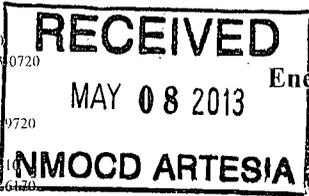


**District I**  
1625 N. French Dr., Hobbs, NM 88240  
Phone: (575) 393-6161 Fax: (575) 393-0720

**District II**  
811 S. First St., Artesia, NM 88210  
Phone: (575) 748-1283 Fax: (575) 748-0720

**District III**  
1000 Rio Brazos Road, Aztec, NM 87410  
Phone: (505) 334-6178 Fax: (505) 334-6120

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



State of New Mexico  
Energy Minerals and Natural Resources  
Oil Conservation Division  
1220 South St. Francis Dr.  
Santa Fe, NM 87505

Form C-101  
Revised November 14, 2012

AMENDED REPORT

**APPLICATION FOR PERMIT TO DRILL, RE-ENTER, DEEPEN, PLUGBACK, OR ADD A ZONE**

<sup>1</sup> Operator Name and Address OXY USA INC. P.O. Box 50250 Midland, TX 79710		<sup>2</sup> OGRID Number 16696	
		<sup>3</sup> API Number 30-015-41324	
<sup>4</sup> Property Code	<sup>5</sup> Property Name Cedar Canyon 16 SWD		<sup>6</sup> Well No. 3

**<sup>7</sup> Surface Location**

UL - Lot	Section	Township	Range	Lot Idn	Feet from	N/S Line	Feet From	E/W Line	County
D	16	24S	29E		725	N	660	W	Eddy

**<sup>8</sup> Proposed Bottom Hole Location**

UL - Lot	Section	Township	Range	Lot Idn	Feet from	N/S Line	Feet From	E/W Line	County

**<sup>9</sup> Pool Information**

<sup>9</sup> Pool Name SWD Delaware	<sup>10</sup> Pool Code 96100
--	----------------------------------

**Additional Well Information**

<sup>11</sup> Work Type N	<sup>12</sup> Well Type S	<sup>13</sup> Cable/Rotary R	<sup>14</sup> Lease Type P	<sup>15</sup> Ground Level Elevation 2927'
<sup>16</sup> Multiple N	<sup>17</sup> Proposed Depth 4400'	<sup>18</sup> Formation Delaware	<sup>19</sup> Contractor TBD	<sup>20</sup> Spud Date 7/1/13
Depth to Ground water		Distance from nearest fresh water well		Distance to nearest surface water

**<sup>21</sup> Proposed Casing and Cement Program**

Type	Hole Size	Casing Size	Casing Weight/ft	Setting Depth	Sacks of Cement	Estimated TOC
Surf	12 1/4"	9 5/8"	36	310'	210	Surf
Prod.	8 3/4"	7"	26	4400'	1230	Surf

**Casing/Cement Program: Additional Comments**

See attached for additional information

**<sup>22</sup> Proposed Blowout Prevention Program**

Type	Working Pressure	Test Pressure	Manufacturer
Double Ram	5000	5000	

<sup>23</sup> I hereby certify that the information given above is true and complete to the best of my knowledge and belief. I further certify that I have complied with 19.15.14.9 (A) NMAC <input checked="" type="checkbox"/> and/or 19.15.14.9 (B) NMAC <input checked="" type="checkbox"/> , if applicable. Signature: <i>David Stewart</i>	OIL CONSERVATION DIVISION	
	Approved By:	
Printed name: David Stewart	Title:	
Title: Sr. Regulatory Advisor	Approved Date:	Expiration Date:
E-mail Address: david_stewart@oxy.com		
Date: 5/6/13	Phonc: 432-685-5717	Conditions of Approval Attached

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1625 N. French Dr., Hobbs, NM 88240  
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State of New Mexico  
Energy, Minerals & Natural Resources Department  
OIL CONSERVATION DIVISION  
1220 South St. Francis Dr.  
Santa Fe, New Mexico 87505

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

AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number 30-015-41324	Pool Code 11540	Pool Name Cedar Canyon Delaware
Property Code 39045	Property Name CEDAR CANYON 16 SWD	Well Number 3
OGRID No. 16696	Operator Name OXY U.S.A. INC.	Elevation 2927'

Surface Location

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
D	16	24-S	29-E		725	NORTH	660	WEST	EDDY

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

Dedicated Acres 0	Joint or Infill N	Consolidation Code	Order No.
----------------------	----------------------	--------------------	-----------

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

	<p><b>OPERATOR CERTIFICATION</b></p> <p>I hereby certify that the information herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.</p> <p><i>David Stewart</i> 4/24/13 Signature Date</p> <p>David Stewart Sr. Reg. Ado. Printed Name</p> <p>dauid_stewart@oxy.com E-mail Address</p>
	<p><b>SURVEYOR CERTIFICATION</b></p> <p>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.</p> <p>MARCH 15, 2013</p> <p>Date of Survey</p> <p>Signature &amp; Seal of Professional Surveyor:</p>
	<p>Certificate Number Gary G. Edson 12641 Ronald J. Edson 3239</p> <p>BKL PROFESSIONAL SURVEYOR W.O. 13.11.0263</p>

Operator Name/Number: OXY USA Inc. 16696  
 Lease Name/Number: Cedar Canyon 16 SWD #3 39045  
 Pool Name/Number: Cedar Canyon Delaware 11540  
 Surface Location: 725 FNL 660 FWL D Sec 16 T24S R29E

C-102 Plats: 3/15/13 3/27/13 4/18/13 Elevation: 2927' GL

Proposed TD: 4400' TVD  
 SL - Lat: 32.2222738 Long: 103.995408 X=604501.4 Y=4444915.5 NAD - 1927

**Casing Program:**

<u>Hole Size</u>	<u>Interval</u>	<u>OD Csg</u>	<u>Weight</u>	<u>Collar</u>	<u>Grade</u>	<u>Condition</u>	<u>Collapse Design Factor</u>	<u>Burst Design Factor</u>	<u>Tension Design Factor</u>
12-1/4"	0-310'	9-5/8"	36	ST&C	J-55	New	14.92	2.38	3.54
				Hole filled with 8.4# Mud			2020#	3520#	
8-3/4"	0-4400'	7"	26	LT&C	L-80	New	2.46	4.12	3.38
				Hole filled with 9.6# Mud			5410#	7240#	

Collapse and burst loads calculated using Stress Check with anticipated loads

**Cement Program:**

- a. 9-5/8" Surface Circulate cement to surface w/ 210sx PP cmt w/ 1% CaCl<sub>2</sub>, 14.8ppg 1.35 yield 1346# 24hr CS 165% Excess
- c. 7" Production Circulate cement w/ 850sx HES light PP cmt w/ .5% salt + .35% HR-800, 12.9ppg 1.85 yield 734# 24hr CS, 125% Excess followed by 380sx PP cmt w/ .5% Halad R-344 + .2% WellLife 734 + 5#/sx Microbond + .3% Econolite + .3% CFR-3, 14.2ppg 1.55 yield 1914# 24hr CS 125% Excess

**Description of Cement Additives:** Calcium Chloride, Salt (Accelerator); WellLife 734 (Cement Enhancer); D-Air 6000 (Defoamer); CFR-3 (Dispersant); Microbond (Expander); Kol Seal, Poly-E-Flake (Lost Circulation Additive); Halad R-344 (Low Fluid Loss Control); HR-601, HR-800 (Retarder)

The above cement volumes could be revised pending the caliper measurement.

**Proposed Mud Circulation System:**

<u>Depth</u>	<u>Mud Wt. ppg</u>	<u>Visc sec</u>	<u>Fluid Loss</u>	<u>Type System</u>
0 - 310'	8.4-8.8	27-38	NC	Fresh Water/Spud Mud
310' - TD	9.6-10.0	28-40	NC	Cut Brine/Salt Gel-Starch

Pump high viscosity sweeps as needed for hole cleaning. The mud system will be monitored visually/manually as well as with an electronic PVT. The necessary mud products for additional weight and fluid loss control will be on location at all times.

**BOP Program:**

Surface None  
 Intermediate/Production 11" 5M two ram stack w/ 3M annular preventer, 5M Choke Manifold

**Estimated Tops of Geological Markers & Depths of Anticipated Fresh Water, Oil or Gas:**

<u>Geological Marker</u>	<u>Depth</u>	<u>Type</u>
a. Rustler	285'	Formation
b. Top Salt	330'	Formation
c. Bottom Salt	2690'	Formation
d. Base Anhydrite	2875'	Formation
e. Delaware-Bell Canyon	2968'	Oil/Gas
f. Delaware-Brushy Canyon	3720'	Oil/Gas

Fresh water may be present above the Rustler formation. Surface casing will be set below the top of the Rustler, which will cover potential fresh water sources.

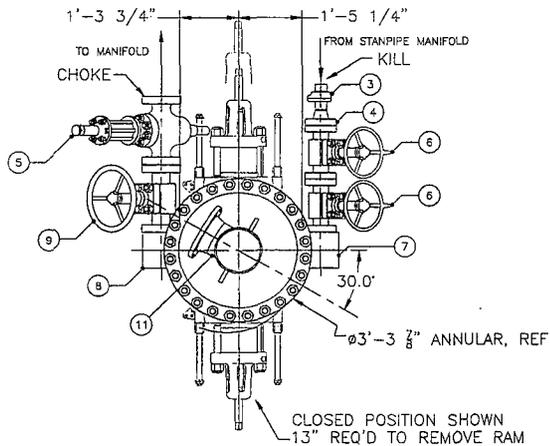
## Permit Comments

**Operator:** OXY USA INC , 16696

**Well:** CEDAR CANYON 16 SWD #003

**API:**

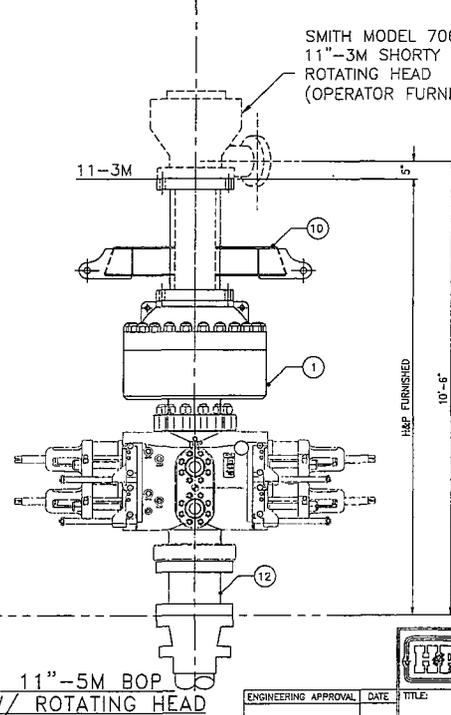
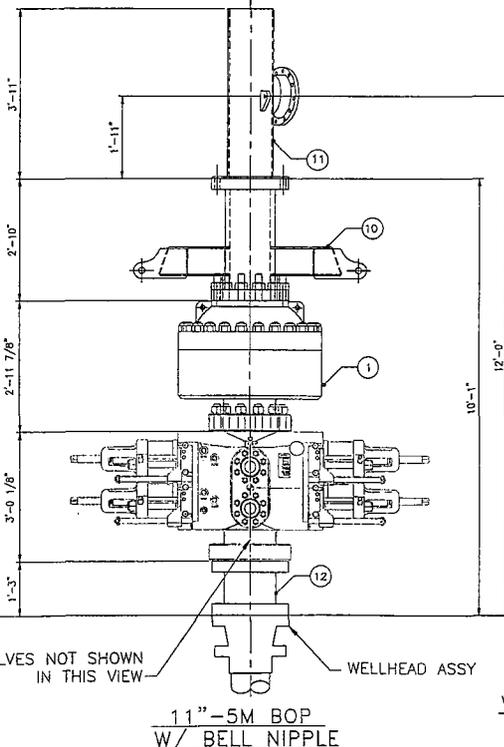
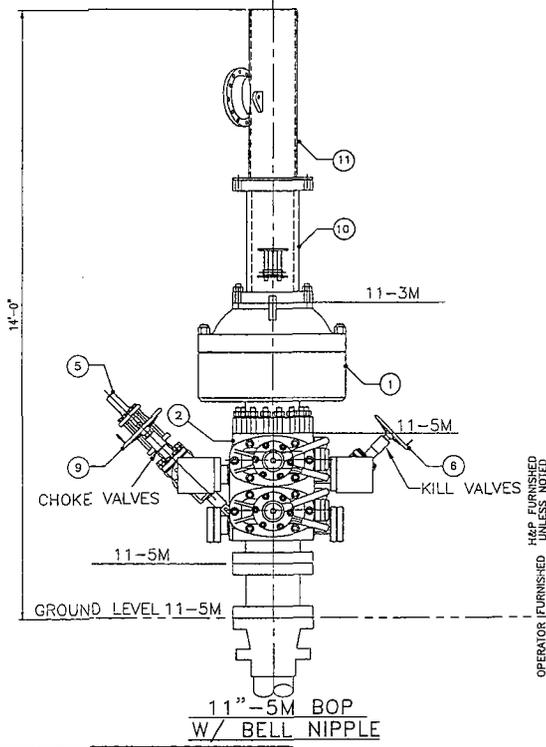
<b>Created By</b>	<b>Comment</b>	<b>Comment Date</b>
STEWARTD	This will be drilled as a SWD well. Currently working on the C-108 SWD application.	4/24/2013
STEWARTD	BOP - 11" 5M two ram stack w/ 3M annular preventer, 5M choke manifold	4/24/2013
Artesia	APD's for injection or SWD wells cannot be submitted on. They must be submit by mail using paper forms.	5/1/2013



PROPER TORQUE FOR BOLTS				
COMPONENT	FLANGE SIZE & RATING	BOLT SIZE	TORQUE (FT/LBS)	
			CF=0.07	CF=0.13
SPOOLS, ANNULAR & RAMS	11"x5M	1 7/8" DIA.	1890	3330
BLOCKS	3 1/8x5M	1 1/8" DIA.	401	686
CHOKE VALVES	3 1/8x5M	1 1/8" DIA.	401	686
KILL VALVES	2 1/16x5M	7/8" DIA.	188	319

BILL OF MATERIAL				
ITEM NO.	QUAN.	DESCRIPTION	PART NUMBER	WEIGHT
		11-5M BOP ASSEMBLY		
1	1	ANNULAR, 11x5M BOLTED TYPE		6005
2	1	BOP DOUBLE RAM		7600
4		RAM ELEMENTS		444
3	1	HAMMER UNION, 2-1502# XOM (BW)		5
4	1	FLANGE, WN 2 1/16-5M API		42
5	1	VALVE, GATE FLS-HCR 3 1/8-5M		398
6	2	VALVE, GATE 2 1/16-5M		350
7	1	90° STUDDED BLOCK, 3 1/8-5M X 2 1/16-5M		240
8	1	90° STUDDED BLOCK, 3 1/8-5M X 3 1/8-5M		250
9	2	VALVE, GATE 3 1/8-5M		720
10	1	BELL NIPPLE BOP LIFTING SECTION	WV F4H-H-318.01A	780
11	1	BELL NIPPLE EXTENSION	WV F4H-H-319.01A	396
12	1	11"-5M x 11"-5M x 1'-3" LONG SPACER		600
		SPOOL- WORKING PRESSURE 5000 PSI		

HARDWARE				
ITEM NO.	QUAN.	DESCRIPTION	PART NUMBER	WEIGHT
		RINGS AND BOLTS		400



APPROX. TOTAL WEIGHT = 18,228 LBS.

**ISSUED FOR FABRICATION**  
August-08-2008  
DRAFTSMAN \_\_\_\_\_  
ENGINEER \_\_\_\_\_

**HELMERICH & PAYNE**  
INTERNATIONAL DRILLING CO.

TITLE: 11-5M BOP EQUIPMENT GENERAL ARRANGEMENT

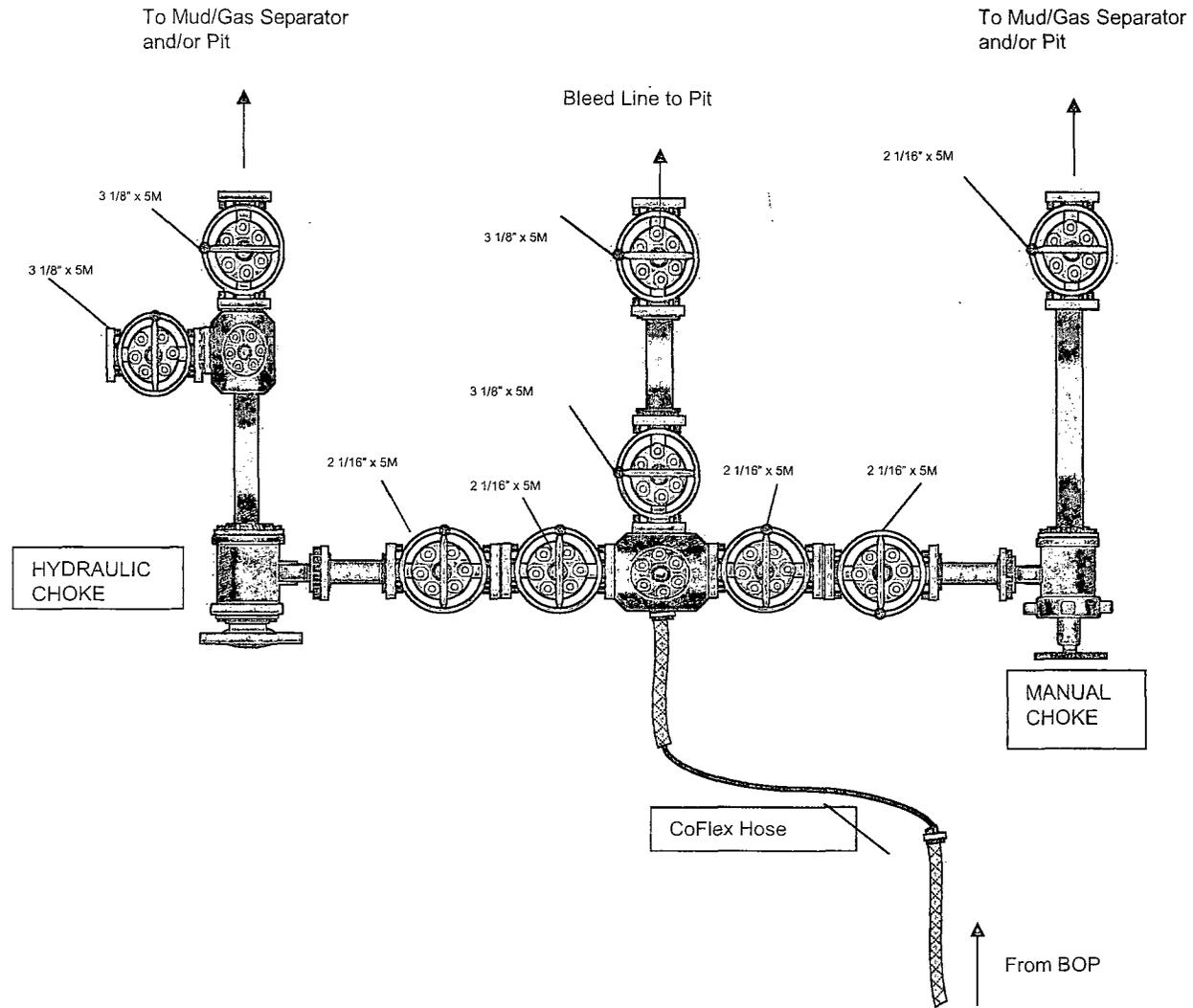
CUSTOMER: OXY-PERMAN  
PROJECT: F4M

ENGINEERING APPROVAL: \_\_\_\_\_ DATE: \_\_\_\_\_

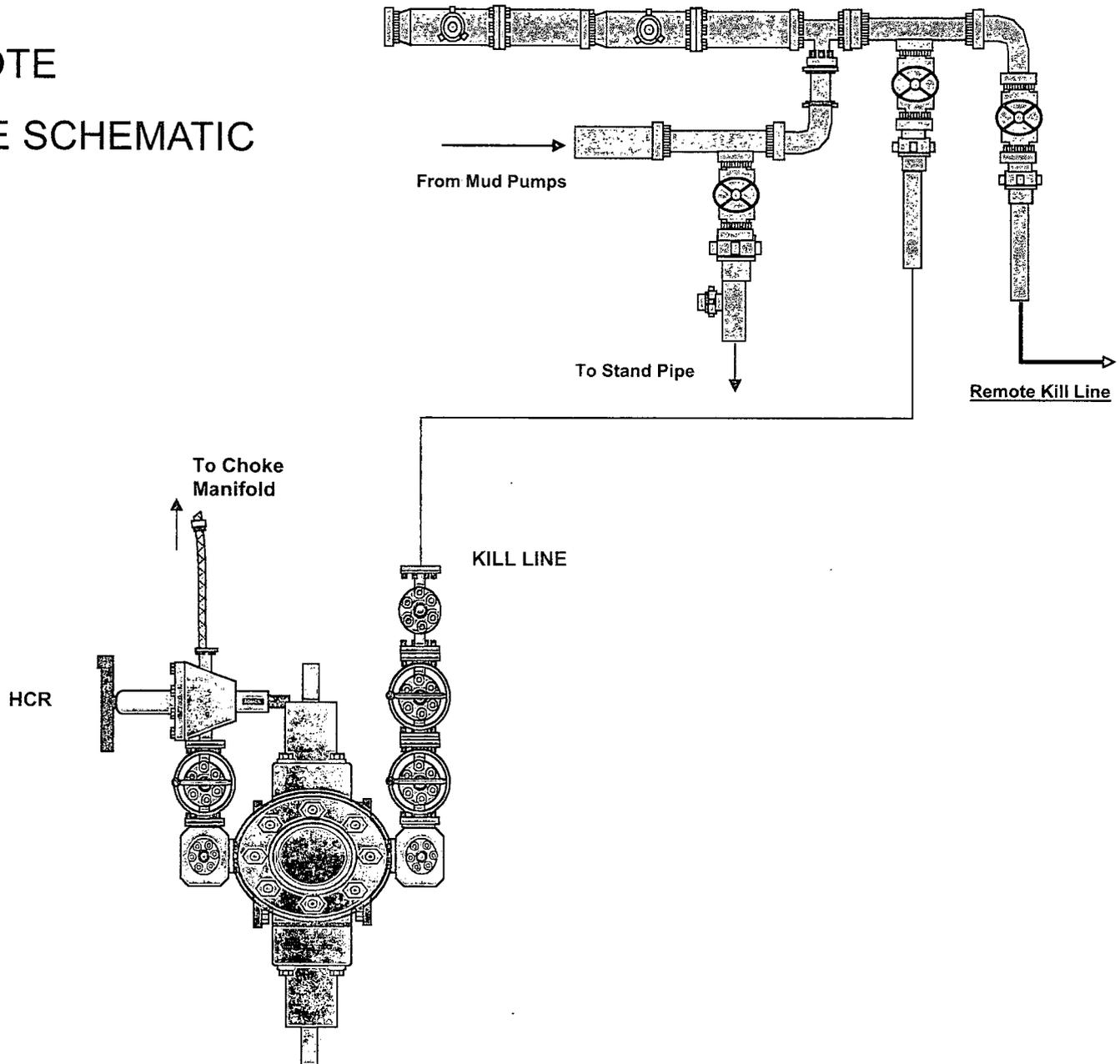
PROPRIETARY  
THIS DRAWING AND THE IDEAS AND INFORMATION INCLUDED IN THIS DRAWING ARE PROPRIETARY AND ARE NOT TO BE

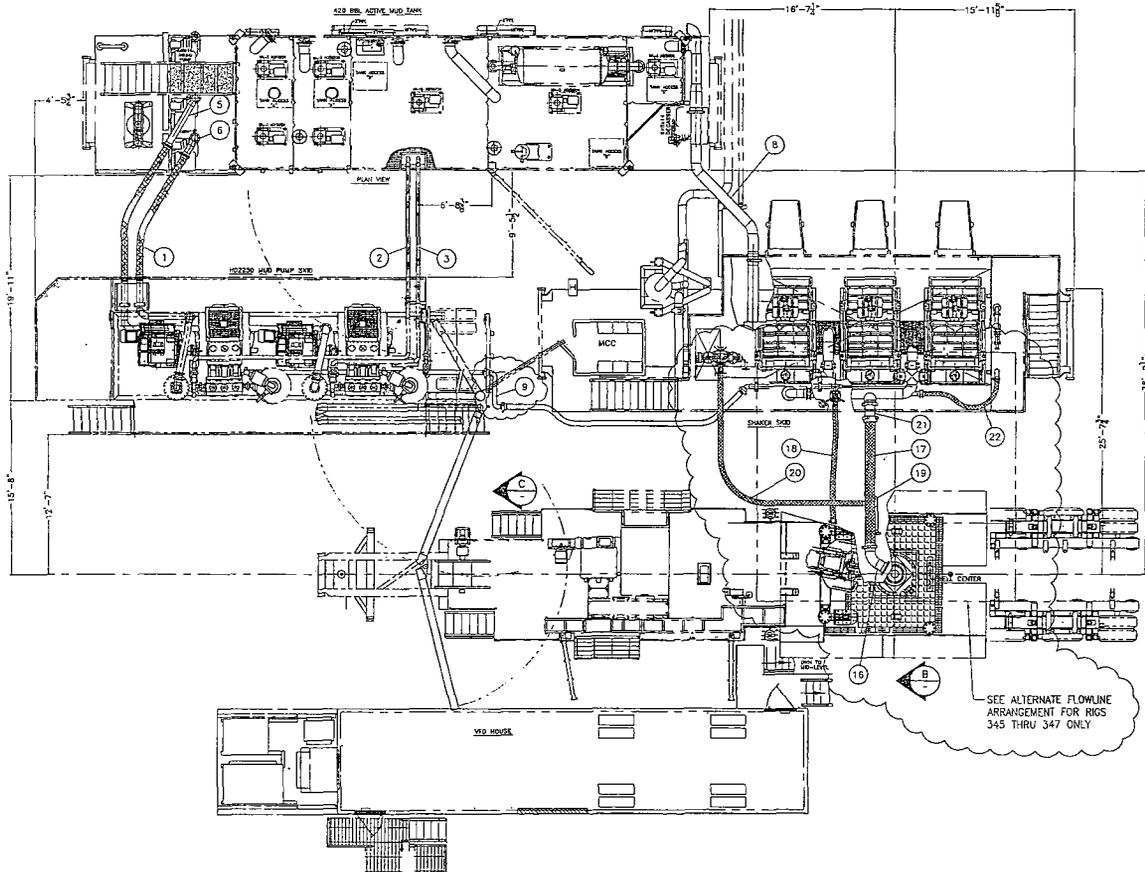
NOTES:

# 5M CHOKE MANIFOLD CONFIGURATION

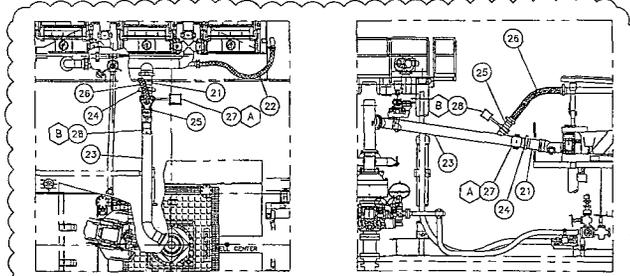


# 5M REMOTE KILL LINE SCHEMATIC



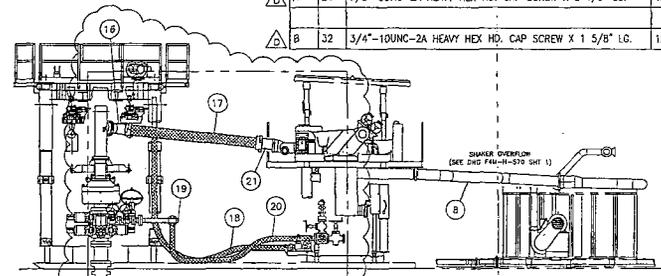


PARTIAL PLAN VIEW



ALTERNATE FLOWLINE ARRANGEMENT  
(FOR RIGS 345 THRU 347 ONLY)

**ISSUED FOR FABRICATION**  
October-23-2008  
DRAFTSMAN \_\_\_\_\_  
ENGINEER \_\_\_\_\_



SECTION B-B

SEE ALTERNATE FLOWLINE ARRANGEMENT FOR RIGS 345 THRU 347 ONLY

**BILL OF MATERIAL**

ITEM NO.	QUAN.	DESCRIPTION	PART NUMBER	WT.
1	2	LOW PRESSURE SPOOL #1	MKFAH-H-570.07	239
2	1	POP-OFF/BLEED SPOOL #1	MKFAH-H-570.01A	157
3	1	POP-OFF/BLEED SPOOL #2	MKFAH-H-570.01B	140
4		DELETED		
5	1	LOW PRESSURE SUCTION SPOOL #1	MKFAH-H-570.010	199
6	1	LOW PRESSURE SUCTION SPOOL #2	MKFAH-H-570.01H	101
7	1	HOSE-HIGH PRESSURE	MKFAH-H-570.01C	276
8	1	OVERFLOW RETURN SPOOL	MKFAH-H-563.00A	678
9	1	MUD PUMP/SHAKER SKID SPOOL	MKFAH-H-570.01E	181
10	22FT	TS 1 1/2x1 1/2x3/16 (A500)		150
11	1	POP-OFF PIPE HANGER SUPPORT	MKFAH-H-570.01C	30
12	1	L3x3x1/4 (1'-6" LG) (A36)		7
13	1	L3x3x1/4 (1'-6" LG) (A36)		7
14	1	PLATE, 1/4" THK. 4x2'-3 1/4" (A36)		8
15	1	L3x3x1/4 (4'-11 3/4" LG) (A36)		25
16	1	SHAKER FLOWLINE	MKFAH-H-562.02A	230
17	1	SHAKER FLOWLINE	MKFAH-H-562.02B	281
18	1	HOSE	MKFAH-H-563.03E	
19	1	SPOOL #1	MKFAH-H-564.02A	182
20	1	HIGH PRESSURE HOSE, 3" I.D. x 29'-0" LG. WITH 3 1/8" - SM FLANGED ENDS	FRIDON HEATY	
21	1	SHAKER FLOWLINE	MKFAH-H-562.02C	73
22	1	SHAKER SPOOL	MKFAH-H-562.02B	177

**RIGS 345 - 347 ONLY**

**BILL OF MATERIAL**

ITEM NO.	QUAN.	DESCRIPTION	PART NUMBER	WT.
23	1	SHAKER FLOWLINE	MKFAH-H-569-04A	656
24	1	SHAKER FLOWLINE	MKFAH-H-569-04B	118
25	1	SHAKER FLOWLINE	MKFAH-H-569-04C	67
26	1	SHAKER FLOWLINE HOSE	MKFAH-H-569-04D	77
27	1	FABRI - 10" AIR ACTUATED KNIFE GATE VALVE		56
28	1	FABRI - 6" AIR ACTUATED KNIFE GATE VALVE		52

THESE ITEMS REPLACE ITEMS 16 & 17

**HARDWARE**

ITEM NO.	QUAN.	DESCRIPTION	PART NUMBER	WT.
A	24	7/8"-BUNC-2A HEAVY HEX HD: CAP SCREW X 2 1/8" LG.		18
B	32	3/4"-10UNC-2A HEAVY HEX HD: CAP SCREW X 1 5/8" LG.		12

**PROPRIETARY**  
THIS DRAWING AND THE IDEAS AND INFORMATION INCLUDED IN THIS DRAWING ARE PROPRIETARY AND ARE NOT TO BE REPRODUCED, DISTRIBUTED OR DISCLOSED IN ANY MANNER, WITHOUT THE PRIOR, WRITTEN CONSENT OF A DULY AUTHORIZED OFFICER OF HELMERICH & PAYNE INTERNATIONAL DRILLING CO.

DATE	DESCRIPTION	BY	CC/APPV.
10/23/08	ISSUED FOR FABRICATION	DRJ	
09/04/08	ADDED SHT 2 & BOM	DRJ	
08/05/08	ADDED XX-HVY PIPING TO POP-OFF	DRJ	
07/17/08			

**HELMERICH & PAYNE**  
INTERNATIONAL DRILLING CO.

ENGINEERING APPROVAL \_\_\_\_\_ DATE \_\_\_\_\_

TITLE: **MUD SYSTEM INTERCONNECT PIPING ASSEMBLY**

CUSTOMER: **OXY PERMIAN**

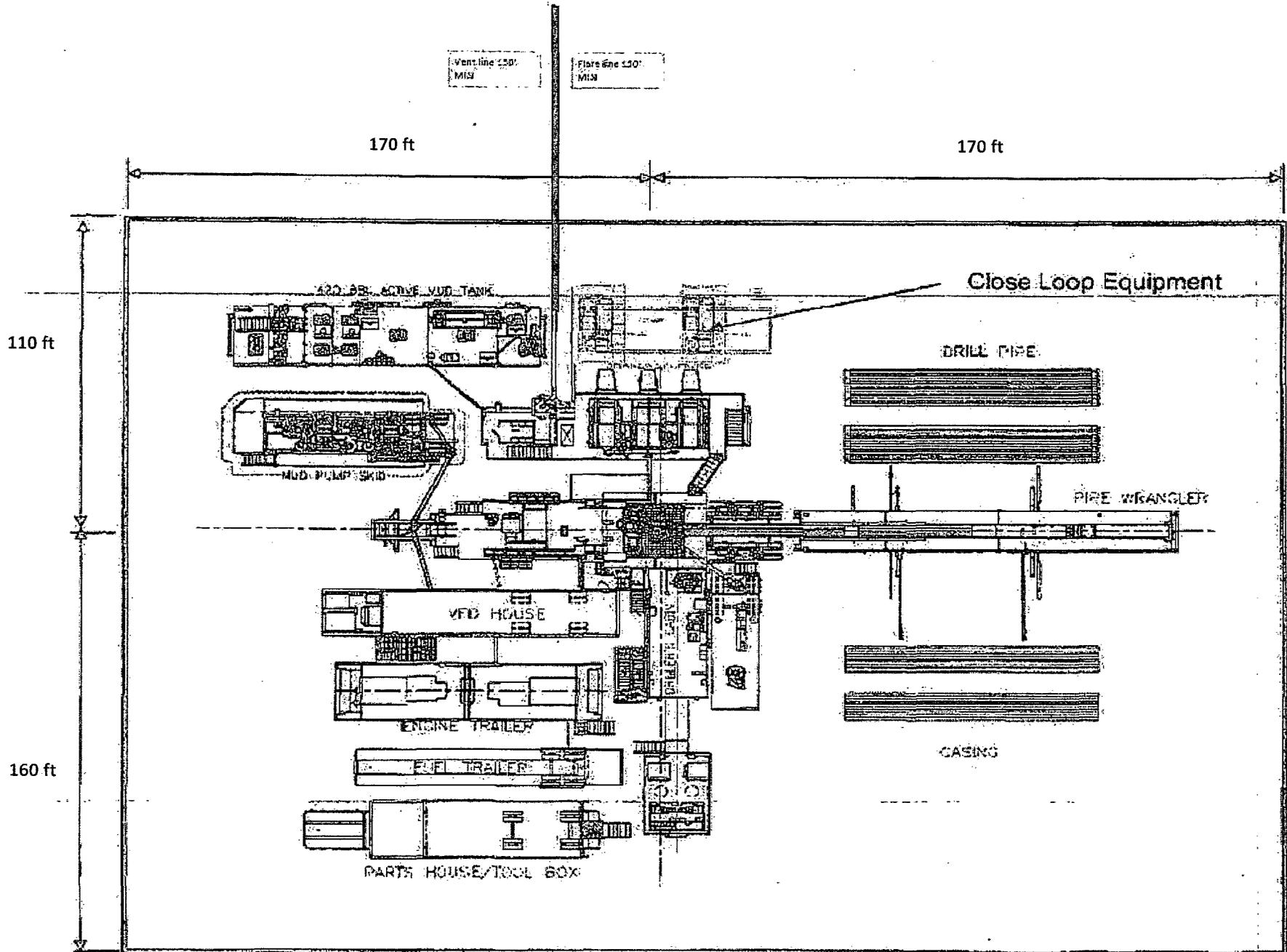
PROJECT: **F4M**

DRAWN: **O.JOHNSON** DATE: **07/08/08** DWG. NO.: \_\_\_\_\_ REV: \_\_\_\_\_



OXY FLEX IV PAD (Closed Loop System)

Revised 05/14/2009





## **Permian Drilling Hydrogen Sulfide Drilling Operations Plan New Mexico**

### **Scope**

This contingency plan establishes guidelines for the public, all company employees, and contract employees who's work activities may involve exposure to hydrogen sulfide (H<sub>2</sub>S) gas.

While drilling this well, it is possible to encounter H<sub>2</sub>S bearing formations. At all times, the first barrier to control H<sub>2</sub>S emissions will be the drilling fluid, which will have a density high enough to control influx.

### **Objective**

1. Provide an immediate and predetermined response plan to any condition when H<sub>2</sub>S is detected. All H<sub>2</sub>S detections in excess of 10 parts per million (ppm) concentration are considered an Emergency.
2. Prevent any and all accidents, and prevent the uncontrolled release of hydrogen sulfide into the atmosphere.
3. Provide proper evacuation procedures to cope with emergencies.
4. Provide immediate and adequate medical attention should an injury occur.

## Discussion

Implementation:	This plan with all details is to be fully implemented before drilling to <u>commence</u> .
Emergency response Procedure:	This section outlines the conditions and denotes steps to be taken in the event of an emergency.
Emergency equipment Procedure:	This section outlines the safety and emergency equipment that will be required for the drilling of this well.
Training provisions:	This section outlines the training provisions that must be adhered to prior to drilling.
Drilling emergency call lists:	Included are the telephone numbers of all persons to be contacted should an emergency exist.
Briefing:	This section deals with the briefing of all people involved in the drilling operation.
Public safety:	Public safety personnel will be made aware of any potential evacuation and any additional support needed.
Check lists:	Status check lists and procedural check lists have been included to insure adherence to the plan.
General information:	A general information section has been included to supply support information.

## Hydrogen Sulfide Training

All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis, will receive training from a qualified instructor in the following areas prior to commencing drilling operations on the well:

1. The hazards and characteristics of H<sub>2</sub>S.
2. Proper use and maintenance of personal protective equipment and life support systems.
3. H<sub>2</sub>S detection.
4. Proper use of H<sub>2</sub>S detectors, alarms, warning systems, briefing areas, evacuation procedures and prevailing winds.
5. Proper techniques for first aid and rescue procedures.
6. Physical effects of hydrogen sulfide on the human body.
7. Toxicity of hydrogen sulfide and sulfur dioxide.
8. Use of SCBA and supplied air equipment.
9. First aid and artificial respiration.
10. Emergency rescue.

In addition, supervisory personnel will be trained in the following areas:

1. The effects of H<sub>2</sub>S on metal components. If high tensile strength tubular is to be used, personnel will be trained in their special maintenance requirements.
2. Corrective action and shut-in procedures when drilling a well, blowout prevention and well control procedures.
3. The contents and requirements of the H<sub>2</sub>S Drilling Operations Plan.

H<sub>2</sub>S training refresher must have been taken within one year prior to drilling the well. Specifics on the well to be drilled will be discussed during the pre-spud meeting. H<sub>2</sub>S and well control (choke) drills will be performed while drilling the well, at least on a weekly basis. This plan shall be available in the well site. All personnel will be required to carry the documentation proving that the H<sub>2</sub>S training has been taken.

### Service company and visiting personnel

- A. Each service company that will be on this well will be notified if the zone contains H<sub>2</sub>S.
- B. Each service company must provide for the training and equipment of their employees before they arrive at the well site.
- C. Each service company will be expected to attend a well site briefing

## Emergency Equipment Requirements

1. Well control equipment

The well shall have hydraulic BOP equipment for the anticipated pressures. Equipment is to be tested on installation and follow Oxy Well Control standard, as well as BLM Onshore Order #2.

*Special control equipment:*

- A. Hydraulic BOP equipment with remote control on ground.
- B. Rotating head
- C. Gas buster equipment shall be installed before drilling out of surface pipe.

2. Protective equipment for personnel

- A. Four (4) 30-minute positive pressure air packs (2 at each briefing area) on location.
- B. Adequate fire extinguishers shall be located at strategic locations.
- C. Radio / cell telephone communication will be available at the rig.
  - Rig floor and trailers.
  - Vehicle.

3. Hydrogen sulfide sensors and alarms

- A. H<sub>2</sub>S sensor with alarms will be located on the rig floor, at the bell nipple, and at the flow line. These monitors will be set to alarm at 10 ppm with strobe light, and audible alarm.
- B. Hand operated detectors with tubes.
- C. H<sub>2</sub>S monitor tester (to be provided by contract Safety Company.)
- D. There shall be one combustible gas detector on location at all times.

4. Visual Warning Systems

- A. One sign located at each location entrance with the following language:

**Caution – potential poison gas  
Hydrogen sulfide  
No admittance without authorization**

*Wind sock – wind streamers:*

- A. One 36” (in length) wind sock located at protection center, at height visible from rig floor.
- B. One 36” (in length) wind sock located at height visible from pit areas.

*Condition flags*

- A. One each condition flag to be displayed to denote conditions.

**green – normal conditions**  
**yellow – potential danger**  
**red – danger, H2S present**

- B. Condition flag shall be posted at each location sign entrance.

5. Mud Program

The mud program is designed to minimize the risk of having H2S and other formation fluids at surface. Proper mud weight and safe drilling practices will be applied. H2S scavengers will be used to minimize the hazards while drilling. Below is a summary of the drilling program.

*Mud inspection devices:*

Garrett gas train or hatch tester for inspection of sulfide concentration in mud system.

6. Metallurgy

- A. Drill string, casing, tubing, wellhead, blowout preventers, drilling spools or adapters, kill lines, choke manifold, lines and valves shall be suitable for the H2S service.
- B. All the elastomers, packing, seals and ring gaskets shall be suitable for H2S service.

7. Well Testing

No drill stem test will be performed on this well.

8. Evacuation plan

Evacuation routes should be established prior to well spud for each well and discussed with all rig-personnel.

9. Designated area

- A. Parking and visitor area: all vehicles are to be parked at a predetermined safe distance from the wellhead.
- B. There will be a designated smoking area.
- C. Two briefing areas on either side of the location at the maximum allowable distance from the well bore so they offset prevailing winds perpendicularly, or at a 45-degree angle if wind direction tends to shift in the area.

**Emergency procedures**

- A. In the event of any evidence of H<sub>2</sub>S level above 10 ppm, take the following steps:
  - 1. The Driller will pick up off bottom, shut down the pumps, slow down the pipe rotation.
  - 2. Secure and don escape breathing equipment, report to the upwind designated safe briefing / muster area.
  - 3. All personnel on location will be accounted for and emergency search should begin for any missing, the Buddy System will be implemented.
  - 4. Order non-essential personnel to leave the well site, order all essential personnel out of the danger zone and upwind to the nearest designated safe briefing / muster area.
  - 5. Entrance to the location will be secured to a higher level than our usual "Meet and Greet" requirement, and the proper condition flag will be displayed at the entrance to the location.
  - 6. Take steps to determine if the H<sub>2</sub>S level can be corrected or suppressed and, if so, proceed as required.
- B. If uncontrollable conditions occur:
  - 1. Take steps to protect and/or remove any public in the down-wind area from the rig – partial evacuation and isolation. Notify necessary public safety personnel and appropriate regulatory entities (i.e. BLM) of the situation.

2. Remove all personnel to the nearest upwind designated safe briefing / muster area or off location.
3. Notify public safety personnel of safe briefing / muster area.
4. An assigned crew member will blockade the entrance to the location. No unauthorized personnel will be allowed entry to the location.
5. Proceed with best plan (at the time) to regain control of the well. Maintain tight security and safety procedures.

C. Responsibility:

1. Designated personnel.
  - a. Shall be responsible for the total implementation of this plan.
  - b. Shall be in complete command during any emergency.
  - c. Shall designate a back-up.

- All personnel:
1. On alarm, don escape unit and report to the nearest upwind designated safe briefing / muster area upw
  2. Check status of personnel (buddy system).
  3. Secure breathing equipment.
  4. Await orders from supervisor.

- Drill site manager:
1. Don escape unit if necessary and report to nearest upwind designated safe briefing / muster area.
  2. Coordinate preparations of individuals to return to point of release with tool pusher and driller (using the buddy system).
  3. Determine H2S concentrations.
  4. Assess situation and take control measures.

- Tool pusher:
1. Don escape unit Report to up nearest upwind designated safe briefing / muster area.
  2. Coordinate preparation of individuals to return to point of release with tool pusher drill site manager (using the buddy system).
  3. Determine H2S concentration.
  4. Assess situation and take control measures.

- Driller:
1. Don escape unit, shut down pumps, continue rotating DP.

2. Check monitor for point of release.
3. Report to nearest upwind designated safe briefing / muster area.
4. Check status of personnel (in an attempt to rescue, use the buddy system).
5. Assigns least essential person to notify Drill Site Manager and tool pusher by quickest means in case of their absence.
6. Assumes the responsibilities of the Drill Site Manager and tool pusher until they arrive should they be absent.

Derrick man  
 Floor man #1  
 Floor man #2

1. Will remain in briefing / muster area until instructed by supervisor.

Mud engineer:

1. Report to nearest upwind designated safe briefing / muster area.
2. When instructed, begin check of mud for ph and H2S level. (Garett gas train.)

Safety personnel:

1. Mask up and check status of all personnel and secure operations as instructed by drill site manager.

### **Taking a kick**

When taking a kick during an H2S emergency, all personnel will follow standard Well control procedures after reporting to briefing area and masking up.

### **Open-hole logging**

All unnecessary personnel off floor. Drill Site Manager and safety personnel should monitor condition, advise status and determine need for use of air equipment.

### **Running casing or plugging**

Following the same “tripping” procedure as above. Drill Site Manager and safety personnel should determine if all personnel have access to protective equipment.

## Ignition procedures

The decision to ignite the well is the responsibility of the operator (Oxy Drilling Management). The decision should be made only as a last resort and in a situation where it is clear that:

1. Human life and property are endangered.
2. There is no hope controlling the blowout under the prevailing conditions at the well.

### Instructions for igniting the well

1. Two people are required for the actual igniting operation. They must wear self-contained breathing units and have a safety rope attached. One man (tool pusher or safety engineer) will check the atmosphere for explosive gases with the gas monitor. The other man is responsible for igniting the well.
2. Primary method to ignite: 25 mm flare gun with range of approximately 500 feet.
3. Ignite upwind and do not approach any closer than is warranted.
4. Select the ignition site best for protection, and which offers an easy escape route.
5. Before firing, check for presence of combustible gas.
6. After lighting, continue emergency action and procedure as before.
7. All unassigned personnel will remain in briefing area until instructed by supervisor or directed by the Drill Site Manager.

**Remember:** After well is ignited, burning hydrogen sulfide will convert to sulfur dioxide, which is also highly toxic. **Do not assume the area is safe after the well is ignited.**

Status check list

Note: All items on this list must be completed before drilling to production casing point.

1. H2S sign at location entrance.
2. Two (2) wind socks located as required.
3. Four (4) 30-minute positive pressure air packs (2 at each Briefing area) on location for all rig personnel and mud loggers.
4. Air packs inspected and ready for use.
5. Cascade system and hose line hook-up as needed.
6. Cascade system for refilling air bottles as needed.
7. Condition flag on location and ready for use.
8. H2S detection system hooked up and tested.
9. H2S alarm system hooked up and tested.
10. Hand operated H2S detector with tubes on location.
11. 1 – 100' length of nylon rope on location.
12. All rig crew and supervisors trained as required.
13. All outside service contractors advised of potential H2S hazard on well.
14. No smoking sign posted and a designated smoking area identified.
15. Calibration of all H2S equipment shall be noted on the IADC report.

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

## Procedural check list during H2S events

### **Perform each tour:**

1. Check fire extinguishers to see that they have the proper charge.
2. Check breathing equipment to ensure that it is in proper working order.
3. Make sure all the H2S detection system is operative.

### **Perform each week:**

1. Check each piece of breathing equipment to make sure that demand or forced air regulator is working. This requires that the bottle be opened and the mask assembly be put on tight enough so that when you inhale, you receive air or feel air flow.
2. BOP skills (well control drills).
3. Check supply pressure on BOP accumulator stand by source.
4. Check breathing equipment mask assembly to see that straps are loosened and turned back, ready to put on.
5. Check pressure on breathing equipment air bottles to make sure they are charged to full volume. ( Air quality checked for proper air grade "D" before bringing to location)
6. Confirm pressure on all supply air bottles.
7. Perform breathing equipment drills with on-site personnel.
8. Check the following supplies for availability.
  - A. Emergency telephone list.
  - B. Hand operated H2S detectors and tubes.

### General evacuation plan

1. When the company approved supervisor (Drill Site Manager, consultant, rig pusher, or driller) determines the H<sub>2</sub>S gas cannot be limited to the well location and the public will be involved, he will activate the evacuation plan.
2. Drill Site Manager or designee will notify local government agency that a hazardous condition exists and evacuation needs to be implemented.
3. Company or contractor safety personnel that have been trained in the use of H<sub>2</sub>S detection equipment and self-contained breathing equipment will monitor H<sub>2</sub>S concentrations, wind directions, and area of exposure. They will delineate the outer perimeter of the hazardous gas area. Extension to the evacuation area will be determined from information gathered.
4. Law enforcement personnel (state police, police dept., fire dept., and sheriff's dept.) Will be called to aid in setting up and maintaining road blocks. Also, they will aid in evacuation of the public if necessary.
5. After the discharge of gas has been controlled, company safety personnel will determine when the area is safe for re-entry.

**Important: Law enforcement personnel will not be asked to come into a contaminated area. Their assistance will be limited to uncontaminated areas. Constant radio contact will be maintained with them.**

## Emergency actions

### Well blowout – if emergency

1. Evacuate all personnel to “Safe Briefing / Muster Areas” or off location if needed.
2. If sour gas – evacuate rig personnel.
3. If sour gas – evacuate public within 3000 ft radius of exposure.
4. Don SCBA and shut well in if possible using the buddy system.
5. Notify Drilling Superintendent and call 911 for emergency help (fire dept and ambulance) if needed.
6. Implement the Blowout Contingency Plan, and Drilling Emergency Action Plan.
6. Give first aid as needed.

### Person down location/facility

1. If immediately possible, contact 911. Give location and wait for confirmation.
2. Don SCBA and perform rescue operation using buddy system.

### Toxic effects of hydrogen sulfide

Hydrogen sulfide is extremely toxic. The acceptable ceiling concentration for eight-hour exposure is 10 ppm, which is .001% by volume. Hydrogen sulfide is heavier than air (specific gravity – 1.192) and colorless. It forms an explosive mixture with air between 4.3 and 46.0 percent by volume. Hydrogen sulfide is almost as toxic as hydrogen cyanide and is between five and six times more toxic than carbon monoxide. Toxicity data for hydrogen sulfide and various other gases are compared in table i. Physical effects at various hydrogen sulfide exposure levels are shown in table ii.

Table i  
Toxicity of various gases

Common name	Chemical formula	Specific gravity (sc=1)	Threshold limit (1)	Hazardous limit (2)	Lethal concentration (3)
Hydrogen Cyanide	Hcn	0.94	10 ppm	150 ppm/hr	300 ppm
Hydrogen Sulfide	H2S	1.18	10 ppm	250 ppm/hr	600 ppm
Sulfur Dioxide	So2	2.21	5 ppm	-	1000 ppm
Chlorine	Cl2	2.45	1 ppm	4 ppm/hr	1000 ppm
Carbon Monoxide	Co	0.97	50 ppm	400 ppm/hr	1000 ppm
Carbon Dioxide	Co2	1.52	5000 ppm	5%	10%
Methane	Ch4	0.55	90,000 ppm	Combustible above 5% in air	

- 1) threshold limit – concentration at which it is believed that all workers may be repeatedly exposed day after day without adverse effects.
- 2) hazardous limit – concentration that will cause death with short-term exposure.
- 3) lethal concentration – concentration that will cause death with short-term exposure.

### Toxic effects of hydrogen sulfide

Table ii  
Physical effects of hydrogen sulfide

<u>Percent (%)</u>	<u>Ppm</u>	<u>Concentration</u> Grains 100 std. Ft3*	<u>Physical effects</u>
0.001	<10	00.65	Obvious and unpleasant odor.

0.002	10	01.30	Safe for 8 hours of exposure.
0.010	100	06.48	Kill smell in 3 - 15 minutes. May sting eyes and throat.
0.020	200	12.96	Kills smell shortly; stings eyes and throat.
0.050	500	32.96	Dizziness; breathing ceases in a few minutes; needs prompt artificial respiration.
0.070	700	45.36	Unconscious quickly; death will result if not rescued promptly.
0.100	1000	64.30	Unconscious at once; followed by death within minutes.

\*at 15.00 psia and 60'f.

### Use of self-contained breathing equipment (SCBA)

1. Written procedures shall be prepared covering safe use of SCBA's in dangerous atmosphere, which might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available SCBA.
2. SCBA's shall be inspected frequently at random to insure that they are properly used, cleaned, and maintained.
3. Anyone who may use the SCBA's shall be trained in how to insure proper face-piece to face seal. They shall wear SCBA's in normal air and then wear them in a test atmosphere. (note: such items as facial hair {beard or sideburns} and eyeglasses will not allow proper seal.) Anyone that may be reasonably expected to wear SCBA's should have these items removed before entering a toxic atmosphere. A special mask must be obtained for anyone who must wear eyeglasses or contact lenses.
4. Maintenance and care of SCBA's:
  - a. A program for maintenance and care of SCBA's shall include the following:
    1. Inspection for defects, including leak checks.
    2. Cleaning and disinfecting.
    3. Repair.
    4. Storage.
  - b. Inspection, self-contained breathing apparatus for emergency use shall be inspected monthly.
    1. Fully charged cylinders.
    2. Regulator and warning device operation.
    3. Condition of face piece and connections.
    4. Rubber parts shall be maintained to keep them pliable and prevent deterioration.
  - c. Routinely used SCBA's shall be collected, cleaned and disinfected as frequently as necessary to insure proper protection is provided.
5. Persons assigned tasks that requires use of self-contained breathing equipment shall be certified physically fit (medically cleared) for breathing equipment usage at least annually.
6. SCBA's should be worn when:
  - A. Any employee works near the top or on top of any tank unless test reveals less than 10 ppm of H<sub>2</sub>S.

- B. When breaking out any line where H2S can reasonably be expected.
- C. When sampling air in areas to determine if toxic concentrations of H2S exists.
- D. When working in areas where over 10 ppm H2S has been detected.
- E. At any time there is a doubt as to the H2S level in the area to be entered.

**Rescue**  
**First aid for H2S poisoning**

Do not panic!

Remain calm – think!

1. Don SCBA breathing equipment.
2. Remove victim(s) utilizing buddy system to fresh air as quickly as possible. (go up-wind from source or at right angle to the wind. Not down wind.)
3. Briefly apply chest pressure – arm lift method of artificial respiration to clean the victim's lungs and to avoid inhaling any toxic gas directly from the victim's lungs.
4. Provide for prompt transportation to the hospital, and continue giving artificial respiration if needed.
5. Hospital(s) or medical facilities need to be informed, before-hand, of the possibility of H2S gas poisoning – no matter how remote the possibility is.
6. Notify emergency room personnel that the victim(s) has been exposed to H2S gas.

Besides basic first aid, everyone on location should have a good working knowledge of artificial respiration.

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