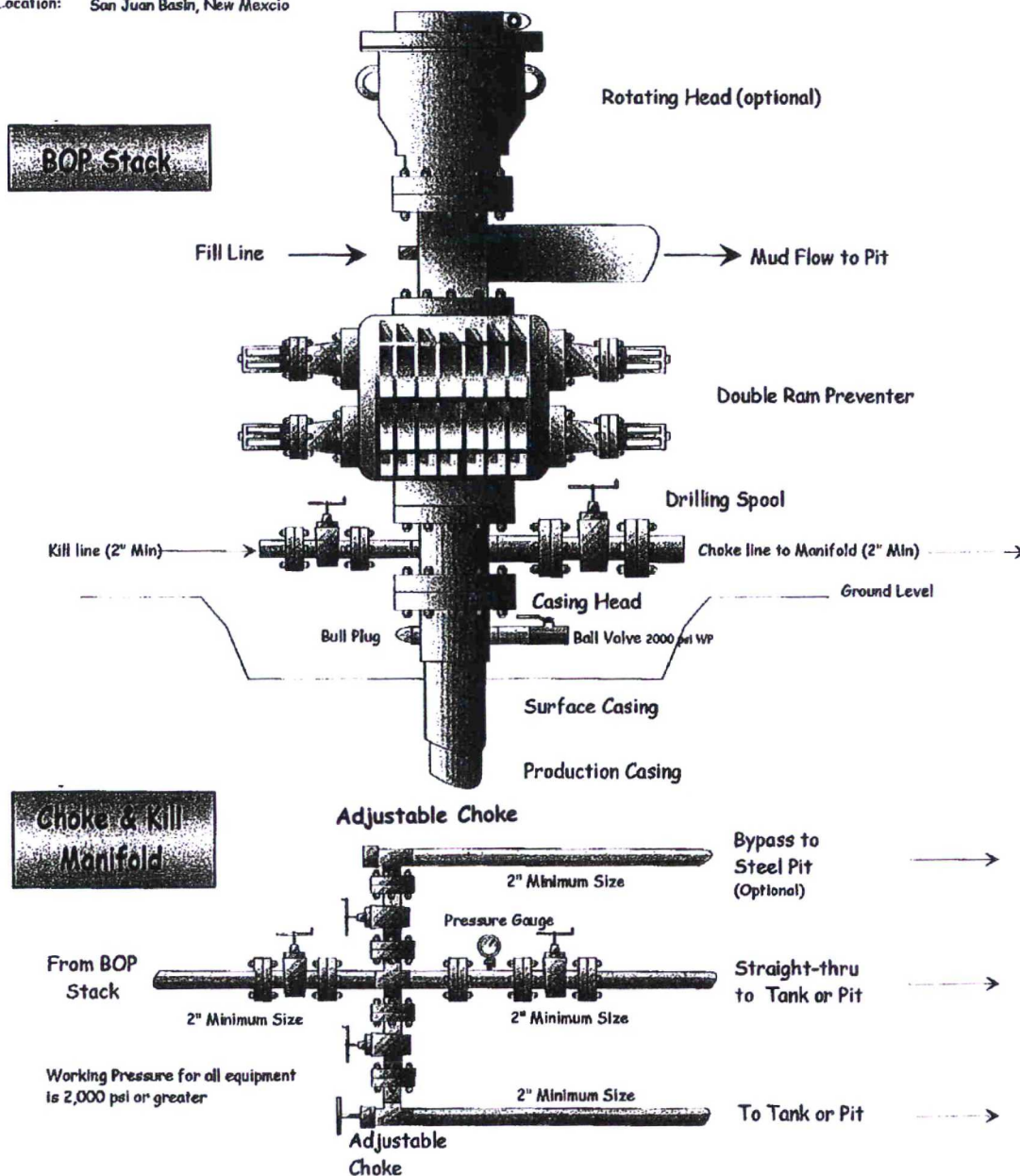


Well Control Equipment Schematic for 2M Service

Attachment to Drilling Technical Program

Exhibit #1 Typical BOP setup

Location: San Juan Basin, New Mexico



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

to

**LOGOS OPERATING, LLC
FEDERAL 2407 28M COM #2H
5' FSL 893' FWL,
Section 28, T24N, R7W, N.M.P.M.,
RIO ARRIBA COUNTY, NEW MEXICO
Latitude: 36° 16' 38.547" N
Longitude: 107° 35' 10.295" W
Nad 1983**

**From the Intersection of
Highway 550 & Highway 64, in Bloomfield, N.M.,
Go South on Hwy 550 for 46.9 miles to CR 0377
turn left on CR0377 (northerly) for 4.1 miles,
turn right (easterly) for 0.5 miles
to the new location.**