

Form 3160-3  
(June 2015)FORM APPROVED  
OMB No. 1004-0137  
Expires: January 31, 2018

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 1b. Type of Well: <input checked="" type="checkbox"/> Oil Well <input type="checkbox"/> Gas Well <input type="checkbox"/> Other 1c. Type of Completion: <input type="checkbox"/> Hydraulic Fracturing <input checked="" type="checkbox"/> Single Zone <input type="checkbox"/> Multiple Zone		5. Lease Serial No. <b>NMNM04986</b> 6. If Indian, Allottee or Tribe Name  7. If Unit or CA Agreement, Name and No.  8. Lease Name and Well No.  <b>DAKOTA 32 STATE FED COM</b>  <b>134H</b>
2. Name of Operator <b>COLGATE OPERATING LLC</b>		9. API Well No.  <b>30-015-47744</b>
3a. Address <b>306 W. Wall St., Suite 500, Midland, TX 79701</b>	3b. Phone No. (include area code) <b>(432) 695-4224</b>	10. Field and Pool, or Exploratory <b>WINCHESTER/3RD BONE SPRING</b>
4. Location of Well (Report location clearly and in accordance with any State requirements. *) At surface <b>SESE / 1298 FSL / 300 FEL / LAT 32.6134644 / LONG -104.1915778</b> At proposed prod. zone <b>SWSW / 355 FSL / 10 FWL / LAT 32.6107466 / LONG -104.2254439</b>		11. Sec., T. R. M. or Blk. and Survey or Area <b>SEC 32/T19S/R28E/NMP</b>
14. Distance in miles and direction from nearest town or post office*		12. County or Parish <b>EDDY</b>
13. State <b>NM</b>		
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) <b>5016 feet</b>	16. No of acres in lease  	17. Spacing Unit dedicated to this well  <b>320.0</b>
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. <b>704 feet</b>	19. Proposed Depth <b>8177 feet / 18886 feet</b>	20. BLM/BIA Bond No. in file <b>FED: NMB001382</b>
21. Elevations (Show whether DF, KDB, RT, GL, etc.) <b>3341 feet</b>	22. Approximate date work will start* <b>10/31/2020</b>	23. Estimated duration <b>90 days</b>
24. Attachments		

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

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

25. Signature (Electronic Submission)	Name (Printed/Typed) <b>MIKAH THOMAS / Ph: (432) 695-4224</b>	Date <b>09/01/2020</b>
Title <b>Operations Tech</b>		
Approved by (Signature) (Electronic Submission)	Name (Printed/Typed) <b>Cody Layton / Ph: (575) 234-5959</b>	Date <b>11/23/2020</b>
Title <b>Assistant Field Manager Lands &amp; Minerals</b>		
Office <b>Carlsbad Field Office</b>		

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

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

Oil base muds are not to be used until fresh water zones are cased and cemented providing isolation from the oil or diesel. This includes synthetic oils. Oil based mud, drilling fluids and solids must be contained in a steel closed loop system.

- Will require a directional survey with the C-104
- Surface casing must be set 25' below top of Rustler Anhydrite
- in order to seal off protectable water

Once the well is spud, to prevent ground water contamination through whole or partial conduits from the surface, the operator shall drill without interruption through the fresh water zone or zones and shall immediately set in cement the water protection string

APPROVED WITH CONDITIONS

SL  
(Continued on page 2)

Approval Date: 11/23/2020

KP 11/30/2020 GEO Review

\*(Instructions on page 2)

JAG 12/1/2020

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

**DISTRICT II**  
811 S. First St., Artesia, N.M. 88210  
Phone: (575) 748-1283 Fax: (575) 748-9720

**DISTRICT III**  
1000 Rio Brazos Rd., Aztec, N.M. 87410  
Phone: (505) 334-6178 Fax: (505) 334-6170

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

State of New Mexico  
Energy, Minerals & Natural Resources Department

**OIL CONSERVATION DIVISION**  
1220 South St. Francis Dr.  
Santa Fe, N.M. 87505

Form C-102

Revised August 1, 2011

Submit one copy to appropriate  
District Office

☐ AMENDED REPORT

**WELL LOCATION AND ACREAGE DEDICATION PLAT**

<sup>1</sup> API Number <b>30-015-47744</b>		<sup>2</sup> Pool Code <b>97569</b>		<sup>3</sup> Pool Name <b>Winchester; Bone Spring, West</b>	
<sup>4</sup> Property Code <b>329864</b>		<sup>5</sup> Property Name <b>Dakota 32 State Fed Com</b>			<sup>6</sup> Well Number <b>134H</b>
<sup>7</sup> OGRI No. <b>371449</b>		<sup>8</sup> Operator Name <b>Colgate Operating, LLC</b>			<sup>9</sup> Elevation <b>3341</b>

<sup>10</sup> Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
<b>P</b>	<b>32</b>	<b>19 S</b>	<b>28 E</b>		<b>1298</b>	<b>South</b>	<b>300</b>	<b>East</b>	<b>Eddy</b>

<sup>11</sup> 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
<b>M</b>	<b>31</b>	<b>19 S</b>	<b>28 E</b>		<b>355</b>	<b>South</b>	<b>10</b>	<b>West</b>	<b>Eddy</b>

<sup>12</sup> Dedicated Acres <b>320</b>	<sup>13</sup> Joint or Infill	<sup>14</sup> Consolidation Code	<sup>15</sup> Order No.
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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

**16**

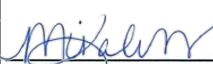
**Legend:**

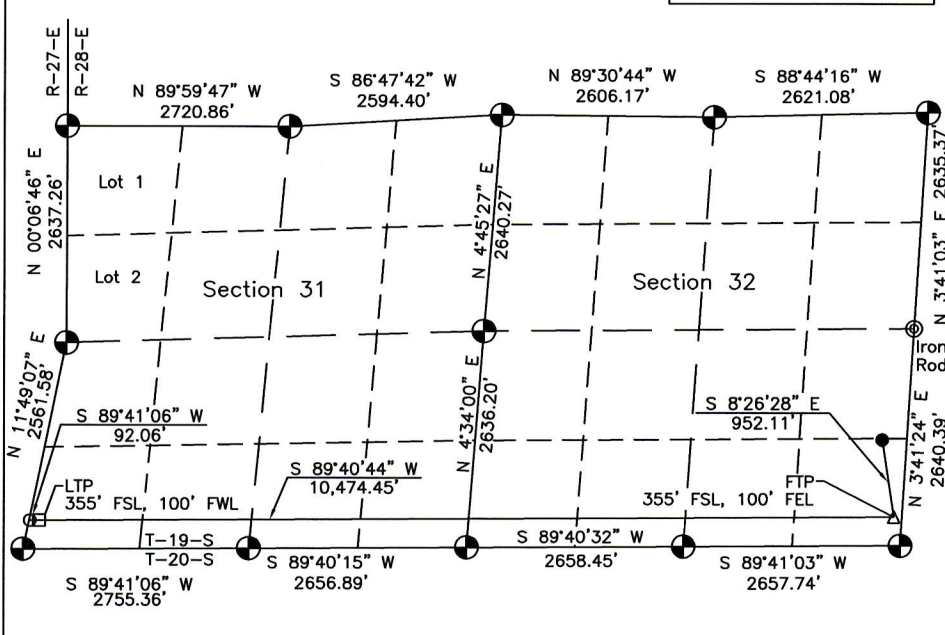
- = Surface Location
- = Bottom Hole Location
- △ = First Take Point (FTP)
- = Last Take Point (LTP)
- ⊙ = Found 1941 USGLO Brass Cap
- ⊗ = Found Monument

**FIRST TAKE POINT**  
NAD 83 NMSPC ZONE 3001  
355' FSL, 100' FEL  
SEC. 32, T19S, R28E  
Y= 585996.45 N  
X= 585124.70 E  
LAT.= 32.6108752° N  
LONG.= 104.1911280° W

**17 OPERATOR CERTIFICATION**

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 or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

 8/28/2020  
Signature Date  
Mikah Thomas  
Printed Name  
mthomas@colgateenergy.com  
E-mail Address



**BOTTOM HOLE LOCATION**  
NAD 83 NMSPC ZONE 3001  
Y= 585937.22 N  
X= 574558.36 E  
LAT.= 32.6107466° N  
LONG.= 104.2254439° W

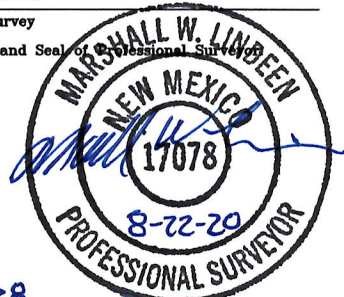
**LAST TAKE POINT**  
NAD 83 NMSPC ZONE 3001  
355' FSL, 100' FWL  
SEC. 31, T19S, R28E  
Y= 585937.73 N  
X= 574650.41 E  
LAT.= 32.6107477° N  
LONG.= 104.2251449° W

**SURFACE LOCATION**  
NAD 83 NMSPC ZONE 3001  
Y= 586938.24 N  
X= 584984.94 E  
LAT.= 32.6134644° N  
LONG.= 104.1915778° W

**18 SURVEYOR CERTIFICATION**

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.

6/16/20  
Date of Survey  
Signature and Seal of Professional Surveyor



17078  
Certificate Number

## **Additional Operator Remarks**

### **Location of Well**

0. SHL: SESE / 1298 FSL / 300 FEL / TWSP: 19S / RANGE: 28E / SECTION: 32 / LAT: 32.6134644 / LONG: -104.1915778 ( TVD: 0 feet, MD: 0 feet )

PPP: 0 / 0 / SECTION: / LAT: 0.0 / LONG: 0.0 ( TVD: 0 feet, MD: 0 feet )

PPP: SESE / 355 FSL / 0 FEL / TWSP: 19S / RANGE: 28E / SECTION: 31 / LAT: 32.6108129 / LONG: -104.2080496 ( TVD: 8314 feet, MD: 13528 feet )

PPP: SESE / 355 FSL / 100 FEL / TWSP: 19S / RANGE: 28E / SECTION: 32 / LAT: 32.6108752 / LONG: -104.191128 ( TVD: 8273 feet, MD: 8415 feet )

BHL: SWSW / 355 FSL / 10 FWL / TWSP: 19S / RANGE: 28E / SECTION: 31 / LAT: 32.6107466 / LONG: -104.2254439 ( TVD: 8177 feet, MD: 18886 feet )

### **BLM Point of Contact**

Name: Gavin Mickwee

Title: Land Law Examiner

Phone: (575) 234-5972

Email: gmickwee@blm.gov

# PECOS DISTRICT

## DRILLING CONDITIONS OF APPROVAL

<b>OPERATOR'S NAME:</b>	<b>Colgate Operating LLC</b>
<b>LEASE NO.:</b>	<b>NMNM004986</b>
<b>LOCATION:</b>	Section 32, T.19 S., R.28 E., NMPM
<b>COUNTY:</b>	Eddy County, New Mexico

<b>WELL NAME &amp; NO.:</b>	Dakota 32 State Fed Com 133H
<b>SURFACE HOLE FOOTAGE:</b>	1388'/S & 300'/E
<b>BOTTOM HOLE FOOTAGE:</b>	1681'/S & 10'/W

<b>WELL NAME &amp; NO.:</b>	Dakota 32 State Fed Com 134H
<b>SURFACE HOLE FOOTAGE:</b>	1298'/S & 300'/E
<b>BOTTOM HOLE FOOTAGE:</b>	355'/S & 10'/W

COA

H2S	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Potash	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Secretary	<input type="checkbox"/> R-111-P
Cave/Karst Potential	<input type="checkbox"/> Low	<input checked="" type="checkbox"/> Medium	<input type="checkbox"/> High
Cave/Karst Potential	<input type="checkbox"/> Critical		
Variance	<input checked="" type="checkbox"/> None	<input checked="" type="checkbox"/> Flex Hose	<input type="checkbox"/> Other
Wellhead	<input checked="" type="checkbox"/> Conventional	<input checked="" type="checkbox"/> Multibowl	<input type="checkbox"/> Both
Other	<input type="checkbox"/> 4 String Area	<input type="checkbox"/> Capitan Reef	<input type="checkbox"/> WIPP
Other	<input type="checkbox"/> Fluid Filled	<input type="checkbox"/> Cement Squeeze	<input type="checkbox"/> Pilot Hole
Special Requirements	<input type="checkbox"/> Water Disposal	<input checked="" type="checkbox"/> COM	<input type="checkbox"/> Unit

### A. HYDROGEN SULFIDE

A Hydrogen Sulfide (H2S) Drilling Plan shall be activated 500 feet prior to drilling into the **Cherry Canyon, Brushy Canyon** formation. As a result, the Hydrogen Sulfide area must meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, please provide measured values and formations to the BLM.

### B. CASING

1. The **13-3/8** inch surface casing shall be set at approximately **195 feet** (a minimum of **70 feet (Eddy County)** into the Rustler Anhydrite and above the salt) and cemented to the surface.
  - a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature

survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.

- b. Wait on cement (WOC) time for a primary cement job will be a minimum of **8 hours** or 500 pounds compressive strength, whichever is greater. (This is to include the lead cement)
  - c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength, whichever is greater.
  - d. If cement falls back, remedial cementing will be done prior to drilling out that string.
2. The minimum required fill of cement behind the **9-5/8** inch intermediate casing shall be set at approximately **2890 feet** is:
    - Cement to surface. If cement does not circulate see B.1.a, c-d above.  
**Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to cave/karst or potash.**
- ❖ In Medium Cave/Karst Areas if cement does not circulate to surface on the first two casing strings, the cement on the 3rd casing string must come to surface.
3. The minimum required fill of cement behind the **5-1/2** inch production casing is:
    - Cement should tie-back at least **200 feet** into previous casing string. Operator shall provide method of verification.  
**Cement excess is less than 25%, more cement might be required.**

### **C. PRESSURE CONTROL**

1. Variance approved to use flex line from BOP to choke manifold. Manufacturer's specification to be readily available. No external damage to flex line. Flex line to be installed as straight as possible (no hard bends).'
2. Operator has proposed a multi-bowl wellhead assembly. This assembly will only be tested when installed on the surface casing. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **5000 (5M)** psi.
  - a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
  - b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.
  - c. Manufacturer representative shall install the test plug for the initial BOP test.

- d. If the cement does not circulate and one inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.
- e. Whenever any seal subject to test pressure is broken, all the tests in OOGO2.III.A.2.i must be followed.

#### **D. SPECIAL REQUIREMENT (S)**

##### **Communitization Agreement**

- The operator will submit a Communitization Agreement to the Santa Fe Office, 301 Dinosaur Trail Santa Fe, New Mexico 87508, at least 90 days before the anticipated date of first production from a well subject to a spacing order issued by the New Mexico Oil Conservation Division. The Communitization Agreement will include the signatures of all working interest owners in all Federal and Indian leases subject to the Communitization Agreement (i.e., operating rights owners and lessees of record), or certification that the operator has obtained the written signatures of all such owners and will make those signatures available to the BLM immediately upon request.
- If the operator does not comply with this condition of approval, the BLM may take enforcement actions that include, but are not limited to, those specified in 43 CFR 3163.1.
- In addition, the well sign shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

## GENERAL REQUIREMENTS

The BLM is to be notified in advance for a representative to witness:

- a. Spudding well (minimum of 24 hours)
- b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
- c. BOPE tests (minimum of 4 hours)

☒ Eddy County

Call the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220,  
(575) 361-2822

☒ Lea County

Call the Hobbs Field Station, 414 West Taylor, Hobbs NM 88240, (575)  
393-3612

1. 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.
  - a. In the event the operator has proposed to drill multiple wells utilizing a skid/walking rig. Operator shall secure the wellbore on the current well, after installing and testing the wellhead, by installing a blind flange of like pressure rating to the wellhead and a pressure gauge that can be monitored while drilling is performed on the other well(s).
  - b. When the operator proposes to set surface casing with Spudder Rig
    - Notify the BLM when moving in and removing the Spudder Rig.
    - Notify the BLM when moving in the 2<sup>nd</sup> Rig. Rig to be moved in within 90 days of notification that Spudder Rig has left the location.
    - BOP/BOPE test to be conducted per Onshore Oil and Gas Order No. 2 as soon as 2nd Rig is rigged up on well.
2. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works are located, this does not include the dog house or stairway area.
3. The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) shall be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.



A. CASING

1. Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.). The initial wellhead installed on the well will remain on the well with spools used as needed.
2. Wait on cement (WOC) for Potash Areas: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi for all cement blends, 2) until cement has been in place at least 24 hours. WOC time will be recorded in the driller's log. The casing integrity test can be done (prior to the cement setting up) immediately after bumping the plug.
3. Wait on cement (WOC) for Water Basin: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements. The casing integrity test can be done (prior to the cement setting up) immediately after bumping the plug.
4. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. Have well specific cement details onsite prior to pumping the cement for each casing string.
5. No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.
6. On that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.
7. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.
8. Whenever a casing string is cemented in the R-111-P potash area, the NMOCD requirements shall be followed.

B. PRESSURE CONTROL



1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.
2. If a variance is approved for a flexible hose to be installed from the BOP to the choke manifold, the following requirements apply: The flex line must meet the requirements of API 16C. Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.
3. 5M or higher system requires an HCR valve, remote kill line and annular to match. The remote kill line is to be installed prior to testing the system and tested to stack pressure.
4. If the operator has proposed a multi-bowl wellhead assembly in the APD. The following requirements must be met:
  - a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
  - b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.
  - c. Manufacturer representative shall install the test plug for the initial BOP test.
  - d. Whenever any seal subject to test pressure is broken, all the tests in OOGO2.III.A.2.i must be followed.
  - e. If the cement does not circulate and one inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.
5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.
  - a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not

hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

- b. In potash areas, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. For all casing strings, casing cut-off and BOP installation can be initiated at twelve hours after bumping the plug. However, **no tests** shall commence until the cement has had a minimum of 24 hours setup time, except the casing pressure test can be initiated immediately after bumping the plug (only applies to single stage cement jobs).
- c. The tests shall be done by an independent service company utilizing a test plug not a cup or J-packer. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (8 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).
- d. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock. If a twelve hour or twenty-four hour chart is used, tester shall make a notation that it is run with a two hour clock.
- e. The results of the test shall be reported to the appropriate BLM office.
- f. All tests are required to be recorded on a calibrated test chart. A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.
- g. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.
- h. BOP/BOPE must be tested by an independent service company within 500 feet of the top of the Wolfcamp formation if the time between the setting of the intermediate casing and reaching this depth exceeds 20 days. This test does not exclude the test prior to drilling out the casing shoe as per Onshore Order No. 2.

C. DRILLING MUD

Mud system monitoring equipment, with derrick floor indicators and visual and audio alarms, shall be operating before drilling into the Wolfcamp formation, and shall be used until production casing is run and cemented.

**D. WASTE MATERIAL AND FLUIDS**

All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.

Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.

District I  
1625 N. French Dr., Hobbs, NM 88240  
District II  
811 S. First St., Artesia, NM 88210  
District III  
1000 Rio Brazos Road, Aztec, NM 87410  
District IV  
1220 S. St. Francis Dr., Santa Fe, NM 87505

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

Submit Original  
to Appropriate  
District Office

## GAS CAPTURE PLAN

Date: 08/25/2020

☒ Original

Operator & OGRID No.: Colgate Operating, LLC (371449)

☐ Amended - Reason for Amendment: \_\_\_\_\_

This Gas Capture Plan outlines actions to be taken by the Operator to reduce well/production facility flaring/venting for new completion (new drill, recomplete to new zone, re-frac) activity.

*Note: Form C-129 must be submitted and approved prior to exceeding 60 days allowed by Rule (Subsection A of 19.15.18.12 NMAC).*

### Well(s)/Production Facility – Name of facility

The well(s) that will be located at the production facility are shown in the table below.

Well Name	API	Well Location (ULSTR)	Footages	Expected MCF/D	Flared or Vented	Comments
Dakota 32 State Fed Com 134H	30-015					

### Gathering System and Pipeline Notification

Well(s) will be connected to a production facility after flowback operations are complete, if gas transporter system is in place. The gas produced from production facility is dedicated to LM Touchdown, LLC and will be connected to LM Touchdown, LLC low/high pressure gathering system located in Eddy County, New Mexico. It will require 10' of pipeline to connect the facility to low/high pressure gathering system. Colgate Operating, LLC provides (periodically) to LM Touchdown, LLC a drilling, completion and estimated first production date for wells that are scheduled to be drilled in the foreseeable future. In addition, Colgate Operating, LLC and LM Touchdown, LLC have periodic conference calls to discuss changes to drilling and completion schedules. Gas from these wells will be processed at LM Touchdown, LLC Processing Plant located in Sec. 22, Twn. 19S Rng. 28E Eddy County, New Mexico. The actual flow of the gas will be based on compression operating parameters and gathering system pressures.

### Flowback Strategy

After the fracture treatment/completion operations, well(s) will be produced to production facilities. During flowback, the fluids and sand content will be monitored. Gas sales should start as soon as the wells start flowing through the production facilities, unless there are operational issues on LM Touchdown, LLC system at that time. Based on current information, it is Colgate Operating, LLC belief the system can take this gas upon completion of the well(s).

Safety requirements during cleanout operations from the use of underbalanced air cleanout systems may necessitate that sand and non-pipeline quality gas be vented and/or flared rather than sold on a temporary basis.

### Alternatives to Reduce Flaring

Below are alternatives considered from a conceptual standpoint to reduce the amount of gas flared.

- Power Generation – On lease
  - Only a portion of gas is consumed operating the generator, remainder of gas will be flared
- Compressed Natural Gas – On lease
  - Gas flared would be minimal, but might be uneconomical to operate when gas volume declines

- NGL Removal – On lease
  - Plants are expensive, residue gas is still flared, and uneconomical to operate when gas volume declines

APD ID: 10400061104

Submission Date: 09/01/2020

Highlighted data  
reflects the most  
recent changes

Operator Name: COLGATE OPERATING LLC

Well Name: DAKOTA 32 STATE FED COM

Well Number: 134H

[Show Final Text](#)

Well Type: OIL WELL

Well Work Type: Drill

## Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
846213	QUATERNARY	3366	26	26	OTHER : None	NONE	N
846214	RUSTLER	3200	166	166	ANHYDRITE, LIMESTONE	NONE	N
846215	TOP SALT	3145	221	221	ANHYDRITE, SALT	NONE	N
846216	BASE OF SALT	2838	528	528	ANHYDRITE, SALT	NONE	N
1132782	TANSILL	2716	650	650	ANHYDRITE, DOLOMITE	NONE	N
846217	YATES	2620	746	746	ANHYDRITE, SHALE, SILTSTONE	NONE	N
1132783	SEVEN RIVERS	2121	1245	1245	ANHYDRITE, DOLOMITE, SANDSTONE	NONE	N
1132784	QUEEN	1676	1690	1690	ANHYDRITE, DOLOMITE, SANDSTONE, SHALE	NONE	N
1132785	GRAYBURG	1326	2040	2040	ANHYDRITE, DOLOMITE, SANDSTONE, SHALE	NONE	N
1132786	SAN ANDRES	911	2455	2455	ANHYDRITE, DOLOMITE	NONE	N
846218	CHERRY CANYON	395	2971	2995	LIMESTONE, SANDSTONE, SILTSTONE	NONE	N
846219	LOWER BRUSHY CANYON 8A	-14	3380	3413	CHERT, LIMESTONE, SANDSTONE, SILTSTONE	NATURAL GAS, OIL	N
846220	BONE SPRING LIME	-450	3816	3858	LIMESTONE, SHALE	NATURAL GAS, OIL	N
846221	BONE SPRING 1ST	-2390	5756	5839	CHERT, LIMESTONE, SHALE	NATURAL GAS, OIL	N
846223	2ND BONE SPRING LIME	-2450	5816	5900	CHERT, LIMESTONE, SHALE	NATURAL GAS, OIL	N
846222	BONE SPRING 2ND	-3575	6941	7029	LIMESTONE, SANDSTONE, SHALE	NATURAL GAS, OIL	N
846224	BONE SPRING 3RD	-4120	7486	7574	LIMESTONE, SANDSTONE, SHALE	NATURAL GAS, OIL	N
846225	BONE SPRING 3RD	-4850	8216	8336	LIMESTONE, SANDSTONE, SHALE	NATURAL GAS, OIL	Y

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** DAKOTA 32 STATE FED COM

**Well Number:** 134H

## Section 2 - Blowout Prevention

**Pressure Rating (PSI):** 10M

**Rating Depth:** 15000

**Equipment:** BOPE with working pressure ratings in excess of anticipated maximum surface pressure will be utilized for well control from drill out of surface casing to TMD. A rotating head will also be installed and utilized as needed. All BOPE connections shall be flanged, welded or clamped. All choke lines shall be straight unless targeted with running tees or tee blocks are used, and choke lines shall be anchored to prevent whip and reduce vibrations. All valves in the choke line & the choke manifold shall be full opening as to not cause restrictions and to allow for straight fluid paths to minimize potential erosion. All gauges utilized in the well control system shall be of a type designed for drilling fluid service. A top drive inside BOP valve will be utilized at all times. Subs equipped with full opening valves sized to fit the drill pipe and collars will be available on the rig floor in the open position. The key to operate said valve equipped subs will be on the rig floor at all times. The accumulator system will have sufficient capacity to open the HCR and close all three sets of rams plus the annular preventer while retaining at least 300 psi above precharge on the closing manifold (accumulator system shall be capable of doing so without using the closing unit pumps). The fluid reservoir capacity will be double the usable fluid volume of the accumulator system capacity, and the fluid level will be maintained at the manufacturer's recommended level. Prior to connecting the closing unit to the BOP stack, an accumulator precharge pressure test shall be performed to ensure the precharge pressure is within 100 psi of the desired precharge pressure (only nitrogen gas will be used to precharge). Two independent power sources will be made available at all times to power the closing unit pumps so that the pumps can automatically start when the closing valve manifold pressure has decreased to the preset level. Closing unit pumps will be sized to allow opening of HCR and closing of annular preventer on 5" drill pipe achieving at least 200 psi above precharge pressure with the accumulator system isolated from service in less than two minutes. A valve shall be installed in the closing line as close to the annular preventer as possible to act as a locking device; the valve shall be maintained in the open position and shall be closed only when the power source for the accumulator system is inoperative. Remote controls capable of opening and closing all preventers & the HCR shall be readily accessible to the driller; master controls with the same capability will be operable at the accumulator. The wellhead will be a multibowl speed head allowing for hangoff of intermediate casing & isolation of the 133/8 x 95/8 annulus without breaking the connection between the BOP & wellhead to install an additional casing head. A wear bushing will be installed & inspected frequently to guard against internal wear to wellhead.

**Requesting Variance?** YES

**Variance request:** Colgate Energy requests a variance to drill this well using a co flex line between the BOP and choke manifold. Certification for proposed coflex hose is attached. The hose is not required by the manufacturer to be anchored. In the event the specific hose is not available, one of equal or higher rating will be used.

**Testing Procedure:** After surface casing is set and the BOPE installed, pressure tests of BOPE will be performed by a third party tester utilizing water and a test plug to 250 psi low and 10,000 psi high. To deem a pressure test successful, pressure must be maintained for ten minutes without any bleedoff. A valve on the wellhead below seat of test plug will be open at all time during BOPE tests to guard against damage to casing. The BOPE will be retested in this manner after any connection breaks or passage of allotted time (25 days). Any BOPE which fails to pass pressure tests after initial install will be replaced prior to drilling out of surface casing shoe. If at any time a BOPE component cannot function to secure the hole, the hole shall be secured utilizing a retrievable packer, and the nonfunctioning BOPE component shall be repair or replaced. After repair or replacement, a pressure test of the repaired or replaced component and any connections broken to repair or replace the nonfunctioning component will be tested in the same manner as described for initial install of BOPE. The annular preventer will be function tested at least weekly, and the ramtype preventers will be function tested on each trip. BOPE pit level drills will be conducted weekly with each drilling crews. All pressure tests performed on BOPE and BOPE pit level drills will be logged in the drilling log. Isolation of 133/8" x 95/8" casing annulus shall be confirmed by pressure testing of wellhead sealing component after said sealing component is installed.

**Choke Diagram Attachment:**

Dakota\_32\_State\_Fed\_Com\_134H\_Choke\_Layout\_20200831123135.pdf

**BOP Diagram Attachment:**

Dakota\_32\_State\_Fed\_Com\_134H\_BOP\_Sta\_k\_20200831123140.pdf



**Operator Name:** COLGATE OPERATING LLC

**Well Name:** DAKOTA 32 STATE FED COM

**Well Number:** 134H

Dakota\_32\_State\_Fed\_Com\_134H\_Choke\_Layout\_20200831123135.pdf

Dakota\_32\_State\_Fed\_Com\_134H\_BOP\_Sta\_k\_20200831123140.pdf

### Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	17.5	13.375	NEW	API	N	0	180	0	180	3341	3161	180	J-55	54.5	BUTT	1.125	1.2	DRY	1.6	DRY	1.6
2	INTERMEDIATE	12.25	9.625	NEW	API	N	0	2890	0	2869	3341	472	2890	J-55	36	BUTT	1.125	1.2	DRY	1.6	DRY	1.6
3	PRODUCTION	8.75	5.5	NEW	API	N	0	18886	0	8177	3341	-4836	18886	HCP-110	20	OTHER - CDC HTQ	1.125	1.2	DRY	1.6	DRY	1.6

#### Casing Attachments

**Casing ID:** 1      **String Type:** SURFACE

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

**Casing Design Assumptions and Worksheet(s):**

Dakota\_32\_State\_Fed\_Com\_134H\_\_\_Casing\_Design\_Summary\_rv1\_20200831123253.pdf

Casing\_Design\_Assumptions\_20200831123258.pdf

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** DAKOTA 32 STATE FED COM

**Well Number:** 134H

#### Casing Attachments

**Casing ID:** 2      **String Type:** INTERMEDIATE

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

#### Casing Design Assumptions and Worksheet(s):

Casing\_Design\_Assumptions\_20200831123508.pdf

Dakota\_32\_State\_Fed\_Com\_134H\_\_\_Casing\_Design\_Summary\_rv1\_20200831123518.pdf

**Casing ID:** 3      **String Type:** PRODUCTION

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

#### Casing Design Assumptions and Worksheet(s):

Dakota\_32\_State\_Fed\_Com\_134H\_\_\_Casing\_Design\_Summary\_rv1\_20200831123650.pdf

Casing\_Design\_Assumptions\_20200831123724.pdf

### Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	0	0	0	0	0		0	0
SURFACE	Tail		0	180	124	1.8	13.5	223.2	100	Class C	Salt, accelerator, extender and LCM additives
PRODUCTION	Lead		0	0	0	0	0	0		0	0

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** DAKOTA 32 STATE FED COM

**Well Number:** 134H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
PRODUCTION	Tail		2050	1888 6	4087	1.24	14.2	5067. 88	20	Class H	Fluid Loss, Dispersant, Retarder and LCM additives
INTERMEDIATE	Lead		0	2312	640	2.19	12.7	1401. 6	100	Class C	Salt, extender, and LCM additives
INTERMEDIATE	Tail		2312	2890	170	1.33	14.8	226.1	25	Class C	Accelerator and LCM additives

## Section 5 - Circulating Medium

**Mud System Type:** Closed

**Will an air or gas system be Used?** NO

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

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

**Describe what will be on location to control well or mitigate other conditions:** All necessary mud products for weight addition and fluid loss control will be on location at all times.

**Describe the mud monitoring system utilized:** Mud program is subject to change due to hole conditions. The mud monitoring system is an electronic Pason system satisfying requirements of Onshore Order #1. Both visual and electronic mud monitoring equipment will be utilized to detect volume changes indicating loss or gain of circulating system fluid volume. Slow pump rates will be taken & recorded tourly in the drilling log. Mud engineer will perform tests and provide written report at least every 12 hours while circulating. A trip tank will be utilized and trip sheet will be recorded to ensure wellbore is taking proper fill or displacing proper fluid volume during all tripping operations. Gas detecting equipment will be utilized to monitor for hydrocarbon gas at the shakers while drilling and/or circulating. H2S monitoring equipment with both visual & auditory alarms will be installed and operational at the shakers, rig floor and cellar while drilling and/or circulating. A flare system with an effective method for ignition & discharge more than 100 feet from the wellbore will be utilized to gather and burn all gas; lines will be straight unless targeted with running tees. A mud gas separator will be installed and operable at least 500 feet before first anticipated hydrocarbon zone.

## Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
0	180	SPUD MUD	8.6	9							
180	2890	SALT SATURATED	10	10.2							

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** DAKOTA 32 STATE FED COM

**Well Number:** 134H

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
2890	1888 6	WATER-BASED MUD	9	10							

## Section 6 - Test, Logging, Coring

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

Directional surveys will be collected at no greater than 200' intervals while drilling through the MWD tools. A GR log will be collected while drilling through the MWD tools from intermediate casing to TD. No DSTs or cores are planned at this time. No CBL or temperature logs planned at this time. A formation integrity test (FIT) will be performed on all casing strings after BOPE is installed to at least 1 ppge over planned section mud weight after drilling ten feet of new hole.

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

GAMMA RAY LOG,

### Coring operation description for the well:

No openhole logs are planned at this time.

## Section 7 - Pressure

**Anticipated Bottom Hole Pressure:** 3646

**Anticipated Surface Pressure:** 1816

**Anticipated Bottom Hole Temperature(F):** 120

**Anticipated abnormal pressures, temperatures, or potential geologic hazards?** NO

**Describe:**

**Contingency Plans geohazards description:**

**Contingency Plans geohazards attachment:**

**Hydrogen Sulfide drilling operations plan required?** YES

**Hydrogen sulfide drilling operations plan:**

Colgate\_H2S\_Contingency\_Plan\_20200831124726.pdf

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** DAKOTA 32 STATE FED COM

**Well Number:** 134H

## Section 8 - Other Information

### **Proposed horizontal/directional/multi-lateral plan submission:**

03\_Dakota\_32\_State\_Fed\_Com\_134H\_\_\_APD\_Rev1\_AC\_20200831124737.pdf

03\_Dakota\_32\_State\_Fed\_Com\_134H\_\_\_APD\_Rev1\_WM\_20200831124742.pdf

03\_Dakota\_32\_State\_Fed\_Com\_134H\_\_\_APD\_Rev1\_20200831124751.pdf

### **Other proposed operations facets description:**

After cement has been allowed to sit undisturbed for eight hours and has reached a compressive strength of 500 psi across the zone of interest, the 133/8 surface casing will be pressured to 1,500 psi and held for 30 minutes. Lab reports with the 500 psi compressive strength time for the cement will be onsite for review. A casing test will be deemed successful if test pressure does not decline more than 10% over the thirty minute period. The casing pressure test will be completed against the blind rams of 135/8 10M BOPE prior to PU tools to drill out. After cement has been allowed to sit undisturbed for eight hours and has reached a compressive strength of 500 psi across the zone of interest, the 95/8 intermediate casing will be pressured to 2,500 psi and held for 30 minutes. Lab reports with the 500 psi compressive strength time for the cement will be onsite for review. A casing test will be deemed successful if test pressure does not decline more than 10% over the thirty minute period. Casing pressure test will be completed against the lower pipe rams of 135/8 10M BOPE immediately prior to drilling out float equipment. Casing pressure test on 51/2 production casing will occur more than 72 hours after cement is placed and reached ultimate compressive strength. Lab reports with the 500 psi compressive strength time for the cement will be onsite for review. A casing test will be deemed successful if test pressure does not decline more than 10% over the thirty minute period. Casing will be tested by pressuring up to 10,000 psi and holding pressure for 30 minutes prior to the beginning of perforating & stimulating operations.

Cement will be placed on all casing strings utilizing the pump and plug method. A float will be installed in the casing shoe and float collar on all casing strings to hold cement in place once pumping is completed. A top plug will be utilized on all casing strings to prevent contamination of the cement by the displacement fluid. A preflush fluid will be pumped prior to cement to aid in removal of drilling mud from the wellbore, eliminate drilling mud contamination of the cement slurry and prepare the surface of both the wellbore and casing for cement.

No abnormal pressures or temperatures are expected. In accordance with Onshore Order No. 6, Colgate Energy does not anticipate that there will be enough H2S from the surface to the Wolfcamp formations to meet the BLMs minimum requirements for the submission of an H2S Drilling Operation Plan or Public Protection Plan for the drilling and completion of this well. Since we have an H2S safety package on all wells, attached is an H2S Drilling Operations Plan. Adequate flare lines will be installed off the mud/gas separator where gas may be flared safely. All personnel will be familiar with all aspects of safe operation of equipment being used.

### **Other proposed operations facets attachment:**

Choke\_Hose\_SN\_20200831124853.pdf

Dakota\_32\_State\_Fed\_Com\_134H\_Gas\_Capture\_Plan\_20200831124858.docx

Encore\_Wellhead\_Multi\_Bowl\_20200831124906.docx

Dakota\_32\_State\_Fed\_Com\_134H\_APD\_Procedure\_rv1\_20200831124918.pdf

### **Other Variance attachment:**



## **Colgate Energy**

**Eddy County, NM (N83-NME)**

**Dakota 32 State Fed Com**

**03 Dakota 32 State Fed Com 134H**

**Permit**

**Plan: APD-Rev 1 269.68**

## **Standard Planning Report**

**27 August, 2020**

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

<b>Project</b>	Eddy County, NM (N83-NME)		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	New Mexico Eastern Zone		

Site		Dakota 32 State Fed Com			
Site Position:		Northing:	586,983.29 usft	Latitude:	32.61358824
From:	Map	Easting:	584,987.91 usft	Longitude:	-104.19156799
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.08 °

Well	03 Dakota 32 State Fed Com 134H					
Well Position	+N/-S	-45.05 usft	Northing:	586,938.24 usft	Latitude:	32.61346442
	+E/-W	-2.97 usft	Easting:	584,984.94 usft	Longitude:	-104.19157783
Position Uncertainty		0.00 usft	Wellhead Elevation:		Ground Level:	3,341.00 usft

<b>Wellbore</b>	Permit				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2020	8/17/2020	6.96	60.19	47,745.96062097

<b>Design</b>	APD-Rev 1 269.68			
<b>Audit Notes:</b>				
<b>Version:</b>	<b>Phase:</b>	PLAN	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>
	0.00	0.00	0.00	269.68

<b>Plan Survey Tool Program</b>	<b>Date</b>	8/27/2020		
<b>Depth From (usft)</b>	<b>Depth To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Remarks</b>
1	0.00	18,885.80	APD-Rev 1 269.68 (Permit)	OWSG MWD Rev 4
				OWSG MWD - Standard



<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,077.45	11.66	167.78	2,072.09	-77.06	16.69	1.50	1.50	0.00	167.78	
5,810.32	11.66	167.78	5,727.91	-814.50	176.41	0.00	0.00	0.00	0.00	
6,587.77	0.00	0.01	6,500.00	-891.56	193.11	1.50	-1.50	0.00	180.00	L07-00-EON (Dak32-
7,932.93	0.00	0.01	7,845.16	-891.56	193.11	0.00	0.00	0.00	0.01	
8,532.93	60.00	262.95	8,341.36	-926.72	-91.21	10.00	10.00	0.00	262.95	
8,848.72	90.92	269.68	8,419.76	-944.84	-392.45	10.00	9.79	2.13	12.93	
10,951.27	90.92	269.68	8,386.00	-956.58	-2,494.70	0.00	0.00	0.00	0.00	
10,985.27	91.60	269.68	8,385.26	-956.77	-2,528.69	2.00	2.00	0.00	0.00	
13,452.24	91.60	269.68	8,316.37	-970.55	-4,994.66	0.00	0.00	0.00	0.00	
13,463.74	91.83	269.68	8,316.03	-970.61	-5,006.15	2.00	2.00	0.00	0.00	
15,953.51	91.83	269.68	8,236.52	-984.51	-7,494.62	0.00	0.00	0.00	0.00	
15,987.51	91.15	269.68	8,235.64	-984.70	-7,528.60	2.00	-2.00	-0.01	-179.78	
18,886.11	91.15	269.68	8,177.46	-1,001.02	-10,426.58	0.00	0.00	0.00	0.00	L07-03-PBHL(Dak32-

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
166.00	0.00	0.00	166.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Rustler</b>									
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
221.00	0.00	0.00	221.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Top of Salt</b>									
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
528.00	0.00	0.00	528.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Base of Salt</b>									
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
746.00	0.00	0.00	746.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Yates</b>									
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	1.50	167.78	1,399.99	-1.28	0.28	-0.27	1.50	1.50	0.00
1,500.00	3.00	167.78	1,499.91	-5.12	1.11	-1.08	1.50	1.50	0.00
1,600.00	4.50	167.78	1,599.69	-11.51	2.49	-2.43	1.50	1.50	0.00
1,700.00	6.00	167.78	1,699.27	-20.45	4.43	-4.32	1.50	1.50	0.00
1,800.00	7.50	167.78	1,798.57	-31.94	6.92	-6.74	1.50	1.50	0.00
1,900.00	9.00	167.78	1,897.54	-45.96	9.95	-9.70	1.50	1.50	0.00
2,000.00	10.50	167.78	1,996.09	-62.51	13.54	-13.19	1.50	1.50	0.00
2,077.45	11.66	167.78	2,072.09	-77.06	16.69	-16.26	1.50	1.50	0.00
2,100.00	11.66	167.78	2,094.18	-81.51	17.66	-17.20	0.00	0.00	0.00
2,200.00	11.66	167.78	2,192.11	-101.27	21.93	-21.37	0.00	0.00	0.00
2,300.00	11.66	167.78	2,290.05	-121.03	26.21	-25.54	0.00	0.00	0.00
2,400.00	11.66	167.78	2,387.99	-140.78	30.49	-29.71	0.00	0.00	0.00
2,500.00	11.66	167.78	2,485.92	-160.54	34.77	-33.87	0.00	0.00	0.00
2,600.00	11.66	167.78	2,583.86	-180.29	39.05	-38.04	0.00	0.00	0.00
2,700.00	11.66	167.78	2,681.79	-200.05	43.33	-42.21	0.00	0.00	0.00
2,800.00	11.66	167.78	2,779.73	-219.80	47.61	-46.38	0.00	0.00	0.00
2,900.00	11.66	167.78	2,877.66	-239.56	51.89	-50.55	0.00	0.00	0.00
2,995.30	11.66	167.78	2,971.00	-258.38	55.96	-54.52	0.00	0.00	0.00
<b>DLWR Mnt. Group</b>									
3,000.00	11.66	167.78	2,975.60	-259.31	56.17	-54.72	0.00	0.00	0.00
3,100.00	11.66	167.78	3,073.54	-279.07	60.44	-58.88	0.00	0.00	0.00
3,200.00	11.66	167.78	3,171.47	-298.82	64.72	-63.05	0.00	0.00	0.00
3,300.00	11.66	167.78	3,269.41	-318.58	69.00	-67.22	0.00	0.00	0.00
3,400.00	11.66	167.78	3,367.34	-338.33	73.28	-71.39	0.00	0.00	0.00
3,412.92	11.66	167.78	3,380.00	-340.89	73.83	-71.93	0.00	0.00	0.00
<b>Lower Brushy Canyon</b>									
3,500.00	11.66	167.78	3,465.28	-358.09	77.56	-75.56	0.00	0.00	0.00
3,600.00	11.66	167.78	3,563.21	-377.84	81.84	-79.73	0.00	0.00	0.00
3,700.00	11.66	167.78	3,661.15	-397.60	86.12	-83.90	0.00	0.00	0.00
3,800.00	11.66	167.78	3,759.09	-417.35	90.40	-88.06	0.00	0.00	0.00
3,858.11	11.66	167.78	3,816.00	-428.83	92.88	-90.49	0.00	0.00	0.00

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
<b>Bone Spring Lime</b>										
3,900.00	11.66	167.78	3,857.02	-437.11	94.67	-92.23	0.00	0.00	0.00	
4,000.00	11.66	167.78	3,954.96	-456.86	98.95	-96.40	0.00	0.00	0.00	
4,100.00	11.66	167.78	4,052.89	-476.62	103.23	-100.57	0.00	0.00	0.00	
4,200.00	11.66	167.78	4,150.83	-496.37	107.51	-104.74	0.00	0.00	0.00	
4,300.00	11.66	167.78	4,248.77	-516.13	111.79	-108.91	0.00	0.00	0.00	
4,400.00	11.66	167.78	4,346.70	-535.89	116.07	-113.07	0.00	0.00	0.00	
4,500.00	11.66	167.78	4,444.64	-555.64	120.35	-117.24	0.00	0.00	0.00	
4,600.00	11.66	167.78	4,542.57	-575.40	124.63	-121.41	0.00	0.00	0.00	
4,700.00	11.66	167.78	4,640.51	-595.15	128.91	-125.58	0.00	0.00	0.00	
4,800.00	11.66	167.78	4,738.44	-614.91	133.18	-129.75	0.00	0.00	0.00	
4,900.00	11.66	167.78	4,836.38	-634.66	137.46	-133.92	0.00	0.00	0.00	
5,000.00	11.66	167.78	4,934.32	-654.42	141.74	-138.09	0.00	0.00	0.00	
5,100.00	11.66	167.78	5,032.25	-674.17	146.02	-142.25	0.00	0.00	0.00	
5,200.00	11.66	167.78	5,130.19	-693.93	150.30	-146.42	0.00	0.00	0.00	
5,300.00	11.66	167.78	5,228.12	-713.68	154.58	-150.59	0.00	0.00	0.00	
5,400.00	11.66	167.78	5,326.06	-733.44	158.86	-154.76	0.00	0.00	0.00	
5,500.00	11.66	167.78	5,424.00	-753.19	163.14	-158.93	0.00	0.00	0.00	
5,600.00	11.66	167.78	5,521.93	-772.95	167.42	-163.10	0.00	0.00	0.00	
5,700.00	11.66	167.78	5,619.87	-792.70	171.69	-167.26	0.00	0.00	0.00	
5,800.00	11.66	167.78	5,717.80	-812.46	175.97	-171.43	0.00	0.00	0.00	
5,810.32	11.66	167.78	5,727.91	-814.50	176.41	-171.86	0.00	0.00	0.00	
5,838.98	11.23	167.78	5,756.00	-820.06	177.62	-173.04	1.50	-1.50	0.00	
<b>1st Bone Spring Sand</b>										
5,900.00	10.32	167.78	5,815.94	-831.20	180.03	-175.39	1.50	-1.50	0.00	
5,900.06	10.32	167.78	5,816.00	-831.21	180.04	-175.39	0.00	0.00	0.00	
<b>2nd BS Limestone</b>										
6,000.00	8.82	167.78	5,914.55	-847.45	183.55	-178.82	1.50	-1.50	0.00	
6,100.00	7.32	167.78	6,013.56	-861.16	186.52	-181.71	1.50	-1.50	0.00	
6,200.00	5.82	167.78	6,112.90	-872.34	188.94	-184.07	1.50	-1.50	0.00	
6,300.00	4.32	167.78	6,212.51	-880.97	190.81	-185.89	1.50	-1.50	0.00	
6,400.00	2.82	167.78	6,312.31	-887.05	192.13	-187.17	1.50	-1.50	0.00	
6,500.00	1.32	167.78	6,412.24	-890.57	192.89	-187.91	1.50	-1.50	0.00	
6,587.77	0.00	0.01	6,500.00	-891.56	193.11	-188.12	1.50	-1.50	0.00	
<b>L07-00-EON (Dak32-134H)</b>										
6,600.00	0.00	0.00	6,512.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
6,700.00	0.00	0.00	6,612.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
6,800.00	0.00	0.00	6,712.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
6,900.00	0.00	0.00	6,812.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,000.00	0.00	0.00	6,912.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,028.77	0.00	0.00	6,941.00	-891.56	193.11	-188.12	0.00	0.00	0.00	
<b>2nd Bone Spring Sand</b>										
7,100.00	0.00	0.00	7,012.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,200.00	0.00	0.00	7,112.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,300.00	0.00	0.00	7,212.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,400.00	0.00	0.00	7,312.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,500.00	0.00	0.00	7,412.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,573.77	0.00	0.00	7,486.00	-891.56	193.11	-188.12	0.00	0.00	0.00	
<b>3rd BS Limestone</b>										
7,600.00	0.00	0.00	7,512.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,700.00	0.00	0.00	7,612.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,800.00	0.00	0.00	7,712.23	-891.56	193.11	-188.12	0.00	0.00	0.00	
7,900.00	0.00	0.00	7,812.23	-891.56	193.11	-188.12	0.00	0.00	0.00	

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
7,932.93	0.00	0.00	7,845.16	-891.56	193.11	-188.12	0.00	0.00	0.00
<b>KOP: 7932.93' MD, -188.12' VS, 7845.16' TVD</b>									
7,950.00	1.71	262.95	7,862.23	-891.59	192.85	-187.87	10.00	10.00	0.00
8,000.00	6.71	262.95	7,912.08	-892.04	189.21	-184.23	10.00	10.00	0.00
8,050.00	11.71	262.95	7,961.42	-893.02	181.28	-176.29	10.00	10.00	0.00
8,100.00	16.71	262.95	8,009.88	-894.52	169.10	-164.10	10.00	10.00	0.00
8,150.00	21.71	262.95	8,057.08	-896.54	152.78	-147.77	10.00	10.00	0.00
8,200.00	26.71	262.95	8,102.67	-899.06	132.44	-127.42	10.00	10.00	0.00
8,250.00	31.71	262.95	8,146.30	-902.05	108.23	-103.19	10.00	10.00	0.00
8,300.00	36.71	262.95	8,187.63	-905.50	80.35	-75.29	10.00	10.00	0.00
8,336.26	40.33	262.95	8,216.00	-908.27	57.94	-52.86	10.00	10.00	0.00
<b>3rd Bone Spring Sand</b>									
8,350.00	41.71	262.95	8,226.36	-909.38	48.99	-43.91	10.00	10.00	0.00
8,400.00	46.71	262.95	8,262.19	-913.66	14.40	-9.30	10.00	10.00	0.00
8,415.45	48.25	262.95	8,272.63	-915.05	3.10	2.01	10.00	10.00	0.00
<b>L07-01-FTP (Dak32-134H)</b>									
8,450.00	51.71	262.95	8,294.85	-918.30	-23.15	28.28	10.00	10.00	0.00
8,500.00	56.71	262.95	8,324.08	-923.28	-63.39	68.55	10.00	10.00	0.00
8,532.93	60.00	262.95	8,341.36	-926.72	-91.21	96.38	10.00	10.00	0.00
8,550.00	61.66	263.38	8,349.68	-928.49	-106.01	111.19	10.00	9.75	2.54
8,600.00	66.55	264.58	8,371.51	-933.19	-150.73	155.94	10.00	9.76	2.40
8,650.00	71.44	265.70	8,389.43	-937.14	-197.22	202.45	10.00	9.78	2.23
8,700.00	76.34	266.75	8,403.30	-940.30	-245.14	250.39	10.00	9.79	2.10
8,750.00	81.24	267.75	8,413.02	-942.65	-294.11	299.37	10.00	9.80	2.02
8,800.00	86.14	268.73	8,418.51	-944.17	-343.77	349.04	10.00	9.81	1.96
8,848.72	90.92	269.68	8,419.76	-944.84	-392.45	397.73	10.00	9.81	1.94
<b>EOC: 8848.72' MD, 397.73' VS, 8419.76' TVD</b>									
8,900.00	90.92	269.68	8,418.94	-945.13	-443.73	449.00	0.00	0.00	0.00
9,000.00	90.92	269.68	8,417.33	-945.69	-543.71	548.99	0.00	0.00	0.00
9,100.00	90.92	269.68	8,415.73	-946.25	-643.70	648.97	0.00	0.00	0.00
9,200.00	90.92	269.68	8,414.12	-946.81	-743.68	748.96	0.00	0.00	0.00
9,300.00	90.92	269.68	8,412.52	-947.36	-843.67	848.95	0.00	0.00	0.00
9,400.00	90.92	269.68	8,410.91	-947.92	-943.65	948.93	0.00	0.00	0.00
9,500.00	90.92	269.68	8,409.31	-948.48	-1,043.64	1,048.92	0.00	0.00	0.00
9,600.00	90.92	269.68	8,407.70	-949.04	-1,143.63	1,148.91	0.00	0.00	0.00
9,700.00	90.92	269.68	8,406.09	-949.60	-1,243.61	1,248.90	0.00	0.00	0.00
9,800.00	90.92	269.68	8,404.49	-950.16	-1,343.60	1,348.88	0.00	0.00	0.00
9,900.00	90.92	269.68	8,402.88	-950.71	-1,443.58	1,448.87	0.00	0.00	0.00
10,000.00	90.92	269.68	8,401.28	-951.27	-1,543.57	1,548.86	0.00	0.00	0.00
10,100.00	90.92	269.68	8,399.67	-951.83	-1,643.55	1,648.84	0.00	0.00	0.00
10,200.00	90.92	269.68	8,398.07	-952.39	-1,743.54	1,748.83	0.00	0.00	0.00
10,300.00	90.92	269.68	8,396.46	-952.95	-1,843.52	1,848.82	0.00	0.00	0.00
10,400.00	90.92	269.68	8,394.86	-953.51	-1,943.51	1,948.81	0.00	0.00	0.00
10,500.00	90.92	269.68	8,393.25	-954.06	-2,043.50	2,048.79	0.00	0.00	0.00
10,600.00	90.92	269.68	8,391.64	-954.62	-2,143.48	2,148.78	0.00	0.00	0.00
10,700.00	90.92	269.68	8,390.04	-955.18	-2,243.47	2,248.77	0.00	0.00	0.00
10,800.00	90.92	269.68	8,388.43	-955.74	-2,343.45	2,348.75	0.00	0.00	0.00
10,900.00	90.92	269.68	8,386.83	-956.30	-2,443.44	2,448.74	0.00	0.00	0.00
10,951.27	90.92	269.68	8,386.00	-956.58	-2,494.70	2,500.00	0.00	0.00	0.00
10,985.27	91.60	269.68	8,385.26	-956.77	-2,528.69	2,533.99	2.00	2.00	0.00
11,000.00	91.60	269.68	8,384.85	-956.86	-2,543.42	2,548.72	0.00	0.00	0.00
11,100.00	91.60	269.68	8,382.05	-957.41	-2,643.38	2,648.68	0.00	0.00	0.00
11,200.00	91.60	269.68	8,379.26	-957.97	-2,743.33	2,748.64	0.00	0.00	0.00

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
11,300.00	91.60	269.68	8,376.47	-958.53	-2,843.29	2,848.60	0.00	0.00	0.00
11,400.00	91.60	269.68	8,373.68	-959.09	-2,943.25	2,948.56	0.00	0.00	0.00
11,500.00	91.60	269.68	8,370.88	-959.65	-3,043.21	3,048.53	0.00	0.00	0.00
11,600.00	91.60	269.68	8,368.09	-960.21	-3,143.17	3,148.49	0.00	0.00	0.00
11,700.00	91.60	269.68	8,365.30	-960.76	-3,243.13	3,248.45	0.00	0.00	0.00
11,800.00	91.60	269.68	8,362.51	-961.32	-3,343.09	3,348.41	0.00	0.00	0.00
11,900.00	91.60	269.68	8,359.72	-961.88	-3,443.05	3,448.37	0.00	0.00	0.00
12,000.00	91.60	269.68	8,356.92	-962.44	-3,543.01	3,548.33	0.00	0.00	0.00
12,100.00	91.60	269.68	8,354.13	-963.00	-3,642.97	3,648.29	0.00	0.00	0.00
12,200.00	91.60	269.68	8,351.34	-963.56	-3,742.93	3,748.25	0.00	0.00	0.00
12,300.00	91.60	269.68	8,348.55	-964.11	-3,842.89	3,848.21	0.00	0.00	0.00
12,400.00	91.60	269.68	8,345.75	-964.67	-3,942.85	3,948.17	0.00	0.00	0.00
12,500.00	91.60	269.68	8,342.96	-965.23	-4,042.81	4,048.14	0.00	0.00	0.00
12,600.00	91.60	269.68	8,340.17	-965.79	-4,142.77	4,148.10	0.00	0.00	0.00
12,700.00	91.60	269.68	8,337.38	-966.35	-4,242.73	4,248.06	0.00	0.00	0.00
12,800.00	91.60	269.68	8,334.59	-966.91	-4,342.69	4,348.02	0.00	0.00	0.00
12,900.00	91.60	269.68	8,331.79	-967.46	-4,442.65	4,447.98	0.00	0.00	0.00
13,000.00	91.60	269.68	8,329.00	-968.02	-4,542.61	4,547.94	0.00	0.00	0.00
13,100.00	91.60	269.68	8,326.21	-968.58	-4,642.56	4,647.90	0.00	0.00	0.00
13,200.00	91.60	269.68	8,323.42	-969.14	-4,742.52	4,747.86	0.00	0.00	0.00
13,300.00	91.60	269.68	8,320.63	-969.70	-4,842.48	4,847.82	0.00	0.00	0.00
13,400.00	91.60	269.68	8,317.83	-970.26	-4,942.44	4,947.78	0.00	0.00	0.00
13,452.24	91.60	269.68	8,316.37	-970.55	-4,994.66	5,000.00	0.00	0.00	0.00
13,463.74	91.83	269.68	8,316.03	-970.61	-5,006.15	5,011.49	2.00	2.00	0.00
13,500.00	91.83	269.68	8,314.87	-970.81	-5,042.40	5,047.74	0.00	0.00	0.00
13,528.27	91.83	269.68	8,313.97	-970.97	-5,070.65	5,075.99	0.00	0.00	0.00
<b>L07-01-MP (Dak32-134H)</b>									
13,528.27	91.83	269.68	8,313.97	-970.97	-5,070.65	5,076.00	0.00	0.00	0.00
<b>Sec31: 32.61081299, -104.20804967 - Sec31:: 13528.27' MD, 5076.00' VS, 8313.97' TVD</b>									
13,600.00	91.83	269.68	8,311.68	-971.37	-5,142.34	5,147.69	0.00	0.00	0.00
13,700.00	91.83	269.68	8,308.49	-971.93	-5,242.29	5,247.64	0.00	0.00	0.00
13,800.00	91.83	269.68	8,305.29	-972.49	-5,342.24	5,347.59	0.00	0.00	0.00
13,900.00	91.83	269.68	8,302.10	-973.05	-5,442.19	5,447.54	0.00	0.00	0.00
14,000.00	91.83	269.68	8,298.91	-973.60	-5,542.13	5,547.49	0.00	0.00	0.00
14,100.00	91.83	269.68	8,295.71	-974.16	-5,642.08	5,647.43	0.00	0.00	0.00
14,200.00	91.83	269.68	8,292.52	-974.72	-5,742.03	5,747.38	0.00	0.00	0.00
14,300.00	91.83	269.68	8,289.33	-975.28	-5,841.98	5,847.33	0.00	0.00	0.00
14,400.00	91.83	269.68	8,286.13	-975.84	-5,941.92	5,947.28	0.00	0.00	0.00
14,500.00	91.83	269.68	8,282.94	-976.40	-6,041.87	6,047.23	0.00	0.00	0.00
14,600.00	91.83	269.68	8,279.74	-976.95	-6,141.82	6,147.18	0.00	0.00	0.00
14,700.00	91.83	269.68	8,276.55	-977.51	-6,241.77	6,247.13	0.00	0.00	0.00
14,800.00	91.83	269.68	8,273.36	-978.07	-6,341.71	6,347.08	0.00	0.00	0.00
14,900.00	91.83	269.68	8,270.16	-978.63	-6,441.66	6,447.03	0.00	0.00	0.00
15,000.00	91.83	269.68	8,266.97	-979.19	-6,541.61	6,546.98	0.00	0.00	0.00
15,100.00	91.83	269.68	8,263.78	-979.75	-6,641.56	6,646.92	0.00	0.00	0.00
15,200.00	91.83	269.68	8,260.58	-980.30	-6,741.50	6,746.87	0.00	0.00	0.00
15,300.00	91.83	269.68	8,257.39	-980.86	-6,841.45	6,846.82	0.00	0.00	0.00
15,400.00	91.83	269.68	8,254.20	-981.42	-6,941.40	6,946.77	0.00	0.00	0.00
15,500.00	91.83	269.68	8,251.00	-981.98	-7,041.35	7,046.72	0.00	0.00	0.00
15,600.00	91.83	269.68	8,247.81	-982.54	-7,141.29	7,146.67	0.00	0.00	0.00
15,700.00	91.83	269.68	8,244.62	-983.09	-7,241.24	7,246.62	0.00	0.00	0.00
15,800.00	91.83	269.68	8,241.42	-983.65	-7,341.19	7,346.57	0.00	0.00	0.00
15,900.00	91.83	269.68	8,238.23	-984.21	-7,441.14	7,446.52	0.00	0.00	0.00
15,953.51	91.83	269.68	8,236.52	-984.51	-7,494.62	7,500.00	0.00	0.00	0.00

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
15,987.51	91.15	269.68	8,235.64	-984.70	-7,528.60	7,533.99	2.00	-2.00	-0.01
16,000.00	91.15	269.68	8,235.39	-984.77	-7,541.09	7,546.48	0.00	0.00	0.00
16,100.00	91.15	269.68	8,233.38	-985.33	-7,641.07	7,646.45	0.00	0.00	0.00
16,200.00	91.15	269.68	8,231.37	-985.90	-7,741.05	7,746.43	0.00	0.00	0.00
16,300.00	91.15	269.68	8,229.37	-986.46	-7,841.03	7,846.41	0.00	0.00	0.00
16,400.00	91.15	269.68	8,227.36	-987.02	-7,941.01	7,946.39	0.00	0.00	0.00
16,500.00	91.15	269.68	8,225.35	-987.59	-8,040.98	8,046.37	0.00	0.00	0.00
16,600.00	91.15	269.68	8,223.34	-988.15	-8,140.96	8,146.35	0.00	0.00	0.00
16,700.00	91.15	269.68	8,221.34	-988.71	-8,240.94	8,246.33	0.00	0.00	0.00
16,800.00	91.15	269.68	8,219.33	-989.27	-8,340.92	8,346.31	0.00	0.00	0.00
16,900.00	91.15	269.68	8,217.32	-989.84	-8,440.90	8,446.29	0.00	0.00	0.00
17,000.00	91.15	269.68	8,215.32	-990.40	-8,540.88	8,546.27	0.00	0.00	0.00
17,100.00	91.15	269.68	8,213.31	-990.96	-8,640.85	8,646.25	0.00	0.00	0.00
17,200.00	91.15	269.68	8,211.30	-991.53	-8,740.83	8,746.23	0.00	0.00	0.00
17,300.00	91.15	269.68	8,209.29	-992.09	-8,840.81	8,846.21	0.00	0.00	0.00
17,400.00	91.15	269.68	8,207.29	-992.65	-8,940.79	8,946.19	0.00	0.00	0.00
17,500.00	91.15	269.68	8,205.28	-993.22	-9,040.77	9,046.17	0.00	0.00	0.00
17,533.74	91.15	269.68	8,204.60	-993.41	-9,074.50	9,079.91	0.00	0.00	0.00
UnitM: 32.61076362, -104.22105279 - UnitM: 17533.74' MD, 8204.60' TVD									
17,600.00	91.15	269.68	8,203.27	-993.78	-9,140.75	9,146.15	0.00	0.00	0.00
17,700.00	91.15	269.68	8,201.27	-994.34	-9,240.72	9,246.13	0.00	0.00	0.00
17,800.00	91.15	269.68	8,199.26	-994.90	-9,340.70	9,346.11	0.00	0.00	0.00
17,900.00	91.15	269.68	8,197.25	-995.47	-9,440.68	9,446.09	0.00	0.00	0.00
18,000.00	91.15	269.68	8,195.25	-996.03	-9,540.66	9,546.07	0.00	0.00	0.00
18,100.00	91.15	269.68	8,193.24	-996.59	-9,640.64	9,646.05	0.00	0.00	0.00
18,200.00	91.15	269.68	8,191.23	-997.16	-9,740.61	9,746.03	0.00	0.00	0.00
18,300.00	91.15	269.68	8,189.22	-997.72	-9,840.59	9,846.01	0.00	0.00	0.00
18,400.00	91.15	269.68	8,187.22	-998.28	-9,940.57	9,945.99	0.00	0.00	0.00
18,500.00	91.15	269.68	8,185.21	-998.85	-10,040.55	10,045.97	0.00	0.00	0.00
18,600.00	91.15	269.68	8,183.20	-999.41	-10,140.53	10,145.95	0.00	0.00	0.00
18,700.00	91.15	269.68	8,181.20	-999.97	-10,240.51	10,245.93	0.00	0.00	0.00
18,794.04	91.15	269.68	8,179.31	-1,000.50	-10,334.53	10,339.96	0.00	0.00	0.00
L07-02-LTP (Dak32-134H)									
18,800.00	91.15	269.68	8,179.19	-1,000.54	-10,340.48	10,345.91	0.00	0.00	0.00
18,886.11	91.15	269.68	8,177.46	-1,001.02	-10,426.58	10,432.00	0.00	0.00	0.00
TD: 18886.11' MD, 10432.00' VS, 8177.46' TVD - L07-03-PBHL(Dak32-134H)									

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well 03 Dakota 32 State Fed Com 134H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3341+25 @ 3366.00usft (Permit)
<b>Site:</b>	Dakota 32 State Fed Com	<b>North Reference:</b>	Grid
<b>Well:</b>	03 Dakota 32 State Fed Com 134H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Permit		
<b>Design:</b>	APD-Rev 1 269.68		

Design Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
L07-00-EON (Dak32-134) - plan hits target center - Point	0.00	0.01	6,500.00	-891.56	193.11	586,046.69	585,178.05	32.61101306	-104.19095456
L07-03-PBHL(Dak32-134) - plan hits target center - Point	0.00	0.00	8,177.46	-1,001.02	-10,426.58	585,937.22	574,558.36	32.61074654	-104.22544389
L07-02-LTP (Dak32-134) - plan misses target center by 0.01usft at 18794.04usft MD (8179.31 TVD, -1000.50 N, -10334.53 E) - Point	0.00	0.00	8,179.31	-1,000.51	-10,334.53	585,937.73	574,650.41	32.61074768	-104.22514494
L07-01-MP (Dak32-134) - plan misses target center by 0.02usft at 13528.26usft MD (8313.97 TVD, -970.97 N, -5070.65 E) - Point	0.00	0.00	8,313.97	-970.99	-5,070.65	585,967.25	579,914.30	32.61081294	-104.20804965
L07-01-FTP (Dak32-134) - plan misses target center by 207.15usft at 8415.45usft MD (8272.63 TVD, -915.05 N, 3.10 E) - Point	0.00	0.00	8,426.00	-941.79	139.76	585,996.45	585,124.70	32.61087518	-104.19112802

Formations					
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
166.00	166.00	Rustler			
221.00	221.00	Top of Salt			
528.00	528.00	Base of Salt			
746.00	746.00	Yates			
2,995.30	2,971.00	DLWR Mnt. Group			
3,412.92	3,380.00	Lower Brushy Canyon			
3,858.11	3,816.00	Bone Spring Lime			
5,838.98	5,756.00	1st Bone Spring Sand			
5,900.06	5,816.00	2nd BS Limestone			
7,028.77	6,941.00	2nd Bone Spring Sand			
7,573.77	7,486.00	3rd BS Limestone			
8,336.26	8,216.00	3rd Bone Spring Sand			

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
7,932.93	7,845.16	-891.56	193.11	KOP: 7932.93' MD, -188.12' VS, 7845.16' TVD
8,848.72	8,419.76	-944.84	-392.45	EOC: 8848.72' MD, 397.73' VS, 8419.76' TVD
13,528.27	8,313.97	-970.97	-5,070.65	Sec31: 32.61081299, -104.20804967
13,528.27	8,313.97	-970.97	-5,070.65	Sec31:: 13528.27' MD, 5076.00' VS, 8313.97' TVD
17,533.74	8,204.60	-993.41	-9,074.50	UnitM: 32.61076362, -104.22105279
17,533.74	8,204.60	-993.41	-9,074.50	UnitM: 17533.74' MD, 8204.60' TVD
18,886.11	8,177.46	-1,001.02	-10,426.58	TD: 18886.11' MD, 10432.00' VS, 8177.46' TVD





# H<sub>2</sub>S Contingency Plan



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## I. EMERGENCY ASSISTANCE TELEPHONE LIST

### **PUBLIC SAFETY**

**911 or**

#### **Sheriff's Department:**

Eddy County Sheriff's Office (575) 887-7551

#### **Fire Department:**

Carlsbad Fire Department (575) 885-3125

Artesia Fire Department (575) 746-5051

#### **Ambulance:**

Elite Medical Transport (Carlsbad) (915) 542-1144

Trans Aero MedEvac (Artesia) (970) 657-7449

#### **Hospitals:**

Carlsbad Medical Center (575) 887-4100

Artesia General Hospital (575) 748-3333

#### **New Mexico Dept. of Transportation:**

Highway & Transportation Department (505) 795- 1401

#### **New Mexico Railroad Commission:**

Main Line (505) 476-3441

#### **OSHA 24 Hr. Reporting**

(800) 321-6742

(8 hrs. after death or 24 hrs. after in-patient, amputation, loss of an eye)

**Office Contacts****911 or****Colgate Energy LLC.****(432) 695-4222****Vice President of Operations:**

Casey McCain

(432) 664-6140

**Drilling Engineering Supervisor**

Rafael Madrid

(432) 556-6387

**Drilling Engineering Technical Adviser**

Steven Segrest

(405) 550-0277

**Operations Superintendent**

Rick Lawson

(432) 530- 3188

**Drilling Superintendent**

Daniel Cameron

(405) 933-0435

**Onsite Supervision (H&P 481 Rig Managers)**

Juan Gutierrez

(970)394-4768

Jonathan Jackson

(970)394-4768

**Onsite Supervision (H&P 481 Company Men)**

Pierre Dupuis

(432)438-0114

Eric Rutherford

(432)438-0114

Rolando Torres

(432)438-0114

Trevor Hein

(432)438-0114

**Emergency Accommodations**

Safety Solutions Office

(432) 563-0400

Safety Solutions Dispatch

(432) 556-2002

Craig Strasner

(432) 894-0341 (Cell)

## II. H<sub>2</sub>S CONTINGENCY PLAN SECTION

### Scope:

This contingency plan provides an organized plan of action for alerting and protecting the public within an area of exposure prior to an intentional release or following the accidental release of a potentially hazardous volume of hydrogen sulfide. The plan establishes guidelines for all personnel whose work activity may involve exposure to Hydrogen Sulfide Gas (H<sub>2</sub>S).

### Objective:

Prevent any and all accidents and prevent the uncontrolled release of H<sub>2</sub>S into the atmosphere.

Provide proper evacuation procedures to cope with emergencies.

Provide immediate and adequate medical attention should an injury occur.

### Purpose, Distribution and Updating of Contingency Plan:

The Purpose of this contingency plan is to protect the general public from the harmful effects of H<sub>2</sub>S accidentally escaping from the subject producing well. This plan is designed to accomplish its purpose by assuring the preparedness necessary to:

1. Minimize the possibility of releasing H<sub>2</sub>S into the atmosphere during related operations.
2. Provide for the logical, efficient, and safe emergency actions required to protect the general public in the event of an accidental release of a potentially hazardous quantity of H<sub>2</sub>S.

Supplemental information is included with this plan and is intended as reference material for anyone needing a more detailed understanding of the many factors pertinent to H<sub>2</sub>S drilling operations safety. The release of a potentially hazardous quantity of H<sub>2</sub>S is highly unlikely. If such a release should occur however, obviously the exact time, rate, duration, and other pertinent facts will be known in advance thus, this contingency plan must necessarily be somewhat general. The plan does review in detail, as is reasonably possible, the type of accidental release that could possibly endanger the general public, the probable extent of such danger, and the emergency actions generally appropriate. In the event of such an accidental release, the specific actions to be taken will have to be determined at the time of release by the responsible personnel at the drilling location. Complete familiarity with this plan will help such personnel make the proper decisions rapidly. Familiarity with this plan is so required all operators, operator representatives, and drilling contractor supervisory personnel who could possibly be on duty at the drilling location at the time of an H<sub>2</sub>S emergency.

**IT IS THE RESPONSIBILITY OF THE OPERATOR TO ASSURE SUCH FAMILIARITY BEFORE DRILLING WITHIN 1000' OR THREE DAYS PRIOR TO PENETRATION OF THE SHALLOWEST FORMATION KNOWN OR SUSPECTED TO CONTAIN H<sub>2</sub>S IN POTENTIALLY HAZARDOUS QUANTITIES, AND ALSO TO ASSURE THE TIMELY ACCOMPLISHMENT OF ALL THE OTHER ACTION SPECIFIED HERE IN.**

As this contingency plan was prepared considerably in advance of the anticipated H<sub>2</sub>S operation, the plan must be kept current if it is to effectively serve its purpose. The operators will be responsible for seeing that all copies are updated. Updating the plan is required when any changes to the personnel Call List (Section ) including telephone numbers occur or when any pertinent data or plans for the well are altered. The plan must also be updated when any changes in the general public likely to be within the exposure area in the event of an

accidental release from the well bore of a potentially hazardous quantity of H<sub>2</sub>S. Two copies of this plan shall be retained at the office of Colgate Energy. Two copies shall be retained at the drilling location.

**Discussion of Plan:**

**Suspected Problem Zones:**

**Implementation:** This plan, with all details, is to be fully implemented 1000' before drilling into the first sour zone.

**Emergency Response Procedure:** This section outlines the conditions and denotes steps to be taken in the event of an emergency.

**Emergency Equipment and 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 1000' before drilling into the first sour zone.

**Emergency call list:** Included are the telephone numbers of all persons that would need to be contacted, should an H<sub>2</sub>S emergency occur.

**Briefing:** This section deals with the briefing of all persons involved with the drilling of this well.

**Public Safety:** Public Safety Personnel will be made aware of the drilling of this well.

**Check Lists:** Status check lists and procedural check lists have been included to ensure adherence to the plan.

**General Information:** A general information section has been included to supply support information.

### III. OPERATING PROCEDURES

#### A. Blowout Preventer Drills

Due to the special piping and Mani folding necessary to handle poisonous gas, particular care will be taken to ensure that all rig personnel are completely familiar with their jobs during the drills. The Drilling Consultant and Tool Pusher (Rig Superintendent) are thoroughly familiar with the additional controls and piping necessary.

#### B. H<sub>2</sub>S Alarm Drills

The Company Man and/ or designee will conduct frequent H<sub>2</sub>S alarm drills for each crew by injecting a trace of H<sub>2</sub>S where the detector will give an alarm. Under these conditions all personnel on location will put on air equipment and remain masked until all clear is announced.

#### C. Surface Annular Preventer/ Diverter System Testing

After installation of the surface annular preventer, Hydraulic Control Valve and diverter system, both are to be function tested. They also should be function tested frequently while drilling surface hole.

#### D. Blowout Preventer

After installation of the Blowout Preventer Stack, the stack will be pressure tested. The Choke manifold is also to be pressure tested at this time. This procedure will be repeated as required by the NMOCD, the BLM, or if any of the stack is nipped down. Also, at this time, the Blind and Pipe Rams are checked for correct operation.

#### E. Well Control Practice Drills and Safety Meeting for Crew Members

Pit drills are for the purpose of acquainting each member of the drilling crew with his duties in the event of an emergency. Drills will be held with each crew as frequently as required to thoroughly familiarize each man with his duties. Drills are to be held at least weekly from that time forward.

##### 1. BOP Drill while on Bottom Drilling:

A. Signal will be three or more long blast given by driller on the horn.

B. Procedure will be as follows:

1. Tool Pusher: Supervises entire operation.

2. Driller

a. Gives signal.

b. Picks up Kelly.

c. Stops pumps.

d. Observes flow.

e. Signal to close (pipe rams if necessary).

f. Check that Choke Manifold is closed.

g. Record drill pipe pressure, casing pressure and determine mud volume gain.

3. Motorman

a. Go to closing unit and standby for signal to close BOP.

b. Close BOP in signal.

c. Check on BOP closing.

d. Go to floor to assist driller. (NOTE: During test drills the BOP



need not be completely closed at the discretion of the supervisor. Supervisor should make it very clear that it is a test drill only!)

4. Derrickman

- a. Check pumps.
- b. Go to floor for directions from the driller.

5. Floorman

- a. Go to manifold.
- b. Observe and record pressure.
- c. Check manifold and BOP for leaks.
- d. Check with driller for additional instructions.

2. BOP Drill While Making Trip:

A. During trip driller will fill hole every five (5) stands and check the pits to be sure hole is taking mud.

B. Drill Procedure is as follows:

1. Driller

- a. Order Safety valve installed.
- b. Alert those not on the floor.
- c. Go to stations as described in above drill.

3. Safety Meetings

A. Every person involved in the operating will be informed of the characteristics of H<sub>2</sub>S, its danger and safety procedures to be used when it is encountered, and recommended first-aid procedure for regular rig personnel. This will be done through a series of talks made before spud.

B. The Safety Advisor or Drilling Supervisor will conduct these training sessions and will repeat them as deemed necessary by him or as instructed by Colgate Energy. Talks may include the following subjects:

1. Dangers of Hydrogen Sulfide (H<sub>2</sub>S).
2. Use and limitations of air equipment.
3. Use of resuscitator.
4. Organize Buddy System.
5. First Aid procedures.
6. Use of H<sub>2</sub>S detection devices.
7. Designate responsible people.
8. Explain rig layout and policy to visitors.
  - a. Designate smoking and safety or Muster area.
  - b. Emphasize the importance of wind directions.
9. Describe and explain operation of BOP stack, manifold, separator, and pit piping. Include maximum allowable pressure for casing procedure.
10. Explain functions of Safety Supervisor.
11. Explain organize H<sub>2</sub>S Drills.
12. Explain the overall emergency plan with emphasis given to the evacuation phase of the plans.

- Note: The above talks will be attended by every person involved in the operation. When drilling has reached a depth where H<sub>2</sub>S is anticipated, temporary service personnel and visitors will be directed to the Drilling Consultant, who will designate the air equipment to be used by them in case of emergency, acquaint them with the dangers involved and be sure of their safety while they are in the area. He will point out the Briefing Areas, Windsocks, and Smoking Areas. He may refuse entrance to anyone, who in his opinion should not be admitted because of lack of safety equipment, special operations in progress or for other reasons involving personnel safety.

#### **F. Outside Service Personnel**

All service people such as cementing crews, logging crews, specialist, mechanics, and welders will furnish their own safety equipment. The Company Man/ or designee will be sure that the number of people on location does not exceed the number of masks on location, and they have been briefed regarding safety procedures. He will also be sure each of these people know about smoking and “Briefing Areas” and know what to do in case of an emergency alert or drill. Visitors will be restricted, except with special permission from the Drilling Consultant, when H<sub>2</sub>S might be encountered. They will be briefed as to what to do in case of an alert or drill.

#### **G. Onsite/ off shift workers**

All workers that are staying on site must be identified as to where they are staying while off tour. If a drill/ or emergency takes place related to an H<sub>2</sub>S release, each crew must have a designated person(s) that will wake them up and ensure that they are cleared to the appropriate muster area immediately.

#### **H. Simultaneous Operations (SIMOPS)**

If work is going on adjacent to the location is the responsibility of the Drilling Consultant or designee to communicate any applicable risks that may affect personnel working on that adjacent location. In the case of an H<sub>2</sub>S drill or event, there should be a designated crew member that is responsible for contacting personnel on adjacent locations. This could include just communication on potential events or in case of an event, notification to evacuate location. Drilling Consultant or designee are the Point of Contact and oversee all activities at such point of an H<sub>2</sub>S event occurrence.

#### **I. Area Residences/ Occupied Locations/ Public Roads**

Any occupied residences/ businesses that are within a reasonable perimeter of the location (attached map will identify a 3000’ radius around location) should be identified as part of this contingency and a reasonable effort will be made to gain contact information for them. As part of the briefing of the contingency plan, the team reviewing should identify where these potential receptors are and plan on who will contact them in case of a release that may impact that area.

#### **J. Drilling Fluids**

Drilling Fluid Monitoring – On Any Hazardous H<sub>2</sub>S gas well, the earlier the warning of danger the better chance to control operations. Mud Company will be in daily contact with Colgate Energy Consultant. The Mud Engineer will take samples of the mud, analyze these samples, and make necessary recommendations to prevent H<sub>2</sub>S gas from the formation, the pH will be increased as necessary for corrosion control.

pH Control – For normal drilling, pH of 10.5 – 11.5. Would be enough for corrosion protection. If there is an influx of H<sub>2</sub>S gas from the formation, the pH will be increased as necessary for corrosion control.

H<sub>2</sub>S Scavengers – If necessary H<sub>2</sub>S scavengers will be added to the drilling mud.

## IV. OPERATING CONDITIONS

### A. Posting Well Condition Flags

Post the green, yellow or red well condition flag, as appropriate, on the well condition sign at the location entrance, and take necessary precautions as indicated below:

1. **Green Flag:** Potential Danger- When Drilling in known H<sub>2</sub>S zones or when H<sub>2</sub>S has been detected in the drilling fluid atmosphere. Protective breathing equipment shall be inspected, and all personnel on duty shall be alerted to be ready to use this equipment.
2. **Yellow Flag:** Potential Danger- When the threshold limit value of H<sub>2</sub>S (10 PPM) or of SO<sub>2</sub> (5 PPM) is reached. If the concentration of H<sub>2</sub>S or SO<sub>2</sub> reaches 10 PPM, protective breathing equipment shall be worn by all working personnel, and non-working personnel shall go to the upwind Safe Briefing Area.
3. **Red Flag:** Extreme danger\*- When the ambient concentration of H<sub>2</sub>S or SO<sub>2</sub> is reasonably believed or determined to have exceeded the potentially hazardous level. All non-essential personnel shall leave the drilling location taking the route most likely to exposure to escaping gas.

### B. Requiring Air Masks Conditions

1. Whenever air masks are used, the person must be clean shaven as shown in the APC Guidelines
2. When breaking out any line where H<sub>2</sub>S can reasonably be expected.
3. When sampling air in areas to determine if toxic concentrations of H<sub>2</sub>S exist.
4. When working in areas where 10 PPM or more of H<sub>2</sub>S has been detected.
5. At any time, there is doubt as to the H<sub>2</sub>S level in the area to be entered.

### C. Kick Procedure

1. It is very important that the driller be continuously alert, especially when approaching a gas formation.
2. Should gas come into the well bore, it is very important to be aware of a kick at the earliest time.
3. If a kick is identified, follow appropriate diverter or shut in procedures according to the situation that is presented utilizing appropriate kick procedures.

## **V. EMERGENCY PROCEDURES**

- I. In the event of any evidence of H<sub>2</sub>S level above 10ppm, take the following steps immediately:
  - a. Secure breathing apparatus.
  - b. Order non-essential personnel out of the danger zone.
  - c. Take steps to determine if the H<sub>2</sub>S level can be corrected or suppressed, and if so, proceed with normal operations.
- II. If uncontrollable conditions occur, proceed with the following:
  - a. Take steps to protect and/or remove any public downwind of the rig, including partial evacuation or isolation. Notify necessary public safety personnel.
  - b. Remove all personnel to the Safe Briefing Area.
  - c. Notify public safety personnel for help with maintaining roadblocks, thus limiting traffic and implementing evacuation.
  - d. Determine and proceed with the best possible plan to regain control of the well. Maintain tight security and safety measures.
- III. Responsibility
  - a. The Company Approved Supervisor shall be responsible for the total implementation of the plan.
  - b. The Company Approved Supervisor shall be in complete command during any emergency.
  - c. The Company Approved Supervisor shall designate a backup Supervisor if he/she is not available.
- IV. Actions to be taken
  - a. Assign specific tasks to drilling location personnel
  - b. Evacuate the general public from the exposure area
  - c. Cordon off the exposure area to prevent entry by unauthorized persons
  - d. Request assistance if and as needed and initiate emergency notifications
  - e. Stop the dispersion of H<sub>2</sub>S
  - f. Complete emergency notifications as required
  - g. Return the situation to normal

## EMERGENCY PROCEDURE IMPLEMENTATION

### I. Drilling or Tripping

#### a. All Personnel

- i. When alarm sounds, don escape unit and report to upwind Safe Briefing Area.
- ii. Check status of other personnel (buddy system).
- iii. Secure breathing apparatus.
- iv. Wait for orders from supervisor.

#### b. Drilling Consultant

- i. Report to the upwind Safe Briefing Area.
- ii. Don Breathing Apparatus and return to the point of release with the Tool Pusher or Driller (buddy system).
- iii. Determine the concentration of H<sub>2</sub>S.
- iv. Assess the situation and take appropriate control measures.

#### c. Tool Pusher

- i. Report to the upwind Safe Briefing Area.
- ii. Don Breathing Apparatus and return to the point of release with the Drilling Consultant or the Driller (buddy system).
- iii. Determine the concentration of H<sub>2</sub>S.
- iv. Assess the situation and take appropriate control measures.

#### d. Driller

- i. Check the status of other personnel (in a rescue attempt, always use the buddy system).
- ii. Assign the least essential person to notify the Drilling Consultant and Tool Pusher, in the event of their absence.
- iii. Assume the responsibility of the Drilling Consultant and the Tool Pusher until they arrive, in the event of their absence.

#### e. Derrick Man and Floor Hands

- i. Remain in the upwind Safe Briefing Area until otherwise instructed by a supervisor.

#### f. Mud Engineer

- i. Report to the upwind Safe Briefing Area.
- ii. When instructed, begin check of mud for pH level and H<sub>2</sub>S level.

#### g. Safety Personnel

- i. Don Breathing Apparatus.
- ii. Check status of personnel.
- iii. Wait for instructions from Drilling Consultant or Tool Pusher.

## **II. Taking a Kick**

- a.* All Personnel report to the upwind Safe Briefing Area.
- b.* Follow standard BOP/ diverter procedures.

## **III. Open Hole Logging**

- a.* All unnecessary personnel should leave the rig floor.
- b.* Drilling Consultant and Safety Personnel should monitor the conditions and make necessary safety equipment recommendations.

## **IV. Running Casing or Plugging**

- a.* Follow “Drilling or Tripping” procedures.
- b.* Assure that all personnel have access to protective equipment.

## **VI. POST EMERGENCY ACTIONS**

In the event this plan is activated, the following post emergency actions shall be taken in an effort to reduce the possibility of a reoccurrence of the type of problem that required its activation, and/or assure that any future activation of a similar plan will be as effective as possible.

- A. Review the factors that caused or permitted the emergency occur, and if the need is indicated, modify operating, maintenance and/or surveillance procedures.
- B. If the need is indicated, retrain employees in blowout prevention, H<sub>2</sub>S emergency procedures and etc.
- C. Clean up, recharge, restock, repair, and/ or replace H<sub>2</sub>S emergency equipment as necessary, and return it to its proper place. (For whatever rental equipment is used, this will be the responsibility of Rental Company).
- D. See that future H<sub>2</sub>S drilling contingency plans are modified accordingly, if the need is indicated.

## VII. IGNITION PROCEDURES

### Responsibilities:

The decision to ignite the well is the responsibility of the DRILLING CONSULTANT in concurrence with the STATE POLICE. In the event the Drilling Consultant is incapacitated, it becomes the responsibility of the RIG TOOL PUSHER. This 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 of controlling the blowout under the prevailing conditions.

If time permits, notify the main office, but do not delay if human life is in danger. Initiate the first phase of the evacuation plan.

### Instructions for Igniting the Well:

1. Two people are required for the actual igniting operation. Both men must wear self-contained breathing apparatus and must use a full body harness and attach a retrievable safety line to the D-Ring in the back. One man must monitor the atmosphere for explosive gases with the LEL monitor, while the Drilling Consultant is responsible for igniting the well.
2. The primary method to ignite is a 25mm flare gun with a range of approximately 500 feet.
3. Ignite from upwind and do not approach any closer than is warranted.
4. Select the ignition site best suited for protection and which offers an easy escape route.
5. Before igniting, check for the presence of combustible gases.
6. After igniting, continue emergency actions and procedures as before.
7. All unassigned personnel will limit their actions to those directed by the Drilling Consultant.

**Note:** After the well is ignited, burning Hydrogen Sulfide will convert to Sulfur Dioxide, which is also highly toxic. Also, both are heavier than air. Do not assume the area is safe even after the well is ignited.



## VIII. TRAINING PROGRAM

When working in an area where Hydrogen Sulfide (H<sub>2</sub>S) might be encountered, definite training requirements must be carried out. The Company Supervisor will ensure that all personnel, at the well site, have had adequate training in the following:

1. Hazards and characteristics of Hydrogen Sulfide (H<sub>2</sub>S).
2. Physical effects of Hydrogen Sulfide on the human body.
3. Toxicity of Hydrogen Sulfide and Sulfur Dioxide.
4. H<sub>2</sub>S detection, Emergency alarm and sensor location.
5. Don and Doff of SCBA and be clean shaven.
6. Emergency rescue.
7. Resuscitators.
8. First aid and artificial resuscitation.
9. The effects of Hydrogen Sulfide on metals.
10. Location safety.

Service company personnel and visiting personnel must be notified if the zone contains H<sub>2</sub>S, and each service company must provide adequate training and equipment for their employees before they arrive at the well site.

## IX. EMERGENCY EQUIPMENT

### **Lease Entrance Sign:**

Should be located at the lease entrance with the following information:

CAUTION – POTENTIAL POISON GAS  
HYDROGEN SULFIDE  
NO ADMITTANCE WITHOUT AUTHORIZATION

### **Respiratory Equipment:**

- Fresh air breathing equipment should be placed at the safe briefing areas and should include the following:
- Two SCBA's at each briefing area.
- Enough airline units to operate safely, anytime the H<sub>2</sub>S concentration reaches the IDLH level (100 ppm).

- Cascade system with enough breathing air hose and manifolds to reach the rig floor, the derrickman and the other operation areas.

#### **Windssocks or Wind Streamers:**

- A minimum of two 10" windssocks located at strategic locations so that they may be seen from any point on location.
- Wind streamers (if preferred) should always be placed at various locations on the well site to ensure wind consciousness. (Corners of location).

#### **Hydrogen Sulfide Detector and Alarms:**

- 1 - Four channel H<sub>2</sub>S monitor with alarms.
- Three (3) sensors located as follows: #1 – Rig Floor, #2 – Shale Shaker, #3 – Cellar.
- Gastec or Draeger pump with tubes.
- Sensor test gas.

#### **Well Condition Sign and Flags:**

The Well Condition Sign w/flags should be placed a minimum of 150' before you enter the location. It should have three (3) color coded flags (green, yellow and red) that will be used to denote the following location conditions:

GREEN – Normal Operating Conditions  
 YELLOW – Potential Danger  
 RED – Danger, H<sub>2</sub>S Gas Present

#### **Auxiliary Rescue Equipment:**

- Stretcher
- 2 – 100' Rescue lines.
- First Aid kit properly stocked.

#### **Mud Inspection Equipment:**

Garret Gas Train or Hach Tester for inspection of Hydrogen Sulfide in the drilling mud system.

#### **Fire Extinguishers:**

Adequate fire extinguishers shall be located at strategic locations.

**Blowout Preventer:**

- The well shall have hydraulic BOP equipment for the anticipated bottom hole pressure (BHP).
- The BOP should be tested upon installation.
- BOP, Choke Line and Kill Line will be tested as specified by Operator.

**Confined Space Monitor:**

There should be a portable multi-gas monitor with at least 3 sensors (O<sub>2</sub>, LEL H<sub>2</sub>S), preferably 4 (O<sub>2</sub>, LEL, H<sub>2</sub>S, CO). This instrument should be used to test the atmosphere of any confined space before entering. It should also be used for atmospheric testing for LEL gas before beginning any type of Hot Work. Proper calibration documentation will need to be provided.

**Communication Equipment:**

- Proper communication equipment such as cell phones or 2-way radios should be available at the rig.
- Radio communication shall be available for communication between the company man's trailer, rig floor and the tool pusher's trailer.
- Communication equipment shall be available on the vehicles.

**Special Control Equipment:**

- Hydraulic BOP equipment with remote control on the ground.
- Rotating head at the surface casing point.

**Evacuation Plan:**

- Evacuation routes should be established prior to spudding the well.
- Should be discussed with all rig personnel.

**Designated Areas:*****Parking and Visitor area:***

- All vehicles are to be parked at a pre-determined safe distance from the wellhead.
- Designated smoking area.

***Safe Briefing Areas:***

- Two Safe Briefing Areas shall be designated on either side of the location at the maximum allowable distance from the well bore so they offset prevailing winds, or they are at a 180-degree angle if wind directions tend to shift in the area.
- Personal protective equipment should be stored at both briefing areas and if a moveable cascade trailer is used, it should be kept upwind of existing winds. When wind is from the prevailing direction, both briefing areas should be accessible.

***Note:***

- Additional equipment will be available at the H<sub>2</sub>S Provider Safety office.
- Additional personal H<sub>2</sub>S monitors are available for all employees on location.
- Automatic Flare Igniters are recommended for installation on the rig.

## X. CHECKLISTS

### Rig-up & Equipment Status Check List

Note: Initial & Date each item as they are implemented. Multiple wells require additional Columns to be Dated/ Initialed

	Date & Initial 1 <sup>st</sup> Well	Date & Initial 2 <sup>nd</sup> Well	Date & Initial 3 <sup>rd</sup> Well	Date & Initial 4 <sup>th</sup> Well
Sign at location entrance.				
Two (2) windsocks (in required locations).				
Wind Streamers (if required).				
SCBA's on location (Minimum of 2 @ each Muster Area)				
Air packs (working packs and escape packs), inspected and ready for use.				
Spare bottles for each air pack (if required).				
Cascade system and hose line hook up.				
Choke manifold hooked-up and tested. (before drilling out surface casing.)				
Remote Hydraulic BOP control tested (before drilling out surface casing).				
BOP tested (before drilling out surface casing).				
Safe Briefing Areas set-up				
Well Condition sign and flags on location and ready.				
Hydrogen Sulfide detection/ alarm system hooked-up & tested.				
Stretcher on location				
2 – 100' Lifelines on location.				
1 – 20# Fire Extinguisher in safety trailer.				
Confined Space monitor on location and tested.				
All rig crews and supervisor trained (as required).				
All rig crews and supervision medically qualified and fit tested on proper respirators				
Access restricted for unauthorized personnel.				
Pre-spud meeting held reviewing Contingencies				
Drills on H <sub>2</sub> S and well control procedures.				
All outside service contractors advised of potential H <sub>2</sub> S on the well.				
25mm Flare Gun on location w/flares.				

## Procedural Check List

Perform the following on each tour:

1. Check fire extinguishers to see that they have the proper charge.
2. Check breathing equipment to ensure that they have not been tampered with.
3. Check pressure on the supply air bottles to make sure they are capable of recharging.
4. Make sure all the Hydrogen Sulfide detection systems are operative.
5. Ensure that all BOP/ Surface Annular/ Diverter systems are functioning and operational.

Perform the following each week:

1. Check each piece of breathing equipment to make sure that they are fully charged and operational. This requires that the air cylinder be opened, and the mask assembly be put on and tested to make sure that the regulators and masks are properly working. Negative and Positive pressure should be conducted on all masks.
2. BOP skills.
3. Check supply pressure on BOP accumulator stand-by source.
4. Check all breathing air mask assemblies to see that straps are loosened and turned back, ready for use.
5. Check pressure on cascade air cylinders to make sure they are fully charged and ready to use for refill purposes if necessary.
6. Check all cascade system regulators to make sure they work properly.
7. Perform breathing drills with on-site personnel.
8. Check the following supplies for availability (may be with H<sub>2</sub>S Techs On-call):
  - Stretcher
  - Safety Belts and Ropes
  - Spare air Bottles
  - Spare Oxygen Bottles (if resuscitator required)
  - Gas Detector Pump and Tubes
  - Emergency telephone lists
  - Test the Confined Space Monitor to verify the batteries are good.

## **XI. BRIEFING PROCEDURES**

The following scheduled briefings will be held to ensure the effective drilling and operation of this project:

### **Pre-Spud Meeting**

**Date:** Prior to spudding the well.

**Attendance:**   Drilling Supervisor  
                      Drilling Engineer  
                      Drilling Consultant  
                      Rig Tool Pushers  
                      Rig Drillers  
                      Mud Engineer  
                      All Safety Personnel  
                      Key Service Company Personnel

**Purpose:**       Review and discuss the well program, step-by-step, to insure complete understanding of assignments and responsibilities.

## **XII. EVACUATION PLAN**

### **General Plan**

The direct lines of action prepared by Colgate Energy to protect the public from hazardous gas situations are as follows:

1. When the company approved supervisor (Drilling Consultant, Tool Pusher or Driller) determine that Hydrogen Sulfide gas cannot be limited to the well location, and the public will be involved, he will activate the evacuation plan. Escape routes are noted on the area map.
2. Company safety personnel or designee will notify the appropriate local government agency that a hazardous condition exists, and evacuation needs to be implemented.
3. Company approved safety personnel that have been trained in the use of the proper emergency equipment will be utilized.
4. Law enforcement personnel (State Police, Local Police Department, Fire Department, and the Sheriff's Department) will be called to aid in setting up and maintaining roadblocks. Also, they will aid in evacuation of the public if necessary.

NOTE: 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.

5. After the discharge of gas has been controlled, "Company" personnel will determine when the area is safe for re-entry.
6. If a major release is secured, all exposed housing, vehicles, rig buildings, and low-lying areas and other structures downwind must be tested and clear with SCBAs donned to ensure that all residual H<sub>2</sub>S is cleared. Fans, or opening of doors is recommended to ensure that areas are cleared out as part of this process.



### **XIII. APPENDICES AND GENERAL INFORMATION**

#### **Radius of Exposure Affected Notification List**

**(within a 65' radius of exposure @100ppm)**

The geologic zones that will be encountered during drilling are known to contain hazardous quantities of H<sub>2</sub>S. The accompanying map illustrates the affected areas of the community. The residents within this radius will be notified via a hand delivered written notice describing the activities, potential hazards, conditions of evacuation, evacuation drill siren alarms and other precautionary measures.

#### **Evacuee Description:**

**Residents:**

#### **Notification Process:**

A continuous siren audible to all residence will be activated, signaling evacuation of previously notified and informed residents.

#### **Evacuation Plan:**

All evacuees will migrate lateral to the wind direction.

The Operating Company will identify all home bound or highly susceptible individuals and make special evacuation preparations, interfacing with the local and emergency medical service as necessary.

## Toxic Effects of H<sub>2</sub>S 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 gases are compared below in Table 1. Toxicity table for H<sub>2</sub>S and physical effects are shown in Table 2.

Table 1  
Permissible Exposure Limits of Various Gases

<u>Common Name</u>	<u>Symbol</u>	<u>Sp. Gravity</u>	<u>TLV</u>	<u>STEL</u>	<u>IDLH</u>
Hydrogen Cyanide	HCN	.94	4.7 ppm	4.7 ppm	50 ppm
Hydrogen Sulfide	H <sub>2</sub> S	1.192	10 ppm	15 ppm	100 ppm
Sulfide Dioxide	SO <sub>2</sub>	2.21	2 ppm	5 ppm	100 ppm
Chlorine	CL	2.45	.5 ppm	1 ppm	10 ppm
Carbon Monoxide	CO	.97	25 ppm	200 ppm	1200 ppm
Carbon Dioxide	CO <sub>2</sub>	1.52	5000 ppm	30,000 ppm	40,000 ppm
Methane	CH <sub>4</sub>	.55	5% LEL	15% UEL	

## Definitions

- A. TLV – Threshold Limit Value is the concentration employees may be exposed 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 H<sub>2</sub>S is 20 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 H<sub>2</sub>S 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 based on a TWA.

### Toxicity Table of H<sub>2</sub>S

<u>Percent %</u>	<u>PPM</u>	<u>Physical Effects</u>
.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 <b>in a few minutes</b> .
.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 gases 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 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. In fact, that makes this gas extremely dangerous to be around.

### ***ODOR – ROTTEN EGGS***

Hydrogen Sulfide has a distinctive offensive smell, like "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 – 4.0% TO 44%***

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 – (-77° Fahrenheit)***

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

## RESPIRATOR USE

The Occupational Safety and Health Administration (OSHA) regulate the use of respiratory protection to protect the health of employees. OSHA's requirements are written in the Code of Federal Regulations, Title 29, Part 1910, Section 134, Respiratory Protection. This regulation requires that all employees who might be required to wear respirators, shall complete an OSHA mandated medical evaluation questionnaire. The employee then should be fit tested prior to wearing any respirator while being exposed to hazardous gases.

Written procedures shall be prepared covering safe use of respirators in dangerous atmospheric situations, which might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

Respirators shall be inspected prior to and after each use to make sure that the respirator has been properly cleaned, disinfected and that the respirator works properly. The unit should be fully charged prior to being used.

Anyone who may use respirators shall be properly trained in how to properly seal the face piece. They shall wear respirators in normal air and then in a test atmosphere. (Note: Such items as facial hair (beard or sideburns) and eyeglass temple pieces will not allow a proper seal.) Anyone who may be expected to wear respirators should have these items removed before entering a toxic atmosphere. A special mask must be obtained for anyone who must wear eyeglasses. Contact lenses should not be allowed.

Respirators shall be worn during the following conditions:

- A. Any employee who works near the top or on the top of any tank unless tests reveal less than 20 ppm of H<sub>2</sub>S.
- B. When breaking out any line where H<sub>2</sub>S can reasonably be expected.
- C. When sampling air in areas where H<sub>2</sub>S may be present.
- D. When working in areas where the concentration of H<sub>2</sub>S exceeds the Threshold Limit Value for H<sub>2</sub>S (10 ppm).
- E. At any time where there is a doubt as to the H<sub>2</sub>S level in the area to be entered.

## **EMERGENCY RESCUE PROCEDURES**

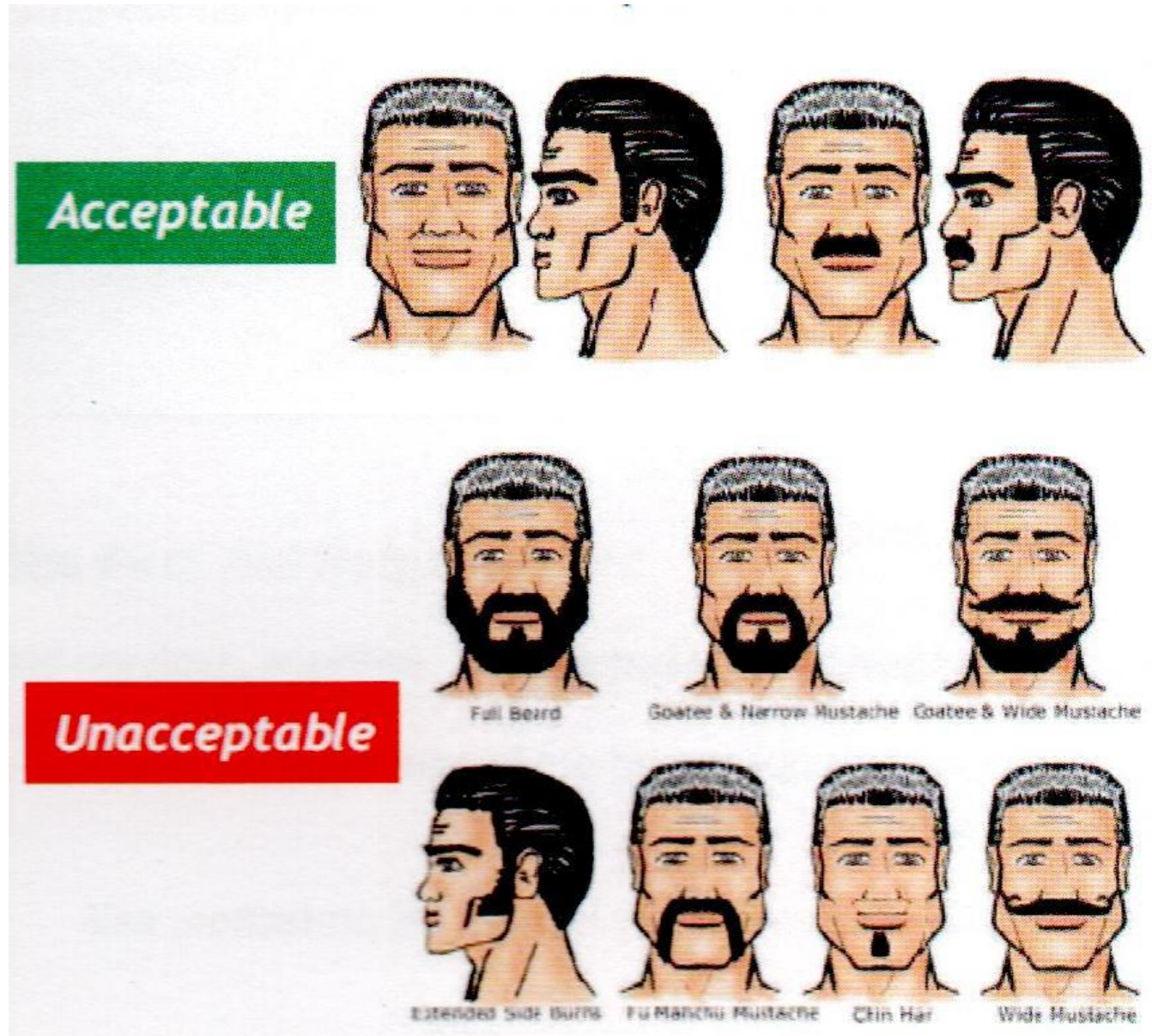
***DO NOT PANIC!!!***

**Remain Calm – Think**

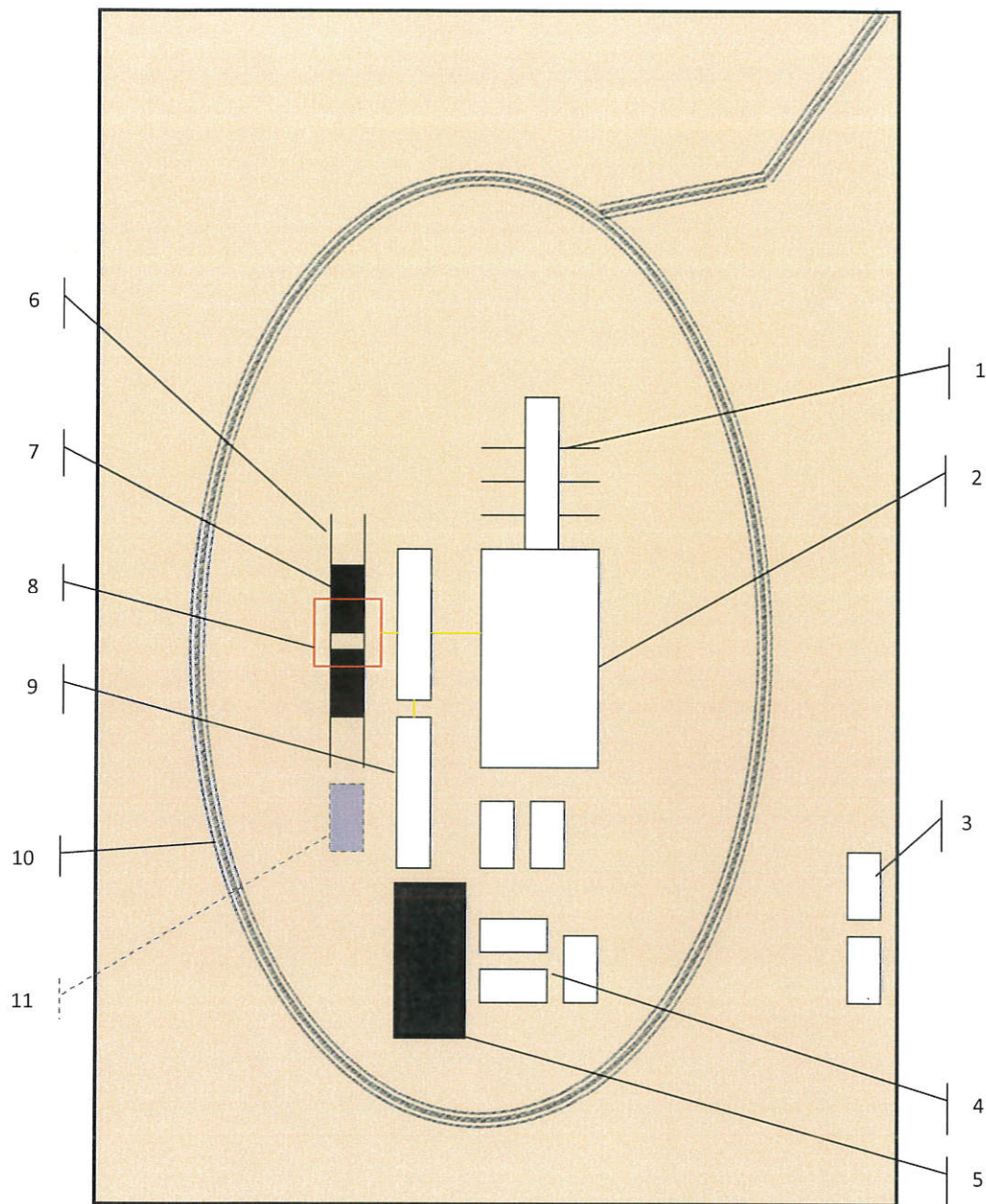
1. Before attempting any rescue, you must first get out of the hazardous area yourself. Go to a safe briefing area.
2. Sound alarm and activate the 911 system.
3. Put on breathing apparatus. At least two persons should do this, when available use the buddy system.
4. Rescue the victim and return them to a safe briefing area.
5. Perform an initial assessment and begin proper First Aid/CPR procedures.
6. Keep victim lying down with a blanket or coat, etc., under the shoulders to keep airway open. Conserve body heat and do not leave unattended.
7. If the eyes are affected by H<sub>2</sub>S, wash them thoroughly with potable water. For slight irritation, cold compresses are helpful.
8. In case a person has only minor exposure and does not lose consciousness totally, it's best if he doesn't return to work until the following day.
9. Any personnel overcome by H<sub>2</sub>S should always be examined by medical personnel. They should always be transported to a hospital or doctor.

## Facial Hair – Clean Shaven Examples

Purpose: To define clean shaven expectations in the field for: 1) Respirator Use, if applicable and 2) First Aid Administration, if situation occurs related to H<sub>2</sub>S exposure, having no facial hair can greatly benefit response time and treatment ability.







**Schematic Closed Loop Drilling Rig\***

1. Pipe Rack
2. Drill Rig
3. House Trailers/ Offices
4. Generator/Fuel/Storage
5. Overflow-Frac Tank
6. Skids
7. Roll Offs
8. Hopper or Centrifuge
9. Mud Tanks
10. Loop Drive
11. Generator (only for use with centrifuge)

\*Not drawn to scale: Closed loop system requires at least 30 feet beyond mud tanks. Ideally 60 feet would be available



Above: Centrifugal Closed Loop System



Closed Loop Drilling System: Mud tanks to right (1)  
 Hopper in air to settle out solids (2)  
 Water return pipe (3)  
 Shaker between hopper and mud tanks (4)  
 Roll offs on skids (5)

#### Flow Chart for Drilling Fluids and Solids

