

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENTFORM APPROVED
OMB NO. 1004-0137
Expires: January 31, 2018**SUNDRY NOTICES AND REPORTS ON WELLS**
*Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.*5. Lease Serial No.
NMSF078924

6. If Indian, Allottee or Tribe Name

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

SUBMIT IN TRIPLICATE - Other instructions on page 2

1. Type of Well

☒ Oil Well ☐ Gas Well ☐ Other8. Well Name and No.
APOLLO 2407 29E 1H2. Name of Operator
LOGOS OPERATING LLCContact: MARIE E FLOREZ
E-Mail: mflorez@logosresourcesllc.com9. API Well No.
30-039-31379-00-X13a. Address
2010 AFTON PLACE
FARMINGTON, NM 874013b. Phone No. (include area code)
Ph: 505-787-221810. Field and Pool or Exploratory Area
ESCRITO GALLUP

4. Location of Well (Footage, Sec., T., R., M., or Survey Description)

Sec 29 T24N R7W SWNW 2188FNL 93FWL
36.286110 N Lat, 107.606384 W Lon

11. County or Parish, State

RIO ARRIBA COUNTY, NM

12. CHECK THE APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Hydraulic Fracturing	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☒ Other
BP	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	Change to Original A
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	PD

13. Describe Proposed or Completed Operation: Clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed and the operator has determined that the site is ready for final inspection.

LOGOS Operating request a name change from Federal 2407 29E 1H to Apollo 2407 29E 1H and request a change in plans for the following:

Original surface location from 2188' FNL & 93' FWL to new surface location 2175' FNL & 78' FWL.

Original bottom-hole location from 85' FNL & 2352' FWL to new bottom-hole location 67' FNL & 2299' FWL.

Original TD @ 13058' MD 6169' TVD to new TD @ 13788' MD 6144' TVD.

Geology tops have been updated per changes.

Original KOP @ 5698' MD 5543' TVD to new KOP @ 5389' MD 5354' TVD.

Adhere to Previous NMOCD
Conditions of Approval

OCD Received
4/6/2020

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #503028 verified by the BLM Well Information System
For LOGOS OPERATING LLC, sent to the Farmington
Committed to AFMSS for processing by JOE KILLINS on 02/25/2020 (20JK0123SE)

Name (Printed/Typed) MARIE E FLOREZ

Title REGULATORY SPECIALIST

Signature (Electronic Submission)

Date 02/12/2020

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By JOE KILLINS

Title ENGINEER

Date 02/25/2020

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office Farmington

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED **

Additional data for EC transaction #503028 that would not fit on the form

32. Additional remarks, continued

Original Landing point @ 6659' MD 6094' TVD to new Landing point @ 6512' MD 6068' TVD.

Original 7" Casing Intermediate @ 6659' MD to new 6512' MD.

Original 4.5" Casing Production @ 6509' - 13058' to new 6412' - 13788'.

Original 7" Intermediate & 4.5" production cementing bbls and sacks have been updated per casing depth changes.

Attached: New C102 Plat, Operation and Directional Drill plans.

Submit one copy to
Appropriate District Office

District II
811 S. First Street, Artesia, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720

District III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

District IV
1220 S. St. Francis Drive, Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

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

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

*API Number 30-039-31379		*Pool Code 22619	*Pool Name ESCRITO GALLUP (ASSOCIATED)
*Property Code 328118	*Property Name APOLLO 2407 29E		*Well Number 1H
*GRID No. 289408	*Operator Name LOGOS OPERATING, LLC		*Elevation 7300'

¹⁰ Surface Location

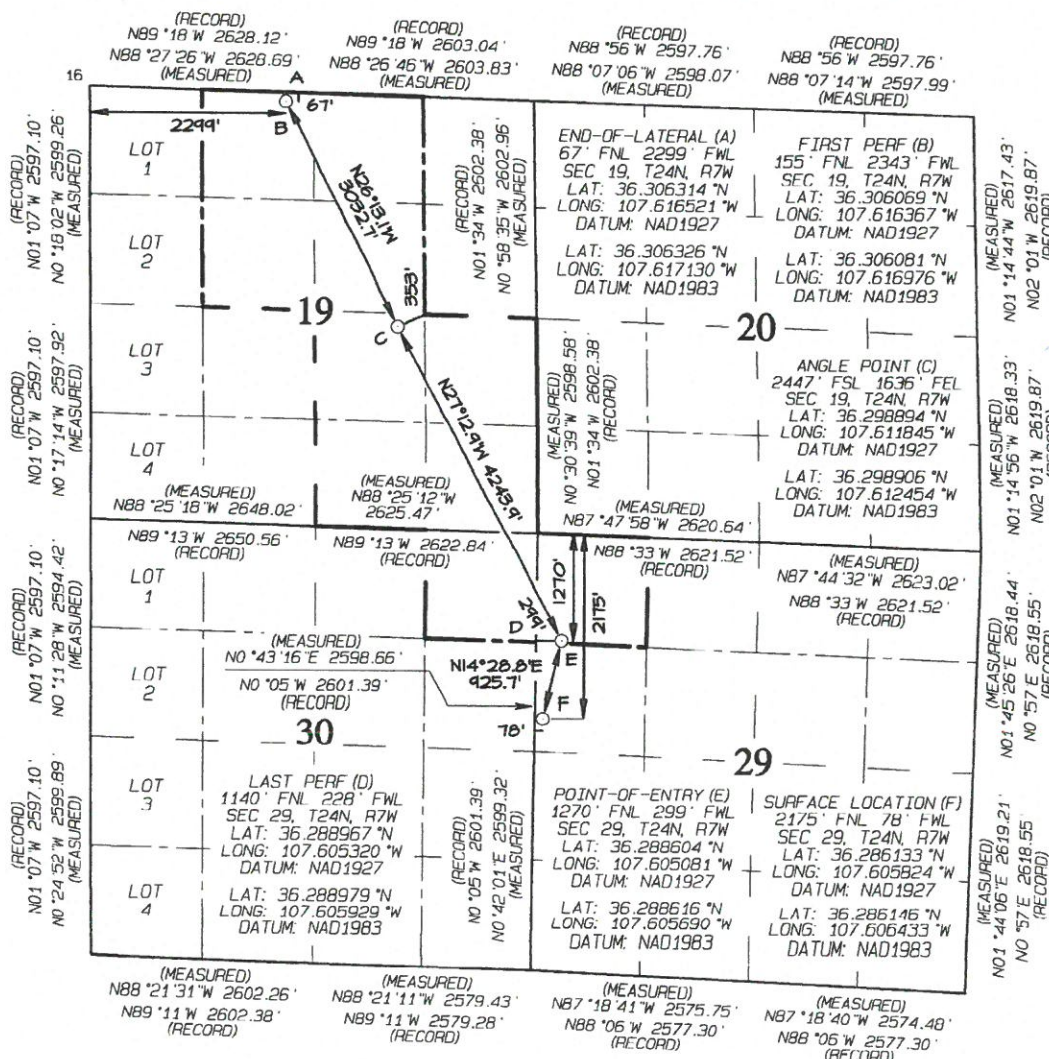
Ul. or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
E	29	24N	7W		2175	NORTH	78	WEST	RIO ARriba

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
C	19	24N	7W		67	NORTH	2299	WEST	RIO ARriba

12	Dedicated Acres	SE/4, W/2 NE/4	
	400.00	E/2 NW/4 - Section 19	
		NW/4 NW/4 - Section 29	
		NE/4 NE/4 - Section 30	

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



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

Signature Tan Jerni Date 2/3/20

Signature _____ Date _____
Tamra Sessions

Printed Name _____

tsessions@logosresourcesllc.com

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.

Date Revised: FEBRUARY 3, 2020
Survey Date: OCTOBER 31, 2018

Signature and Seal of Professional Surveyor



JASON C. EDWARDS
Certificate Number 15269



LOGOS Operating, LLC Operations Plan

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

Date:	January 29, 2020	Pool:	Escrito Gallup
Well Name:	Apollo 2407 29E 1H	Elevation:	7,300'
Surface Location:	Sec 29, T24N, R7W 2175 FNL, 78 FWL (36.286146° N, 107.606433° W – NAD83)	Measured Depth:	13,788'
Bottom Hole Location:	Sec 19, T24N, R7W 67 FNL, 2299 FWL (36.306326° N, 107.617130° W – NAD83)	County:	Rio Arriba

Lease Serial #NMSF-0078924,

I. GEOLOGY

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

NOTE: All Formation Tops/Kickoff points/Landing Depths are based on Ground Level elevation as a reference point and will be adjusted to actual KB when the actual rig is selected.

SURFACE FORMATION - NACIMIENTO

NAME	MD	TVD	NAME	MD	TVD
OJO ALAMO	1756	1756	MENEFEE	4069	4047
KIRTLAND	1907	1905	*POINT LOOKOUT	4810	4781
*FRUITLAND	2120	2116	*MANCOS	5055	5024
*PICTURED CLIFFS	2454	2447	GALLUP	5886	5809
CHACRA	3331	3316	KICKOFF POINT	5,389	5,354
*CLIFF HOUSE	4006	3984	LANDING POINT	6,512	6,068
			TD	13,788	6,144

* 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.

Above ground steel pits will be used for fluid and cuttings while drilling. In the unlikely event that a tank develops a leak, upon immediate visual discovery, the fluid would be transferred to another tank and contaminated

APOLLO 2407 29E 1H



soil would be removed and disposed. Any leaks, spills or other undesirable events will be reported in accordance with BLM NTL 3A. Rig crews will monitor the tanks at all times.

- 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	CONN
SURFACE	12.25"	320'	9.625"	36 LBS	J-55 or equiv	STC
INTERMEDIATE	8.75"	6,512'	7"	23 LBS	J-55 or equiv	LTC
PRODUCTION	6.125"	6,412' – 13,788'	4.5"	11.6 LBS	P-110 or equiv	LTC or BTC
TIE BACK	6.125"	Surf. – 6,412'	4.5"	11.6 LBS	P-110 or equiv	LTC or BTC

NOTE: All casing depths are approximate and will be based on drilling conditions +/- 50'. Weights, grades and connections will be based on availability and may vary but will be equivalent or greater.

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. Optional use of DV Tool will be considered if losses while drilling are encountered. See note below.
3. **PRODUCTION LINER:** Run 4-1/2" Liner with cement nose guide Float Shoe+ 1 jnt of 4-1/2" casing+ Landing Collar+ 4-1/2" pup joint+ 1 RSI (Sliding Sleeve) positioned inside the legal setback. Centralizer program will be determined by wellbore condition. Set seals on Liner Hanger.

NOTE: Use of DV tool would be considered by operator as back up in case we experience heavy losses and are concerned with cement not reaching surface. If major losses are not encountered we will not run DV tool. Optional use of cancellation plugs for DV tools may be used if losses while cementing are not encountered.

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/ Bbls). TOC at Surface.



2. INTERMEDIATE: If deemed necessary, the intermediate casing will be cemented in 1 or 2 stages using DV/STAGE tools in order to reduce cement losses and maximize cement coverage. If losses are not observed a cancellation plug will be pumped and the remaining cement will be pumped during stage 1.

Stage 1: Spacer #1: 20 bbl (112 cuft) Chemwash. Lead Cement: 240 bbls, 692 sks (1349 cu.ft.), 12.3 ppg@ 1.95 cuft/sk yield. Tail Cement: 53 bbls, 228 sks, (296 cuft), 13.5 ppg@ 1.3 cu'ft/sk yield. Displacement: Displace with drilling mud or water. Total Cement: 293 bbls, 920 sks, (1645 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 (686 sk / 933 cuft / 166 bbls). Tail Spacer: 40 BBL of MMCR. Displacement: Displace with drilling mud or water.

IV. COMPLETION

A. CBL

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

B. PRESSURE TEST

With frac stack installed on wellhead, 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

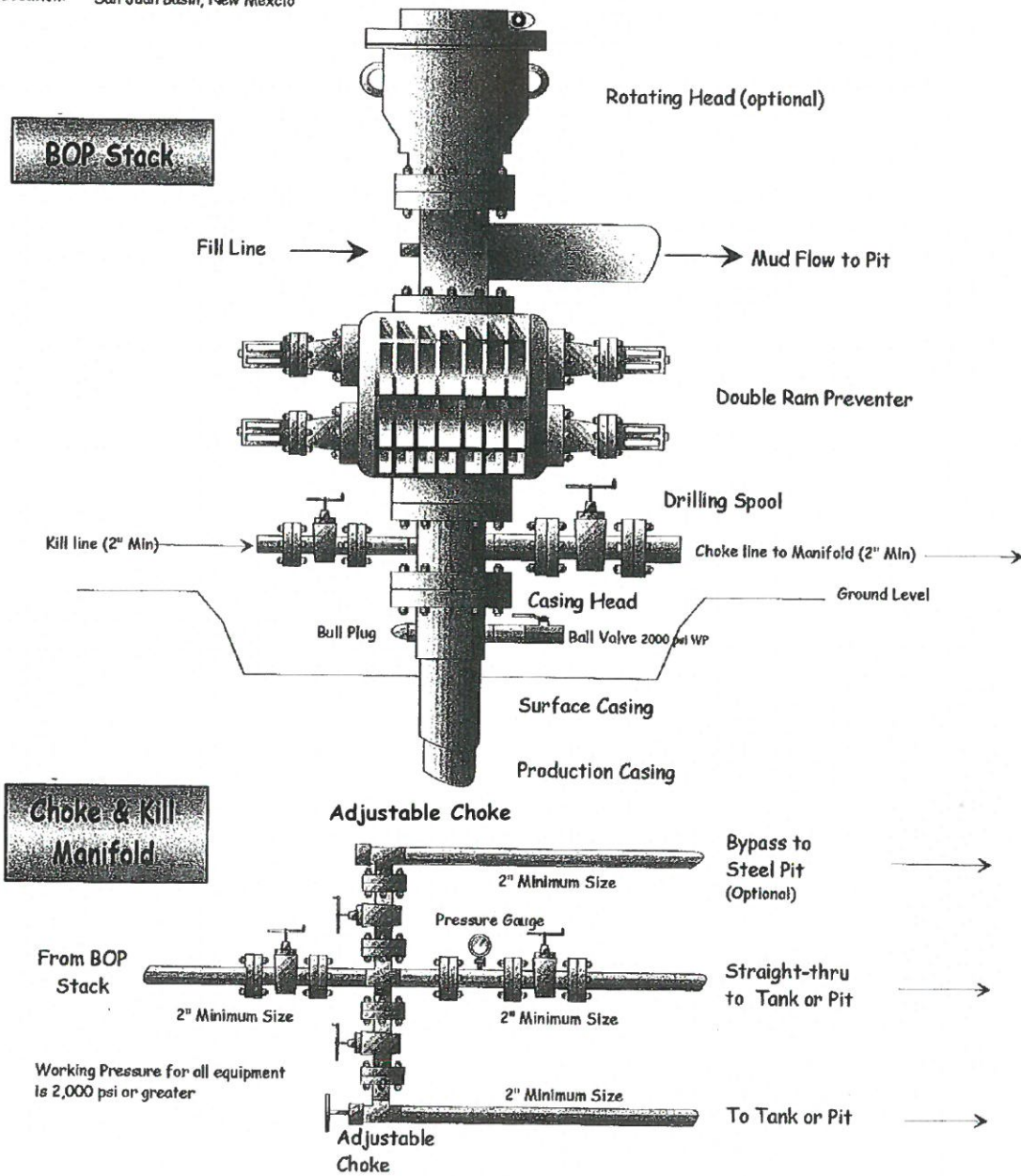
*NOTE: Although this horizontal well may be drilled past the applicable setbacks, an unorthodox location application is not required because the completed interval in this well, as defined by 19.15.16.7 8(1) NMAC, will be entirely within the applicable setbacks. This approach complies with all applicable rules, including 19.15.16.14 A(3) NMAC, 19.15.16.14 8(2) NMAC, 19.15.16.15 8(2)NMAC, and 19.15.16.15. 8(4) NMAC.

Well Control Equipment Schematic for 2M Service

Attachment to Drilling Technical Program

Exhibit #1 Typical BOP setup

Location: San Juan Basin, New Mexico





Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Apollo 2407-29E 1H
Well: Apollo 2407-29E 1H
Wellbore: OH
Design: Plan #3

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

Scientific Drilling



Azimuths to True North
Magnetic North: 8.62°
Magnetic Field
Strength: 49371.5nT
Dip Angle: 62.83°
Date: 4/30/2020
Model: HDGM_FILE

WELL DETAILS: Apollo 2407-29E 1H

+N/-S +E/-W Northing Easting
0.00 0.00 1923534.89 2789962.68
GL 7300' @ 7300.00usft
Longitude Latitude
-107.6064330 36.2861480

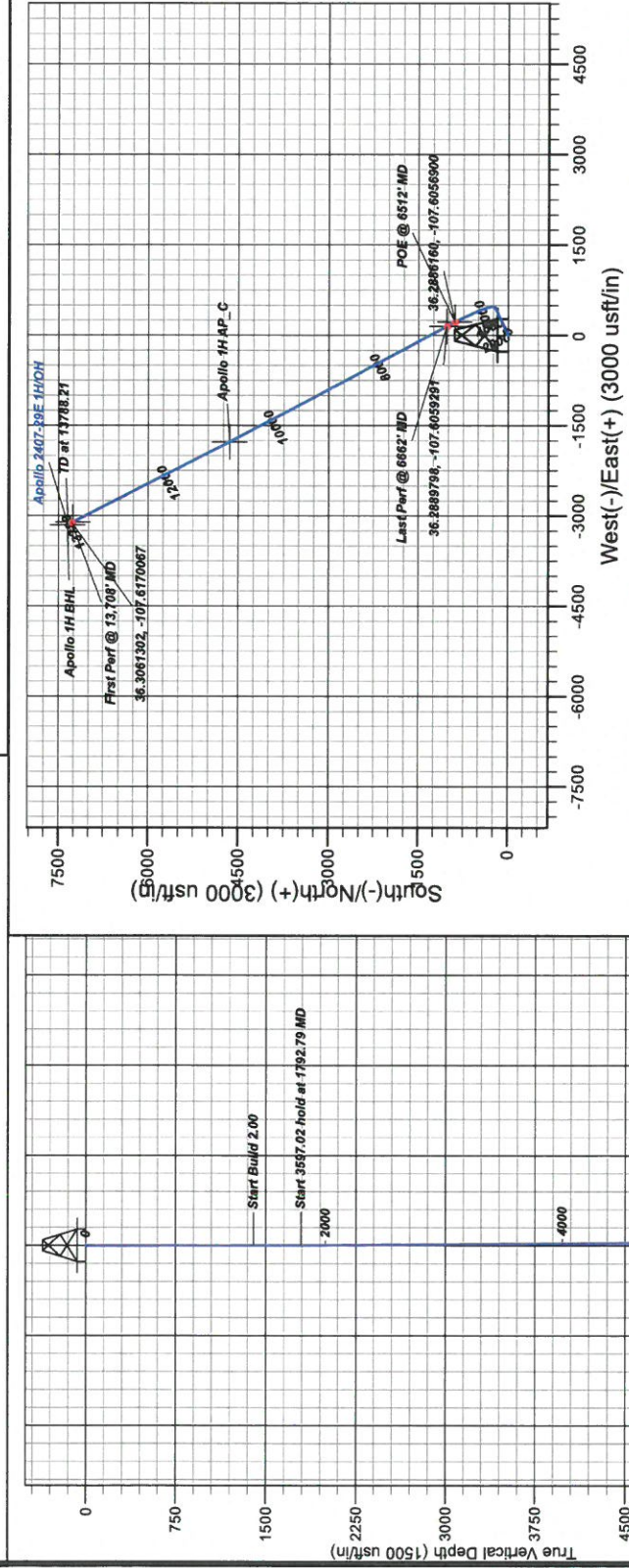
Plan: Plan #3 (Apollo 2407-29E 1H/OH)
Created By: Janie Collins Date: 11:39, January 30 2020

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Apollo 1H POE	6065.00	899.15	218.97	1924434.54	2799179.55	36.286156	-107.606433
Apollo 1H AP_C	6144.00	7346.25	-3151.77	1930873.73	2788177.60	36.29890560	-107.6124540
Apollo 1H BHL	6143.00	7257.06	-3106.41	1930784.64	2786539.27	36.3063260	-107.6171300
Apollo 1H LPerf	6069.00	1031.29	148.53	1924566.52	2790108.80	36.2889790	-107.6169760

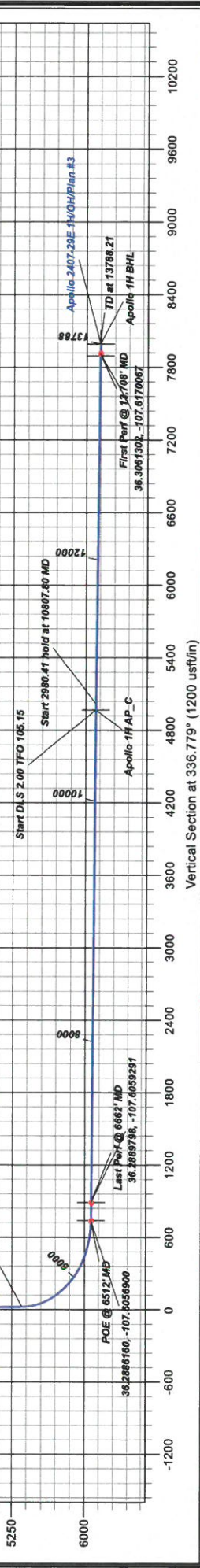
SECTION DETAILS

MD	Inc	As	TVD	+N/-S	+E/-W	Dleg	TFace	VSecl	Target
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
1400.00	7.86	64.111	1791.56	11.74	24.19	2.00	64.11	1.25	
5389.81	7.86	64.111	5354.83	226.41	466.49	0.00	0.00	24.14	
6512.43	89.51	331.983	6068.00	899.15	218.97	8.00	-92.17	739.98	Apollo 1H POE
10755.75	89.51	331.983	6104.00	4645.04	-1774.20	0.00	0.00	4968.28	Apollo 1H AP_C
10807.90	88.24	332.988	6104.57	4891.20	-1798.24	2.00	105.15	5020.18	
13788.21	89.24	332.988	6144.00	7346.25	-3151.77	0.00	0.00	7993.81	Apollo 1H BHL



FORMATION DETAILS

MDPath	Formation
1756.92	Ojo Alamo
1905.00	Kirtland
2116.00	Frutland
2447.00	Pictured Cliffs
3316.00	Chacra
3984.00	Cliff House
4047.00	Menefee
4781.00	Point Lookout
5024.00	Mancos
5809.00	Gallup





Logos Operating LLC

Rio Arriba, NM NAD83

Apollo 2407-29E

Apollo 2407-29E 1H - Slot B

OH

Plan: Plan #3

Standard Planning Report

30 January, 2020



www.scientificdrilling.com

Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

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	Apollo 2407-29E				
Site Position:		Northing:	1,923,521.45 usft	Latitude:	36.2861090
From:	Lat/Long	Easting:	2,789,977.45 usft	Longitude:	-107.6063830
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.13

Well	Apollo 2407-29E 1H - Slot B					
Well Position	+N/-S	13.47 usft	Northing:	1,923,534.89 usft	Latitude:	36.2861460
	+E/-W	-14.74 usft	Easting:	2,789,962.69 usft	Longitude:	-107.6064330
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	7,300.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM_FILE	4/30/2020	8.62	62.83	49,371.50000000

Design	Plan #3			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	336.779

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	
1,400.00	0.00	0.000	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,792.79	7.86	64.111	1,791.56	11.74	24.19	2.00	2.00	0.00	64.11	
5,389.81	7.86	64.111	5,354.83	226.41	466.49	0.00	0.00	0.00	0.00	
6,512.43	89.51	331.983	6,068.00	899.15	218.97	8.00	7.27	-8.21	-92.17	Apollo 1H POE
10,755.75	89.51	331.983	6,104.00	4,645.04	-1,774.20	0.00	0.00	0.00	0.00	Apollo 1H AP_C
10,807.80	89.24	332.988	6,104.57	4,691.20	-1,798.24	2.00	-0.52	1.93	105.15	
13,788.21	89.24	332.988	6,144.00	7,346.25	-3,151.77	0.00	0.00	0.00	0.00	Apollo 1H BHL



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

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	2.00	64.111	1,499.98	0.76	1.57	0.08	2.00	2.00	0.00
1,600.00	4.00	64.111	1,599.84	3.05	6.28	0.32	2.00	2.00	0.00
1,700.00	6.00	64.111	1,699.45	6.85	14.12	0.73	2.00	2.00	0.00
1,792.79	7.86	64.111	1,791.56	11.74	24.19	1.25	2.00	2.00	0.00
1,800.00	7.86	64.111	1,798.70	12.17	25.07	1.30	0.00	0.00	0.00
1,900.00	7.86	64.111	1,897.76	18.14	37.37	1.93	0.00	0.00	0.00
2,000.00	7.86	64.111	1,996.83	24.11	49.67	2.57	0.00	0.00	0.00
2,100.00	7.86	64.111	2,095.89	30.07	61.96	3.21	0.00	0.00	0.00
2,200.00	7.86	64.111	2,194.95	36.04	74.26	3.84	0.00	0.00	0.00
2,300.00	7.86	64.111	2,294.01	42.01	86.56	4.48	0.00	0.00	0.00
2,400.00	7.86	64.111	2,393.07	47.98	98.85	5.12	0.00	0.00	0.00
2,500.00	7.86	64.111	2,492.13	53.95	111.15	5.75	0.00	0.00	0.00
2,600.00	7.86	64.111	2,591.20	59.91	123.44	6.39	0.00	0.00	0.00
2,700.00	7.86	64.111	2,690.26	65.88	135.74	7.02	0.00	0.00	0.00
2,800.00	7.86	64.111	2,789.32	71.85	148.04	7.66	0.00	0.00	0.00
2,900.00	7.86	64.111	2,888.38	77.82	160.33	8.30	0.00	0.00	0.00
3,000.00	7.86	64.111	2,987.44	83.79	172.63	8.93	0.00	0.00	0.00
3,100.00	7.86	64.111	3,086.50	89.75	184.93	9.57	0.00	0.00	0.00
3,200.00	7.86	64.111	3,185.56	95.72	197.22	10.21	0.00	0.00	0.00
3,300.00	7.86	64.111	3,284.63	101.69	209.52	10.84	0.00	0.00	0.00
3,400.00	7.86	64.111	3,383.69	107.66	221.81	11.48	0.00	0.00	0.00
3,500.00	7.86	64.111	3,482.75	113.62	234.11	12.12	0.00	0.00	0.00
3,600.00	7.86	64.111	3,581.81	119.59	246.41	12.75	0.00	0.00	0.00
3,700.00	7.86	64.111	3,680.87	125.56	258.70	13.39	0.00	0.00	0.00
3,800.00	7.86	64.111	3,779.93	131.53	271.00	14.03	0.00	0.00	0.00
3,900.00	7.86	64.111	3,878.99	137.50	283.30	14.66	0.00	0.00	0.00
4,000.00	7.86	64.111	3,978.06	143.46	295.59	15.30	0.00	0.00	0.00
4,100.00	7.86	64.111	4,077.12	149.43	307.89	15.93	0.00	0.00	0.00
4,200.00	7.86	64.111	4,176.18	155.40	320.18	16.57	0.00	0.00	0.00
4,300.00	7.86	64.111	4,275.24	161.37	332.48	17.21	0.00	0.00	0.00
4,400.00	7.86	64.111	4,374.30	167.34	344.78	17.84	0.00	0.00	0.00
4,500.00	7.86	64.111	4,473.36	173.30	357.07	18.48	0.00	0.00	0.00
4,600.00	7.86	64.111	4,572.43	179.27	369.37	19.12	0.00	0.00	0.00
4,700.00	7.86	64.111	4,671.49	185.24	381.67	19.75	0.00	0.00	0.00
4,800.00	7.86	64.111	4,770.55	191.21	393.96	20.39	0.00	0.00	0.00
4,900.00	7.86	64.111	4,869.61	197.18	406.26	21.03	0.00	0.00	0.00
5,000.00	7.86	64.111	4,968.67	203.14	418.55	21.66	0.00	0.00	0.00
5,100.00	7.86	64.111	5,067.73	209.11	430.85	22.30	0.00	0.00	0.00
5,200.00	7.86	64.111	5,166.79	215.08	443.15	22.93	0.00	0.00	0.00

Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

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)
5,300.00	7.86	64.111	5,265.86	221.05	455.44	23.57	0.00	0.00	0.00
5,389.81	7.86	64.111	5,354.83	226.41	466.49	24.14	0.00	0.00	0.00
5,400.00	7.87	58.151	5,364.92	227.08	467.71	24.28	8.00	0.11	-58.51
5,500.00	11.56	14.289	5,463.59	240.42	476.01	33.27	8.00	3.69	-43.86
5,600.00	18.24	356.649	5,560.22	265.80	477.57	55.97	8.00	6.68	-17.64
5,700.00	25.67	348.588	5,652.93	302.71	472.36	91.95	8.00	7.43	-8.06
5,800.00	33.35	344.010	5,739.90	350.44	460.48	140.49	8.00	7.68	-4.58
5,900.00	41.14	340.997	5,819.46	408.06	442.17	200.66	8.00	7.79	-3.01
6,000.00	48.99	338.802	5,890.04	474.44	417.78	271.29	8.00	7.85	-2.19
6,100.00	56.87	337.078	5,950.27	548.30	387.78	350.99	8.00	7.88	-1.72
6,200.00	64.77	335.641	5,998.99	628.20	352.76	438.23	8.00	7.90	-1.44
6,300.00	72.68	334.379	6,035.24	712.58	313.40	531.29	8.00	7.91	-1.26
6,400.00	80.60	333.223	6,058.33	799.81	270.46	628.38	8.00	7.92	-1.16
6,500.00	88.53	332.119	6,067.79	888.17	224.79	727.59	8.00	7.92	-1.10
6,512.43	89.51	331.983	6,068.00	899.15	218.97	739.98	8.00	7.93	-1.09
6,600.00	89.51	331.983	6,068.74	976.45	177.83	827.24	0.00	0.00	0.00
6,700.00	89.51	331.983	6,069.59	1,064.73	130.86	926.88	0.00	0.00	0.00
6,800.00	89.51	331.983	6,070.44	1,153.01	83.89	1,026.53	0.00	0.00	0.00
6,900.00	89.51	331.983	6,071.29	1,241.29	36.92	1,126.18	0.00	0.00	0.00
7,000.00	89.51	331.983	6,072.14	1,329.56	-10.05	1,225.82	0.00	0.00	0.00
7,100.00	89.51	331.983	6,072.99	1,417.84	-57.03	1,325.47	0.00	0.00	0.00
7,200.00	89.51	331.983	6,073.83	1,506.12	-104.00	1,425.11	0.00	0.00	0.00
7,300.00	89.51	331.983	6,074.68	1,594.40	-150.97	1,524.76	0.00	0.00	0.00
7,400.00	89.51	331.983	6,075.53	1,682.67	-197.94	1,624.41	0.00	0.00	0.00
7,500.00	89.51	331.983	6,076.38	1,770.95	-244.91	1,724.05	0.00	0.00	0.00
7,600.00	89.51	331.983	6,077.23	1,859.23	-291.89	1,823.70	0.00	0.00	0.00
7,700.00	89.51	331.983	6,078.08	1,947.51	-338.86	1,923.35	0.00	0.00	0.00
7,800.00	89.51	331.983	6,078.92	2,035.78	-385.83	2,022.99	0.00	0.00	0.00
7,900.00	89.51	331.983	6,079.77	2,124.06	-432.80	2,122.64	0.00	0.00	0.00
8,000.00	89.51	331.983	6,080.62	2,212.34	-479.77	2,222.28	0.00	0.00	0.00
8,100.00	89.51	331.983	6,081.47	2,300.62	-526.74	2,321.93	0.00	0.00	0.00
8,200.00	89.51	331.983	6,082.32	2,388.89	-573.72	2,421.58	0.00	0.00	0.00
8,300.00	89.51	331.983	6,083.17	2,477.17	-620.69	2,521.22	0.00	0.00	0.00
8,400.00	89.51	331.983	6,084.01	2,565.45	-667.66	2,620.87	0.00	0.00	0.00
8,500.00	89.51	331.983	6,084.86	2,653.73	-714.63	2,720.52	0.00	0.00	0.00
8,600.00	89.51	331.983	6,085.71	2,742.00	-761.60	2,820.16	0.00	0.00	0.00
8,700.00	89.51	331.983	6,086.56	2,830.28	-808.58	2,919.81	0.00	0.00	0.00
8,800.00	89.51	331.983	6,087.41	2,918.56	-855.55	3,019.45	0.00	0.00	0.00
8,900.00	89.51	331.983	6,088.26	3,006.84	-902.52	3,119.10	0.00	0.00	0.00
9,000.00	89.51	331.983	6,089.10	3,095.11	-949.49	3,218.75	0.00	0.00	0.00
9,100.00	89.51	331.983	6,089.95	3,183.39	-996.46	3,318.39	0.00	0.00	0.00
9,200.00	89.51	331.983	6,090.80	3,271.67	-1,043.44	3,418.04	0.00	0.00	0.00
9,300.00	89.51	331.983	6,091.65	3,359.95	-1,090.41	3,517.69	0.00	0.00	0.00
9,400.00	89.51	331.983	6,092.50	3,448.22	-1,137.38	3,617.33	0.00	0.00	0.00
9,500.00	89.51	331.983	6,093.35	3,536.50	-1,184.35	3,716.98	0.00	0.00	0.00
9,600.00	89.51	331.983	6,094.19	3,624.78	-1,231.32	3,816.62	0.00	0.00	0.00
9,700.00	89.51	331.983	6,095.04	3,713.06	-1,278.29	3,916.27	0.00	0.00	0.00
9,800.00	89.51	331.983	6,095.89	3,801.33	-1,325.27	4,015.92	0.00	0.00	0.00
9,900.00	89.51	331.983	6,096.74	3,889.61	-1,372.24	4,115.56	0.00	0.00	0.00
10,000.00	89.51	331.983	6,097.59	3,977.89	-1,419.21	4,215.21	0.00	0.00	0.00
10,100.00	89.51	331.983	6,098.44	4,066.17	-1,466.18	4,314.86	0.00	0.00	0.00
10,200.00	89.51	331.983	6,099.29	4,154.44	-1,513.15	4,414.50	0.00	0.00	0.00
10,300.00	89.51	331.983	6,100.13	4,242.72	-1,560.13	4,514.15	0.00	0.00	0.00
10,400.00	89.51	331.983	6,100.98	4,331.00	-1,607.10	4,613.79	0.00	0.00	0.00



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

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)
10,500.00	89.51	331.983	6,101.83	4,419.28	-1,654.07	4,713.44	0.00	0.00	0.00
10,600.00	89.51	331.983	6,102.68	4,507.55	-1,701.04	4,813.09	0.00	0.00	0.00
10,700.00	89.51	331.983	6,103.53	4,595.83	-1,748.01	4,912.73	0.00	0.00	0.00
10,755.75	89.51	331.983	6,104.00	4,645.04	-1,774.20	4,968.28	0.00	0.00	0.00
10,800.00	89.28	332.837	6,104.46	4,684.26	-1,794.70	5,012.40	2.00	-0.52	1.93
10,807.80	89.24	332.988	6,104.57	4,691.20	-1,798.24	5,020.18	2.00	-0.52	1.93
10,900.00	89.24	332.988	6,105.79	4,773.34	-1,840.12	5,112.18	0.00	0.00	0.00
11,000.00	89.24	332.988	6,107.11	4,862.42	-1,885.53	5,211.95	0.00	0.00	0.00
11,100.00	89.24	332.988	6,108.43	4,951.51	-1,930.95	5,311.72	0.00	0.00	0.00
11,200.00	89.24	332.988	6,109.75	5,040.59	-1,976.36	5,411.49	0.00	0.00	0.00
11,300.00	89.24	332.988	6,111.08	5,129.67	-2,021.77	5,511.27	0.00	0.00	0.00
11,400.00	89.24	332.988	6,112.40	5,218.76	-2,067.19	5,611.04	0.00	0.00	0.00
11,500.00	89.24	332.988	6,113.72	5,307.84	-2,112.60	5,710.81	0.00	0.00	0.00
11,600.00	89.24	332.988	6,115.05	5,396.92	-2,158.02	5,810.58	0.00	0.00	0.00
11,700.00	89.24	332.988	6,116.37	5,486.01	-2,203.43	5,910.36	0.00	0.00	0.00
11,800.00	89.24	332.988	6,117.69	5,575.09	-2,248.85	6,010.13	0.00	0.00	0.00
11,900.00	89.24	332.988	6,119.02	5,664.17	-2,294.26	6,109.90	0.00	0.00	0.00
12,000.00	89.24	332.988	6,120.34	5,753.25	-2,339.67	6,209.67	0.00	0.00	0.00
12,100.00	89.24	332.988	6,121.66	5,842.34	-2,385.09	6,309.45	0.00	0.00	0.00
12,200.00	89.24	332.988	6,122.99	5,931.42	-2,430.50	6,409.22	0.00	0.00	0.00
12,300.00	89.24	332.988	6,124.31	6,020.50	-2,475.92	6,508.99	0.00	0.00	0.00
12,400.00	89.24	332.988	6,125.63	6,109.59	-2,521.33	6,608.76	0.00	0.00	0.00
12,500.00	89.24	332.988	6,126.96	6,198.67	-2,566.74	6,708.53	0.00	0.00	0.00
12,600.00	89.24	332.988	6,128.28	6,287.75	-2,612.16	6,808.31	0.00	0.00	0.00
12,700.00	89.24	332.988	6,129.60	6,376.84	-2,657.57	6,908.08	0.00	0.00	0.00
12,800.00	89.24	332.988	6,130.92	6,465.92	-2,702.99	7,007.85	0.00	0.00	0.00
12,900.00	89.24	332.988	6,132.25	6,555.00	-2,748.40	7,107.62	0.00	0.00	0.00
13,000.00	89.24	332.988	6,133.57	6,644.09	-2,793.82	7,207.40	0.00	0.00	0.00
13,100.00	89.24	332.988	6,134.89	6,733.17	-2,839.23	7,307.17	0.00	0.00	0.00
13,200.00	89.24	332.988	6,136.22	6,822.25	-2,884.64	7,406.94	0.00	0.00	0.00
13,300.00	89.24	332.988	6,137.54	6,911.34	-2,930.06	7,506.71	0.00	0.00	0.00
13,400.00	89.24	332.988	6,138.86	7,000.42	-2,975.47	7,606.49	0.00	0.00	0.00
13,500.00	89.24	332.988	6,140.19	7,089.50	-3,020.89	7,706.26	0.00	0.00	0.00
13,600.00	89.24	332.988	6,141.51	7,178.58	-3,066.30	7,806.03	0.00	0.00	0.00
13,700.00	89.24	332.988	6,142.83	7,267.67	-3,111.71	7,905.80	0.00	0.00	0.00
13,788.21	89.24	332.988	6,144.00	7,346.25	-3,151.77	7,993.81	0.00	0.00	0.00



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

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
Apollo 1H POE - plan hits target center - Point	0.00	0.000	6,068.00	899.15	218.97	1,924,434.55	2,790,179.54	36.2886160	-107.6056900
Apollo 1H LPerf - plan misses target center by 0.29usft at 6662.17usft MD (6069.27 TVD, 1031.34 N, 148.63 E) - Point	0.00	0.000	6,069.00	1,031.29	148.53	1,924,566.52	2,790,108.80	36.2889790	-107.6059290
Apollo 1H AP_C - plan hits target center - Point	0.00	0.000	6,104.00	4,645.04	-1,774.20	1,928,175.76	2,788,177.60	36.2989060	-107.6124540
Apollo 1H FPerf - plan misses target center by 0.34usft at 13688.14usft MD (6142.68 TVD, 7257.10 N, -3106.33 E) - Point	0.00	0.000	6,143.00	7,257.06	-3,106.41	1,930,784.64	2,786,839.27	36.3060810	-107.6169760
Apollo 1H BHL - plan hits target center - Point	0.00	0.000	6,144.00	7,346.25	-3,151.77	1,930,873.73	2,786,793.70	36.3063260	-107.6171300

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,756.92	1,756.00	Ojo Alamo		0.00	0.000
1,907.30	1,905.00	Kirtland		0.00	0.000
2,120.30	2,116.00	Fruitland		0.00	0.000
2,454.44	2,447.00	Pictured Cliffs		0.00	0.000
3,331.67	3,316.00	Chacra		0.00	0.000
4,006.00	3,984.00	Cliff House		0.00	0.000
4,069.60	4,047.00	Menefee		0.00	0.000
4,810.55	4,781.00	Point Lookout		0.00	0.000
5,055.85	5,024.00	Mancos		0.00	0.000
5,886.23	5,809.00	Gallup		0.00	0.000

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,400.00	1,400.00	0.00	0.00	Start Build 2.00
1,792.79	1,791.56	11.74	24.19	Start 3597.02 hold at 1792.79 MD
5,389.81	5,354.83	226.41	466.49	Start DLS 8.00 TFO -92.17
6,512.43	6,068.00	899.15	218.97	POE @ 6512' MD
6,512.43	6,068.00	899.15	218.97	36.2886160, -107.6056900
6,662.43	6,069.27	1,031.57	148.51	Last Perf @ 6662' MD
6,662.43	6,069.27	1,031.57	148.51	36.2889798, -107.6059291
10,755.75	6,104.00	4,645.05	-1,774.20	Start DLS 2.00 TFO 105.15
10,807.80	6,104.57	4,691.21	-1,798.25	Start 2980.41 hold at 10807.80 MD
13,708.21	6,142.94	7,274.98	-3,115.44	First Perf @ 13,708' MD
13,708.21	6,142.94	7,274.98	-3,115.44	36.3061302, -107.6170067
13,788.21	6,144.00	7,346.25	-3,151.77	TD at 13788.21



Logos Operating LLC

Rio Arriba, NM NAD83

Apollo 2407-29E

Apollo 2407-29E 1H

OH

Plan #3

Anticollision Report

30 January, 2020



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Scientific Drilling, Intl
Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Reference	Plan #3		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum ellipse separation of 1,000.00 usft	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	1/30/2020		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.00	13,788.21	Plan #3 (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						
Apollo 2407-29E						
Apollo 2407-29E 2H - OH - Plan #3	1,303.40	1,303.40	19.96	10.62	2.137	CC
Apollo 2407-29E 2H - OH - Plan #3	1,400.00	1,399.67	20.38	10.34	2.031	ES, SF
Apollo 2407-29E 3H - OH - Plan #3	1,203.33	1,203.33	39.93	31.30	4.628	CC
Apollo 2407-29E 3H - OH - Plan #3	1,300.00	1,299.31	40.36	31.04	4.332	ES, SF
Apollo 2407-29E 4H - OH - Plan #3	1,100.00	1,100.00	19.96	12.08	2.531	CC, ES
Apollo 2407-29E 4H - OH - Plan #3	1,200.00	1,199.42	21.33	12.74	2.483	SF

Offset Design	Apollo 2407-29E - Apollo 2407-29E 2H - OH - Plan #3										Offset Site Error:	0.00 usft
Survey Program:	O-MWD+HDGM										Offset Well Error:	0.00 usft
Reference	Offset	Semi Major Axis			Distance				Minimum Separation		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)	Separation Factor	
0.00	0.00	0.00	0.00	0.00	0.00	-47.57	13.47	-14.74	19.96	19.96	0.00	N/A
100.00	100.00	100.00	100.00	0.36	0.36	-47.57	13.47	-14.74	19.96	19.25	0.72	27.847
200.00	200.00	200.00	200.00	0.72	0.72	-47.57	13.47	-14.74	19.96	18.53	1.43	13.924
300.00	300.00	300.00	300.00	1.08	1.08	-47.57	13.47	-14.74	19.96	17.81	2.15	9.282
400.00	400.00	400.00	400.00	1.43	1.43	-47.57	13.47	-14.74	19.96	17.10	2.87	6.962
500.00	500.00	500.00	500.00	1.79	1.79	-47.57	13.47	-14.74	19.96	16.38	3.58	5.569
600.00	600.00	600.00	600.00	2.15	2.15	-47.57	13.47	-14.74	19.96	15.66	4.30	4.641
700.00	700.00	700.00	700.00	2.51	2.51	-47.57	13.47	-14.74	19.96	14.95	5.02	3.978
800.00	800.00	800.00	800.00	2.87	2.87	-47.57	13.47	-14.74	19.96	14.23	5.74	3.481
900.00	900.00	900.00	900.00	3.23	3.23	-47.57	13.47	-14.74	19.96	13.51	6.45	3.094
1,000.00	1,000.00	1,000.00	1,000.00	3.58	3.58	-47.57	13.47	-14.74	19.96	12.80	7.17	2.785
1,100.00	1,100.00	1,100.00	1,100.00	3.94	3.94	-47.57	13.47	-14.74	19.96	12.08	7.89	2.532
1,200.00	1,200.00	1,200.00	1,200.00	4.30	4.30	-47.57	13.47	-14.74	19.96	11.36	8.60	2.321
1,300.00	1,300.00	1,300.00	1,300.00	4.66	4.66	-47.57	13.47	-14.74	19.96	10.64	9.32	2.142
1,303.40	1,303.40	1,303.40	1,303.40	4.67	4.67	-47.57	13.47	-14.74	19.96	10.62	9.34	2.137 CC
1,400.00	1,400.00	1,399.67	1,399.66	5.02	5.02	-47.21	13.84	-14.95	20.38	10.34	10.03	2.031 ES, SF
1,500.00	1,499.98	1,498.85	1,498.78	5.37	5.37	-112.65	16.82	-16.67	24.33	13.60	10.73	2.267
1,600.00	1,599.84	1,597.53	1,597.22	5.72	5.72	-117.03	22.72	-20.08	33.00	21.58	11.42	2.891
1,700.00	1,699.45	1,695.33	1,694.49	6.08	6.08	-121.33	31.47	-25.14	46.60	34.51	12.09	3.854
1,792.79	1,791.56	1,784.98	1,783.31	6.41	6.40	-124.36	42.01	-31.23	63.68	50.97	12.71	5.010
1,800.00	1,798.70	1,791.89	1,790.14	6.44	6.43	-124.58	42.92	-31.75	65.18	52.42	12.76	5.109

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



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Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 2H - OH - Plan #3													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)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
1,900.00	1,897.76	1,887.20	1,884.06	6.80	6.78	-126.16	56.95	-39.86	87.52	74.11	13.41	6.526		
2,000.00	1,996.83	1,983.88	1,978.96	7.17	7.14	-126.52	72.93	-49.10	111.61	97.51	14.11	7.912		
2,100.00	2,095.89	2,080.92	2,074.21	7.54	7.52	-126.74	89.01	-58.38	135.74	120.93	14.82	9.161		
2,200.00	2,194.95	2,177.97	2,169.46	7.91	7.90	-126.89	105.08	-67.67	159.87	144.34	15.53	10.293		
2,300.00	2,294.01	2,275.01	2,264.71	8.29	8.29	-127.01	121.15	-76.96	184.01	167.75	16.25	11.321		
2,400.00	2,393.07	2,372.06	2,359.97	8.67	8.68	-127.10	137.22	-86.24	208.14	191.16	16.98	12.258		
2,500.00	2,492.13	2,469.10	2,455.22	9.06	9.07	-127.17	153.29	-95.53	232.27	214.56	17.71	13.116		
2,600.00	2,591.20	2,566.14	2,550.47	9.44	9.47	-127.22	169.37	-104.82	256.40	237.96	18.44	13.904		
2,700.00	2,690.26	2,663.19	2,645.72	9.83	9.87	-127.27	185.44	-114.11	280.54	261.36	19.18	14.629		
2,800.00	2,789.32	2,760.23	2,740.98	10.22	10.27	-127.31	201.51	-123.39	304.67	284.75	19.92	15.298		
2,900.00	2,888.38	2,857.28	2,836.23	10.60	10.68	-127.34	217.58	-132.68	328.80	308.15	20.66	15.918		
3,000.00	2,987.44	2,954.32	2,931.48	11.00	11.08	-127.37	233.65	-141.97	352.93	331.54	21.40	16.493		
3,100.00	3,086.50	3,051.36	3,026.73	11.39	11.49	-127.40	249.73	-151.25	377.07	354.92	22.14	17.028		
3,200.00	3,185.56	3,148.41	3,121.99	11.78	11.91	-127.42	265.80	-160.54	401.20	378.31	22.89	17.526		
3,300.00	3,284.63	3,245.45	3,217.24	12.17	12.32	-127.44	281.87	-169.83	425.33	401.69	23.64	17.992		
3,400.00	3,383.69	3,342.50	3,312.49	12.57	12.73	-127.46	297.94	-179.11	449.47	425.08	24.39	18.429		
3,500.00	3,482.75	3,439.54	3,407.74	12.96	13.15	-127.47	314.02	-188.40	473.60	448.46	25.14	18.838		
3,600.00	3,581.81	3,536.58	3,502.99	13.36	13.56	-127.49	330.09	-197.69	497.73	471.84	25.89	19.222		
3,700.00	3,680.87	3,633.63	3,598.25	13.75	13.98	-127.50	346.16	-206.97	521.87	495.22	26.65	19.584		
3,800.00	3,779.93	3,730.67	3,693.50	14.15	14.40	-127.51	362.23	-216.26	546.00	518.60	27.40	19.926		
3,900.00	3,878.99	3,827.72	3,788.75	14.55	14.82	-127.52	378.30	-225.55	570.14	541.98	28.16	20.248		
4,000.00	3,978.06	3,924.76	3,884.00	14.94	15.24	-127.53	394.38	-234.84	594.27	565.35	28.91	20.553		
4,100.00	4,077.12	4,021.81	3,979.26	15.34	15.66	-127.54	410.45	-244.12	618.40	588.73	29.67	20.842		
4,200.00	4,176.18	4,118.85	4,074.51	15.74	16.08	-127.55	426.52	-253.41	642.54	612.11	30.43	21.115		
4,300.00	4,275.24	4,215.89	4,169.76	16.14	16.50	-127.56	442.59	-262.70	666.67	635.48	31.19	21.375		
4,400.00	4,374.30	4,312.94	4,265.01	16.54	16.93	-127.56	458.66	-271.98	690.80	658.85	31.95	21.623		
4,500.00	4,473.36	4,409.98	4,360.27	16.94	17.35	-127.57	474.74	-281.27	714.94	682.23	32.71	21.858		
4,600.00	4,572.43	4,507.03	4,455.52	17.34	17.77	-127.58	490.81	-290.56	739.07	705.60	33.47	22.082		
4,700.00	4,671.49	4,604.07	4,550.77	17.74	18.20	-127.58	506.88	-299.84	763.20	728.97	34.23	22.296		
4,800.00	4,770.55	4,701.11	4,646.02	18.14	18.62	-127.59	522.95	-309.13	787.34	752.34	34.99	22.500		
4,900.00	4,869.61	4,798.16	4,741.27	18.54	19.05	-127.59	539.02	-318.42	811.47	775.72	35.76	22.695		
5,000.00	4,968.67	4,895.20	4,836.53	18.94	19.47	-127.60	555.10	-327.70	835.60	799.09	36.52	22.882		
5,100.00	5,067.73	4,992.25	4,931.78	19.34	19.90	-127.60	571.17	-336.99	859.74	822.46	37.28	23.061		
5,200.00	5,166.79	5,089.29	5,027.03	19.74	20.32	-127.61	587.24	-346.28	883.87	845.83	38.05	23.232		
5,300.00	5,265.86	5,186.34	5,122.28	20.14	20.75	-127.61	603.31	-355.57	908.01	869.20	38.81	23.397		
5,389.81	5,354.83	5,273.49	5,207.83	20.50	21.13	-127.62	617.75	-363.91	929.68	890.19	39.50	23.539		
5,400.00	5,364.92	5,283.39	5,217.55	20.54	21.18	-121.60	619.39	-364.85	932.08	892.51	39.57	23.553		
5,450.00	5,414.39	5,332.33	5,265.58	20.74	21.39	-95.22	627.49	-369.54	942.19	902.23	39.96	23.578		
5,500.00	5,463.59	5,381.66	5,314.00	20.93	21.61	-77.78	635.66	-374.26	949.49	909.14	40.35	23.529		
5,550.00	5,512.28	5,431.15	5,362.58	21.12	21.83	-67.41	643.86	-378.99	953.97	913.22	40.75	23.409		
5,600.00	5,560.22	5,480.56	5,411.08	21.31	22.04	-61.18	652.04	-383.72	955.64	914.49	41.15	23.221		
5,650.00	5,607.18	5,529.65	5,459.26	21.48	22.26	-57.38	660.17	-388.42	954.53	912.98	41.56	22.969		
5,700.00	5,652.93	5,555.35	5,484.48	21.65	22.37	-54.80	664.43	-390.88	951.00	909.25	41.75	22.779		
5,750.00	5,697.24	5,600.00	5,528.02	21.82	22.58	-53.47	672.94	-395.92	945.82	903.69	42.13	22.452		
5,800.00	5,739.90	5,600.00	5,528.02	21.97	22.58	-52.06	672.94	-395.92	939.33	897.30	42.02	22.352		
5,850.00	5,780.71	5,634.08	5,560.78	22.12	22.75	-51.75	680.93	-400.81	931.43	889.13	42.30	22.022		
5,900.00	5,819.46	5,650.00	5,575.93	22.27	22.83	-51.47	685.11	-403.39	922.51	880.18	42.33	21.791		
5,950.00	5,855.96	5,679.10	5,603.31	22.41	22.99	-51.80	693.44	-408.60	912.35	869.79	42.56	21.437		
6,000.00	5,890.04	5,700.00	5,622.73	22.55	23.11	-52.23	699.99	-412.74	901.16	858.48	42.68	21.116		
6,050.00	5,921.53	5,723.82	5,644.56	22.70	23.25	-52.99	708.01	-417.84	888.94	846.08	42.86	20.739		
6,100.00	5,950.27	5,750.00	5,668.18	22.87	23.41	-54.06	717.52	-423.92	875.82	832.70	43.12	20.312		
6,150.00	5,976.14	5,768.16	5,684.32	23.06	23.53	-55.10	724.53	-428.43	861.84	818.56	43.28	19.915		

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



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Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 2H - OH - Plan #3													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)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
6,200.00	5,998.99	5,800.00	5,712.08	23.29	23.74	-56.82	737.61	-436.89	847.25	803.51	43.74	19.370		
6,250.00	6,018.73	5,812.06	5,722.41	23.57	23.82	-58.01	742.83	-440.28	831.84	787.95	43.89	18.953		
6,300.00	6,035.24	5,833.81	5,740.77	23.90	23.98	-59.74	752.60	-446.63	816.07	771.76	44.30	18.421		
6,350.00	6,048.47	5,850.00	5,754.21	24.27	24.09	-61.39	760.17	-451.57	800.00	755.32	44.68	17.906		
6,400.00	6,058.33	5,876.82	5,776.00	24.69	24.29	-63.69	773.25	-460.14	783.70	738.31	45.39	17.265		
6,450.00	6,064.78	5,900.00	5,794.35	25.15	24.47	-65.98	785.08	-467.91	767.46	721.33	46.13	16.637		
6,500.00	6,067.79	5,919.06	5,809.10	25.65	24.63	-68.18	795.17	-474.55	751.43	704.54	46.89	16.025		
6,512.43	6,068.00	5,924.24	5,813.05	25.78	24.67	-68.77	797.97	-476.40	747.51	700.40	47.11	15.868		
6,600.00	6,068.74	5,962.94	5,841.78	26.74	25.00	-71.01	819.60	-490.69	723.21	674.44	48.78	14.828		
6,700.00	6,069.59	6,013.08	5,876.84	27.96	25.45	-73.82	849.45	-510.50	703.45	652.48	50.97	13.803		
6,800.00	6,070.44	6,070.39	5,913.73	29.29	26.01	-76.83	885.92	-534.80	691.87	638.48	53.39	12.960		
6,900.00	6,071.29	6,135.59	5,951.30	30.71	26.71	-79.94	930.18	-564.44	687.61	631.65	55.97	12.286		
6,919.04	6,071.45	6,150.00	5,958.93	31.00	26.86	-80.58	940.33	-571.25	687.53	631.04	56.50	12.169		
7,000.00	6,072.14	6,209.14	5,987.65	32.22	27.56	-82.98	983.21	-600.09	689.38	630.71	58.67	11.750		
7,100.00	6,072.99	6,290.89	6,020.14	33.80	28.61	-85.67	1,045.34	-642.05	695.56	634.06	61.51	11.309		
7,200.00	6,073.83	6,379.82	6,045.54	35.43	29.86	-87.74	1,115.82	-689.86	704.53	640.04	64.49	10.925		
7,300.00	6,074.68	6,473.89	6,060.70	37.13	31.27	-88.93	1,192.50	-742.09	714.94	647.32	67.63	10.572		
7,400.00	6,075.53	6,571.18	6,064.27	38.87	32.81	-89.16	1,272.70	-796.95	725.96	655.07	70.89	10.241		
7,500.00	6,076.38	6,670.56	6,065.08	40.65	34.47	-89.17	1,354.71	-853.09	737.07	662.76	74.31	9.919		
7,600.00	6,077.23	6,769.94	6,065.88	42.46	36.19	-89.18	1,436.71	-909.23	748.17	670.34	77.84	9.612		
7,700.00	6,078.08	6,869.32	6,066.68	44.31	37.98	-89.19	1,518.71	-965.37	759.28	677.82	81.46	9.321		
7,800.00	6,078.92	6,968.70	6,067.48	46.18	39.83	-89.20	1,600.71	-1,021.50	770.39	685.22	85.17	9.045		
7,900.00	6,079.77	7,068.08	6,068.28	48.08	41.72	-89.21	1,682.71	-1,077.64	781.50	692.55	88.95	8.786		
8,000.00	6,080.62	7,167.46	6,069.08	50.00	43.65	-89.21	1,764.72	-1,133.78	792.61	699.82	92.79	8.542		
8,100.00	6,081.47	7,266.84	6,069.88	51.94	45.63	-89.22	1,846.72	-1,189.92	803.72	707.03	96.69	8.312		
8,200.00	6,082.32	7,366.22	6,070.68	53.90	47.63	-89.23	1,928.72	-1,246.06	814.82	714.19	100.64	8.097		
8,300.00	6,083.17	7,465.60	6,071.48	55.87	49.66	-89.24	2,010.72	-1,302.20	825.93	721.31	104.63	7.894		
8,400.00	6,084.01	7,564.99	6,072.28	57.85	51.72	-89.25	2,092.73	-1,358.34	837.04	728.38	108.66	7.703		
8,500.00	6,084.86	7,664.37	6,073.08	59.85	53.80	-89.25	2,174.73	-1,414.48	848.15	735.43	112.72	7.524		
8,600.00	6,085.71	7,763.75	6,073.89	61.85	55.90	-89.26	2,256.73	-1,470.61	859.26	742.44	116.82	7.356		
8,700.00	6,086.56	7,863.13	6,074.69	63.87	58.01	-89.27	2,338.73	-1,526.75	870.37	749.43	120.94	7.197		
8,800.00	6,087.41	7,962.51	6,075.49	65.90	60.15	-89.27	2,420.74	-1,582.89	881.48	756.39	125.08	7.047		
8,900.00	6,088.26	8,061.89	6,076.29	67.93	62.29	-89.28	2,502.74	-1,639.03	892.58	763.33	129.25	6.906		
9,000.00	6,089.10	8,161.27	6,077.09	69.97	64.45	-89.29	2,584.74	-1,695.17	903.69	770.25	133.44	6.772		
9,100.00	6,089.95	8,260.65	6,077.89	72.02	66.62	-89.29	2,666.74	-1,751.31	914.80	777.15	137.65	6.646		
9,200.00	6,090.80	8,360.03	6,078.69	74.08	68.80	-89.30	2,748.75	-1,807.45	925.91	784.04	141.87	6.526		
9,300.00	6,091.65	8,459.42	6,079.49	76.14	70.99	-89.31	2,830.75	-1,863.59	937.02	790.91	146.11	6.413		
9,400.00	6,092.50	8,558.80	6,080.29	78.21	73.19	-89.31	2,912.75	-1,919.72	948.13	797.76	150.37	6.305		
9,500.00	6,093.35	8,658.18	6,081.09	80.28	75.40	-89.32	2,994.75	-1,975.86	959.24	804.60	154.63	6.203		
9,600.00	6,094.19	8,757.56	6,081.89	82.35	77.61	-89.32	3,076.75	-2,032.00	970.35	811.44	158.91	6.106		
9,700.00	6,095.04	8,856.94	6,082.70	84.43	79.83	-89.33	3,158.76	-2,088.14	981.45	818.26	163.20	6.014		
9,800.00	6,095.89	8,956.32	6,083.50	86.52	82.05	-89.33	3,240.76	-2,144.28	992.56	825.07	167.49	5.926		

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



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 3H - OH - Plan #3													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	-47.57	26.94	-29.47	39.93					
100.00	100.00	100.00	100.00	0.36	0.36	-47.57	26.94	-29.47	39.93	39.21	0.72	55.692		
200.00	200.00	200.00	200.00	0.72	0.72	-47.57	26.94	-29.47	39.93	38.49	1.43	27.846		
300.00	300.00	300.00	300.00	1.08	1.08	-47.57	26.94	-29.47	39.93	37.78	2.15	18.564		
400.00	400.00	400.00	400.00	1.43	1.43	-47.57	26.94	-29.47	39.93	37.06	2.87	13.923		
500.00	500.00	500.00	500.00	1.79	1.79	-47.57	26.94	-29.47	39.93	36.34	3.58	11.138		
600.00	600.00	600.00	600.00	2.15	2.15	-47.57	26.94	-29.47	39.93	35.63	4.30	9.282		
700.00	700.00	700.00	700.00	2.51	2.51	-47.57	26.94	-29.47	39.93	34.91	5.02	7.956		
800.00	800.00	800.00	800.00	2.87	2.87	-47.57	26.94	-29.47	39.93	34.19	5.74	6.962		
900.00	900.00	900.00	900.00	3.23	3.23	-47.57	26.94	-29.47	39.93	33.48	6.45	6.188		
1,000.00	1,000.00	1,000.00	1,000.00	3.58	3.58	-47.57	26.94	-29.47	39.93	32.76	7.17	5.569		
1,100.00	1,100.00	1,100.00	1,100.00	3.94	3.94	-47.57	26.94	-29.47	39.93	32.04	7.89	5.063		
1,200.00	1,200.00	1,200.00	1,200.00	4.30	4.30	-47.57	26.94	-29.47	39.93	31.32	8.60	4.641		
1,203.33	1,203.33	1,203.33	1,203.33	4.31	4.31	-47.57	26.94	-29.47	39.93	31.30	8.63	4.628 CC		
1,300.00	1,300.00	1,299.31	1,299.31	4.66	4.66	-47.61	27.20	-29.80	40.36	31.04	9.32	4.332 ES, SF		
1,400.00	1,400.00	1,397.81	1,397.75	5.02	5.00	-47.92	29.31	-32.46	43.79	33.78	10.01	4.374		
1,500.00	1,499.98	1,495.88	1,495.58	5.37	5.35	-114.16	33.49	-37.74	51.34	40.64	10.69	4.801		
1,600.00	1,599.84	1,594.18	1,593.40	5.72	5.70	-118.46	39.46	-45.28	63.45	52.07	11.38	5.577		
1,700.00	1,699.45	1,692.90	1,691.61	6.08	6.06	-123.46	45.68	-53.14	78.06	65.98	12.08	6.464		
1,792.79	1,791.56	1,784.03	1,782.28	6.41	6.39	-128.09	51.43	-60.39	93.89	81.16	12.73	7.378		
1,800.00	1,798.70	1,791.10	1,789.30	6.44	6.42	-128.46	51.87	-60.95	95.21	82.44	12.78	7.451		
1,900.00	1,897.76	1,889.04	1,886.74	6.80	6.78	-132.67	58.05	-68.75	113.91	100.43	13.48	8.451		
2,000.00	1,996.83	1,986.99	1,984.19	7.17	7.14	-135.68	64.22	-76.55	133.04	118.86	14.18	9.381		
2,100.00	2,095.89	2,084.94	2,081.63	7.54	7.50	-137.94	70.40	-84.34	152.43	137.54	14.89	10.238		
2,200.00	2,194.95	2,182.88	2,179.07	7.91	7.86	-139.68	76.57	-92.14	172.00	156.40	15.60	11.028		
2,300.00	2,294.01	2,280.83	2,276.51	8.29	8.23	-141.07	82.75	-99.94	191.69	175.38	16.31	11.754		
2,400.00	2,393.07	2,378.78	2,373.95	8.67	8.59	-142.20	88.92	-107.73	211.47	194.45	17.02	12.424		
2,500.00	2,492.13	2,476.73	2,471.39	9.06	8.96	-143.14	95.10	-115.53	231.31	213.58	17.73	13.043		
2,600.00	2,591.20	2,574.67	2,568.83	9.44	9.33	-143.93	101.27	-123.32	251.21	232.76	18.45	13.615		
2,700.00	2,690.26	2,672.62	2,666.27	9.83	9.70	-144.60	107.45	-131.12	271.14	251.97	19.17	14.146		
2,800.00	2,789.32	2,770.57	2,763.71	10.22	10.06	-145.18	113.62	-138.92	291.11	271.22	19.89	14.639		
2,900.00	2,888.38	2,868.51	2,861.15	10.60	10.43	-145.69	119.79	-146.71	311.10	290.49	20.61	15.098		
3,000.00	2,987.44	2,966.46	2,958.59	11.00	10.80	-146.13	125.97	-154.51	331.11	309.78	21.33	15.526		
3,100.00	3,086.50	3,064.41	3,056.03	11.39	11.17	-146.52	132.14	-162.31	351.13	329.09	22.05	15.926		
3,200.00	3,185.56	3,162.35	3,153.48	11.78	11.54	-146.88	138.32	-170.10	371.18	348.41	22.77	16.302		
3,300.00	3,284.63	3,260.30	3,250.92	12.17	11.92	-147.19	144.49	-177.90	391.23	367.74	23.49	16.654		
3,400.00	3,383.69	3,358.25	3,348.36	12.57	12.29	-147.48	150.67	-185.69	411.29	387.08	24.22	16.984		
3,500.00	3,482.75	3,456.20	3,445.80	12.96	12.66	-147.74	156.84	-193.49	431.37	406.43	24.94	17.296		
3,600.00	3,581.81	3,554.14	3,543.24	13.36	13.03	-147.97	163.02	-201.29	451.45	425.78	25.66	17.590		
3,700.00	3,680.87	3,652.09	3,640.68	13.75	13.40	-148.19	169.19	-209.08	471.53	445.14	26.39	17.868		
3,800.00	3,779.93	3,750.04	3,738.12	14.15	13.77	-148.38	175.37	-216.88	491.63	464.51	27.12	18.131		
3,900.00	3,878.99	3,847.98	3,835.56	14.55	14.15	-148.57	181.54	-224.68	511.72	483.88	27.84	18.379		
4,000.00	3,978.06	3,945.93	3,933.00	14.94	14.52	-148.73	187.72	-232.47	531.83	503.26	28.57	18.616		
4,100.00	4,077.12	4,043.88	4,030.44	15.34	14.89	-148.89	193.89	-240.27	551.93	522.64	29.30	18.840		
4,200.00	4,176.18	4,141.83	4,127.88	15.74	15.27	-149.04	200.07	-248.06	572.04	542.02	30.02	19.053		
4,300.00	4,275.24	4,239.77	4,225.32	16.14	15.64	-149.17	206.24	-255.86	592.16	561.41	30.75	19.256		
4,400.00	4,374.30	4,337.72	4,322.76	16.54	16.01	-149.30	212.42	-263.66	612.27	580.80	31.48	19.450		
4,500.00	4,473.36	4,435.67	4,420.21	16.94	16.39	-149.42	218.59	-271.45	632.39	600.19	32.21	19.635		
4,600.00	4,572.43	4,533.61	4,517.65	17.34	16.76	-149.53	224.77	-279.25	652.52	619.58	32.94	19.811		
4,700.00	4,671.49	4,631.56	4,615.09	17.74	17.14	-149.63	230.94	-287.05	672.64	638.97	33.67	19.980		
4,800.00	4,770.55	4,729.51	4,712.53	18.14	17.51	-149.73	237.11	-294.84	692.77	658.37	34.39	20.142		
4,900.00	4,869.61	4,827.45	4,809.97	18.54	17.88	-149.82	243.29	-302.64	712.89	677.77	35.12	20.296		

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	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 3H - OH - Plan #3														Offset Site Error:	0.00 usft
Survey Program: O-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			
5,000.00	4,968.67	4,925.40	4,907.41	18.94	18.26	-149.91	249.46	-310.43	733.02	697.17	35.85	20.445			
5,100.00	5,067.73	5,023.35	5,004.85	19.34	18.63	-149.99	255.64	-318.23	753.16	716.57	36.58	20.587			
5,200.00	5,166.79	5,121.30	5,102.29	19.74	19.01	-150.07	261.81	-326.03	773.29	735.97	37.31	20.724			
5,300.00	5,265.86	5,219.24	5,199.73	20.14	19.38	-150.15	267.99	-333.82	793.42	755.38	38.04	20.855			
5,389.81	5,354.83	5,307.21	5,287.25	20.50	19.72	-150.21	273.53	-340.83	811.51	772.80	38.70	20.969			
5,400.00	5,364.92	5,317.20	5,297.18	20.54	19.76	-144.18	274.16	-341.62	813.52	774.74	38.78	20.980			
5,450.00	5,414.39	5,366.34	5,346.07	20.74	19.94	-117.76	277.26	-345.53	822.30	783.16	39.14	21.008			
5,500.00	5,463.59	5,415.54	5,395.02	20.93	20.13	-100.35	280.36	-349.45	829.26	789.75	39.51	20.987			
5,550.00	5,512.28	5,450.00	5,429.27	21.12	20.26	-89.88	282.65	-352.42	834.77	795.00	39.77	20.991			
5,600.00	5,560.22	5,470.89	5,449.95	21.31	20.35	-83.24	284.36	-354.84	839.89	799.99	39.89	21.054			
5,650.00	5,607.18	5,500.00	5,478.60	21.48	20.47	-79.03	287.19	-359.11	844.77	804.70	40.07	21.080			
5,700.00	5,652.93	5,517.45	5,495.67	21.65	20.54	-75.98	289.15	-362.17	849.32	809.21	40.11	21.173			
5,750.00	5,697.24	5,550.00	5,527.25	21.82	20.69	-74.16	293.29	-368.85	853.80	813.48	40.32	21.175			
5,800.00	5,739.90	5,562.92	5,539.68	21.97	20.74	-72.49	295.12	-371.86	857.87	817.60	40.27	21.304			
5,850.00	5,780.71	5,585.19	5,560.95	22.12	20.85	-71.50	298.50	-377.51	861.92	821.58	40.34	21.368			
5,900.00	5,819.46	5,600.00	5,574.98	22.27	20.92	-70.60	300.92	-381.60	865.93	825.64	40.29	21.491			
5,950.00	5,855.96	5,628.70	5,601.88	22.41	21.06	-70.40	305.97	-390.25	869.79	829.30	40.49	21.481			
6,000.00	5,890.04	5,650.00	5,621.57	22.55	21.16	-70.17	310.04	-397.28	873.74	833.14	40.60	21.523			
6,050.00	5,921.53	5,670.73	5,640.48	22.70	21.27	-70.09	314.24	-404.62	877.77	837.04	40.73	21.550			
6,100.00	5,950.27	5,700.00	5,666.77	22.87	21.43	-70.48	320.60	-415.82	882.04	840.97	41.07	21.476			
6,150.00	5,976.14	5,700.00	5,666.77	23.06	21.43	-69.78	320.60	-415.82	886.49	845.57	40.92	21.665			
6,200.00	5,998.99	5,730.63	5,693.69	23.29	21.60	-70.44	327.76	-428.56	891.03	849.61	41.42	21.513			
6,250.00	6,018.73	5,750.00	5,710.38	23.57	21.71	-70.70	332.55	-437.14	896.05	854.28	41.77	21.452			
6,300.00	6,035.24	5,768.24	5,725.85	23.90	21.82	-70.95	337.25	-445.59	901.47	859.30	42.18	21.373			
6,350.00	6,048.47	5,786.28	5,740.90	24.27	21.94	-71.24	342.07	-454.28	907.37	864.71	42.66	21.271			
6,400.00	6,058.33	5,800.00	5,752.18	24.69	22.02	-71.34	345.84	-461.12	913.80	870.67	43.12	21.190			
6,450.00	6,064.78	5,820.67	5,768.89	25.15	22.16	-71.80	351.71	-471.79	920.77	876.97	43.80	21.020			
6,500.00	6,067.79	5,836.96	5,781.79	25.65	22.27	-72.06	356.49	-480.49	928.39	883.93	44.46	20.883			
6,512.43	6,068.00	5,850.00	5,791.97	25.78	22.36	-72.60	360.41	-487.65	930.46	885.65	44.81	20.766			
6,600.00	6,068.74	5,869.88	5,807.18	26.74	22.50	-73.63	366.53	-498.88	947.82	901.96	45.86	20.667			
6,700.00	6,069.59	5,900.00	5,829.55	27.96	22.72	-75.14	376.17	-516.61	975.17	927.97	47.20	20.659			



Scientific Drilling, Intl
Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 4H - OH - Plan #3													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)	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	132.43	-13.47	14.74	19.96	19.96	0.00	N/A		
100.00	100.00	100.00	100.00	0.36	0.36	132.43	-13.47	14.74	19.96	19.25	0.72	27.845		
200.00	200.00	200.00	200.00	0.72	0.72	132.43	-13.47	14.74	19.96	18.53	1.43	13.923		
300.00	300.00	300.00	300.00	1.08	1.08	132.43	-13.47	14.74	19.96	17.81	2.15	9.282		
400.00	400.00	400.00	400.00	1.43	1.43	132.43	-13.47	14.74	19.96	17.10	2.87	6.961		
500.00	500.00	500.00	500.00	1.79	1.79	132.43	-13.47	14.74	19.96	16.38	3.58	5.569		
600.00	600.00	600.00	600.00	2.15	2.15	132.43	-13.47	14.74	19.96	15.66	4.30	4.641		
700.00	700.00	700.00	700.00	2.51	2.51	132.43	-13.47	14.74	19.96	14.94	5.02	3.978		
800.00	800.00	800.00	800.00	2.87	2.87	132.43	-13.47	14.74	19.96	14.23	5.74	3.481		
900.00	900.00	900.00	900.00	3.23	3.23	132.43	-13.47	14.74	19.96	13.51	6.45	3.094		
1,000.00	1,000.00	1,000.00	1,000.00	3.58	3.58	132.43	-13.47	14.74	19.96	12.79	7.17	2.785		
1,100.00	1,100.00	1,100.00	1,100.00	3.94	3.94	132.43	-13.47	14.74	19.96	12.08	7.89	2.531 CC, ES		
1,200.00	1,200.00	1,199.42	1,199.40	4.30	4.29	129.48	-13.56	16.46	21.33	12.74	8.59	2.483 SF		
1,300.00	1,300.00	1,298.61	1,298.45	4.66	4.63	122.61	-13.83	21.61	25.70	16.42	9.28	2.770		
1,400.00	1,400.00	1,397.32	1,396.79	5.02	4.98	115.34	-14.27	30.13	33.49	23.54	9.96	3.364		
1,500.00	1,499.98	1,495.52	1,494.26	5.37	5.33	46.89	-14.89	41.96	43.69	33.07	10.62	4.116		
1,600.00	1,599.84	1,593.29	1,590.85	5.72	5.69	45.72	-15.67	57.04	54.85	43.59	11.26	4.871		
1,700.00	1,699.45	1,690.59	1,686.42	6.08	6.06	46.17	-16.62	75.31	66.83	54.93	11.90	5.617		
1,792.79	1,791.56	1,780.44	1,774.06	6.41	6.41	47.36	-17.65	95.06	78.69	66.20	12.49	6.301		
1,800.00	1,798.70	1,787.40	1,780.82	6.44	6.44	47.48	-17.74	96.70	79.65	67.12	12.53	6.355		
1,900.00	1,897.76	1,883.51	1,873.77	6.80	6.85	48.54	-19.01	121.07	94.66	81.49	13.17	7.187		
2,000.00	1,996.83	1,978.63	1,964.92	7.17	7.28	48.72	-20.42	148.24	112.77	98.97	13.80	8.174		
2,100.00	2,095.89	2,072.57	2,054.00	7.54	7.73	48.37	-21.97	178.02	133.92	119.51	14.41	9.292		
2,200.00	2,194.95	2,165.17	2,140.79	7.91	8.22	47.74	-23.65	210.22	158.06	143.04	15.01	10.527		
2,300.00	2,294.01	2,256.24	2,225.11	8.29	8.74	46.96	-25.44	244.61	185.14	169.54	15.60	11.866		
2,400.00	2,393.07	2,345.67	2,306.79	8.67	9.29	46.14	-27.33	280.96	215.13	198.95	16.18	13.300		
2,500.00	2,492.13	2,433.31	2,385.70	9.06	9.88	45.33	-29.32	319.03	247.95	231.21	16.73	14.818		
2,600.00	2,591.20	2,519.07	2,461.75	9.44	10.51	44.54	-31.38	358.61	283.54	266.26	17.28	16.413		
2,700.00	2,690.26	2,600.00	2,532.39	9.83	11.15	43.83	-33.43	398.03	321.83	304.10	17.73	18.149		
2,800.00	2,789.32	2,686.05	2,606.28	10.22	11.89	43.11	-35.72	442.08	362.68	344.33	18.35	19.766		
2,900.00	2,888.38	2,776.80	2,683.69	10.60	12.71	42.46	-38.19	489.37	404.50	385.40	19.09	21.186		
3,000.00	2,987.44	2,867.56	2,761.11	11.00	13.56	41.94	-40.65	536.66	446.35	426.50	19.84	22.492		
3,100.00	3,086.50	2,958.31	2,838.53	11.39	14.42	41.50	-43.11	583.95	488.23	467.62	20.60	23.695		
3,200.00	3,185.56	3,049.06	2,915.94	11.78	15.30	41.13	-45.57	631.24	530.12	508.75	21.37	24.805		
3,300.00	3,284.63	3,139.81	2,993.36	12.17	16.19	40.82	-48.04	678.53	572.04	549.89	22.14	25.832		
3,400.00	3,383.69	3,230.56	3,070.78	12.57	17.10	40.55	-50.50	725.82	613.96	591.04	22.92	26.785		
3,500.00	3,482.75	3,321.31	3,148.19	12.96	18.02	40.31	-52.96	773.11	655.90	632.19	23.70	27.670		
3,600.00	3,581.81	3,412.06	3,225.61	13.36	18.94	40.10	-55.42	820.40	697.84	673.35	24.49	28.494		
3,700.00	3,680.87	3,502.82	3,303.03	13.75	19.87	39.92	-57.89	867.69	739.79	714.51	25.28	29.262		
3,800.00	3,779.93	3,593.57	3,380.44	14.15	20.81	39.76	-60.35	914.99	781.75	755.67	26.07	29.981		
3,900.00	3,878.99	3,684.32	3,457.86	14.55	21.75	39.61	-62.81	962.28	823.71	796.83	26.87	30.653		
4,000.00	3,978.06	3,775.07	3,535.28	14.94	22.70	39.48	-65.28	1,009.57	865.67	838.00	27.67	31.284		
4,100.00	4,077.12	3,865.82	3,612.69	15.34	23.66	39.35	-67.74	1,056.86	907.64	879.17	28.47	31.877		
4,200.00	4,176.18	3,956.57	3,690.11	15.74	24.61	39.24	-70.20	1,104.15	949.61	920.33	29.28	32.435		
4,300.00	4,275.24	4,047.32	3,767.53	16.14	25.57	39.14	-72.66	1,151.44	991.58	961.50	30.08	32.961		
5,200.00	5,166.79	7,834.88	6,058.87	19.74	69.71	134.26	-103.64	428.20	947.42	906.33	41.09	23.056		
5,300.00	5,265.86	7,821.75	6,059.00	20.14	69.39	132.43	-103.90	441.33	857.24	813.43	43.81	19.568		
5,389.81	5,354.83	7,809.96	6,059.11	20.50	69.11	130.74	-104.13	453.12	778.11	731.26	46.85	16.609		
5,400.00	5,364.92	7,808.66	6,059.12	20.54	69.08	135.52	-104.16	454.42	769.30	722.06	47.24	16.285		
5,450.00	5,414.39	7,803.30	6,059.17	20.74	68.95	156.87	-104.27	459.77	727.42	677.97	49.45	14.711		
5,500.00	5,463.59	7,799.68	6,059.21	20.93	68.86	170.80	-104.34	463.40	688.32	636.15	52.16	13.196		
5,550.00	5,512.28	7,797.81	6,059.23	21.12	68.82	178.87	-104.38	465.27	652.72	597.31	55.42	11.779		

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	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 4H - OH - Plan #3													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)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
5,600.00	5,560.22	7,797.69	6,059.23	21.31	68.82	-176.18	-104.38	465.38	621.44	562.25	59.19	10.500		
5,650.00	5,607.18	7,799.34	6,059.21	21.48	68.86	-172.80	-104.35	463.73	595.32	531.91	63.40	9.390		
5,700.00	5,652.93	7,802.74	6,059.18	21.65	68.94	-170.18	-104.28	460.33	575.17	507.26	67.91	8.469		
5,750.00	5,697.24	7,807.88	6,059.13	21.82	69.06	-167.90	-104.18	455.20	561.73	489.22	72.51	7.747		
5,800.00	5,739.90	7,814.73	6,059.06	21.97	69.22	-165.72	-104.04	448.35	555.48	478.55	76.94	7.220		
5,817.11	5,754.08	7,817.46	6,059.04	22.02	69.29	-164.96	-103.98	445.62	555.05	476.68	78.37	7.082		
5,850.00	5,780.71	7,823.26	6,058.98	22.12	69.43	-163.46	-103.87	439.82	556.65	475.68	80.97	6.875		
5,900.00	5,819.46	7,833.42	6,058.88	22.27	69.67	-161.02	-103.67	429.66	565.11	480.67	84.43	6.693		
5,950.00	5,855.96	7,845.17	6,058.77	22.41	69.96	-158.28	-103.43	417.92	580.40	493.14	87.26	6.651		
6,000.00	5,890.04	7,858.45	6,058.64	22.55	70.27	-155.15	-103.17	404.64	601.86	512.39	89.47	6.727		
6,050.00	5,921.53	7,873.20	6,058.50	22.70	70.63	-151.53	-102.87	389.90	628.65	537.51	91.15	6.897		
6,100.00	5,950.27	7,889.33	6,058.35	22.87	71.02	-147.31	-102.55	373.76	659.92	567.51	92.41	7.141		
6,150.00	5,976.14	7,906.79	6,058.18	23.06	71.44	-142.40	-102.20	356.31	694.81	601.44	93.37	7.441		
6,200.00	5,998.99	7,925.47	6,058.00	23.29	71.89	-136.70	-101.83	337.64	732.57	638.42	94.15	7.781		
6,250.00	6,018.73	7,945.29	6,057.81	23.57	72.38	-130.20	-101.44	317.82	772.52	677.72	94.81	8.149		
6,300.00	6,035.24	7,966.15	6,057.61	23.90	72.89	-122.94	-101.02	296.96	814.08	718.68	95.40	8.533		
6,350.00	6,048.47	7,987.96	6,057.40	24.27	73.42	-115.11	-100.59	275.17	856.75	760.77	95.98	8.926		
6,400.00	6,058.33	8,010.59	6,057.18	24.69	73.98	-106.98	-100.14	252.54	900.12	803.55	96.57	9.321		
6,450.00	6,064.78	8,033.95	6,056.95	25.15	74.56	-98.94	-99.67	229.18	943.84	846.65	97.19	9.712		
6,500.00	6,067.79	8,057.92	6,056.72	25.65	75.15	-91.33	-99.19	205.22	987.62	889.79	97.83	10.095		
6,512.43	6,068.00	8,063.96	6,056.66	25.78	75.30	-89.54	-99.07	199.18	998.48	900.49	97.99	10.189		

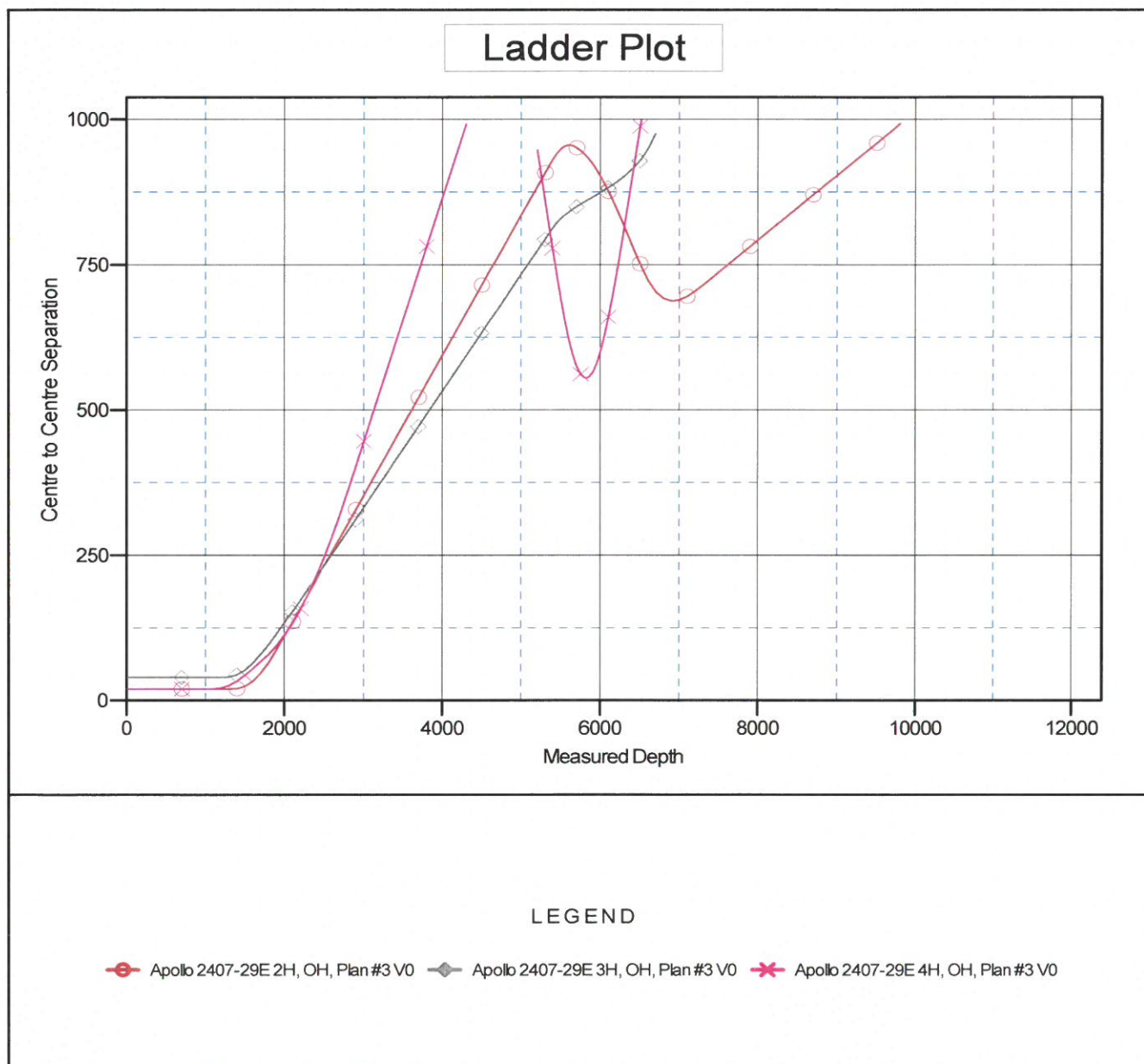
CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Reference Site: Apollo 2407-29E
Site Error: 0.00 usft
Reference Well: Apollo 2407-29E 1H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #3

Local Co-ordinate Reference: Well Apollo 2407-29E 1H - Slot B
TVD Reference: GL 7300' @ 7300.00usft
MD Reference: GL 7300' @ 7300.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: Grand Junction
Offset TVD Reference: Offset Datum

Reference Depths are relative to GL 7300' @ 7300.00usft
Offset Depths are relative to Offset Datum
Central Meridian is -107.8333334

Coordinates are relative to: Apollo 2407-29E 1H - Slot B
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.13°

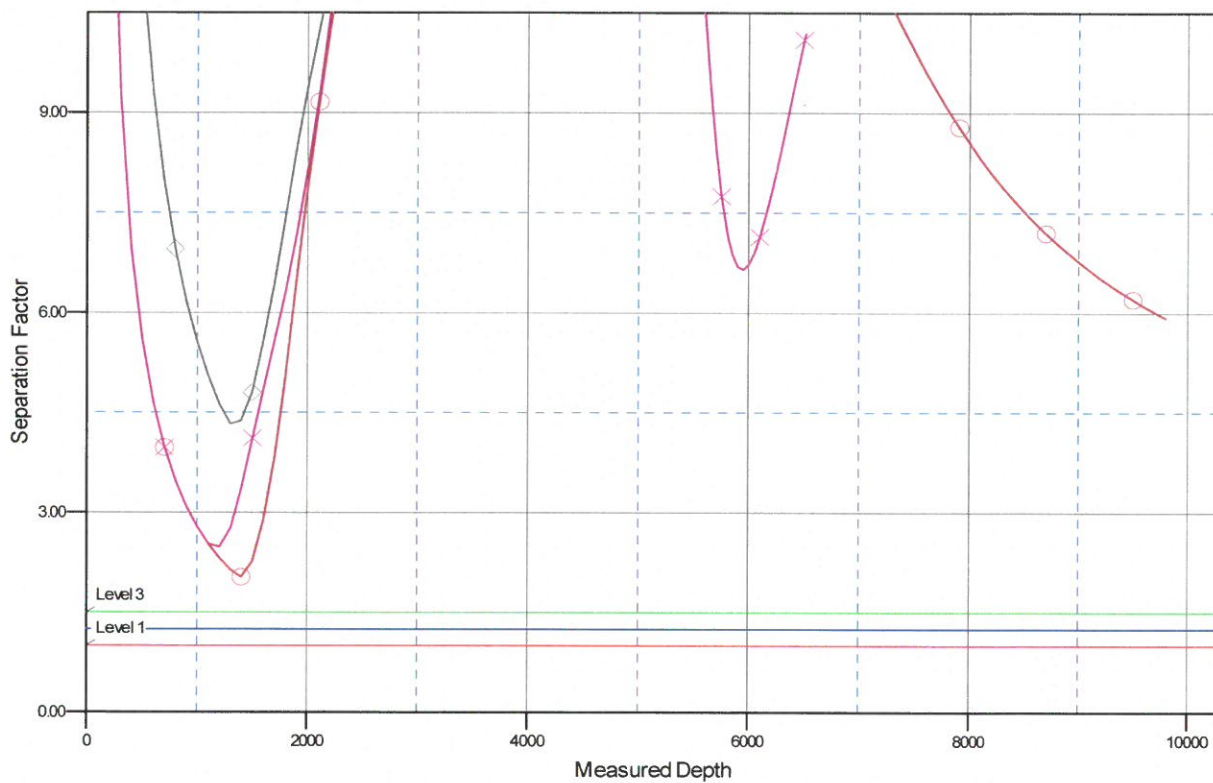


Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 1H - Slot B
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 1H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 7300' @ 7300.00usft
Offset Depths are relative to Offset Datum
Central Meridian is -107.8333334

Coordinates are relative to: Apollo 2407-29E 1H - Slot B
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.13°

Separation Factor Plot



LEGEND

—○— Apollo 2407-29E 2H, OH, Plan #3 V0 —◇— Apollo 2407-29E 3H, OH, Plan #3 V0 —×— Apollo 2407-29E 4H, OH, Plan #3 V0