



**OCD-ARTESIA  
R-111-POTASH**

ATS-07-190



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

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

**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>NMNM 114978</b>
1b. Type of Well: <input checked="" type="checkbox"/> Oil Well <input 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>N/A</b>
2. Name of Operator <b>Bold Energy, LP (OGRID #233545)</b>		7. If Unit or CA Agreement, Name and No. <b>N/A</b>
3a. Address <b>415 W. Wall, Ste. 500 Midland, TX 79701</b>		8. Lease Name and Well No. <b>Sandy Federal #5 #36454</b>
3b. Phone No. (include area code) <b>432-676-1100</b>		9. API Well No. <b>30-06-35535</b>
4. Location of Well (Report location clearly and in accordance with any State requirements.)* At surface <b>Unit H, 1980' FNL &amp; 820' FEL</b> At proposed prod. zone <b>(same) Unit H, 1980' FNL &amp; 820' FEL</b>		10. Field and Pool, or Exploratory <b>Forty Niner Ridge; Delaware, SE</b>
11. Sec., T. R. M. or Blk. and Survey or Area <b>Sec 23, T23S, R30E</b>		12. County or Parish <b>Eddy</b>
13. State <b>NM</b>		14. Distance in miles and direction from nearest town or post office* <b>Approximately 15 miles East of Loving, NM</b>
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) <b>820'</b>	16. No. of acres in lease <b>960.0</b>	17. Spacing Unit dedicated to this well <b>40</b>
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. <b>N/A</b>	19. Proposed Depth <b>8000'</b>	20. BLM/BIA Bond No. on file <b>#000314</b>
21. Elevations (Show whether DF, KDB, RT, GL, etc.) <b>3252' GL</b>	22. Approximate date work will start* <b>03/15/2007</b>	23. Estimated duration <b>40 days</b>

**24. Attachments**

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

- |  |   |
|--|---|
| 1. Well plat certified by a registered surveyor.   | 4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above). |
| 2. A Drilling Plan.  | 5. Operator certification   |
| 3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office). | 6. Such other site specific information and/or plans as may be required by the BLM.             |

25. Signature <i>Denise Menoud</i>	Name (Printed/Typed) <b>Denise Menoud</b>	Date <b>01/04/2007</b>
Title <b>Regulatory Specialist, Agent for Bold Energy, LP</b>		
Approved by (Signature) <i>Linda S.C. Rundell</i>	Name (Printed/Typed) <b>Linda S.C. Rundell</b>	Date <b>MAR 30 2007</b>
Title <b>STATE DIRECTOR</b>		
Office <b>NM STATE OFFICE</b>		

If earthen pits are used in association with the drilling of this well, an OCD pit permit must be obtained prior to pit construction.

ant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to

**APPROVAL FOR 1 YEAR**

It is a crime for any person knowingly and willfully to make to any department or agency of the United States any false statement or to conceal any material fact which would entitle the applicant to a permit or approval as to any matter within its jurisdiction.

**Witness Surface Casing**

**CARLSBAD CONTROLLED WATER BASIN**

**APPROVAL SUBJECT TO  
GENERAL REQUIREMENTS AND  
SPECIAL STIPULATIONS  
ATTACHED**

**SEE ATTACHED FOR  
CONDITIONS OF APPROVAL**

## EXHIBIT "A"

## DISTRICT I

1625 N. French Dr., Hobbs, NM 88240

## DISTRICT II

1301 W. Grand Avenue, 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 Department

Form C-102

Revised October 12, 2005

Submit to Appropriate District Office

State Lease - 4 Copies

Fee Lease - 3 Copies

**OIL CONSERVATION DIVISION**  
1220 South St. Francis Dr.  
Santa Fe, New Mexico 87505

☐ AMENDED REPORT

## WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number	Pool Code 96843	Pool Name Forty Niner Ridge, Delaware, SE
Property Code	Property Name SANDY FEDERAL	Well Number 5
OGRID No. 233545	Operator Name BOLD ENERGY, LP	Elevation 3252'

## Surface Location

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
H	23	23 S	30 E		1980	NORTH	820	EAST	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 40	Joint or Infill	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 contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.</p> <p>1/5/07</p> <p><i>Denise Menoud</i></p> <p>Signature Date</p> <p>Denise Menoud, Agent for Bold Energy, LP</p> <p>Printed Name</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>DECEMBER 07, 2006</p> <p>Date Surveyed</p> <p>Signature &amp; Seal of Professional Surveyor</p> <p><i>Gary L. Jones</i></p> <p>Professional Surveyor No. 7977</p> <p>Certificate No. Gary L. Jones 7977</p> <p>BASIN SURVEYS</p>	

# Drilling Prognosis

January 5, 2007

Operator: Bold Energy, LP Field: Undes. Forty Niner Ridge, Delaware  
Well: Sandy Federal #5 API: 30 - 015 - Pending  
Drilling Permit BLM Approval - Pending AFE: Pending

## General Information

Location: 1980' FNL & 820' FEL, Section 23 - T23S - R30E Eddy County, New Mexico  
Elevation: 3252' TD: 8000' RKB: 18'  
Objective: Delaware / Bone Springs Contractor: Nabors #142  
Contractor Office: 432 / 550-7808 Superintendent: Don Nelson (664-9990)  
Toolpushers: Roy Brumfield / William Lewis Cell: 432 / 664-9942  
Sierra Supervisor: Frank Dowdy / Tony Vickery Cell: 432 / 557-1223

## Drilling Program

Hole Size	Depth	Casing	Weight	Grade	Connect	Cement	TOC
17½"	440'	13 3/8"	48	H-40	STC	500 sx	Circulate
11"	3750'	8 5/8"	32	K-55	STC	1100 sx	Circulate
7 7/8"	8000'	5½"	17	P-110	LTC	1100 sx	Circulate

## Wellhead / BOPE

Wellhead	13 5/8" - 3K SOW	13 5/8" - 3K x 11" - 5K	11" - 5K x 7 1/16" - 10K
BOPE	13 5/8" - 5K Stack SRRAG	13 5/8" - 5K Stack SRRAG	

## Mud Program

Interval	Type	MW	VIS	FL
0' - 440'	FW - Spud	8.4 - 9.2	32 - 34	NC
440' - 3750'	Brine / Sweeps	10.0	28 - 30	NC
3800' - 8000'	FW / Cut Brine / Sweeps	8.4 - 9.0	28 - 30	NC

Company: NOVA Drilling Fluids Office: \_\_\_\_\_  
Engineer: TBA Warehouse: \_\_\_\_\_

**Geological Data**

**Geologist:** John Worrall 505 / 622-5893 office 432 / 230-9431 cell 505 / 622-2768 home

**Estimated Formation Tops:** (GL = 3252')

Formation	Subsea	MD	Formation	Subsea	MD
Triassic	0'	0'	Manzanita Mkr	-1703'	4955'
Rustler	2812'	440'	L Sand Objective	-4348'	7600'
B/ 1 <sup>st</sup> Salt	1042'	2210'	Bone Spring	-4448'	7700'
T/ 2 <sup>nd</sup> Salt	472'	2780'	Bone Spring, Upper	-4528'	7780'
B/ Salt	-328'	3580'	TD	-4748'	8000'
Delaware	-583'	3835'			

**Evaluation Program**

**Mud Logs:** 3750' to TD **Mud Logger:** TBD

**DST / Coring Intervals:** None Anticipated

**E-Log Suite:** Triple Combo (GR - DSN, SDL, DLL/MSFL) w/ CSNG @ TD. Pull GR-N to surface. SWC's may be taken in zones of interest.

**Logging Company:** Halliburton **Contact:** Richard Kelley

**Location:** Hobbs, New Mexico **Phone:** 505 / 914-0324 cell 505 / 392-0776 office

**Completion**

Single Delaware / Bone Spring oil well; multi-stage completion - selectively perfed & stimulated down 5½" casing. Well will be equipped to be rod pumped.

**Emergency Contacts / Notifications**

Sierra Engineering	Drilling Superintendent	Russ Ginanni	432 / 425-7450 cell 432 / 683-8000 off
Sierra Engineering	HSE Manager	Montie Low	432 / 559-8950 cell 432 / 683-8000 off
Bold Energy, LP	Operations Engineering Manager	Shannon Klier	432 / 296-8602 cell 432 / 686-1100 off
Bold Energy, LP	President	Joe Castillo	432 / 230-0202 cell 432 / 686-1100 off
Bold Energy, LP	Production Supt.	Donny Money	432 / 661-8803 cell
BLM	Carlsbad	Notifications After Hours	505 / 234-5972 505 / 361-2822

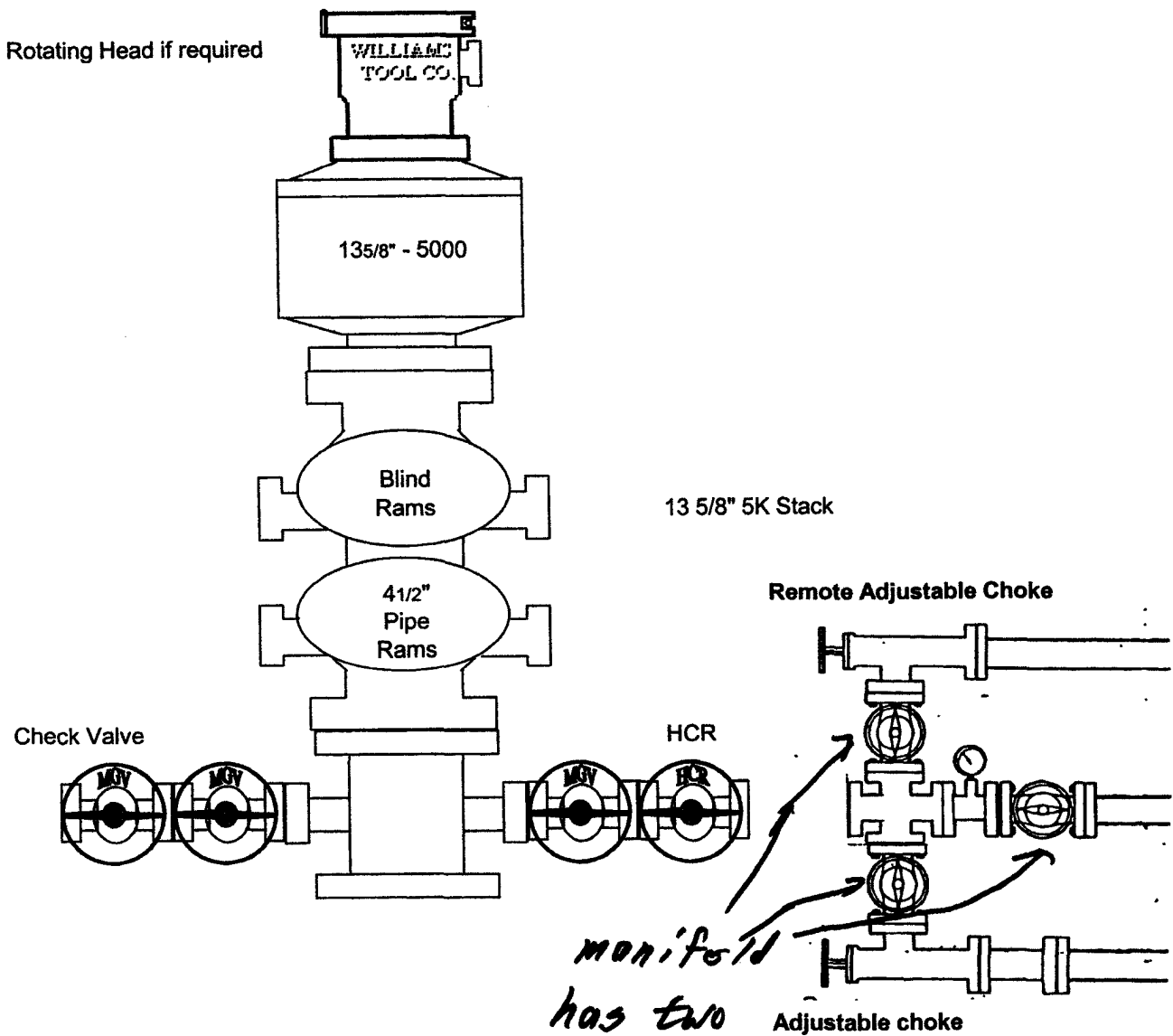
**Directions**

From the junction of New Mexico State Highway 128 & County Road 795 (Mobley Ranch), (1) go south ½ mile on CR 795 to "Y"; (2) take left fork and go 2½ miles to lease road on left; (3) turn east for 0.8 mile to new lease road and follow into location.

# BOPE Schematic

Sandy Federal #5  
1980' FNL & 820' FEL  
Section 23 - T23S - R30E  
Eddy County, New Mexico

13 5/8" - 5000 PSI Stack



*manifold  
has two  
valves as  
required  
per Sierra Engr. 1/29/07*

**SURFACE USE AND OPERATIONS PLAN FOR  
DRILLING, COMPLETION, AND PRODUCING**

**Bold Energy, LP  
Sandy Federal #5  
1980' FNL, 820' FEL, Unit H, Section 23, T23S, R30E  
Eddy County, New Mexico**

**LOCATED**

Approximately 15 miles East of Loving, NM

**OIL & GAS LEASE**

NMMN 114978

**ACRES IN BLM LEASE**

960.0

**OIL & GAS LESSEES**

Rubicon Oil & Gas II, LP, 508 W. Wall, Suite 500, Midland, TX 79701

Bold Energy, LP; 415 W. Wall, Suite 500, Midland, TX 79701 has operating rights

**BOND COVERAGE**

\$25,000 statewide bond of Bold Energy, LP

**SURFACE OWNER**

Bureau of Land Management

**MINERAL OWNER**

Bureau of Land Management

**GRAZING TENANT:**

Allotment #7033, Nash Draw:

W. L. Mobley, Jr., 3515 Standpipe Rd., Carlsbad, NM 88220

**POOL**

Forty Niner Ridge; Delaware (#24750)

**EXHIBITS**

- |                |   |
|----------------|---|
| A.             | Well Location & Acreage Dedication Map    |
| B., B-1, & B-2 | Area Road Maps                            |
| C. & C-1.      | Vicinity Oil & Gas Maps                   |
| D.             | Topographic & Location Verification Map   |
| E.             | Drilling Rig Layout                       |
| F.             | BOPE Schematic & Choke Manifold Schematic |

This well will be drilled to a depth of approximately 8000'.

**1. EXISTING ROADS**

- A. Exhibit A is a portion of a section map showing the location of the proposed well as staked.
- B. Exhibit B, B-1, and B-2 are maps showing existing roads in the vicinity of the proposed well site.
- C. Directions to well location:  
From the junction of State Highway 128 and County Road 795 (Mobley Ranch), proceed south 0.5 miles on County Road 795 to a "Y". Take left fork and proceed 2.5 miles to lease road east, proceed east 0.8 miles to the proposed lease road.

**2. ACCESS ROADS**

- A. Length and Width: 860.7' long and 30' wide

The access road will be built and is shown on Exhibit A-1.

- B. Surface Material

Existing

- C. Maximum Grad

Less than five percent

- D. Turnouts

None necessary

- E. Drainage Design

Existing

- F. Culverts

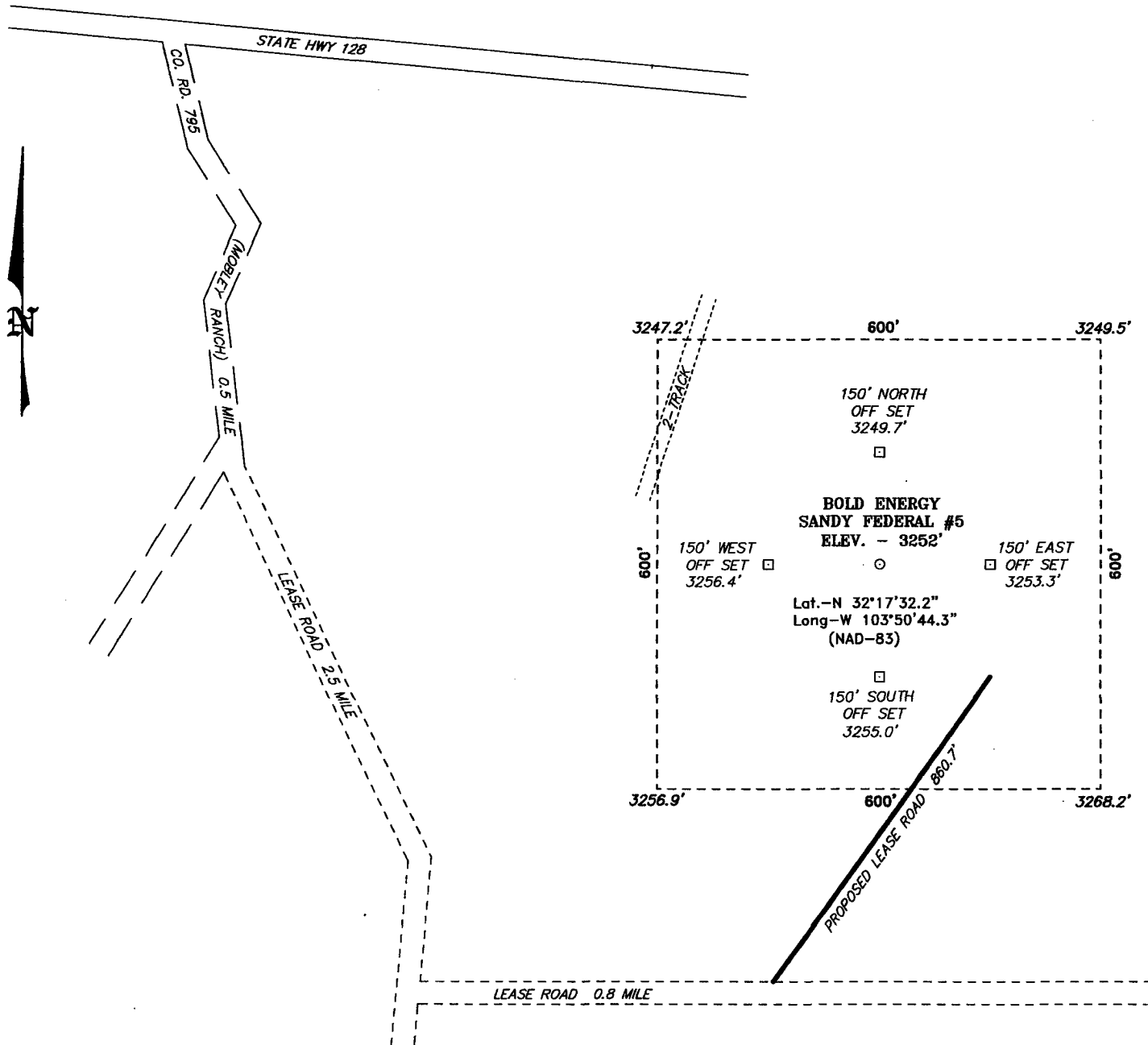
None necessary

- G. Gates and Cattle Guards

None needed

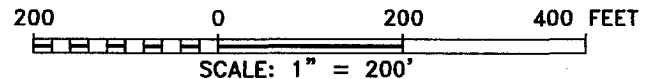
## EXHIBIT "B-2"

SECTION 23, TOWNSHIP 23 SOUTH, RANGE 30 EAST, N.M.P.M.,  
EDDY COUNTY, NEW MEXICO.



## Directions to Location:

FROM THE JUNCTION OF STATE HWY 128 AND CO. RD. 795 (MOBLEY RANCH), PROCEED SOUTH 0.5 MILE ON CO. RD. 795 TO A "Y", TAKE LEFT FORK AND PROCEED 2.5 MILE TO LEASE ROAD EAST, PROCEED EAST 0.8 MILE TO THE PROPOSED LEASE ROAD.

**BOLD ENERGY, LP**

REF: SANDY FEDERAL #5 / WELL PAD TOPO

THE SANDY FEDERAL No. 5 LOCATED 1980' FROM  
THE NORTH LINE AND 820' FROM THE EAST LINE OF  
SECTION 23, TOWNSHIP 23 SOUTH, RANGE 30 EAST,  
N.M.P.M., EDDY COUNTY, NEW MEXICO.

**BASIN SURVEYS** P.O. BOX 1786-HOBBS, NEW MEXICO

W.O. Number: 17524

Drawn By: J. M. SMALL

Date: 12-12-2006

Disk: JMS 17524W

Survey Date: 12-07-2006

Sheet 1 of 1 Sheets



## **Bold Energy, LP**

### **HYDROGEN SULFIDE DRILLING OPERATIONS PLAN**

#### **I Hydrogen Sulfide Training**

All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis will show proof of training from a qualified instructor in the following areas before commencing any work on the above named well.

1. The hazards and characteristics of hydrogen sulfide ( $H_2S$ ).
2. The proper use and maintenance of personal protective equipment and life support systems.
3. The proper use of  $H_2S$  detectors, alarms, warning signs, briefing areas, and evacuation procedures.
4. The proper technique for first aid and rescues.

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

1. The effects of  $H_2S$  on metal components. If high tensile tubulars are used, personnel will be trained in their special maintenance requirements.
2. Corrective action and shut-in procedures when drilling or reworking a well and blowout prevention and well control procedures.
3. The contents and requirements of the  $H_2S$  Drilling Operations Plan.

The well site is not within 3000' of any public roadway or dwelling; therefore an  $H_2S$  Contingency Plan is not necessary.

There will be an initial safety meeting just prior to commencing operations on the well, which shall include a review of the site-specific  $H_2S$  Drilling Operations Plan. This plan will be available at the well site. All personnel will be required to carry documentation that they have received the proper  $H_2S$  training.

#### **II $H_2S$ Safety Equipment and Systems**

All  $H_2S$  safety equipment and systems will be installed upon setting 8 5/8" casing at 1800'.

1. Well Control Equipment
  - A. Choke manifold with a minimum of two adjustable chokes, one remotely operated.
  - B. Blind and pipe rams to accommodate all pipe in use.
  - C. Auxiliary equipment to include annular preventer and rotating head.
2. Protective Equipment for Essential Personnel
  - A. Four - 5 minute escape units in top dog house.
  - B. One - 30 minute SCBA at each briefing area.

**II H<sub>2</sub>S Safety Equipment and Systems - cont'd**

**3. H<sub>2</sub>S Detection and Monitoring Equipment**

- A. Three-channel monitor located on floor, with detectors located on floor, on flow nipple and on flow line on mud pit.
- B. The mud logging unit shall have H<sub>2</sub>S monitoring equipment.

**4. Visual Warning Systems**

- A. Windsock located on floor and mud pits.
- B. Briefing area signs located on NE & SW corners of pad.
- C. H<sub>2</sub>S Condition sign located at entrance to location.

**5. Mud Program**

The mud program has been designed to minimize the volume of possible H<sub>2</sub>S circulated to surface. Proper weight, safe drilling practices, and the use of H<sub>2</sub>S scavengers will minimize hazards when penetrating possible H<sub>2</sub>S bearing zones.

**6. Metallurgy**

All drill strings, casing, tubing, wellhead, blowout preventers, drilling spool, kill lines, choke manifolds, and associated lines and valves shall be suitable for an H<sub>2</sub>S environment.

**7. Communications**

Drilling rig and company vehicles will be equipped with two way radios or cellular telephones.

**8. Well Testing**

At least One Drill Stem Test is planned for this well.

## CONDITIONS OF APPROVAL - DRILLING

Well Name & No. 5-Sandy Federal  
Operator's Name: Bold Energy, LP  
Location: 1980FNL, 0820FEL, Section 23, T-23-S, R-30-E  
Lease: NM-114978

### I. DRILLING OPERATIONS REQUIREMENTS:

1. The Bureau of Land Management (BLM) is to be notified at the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220, (505) 361-2822 - for wells in Eddy County, in sufficient time for a representative to witness:
  - A. Spudding
  - B. Cementing casing: 13-3/8 inch 8-5/8 inch 5-1/2 inch
  - C. BOP tests
2. Although Hydrogen Sulfide is not reported in Section 23, it is always a potential hazard.
3. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval.
4. Submit a Sundry Notice (Form 3160-5, one original and five copies) for each casing string, describing the casing and cementing operations. Include pertinent information such as; spud date, hole size, casing ( size, weight, grade and thread type), cement (type, quantity and top), water zones and problems or hazards encountered. The Sundry shall be submitted within 15 days of completion of each casing string. The reports may be combined into the same Sundry if they fall within the same 15 day time frame.
5. The API No. assigned to the well by NMOCD shall be included on the subsequent report of setting the first casing string.
6. Gamma-Ray/Neutron logs shall be run from the base of the Salado Formation to the surface; cable speed not to exceed 30 feet per minute.

### II. CASING:

1. The 13-3/8 inch surface casing shall be set a minimum of 25 feet into the Rustler Anhydrite approximately 440 feet and above the salt, below usable water and cement circulated to the surface. If cement does not circulate to the surface the appropriate BLM office shall be notified and a temperature survey or cement bond log shall be run to verify the top of the cement. Remedial cementing shall be completed prior to drilling out that string.

**Possible lost circulation in the Delaware and Bone Spring formations.**

**High cave/karst area.**

2. The minimum required fill of cement behind the 8-5/8 inch salt protection casing is circulate cement to the surface.
3. The minimum required fill of cement behind the 5-1/2 inch production casing is cement shall circulate to surface.
4. Whenever a casing string is cemented in the R-111-P Potash Area, cement shall be allowed to stand a minimum of twelve (12) hours under pressure and a total of twenty-four (24) hours before drilling the plug or initiating tests.

### **III. PRESSURE CONTROL:**

1. All BOP systems and related equipment shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2. The BOP and related equipment shall be installed and operational before drilling below the 13-3/8 inch casing shoe and shall be tested as described in Onshore Order No. 2. Any equipment failing to test satisfactorily shall be repaired or replaced.
2. Minimum working pressure of the blowout preventer and related equipment (BOPE) required for drilling the surface and intermediate casing shall be 5M psi. Minimum working pressure of the blowout preventer and related equipment (BOPE) required for drilling below the 8-5/8 inch casing shall be 5M psi.
3. The appropriate BLM office shall be notified in sufficient time for a representative to witness the tests.
  - The tests shall be done by an independent service company.
  - The results of the test shall be reported to the appropriate BLM office.
  - Testing fluid must be water or an appropriate clear liquid suitable for sub-freezing temperatures. Use of drilling mud for testing is not permitted since it can mask small leaks.
  - Testing must be done in a safe workman-like manner. Hard line connections shall be required.

**Engineer on call phone: 505-706-2779**

**WWI 012907**

# **BOLD ENERGY, LP**

**HYDROGEN SULFIDE (H<sub>2</sub>S) CONTINGENCY PLAN  
FOR DRILLING / COMPLETING / WORKOVER / FACILITY  
WITH THE EXPECTATION OF H<sub>2</sub>S IN EXCESS OF 100 PPM**

**SANDY FEDERAL #5  
NEW DRILL WELL  
1980' FNL & 820' FEL, UNIT H  
SECTION 23, T23S, R30E  
EDDY COUNTY, NEW MEXICO**

**This well / facility is not expected to have H<sub>2</sub>S, but the following is submitted as requested.**

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## **GENERAL H2S EMERGENCY ACTIONS**

In the event of any evidence of H2S emergency, the following plan will be initiated:

1. All personnel will immediately evacuate to an up-wind and if possible up-hill "safe area".
2. If for any reason a person must enter the hazardous area, they must wear a SCBA (self-contained breathing apparatus).
3. Always use the "buddy system".
4. Isolate the well / problem if possible.
5. Account for all personnel.
6. Display the proper colors warning all unsuspecting personnel of the danger at hand.
7. Contact the company representative as soon as possible if not at the location (use the enclosed call list as instructed).

At this point the company representative will evaluate the situation and coordinate the necessary duties to bring the situation under control, and if necessary, the notification of emergency response agencies and residents.

## **EMERGENCY PROCEDURES FOR AN UNCONTROLLABLE RELEASE OF H2S**

1. All personnel will don the self-contained breathing apparatus.
2. Remove all personnel to the "safe area: (always use the "buddy system")".
3. Contact company representative if not on location.
4. Set in motion the steps to protect and / or remove the general public to any upwind "safe are". Maintain strict security and safety procedures while dealing with the source.
5. No entry to any unauthorized personnel.
6. Notify the appropriate agencies:  
City Police - City streets  
State Police - State Roads  
County Sheriff - County Roads
7. Call the NMOCD.

If at this time the supervising person determines the release of H2S cannot be contained to the site location and the general public is in harms way, he will immediately notify public safety personnel.

## **EMERGENCY CALL LIST**

<b><u>Contact</u></b>	<b><u>Office</u></b>	<b><u>Cell</u></b>	<b><u>Home</u></b>
Shannon Klier (drilling / completions)	432-686-1100	432-296-8602	432-669-6341
Donny Money (production)	432-686-1100	432-661-8803	
Joseph Castillo	432-686-1100	432-230-0202	

## **EMERGENCY RESPONSE NUMBERS** **Eddy County, New Mexico**

<b>State Police</b>	<b>505-748-9718</b>
<b>Eddy County Sheriff</b>	<b>505-746-2701</b>
<b>Emergency Medical Services (Ambulance)</b>	<b>911 or 505-746-2701</b>
<b>Eddy County Emergency Management (Harry Burgess)</b>	<b>505-887-9511</b>
<b>State Emergency Response Center (SERC)</b>	<b>505-476-9620</b>
<b>Carlsbad Police Department</b>	<b>505-885-2111</b>
<b>Carlsbad Fire Department</b>	<b>505-885-3125</b>
<b>New Mexico Oil Conservation Division - Artesia</b>	<b>505-748-1283</b>
<b>Callaway Safety Equipment, Inc.</b>	<b>505-392-2973</b>



## PROTECTION OF THE GENERAL (ROE) RADIUS OF EXPOSURE

In the event greater than 100 ppg H<sub>2</sub>S is present, the ROE calculations will be done to determine if the following is warranted:

- \* 100 ppm at any public area (any place not associated with this site)
- \* 500 ppm at any public road (any road which the general public may travel).
- \* 100 ppm radius of 3000' will be assumed if there is insufficient data to do the calculations, and there is a reasonable expectation that H<sub>2</sub>S could be present in concentrations greater than 100 ppm in the gas mixture.

**Calculation for the 100 ppm ROE:** (H<sub>2</sub>S concentrations in decimal form)

$$X = [(1.589)(\text{concentration})(Q)] (0.6258)$$

10,000 ppm + = .01  
1,000 ppm + = .001

**Calculation for the 500 ppm ROE:**

100 ppm + = .0001  
10 ppm + = .00001

$$X = [(0.4546)(\text{concentration})(Q)] (.06258)$$

EXAMPLE: If a well / facility has been determined to have 150 ppm H<sub>2</sub>S in the gas mixture and the well / facility is producing at a gas rate of 200 MCFD then:

ROE for 100 ppm      $X = [(1.589)(.00010)(200,000)] (0.6258)$   
                                $X = 8.8'$

ROE for 500 ppm      $X = [(0.4546)(.00050)(200,000)] (0.6258)$   
                                $X = 10.9'$

These calculations will be forwarded to the appropriate NMOCD district office when applicable.

## **PUBLIC EVACUATION PLAN**

When the supervisor has determined that the general public will be involved, the following plan will be implemented.

1. Notification of the emergency response agencies of the hazardous condition and implement evacuation procedures.
2. A trained person in H<sub>2</sub>S safety shall monitor with detection equipment the H<sub>2</sub>S concentration, wind and area of exposure. This person will determine the outer perimeter of the hazardous area. The extent of the evacuation area will be determined from the data being collected. Monitoring shall continue until the situation has been resolved. All monitoring equipment shall be UL approved for use in Class I Groups A, B, C & D, Division I hazardous locations. All monitors will have a minimum capability of measuring H<sub>2</sub>S, oxygen, and flammable values.
3. Law enforcement shall be notified to set up necessary barriers and maintain such for the duration of the situation as well as aid in the evacuation procedure.
4. The company representative shall stay in communication with all agencies throughout the duration of the situation and inform such agencies when the situation has been contained and the effected area is safe to enter.

## **PROCEDURE FOR IGNITING AN UNCONTROLLABLE CONDITION**

The decision to ignite a well should be a last resort and one, if not both, of the following pertain:

1. Human life and / or property are endangered.
2. There is no hope of bringing the situation under control with the prevailing conditions at the site.

### **Instructions for Igniting the Well:**

1. Two people are required. They must be equipped with positive pressure, self-contained breathing apparatus and "D"-ring style, full body, OSHA approved safety harness. Non-flammable rope will be attached.
2. One of the people will be a qualified safety person who will test the atmosphere for H<sub>2</sub>S, oxygen and LFL. The other person will be the company representative.
3. Ignite upwind from a distance no closer than necessary. Make sure that where you ignite from has the maximum escape avenue available. A 25mm flare gun with a range of approximately +/- 500 feet shall be used to ignite the gas.
4. Before igniting, check for the presence of combustible gases.
5. After igniting, continue emergency actions and procedures as before.

## **REQUIRED EMERGENCY EQUIPMENT**

### **1. Breathing Apparatus**

- \* Rescue Packs (SCBA) – 1 unit shall be placed at each breathing area, 2 shall be stored in the safety trailer.
- \* Work / Escape Packs – 4 packs shall be stored on the rig floor with sufficient air hose not to restrict work activity.
- \* Emergency Escape Packs – 4 packs shall be stored in the doghouse for emergency evacuation.

### **2. Signage and Flagging**

- \* One Color Code Condition Sign will be placed at the entrance to the site reflecting the possible conditions at the site.
- \* A Colored Condition flag will be on display reflecting the condition at the site at that time.

### **3. Briefing Area**

- \* Two perpendicular areas will be designated by signs and readily accessible.

### **4. Windssocks**

- \* Two windssocks will be placed in strategic locations, visible from all angles.

### **5. H2S Detectors and Alarms**

\* The stationary detector with three (3) sensors will be placed in the upper dog house if equipped, set to visually alarm @ 10 ppm and audible alarm @ 15 ppm. Calibrate a minimum of every 30 days or as needed. The three sensors will be placed in the following places: (Gas sample tubes will be stored in the safety trailer):

- \* Rig Floor
- \* Bell Nipple
- \* End of flow line or where well bore fluid is being discharged

### **6. Auxiliary Rescue Equipment**

- \* Stretcher
- \* Two OSHA full body harnesses
- \* 100' of 5/8" OSHA approved rope
- \* One 20 lb. Class ABC fire extinguisher
- \* Communication via cell phones on location and vehicles on location

## **USING SELF-CONTAINED BREATHING AIR EQUIPMENT (SCBA)**

1. SCBA should be worn when any of the following are performed:
  - \* Working near the top or on top of a tank
  - \* Disconnecting any line where H<sub>2</sub>S can reasonably be expected.
  - \* Sampling air in the area to determine if toxic concentrations of H<sub>2</sub>S exist.
  - \* Working in areas where over 10 ppm of H<sub>2</sub>S has been detected.
  - \* At any time there is a doubt of the level of H<sub>2</sub>S in the area.
2. All personnel shall be trained in the use of SCBA prior to working in a potentially hazardous location.
3. Facial hair and standard eyeglasses are not allowed with SCBA.
4. Contact lenses are never allowed with SCBA.
5. When breaking out any line where H<sub>2</sub>S can reasonably be expected.
6. After each use, the SCBA unit shall be cleaned, disinfected, serviced and inspected.
7. All SCBA shall be inspected monthly.

## **RESCUE & FIRST AID FOR VICTIMS OF H<sub>2</sub>S POISONING**

- \* Do not panic.
- \* Remain calm and think.
- \* Get on the breathing apparatus.
- \* Remove the victim to the safe breathing area as quickly as possible, upwind and uphill from source or crosswind to achieve upwind.
- \* Notify emergency response personnel.
- \* Provide artificial respiration and / or CPR as necessary.
- \* Remove all contaminated clothing to avoid further exposure.
- \* A minimum of two (2) personnel on location shall be trained in CPR and First Aid.

## Toxic Effects of H2S Poisoning

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 is colorless and transparent. Hydrogen Sulfide is almost as toxic as Hydrogen Cyanide and is 5-6 times more toxic than Carbon Monoxide. Occupational exposure limits for Hydrogen sulfide and other gasses are compared below in Table 1. toxicity table for H2S and physical effects are shown in Table II.

**Table 1**  
Permissible Exposure Limits of Various Gasses

Common Name	Symbol	Sp. Gravity	TLV	STEL	IDLH
Hydrogen Cyanide	HCN	.94	4.7 ppm	C	
Hydrogen Sulfide	H2S	1.192	10 ppm	15 ppm	100 ppm
Sulfide Dioxide	SO2	2.21	2 ppm	5 ppm	
Chlorine	CL	2.45	.5 ppm	1 ppm	
Carbon Monoxide	CO	.97	25 ppm	200 ppm	
Carbon Dioxide	CO2	1.52	5000 ppm	30,000 ppm	
Methane	CH4	.55	4.7% LEL	14% UEL	

### Definitions

- A. TLV – Threshold Limit Value is the concentration employees may be exposed to based on a TWA (time weighted average) for eight (8) hours in one day for 40 hours in one (1) week. This is set by ACGIH (American Conference of Governmental Hygienists and regulated by OSHA.
- B. STEL – Short Term Exposure Limit is the 15 minute average concentration an employee may be exposed to providing that the highest exposure never exceeds the OEL (Occupational Exposure Limit). The OEL for H2S is 19 PPM.
- C. IDLH – Immediately Dangerous to Life and Health is the concentration that has been determined by the ACGIH to cause serious health problems or death if exposed to this level. The IDLH for H2S is 100 PPM.
- D. TWA – Time Weighted Average is the average concentration of any chemical or gas for an eight (8) hour period. This is the concentration that any employee may be exposed to based on an TWA.

**TABLE II**  
Toxicity Table of H<sub>2</sub>S

Percent %	PPM	Physical Effects
.0001	1	Can smell less than 1 ppm.
.001	10	TLV for 8 hours of exposure
.0015	15	STEL for 15 minutes of exposure
.01	100	Immediately Dangerous to Life & Health. Kills sense of smell in 3 to 5 minutes.
.02	200	Kills sense of smell quickly, may burn eyes and throat.
.05	500	Dizziness, cessation of breathing begins in a few minutes.
.07	700	Unconscious quickly, death will result if not rescued promptly.
.10	1000	Death will result unless rescued promptly. Artificial resuscitation may be necessary.



## **PHYSICAL PROPERTIES OF H<sub>2</sub>S**

The properties of all gasses are usually described in the context of seven major categories:

COLOR  
ODOR  
VAPOR DENSITY  
EXPLOSIVE LIMITS  
FLAMMABILITY  
SOLUBILITY (IN WATER)  
BOILING POINT

Hydrogen Sulfide is no exception. Information from these categories should be considered in order to provide a fairly complete picture of the properties of the gas.

### **COLOR – TRANSPARENT**

Hydrogen Sulfide is colorless so it is invisible. This fact simply means that you can't rely on your eyes to detect its presence, a fact that makes the gas extremely dangerous to be around.

### **ODOR – ROTTEN EGGS**

Hydrogen Sulfide has a distinctive offensive smell, similar to "rotten eggs". For this reason it earned its common name "sour gas". However, H<sub>2</sub>S, even in low concentrations, is so toxic that it attacks and quickly impairs a victim's sense of smell; so it could be fatal to rely on your nose as a detection device.

### **VAPOR DENSITY – SPECIFIC GRAVITY OF 1.192**

Hydrogen Sulfide is heavier than air so it tends to settle in low-lying areas like pits, cellars or tanks. If you find yourself in a location where H<sub>2</sub>S is known to exist, protect yourself. Whenever possible, work in an area upwind and keep to higher ground.

### **EXPLOSIVE LIMITS – 4.3% TO 46%**

Mixed with the right proportion of air or oxygen, H<sub>2</sub>S will ignite and burn or explode, producing another alarming element of danger besides poisoning.

### **FLAMMABILITY**

Hydrogen Sulfide will burn readily with a distinctive clear blue flame, producing Sulfur Dioxide (SO<sub>2</sub>), another hazardous gas that irritates the eyes and lungs.

### **SOLUBILITY – 4 TO 1 RATIO WITH WATER**

Hydrogen Sulfide can be dissolved in liquids, which means that it can be present in any container or vessel used to carry or hold well fluids including oil, water, emulsion and sludge. The solubility of H<sub>2</sub>S is dependent on temperature and pressure, but if conditions are right, simply agitating a fluid containing H<sub>2</sub>S may release the gas into the air.

**BOILING POINT – (-76 degrees Fahrenheit)**

Liquefied Hydrogen Sulfide boils at a very low temperature, so it is usually found as a gas.