Form 3160-3
(March 2012)

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

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

1a. Type of work: ☑ DRILL ☐ REENTER	5. Lease Serial No. NMNM60393
	6. If Indian, Allotee or Tribe Name
	7. If Unit or CA Agreement, Name and No.
1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other ☑ Single Zone ☐ Multiple Zone	8. Lease Name and Well No. BLACK & TAN 27 FEDERAL C 305H (319564)
2. Name of Operator APACHE CORPORATION (873)	9. API Well No. 30-025-43940
3a. Address 303 Veterans Airpark Lane #1000 Midland TX	3b. Phone No. (include area code) (432)818-1000
	10. Field and Pool, or Exploratory (37580) BONE SPRING / LEA, BONE SPRING, S
4. Location of Well (Report location clearly and in accordance with any State requirements.*) At surface SWSE / 215 FSL / 2112 FEL / LAT 32.5374365 / LONG -103.5463507 At proposed prod. zone NWNE / 280 FNL / 2315 FEL / LAT 32.5505934 / LONG -103.5470155	11. Sec., T. R. M. or Blk. and Survey or Area SEC 27 / T20S / R34E / NMP
14. Distance in miles and direction from nearest town or post office* 25 miles	12. County or Parish LEA / 13. State NM

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 215 feet	16. No. of acres in lease 80	17. Spacing Unit dedicated to this well 160
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 40 feet	19. Proposed Depth 11039 feet / 15723 feet	20. BLM/BIA Bond No. on file FED: NMB000736
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 3714 feet	22. Approximate date work will start* 08/25/2017	23. Estimated duration 35 days

24. Attachments

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

1. Well plat certified by a registered surveyor.
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 required by the BLM.

25. Signature (Electronic Submission)	Name (Printed/Typed) Sorina Flores / Ph: (432)818-1167	Date 02/07/2017
Title Supv of Drilling Services		
Approved by (Signature) (Electronic Submission)	Name (Printed/Typed) Cody Layton / Ph: (575)234-5959	Date 08/31/2017
Title Supervisor Multiple Resources	Office CARLSBAD	

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

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

(Continued on page 2)

*(Instructions on page 2)

APPROVED WITH CONDITIONS

KZ
09/06/17

AFMSS

U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT

Operator Certification Data Report

09/01/2017

Operator Certification

I hereby certify that I, or someone under my direct supervision, have inspected the drill site and access route proposed herein; that I am familiar with the conditions which currently exist; that I have full knowledge of state and Federal laws applicable to this operation; that the statements made in this APD package are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed in conformity with this APD package and the terms and conditions under which it is approved. I also certify that I, or the company I represent, am responsible for the operations conducted under this application. These statements are subject to the provisions of 18 U.S.C. 1001 for the filing of false statements.

NAME: Sorina Flores **Signed on:** 02/01/2017

Title: Supv of Drilling Services

Street Address: 303 Veterans Airpark Ln #1000

City: Midland **State:** TX **Zip:** 79705

Phone: (432)818-1167

Email address: sorina.flores@apachecorp.com

Field Representative

Representative Name:

Street Address:

City: **State:** **Zip:**

Phone:

Email address:

AFMSS

U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT

Application Data Report

09/01/2017

APD ID: 10400010818 **Submission Date:** 02/07/2017

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - General

APD ID: 10400010818 **Tie to previous NOS?** **Submission Date:** 02/07/2017

BLM Office: CARLSBAD **User:** Sorina Flores **Title:** Supv of Drilling Services

Federal/Indian APD: FED **Is the first lease penetrated for production Federal or Indian?** FED

Lease number: NMNM60393 **Lease Acres:** 80

Surface access agreement in place? **Allotted?** **Reservation:**

Agreement in place? NO **Federal or Indian agreement:**

Agreement number:

Agreement name:

Keep application confidential? YES

Permitting Agent? NO **APD Operator:** APACHE CORPORATION

Operator letter of designation:

Operator Info

Operator Organization Name: APACHE CORPORATION

Operator Address: 303 Veterans Airpark Lane #1000

Zip: 79705

Operator PO Box:

Operator City: Midland **State:** TX

Operator Phone: (432)818-1000

Operator Internet Address:

Section 2 - Well Information

Well in Master Development Plan? NO **Mater Development Plan name:**

Well in Master SUPO? NO **Master SUPO name:**

Well in Master Drilling Plan? NO **Master Drilling Plan name:**

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H **Well API Number:**

Field/Pool or Exploratory? Field and Pool **Field Name:** BONE SPRING **Pool Name:** LEA, BONE SPRING, S

Is the proposed well in an area containing other mineral resources? POTASH

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

Describe other minerals:

Is the proposed well in a Helium production area? N **Use Existing Well Pad?** NO **New surface disturbance?**

Type of Well Pad: SINGLE WELL **Multiple Well Pad Name:** **Number:**

Well Class: HORIZONTAL **Number of Legs:**

Well Work Type: Drill

Well Type: OIL WELL

Describe Well Type:

Well sub-Type: OTHER

Describe sub-type: DEVELOPMENT

Distance to town: 25 Miles **Distance to nearest well:** 40 FT **Distance to lease line:** 215 FT

Reservoir well spacing assigned acres Measurement: 160 Acres

Well plat: BlkTan27FedCom305H_PlatREV2_sign_04-13-2017.pdf

Well work start Date: 08/25/2017 **Duration:** 35 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number:

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
SHL Leg #1	215	FSL	2112	FEL	20S	34E	27	Aliquot SWSE	32.5374365	-103.5463507	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 60393	3714	0	0
KOP Leg #1	215	FSL	2112	FEL	20S	34E	27	Aliquot SWSE	32.5374365	-103.5463507	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 60393	-6852	10566	10566
PPP Leg #1	215	FSL	2112	FEL	20S	34E	27	Aliquot SWSE	32.5374365	-103.5463507	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 60393	-4863	8577	8577

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
EXIT Leg #1	280	FNL	2315	FEL	20S	34E	27	Aliquot NWNE	32.5505934	-103.5470155	LEA	NEW MEXICO	FIRST PRIN	F	NMNM 082	-7325	15723	11039
BHL Leg #1	280	FNL	2315	FEL	20S	34E	27	Aliquot NWNE	32.5505934	-103.5470155	LEA	NEW MEXICO	FIRST PRIN	F	NMNM 082	-7325	15723	11039

APD ID: 10400010818 **Submission Date:** 02/07/2017

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
17746	RUSTLER	3714	1629	1629		POTASH	No
18574	SALADO	1753	1961	1961		POTASH	No
17724	TANSILL	345	3369	3369		OIL	No
17694	YATES	190	3524	3524		NATURAL GAS,OIL	No
17740	CAPITAN REEF	-1038	4752	4752		USEABLE WATER	No
15315	DELAWARE	-1760	5474	5474		OIL	No
17688	BONE SPRING	-4863	8577	8577		OIL	Yes

Section 2 - Blowout Prevention

Pressure Rating (PSI): 5M **Rating Depth:** 12500

Equipment: Rotating Head, Mud Gas Separator, Blow Down Pit, Flare Line

Requesting Variance? NO

Variance request:

Testing Procedure: BOP/BOPE will be tested by independent service company to 250psi low and high pressure indicated above per Onshore Order 2 requirements. System may be upgraded to higher pressure but sill tested to WP listed . If system is upgraded, all components installed will be functional and tested. Pipe rams will be operationally checked each 24 hr period. Blind rams will be operationally checked on each TOOH. These checks will be noted on daily tour sheets. Other accessories to BOP equipment will include Kelly cock and floor safety valve (inside BOP), choke lines and choke manifold. (see attached schematic)

Choke Diagram Attachment:

BlkTan27Fed305H_BOP_Manif_SchemREV_07-18-2017.pdf

BOP Diagram Attachment:

BlkTan27Fed305H_BOP_Manif_SchemREV_07-18-2017.pdf

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	INTERMEDIATE	12.25	9.625	NEW	API	N	0	900	0	900	-7325	-8225	900	J-55	40	BUTT	5.37	1.7	BUOY	2.24	BUOY	1.96
2	SURFACE	17.5	13.375	NEW	API	N	0	1700	0	1700	-7325	-9025	1700	J-55	54.5	BUTT	2.15	1.82	BUOY	4.04	BUOY	3.79
3	INTERMEDIATE	12.25	9.625	NEW	API	N	900	5780	900	5780	-8225	-13105	4880	J-55	40	LTC	1.54	1.87	BUOY	1.8	BUOY	2.15
4	PRODUCTION	8.75	5.5	NEW	API	N	0	15723	0	15723	-7325	-23048	15723	P-110	17	BUTT	1.35	1.28	BUOY	2.12	BUOY	2.03

Casing Attachments

Casing ID: 1 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

BlkTan27FedCom305H_IntermCsgAssum_04-06-2017.pdf

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

Casing Attachments

Casing ID: 2 **String Type:** SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

BlkTan27FedCom305H_SurfCsgAssum_04-06-2017.pdf

Casing ID: 3 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

BlkTan27FedCom305H_IntermCsgAssum_04-06-2017.pdf

Casing ID: 4 **String Type:** PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

BlkTan27FedCom305H_ProdCsgAssum_04-06-2017.pdf

Section 4 - Cement

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	1295	650	1.73	13.5	1124.5	25	CI C	4% Bentonite + 1% CaCl2
SURFACE	Tail		1285	1700	300	1.33	14.8	399	25	CI C	1% CaCl2
INTERMEDIATE	Lead		0	5144	1043	1.89	12.9	1966.06	25	CI C	5% NaCl + 6% Bentonite + 2lb/sk Kolseal + 0.125 lb/sk CF + 0.4% Retarder
INTERMEDIATE	Tail		5144	5780	200	1.34	14.8	268	25	CI C	0.2% Retarder
INTERMEDIATE	Lead		0	5144	1043	1.89	12.9	1966.06	25	CI C	5% NaCl + 6% Bentonite + 2 lb/sk Kolseal + 0.125 lb/sk CF + 0.4% Retarder
INTERMEDIATE	Tail		5144	5780	200	1.34	14.8	268	25	CI C	0.2% Retarder
PRODUCTION	Lead		3000	10566	938	2.32	11.9	2176.16	20	H	10% Gel + 5% Salt
PRODUCTION	Tail		10566	15723	1092	1.44	12.8	1572.48	20	TXI Lite	0.3% Fluid Loss + 0.2% Retarder

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

Description of the equipment for the circulating system in accordance with Onshore Order #2:

Diagram of the equipment for the circulating system in accordance with Onshore Order #2:

Describe what will be on location to control well or mitigate other conditions: Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times

Describe the mud monitoring system utilized: PVT/Pason/Visual Monitoring

Circulating Medium Table

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
0	1700	SPUD MUD	8.3	9							
1700	5780	SALT SATURATED	9.8	10.5							
5780	11113	OTHER : CUT BRINE	8.6	9.5							

Section 6 - Test, Logging, Coring

List of production tests including testing procedures, equipment and safety measures:

Drill stem test will be based on geological sample shows. Onshore Order 2.111.D shall be followed. Will run GR/CNL from TD to surf (horizontal well - vertical portion of hole). Stated logs run will be in the completion report & submitted to BLM.

List of open and cased hole logs run in the well:

CBL,CNL/FDC,DS,GR,MWD,MUDLOG,TL

Coring operation description for the well:

None planned

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 5201 **Anticipated Surface Pressure:** 2754.6

Anticipated Bottom Hole Temperature(F): 150

Anticipated abnormal pressures, temperatures, or potential geologic hazards? YES

Describe:

Capital Reef poses lost circulation potential

Contingency Plans geoharzards description:

For Capitan Reef we will be switching over to a fresh water system if lost circ is encountered. A 2 stage cement job will be proposed to get cement to surface.

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

BlkTan27FedCom305H_H2SOpsContPlan_04-06-2017.pdf

Operator Name: APACHE CORPORATION

Well Name: BLACK & TAN 27 FEDERAL COM **Well Number:** 305H

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

BlkTan27FedCom305H_DirPlan_04-06-2017.pdf

BlkTan27FedCom305H_WallPlot_04-06-2017.pdf

Other proposed operations facets description:

**Cement contingency plan attached if loss circulation is encountered. System does not allow for contingency plans. Complete csg & cmt plan attached due to system irregularities.
**Cmt info is duplicated on Section 4 for Interm cmt. AFMSS requires same segments in cmt & csg.. AFMSS application is needing to correlate section 3 and section 4. Lucinda Lewis with AFMSS is aware of the issue. AFMSS team working on the issue. Casing & Cement detail attached.
**Apache requesting variance to use flexible hose between BOP & Manifold, see attachment for additional information.
*Anticipated Completion Date: 3/16/2018
*Anticipated First Production Date: 4/23/2018

Other proposed operations facets attachment:

BlackTan27FedCom305H_CsgDetail_04-06-2017.pdf

BlackTan27FedCom305H_CmtDetail_04-06-2017.pdf

BlackTan27FedCom305H_306H_GasCapturePlan_07-18-2017.pdf

Other Variance attachment:

BlkTan27FedCom305H_Flexline_04-06-2017.pdf

APACHE BOP AND CHOKE MANIFOLD SCHEMATIC

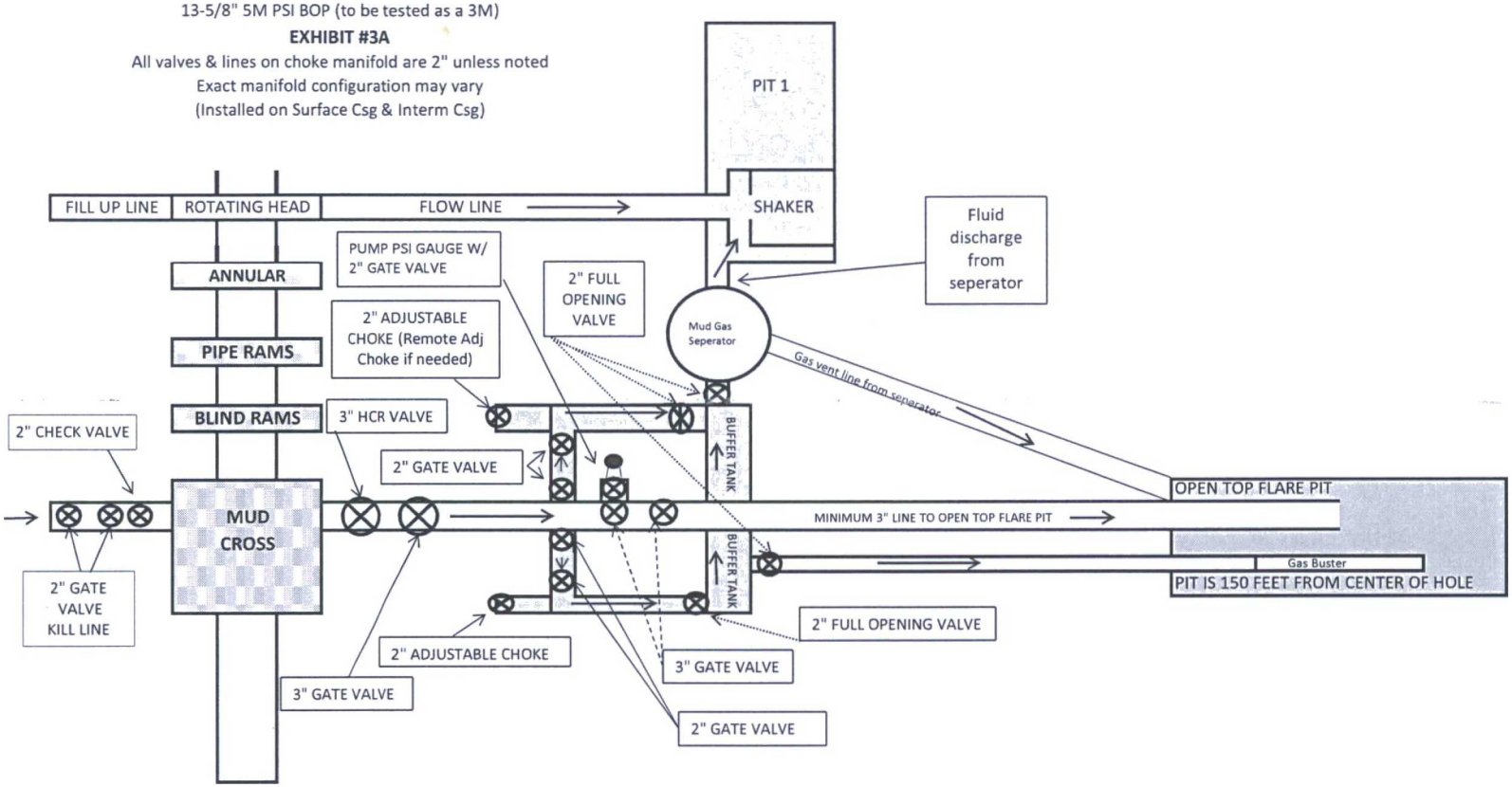
13-5/8" 5M PSI BOP (to be tested as a 3M)

EXHIBIT #3A

All valves & lines on choke manifold are 2" unless noted

Exact manifold configuration may vary

(Installed on Surface Csg & Interm Csg)



*** If H2S is encountered in quantities greater than 100ppm, Apache will shut in well & install a remote operated choke ***

APACHE BOP AND CHOKE MANIFOLD SCHEMATIC

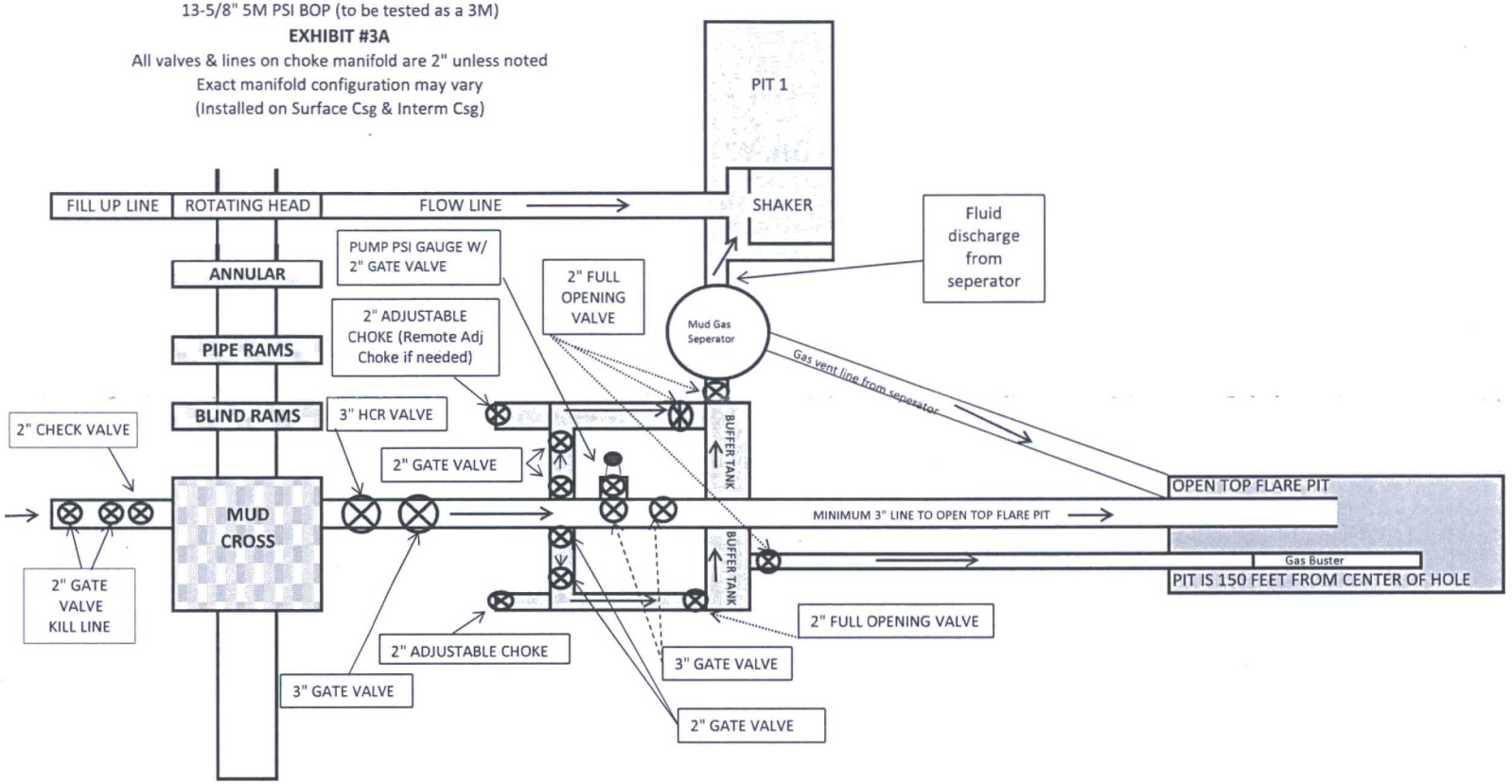
13-5/8" 5M PSI BOP (to be tested as a 3M)

EXHIBIT #3A

All valves & lines on choke manifold are 2" unless noted

Exact manifold configuration may vary

(Installed on Surface Csg & Interm Csg)



*** If H2S is encountered in quantities greater than 100ppm, Apache will shut in well & install a remote operated choke ***

Black and Tan 27 Federal COM 305H Intermediate Casing Design Assumptions

Pore Pressure

Vertical Depth (ft)	Pore Pressure/EMW		Permeable Zones
Depth (ft)	(psi)	(ppg)	Zones
20	0	0	No
1700	748	8.47	No
3900	1621	8	No
5800	2552	8.47	No
8586	3970	8.9	No
11352	5661	9.6	No

Fracture Pressure

Vertical Depth (ft)	Fracture Pressure/EMW	
Depth (ft)	(psi)	(ppg)
20	9	9
1700	1189	13.46
3900	2026	10
5800	4055	13.46
8586	6004	13.46
11352	8551	14.5

Temperature Gradient

Ambient Temperature is 80° F

Temperature gradient of 0.75°/100' TVD

Analysis Options

- Single External Pressure Profile
- Temperature Deration
- Buckling

Intermediate Casing Loads

Burst Loads

Internal Profile

Drilling Loads

- Gas Kick Profile
  - Influx at 15,723.8' MD
  - 30 Bbl Kick Volume
  - 0.5 ppg Kick Intensity
  - Maximum Mud Weight of 9.5 ppg
  - Kick gas gravity of 0.7 ppg
  - No margin of error on frac gradient
  - 5" DP
  - 650' of 6.5" Drill Collars
- Lost Returns with Water
  - No margin of error on frac gradient
  - Mud/Water Interface at 5780'
  - Mud weight with losses at 9.5 ppg
- Pressure Test
  - 1500 psi casing pressure test with 8.33 ppg fresh water
- Green Cement Pressure Test
  - 2300 psi put on casing when bumping the plug with 8.33 ppg displacement fresh water

External Profile

- Mud and Cement Mix-Water
  - TOC at surface
  - Mud weight is 10.2 ppg
  - Cement Mix-Water Density is 8.33 ppg

Collapse Loads

Internal Profile

Drilling Loads

- Partial Evacuation
  - 50% evacuation. Top of mud level at 2890'.
  - Mud Weight is 10.2 ppg
- Lost Returns with Mud Drop

    - Losses occurring at 5800' MD
    - Pore Pressure at 8.33 ppg
    - Current Mud Weight at 9.5 ppg
    - Mud level drops to 714.3'
- Cementing
    - Lead Slurry Density at 12.9 ppg
    - Tail Slurry Density at 14.8 ppg
    - Tail Slurry Length of 500'
    - TOC at surface
    - Mud Weight at shoe 10.2 ppg
    - Displacement fluid density at 8.33 ppg

External Profile

- Fluid Gradients w/ Pore Pressure
    - Fluid Gradient Above TOC is 10.2 ppg
    - Fluid Gradient Below TOC is 10.2 ppg

Axial Loads

- Average Running in hole speed at 2.0 ft/s
- Overpull of 100,000 lbf
- 2300 psi Green Cement Pressure Test
- Service Loads from Burst and Collapse

Black and Tan 27 Federal COM 305H Surface Casing Design Assumptions

Pore Pressure

Vertical Depth (ft)	Pore Pressure/EMW		Permeable Zones
Depth (ft)	(psi)	(ppg)	Zones
20	0	0	No
1700	748	8.47	No
3900	1621	8	No
5800	2552	8.47	No
8586	3970	8.9	No
11352	5661	9.6	No

Fracture Pressure

Vertical Depth (ft)	Fracture Pressure/EMW	
Depth (ft)	(psi)	(ppg)
20	9	9
1700	1189	13.46
3900	2026	10
5800	4055	13.46
8586	6004	13.46
11352	8551	14.5

Temperature Gradient

Ambient Temperature is 80° F

Temperature gradient of 0.75°/100' TVD

Analysis Options

- Single External Pressure Profile
- Temperature Deration
- Buckling

Surface Casing Loads

Burst Loads

Internal Profile

Drilling Loads

- Fracture @ Shoe w/ Gas Gradient Above
  - No margin of error on frac gradient
  - Using a 0.7 ppg gas gradient
- Lost Returns with Water
  - No margin of error on frac gradient
  - Mud/Water Interface at 1700'
  - Mud weight with losses at 10.2 ppg
- Pressure Test
  - 1500 psi casing pressure test with 8.33 ppg fresh water
- Green Cement Pressure Test
  - 1200 psi put on casing when bumping the plug with 8.33 ppg displacement fresh water

External Profile

- Mud and Cement Mix-Water
  - TOC at surface
  - Mud weight is 8.6 ppg
  - Cement Mix-Water Density is 8.33 ppg

Collapse Loads

Internal Profile

Drilling Loads

- Partial Evacuation
  - 50% evacuation. Top of mud level at 850'.
  - Mud Weight is 8.6 ppg
- Lost Returns with Mud Drop
  - Losses occurring at 4000'
  - Pore Pressure at 8.00 ppg
  - Current Mud Weight at 10.2 ppg
  - Mud level drops to 863'
- Cementing
  - Lead slurry of 13.5 ppg with TOC at surface

    - Tail slurry slurry at 14.8 ppg with length of 500'
    - Mud weight at shoe 8.6 ppg
    - Displacement fluid density at 8.33 ppg

External Profile

- Fluid Gradients w/ Pore Pressure
    - Fluid Gradient Above TOC is 8.6 ppg
    - Fluid Gradient Below TOC is 8.6 ppg

Axial Loads

- Average Running in hole speed at 2.0 ft/s
- Overpull of 100,000 lbf
- 1200 psi Green Cement Pressure Test
- Service Loads from Burst and Collapse

Black and Tan 27 Federal COM 305H Production Casing Design Assumptions

Pore Pressure

Vertical Depth (ft)	Pore Pressure/EMW		Permeable Zones
Depth (ft)	(psi)	(ppg)	Zones
20	0	0	No
1700	748	8.47	No
3900	1621	8	No
5800	2552	8.47	No
8586	3970	8.9	No
11352	5661	9.6	No

Fracture Pressure

Vertical Depth (ft)	Fracture Pressure/EMW	
Depth (ft)	(psi)	(ppg)
20	9	9
1700	1189	13.46
3900	2026	10
5800	4055	13.46
8586	6004	13.46
11352	8551	14.5

Temperature Gradient

Ambient Temperature is 80° F

Temperature gradient of 0.75°/100' TVD

Analysis Options

- Single External Pressure Profile
- Temperature Deration
- Buckling

Production Casing Loads

Burst Loads

Internal Profile

Drilling Loads

- Pressure Test
  - 8000 psi with 8.33 ppg fresh water
- Green Cement Pressure Test
  - 3800 psi put on casing when bumping the plug with 8.33 ppg displacement

Production Loads

- Tubing Leak
  - Packer Fluid Density at 8.6 ppg
  - Packer Depth of 10516.5'
  - Perf Depth at 15723.8' MD
  - Gas/Oil Gradient 0.35 psi/ft
  - Reservoir pressure at 5161 psi
- Injection Down Casing
  - Injection pressure of 8000 psi
  - Injection density of 9.4 ppg

External Profile

- Fluid Gradients w/ Pore Pressure
  - 9.5 ppg mud weight above TOC
  - 8.33 ppg below TOC
  - Pore pressure applied in the openhole

Collapse Loads

Internal Profile

Drilling Loads

- Cementing
  - Mud weight at shoe is 9.5 ppg
  - TOC at surface
  - Lead Slurry Density is 11.9 ppg
  - Tail Slurry Density is 12.8 ppg
  - Tail Slurry Length at 5657.4'.
  - Displacement fluid density is 8.33 ppg

Production Loads

- Full Evacuation
- Above/Below Packer
    - Reservoir pressure at 4890 psi
    - Density Above Packer at 8.6 ppg
    - Density Below Packer at 6.0 ppg
    - Assuming a fluid drop above the packer

External Profile

- Fluid Gradients w/ Pore Pressure
    - Fluid Gradient Above TOC is 9.5 ppg
    - Fluid Gradient Below TOC is 9.5 ppg

Axial Loads

- Average Running in hole speed at 2.0 ft/s
- Overpull of 100,000 lbf
- 3800 psi Green Cement Pressure Test
- Service Loads from Burst and Collapse

Black and Tan 27 Federal COM 305H Intermediate Casing Design Assumptions

Pore Pressure

Vertical Depth (ft)	Pore Pressure/EMW		Permeable Zones
Depth (ft)	(psi)	(ppg)	Zones
20	0	0	No
1700	748	8.47	No
3900	1621	8	No
5800	2552	8.47	No
8586	3970	8.9	No
11352	5661	9.6	No

Fracture Pressure

Vertical Depth (ft)	Fracture Pressure/EMW	
Depth (ft)	(psi)	(ppg)
20	9	9
1700	1189	13.46
3900	2026	10
5800	4055	13.46
8586	6004	13.46
11352	8551	14.5

Temperature Gradient

Ambient Temperature is 80° F

Temperature gradient of 0.75°/100' TVD

Analysis Options

- Single External Pressure Profile
- Temperature Deration
- Buckling

Intermediate Casing Loads

Burst Loads

Internal Profile

Drilling Loads

- Gas Kick Profile
  - Influx at 15,723.8' MD
  - 30 Bbl Kick Volume
  - 0.5 ppg Kick Intensity
  - Maximum Mud Weight of 9.5 ppg
  - Kick gas gravity of 0.7 ppg
  - No margin of error on frac gradient
  - 5" DP
  - 650' of 6.5" Drill Collars
- Lost Returns with Water
  - No margin of error on frac gradient
  - Mud/Water Interface at 5780'
  - Mud weight with losses at 9.5 ppg
- Pressure Test
  - 1500 psi casing pressure test with 8.33 ppg fresh water
- Green Cement Pressure Test
  - 2300 psi put on casing when bumping the plug with 8.33 ppg displacement fresh water

External Profile

- Mud and Cement Mix-Water
  - TOC at surface
  - Mud weight is 10.2 ppg
  - Cement Mix-Water Density is 8.33 ppg

Collapse Loads

Internal Profile

Drilling Loads

- Partial Evacuation
  - 50% evacuation. Top of mud level at 2890'.
  - Mud Weight is 10.2 ppg
- Lost Returns with Mud Drop

    - Losses occurring at 5800' MD
    - Pore Pressure at 8.33 ppg
    - Current Mud Weight at 9.5 ppg
    - Mud level drops to 714.3'
- Cementing
    - Lead Slurry Density at 12.9 ppg
    - Tail Slurry Density at 14.8 ppg
    - Tail Slurry Length of 500'
    - TOC at surface
    - Mud Weight at shoe 10.2 ppg
    - Displacement fluid density at 8.33 ppg

External Profile

- Fluid Gradients w/ Pore Pressure
    - Fluid Gradient Above TOC is 10.2 ppg
    - Fluid Gradient Below TOC is 10.2 ppg

Axial Loads

- Average Running in hole speed at 2.0 ft/s
- Overpull of 100,000 lbf
- 2300 psi Green Cement Pressure Test
- Service Loads from Burst and Collapse

WELL CONTROL EMERGENCY RESPONSE PLAN

I. GENERAL PHILOSOPHY

Our objective is to ensure that during an emergency, a predetermined procedure is followed so that prompt decisions can be made based on accurate information.

The best way to handle and emergency is with an experienced organization set up for the sole purpose of solving the problem. The *Well Control Emergency Response Team* was organized to handle dangerous & expensive well control problems. The *Team* is structured such that each individual can contribute the most from his area of expertise. Key decision-makers are determined prior to an emergency to avoid confusion about who is in charge.

If the well is flowing uncontrolled at the surface or subsurface, *The Emergency Response Team* will be mobilized. The *Team* is customized for the people currently on the Apache staff. Staff changes may require a change in the plan.

II. EMERGENCY PROCEDURE ON DRILLING OR COMPLETION OPERATIONS

A. In the event of an emergency the *Drilling Foreman or Tool-Pusher* will immediately contact only one of the following starting with the first name listed:

Name	Office	Mobile	Home
Larry VanGilder – Drlg Superintendent	432-818-1965	432-557-1097	
John Vacek – Drilling Engineer	432-818-1882	281-222-1812	
Bobby Smith – Drilling Manager	432-818-1020	432-556-7701	
Ted Ward – EH&S Coordinator		432-234-0600	
Erick Wood – EH&S Coordinator		432-250-5904	

***This one phone call will free the Drilling Foreman to devote his full time to securing the safety of personnel & equipment. This call will initiate the process to mobilize the Well Control Emergency Response Team. Apache maintains an Emergency Telephone Conference Room in the Houston office. This room is available for us by the Permian Region. The room has 50 separate telephone lines.*

B. The Apache employee contacted by the Drilling Foreman will begin contacting the rest of the *Team*. If **LARRY VAN GILDER** is out of contact, **JOHN VACEK** will be notified.

C. If a member of the *Emergency Response Team* is away from the job, he must be available for call back. Telephone numbers should be left with secretaries or a key decision-maker.

D. Apache's reporting procedure for spills or releases of oil or hazardous materials will be implemented when spills or releases have occurred or are probable.

EMERGENCY RESPONSE NUMBERS:

SHERIFF DEPARTMENT	
Eddy County	575-887-7551
Lea County	575-396-3611
FIRE DEPARTMENT	911
Artesia	575-746-5050
Carlsbad	575-885-2111
Eunice	575-394-2111
Hobbs	575-397-9308
Jal	575-395-2221
Lovington	575-396-2359
HOSPITALS	911
Artesia Medical Emergency	575-746-5050
Carlsbad Medical Emergency	575-885-2111
Eunice Medical Emergency	575-394-2112
Hobbs Medical Emergency	575-397-9308
Jal Medical Emergency	575-395-2221
Lovington Medical Emergency	575-396-2359
AGENT NOTIFICATIONS	
Bureau of Land Management	575-393-3612
New Mexico Oil Conservation Division	575-393-6161