submitted in lieu of Form 3160-5

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Sundry Notices and Reports on Wells

1. Type of Well
GAS

5. Lease Number
I-22-IND-2772

6. If Indian, All.or Tribe Name
Ute

7. Unit Agreement Name

2. Name of Operator
Meridian Oil Inc.

8. Well Name & Number
Ute #4

3. Address & Phone No. of Operator
Box 4289, Farmington,NM 87499 (505)326-9700

9. API Well No.

4. Location of Well, Footage,Sec,T,R,M.
540'S, 1980'W Sec.10, T-32-N, R-14-W, NMPM

10. Field and Pool
Barker Creek Paradox

11. County and State
San Juan County, NM

12. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OTHER DATA

Type of Submission	Type of Action	
X Notice of Intent	__ Abandonment	__ Change of Plans
	X Recompletion	__ New Construction
__ Subsequent Report	__ Plugging Back	__ Non-Routine Fracturing
	__ Casing Repair	__ Water Shut Off
__ Final Abandonment	__ Altering Casing	__ Conversion to Injection
	__ Other	

13. Describe Proposed or Completed Operations

It is intended to recomplete this well per the attached procedure.

RECEIVED
DEC 02 1991
OIL CON. DIV.
DIST. 3

14. I hereby certify that the foregoing is true and correct
Signed Peggy Bradfield (MP) Title Regulatory Affairs Date 11-6-91

(This space for Federal or State office use)

APPROVED BY (S) Kent Hoffman TITLE _____ DATE 12-2-1991
CONDITION OF APPROVAL, IF ANY:

NMOCD

Recommended Procedure

UTE #4 Paradox
UNIT N SECTION 10 T32N R14W
San Juan County, N.M.

All wirelines to be treated w/corrosion inhibitor.

1. Set & test location anchors, dig blow pit, and set blow tank.

2. **Rig up for H2S safety & train all personnel that will be on location.** Comply with all NMOCD, BLM, & MOI, rules and regulations.

3. MOL and RU completion rig. NU 6" 900 series BOP (w/H2S trim) and stripping head. Test operation of rams. NU 2-7/8" relief line with 3000 psi gate valves on tubing head.

4. All water pumped into well should contain 2% KCL and heated to 100 degrees F. TOH & lay down 1-1/4" tbg, 8 gas lift valves, & TIW pkr.

5. TOH w/2-3/8" tbg. Install S.N. & blanking plug. Test tbg to 2500# by running half of the string at a time.

6. Run 5" cmt ret on 2-3/8" rental tbg & set @ 8720'. Load hole & test backside to 500 psi. Sq 2nd Sour w/230 sx cl "H" cmt (100% excess). PU, CO short way, TOH.

7. Run CBL & pulsed neutron (TDT) logs 8720'-8000' & coorelate to 3/19/50 Resistivity log. Initiate sq operations as necessary, if cmt bonding is insufficient above or below 1st Sweet or csg fails pressure test.

8. Perf Upper Ismay (1st Sweet) w/4 spf 8654'-8706'. Use 4" casing gun w/shots phased @ 90 degrees, 23 gr charges which will give a 0.66" diameter hole and a penetration of 16" in concrete.

9. TIH w/5" retrievamatic pkr on 2-3/8" rental tbg & set @ 8400'. Establish rate & acidize Upper Ismay (1st Sweet) w/10,000 gal. 20% HCL acid in two stages separated by 2000# diverting agent (85:15 mixture rocksalt & wax beads). Flush to top perf. All acid & flush to have 1000 scf/bbl Nitrogen. Pump liquid @ 1-1/2 to 2 BPM. Max. pressure = 5000 psi. Anticipated pressure = 3500 psi. Acid to contain the following additives per 1000 gal.:
   - 3 gal aquaflow
   - 3 gal corrosion inhibitor I17
   - 2 gal surfactant & de-emulsifier LT22
   - 3 gal silt suspending agent LT21
   - 5 gal Fe control XR2L

10. Let acid set for one hour, then allow well to flow back through choke manifold. Obtain gas ,water, and oil rates and appropriate samples. Swab test if necessary.

11. When interval has been sufficiently tested, TOH w/rental tbg & pkr.

12. Run 2-3/8" production tbg w/5" Model R-3 Double Grip pkr & set @ 8600'.

Approve: _____
D. C. Walker

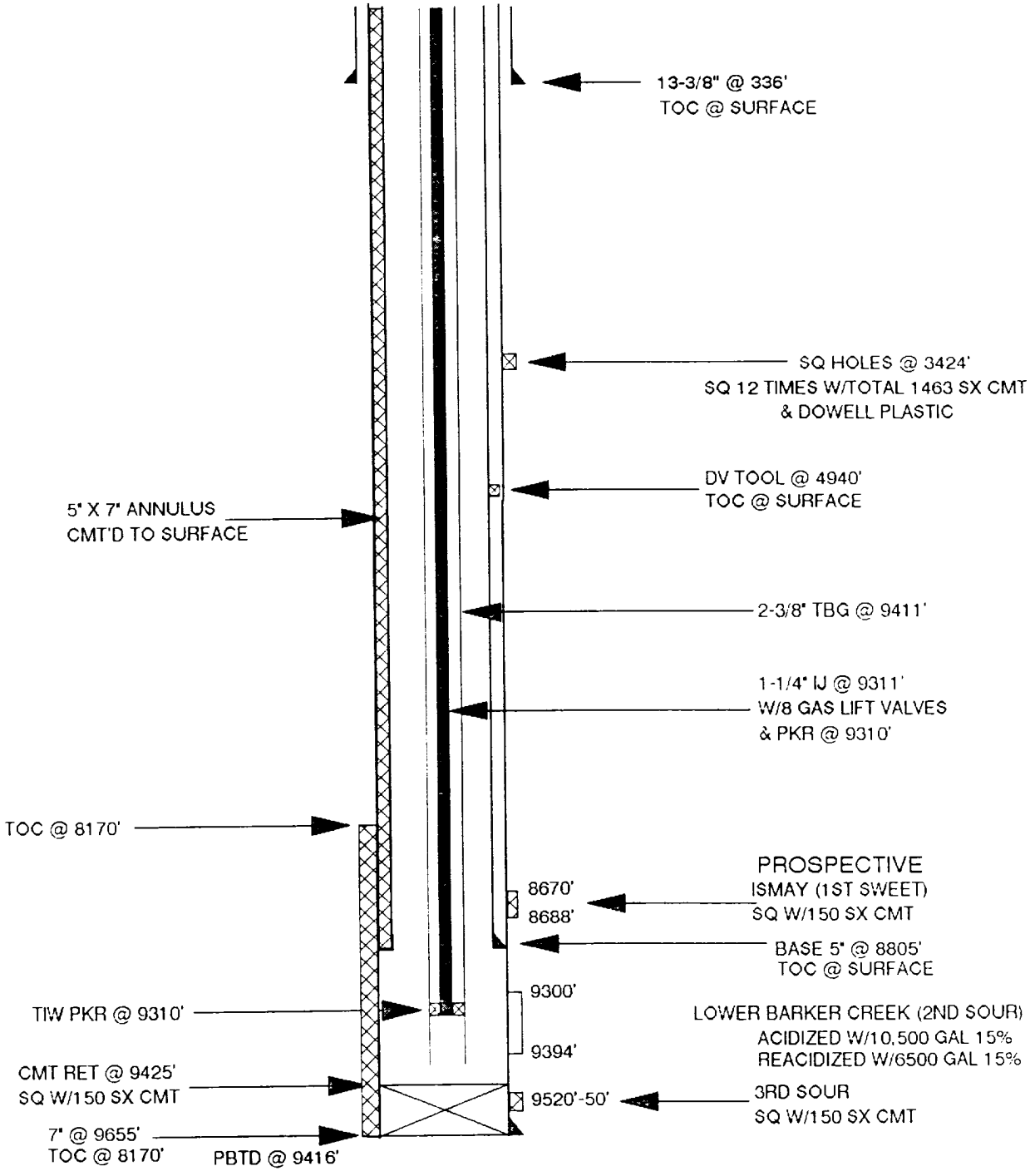
VENDOR:

Acid, N2, & cmt:	Western	327-6222
Wireline:	Schlumberger	325-5006
Packers:	Baker	325-2841

PMP:pmp

UTE #4 PDX

UNIT N SECTION 10 T32N R14W
SAN JUAN COUNTY, NEW MEXICO



H_2S CONTINGENCY PLAN

UTE #4
Well Name & Number

BARKER DOME FIELD
San Juan County, New Mexico

P. M. Pippin
Production Engineer

G. T. Dunn
Regional Production Engineer

J. A. Howieson
Drilling Superintendent

D. C. Walker
Drilling Manager

Introduction

Meridian Oil Inc. is permitting to recomplete the Ute #4, a 9416 foot Ismay test in the Barker Dome Field in San Juan County, New Mexico for the purpose of evaluating/exploiting reservoirs. The Upper Ismay 1st Sweet formation is intended as the primary objective. Production data indicates that hydrogen sulfide (H_2S) and carbon dioxide (CO_2) may be present from the Paradox formation to total depth. Production data further indicates that the present open interval, the 2nd Sour in the Barker Creek formation contains 2% H_2S and 13.5% CO_2. Hydrogen sulfide (H_2S) is a flammable and highly toxic gas which, in relatively small concentrations, can have adverse effects on people and equipment (refer to the section - Effects of H_2S). Carbon dioxide (CO_2) is a nonflammable, odorless, colorless, and tasteless gas. Because of carbon dioxide's higher density (it is 1 1/2 times as heavy as air), it may settle to the ground and be dangerous. The carbon dioxide is not poisonous, but it cuts off the necessary supply of oxygen.

Precautionary measures concerning H_2S in this plan have been formulated based on the following assumptions:

1. No significant (greater than 10 ppm) H_2S is expected above the Ismay at 8640 feet.

2. Based on 20,000 ppm H_2S gas released at a rate of 80 MMCF/day, the maximum 100 ppm H_2S "radius of exposure" (ROE) expected is 10,195 feet and the maximum 500 ppm H_2S "radius of exposure" (ROE) expected is 4660 feet. It is highly unlikely that the rate of release would be as significant as 80 MMCF/day. The 500 ppm CO_2 ROE is estimated at about 15,395 feet.

3. The 100 ppm H_2S ROE does not contain a public area and the 500 ppm H_2S ROE does not contain a public road.

This plan has been designated as a guide for well requirements and special considerations to provide for safe and efficient drilling (or servicing) operations in the presence of either hydrogen sulfide or carbon dioxide.

GENERAL EMERGENCY ACTION

In the event an emergency situation occurs, the following action shall be initiated:

1. If the H_2S alarm sounds, stop the rotation of the drill pipe as time and conditions permit.

2. Evacuate quickly to the "Safe Briefing Area".

3. Those who must enter the hazard area must wear self-contained breathing apparatus and use other appropriate safety equipment. Secure rig and close well in, if necessary. (Use the "buddy system" at all times.)

4. Account for all personnel and take appropriate action as necessary for personnel safety.

5. Raise appropriate color warning flag to describe the type of emergency.

6. The above procedures will apply for CO2 situations also.

The Meridian Oil Drilling Supervisor will assess the situation and assign duties to various persons to bring the situation under control. The Supervisor will advise the Drilling Superintendent as soon as the emergency will permit. In the event of a well kick, procedures outlined in the Operations Plan for Drilling will be followed. Stations to be manned and duties to be performed will be listed on the doghouse bulletin board in the supervisor's trailer and in the safety trailer.

Notification of local law enforcement agencies, residents and emergency vehicles as per the following Communications Director will be assigned by the Meridian Oil Drilling Supervisor.

Any press inquiries are to be referred to the Drilling Manager.

Meridian Oil Inc.

(505) 326-9700

Drilling Department

Dispatch 325-2556, 326-9735

After Hours: Kaibab Answering Service 325-2556, 326-9700

Name	Office	Home	Pager
Drilling Manager:			
Walker, Don	326-9738	325-9468	
Drilling Operations			
Drilling Superintendents:			
Howieson, Jim	326-9784	326-1759	326-8463
Morris, Don	326-9728	326-4949	327-8423
Rig Supervisors:			
Dennington, Ken	326-9731	334-7174	327-8361
Gall, Dale	326-9730	632-2930	327-8611
Kirkpatrick, Morris	326-9729	334-3369	326-8063
Angvick, John	326-9726		
Drilling Engineering			
Regional Drilling Engineer:			
Caldwell, John	326-9707	326-0152	
Drilling Engineer:			
Clayton, John	326-9890	325-4536	

Production Operations Department

Dispatch (505) 326-9816

Name	Office	Home	Pager
Production Operations Manager:			
Jones, Louis	326-9802	325-1739	
Superintendents:			
Fraser, Jim	326-9803	326-6367	326-8836
Headrick, Ron	326-9817	334-2563	326-8939
Raybon, Ken	326-9804	327-7861	326-8938
Trucking Supervisor:			
Marshall, Louie	326-9811	325-7470	327-8178
Regional Production Engineer:			
Dunn, George	326-9712	325-7365	

Safety Department

Safety Representatives:			
Dolan, John	326-9502	326-3240	326-8163
McMillan, Terry	326-9841	326-0163	326-9161

RESPONSIBILITIES

All Personnel

1. All personnel who spend over one day on a Meridian Oil location shall be familiarized with the procedures outlined in this directive.

2. All personnel will attend to their personal safety first.

3. If it can be done safely, help anyone who may be injured or overcome from toxic gasses by administering first aid.

4. Report to the "Safe Briefing Area" and follow the instructions of the supervisor.

Meridian Oil Drilling Supervisor

1. It is the responsibility of the Meridian Oil supervisor to see that these safety and emergency procedures are observed by all personnel on Meridian Oil's location.

2. The supervisor will advise the Drilling Superintendent whenever the procedures as specified herein are complied with or cannot be followed. One (1) completed copy of the checklist will be forwarded to the Superintendent and one copy to John Dolan, Safety Representative.

3. The supervisor shall keep the number of personnel on location to a minimum during hazardous operations.

4. The supervisor shall be trained in the use of all safety equipment and completely briefed on safety and emergency procedures. This shall include full knowledge of the requirements in this contingency plan.

5. It is the responsibility of the Meridian Oil supervisor to see that the Contractor has adequately trained the drilling crews in handling emergency situations. He should satisfy himself that this is the case. He should notify the Meridian Oil Superintendent if the Contract supervisor fails to fulfill this responsibility.

6. If an unexpected emergency occurs, or the H_2S alarm sounds, the supervisor (either Meridian Oil or Contractor) will assess the situation and will advise all personnel what conditions exist. Action to be taken under each of three possible conditions is as follows:

Contract Drilling supervisor

1. In the absence or incapacitation of the Meridian Oil Drilling Supervisor, the Contractor Drilling supervisor will assume all responsibilities designated herein to the Meridian Oil Drilling Supervisor.

2. Assist the Meridian Oil Supervisor and Safety Representative in training crews for handling emergency situations.

3. Will be trained for all well control or emergency situations as contained herein and how to properly use all safety equipment.

Driller

1. In the absence or incapacitation of both Drilling supervisors (Meridian Oil and Contractor), the Driller will assume their responsibilities as designated herein.

2. In the event of any emergency, the Driller will don respiratory equipment and secure the rig if time permits.

3. Assist Contract supervisor in crew preparation.

Regional Safety Department

1. Shall provide safety and environmental information and guidance as required.

2. Shall review and approve any changes in safety or environmental procedures.

3. Shall assist as appropriate with operating and maintenance procedures for the safety equipment called for in this plan.

4. Shall assist with arranging initial training on safety procedures and equipment. They will provide assistance as needed for follow up training.

Contractor

1. Shall have his personnel properly trained in first aid.

2. Shall keep his personnel trained in use of safety equipment and safety procedures.

CONDITION I - POTENTIAL DANGER TO LIFE (such as hazardous amount of toxic gasses detected at surface)

a. Order nonessential personnel out of the potential danger area and display the YELLOW CONDITION I warning sign and flag.

b. Order all essential personnel to check their safety equipment to see that it is working properly and in the proper location (see supervisor's checklist). Persons without respiratory protection cannot work in the hazard area.

c. Notify Superintendent of condition and action taken.

d. Increase gas monitoring activities and continue operations as appropriate.

CONDITION II - MODERATE DANGER TO LIFE (such as circulating out a potentially toxic gas kick). In addition to Condition I requirements:

a. Display only the ORANGE CONDITION II warning sign and flag.

b. Direct corrective action to control flow of gas.

c. Set up roadblocks and restrict personnel movements to minimum.

d. Notify other Regional personnel listed on emergency telephone list.

CONDITION III - EXTREME DANGER TO LIFE (when it appears that well control will be lost). In addition to Conditions I and II requirements:

a. Contact and request local police to evacuate people and to control traffic within the danger zone. Should the condition be immediately dangerous to the public, take necessary life saving action until local police arrive. Display only the RED CONDITION III warning sign and flag.

b. Ignite the well if necessary. (See the following section - Igniting the Well.)

NOTE: The Drilling Superintendent will dispatch additional Meridian Oil personnel and/or additional professional safety personnel to the well site as needed to assist the Drilling supervisor.

Visitors, Service Personnel and Others

1. Only personnel authorized by Meridian Oil Supervisor shall be permitted to enter area when an emergency condition exists.

2. Shall be permitted to enter area under an emergency condition only if needed and then only after being properly instructed in use of safety equipment and have necessary equipment issued or available.

Igniting the Well

1. Responsibility

The decision to ignite the well is the responsibility of the Meridian Oil Drilling Superintendent. However, the decision should be made only as a last resort and in a situation where it is clear that:

a. Human life or property are endangered.

b. There is no hope of controlling the blowout under the prevailing conditions at the well.

In all cases, an attempt should be made to notify the Drilling Manager of the plans to ignite the well, if time permits. However, the Superintendent and supervisor must not delay a decision if human life is threatened.

NOTE: If the CO_2 content of the effluent stream is higher than anticipated, it is likely that the stream will not sustain combustion.

REMEMBER, if the well is ignited, the burning H_2S will be converted to sulfur dioxide (SO_2) which is also highly toxic. Do not assume that the area is safe after the well is ignited. Follow through with all plans to evacuate endangered persons.

2. Means of Ignition

a. In preparation for igniting the well, keep unnecessary persons in the "Safe Briefing Area". Two people are required for the actual ignition. Both men will wear self-contained breathing units and will have 200 feet retrieval ropes attached to safety harnesses. One man is responsible for checking the atmosphere for explosive gasses with the explosimeter. The other man is responsible for igniting the well. Persons remaining in the "Safe Briefing Area" will closely watch the ignition team; and should either man be overcome, they will immediately pull him to safety by the retrieval ropes and apply revival measures.

b. The primary method for igniting the well will be with a 25 mm meteortype flare gun. These guns have a range of approximately 500 feet. If this method fails or well conditions are such that a safer or better method is apparent, then the alternate method should be used.

c. Always ignite the well from upwind and do not approach the well any closer than warranted.

d. Select a location to fire the flare gun which provides maximum protection to the ignition team (behind equipment).

e. Choose a location that has good accessibility and from which retreat can easily be made.

f. REMEMBER, before firing the flare gun or igniting flammable material, check the atmosphere at your location for combustible gasses with explosimeter.

PRECAUTIONARY MEASURES

These measures are to be in effect prior to initiating recompletion procedures.

General

1. Two areas shall be designated as safe briefing areas, each located, as a minimum: 150 feet from the wellhead and vent discharge area; spaced 160 degrees apart on an arc, with the wellhead as the center point; and as best suited for topographical considerations and prevailing winds. Five Scott air packs - IIa (or equivalent) shall be located as follows: one in the supervisor's office and two at each of the "Safe Briefing Areas". Packs should be readily accessible and properly protected from exposure to the elements.

2. Emergency equipment shall be on location as described in the H_2S Contingency Equipment Checklist.

3. A copy of all emergency telephone numbers shall be posted on the doghouse bulletin board, at the "Safe Briefing Area", in the Meridian Oil supervisor's office, and in the Contract supervisor's office.

4. Three wind direction streams shall be located where at least one can be viewed from any position on the location.

5. An automatic hydrogen sulfide (H_2S) monitor shall be provided, with detectors placed at the bell nipple and shale shaker. Either of these detectors shall be capable of sensing a minimum of 5 ppm H_2S in air and shall be able to independently activate visual and audio alarms. The visual alarm will be activated at 10 ppm and the audible alarm at 10 ppm. The audible alarm must be capable of alerting people at any point on the location.

6. A black and yellow sign which read, "Caution - Poisonous Gas May be Present", will be posted at the entrance to the location.

7. If conditions warrant, two (2) explosion-proof, 24 inch or larger, electric fans will be located: (a) one on the rig floor to blow fumes downwind; (b) the second under the rig floor to clear gas from the substructure.

8. The wellsite shall be equipped with commercial communications. The equipment should be located for safe access and should not be an ignition source.

9. The Meridian Oil Supervisor's vehicle should always be parked a safe distance (at least 100 feet) from the rig, and in an upwind direction when feasible.

10. For all well kicks, the Operation Plan II;6) will be followed. All drilling contractor personnel shall be trained, and drills shall be conducted to insure proper well control procedures.

11. The checklist of all emergency equipment (see Drilling supervisor's checklist) shall be completed at 1000± above the suspect formation(s) as identified in the introduction. The equipment shall be inspected by the Drilling supervisor with assistance, as needed, from Meridian Oil Safety personnel as to working condition, proper placement, etc. The inspection will be noted on the checklist. A copy of the checklist will be placed in the Drilling supervisor's files and one copy each will be mailed to the Drilling Superintendent and Safety Department.

12. To ensure proper hole filling during tripping operations, a stroke counter and pit level sensor will be utilized at all times.

SPECIAL SAFETY TRAINING

The minimum training for personnel working in affected areas shall include the following elements:

1. Hazards, characteristics and symptoms of hydrogen sulfide (H_2S), sulfur dioxide (SO_2), carbon dioxide (CO_2), carbon monoxide (CO), methane gas, and other hazardous substances as may be appropriate. Effects of these substances are discussed in a section that follows.

2. Effect on metal components of the system.

3. Safety precautions to include possible sources at the site.

4. Operation of safety equipment and life support means and systems.

5. Corrective action and shutdown procedures.

6. Detection and measurement of H_2S, CO_2, CO and combustible gas.

THE MERIDIAN OIL SUPERVISOR ON LOCATION SHALL BE RESPONSIBLE FOR THE OVERALL ON-SITE OPERATION, INCLUDING THE SAFETY AND TRAINING PROGRAM.

All personnel, contracted or employed on an unscheduled basis, shall be trained as a minimum in the severity of H_2S and other toxic gasses, safety precautions, evacuation procedures, and as appropriate, the use of respiratory protection equipment. Visitors shall also be instructed regarding these matters.

To promote efficient safety procedures, an on-site toxic gas safety program, which includes a bi-weekly drill and training session, shall be established for all crews. Records of attendance shall be maintained on the drilling facility.

EQUIPMENT AND MATERIAL SPECIFICATIONS

1. Wellhead and blowout equipment is to conform as per Operations Plan.

2. BOP equipment will be tested to pressure rating prior to drilling out from the surface casing, with all testing witnessed and recorded by the Meridian Oil Drilling Supervisor.

3. The BOP will be operationally tested on every trip. BOP drills will be held each tour prior to drilling all potential H_2S bearing formations and recorded on the tour sheets.

4. The casing planned for this well is listed in the Operations Plan. This casing has been designed in accordance with Meridian Oil requirements for sour service.

Mud Requirements

1. The pH of the mud system will be maintained above 10.0 to neutralize (disassociate) any H_2S encountered. The pH will be maintained with caustic soda and/or soda ash.

2. While drilling from all potential H_2S bearing formations to total depth, the Mud Engineer is to test daily for filtrate sulfide using a "Hach H_2S Test Kit" and following the procedures of API Standard RP13B (copy in a following section). The results of this test are to be reported on the daily report.

3. Small concentrations of sulfide are expected and can be tolerated. However, concentrations which result in "Hach Tests" of greater than 50 ppm are potentially more serious and should be treated with H_2S scavenger to reduce the concentration of acceptable levels.

4. The Hach Test will be routinely "double-checked" by means of the Garrett Gas Train.

5. Prior to dumping any significant quantities of drilling fluid (changing over, cleaning pits, cementing, etc.), it will be necessary to treat out all sulfides with H_2S scavenger in order to preclude formation of H_2S gas in the reserve pit.

MERIDIAN OIL INC.
H_2S CONTINGENCY EQUIPMENT CHECKLIST

Well: Ute #4 Rig N/N: _____

Date: _____ supervisor: _____

1.	___	(All)	**Personnel training** with attendance records on site.
2.	___	(2)	**Cleared land areas** for use as "Safe Briefing Areas", 150' from wellhead, and 160 degrees apart.
3.	___	(1)	**Warning sign** with current well condition indicator, located near the entrance to the location.
4.	___	(3)	**Wind direction indicators,** located to provide visibility from any place on location.
5.	___	(3)	**No Smoking signs** on drive posts.
6.	___	(3)	**Safe Briefing Area signs** on drive posts.
7.	___	(2)	**Fans** - electric motor driven and explosion proof; one located on rig floor, and one located in substructure.
8.	___	(1)	H_2S **monitor** (continuous) located in the doghouse with detectors (sensitivity of 5 ppm in air) located at the bell nipple, mud return discharge, and on the rig floor.
9.	___	(1)	**Alarm system** capable of individual activation by any detector with maximum settings as follows: visual and audible alarms at 10 ppm (audible must be capable of alerting personnel at any point on location).
10.	___	(5)	**Scott air paks-IIa** (or equivalent) - 30 min. self-contained breathing apparatus: one in the supervisor's office, and two at each of the "Safe Briefing Areas". Easily accessible, and protected from exposure to the elements.
11.	___	(1)	**Flare system** with continuous pilot and remote ignitor.
12.	___	(1)	**Trailer** - full enclosure, at the primary "Safe Briefing Area" (based on prevailing winds), containing the following items (#13 through #24, and also #25d).
13.	___	(3)	**Condition warning flags** (1 each yellow, orange, and red).
14.	___	(1)	**Draeger (or equivalent) portable detection/measuring device** with lower range tubes for CO_2, H_2S, and SO_2.
15.	___	(1)	**MSA explosimeter** (or equivalent).
16.	___	(1)	**Flare gun** - 25mm meteor type with flares.
17.	___	(2)	**Derrick safety belts** with 10' tail ropes.
18.	___	(2)	**200' retrieval ropes.**
19.	___	(3)	**Hearing protectors** - muff type.
20.	___	(1)	**First aid kit** - 25 unit.
21.	___	(3)	**Flashlights** w/batteries (explosion-proof & watertight).
22.	___	(1)	**Disinfectant, cleaner, and towels** for breathing apparatus.
23.	___	(1)	**Inspection records** for breathing apparatus and air supply.
24.	___	(1)	**Fire extinguisher** (rated 60:BC).
25.	___	(4)	**Emergency telephone numbers** in plastic weatherproof holders located at: rig bulletin board; Meridian Oil supervisor's office; Contract supervisor's office; Safe Briefing Area.

Comments: _____

EFFECTS OF HYDROGEN SULFIDE, CARBON DIOXIDE AND OTHER GASSES ON DRILLING OPERATIONS

Toxic Effect

1. Hydrogen Sulfide - H_2S

Hydrogen sulfide is a colorless, flammable, extremely poisonous gas. It is 1.2 times as heavy as air and will accumulate in low areas. It forms an explosive mixture with air between 4.3 and 44.0 percent by volume. It can be detected by smell at a concentration in air of only 0.02 ppm. Exposure to 10 ppm can be tolerated up to 8 hours without respiratory equipment. Respiratory equipment is required to protect workers should conditions exceed the foregoing allowable exposure limit. Concentrations in excess of 20 ppm has an effect on the olfactory nerve which deadens the sense of smell. Unconsciousness can occur without warning within seconds of inhalation at concentrations above 500 ppm.

Physical Effects of Hydrogen Sulfide

Concentration Percent (%)	ppm	Physical Effects
0.001	10	Obvious and unpleasant odor.
0.001	10	Safe for 8 hours exposure.
0.01	100	Kills smell in 3 to 15 minutes; may sting eyes and throat.
0.02	200	Kills smell shortly; stings eyes and throat.
0.05	500	Dizziness; breathing ceases in a few minutes; needs prompt artificial respiration.
0.07	700	Unconscious quickly; death will result if not rescued promptly.
0.10	1000	Unconscious at once; followed by death within minutes.

H_2S Drilling Operations Plan

A. Training Program - Meridian Oil will ensure all personnel have been properly H_2S trained as per API RP 49 prior to 3 days or 500 feet prior to penetrating the Upper Ismay at 8679' KB. An initial training session and weekly H_2S and well control drills for all personnel in each working crew will be conducted. Each training session and drill will be recorded on the drillers log. Two briefing areas will be designated and located at least 150 feet from the wellbore. One such briefing area will be upwind of the well at all times. John Dolan, Meridian Oil Safety Representative, will be designated and identified to all personnel on-site as responsible for on-site safety and training programs.

B. Protective Equipment - Meridian Oil will ensure respirator protection equipment program is implemented as per ANSI Z.88.2-1980. Proper breathing apparatus will be readily accessible for all essential personnel; meaning one working breathing apparatus including a five minute escape-type SCBA for the derrickman available for all essential personnel. The following additional safety equipment will be available for use:

1. Effective means of communication when using breathing apparatus.
2. A flare gun and flares to ignite well.
3. A telephone, radio, mobile phone or other device that provides communication from a safe area, where practical.

C. H_2S Detection and Monitoring Equipment

1. Drilling - will have three sensing points (shale shaker, rig floor, bell nipple) with rapid response sensors capable of sensing a minimum of 10 ppm of H_2S, in ambient air, which automatically activates visible and audible alarms at levels of threshold limits of 10 and 15 ppm, respectively.

   Completion - same as above except sensors will be located at the rig floor, cellar, and shale shaker or circulating tank.

   Workover - will have one sensor operational as close to the wellbore as possible.

2. All tests on H_2S monitoring system will be recorded on driller log.

D. Visible Warning System

1. Wind direction indicators (drilling (2); completion/workover (1)) will be located at separate elevations with one indicator clearly visible at all times from principle working areas. The wind indicator will be clearly visible from the briefing areas or additional indicators will be installed at such areas.

. Operation danger or caution signs will be displayed along all controlled accesses to the site. Each sign will be painted high visibility red, black, and white or yellow with black lettering. Signs will be large enough to be read by all persons entering the well site and be placed a minimum of 200 feet but no more than 500 feet from the well site.

. The sign(s) will read "DANGER - POISON GAS - HYDROGEN SULFIDE" and in smaller lettering, "Do not approach if red flag is flying".

. When H_2S is detected in excess of 10 ppm, red flag(s) will be displayed and visible to all personnel approaching the location under normal lighting and weather conditions.

Warning System Response - H_2S detected above 10 ppm will initiate all non-essential personnel to be moved to a safe area and all essential personnel to don breathing apparatus.

2. Carbon Dioxide - CO_2

Carbon dioxide is a colorless, odorless gas which can be tolerated in relatively high concentrations. Commonly used to extinguish fires, it is 1.5 times heavier than air and will concentrate in low areas of quiet air. The primary danger from CO_2 is that it causes an oxygen deficiency and requires supplied air systems to be provided for protective measures. Humans cannot breath air containing more than 10% carbon dioxide without losing consciousness. Air containing 50,000 ppm (5%) CO_2 will cause disorientation if inhaled for 30 minutes or more. Exposure to 5000 ppm CO_2 can be tolerated for a maximum of eight hours. Continued exposure to carbon dioxide after disorientation will cause convulsions, coma and respiratory failure.

3. Sulfur Dioxide - SO_2

Sulfur dioxide is a colorless, nonflammable, intensely irritating gas and 2.2 times heavier than air. It is a by-product of combustion of hydrogen sulfide and is highly toxic. Exposure to 2 ppm can be tolerated for a maximum of 8 hours. Respiratory equipment will be available and should be used by personnel measuring SO_2 concentration downwind from a flare.

4. Methane - CH_4

Methane is the major component of natural gas and is colorless, odorless and extremely flammable. The chief danger from methane is explosion. Mixture of CO_2, H_2S and CH_4 will burn if the total H_2S and CH_4 content, in any ratio, is above 25 percent. Also the presence of methane causes an oxygen deficient environment and requires adequate ventilation for breathing.

5. Carbon Monoxide - CO

Carbon monoxide is a colorless, odorless toxic gas. It's toxicity results from preferential reaction with the hemoglobin in the blood; however, it has no unique toxic action on any of the bodily tissues. CO displaces oxygen from hemoglobin and reduces the oxygen carrying capability of the blood.

The primary danger from CO is that it causes oxygen deficiency similar to carbon dioxide (CO_2). Respiratory equipment should be used for atmospheres containing greater than 35 ppm. Exposure to 100 ppm (.0190) for three hours produces no perceptible effects; however, after nine hours will tend to cause headaches and nausea. Concentrations above 1500 ppm may be dangerous to life.

In addition to the toxic effects of CO, carbon monoxide burns readily in air. The flammability limits of CO in air change with pressure. At atmospheric pressure, however, the lower limit is ±12.5% and upper limit is ±74%.

5. Properties of Various Gasses

mmon me	Chemical Formula	Specific Gravity Air=1	Time-Weighted Average[1]	Hazardous Limit[2]	Lethal Concentration[3]	Flammability
drogen lfide	H_2S	1.18	10 ppm	300 ppm/1hr	600 ppm	4.3% to 44% by volume in air
lfur oxide	SO_2	2.21	2 ppm	---	1000 ppm	
arbon ioxide	CO_2	1.52	5000 ppm	5%	10%	
ethane	CH_4	0.55	Simple Asphyxiant	---	---	5.3% to 14.0% by volume in air
arbon noxide	CO	0.97	35 ppm	1500 ppm	4000 ppm	12.5% to 74% by volume in air

Time Weighted Average (TWA) - Employee's average exposure in any eight our work shift of a 40 hour work week which shall not be exceeded.

Hazardous - Concentration that may cause death.

Lethal - Concentration that will cause death with short term exposure.

Corrosion Effects of H_2S and CO_2 on Steel

1. Hydrogen Sulfide (H_2S)

The three forms of hydrogen sulfide corrosion of steel are as follows:

(a) general or weight loss,
(b) localized or pitting, and
(c) sulfide stress cracking.

In both general and localized corrosion, hydrogen sulfide reacts with the steel to produce iron sulfide. General corrosion is characterized by the formation of an iron sulfide film on the surface of the steel. After long periods of exposure, weight loss can lead to a significant reduction in strength. Localized corrosion is much more serious and predominantly occurs in the pH range below six. Chloride or similar ions must be present for pitting to occur. Iron chloride accumulates at the metal to iron sulfide film interface and promotes a localized attack. Pitting corrosion has not presented a significant problem in drilling operations.

Of foremost concern is sulfide stress cracking or hydrogen embrittlement where failure may take place without warning or significant metal loss. This problem is related to strength of the steel, hydrogen sulfide concentration, pH, exposure time, temperature and stress level of the steel. Hydrogen sulfide absorbed on the metal surface promotes the entry of atomic hydrogen into the metal. The atomic hydrogen which enters the steel matrix diffuses to positions of high stress where it can induce hydrogen embrittlement. Thus, brittle failure can occur at stress levels significantly less than normal yield stress. A high total dissolved sulfide concentration can be tolerated if the pH is high enough (9.5 or greater).

2. Carbon Dioxide - CO_2

In the presence of water, carbon dioxide dissolves and forms carbonic acid. The carbonic acid causes a reduction in pH of the drilling fluid which makes it quite corrosive to steel. Carbon dioxide contamination is possible from oil and/or gas reservoirs. Sufficient quantities of CO_2 in the wellbore under drilling or static conditions will cause high corrosion rates.

6. Properties of Various Gasses

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Effects of H_2S and CO_2 on Drilling Fluid

1. Hydrogen Sulfide - H_2S

When H_2S is entrained in a drilling fluid, it will disassociate to some degree depending on the pH of the system as follows:

$$H_2S \rightleftharpoons H^+ + HS^- \rightleftharpoons 2H^+ + S^=$$

Hydrogen Sulfide Gas		Hydrogen Ion	+	Bisulfide Ion		Hydrogen Ions	+	Sulfide Ion

Undisassociated hydrogen sulfide is the molecule which attacks steel surfaces and causes corrosion and embrittlement. Below pH 4, nearly all of the H_2S in a system is in this molecular state. With increasing pH, H_2S disassociation increases so that above pH 10, effectively all of the H_2S is disassociated into bisulfide and sulfide ions. These ions are relatively harmless in the mud as long as the high pH is maintained. If pH is lowered, the reaction will be reversed and hydrogen sulfide gas will be evolved.

In addition to sulfide ions, disassociation of H_2S in drilling mud produces hydrogen ions, which will react with hydroxyl ions in a high pH mud to form water. With sufficient H_2S contam- ination, excess lime, if any, can be depleted and pH will begin to drop. A sufficient decrease in pH will, as previously stated, evolve H_2S gas.

It is therefore desirable to know whether H_2S has been encountered at the least possible time. This can be accomplished by testing the mud for sulfide ions daily, as described in the sulfide testing procedures that follow (API RP 13B).

2. Carbon Dioxide - CO_2

When carbon dioxide gas is entrained in a drilling fluid, it will combine with water to form carbonate and bicarbonate ions and will simultaneously reduce pH. If left untreated, this can result in excessive gelation of the drilling fluid. The normal treatment for this contamination is lime, which precipitates out carbonate and raise pH.

Corrosion Effects of H_2S and CO_2 on Steel

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SULFIDE TESTING PROCEDURE

HACH TEST

PROCEDURE FOR ESTIMATING FILTRATE SULFIDE

Equipment

The following materials are required to estimate the sulfide concentration in the mud filtrate:

a. Special test vial with vented cap
b. Lead acetate test paper to fit cap
c. Color comparison chart

NOTE: THE HACH HYDROGEN SULFIDE TEST KIT (MODEL HS-7) CONSISTS OF ITEMS a, b, and c ABOVE.

d. Distilled water
e. Hypodermic syringe
f. Defoamer (such as octyl alcohol or sulfated castor oil)
g. 0.1N acid, sulfuric or hydrochloric

Procedure

Place one disk of dry lead acetate test paper inside the dry cap of the test vial.

Measure 2.5 cm^3 of freshly collected mud filtrate into the test vial. Dilute to the 25 cm^3 with distilled water.

Add 2 cm^3 of 0.1N acid, immediately add a fresh seltzer tablet, and quickly place the cap with the test paper on the vial. Allow the seltzer tablet to dissolve and then wait one minute.

Remove lead acetate paper and observe for brown coloration. If no coloration can be detected, then report the soluble sulfide as zero. If brown coloration is present, compare the test paper with color comparison chart. Read the appropriate ppm value (0.1, 0.3, 0.5, 1, 2, or 5) from the color chart and multiply by 10 to obtain the test result (1, 3, 5, 10, 20, or 50).

If the test paper matches the darkest color (5 ppm) on the color chart, the test result must be interpreted as greater than 50 ppm.

To extend the test range to higher concentration, dilute the filtrate as follows:

a. For a test range of 10 to 500 ppm, dilute 1.0 cm^3 of filtrate with 9.0 cm^3 of distilled water. Use 2.5 cm^3 of the diluted filtrate for the sulfide determination. Multiply the color chart value by 100 to obtain the test result.

Report the test result as filtrate sulfide in ppm.

NOTE 1: IT IS IMPORTANT TO NOTE THAT THIS TEST IN NOT HIGHLY ACCURATE. THE RESULTS SHOULD BE INTERPRETED AS ROUGH ESTIMATES.

NOTE 2: THE METHOD MAY BE USED FOR WATER USING 25 CM^3 SAMPLES OR THE SAME DILUTION PROCEDURE USED FOR MUD FILTRATE. THIS METHOD MAY ALSO BE USED FOR MUD BUT THE PROBABLE MEANING OF THE RESULTS IS VERY UNCERTAIN. THERE COULD ALSO BE CONSIDERABLE DIFFICULTY IN OBTAINING A REPRESENTATIVE SAMPLE OF DILUTED MUD.