

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

FORM APPROVED  
OMB NO. 1004-0137  
Expires March 31, 2007

APPLICATION FOR PERMIT TO DRILL OR REENTER

1a. Type of Work <input checked="" type="checkbox"/> DRILL <input type="checkbox"/> REENTER		5. Lease Serial No. <b>BIA 142060462</b>
1b. Type of Well <input type="checkbox"/> Oil Well <input checked="" type="checkbox"/> Gas Well <input type="checkbox"/> Other <input checked="" type="checkbox"/> Single Zone <input type="checkbox"/> Multiple Zone		6. If Indian, Allottee or Tribe Name <b>UTE MOUNTAIN UTE</b>
2. Name of Operator <b>XIO Energy Inc.</b>		7. Unit or CA Agreement Name and No. <b>N/A</b>
3a. Address <b>2700 Farmington Ave., Bldg. K. Ste 1 Farmington, NM</b>	3b. Phone No. (include area code) <b>505-324-1090</b>	8. Lease Name and Well No. <b>UTE INDIANS A #52</b>
4. Location of Well (Report location clearly and in accordance with any State requirements)* At surface <b>1475' FNL x 1965' FFL</b> At proposed prod. zone <b>SAME</b>		9. API Well No. <b>30-045- 34329</b>
14. Distance in miles and direction from nearest town or post office* <b>APPROXIMATELY 5 MILES NORTHWEST OF LA PLATA POST OFFICE</b>		10. Field and Pool, or Exploratory <b>UTE DOME PARADOK</b>
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drg. unit line, if any) <b>1475'</b>	16. No. of Acres in lease <b>4251.9</b>	11. Sec., T., R., M., or Blk. and Survey or Area <b>(G) SEC 36, T32N, R14W</b>
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. <b>502'</b>	19. Proposed Depth <b>8938'</b>	12. County or Parish <b>SAN JUAN</b>
21. Elevations (Show whether DF, KDB, RT, GL, etc.) <b>6376' GROUND ELEVATION</b>		13. State <b>NM</b>
22. Approximate date work will start* <b>FALL 2007</b>		17. Spacing Unit dedicated to this well <b>RCVD MAY24'07</b> <b>640</b> <b>Oil CONS. DIV.</b>
23. Estimated duration <b>2 WEEKS</b>		20. BLM/BIA Bond No. on file <b>DIST. 3</b> <b>UTB000138</b>

Approval of this agreement does not warrant or certify that the operator thereof and other holders of operating rights hold legal or equitable title to those rights in the subject lease which are committed hereto...

The following, completed in accordance with the requirements of Order No. 1, shall 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 shall 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 authorized officer.

25. Signature <i>Kyla Vaughan</i>	Name (Printed/Typed) <b>Kyla Vaughan</b>	Date <b>04/03/07</b>
Title <b>Regulatory Compliance Tech</b>		
Approved by (Signature) <i>Robert L. Sieger</i>	Name (Printed/Typed) <b>Robert L. Sieger</b>	Date <b>5/22/2007</b>
Title <b>Acting Physical Resources Asst Center Mgr.</b>		
Office <b>San Juan Public Lands Center</b>		

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.

SEE ATTACHED  
CONDITIONS OF APPROVAL

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)

NOTIFY AZTEC OCD 24 HRS.  
PRIOR TO CASING & CEMENT

RECEIVED

APR - 5 2007

Bureau of Land Management  
Bureau, Colorado

APD/ROWE

06-08-07  
BIA

DISTRICT I  
1625 N. French Dr., Hobbs, N.M. 88240

DISTRICT II  
1901 W. Grand Ave., Artesia, N.M. 88210

DISTRICT III  
1000 Rio Brazos Rd., Aztec, N.M. 87410

DISTRICT IV  
1220 South St. Francis Dr., Santa Fe, NM 87505

State of New Mexico  
Energy, Minerals & Natural Resources Department

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

Form C-102

Revised October 12, 2005

Submit to Appropriate District Office

State Lease - 4 Copies

Fee Lease - 3 Copies

☐ AMENDED REPORT

### WELL LOCATION AND ACREAGE DEDICATION PLAT

*API Number 30-045-34329		*Pool Code 80760		*Pool Name UTE DOME PARADOX	
*Property Code 22645		*Property Name UTE INDIANS A			*Well Number 52
*OCRID No. 5380		*Operator Name XTO ENERGY INC.			*Elevation 6376

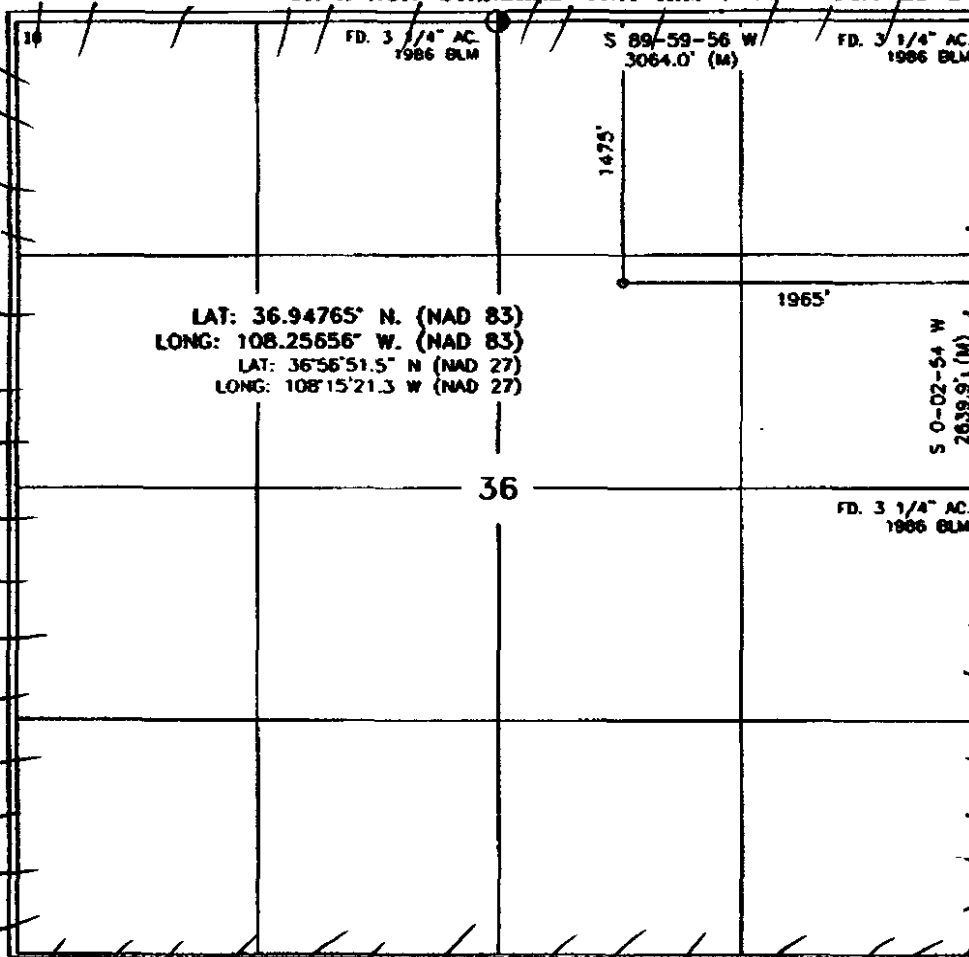
#### 10 Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
G	36	32-N	14-W	400	1475	NORTH	1965	EAST	SAN JUAN

#### 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
								RCOD MAY 24 07	
*Dedicated Acres 691.18		*Joint or Infill		*Consolidation Code		*Order No.		OIL CONS. DIV. DIST. 3	

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

	<b>OPERATOR CERTIFICATION</b> 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 undivided mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or is a voluntary pooling agreement or a compulsory pooling order heretofore entered by the Division.  Signature: <u>Kyla Vaughan</u> Date: <u>4/2/07</u> Printed Name: <u>Kyla Vaughan</u>
	<b>18 SURVEYOR CERTIFICATION</b> 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.  APRIL 18, 2007 Date of Survey Signature: <u>[Signature]</u> Printed Name: <u>ROY A. RUSH</u> Professional Land Surveyor 8894 Certificate Number

Submit 3 Copies To Appropriate District  
Office  
District I  
1625 N. French Dr., Hobbs, NM 87240  
District II  
1301 W. Grand Ave., Artesia, NM 88210  
District III  
1000 Rio Brazos Rd., Aztec, NM 87410  
District IV  
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico  
Energy, Minerals and Natural Resources

Form C-103  
May 27, 2004

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

WELL API NO. 30-045- <b>34329</b>
5. Indicate Type of Lease STATE <input type="checkbox"/> FEE <input type="checkbox"/>
6. State Oil & Gas Lease No. BIA 142060462
7. Lease Name or Unit Agreement Name: UTE INDIANS A
8. Well Number #52
9. OGRID Number 5380
10. Pool name or Wildcat UTE DOME PARADOX

Pit or Below-grade Tank Application ☒ or Closure ☐  
Pit type DRILL Depth to Groundwater >100 Distance from nearest fresh water well >1000 Distance from nearest surface water >1000  
Pit Liner Thickness: 12 mil Below-Grade Tank: Volume \_\_\_\_\_ bbls; Construction Material \_\_\_\_\_

SUNDRY NOTICES AND REPORTS ON WELLS  
(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

1. Type of Well: Oil Well <input type="checkbox"/> Gas Well <input checked="" type="checkbox"/> Other
2. Name of Operator XTO Energy Inc.
3. Address of Operator 2700 Farmington Ave., Bldg. K, Ste 1 Farmington, NM 87401
4. Well Location Unit Letter <u>G</u> : <u>1475</u> feet from the <u>NORTH</u> line and <u>1965</u> feet from the <u>EAST</u> line Section <u>36</u> Township <u>32N</u> Range <u>14W</u> NMPM <u>NMEM</u> County <u>SAN JUAN</u>
11. Elevation (Show whether DR, RKB, RT, GR, etc.) 6376' GROUND ELEVATION

12. Check Appropriate Box to Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:

PERFORM REMEDIAL WORK ☐ PLUG AND ABANDON ☐  
TEMPORARILY ABANDON ☐ CHANGE PLANS ☐  
PULL OR ALTER CASING ☐ MULTIPLE COMPLETION ☐  
OTHER: PIT ☒

SUBSEQUENT REPORT OF:

REMEDIAL WORK ☐ ALTERING CASING ☐  
COMMENCE DRILLING OPNS. ☐ PLUG AND ABANDONMENT ☐  
CASING TEST AND CEMENT JOB ☐  
OTHER: ☐

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 1103. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

XTO Energy plans to install a lined pit on location for drilling.

I hereby certify that the information above is true and complete to the best of my knowledge and belief. I further certify that any pit or below-grade tank has been/will be constructed or closed according to NMOCD guidelines ☒ , a general permit ☐ or an (attached) alternative OCD-approved plan ☐

SIGNATURE Kyla Vaughan TITLE Regulatory Compliance Tech DATE 04/03/07  
Type or print name Kyla Vaughan E-mail address: kyla\_vaughan@xtoenergy.com Telephone No. 505-564-6726

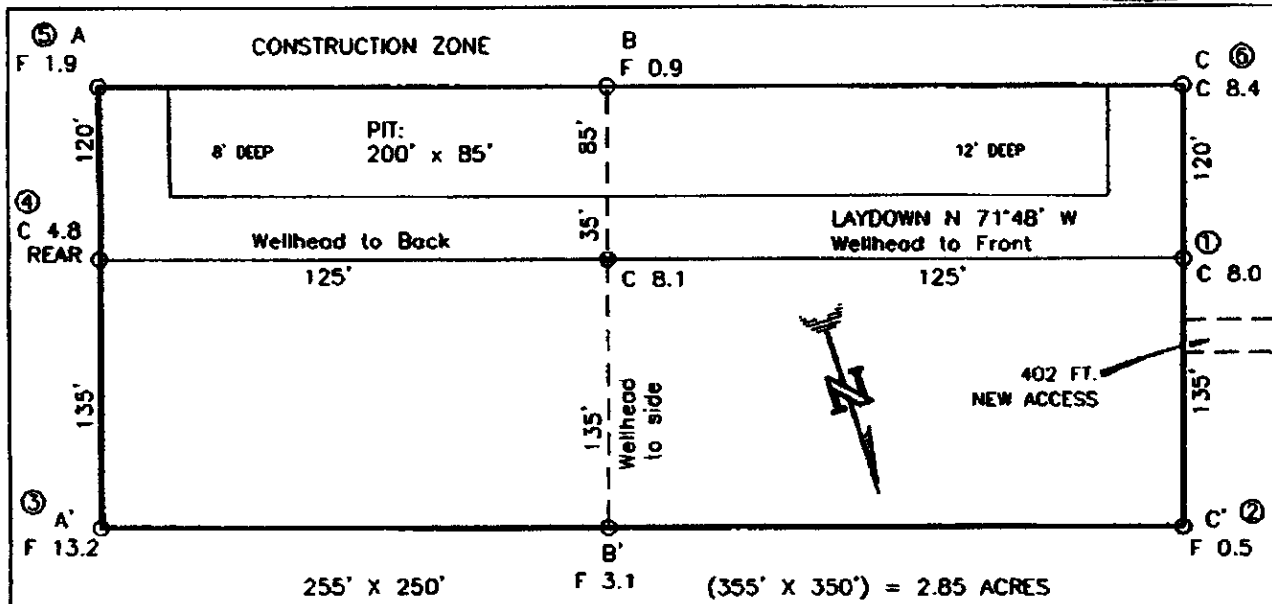
For State Use Only

APPROVED BY [Signature] TITLE DEPUTY OIL & GAS INSPECTOR, DIST. 7 DATE JUN 08 2007  
Conditions of Approval, if any:

EXHIBIT D

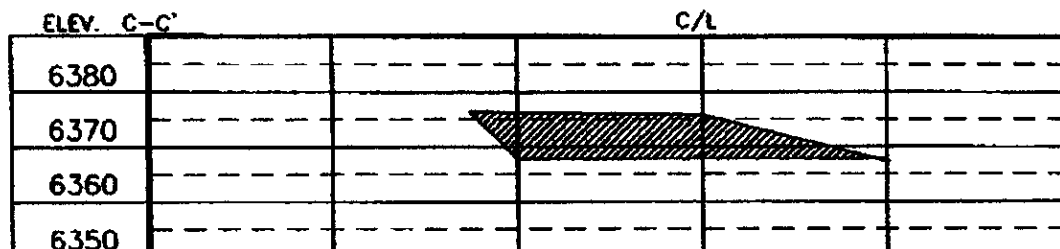
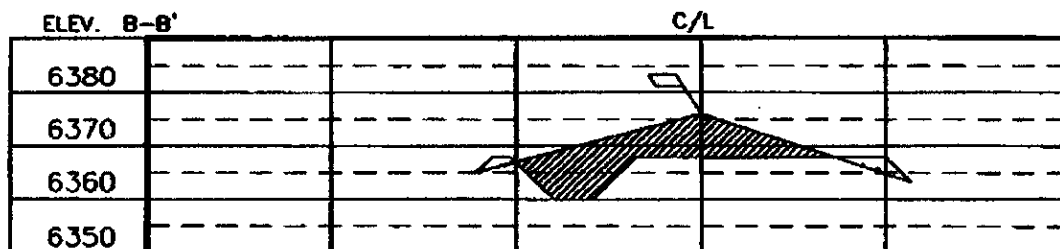
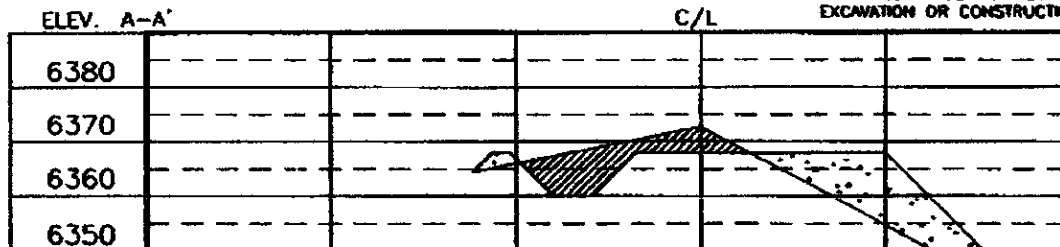
XTO ENERGY INC.  
 UTE INDIANS A No. 52, 1475 FNL 1965 FEL  
 SECTION 36, T32N, R14W, N.M.P.M., SAN JUAN COUNTY, N.M.  
 GROUND ELEVATION: 6376' DATE: APRIL 18, 2006

NAD 83  
 LAT. = 36.94765° N  
 LONG. = 108.25656° W  
 NAD 27  
 LAT. = 36°56'51.5" N  
 LONG. = 108°15'21.3" W



RESERVE PIT DIKE: TO BE 8" ABOVE DEEP SIDE (OVERFLOW - 3' WIDE AND 1" ABOVE SHALLOW SIDE).  
 BLOW PIT: OVERFLOW PIPE HALFWAY BETWEEN TOP AND BOTTOM AND TO EXTEND OVER PLASTIC LINER AND INTO BLOW PIT.

NOTE: DAGGETT ENTERPRISES, INC. IS NOT LIABLE FOR UNDERGROUND UTILITIES OR PIPELINES. NEW MEXICO ONE CALL TO BE NOTIFIED 48 HOURS PRIOR TO EXCAVATION OR CONSTRUCTION.



NOTE: CONTRACTOR SHOULD CALL ONE-CALL FOR LOCATION OF ANY MARKED OR UNMARKED BURIED PIPELINES OR CABLES ON WELL PAD AND OR ACCESS ROAD AT LEAST TWO (2) WORKING DAYS PRIOR TO CONSTRUCTION.

**Daggett Enterprises, Inc.**  
 Surveying and Oil Field Services  
 P. O. Box 15088 Farmington, NM 87401  
 Phone (505) 326-1772 • Fax (505) 326-0019  
 NEW MEXICO L.S. No. 8894  
 028005 C2564 C78  
 Date 10/13/06

EXHIBIT E

# XTO ENERGY INC.

Ute Indians A #52

APD Data

April 3, 2007

Location: 1475' FNL x 1965' FEL Sec 36, T32N, R14W County: San Juan State: New Mexico

GREATEST PROJECTED TD: 8938'  
APPROX GR ELEV: 6376'

OBJECTIVE: Ute Dome Paradox  
Est KB ELEV: 6394' (12' AGL)

## 1. MUD PROGRAM:

INTERVAL	0' to 360'	360' to 2500'	2500' to 8938'
HOLE SIZE	12.25"	8.75"	8.75"
MUD TYPE	FW/Spud Mud	FW/Polymer	LSND / Gel Chemical
WEIGHT	8.6-9.0	8.4-8.8	8.6- 9.20
VISCOSITY	28-32	28-32	45-60
WATER LOSS	NC	NC	8-10

Remarks: Use fibrous materials as needed to control seepage and lost circulation. Pump high viscosity sweeps as needed for hole cleaning. Raise viscosity at TD for logging. Reduce viscosity after logging for cementing purposes.

## 2. CASING PROGRAM:

Surface Casing: 9.625" casing to be set at  $\pm$  360' in a 12-1/4" hole filled with 9.20 ppg mud

Interval	Length	Wt	Gr	Cplg	Coll Rating (psi)	Burst Rating (psi)	Jt Str (M-lbs)	ID (in)	Drift (in)	SF Coll	SF Burst	SF Ten
0'-360'	360'	36.0#	J-55	ST&C	2020	3520	394	8.921	8.765	11.73	20.44	30.40

Production Casing: 5.5" casing to be set at TD ( $\pm$ 8938') in 8.75" hole filled with 9.20 ppg mud.

Interval	Length	Wt	Gr	Cplg	Coll Rating (psi)	Burst Rating (psi)	Jt Str (M-lbs)	ID (in)	Drift (in)	SF Coll	SF Burst	SF Ten
0'-8938'	8938'	17.0#	L-80	LT&C	6280	7740	348	4.892	4.767	1.47	1.81	2.29

## 3. WELLHEAD:

- A. Casing Head: C-22, 11" 3,000 psi WP, 9-5/8" 8-rnd with 2 2" line pipe outlets.
- B. Tubing Head: TCM 11" 3,000 psi WP by 7-1/16" 3,000 psi WP with two 2-1/16" 5,000 studded side outlets, with 9" BG Bottom Viton Seal. (Casing spool, if needed, C-22 11" 3,000 psi WP by 11" 3,000 psi WP, 18" tall.)

EXHIBIT F

**4. CEMENT PROGRAM (Slurry design may change slightly, but the plan is to circulate cement to surface on both casing strings):**

A. Surface: 9.625", 36.0#, J-55, ST&C casing to be set at  $\pm 360'$  in 12-1/4" hole.

162 sx of Type III cement (or equivalent) typically containing accelerator and LCM, mixed at 14.5 ppg, 1.39 ft<sup>3</sup>/sk, & 6.70 gal wtr/sk.

*Total slurry volume is 225 ft<sup>3</sup>, 100% excess of calculated annular volume to 360'.*

B. Production: 5.5", 17.0#, L-80, LT&C casing to be set at  $\pm 8938'$  in 8.75" hole. DV Tool set @  $\pm 4200'$

1<sup>st</sup> Stage

LEAD:

$\pm 719$  sx of Premium Lite HS (Type III/Poz/Gel) or equivalent, with dispersant, fluid loss, accelerator, & LCM mixed at 12.5 ppg, 2.01 ft<sup>3</sup>/sk, 10.55 gal wtr/sx.

TAIL:

150 sx Type III or equivalent cement with bonding additive, LCM, dispersant, & fluid loss mixed at 14.2 ppg, 1.54 cuft/sx, 8.00 gal/sx.

2<sup>nd</sup> Stage

LEAD:

$\pm 533$  sx of Type III or equivalent cement with 8% gel & LCM mixed at 11.9 ppg, 2.54 ft<sup>3</sup>/sk, 15.00 gal wtr/sx.

TAIL:

100 sx Type III neat mixed at 14.5 ppg, 1.39 cuft/sx, 6.3 gal/sx.

*Total estimated slurry volume for the 5-1/2" production casing is 3169 ft<sup>3</sup>.*

*Note: The slurry design may change slightly based upon actual conditions. Final cement volumes will be determined from the caliper logs plus 40%. It will be attempted to circulate cement to the surface.*

**5. LOGGING PROGRAM:**

A. Mud Logger: The mud logger will come on at 2,900' and will remain on the hole until TD. The mud will be logged in 10' intervals.

B. Open Hole Logs as follows: Run Array Induction/SFL/GR/SP fr/TD (8938') to the bottom of the surface csg. Run Neutron/Lithodensity/Pe/GR/Cal from TD (8938') to 3,000'.

**EXHIBIT F**

6. **FORMATION TOPS:**

Est. KB Elevation: 6394'

FORMATION	Sub-Sea Elev.	WELL DEPTH	FORMATION	Sub-Sea Elev.	WELL DEPTH
Gallup SS	4607	1,781	Chinle Fmtn	2137	4,251
Greenhorn LS	3911	2,477	Shinarump Congl.	1500	4,888
Graneros Shale	3858	2,530	Moenkopi Fmtn	1369	5,019
Dakota SS	3753	2,635	Cutler Group	1146	5,242
Burro Canyon SS	3577	2,811	Hermosa Group	-619	7,007
Morrison Fmtn	3577	2,811	Paradox Fmtn	-1476	7,864
Bluff SS	3050	3,338	Ismay Member*	-1600	7,988
Summerville Fmtn	2660	3,728	Desert Creek *	-1801	8,189
Todilto LS	2620	3,768	Akah *	-1933	8,321
Entrada SS	2604	3,784	Barker Creek*	-2121	8,509
Carmel Fmtn	2420	3,968	Alkali Gulch	-2350	8,738
Wingate SS	2280	4,108	<b>Total Depth</b>	<b>-2550</b>	<b>8,938</b>

\* Primary Objective

\*\* Secondary Objective

\*\*\*\* Maximum anticipated BHP should be <5,000 psig ( <0.50 psi/ft) \*\*\*\*\*

7. **ANTICIPATED OIL, GAS, & WATER ZONES:**

- A. Oil & Gas Zones are anticipated at 2635'-3338' & 7988'-8938'.
- B. No Appreciable Water Zones are anticipated.
- C. Appropriately weighted mud will be used to isolate potential gas, oil, and water zones until such time as casing can be cemented into place for zonal isolation.
- D. Once the Morrison is drilled the well will be treated as a potential source of H<sub>2</sub>S.

8. **COMPANY PERSONNEL:**

Name	Title	Office Phone	Home Phone
John Egelston	Drilling Engineer	505-564-6734	505-330-6902
Jerry Lacy	Drilling Superintendent	505-566-7917	505-320-6543
John Klutsch	Project Geologist	817-885-2800	--

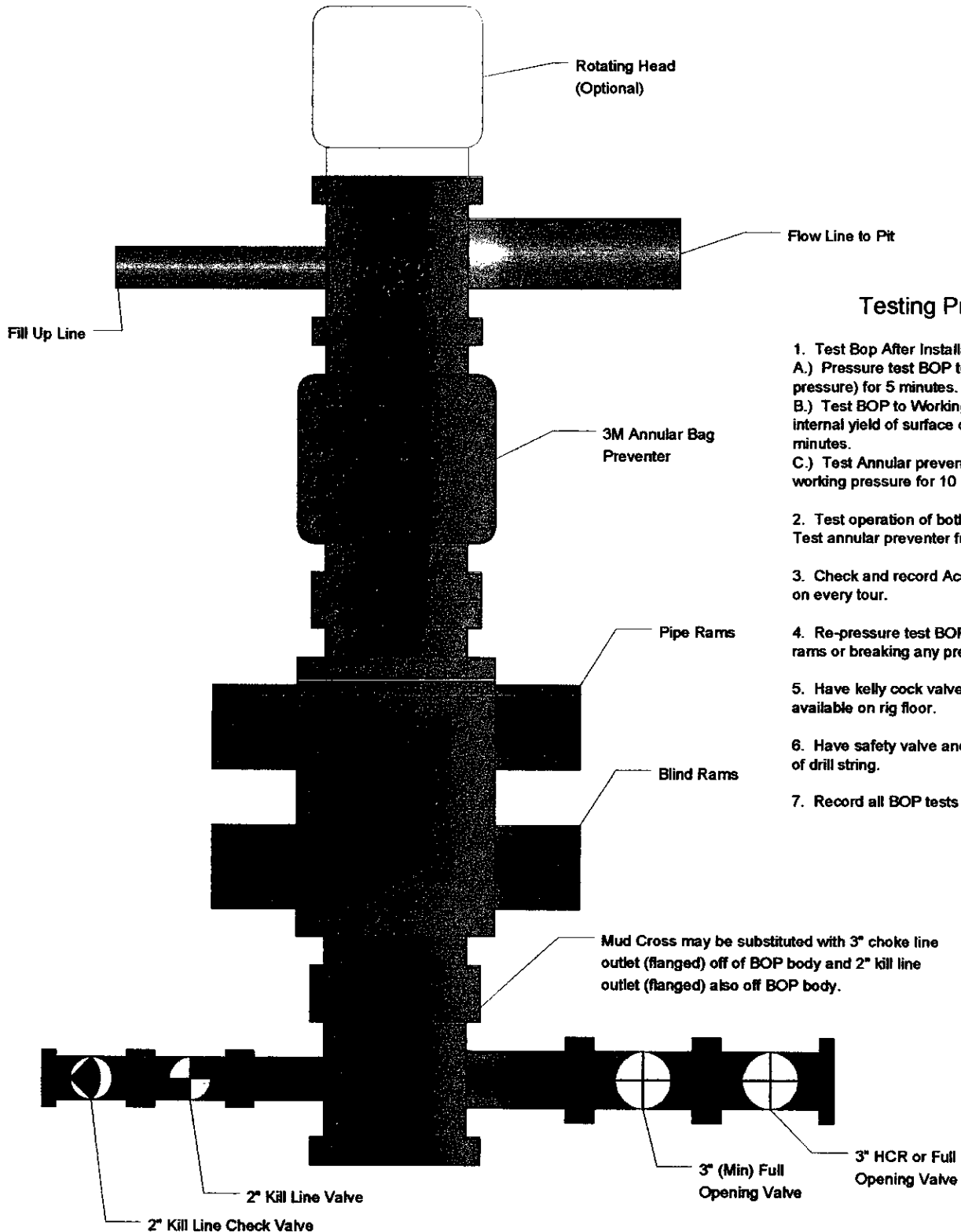
JWE  
4/3/07

EXHIBIT F

# XTO Energy

3M BOP Stack

11/8/2006



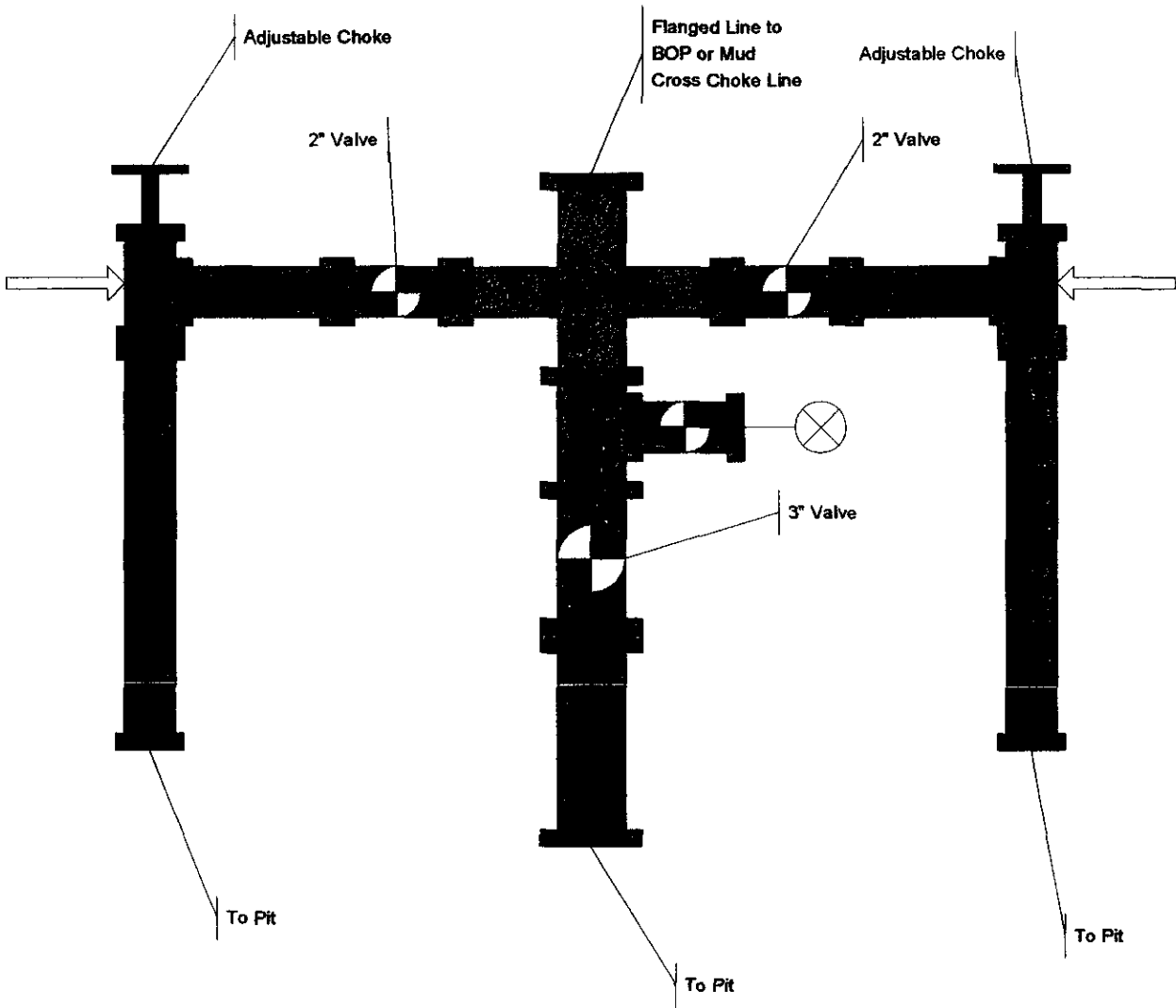
## Testing Procedure

1. Test Bop After Installation:
  - A.) Pressure test BOP to 200-300 psig (low pressure) for 5 minutes.
  - B.) Test BOP to Working pressure or 70% internal yield of surface casing for 10 minutes.
  - C.) Test Annular preventer to 50% of working pressure for 10 minutes.
2. Test operation of both rams on each trip. Test annular preventer function weekly.
3. Check and record Accumulator pressure on every tour.
4. Re-pressure test BOP after changing rams or breaking any pressure tested seal.
5. Have kelly cock valve with handle available on rig floor.
6. Have safety valve and subs to fit all sizes of drill string.
7. Record all BOP tests in IADC book.

EXHIBIT F



XTO Energy		
3M Choke Manifold	11/9/2006	



**H2S Contingency Plan**  
**(Emergency Response and Public Protection Plan)**  
**Drilling Operations**

**XTO Energy Inc.**

**Ute Indians A # 52**  
**San Juan Basin Operations**

***PREPARED BY:***  
**Jeff Clement**

**Office: 505) 324-1090**  
**Cell: 505) 215-0533**

**H2S Contingency Plan**

<b>Company Name:</b>	XTO Energy, Inc.
<b>Address:</b>	2700 Farmington Avenue, Farmington, NM 87401
<b>Phone:</b>	(505) 324-1090
<b>Well Name:</b>	Ute Indians A # 52 1475' FNL / 1965' FEL
<b>TD:</b>	Varied Geological Tops
<b>Location:</b>	Sec.36- T32N- R14W NMPM, San Juan Co. New Mexico Lat: 36.94765N / Long: 108.25802W (NAD 83) Lat: 36-56-51.5N / Long: 108-15-21.3W (NAD 27)
<b>API #</b>	30-045-
<b>BIA</b>	14-20-604-62
<b>Formation</b>	Paradox
<b>Geological Tops</b>	To be determined by data obtained during operations

**EXHIBIT G**

## **Contact Personnel**

### **XTO Energy Drilling Manager**

**Brent Martin**

**Office: (505) 324-1090**

**Cell: (505) 320-4074**

### **XTO Energy Drilling Engineer**

**John Egelston**

**Office: (505) 324-1090**

**Cell: (505) 330-6902**

### **XTO Energy Drilling Superintendent**

**Jerry Lacy**

**Office (505) 324-1090**

**Cell (505) 320-6543**

### **XTO Energy Field Foremen**

**Dennis Elrod**

**Office: (505) 324-1090**

**Cell: (505) 486-6460**

### **XTO Energy Health & Safety Supervisor**

**Jeff Clement**

**Office: (505) 324-1090**

**Cell: (505) 215-0533**

### **RIG CONTRACTOR**

**To be determined**

**(505) 324-1090**

### **CONTRACT SAFETY COMPANY**

**Jacobs Engineering**

**Al Lara**

**Office: (970) 564-1103**

**Cell: (970) 560-1349**

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## 1.00 PURPOSE

This Emergency Response, and Public Protection Plan (Plan), is a specific plan, that applies to the San Juan Basin Operations, of New Mexico, operated by XTO Energy Inc. (XTO). This document is designed to provide for the safety and welfare of XTO and contract personnel, the community, the environment, and property, under H<sub>2</sub>S situations.

This plan establishes evacuation procedures, assigns response duties to specific individuals, provides for notification of outside agencies, and provides details of actions to alert and protect the public. This Plan will be activated immediately upon the detection of the release of a potentially hazardous volume of hydrogen sulfide (H<sub>2</sub>S).

## 2.00 GENERAL INFORMATION ON AND PHYSIOLOGICAL RESPONSES TO HYDROGEN SULFIDE (H<sub>2</sub>S) AND SULFUR DIOXIDE (SO<sub>2</sub>).

### 2.10 HYDROGEN SULFIDE (H<sub>2</sub>S)

Hydrogen sulfide is a flammable, highly toxic, colorless gas that is heavier than air, with the odor of rotten eggs. It can be detected by smell at the concentration of only 0.002 parts per million (ppm). Above concentrations of 100 ppm, it will deaden the sense of smell in a few minutes, and at a concentration of 600 + ppm, a single breath can be fatal. If ignited, it burns with a blue flame. In still air, it tends to accumulate in low places in dangerous concentrations. However, if it is warmer than the surrounding air, it may tend to rise. The upper flammability in air is 4% (40,000 ppm).

Breathing low concentrations of H<sub>2</sub>S can cause headaches. Higher concentrations (0.01 percent by volume) cause irritation of the eyes, nose, throat, and lungs. Eyes become red and swollen, accompanied by sharp pain in more severe cases. Still higher concentrations (0.05 percent by volume) cause dizziness, unconsciousness, and failure of respiration.

The Threshold Limit Value (TLV) is 10 ppm (0.001%) in air. This is the limit for eight hours of continuous exposure as recommended by the American Conference of Governmental Industrial Hygienists. The health and safety reference values of various concentrations of H<sub>2</sub>S are listed in the toxicity chart below. A Manufacturers Safety Data Sheet (MSDS) for hydrogen sulfide is included in Appendix D.

### 2.20 SULFUR DIOXIDE (SO<sub>2</sub>)

Sulfur dioxide is formed with the burning of hydrogen sulfide gas. Sulfur dioxide is a pungent, irritating, suffocating, colorless gas. This gas is normally heavier than air and concentrations above 400 ppm are considered dangerous for even brief exposures.

Under special circumstances, hydrogen sulfide gas may be ignited in order to dissipate a gas cloud and reduce impact on a local area. Often these burning temperatures are enough to raise and mix the SO<sub>2</sub> with air in a ratio well below toxic levels. However, great care and proper monitoring should be used when this is attempted.

Due to the irritating effect of SO<sub>2</sub> at low concentrations of less than 5 ppm, there is usually no doubt as to its presence in an area, which provides better warning characteristics than H<sub>2</sub>S.

### 2.30 TOXICITY CHART

NAME	SPECIFIC GRAVITY (1)	TLV (2) (ppm)	HAZARDOUS LIMIT (3)	LETHAL CONCENTRATION (4)
Hydrogen Sulfide	1.18	10	100 ppm/1hr.	600 + ppm
Sulfur Dioxide	2.21	2	50 ppm/1 hr.	400 ppm

**Notes:**

- (1) Specific gravity of air = 1.00
- (2) TLV – Threshold Limit Value
- (3) Hazardous Limit – concentration that may cause death with short term exposure.
- (4) Lethal concentration – concentration that may cause death with only a few breaths.

**3.00 TREATMENT PROCEDURES FOR H<sub>2</sub>S AND SO<sub>2</sub> EXPOSURE**

- A. Remove the patient to fresh air. Personnel should always use fresh air breathing equipment when entering an area to retrieve a person who has been overcome with H<sub>2</sub>S.
- B. Call a physician and get patient under his care as soon as possible.
- C. If breathing has ceased, begin artificial respiration immediately. Give cardiopulmonary resuscitation (CPR) only if there is no pulse and no breathing. Continue revival efforts until physician arrives or, if patient is mobile and it is determined that he should go to the hospital, continue oxygen inhalation under the physician's direction.
- D. Administer oxygen to help eliminate toxic substances from blood stream.
- E. Keep the patient at rest and protect from chilling.

**4.00 INDIVIDUAL RESPONSIBILITIES**

It is the responsibility of *all personnel* on the location to familiarize themselves with the procedures outlined in this contingency plan.

- A. All Personnel
  - 1. Responsible for their assigned safety equipment.
  - 2. Responsible for familiarizing themselves with the location of all safety equipment.
  - 3. Responsible for reporting any indications of H<sub>2</sub>S to those in the area and to a supervisor.
- B. Operations Supervisor
  - 1. Responsible for thoroughly understanding and seeing that all aspects of this contingency plan are enforced.
  - 2. Responsible for implementing all phases of this contingency plan.
  - 3. Responsible for keeping a minimum of personnel on the location during expected hazardous operations.
  - 4. Responsible for coordinating all well site operations and communications in the event that an emergency condition develops.
  - 5. Responsible for ensuring that all visitors receive an H<sub>2</sub>S safety orientation. A visitors log will be maintained as well as a list of all personnel on location after drilling has progressed to the suspected H<sub>2</sub>S formation.

**4.10 LOCATION LAYOUT**

The location should have at least two pre-determined safe areas to assemble at in the event of an emergency. These locations should be located 180 degrees to one another, and in the direction of the prevailing winds.

- A. H<sub>2</sub>S rig monitor with at least three heads. One located at the bell nipple, one located at the shale shaker, and a third one on the rig floor.  
The location and type of all air masks. Self-contained breathing apparatus for use by rig personnel for this well will be kept in the following location(s):

Type: 1-30 min. rescue unit	Location: Safety Contractor's Trailer
Type: 1-30 min. rescue unit	Location: All Trailers
Type: 2-30 min. rescue unit	Location: Briefing Area #1
Type: 2-30 min. rescue unit	Location: Briefing Area #2
Type: 5-Hoseline work unit	Location: Safety Trailer
Type: 3-5 min escape unit	Location: Rig Floor
Type: 1-5 min. escape unit	Location: Tubing board (derrick)

If a cascade system is utilized, indicate the location(s);

Type: 10 cylinder cascade	Location: Safety Trailer located by rig base of catwalk.
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The location of windsocks or streamers. The wind directions indicators for this well will be located at:

Type: Windsock	Location: Briefing Area #1
Type: Windsock	Location: Briefing Area #2
Type: Windsock	Location: On floor & pits

The location of any other safety equipment used, such as flare guns or bug blowers.

Type: Flare gun	Location: Safety Trailer
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The location of all telephones and/or means of communications are as follows:

Type: Cell phone	Location: Drilling Superintendent Tool Pusher
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**Warning Signs:**

"No Smoking" signs should be strategically located around the rig and rig location. The following locations are appropriate:

Rig Floor  
Dog house  
Substructure  
Lower landing of all stairs to rig floor  
Mud pits  
Shale shaker

"Poison Gas" signs should also be strategically located around the rig and rig location. The following locations are appropriate:

All entrances leading to location  
Lower landing of all stairs leading to rig floor  
All areas around substructure, including mud pits and shale shaker  
Various points along the perimeter of the radius of exposure

**NOTE:** All warnings should be black and yellow in color and of readable size at a distance.

#### 4.20 OPERATING PROCEDURES

The following operating procedures will be utilized for drilling in areas with H<sub>2</sub>S.

- A. Plan of operation for handling gas kicks and other problems. Any gas kick will be controlled by using approved well control techniques. Upon evidence that ambient H<sub>2</sub>S concentrations have reached 10 ppm, all non-essential personnel will be evacuated to pre-determined safe areas. Personnel remaining on the rig floor will continue to control the well until the situation indicates the area is safe to re-enter.

**Special Operations:**

*Drill Stem Tests:* All drill stem tests must be closed chamber and conducted during daylight hours only.

*Coring:* After a core has been cut, circulate bottoms up and monitor for H<sub>2</sub>S. If hole conditions (and/or detectors) indicate potentially hazardous conditions, put breathing equipment on (10) ten stands before core barrel reaches surface. Breathing equipment will be worn by all personnel while core barrel is pulled, broken out and opened, and until a safe atmosphere is indicated.

All equipment with potential for H<sub>2</sub>S shall be suitable for H<sub>2</sub>S service, i.e. Drill String, Casing, Well Head, Blowout Preventor equipment and trim, Rotating Head, Kill Lines, Choke Manifold and Lines.

*A remote controlled choke will be installed prior to all H<sub>2</sub>S drilling.*

Mud system pH will be maintained at or above 10.0 with sufficient materials on location to maintain the required pH.

*A flare pit* will be located a minimum of 150' from the wellhead and 30' from the reserve pit. Should H<sub>2</sub>S be encountered during drilling operations an *ignitable flaring system* will be used and burnable gas will then be vented to the atmosphere. Extreme caution will be noted for Sulfur Dioxide that is a by product of Hydrogen Sulfide when burned.

#### 4.30 OPERATING CONDITIONS

Operating conditions are defined in three categories. A description of each of these conditions and the required action to take are given below.

- A. **Condition I – Normal Operating Conditions, Potential Danger**  
Characterized by: Normal Drilling Operations in zones which contain or may contain H<sub>2</sub>S.  
Warning Flag: Yellow  
Alarm: None  
Probable Occurrence: No detectable gas present at surface  
General Action:  
Know location of safety equipment.  
Check safety equipment for proper function. Keep it available.  
Be alert for a condition change.  
Follow instructions of supervisor.
- B. **Condition II – Potential to Moderate Danger to Life**  
Characterized by: H<sub>2</sub>S gas present. Concentration less than 10 ppm.  
Warning Flag: Orange  
Alarm: Flashing light at 10 ppm H<sub>2</sub>S. Intermittent blasts on horn at 10 ppm H<sub>2</sub>S.  
Probable Occurrence: As drill gas.  
As trip gas when circulating bottoms up  
When a core barrel is pulled  
When a well kick is circulated out  
Surface pressure, well flow or lost operations  
Equipment failure during testing operations



**General Action:**

Follow instructions of supervisor.

Put on breathing equipment if directed, or if conditions warrant it.

Stay in "SAFE BRIEFING AREA" if instructed and not working to correct the problem.

The Drilling Superintendent will initiate action to reduce the H<sub>2</sub>S concentration to zero.

**C. Condition III – Moderate to Extreme Danger to Life**

**Characterized by:** H<sub>2</sub>S present in concentrations at or above 10 ppm. Critical well operations or well control problems. In the extreme, loss of well control.

**Warning Flag:** Red

**Alarm:** Flashing light and continuous blast on horn at 10 ppm H<sub>2</sub>S

**Probable Occurrence:** As drill gas  
As trip gas when circulating bottoms up  
When a core barrel is pulled  
When a well kick is circulated out  
Surface pressure, well flow or lost return problems  
Equipment failure during testing operations

**General Action:**

Put on breathing equipment. Move to "SAFE BRIEFING AREA" and remain there if not working to correct or control problem.

Follow instructions of Drilling Superintendent or other supervisor.

The Drilling Superintendent will initiate emergency action as provided in the contingency plan and as appropriate to the actual conditions. If testing operations are in progress, the well will be shut in.

*The Drilling Superintendent will conduct any necessary operations with an absolute minimum of personnel. All persons in the immediate area will wear a breathing apparatus. All other personnel will restrict their movements to those directed by the Superintendent.*

If gas containing hydrogen sulfide (H<sub>2</sub>S) is ignited, the burning hydrogen sulfide will be converted to sulfur dioxide, which is poisonous.

**5.00 HYDROGEN SULFIDE EMERGENCY PROCEDURES**

The procedures listed below apply to drilling and testing operations:

**A. If at any time during Condition I, the mud logger, mud engineer, or any other person detects H<sub>2</sub>S, he will notify the Drilling Superintendent. All personnel should keep alert to the Drilling Superintendent's orders. He will:**

1. Immediately begin to ascertain the cause or the source of the H<sub>2</sub>S and take steps to reduce the H<sub>2</sub>S concentration to zero. This should include having the mud engineer run a sulfide and pH determination on the flowline mud if water-base mud is in use. If an oil-base mud is in use, the mud engineer should check the lime content of the mud.
2. Order non-essential personnel out of the potential danger area.
3. Order all personnel to check their safety equipment to see that it is working properly and in the proper location. Persons without breathing equipment will not be allowed to work in a hazard area.
4. Notify the Contract Supervisor of condition and action taken.
5. Continue gas monitoring activities and continue with caution.
6. Display the orange warning flag.

**B. If the H<sub>2</sub>S concentration exceeds 10 ppm, the following steps will be taken:**

1. Put on breathing equipment
2. Display red flag
3. Driller – prepare to shut the well in
  - a. Pick up pipe to get Kelly out of BOP's
  - b. Close BOP's if necessary

4. If testing operations are in progress, the well will be shut-in
5. Help anyone who may be affected by the gas
6. Evacuate quickly to the "SAFE BRIEFING AREA" if instructed or conditions warrant

C. In the event a potentially hazardous volume of H<sub>2</sub>S is released into the atmosphere, the following steps must be taken to alert the public:

1. Remove all rig personnel from the danger area and assembly at a pre-determined safe area, preferable upwind from the well site.
2. Alert the drilling office, public safety personnel, regulatory agencies, and the general public of the existence and location of an H<sub>2</sub>S release. See List of Emergency Telephone Numbers.
3. Assign personnel to block any public road (and access road to location) at the boundary of the area of exposure. Any unauthorized people within the area should be informed that an emergency exists and be ordered to leave immediately.
4. Request assistance from public safety personnel to control traffic and/or evacuate people from the threatened area.

## 6.00 TRAINING PROGRAM

All personnel associated with the drilling operations will receive training to ensure efficient and correct action in all situations. This training will be in the general areas of:

(A) Personnel Safety      (B) Rig Operations      (C) Well Control Procedures

A. Personnel Safety Training – All Personnel shall have received H<sub>2</sub>S training in the following areas:

1. Hazards and characteristics of H<sub>2</sub>S.
2. Effect on mental components of the system.
3. Safety precautions.
4. Operation of safety equipment and life support systems.
5. Corrective action and shutdown procedures.

B. Rig Operations – All rig personnel shall have received training in the following areas:

1. Well control procedures.
2. Layout and operations of the well control equipment.

*NOTE: Proficiency will be developed through BOP drills which will be documented by the Drilling Superintendent.*

7. Service Company Personnel – All service personnel shall be trained by their employers in the hazards and characteristics of H<sub>2</sub>S, and the operation of safety equipment, and life support systems.

Visitors – All first time visitors to the location will be required to attend a safety orientation. The Drilling Superintendent shall be responsible for this orientation and he shall see that every visitor is logged correctly.

Public - The public within the area of exposure shall be given an advance briefing by the Drilling Superintendent. This briefing must include the following elements:

1. Hazards and characteristics of hydrogen sulfide. It is an extremely dangerous gas. It is normally detectable by its "rotten egg" odor, but odor is not a reliable means of detections because the sense of smell may be dulled or lost due to intake of the gas. It is colorless, transparent and flammable. It is heavier than air and may accumulate in low places.
2. The necessity of an emergency action plan. Due to the danger of persons exposed to hydrogen sulfide and the need for expeditious action should an emergency occur, this action plan will be put into effect if and when a leak occurs.
3. The location of hydrogen sulfide within the area of exposure at the drilling location.
4. The manner in which the public will be notified of an emergency.
5. Steps to be taken in case of an emergency.
6. Abandon danger area.

7. Notify necessary agencies and request assistance for controlling traffic and evacuating people.

#### 7.00 PROTECTION OF THE GENERAL PUBLIC

##### 7.10 NOTIFICATION OF POTENTIAL DANGER

- Warning signs will be prominently displayed at the well site and at all access points.

##### 7.20 EMERGENCY EVACUATION AND ISOLATION OF DANGER AREA

In the event that toxic gases are released in such quantities as to be a possible hazard to the public, the following steps (in addition to the procedure outlines in Section 5.00) will be taken by the person in charge.

- Choose a command post site in a safe area
- Alert by telephone the Incident Commander or the Safety Manager and notify the person of the situation and your choice of command posts.
- Notify local Law Enforcement Officials of the need to restrict entry to the area and the location of your command post. Request their assistance in restricting entry into the danger area by placing roadblocks or barriers in safe areas.

*NOTE: Alternate command posts and roadblocks may be required; the Incident Commander may make changes in the locations listed above. Care should be taken to notify all responders of the changes.*

- If evacuation cannot be accomplished in a timely manner and the H<sub>2</sub>S release is posing an immediate threat to human life, the Incident Commander may choose to ignite the gas. Because of the increased risks igniting the gas can pose for response personnel, only the Incident Commander can give this order.