

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>NMNM0473362</b> 6. If Indian, Allottee or Tribe Name  7. If Unit or CA Agreement, Name and No.  8. Lease Name and Well No.  <b>SHAMROCK 34 FED STATE COM</b>  <b>122H</b>
2. Name of Operator <b>COLGATE OPERATING LLC</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>		9. API Well No. <b>30-015-47707</b> 10. Field and Pool, or Exploratory & Old Millman <b>WINCHESTER/BONE SPRING Ranch;BS</b> 11. Sec., T. R. M. or Blk. and Survey or Area <b>SEC 34/T19S/R28E/NMP</b>
4. Location of Well (Report location clearly and in accordance with any State requirements. *) At surface <b>NESE / 2610 FSL / 295 FEL / LAT 32.6171893 / LONG -104.1570578</b> At proposed prod. zone <b>SWNW / 2295 FNL / 10 FWL / LAT 32.6180621 / LONG -104.19021</b>		12. County or Parish <b>EDDY</b> 13. State <b>NM</b>
14. Distance in miles and direction from nearest town or post office* <b>14 miles</b>		15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) <b>2345 feet</b> 16. No of acres in lease <b>880</b> 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>45 feet</b> 19. Proposed Depth <b>7219 feet / 17713 feet</b> 20. BLM/BIA Bond No. in file <b>FED: NMB001382</b>		21. Elevations (Show whether DF, KDB, RT, GL, etc.) <b>3309 feet</b> 22. Approximate date work will start* <b>09/01/2020</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)  Title <b>President</b>	Name (Printed/Typed) <b>BRIAN WOOD / Ph: (432) 695-4224</b>	Date <b>06/17/2020</b>
Approved by (Signature) (Electronic Submission)  Title <b>Assistant Field Manager Lands &amp; Minerals</b>	Name (Printed/Typed) <b>Cody Layton / Ph: (575) 234-5959</b>  Office <b>Carlsbad Field Office</b>	Date <b>10/21/2020</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

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



SL

(Continued on page 2)

Submit one C-104 per pool

KP 11/17/2020 GEO Review

\*(Instructions on page 2)

JAG 11/20/2020

Approval Date: 10/21/2020

District I  
1625 N. French Dr., Hobbs, NM 88240  
Phone: (575) 393-6161 Fax: (575) 393-0720  
District II  
811 S. First St., Artesia, NM 88210  
Phone: (575) 748-1283 Fax: (575) 748-9720  
District III  
1000 Rio Brazos Road, Aztec, NM 87410  
Phone: (505) 334-6178 Fax: (505) 334-6170  
District IV  
1220 S. St. Francis Dr., Santa Fe, NM 87505  
Phone: (505) 476-3460 Fax: (505) 476-3462

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

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

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

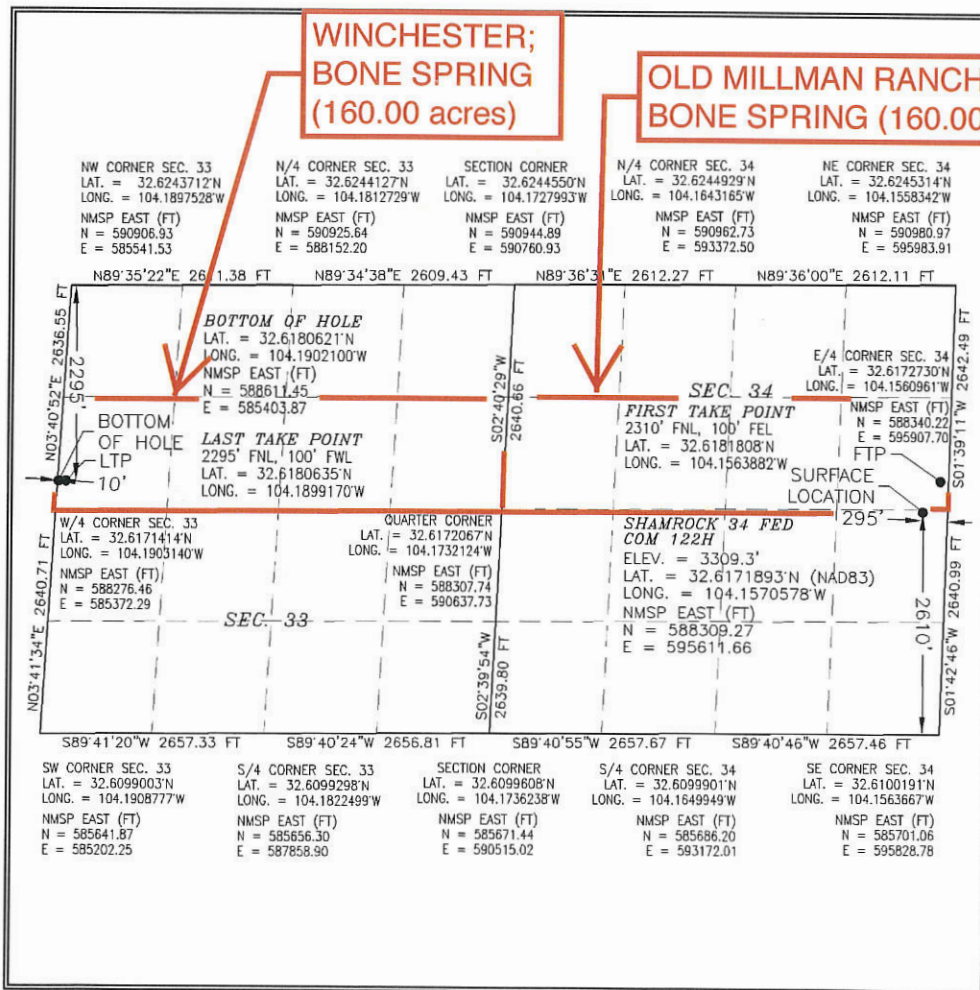
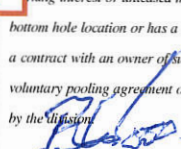

<sup>1</sup> API Number <b>30-015- 47707</b>	<sup>2</sup> Pool Code <b>48035 &amp; 65010</b>	<sup>3</sup> Pool Name <b>OLD MILLMAN RANCH; BS &amp; WINCHESTER; BS</b>
<sup>4</sup> Property Code <b>329804</b>	<sup>5</sup> Property Name <b>SHAMROCK 34 FED COM</b>	<sup>6</sup> Well Number <b>122H</b>
<sup>7</sup> OGRID No. <b>371449</b>	<sup>8</sup> Operator Name <b>COLGATE OPERATING, LLC</b>	<sup>9</sup> Elevation <b>3309.3</b>

<sup>10</sup> Surface Location									
UL or lot no. <b>I</b>	Section <b>34</b>	Township <b>19 S</b>	Range <b>28 E</b>	Lot Idn	Feet from the <b>2610</b>	North/South line <b>SOUTH</b>	Feet from the <b>295</b>	East/West line <b>EAST</b>	County <b>EDDY</b>

<sup>11</sup> Bottom Hole Location If Different From Surface									
UL or lot no. <b>E</b>	Section <b>33</b>	Township <b>19 S</b>	Range <b>28 E</b>	Lot Idn	Feet from the <b>2295</b>	North/South line <b>NORTH</b>	Feet from the <b>10</b>	East/West line <b>WEST</b>	County <b>EDDY</b>

<sup>12</sup> Dedicated Acres <b>320.00</b>	<sup>13</sup> Joint or Infill	<sup>14</sup> Consolidation Code <b>C</b>	<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.

	<p><sup>17</sup> OPERATOR CERTIFICATION</p> <p>I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location 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.</p> <p>Signature:  Date: <b>11-14-20</b></p> <p>Printed Name: <b>BRIAN WOOD</b></p> <p>E-mail Address: <b>brian@permitswest.com</b></p> <p><b>505 466-8120</b></p> <p><sup>18</sup> SURVEYOR CERTIFICATION</p> <p>I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.</p> <p>JUNE 4, 2020</p> <p>Date of Survey</p> <p>Signature and Seal of Professional Surveyor: </p> <p>Certificate Number: <b>WILLIAM F. JARAMELLO, P.S. 12797</b></p>
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## **Additional Operator Remarks**

### **Location of Well**

0. SHL: NESE / 2610 FSL / 295 FEL / TWSP: 19S / RANGE: 28E / SECTION: 34 / LAT: 32.6171893 / LONG: -104.1570578 ( TVD: 0 feet, MD: 0 feet )

PPP: SENW / 2295 FNL / 2640 FWL / TWSP: 19S / RANGE: 28E / SECTION: 34 / LAT: 32.618162 / LONG: -104.164621 ( TVD: 7414 feet, MD: 9833 feet )

PPP: SENE / 2478 FNL / 159 FEL / TWSP: 19S / RANGE: 28E / SECTION: 34 / LAT: 32.617715 / LONG: -104.1566162 ( TVD: 4184 feet, MD: 4196 feet )

BHL: SWNW / 2295 FNL / 10 FWL / TWSP: 19S / RANGE: 28E / SECTION: 33 / LAT: 32.6180621 / LONG: -104.19021 ( TVD: 7219 feet, MD: 17713 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>Devon Energy Production Company LP</b>
<b>LEASE NO.:</b>	<b>NMNM0473362</b>
<b>WELL NAME &amp; NO.:</b>	<b>Shamrock 34 Fed State Com 122H</b>
<b>SURFACE HOLE FOOTAGE:</b>	<b>2610'/S &amp; 295'/E</b>
<b>BOTTOM HOLE FOOTAGE:</b>	<b>2295'/N &amp; 10'/W</b>
<b>LOCATION:</b>	<b>Section 34, T.19 S., R.28 E., NMPM</b>
<b>COUNTY:</b>	<b>Eddy County, New Mexico</b>

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 type="checkbox"/> Medium	<input checked="" type="checkbox"/> High
Cave/Karst Potential	<input type="checkbox"/> Critical		
Variance	<input type="checkbox"/> None	<input checked="" type="checkbox"/> Flex Hose	<input type="checkbox"/> Other
Wellhead	<input 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 checked="" 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 **310 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 **2970 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 High 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.
- Operator has proposed to pump down 13-3/8" X 9-5/8" annulus. Operator must run a CBL from TD of the 9-5/8" casing to surface. Submit results to BLM.**
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.

### **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 **10,000 (10M) psi. Variance is approved to use a 5000 (5M) Annular which shall be tested to 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: 4/3/2020

X 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, recomple to new zone, re-frac) activity.

*Note: A C-129 must be submitted and approved prior to exceeding 60 days allowed by Rule 19.15.18.12.A*

### 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	API	SHL (ULSTR)	SHL Footages	Expected MCF/D	Flared or Vented	Comments
Shamrock 34 Fed Com 122H	30-015-	I-34-19S-28E	2610 FSL & 295 FEL	3000	30 days	Time depends on well clean up
Shamrock 34 Fed Com 132H	30-015-	I-34-19S-28E	2610 FSL & 340 FEL	3000	30 days	Time depends on well clean up

### Gathering System and Pipeline Notification

Well will be connected to a production facility after flowback operations are complete, if gas transporter system is in place. No gas contract has been signed, but a potential transporter is DCP Operating Company, LP (36785) who transports gas from OXY's DWU Federal 6 well in I-34-19s-28e. That well is ≈900' SW. Colgate Operating, LLC will provide (periodically) to its Gas Transporter 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 its Gas Transporter have periodic conference calls to discuss changes to drilling and completion schedules. Gas from these wells will be processed at an as yet undetermined Gas Transporter Processing Plant located in 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 temporary production tanks and gas will be flared or vented. During flowback, the fluids and sand content will be monitored. When the produced fluids contain minimal sand, the wells will be turned to production facilities. Gas sales should start as soon as the wells start flowing through the production facilities, unless there are operational issues on its Gas Transporter system at that time. Based on current information, it is Colgate Operating, LLC's belief an existing or new system can take this gas upon completion of the well(s). Safety requirements during cleanout operations from using 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: 10400058135

Submission Date: 06/17/2020

Highlighted data  
reflects the most  
recent changes

Operator Name: COLGATE OPERATING LLC

Well Name: SHAMROCK 34 FED STATE COM

Well Number: 122H

[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
762376	QUATERNARY	3309	0	0	OTHER : None	USEABLE WATER	N
762377	RUSTLER ANHYDRITE	3209	100	100	ANHYDRITE	NONE	N
762378	TOP SALT	2957	352	352	SALT	NONE	N
762379	BASE OF SALT	2632	677	677	SALT	NONE	N
762380	YATES	2355	954	954	SANDSTONE	NONE	N
762381	CAPITAN REEF	795	2514	2517	LIMESTONE	USEABLE WATER	N
762382	CHERRY CANYON	262	3047	3053	SANDSTONE	NONE	N
762383	LOWER BRUSHY CANYON 8A	-515	3824	3834	SANDSTONE	NATURAL GAS, OIL	N
762384	BONE SPRING	-875	4184	4196	LIMESTONE	NATURAL GAS, OIL	N
762385	BONE SPRING 1ST	-3125	6434	6456	SANDSTONE	NATURAL GAS, OIL	N
762386	BONE SPRING 2ND	-3347	6656	6678	LIMESTONE	NATURAL GAS, OIL	N
762387	BONE SPRING 2ND	-3865	7174	7208	SANDSTONE	NATURAL GAS, OIL	Y

## Section 2 - Blowout Prevention

Pressure Rating (PSI): 10M

Rating Depth: 10000

**Equipment:** 10M BOPE with WP ratings in excess of anticipated maximum surface pressure will be used for well control from drilling out of the surface casing to TMD. A rotating head will also be installed and used as needed. All BOPE connections will be flanged, welded, or clamped. All choke lines will be straight, unless targeted with running tees, or tee blocks are used. Choke lines will be anchored to prevent whip and reduce vibrations. All valves in the choke line and choke manifold will be full opening to avoid restrictions and to allow straight fluid paths to minimize potential erosion. All gauges used in the well control system will be designed for drilling fluid service. A top drive inside BOP valve will be used 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 the valve equipped subs will be on the rig floor at all times. Accumulator system will have

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** SHAMROCK 34 FED STATE COM

**Well Number:** 122H

sufficient capacity to open the HCR and close all 3 sets of rams plus the annular preventer while retaining >300 psi above pre-charge on the closing manifold. (Accumulator system will be capable of doing so without using the closing unit pumps). Fluid reservoir capacity will be twice the usable fluid volume of the accumulator system capacity. Fluid level will be maintained at the manufacturer's recommended level. Before connecting the closing unit to the BOP stack, an accumulator pre-charge pressure test will be performed to ensure the pre-charge pressure is within 100 psi of the desired pre-charge pressure. (Only nitrogen gas will be used to pre-charge). Two independent power sources will be available at all times to power the closing unit pumps so the pumps can automatically start when the closing valve manifold pressure has decreased to the pre-set level. Closing unit pumps will be sized to allow opening of HCR and closing of annular preventer on 5" drill pipe achieving >200 psi above pre-charge pressure with the accumulator system isolated from service in 2 minutes. A valve will be installed in the closing line as close to the annular preventer as possible to act as a locking device. The valve will be maintained in the open position and will be closed only when the power source for the accumulator system is inoperative. Remote controls capable of opening and closing all preventers and the HCR will be readily accessible to the driller. Master controls with the same capability will be operable at the accumulator. Wellhead will be a multi-bowl speed head allowing for hang-off of intermediate casing and isolation of the 13.375 x 9.625 annulus without breaking the connection between the BOP and wellhead to install an additional casing head. A wear bushing will be installed and inspected frequently to guard against internal wear to wellhead.

**Requesting Variance?** YES

**Variance request:** Colgate requests a variance to drill the well using a co-flex line between the BOP and choke manifold. Certificate for proposed hose is attached. Manufacturer does not require the hose to be anchored. If this hose is not available, then a hose 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 3rd party tester using 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 10 minutes without any bleed-off. A valve on the wellhead below the test plug seat will be open at all time during BOPE tests to guard against casing damage. BOPE will be re-tested in this manner after any connection breaks or passage of allotted time (25 days). Any BOPE which fails a pressure test after initial installation will be replaced before drilling out of the surface casing shoe. If at any time a BOPE component cannot function to secure the hole, the hole will be secured using a retrievable packer. The non-functioning BOPE component will be repaired or replaced. After repair or replacement, a pressure test of the component and any connection broken to repair or replace the non-functioning component will be tested in the same manner as described for the initial BOPE installation. Annular preventer will be function tested at least weekly. Ram preventers will be function tested on each trip. BOPE pit level drills will be conducted weekly with each drilling crew. All pressure tests performed on BOPE and BOPE pit level drills will be recorded in the drilling log. Isolation of the 13.375 x 9.625 casing annulus will be confirmed by pressure testing of wellhead sealing component after said sealing component is installed.

**Choke Diagram Attachment:**

Shamrock\_122H\_Choke\_20200617142801.pdf

**BOP Diagram Attachment:**

Shamrock\_122H\_BOP\_20200617142810.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
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**Operator Name:** COLGATE OPERATING LLC

**Well Name:** SHAMROCK 34 FED STATE COM

**Well Number:** 122H

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	310	0	310	3309	2999	310	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	2970	0	2965	3309	344	2970	J-55	36	BUTT	1.125	1.2	DRY	1.6	DRY	1.6
3	PRODUCTION	8.75	5.5	NEW	API	N	0	17713	0	7219	3309	-3910	17713	HCP-110	20	OTHER - CDC HTQ	1.125	1.125	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):**

Shamrock\_122H\_Casing\_Design\_Assumptions\_20200617142944.pdf

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

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

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

Shamrock\_122H\_Casing\_Design\_Assumptions\_20200617143047.pdf

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** SHAMROCK 34 FED STATE COM

**Well Number:** 122H

## Casing Attachments

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

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

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

Shamrock\_122H\_Casing\_Design\_Assumptions\_20200617143204.pdf

5.5in\_USS\_CDC\_Casing\_Spec\_20200617143216.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	None	None
SURFACE	Tail		0	310	224	1.8	13.5	403	100	Class C	Salt + accelerator + extender + LCM
PRODUCTION	Lead		0	0	0	0	0	0	0	None	None
PRODUCTION	Tail		2050	1771 3	3798	1.24	14.2	4709	20	Class H	Fluid loss + dispersant + retarder + LCM
INTERMEDIATE	Lead		0	2970	642	2.19	12.7	1405	100	Class C	Salt + extender + LCM
INTERMEDIATE	Tail		0	2970	175	1.33	14.8	232	25	Class C	Accelerator + LCM

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** SHAMROCK 34 FED STATE COM

**Well Number:** 122H

## 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 site at all times. Mud program is subject to change due to hole conditions.

**Describe the mud monitoring system utilized:** Pason PVT system satisfying Onshore Order 1. Both visual and electronic mud monitoring equipment will be used to detect volume changes indicating loss or gain of circulating system fluid volume. Slow pump rates will be taken and recorded every tour in the drilling log. Mud engineer will perform tests and provide a written report at least every 12 hours while circulating. A trip tank will be used. 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 used to monitor for hydrocarbon gas at the shakers while drilling and/or circulating. H2S monitors with visual and 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 will be used to gather and burn all gas. Flare will discharge >100 from the wellbore. Flare line will be straight unless targeted with running tees. A mud gas separator will be installed and operable >500 before the 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	310	OTHER : Fresh water spud	8.6	9							
310	2970	OTHER : Brine water	10	10.2							
2970	1771 3	OTHER : Cut brine poly oil mud	9	10							

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** SHAMROCK 34 FED STATE COM

**Well Number:** 122H

## Section 6 - Test, Logging, Coring

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

Directional surveys will be collected via MWD tools at <200 intervals.

GR log will be acquired by MWD tools from the intermediate casing to TD.

A formation integrity test (FIT) will be performed on all casing strings after BOPE is installed to at least 1 ppg over planned section mud after drilling 10 of new hole.

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

GAMMA RAY LOG,

### Coring operation description for the well:

No core, drill stem test, open hole log, CBL, or temperature survey is planned.

## Section 7 - Pressure

**Anticipated Bottom Hole Pressure:** 3125

**Anticipated Surface Pressure:** 1493

**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:**

Shamrock\_122H\_H2S\_Plan\_20200617143824.pdf

## Section 8 - Other Information

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

Shamrock\_122H\_Horizontal\_Plan\_20200617143628.pdf

**Other proposed operations facets description:**

Cement will be placed on all casing strings using 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 used on all casing strings to prevent contamination of the cement by the displacement fluid. A pre-flush fluid will be pumped before cementing to aid in removal of the drilling mud from the wellbore, prevent drilling mud contamination of the cement, and prepare the surfaces of the wellbore and casing for cement.

After cement has set undisturbed for 8-hours and has reached a compressive strength of 500-psi across the zone of interest, then the 13.375" surface casing will be pressured to 1500 psi and held for 30-minutes. Lab reports with the 500-psi compressive strength time for the cement will be on-site for review. A casing test will be deemed successful if test pressure does not decline >10% over the 30-minute period.

**Operator Name:** COLGATE OPERATING LLC

**Well Name:** SHAMROCK 34 FED STATE COM

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The casing pressure test will be completed against the blind rams of the 13.625" 10M BOPE before picking up tools to drill out. After cement has set undisturbed for 8-hours and has reached a compressive strength of 500-psi across the zone of interest, then the 9.625" intermediate casing will be pressured to 2500 psi and held for 30-minutes. Lab reports with the 500-psi compressive strength time for the cement will be on-site for review. A casing test will be deemed successful if test pressure does not decline >10% over the 30-minute period.

The casing pressure test will be completed against the lower pipe rams of the 13.625 10M BOPE immediately before drilling out the float equipment. Casing pressure test on the 5.5 production casing will occur >72 hours after the cement is placed and reached ultimate compressive strength. Lab reports with the 500-psi compressive strength time for the cement will be on-site for review. A casing test will be deemed successful if test pressure does not decline >10% over the 30-minute period. Casing will be tested by pressuring up to 10,000 psi and holding pressure for 30-minutes before starting perforation and stimulation operations.

**Other proposed operations facets attachment:**

Shamrock\_122H\_Drill\_Plan\_20200617143650.pdf

CoFlex\_Certs\_20200617143708.pdf

Shamrock\_122H\_Anti\_Collision\_Report\_20200617143733.pdf

Shamrock\_122H\_Speedhead\_Specs\_20200617143741.pdf

Shamrock\_122H\_Closed\_Loop\_20200617143752.pdf

**Other Variance attachment:**

Colgate Operating, LLC  
Shamrock 34 Fed Com 122H  
SHL 2610' FSL & 295' FEL 34-19S-28E  
BHL 2310' FNL & 10' FWL 35-19S-28E  
Eddy County, NM

DRILL PLAN PAGE 1

Drilling Program

1. ESTIMATED TOPS

Formation Name	TVD	MD	Bearing
Quaternary	0'	0'	water
Rustler anhydrite	100'	100'	N/A
top salt	352'	352'	N/A
base salt	677'	677'	N/A
Yates sandstone	954'	954'	N/A
Capitan Reef limestone	2514'	2517'	water
Cherry Canyon sandstone	3047'	3053'	N/A
Lower Brushy Canyon sandstone	3824'	3834'	hydrocarbons
Bone Spring limestone	4184'	4196'	hydrocarbons
1 <sup>st</sup> Bone Spring sandstone	6434'	6456'	hydrocarbons
2 <sup>nd</sup> Bone Spring limestone	6656'	6678'	hydrocarbons
(KOP	6897'	6919'	hydrocarbons)
2nd Bone Spring sandstone	7174'	7208'	hydrocarbons
TD	7219'	17713'	hydrocarbons

2. NOTABLE ZONES

Second Bone Spring is the goal. All perforations will be  $\geq 100'$  from the dedication perimeter. Closest water well (CP 00926 POD1) is 2.00 miles southeast. Depth to water was not reported in this 300' deep well.

3. PRESSURE CONTROL

10M BOPE with WP ratings in excess of anticipated maximum surface pressure will be used for well control from drilling out of the surface casing to TMD. A rotating head will also be installed and used as needed. All BOPE connections

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SHL 2610' FSL & 295' FEL 34-19S-28E  
BHL 2310' FNL & 10' FWL 35-19S-28E  
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DRILL PLAN PAGE 2

will be flanged, welded, or clamped. All choke lines will be straight, unless targeted with running tees, or tee blocks are used. Choke lines will be anchored to prevent whip and reduce vibrations.

All valves in the choke line and choke manifold will be full opening to avoid restrictions and to allow straight fluid paths to minimize potential erosion. All gauges used in the well control system will be designed for drilling fluid service. A top drive inside BOP valve will be used 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 the valve equipped subs will be on the rig floor at all times.

Accumulator system will have sufficient capacity to open the HCR and close all 3 sets of rams plus the annular preventer while retaining  $\geq 300$  psi above pre-charge on the closing manifold. (Accumulator system will be capable of doing so without using the closing unit pumps). Fluid reservoir capacity will be twice the usable fluid volume of the accumulator system capacity. Fluid level will be maintained at the manufacturer's recommended level. Before connecting the closing unit to the BOP stack, an accumulator pre-charge pressure test will be performed to ensure the pre-charge pressure is within 100 psi of the desired pre-charge pressure. (Only nitrogen gas will be used to pre-charge). Two independent power sources will be available at all times to power the closing unit pumps so the pumps can automatically start when the closing valve manifold pressure has decreased to the pre-set level. Closing unit pumps will be sized to allow opening of HCR and closing of annular preventer on 5" drill pipe achieving  $\geq 200$  psi above pre-charge pressure with the accumulator system isolated from service in  $< 2$  minutes. A valve will be installed in the closing line as close to the annular preventer as possible to act as a locking device. The valve will be maintained in the open position and will be closed only when the power source for the accumulator system is inoperative.

Remote controls capable of opening and closing all preventers and the HCR will be readily accessible to the driller. Master controls with the same capability will be operable at the accumulator. Wellhead will be a multi-bowl speed head

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DRILL PLAN PAGE 3

allowing for hang-off of intermediate casing and isolation of the 13.375" x 9.625" annulus without breaking the connection between the BOP and wellhead to install an additional casing head. A wear bushing will be installed and inspected frequently to guard against internal wear to wellhead.

Colgate requests a variance to drill the well using a co-flex line between the BOP and choke manifold. Certificate for proposed hose is attached. Manufacturer does not require the hose to be anchored. If this hose is not available, then a hose of equal or higher rating will be used.

After surface casing is set and the BOPE installed, pressure tests of BOPE will be performed by a 3<sup>rd</sup> party tester using 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 10 minutes without any bleed-off. A valve on the wellhead below the test plug seat will be open at all time during BOPE tests to guard against casing damage. BOPE will be re-tested in this manner after any connection breaks or passage of allotted time (25 days).

Any BOPE which fails a pressure test after initial installation will be replaced before drilling out of the surface casing shoe. If at any time a BOPE component cannot function to secure the hole, the hole will be secured using a retrievable packer. The non-functioning BOPE component will be repaired or replaced. After repair or replacement, a pressure test of the component and any connection broken to repair or replace the non-functioning component will be tested in the same manner as described for the initial BOPE installation.

Annular preventer will be function tested at least weekly. Ram preventers will be function tested on each trip. BOPE pit levels drills will be conducted weekly with each drilling crew. All pressure tests performed on BOPE and BOPE pit level drills will be recorded in the drilling log. Isolation of the 13.375" x 9.625" casing annulus will be confirmed by pressure testing of wellhead sealing component after said sealing component is installed.

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 BHL 2310' FNL & 10' FWL 35-19S-28E  
 Eddy County, NM

## DRILL PLAN PAGE 4

### 4. CASING & CEMENT

All casing will be API and new. See attached casing assumption worksheet.

Hole O. D.	Set MD	Set TVD	Casing OD	Weight (lb/ft)	Grade	Joint	Collapse	Burst	Tension
17.5"	0' - 310'	0' - 310'	13.375" surface	54.5	J-55	BTC	1.125	1.2	1.60
12.25"	0' - 2970'	0' - 2965'	9.625" intermed.	36	J-55	BTC	1.125	1.2	1.60
8.75"	0' - 17713'	0' - 7219'	5.5" product.	20	HCP-110	CDC HTQ	1.125	1.2	1.60

Name	Type	Sacks	Yield	Cu. Ft.	Weight	Blend
Surface	Tail	224	1.8	403	13.5	Class C + salt + accelerator + extender + LCM
TOC = GL		100% Excess			Centralizers on bottom 3 joints starting with the shoe joint, then every other joint to GL	
Intermediate	Lead	642	2.19	1405	12.7	Class C + salt + extender + LCM
	Tail	175	1.33	232	14.8	Class C + accelerator + LCM
TOC = GL		100% Excess Lead & 25% Excess Tail			2 centralizers on 1 <sup>st</sup> joint + 1 centralizer on 2 <sup>nd</sup> joint + 1 centralizer every 4 <sup>th</sup> joint to GL	
Production	Tail	3798	1.24	4709	14.2	Class H + fluid loss + dispersant + retarder + LCM
TOC = 2050'		20% Excess			2 centralizers on 1 <sup>st</sup> joint + 1 centralizer on 2 <sup>nd</sup> joint + 1 centralizer every 3rd joint to 2470'	

Cement will be placed on all casing strings using 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

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BHL 2310' FNL & 10' FWL 35-19S-28E  
Eddy County, NM

DRILL PLAN PAGE 5

be used on all casing strings to prevent contamination of the cement by the displacement fluid. A pre-flush fluid will be pumped before cementing to aid in removal of the drilling mud from the wellbore, prevent drilling mud contamination of the cement, and prepare the surfaces of the wellbore and casing for cement.

After cement has set undisturbed for 8-hours and has reached a compressive strength of 500-psi across the zone of interest, then the 13.375" surface casing will be pressured to 1500 psi and held for 30-minutes. Lab reports with the 500-psi compressive strength time for the cement will be on-site for review. A casing test will be deemed successful if test pressure does not decline >10% over the 30-minute period.

The casing pressure test will be completed against the blind rams of the 13.625" 10M BOPE before picking up tools to drill out. After cement has set undisturbed for 8-hours and has reached a compressive strength of 500-psi across the zone of interest, then the 9.625" intermediate casing will be pressured to 2500 psi and held for 30-minutes. Lab reports with the 500-psi compressive strength time for the cement will be on-site for review. A casing test will be deemed successful if test pressure does not decline >10% over the 30-minute period.

The casing pressure test will be completed against the lower pipe rams of the 13.625" 10M BOPE immediately before drilling out the float equipment. Casing pressure test on the 5.5" production casing will occur >72 hours after the cement is placed and reached ultimate compressive strength. Lab reports with the 500-psi compressive strength time for the cement will be on-site for review. A casing test will be deemed successful if test pressure does not decline >10% over the 30-minute period. Casing will be tested by pressuring up to 10,000 psi and holding pressure for 30-minutes before starting perforation and stimulation operations.

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BHL 2310' FNL & 10' FWL 35-19S-28E  
Eddy County, NM

DRILL PLAN PAGE 6

5. MUD PROGRAM

All necessary mud products for weight addition and fluid loss control will be on site at all times. Mud program is subject to change due to hole conditions. Mud monitoring system will be an electronic Pason PVT system satisfying Onshore Order 1. Both visual and electronic mud monitoring equipment will be used to detect volume changes indicating loss or gain of circulating system fluid volume.

Slow pump rates will be taken and recorded every tour in the drilling log. Mud engineer will perform tests and provide a written report at least every 12 hours while circulating.

A trip tank will be used. 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 used to monitor for hydrocarbon gas at the shakers while drilling and/or circulating. H<sub>2</sub>S monitors with visual and 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 will be used to gather and burn all gas. Flare will discharge  $\geq 100'$  from the wellbore. Flare line will be straight unless targeted with running tees. A mud gas separator will be installed and operable  $\geq 500'$  before the first anticipated hydrocarbon zone.

Type	Interval (MD)	lb/gal	Viscosity	Fluid Loss
fresh water spud	0' - 310'	8.6 - 9.0	28 - 34	NC
brine water	310' - 2970'	10.0 - 10.2	30 - 32	NC
cut brine poly oil mud	2970' - 17713'	9.0 - 10.0	32 - 35	NC

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BHL 2310' FNL & 10' FWL 35-19S-28E  
Eddy County, NM

DRILL PLAN PAGE 7

#### 6. CORES, TESTS, & LOGS

No core, drill stem test, open hole log, CBL, or temperature survey is planned.

Directional surveys will be collected via MWD tools at  $\leq 200'$  intervals.

GR log will be acquired by MWD tools from the intermediate casing to TD.

A formation integrity test (FIT) will be performed on all casing strings after BOPE is installed to at least 1 ppg over planned section mud after drilling 10' of new hole.

#### 7. DOWN HOLE CONDITIONS

No abnormal pressure or temperature is expected. Maximum expected bottom hole pressure is  $\approx 3125$  psi. Expected bottom hole temperature is  $\approx 120^\circ$  F. An H2S plan is attached.

#### 8. OTHER INFORMATION

Anticipated spud date is upon approval. It is expected it will take  $\approx 3$  months to drill and complete the well.



# WELL DETAILS: Shamrock 34 Fed State Com 122H

Northing 588309.27 Easting 595611.66 Latitude 32.61718931 Longitude -104.15705776



Azimuths to Grid North  
True North: -0.10°  
Magnetic North: 6.90°  
  
Magnetic Field  
Strength: 47797.9snT  
Dip Angle: 60.21°  
Date: 3/9/2020  
Model: IGRF2020

PROJECT DETAILS: Eddy County, NM (N83-NME)  
Well Name: Shamrock 34 Fed State Com 122H  
Geodetic System: US State Plane 1983  
Datum: North American Datum 1983  
Ellipsoid: GRS 1980  
Zone: New Mexico Eastern Zone  
System Datum: Mean Sea Level  
Local North: Grid  
KB Elevation: 3309+25 @ 3334.00usft (Permit)  
Elevation: 3309.00

Site: Shamrock 34 Fed State Com  
Well: Shamrock 34 Fed State Com 122H  
Wellbore: 122H  
Plan: Plan #2

## Section Details

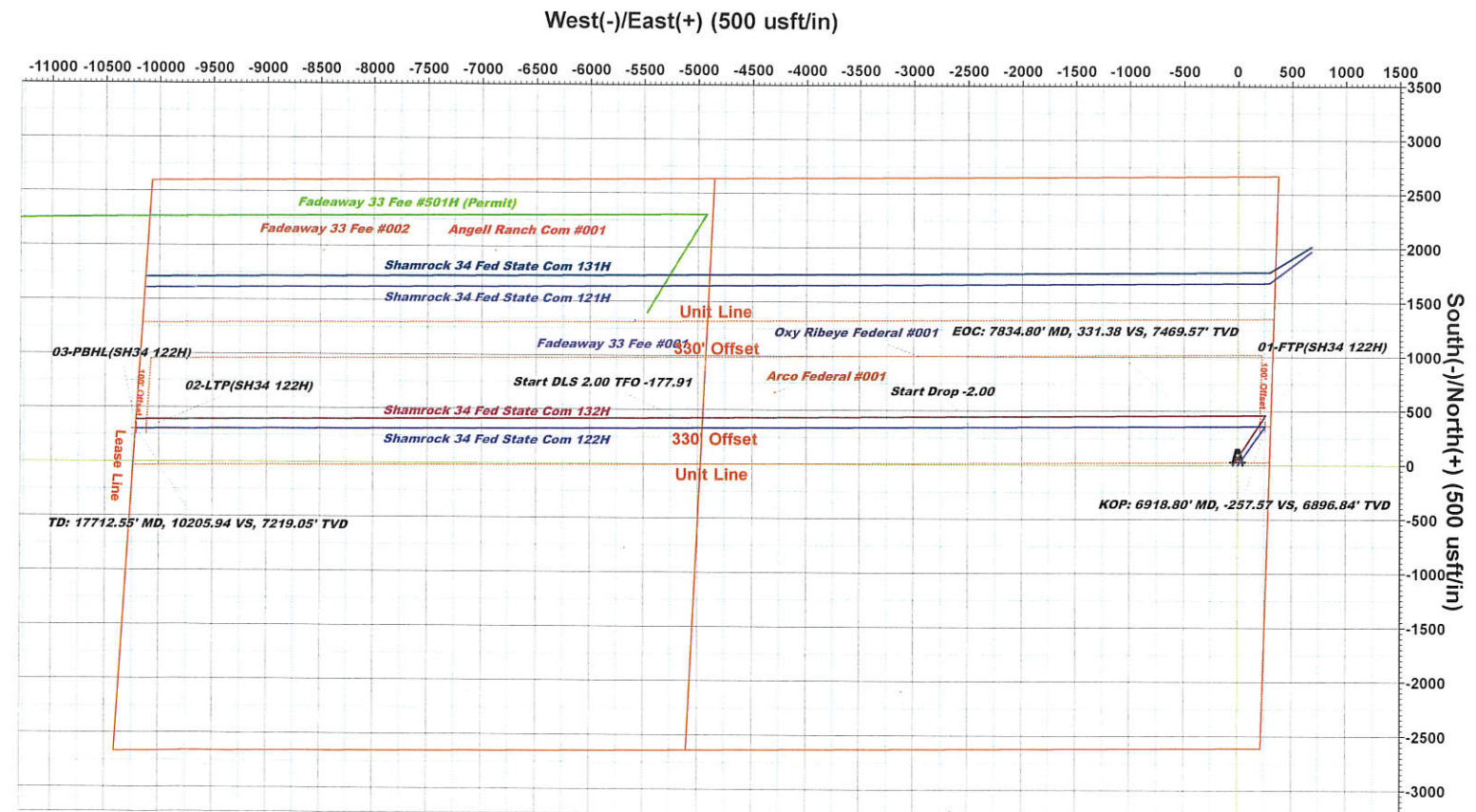
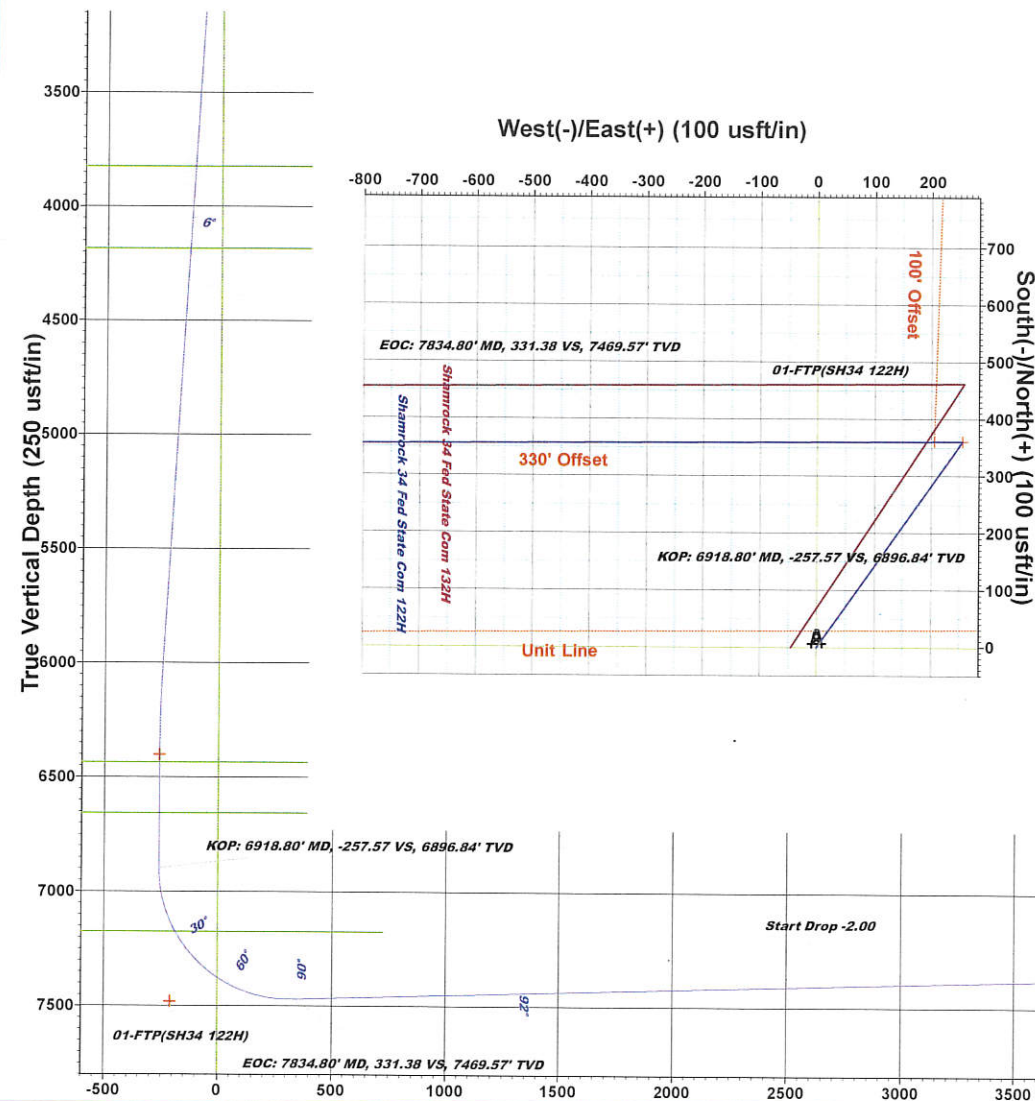
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1700.00	0.00	0.00	1700.00	0.00	0.00	0.00	0.00	0.00
3	2090.72	5.86	35.30	2090.04	16.30	11.54	1.50	35.30	-11.63
4	6031.24	5.86	35.30	6009.96	344.70	244.02	0.00	0.00	-245.95
5	6421.96	0.00	0.00	6400.00	361.00	255.56	1.50	180.00	-257.57
6	6918.80	0.00	0.00	6896.84	361.00	255.56	0.00	0.00	-257.57
7	7834.80	91.60	269.68	7469.57	357.71	-333.39	10.00	269.68	331.38
8	9984.25	91.60	269.68	7409.56	345.71	-2481.97	0.00	0.00	2480.00
9	9989.75	91.49	269.68	7409.41	345.68	-2487.47	2.00	180.00	2485.50
10	12505.11	91.49	269.68	7344.00	331.64	-5001.93	0.00	0.00	5000.00
11	12510.86	91.37	269.68	7343.86	331.60	-5007.69	2.00	-177.91	5005.76
12	17712.55	91.37	269.68	7219.05	302.18	-10207.79	0.00	0.00	10205.94

## FORMATION TOP DETAILS

TVDPath	MDPath	Formation
100.00	100.00	Rustler
352.00	352.00	Top of Salt
677.00	677.00	Base of Salt
954.00	954.00	Yates
2514.00	2516.91	Capitan
3047.00	3052.71	DLWR Mnt. Group
3824.00	3833.79	Lower Brushy Canyon
4184.00	4195.68	Bone Spring Lime
6434.00	6455.96	1st Bone Spring SD
6656.00	6677.96	2nd Bone Spring LM
7174.00	7208.10	2nd Bone Spring SD

## DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
00-EON(SH34 122H)	6400.00	361.00	255.56	588670.27	595867.22	32.61818043	-104.15622578
01-FTP(SH34 122H)	7479.00	361.05	205.55	588670.32	595817.21	32.61818080	-104.15638820
02-LTP(SH34 122H)	7221.21	302.82	-10117.60	588612.09	585494.06	32.61806350	-104.18991700
03-PBHL(SH34 122H)	7219.05	302.18	-10207.79	588611.45	585403.87	32.61806208	-104.19020994



Vertical Section at 269.68° (250 usft/in)



<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Shamrock 34 Fed State Com 122H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3309+25 @ 3334.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3309+25 @ 3334.00usft (Permit)
<b>Site:</b>	Shamrock 34 Fed State Com	<b>North Reference:</b>	Grid
<b>Well:</b>	Shamrock 34 Fed State Com 122H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	122H		
<b>Design:</b>	Plan #2		

<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		Shamrock 34 Fed State Com			
Site Position:		Northing:	590,282.94 usft	Latitude:	32.62261125
From:	Map	Easting:	596,293.88 usft	Longitude:	-104.15483124
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.10 °

Well	Shamrock 34 Fed State Com 122H					
Well Position	+N/-S	-1,973.67 usft	Northing:	588,309.27 usft	Latitude:	32.61718931
	+E/-W	-682.22 usft	Easting:	595,611.66 usft	Longitude:	-104.15705776
Position Uncertainty		0.00 usft	Wellhead Elevation:		Ground Level:	3,309.00 usft

<b>Wellbore</b>	122H				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2020	3/9/2020	6.99	60.21	47,797.87888114

<b>Design</b>	Plan #2			
<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>	3/19/2020		
<b>Depth From (usft)</b>	<b>Depth To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Remarks</b>
1	0.00	17,712.48 Plan #2 (122H)	OWSG MWD Rev 4	
			OWSG MWD - Standard	

**Database:** EDM 5000.14 Single User Db  
**Company:** Colgate Energy  
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**Site:** Shamrock 34 Fed State Com  
**Well:** Shamrock 34 Fed State Com 122H  
**Wellbore:** 122H  
**Design:** Plan #2

**Local Co-ordinate Reference:** Well Shamrock 34 Fed State Com 122H  
**TVD Reference:** 3309+25 @ 3334.00usft (Permit)  
**MD Reference:** 3309+25 @ 3334.00usft (Permit)  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature

## 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	
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,090.72	5.86	35.30	2,090.04	16.30	11.54	1.50	1.50	0.00	35.30	
6,031.24	5.86	35.30	6,009.96	344.70	244.02	0.00	0.00	0.00	0.00	
6,421.96	0.00	0.00	6,400.00	361.00	255.56	1.50	-1.50	0.00	180.00	00-EON(SH34 122H)
6,918.80	0.00	0.00	6,896.84	361.00	255.56	0.00	0.00	0.00	0.00	
7,834.80	91.60	269.68	7,469.57	357.71	-333.39	10.00	10.00	0.00	269.68	
9,984.25	91.60	269.68	7,409.56	345.71	-2,481.97	0.00	0.00	0.00	0.00	
9,989.75	91.49	269.68	7,409.41	345.68	-2,487.47	2.00	-2.00	0.00	180.00	
12,505.11	91.49	269.68	7,344.00	331.64	-5,001.93	0.00	0.00	0.00	0.00	
12,510.87	91.37	269.68	7,343.86	331.60	-5,007.69	2.00	-2.00	-0.07	-177.91	
17,712.55	91.37	269.68	7,219.05	302.18	-10,207.79	0.00	0.00	0.00	0.00	03-PBHL(SH34 122H)

**Database:** EDM 5000.14 Single User Db  
**Company:** Colgate Energy  
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**Site:** Shamrock 34 Fed State Com  
**Well:** Shamrock 34 Fed State Com 122H  
**Wellbore:** 122H  
**Design:** Plan #2

**Local Co-ordinate Reference:** Well Shamrock 34 Fed State Com 122H  
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**MD Reference:** 3309+25 @ 3334.00usft (Permit)  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature

## 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
<b>Rustler</b>									
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
352.00	0.00	0.00	352.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Top of Salt</b>									
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
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
677.00	0.00	0.00	677.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Base of Salt</b>									
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
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
954.00	0.00	0.00	954.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Yates</b>									
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	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	1.50	35.30	1,799.99	1.07	0.76	-0.76	1.50	1.50	0.00
1,900.00	3.00	35.30	1,899.91	4.27	3.02	-3.05	1.50	1.50	0.00
2,000.00	4.50	35.30	1,999.69	9.61	6.80	-6.86	1.50	1.50	0.00
2,090.72	5.86	35.30	2,090.04	16.30	11.54	-11.63	1.50	1.50	0.00
2,100.00	5.86	35.30	2,099.27	17.07	12.08	-12.18	0.00	0.00	0.00
2,200.00	5.86	35.30	2,198.75	25.40	17.98	-18.13	0.00	0.00	0.00
2,300.00	5.86	35.30	2,298.23	33.74	23.88	-24.07	0.00	0.00	0.00
2,400.00	5.86	35.30	2,397.70	42.07	29.78	-30.02	0.00	0.00	0.00
2,500.00	5.86	35.30	2,497.18	50.41	35.68	-35.96	0.00	0.00	0.00
2,516.91	5.86	35.30	2,514.00	51.82	36.68	-36.97	0.00	0.00	0.00
<b>Capitan</b>									
2,600.00	5.86	35.30	2,596.66	58.74	41.58	-41.91	0.00	0.00	0.00
2,700.00	5.86	35.30	2,696.13	67.07	47.48	-47.86	0.00	0.00	0.00
2,800.00	5.86	35.30	2,795.61	75.41	53.38	-53.80	0.00	0.00	0.00
2,900.00	5.86	35.30	2,895.09	83.74	59.28	-59.75	0.00	0.00	0.00
3,000.00	5.86	35.30	2,994.57	92.08	65.18	-65.70	0.00	0.00	0.00
3,052.71	5.86	35.30	3,047.00	96.47	68.29	-68.83	0.00	0.00	0.00
<b>DLWR Mnt. Group</b>									
3,100.00	5.86	35.30	3,094.04	100.41	71.08	-71.64	0.00	0.00	0.00
3,200.00	5.86	35.30	3,193.52	108.74	76.98	-77.59	0.00	0.00	0.00
3,300.00	5.86	35.30	3,293.00	117.08	82.88	-83.54	0.00	0.00	0.00
3,400.00	5.86	35.30	3,392.48	125.41	88.78	-89.48	0.00	0.00	0.00
3,500.00	5.86	35.30	3,491.95	133.75	94.68	-95.43	0.00	0.00	0.00
3,600.00	5.86	35.30	3,591.43	142.08	100.58	-101.37	0.00	0.00	0.00
3,700.00	5.86	35.30	3,690.91	150.42	106.48	-107.32	0.00	0.00	0.00
3,800.00	5.86	35.30	3,790.38	158.75	112.38	-113.27	0.00	0.00	0.00
3,833.79	5.86	35.30	3,824.00	161.57	114.38	-115.28	0.00	0.00	0.00
<b>Lower Brushy Canyon</b>									

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**Wellbore:** 122H  
**Design:** Plan #2

**Local Co-ordinate Reference:** Well Shamrock 34 Fed State Com 122H  
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**MD Reference:** 3309+25 @ 3334.00usft (Permit)  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature

**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)
3,900.00	5.86	35.30	3,889.86	167.08	118.28	-119.21	0.00	0.00	0.00
4,000.00	5.86	35.30	3,989.34	175.42	124.18	-125.16	0.00	0.00	0.00
4,100.00	5.86	35.30	4,088.82	183.75	130.08	-131.11	0.00	0.00	0.00
4,195.68	5.86	35.30	4,184.00	191.73	135.73	-136.80	0.00	0.00	0.00
<b>Bone Spring Lime</b>									
4,200.00	5.86	35.30	4,188.29	192.09	135.98	-137.05	0.00	0.00	0.00
4,300.00	5.86	35.30	4,287.77	200.42	141.88	-143.00	0.00	0.00	0.00
4,400.00	5.86	35.30	4,387.25	208.75	147.78	-148.95	0.00	0.00	0.00
4,500.00	5.86	35.30	4,486.73	217.09	153.68	-154.89	0.00	0.00	0.00
4,600.00	5.86	35.30	4,586.20	225.42	159.58	-160.84	0.00	0.00	0.00
4,700.00	5.86	35.30	4,685.68	233.76	165.48	-166.78	0.00	0.00	0.00
4,800.00	5.86	35.30	4,785.16	242.09	171.38	-172.73	0.00	0.00	0.00
4,900.00	5.86	35.30	4,884.63	250.43	177.28	-178.68	0.00	0.00	0.00
5,000.00	5.86	35.30	4,984.11	258.76	183.18	-184.62	0.00	0.00	0.00
5,100.00	5.86	35.30	5,083.59	267.09	189.08	-190.57	0.00	0.00	0.00
5,200.00	5.86	35.30	5,183.07	275.43	194.98	-196.52	0.00	0.00	0.00
5,300.00	5.86	35.30	5,282.54	283.76	200.88	-202.46	0.00	0.00	0.00
5,400.00	5.86	35.30	5,382.02	292.10	206.78	-208.41	0.00	0.00	0.00
5,500.00	5.86	35.30	5,481.50	300.43	212.68	-214.36	0.00	0.00	0.00
5,600.00	5.86	35.30	5,580.98	308.76	218.58	-220.30	0.00	0.00	0.00
5,700.00	5.86	35.30	5,680.45	317.10	224.48	-226.25	0.00	0.00	0.00
5,800.00	5.86	35.30	5,779.93	325.43	230.38	-232.19	0.00	0.00	0.00
5,900.00	5.86	35.30	5,879.41	333.77	236.28	-238.14	0.00	0.00	0.00
6,000.00	5.86	35.30	5,978.89	342.10	242.18	-244.09	0.00	0.00	0.00
6,031.24	5.86	35.30	6,009.96	344.70	244.02	-245.95	0.00	0.00	0.00
6,100.00	4.83	35.30	6,078.42	349.93	247.72	-249.68	1.50	-1.50	0.00
6,200.00	3.33	35.30	6,178.17	355.74	251.83	-253.82	1.50	-1.50	0.00
6,300.00	1.83	35.30	6,278.06	359.41	254.44	-256.44	1.50	-1.50	0.00
6,400.00	0.33	35.30	6,378.04	360.95	255.52	-257.54	1.50	-1.50	0.00
6,421.96	0.00	0.00	6,400.00	361.00	255.56	-257.57	1.50	-1.50	0.00
<b>00-EON(SH34 122H)</b>									
6,455.96	0.00	0.00	6,434.00	361.00	255.56	-257.57	0.00	0.00	0.00
<b>1st Bone Spring SD</b>									
6,500.00	0.00	0.00	6,478.04	361.00	255.56	-257.57	0.00	0.00	0.00
6,600.00	0.00	0.00	6,578.04	361.00	255.56	-257.57	0.00	0.00	0.00
6,677.96	0.00	0.00	6,656.00	361.00	255.56	-257.57	0.00	0.00	0.00
<b>2nd Bone Spring LM</b>									
6,700.00	0.00	0.00	6,678.04	361.00	255.56	-257.57	0.00	0.00	0.00
6,800.00	0.00	0.00	6,778.04	361.00	255.56	-257.57	0.00	0.00	0.00
6,900.00	0.00	0.00	6,878.04	361.00	255.56	-257.57	0.00	0.00	0.00
6,918.80	0.00	0.00	6,896.84	361.00	255.56	-257.57	0.00	0.00	0.00
<b>KOP: 6918.80' MD, -257.57 VS, 6896.84' TVD</b>									
6,950.00	3.12	269.68	6,928.03	361.00	254.71	-256.72	10.00	10.00	0.00
7,000.00	8.12	269.68	6,977.77	360.97	249.82	-251.83	10.00	10.00	0.00
7,050.00	13.12	269.68	7,026.90	360.92	240.60	-242.62	10.00	10.00	0.00
7,100.00	18.12	269.68	7,075.04	360.84	227.15	-229.16	10.00	10.00	0.00
7,150.00	23.12	269.68	7,121.82	360.74	209.54	-211.55	10.00	10.00	0.00
7,200.00	28.12	269.68	7,166.89	360.62	187.93	-189.94	10.00	10.00	0.00
7,208.10	28.93	269.68	7,174.00	360.60	184.06	-186.08	10.00	10.00	0.00
<b>2nd Bone Spring SD</b>									
7,250.00	33.12	269.68	7,209.90	360.48	162.47	-164.48	10.00	10.00	0.00
7,300.00	38.12	269.68	7,250.53	360.32	133.36	-135.37	10.00	10.00	0.00
7,350.00	43.12	269.68	7,288.47	360.14	100.82	-102.83	10.00	10.00	0.00

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**Survey Calculation Method:** Minimum Curvature

## 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)
7,400.00	48.12	269.68	7,323.43	359.94	65.10	-67.10	10.00	10.00	0.00
<b>01-FTP(SH34 122H)</b>									
7,450.00	53.12	269.68	7,355.15	359.72	26.46	-28.47	10.00	10.00	0.00
7,500.00	58.12	269.68	7,383.37	359.49	-14.79	12.78	10.00	10.00	0.00
7,550.00	63.12	269.68	7,407.89	359.25	-58.35	56.34	10.00	10.00	0.00
7,600.00	68.12	269.68	7,428.53	358.99	-103.87	101.87	10.00	10.00	0.00
7,650.00	73.12	269.68	7,445.11	358.73	-151.02	149.02	10.00	10.00	0.00
7,700.00	78.12	269.68	7,457.53	358.46	-199.44	197.44	10.00	10.00	0.00
7,750.00	83.12	269.68	7,465.67	358.18	-248.76	246.75	10.00	10.00	0.00
7,800.00	88.12	269.68	7,469.49	357.90	-298.59	296.59	10.00	10.00	0.00
7,834.80	91.60	269.68	7,469.57	357.71	-333.39	331.38	10.00	10.00	0.00
<b>EOC: 7834.80' MD, 331.38 VS, 7469.57' TVD</b>									
7,900.00	91.60	269.68	7,467.75	357.35	-398.56	396.56	0.00	0.00	0.00
8,000.00	91.60	269.68	7,464.96	356.79	-498.52	496.52	0.00	0.00	0.00
8,100.00	91.60	269.68	7,462.17	356.23	-598.48	596.48	0.00	0.00	0.00
8,200.00	91.60	269.68	7,459.38	355.67	-698.44	696.44	0.00	0.00	0.00
8,300.00	91.60	269.68	7,456.59	355.11	-798.40	796.40	0.00	0.00	0.00
8,400.00	91.60	269.68	7,453.79	354.56	-898.36	896.36	0.00	0.00	0.00
8,500.00	91.60	269.68	7,451.00	354.00	-998.32	996.33	0.00	0.00	0.00
8,600.00	91.60	269.68	7,448.21	353.44	-1,098.28	1,096.29	0.00	0.00	0.00
8,700.00	91.60	269.68	7,445.42	352.88	-1,198.24	1,196.25	0.00	0.00	0.00
8,800.00	91.60	269.68	7,442.62	352.32	-1,298.20	1,296.21	0.00	0.00	0.00
8,900.00	91.60	269.68	7,439.83	351.76	-1,398.16	1,396.17	0.00	0.00	0.00
9,000.00	91.60	269.68	7,437.04	351.21	-1,498.11	1,496.13	0.00	0.00	0.00
9,100.00	91.60	269.68	7,434.25	350.65	-1,598.07	1,596.09	0.00	0.00	0.00
9,200.00	91.60	269.68	7,431.46	350.09	-1,698.03	1,696.05	0.00	0.00	0.00
9,300.00	91.60	269.68	7,428.66	349.53	-1,797.99	1,796.01	0.00	0.00	0.00
9,400.00	91.60	269.68	7,425.87	348.97	-1,897.95	1,895.97	0.00	0.00	0.00
9,500.00	91.60	269.68	7,423.08	348.41	-1,997.91	1,995.94	0.00	0.00	0.00
9,600.00	91.60	269.68	7,420.29	347.86	-2,097.87	2,095.90	0.00	0.00	0.00
9,700.00	91.60	269.68	7,417.50	347.30	-2,197.83	2,195.86	0.00	0.00	0.00
9,800.00	91.60	269.68	7,414.70	346.74	-2,297.79	2,295.82	0.00	0.00	0.00
9,900.00	91.60	269.68	7,411.91	346.18	-2,397.75	2,395.78	0.00	0.00	0.00
9,984.25	91.60	269.68	7,409.56	345.71	-2,481.97	2,480.00	0.00	0.00	0.00
<b>Start Drop -2.00</b>									
9,989.75	91.49	269.68	7,409.41	345.68	-2,487.47	2,485.50	2.00	-2.00	0.00
10,000.00	91.49	269.68	7,409.14	345.62	-2,497.71	2,495.74	0.00	0.00	0.00
10,100.00	91.49	269.68	7,406.54	345.06	-2,597.67	2,595.71	0.00	0.00	0.00
10,200.00	91.49	269.68	7,403.94	344.51	-2,697.64	2,695.67	0.00	0.00	0.00
10,300.00	91.49	269.68	7,401.34	343.95	-2,797.60	2,795.64	0.00	0.00	0.00
10,400.00	91.49	269.68	7,398.74	343.39	-2,897.57	2,895.61	0.00	0.00	0.00
10,500.00	91.49	269.68	7,396.14	342.83	-2,997.53	2,995.57	0.00	0.00	0.00
10,600.00	91.49	269.68	7,393.54	342.27	-3,097.50	3,095.54	0.00	0.00	0.00
10,700.00	91.49	269.68	7,390.94	341.71	-3,197.46	3,195.50	0.00	0.00	0.00
10,800.00	91.49	269.68	7,388.34	341.16	-3,297.43	3,295.47	0.00	0.00	0.00
10,900.00	91.49	269.68	7,385.74	340.60	-3,397.39	3,395.44	0.00	0.00	0.00
11,000.00	91.49	269.68	7,383.14	340.04	-3,497.36	3,495.40	0.00	0.00	0.00
11,100.00	91.49	269.68	7,380.54	339.48	-3,597.32	3,595.37	0.00	0.00	0.00
11,200.00	91.49	269.68	7,377.94	338.92	-3,697.29	3,695.34	0.00	0.00	0.00
11,300.00	91.49	269.68	7,375.34	338.36	-3,797.25	3,795.30	0.00	0.00	0.00
11,400.00	91.49	269.68	7,372.74	337.81	-3,897.22	3,895.27	0.00	0.00	0.00
11,500.00	91.49	269.68	7,370.14	337.25	-3,997.18	3,995.23	0.00	0.00	0.00
11,600.00	91.49	269.68	7,367.54	336.69	-4,097.14	4,095.20	0.00	0.00	0.00

Database: EDM 5000.14 Single User Db  
 Company: Colgate Energy  
 Project: Eddy County, NM (N83-NME)  
 Site: Shamrock 34 Fed State Com  
 Well: Shamrock 34 Fed State Com 122H  
 Wellbore: 122H  
 Design: Plan #2

Local Co-ordinate Reference: Well Shamrock 34 Fed State Com 122H  
 TVD Reference: 3309+25 @ 3334.00usft (Permit)  
 MD Reference: 3309+25 @ 3334.00usft (Permit)  
 North Reference: Grid  
 Survey Calculation Method: Minimum Curvature

## 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)
11,700.00	91.49	269.68	7,364.94	336.13	-4,197.11	4,195.17	0.00	0.00	0.00
11,800.00	91.49	269.68	7,362.34	335.57	-4,297.07	4,295.13	0.00	0.00	0.00
11,900.00	91.49	269.68	7,359.74	335.01	-4,397.04	4,395.10	0.00	0.00	0.00
12,000.00	91.49	269.68	7,357.14	334.46	-4,497.00	4,495.06	0.00	0.00	0.00
12,100.00	91.49	269.68	7,354.54	333.90	-4,596.97	4,595.03	0.00	0.00	0.00
12,200.00	91.49	269.68	7,351.94	333.34	-4,696.93	4,695.00	0.00	0.00	0.00
12,300.00	91.49	269.68	7,349.34	332.78	-4,796.90	4,794.96	0.00	0.00	0.00
12,400.00	91.49	269.68	7,346.74	332.22	-4,896.86	4,894.93	0.00	0.00	0.00
12,505.11	91.49	269.68	7,344.00	331.64	-5,001.93	5,000.00	0.00	0.00	0.00
<b>Start DLS 2.00 TFO -177.91</b>									
12,510.87	91.37	269.68	7,343.86	331.60	-5,007.69	5,005.76	2.00	-2.00	-0.07
12,600.00	91.37	269.68	7,341.72	331.10	-5,096.80	5,094.87	0.00	0.00	0.00
12,700.00	91.37	269.68	7,339.32	330.53	-5,196.76	5,194.84	0.00	0.00	0.00
12,800.00	91.37	269.68	7,336.92	329.97	-5,296.73	5,294.81	0.00	0.00	0.00
12,900.00	91.37	269.68	7,334.52	329.40	-5,396.70	5,394.78	0.00	0.00	0.00
13,000.00	91.37	269.68	7,332.12	328.84	-5,496.67	5,494.75	0.00	0.00	0.00
13,100.00	91.37	269.68	7,329.72	328.27	-5,596.64	5,594.72	0.00	0.00	0.00
13,200.00	91.37	269.68	7,327.33	327.71	-5,696.61	5,694.69	0.00	0.00	0.00
13,300.00	91.37	269.68	7,324.93	327.14	-5,796.58	5,794.66	0.00	0.00	0.00
13,400.00	91.37	269.68	7,322.53	326.57	-5,896.55	5,894.64	0.00	0.00	0.00
13,500.00	91.37	269.68	7,320.13	326.01	-5,996.52	5,994.61	0.00	0.00	0.00
13,600.00	91.37	269.68	7,317.73	325.44	-6,096.49	6,094.58	0.00	0.00	0.00
13,700.00	91.37	269.68	7,315.33	324.88	-6,196.46	6,194.55	0.00	0.00	0.00
13,800.00	91.37	269.68	7,312.93	324.31	-6,296.43	6,294.52	0.00	0.00	0.00
13,900.00	91.37	269.68	7,310.53	323.75	-6,396.40	6,394.49	0.00	0.00	0.00
14,000.00	91.37	269.68	7,308.13	323.18	-6,496.37	6,494.46	0.00	0.00	0.00
14,100.00	91.37	269.68	7,305.73	322.61	-6,596.34	6,594.43	0.00	0.00	0.00
14,200.00	91.37	269.68	7,303.33	322.05	-6,696.31	6,694.41	0.00	0.00	0.00
14,300.00	91.37	269.68	7,300.93	321.48	-6,796.28	6,794.38	0.00	0.00	0.00
14,400.00	91.37	269.68	7,298.53	320.92	-6,896.25	6,894.35	0.00	0.00	0.00
14,500.00	91.37	269.68	7,296.13	320.35	-6,996.22	6,994.32	0.00	0.00	0.00
14,600.00	91.37	269.68	7,293.73	319.79	-7,096.19	7,094.29	0.00	0.00	0.00
14,700.00	91.37	269.68	7,291.33	319.22	-7,196.16	7,194.26	0.00	0.00	0.00
14,800.00	91.37	269.68	7,288.93	318.66	-7,296.13	7,294.23	0.00	0.00	0.00
14,900.00	91.37	269.68	7,286.54	318.09	-7,396.10	7,394.20	0.00	0.00	0.00
15,000.00	91.37	269.68	7,284.14	317.52	-7,496.07	7,494.18	0.00	0.00	0.00
15,100.00	91.37	269.68	7,281.74	316.96	-7,596.04	7,594.15	0.00	0.00	0.00
15,200.00	91.37	269.68	7,279.34	316.39	-7,696.01	7,694.12	0.00	0.00	0.00
15,300.00	91.37	269.68	7,276.94	315.83	-7,795.97	7,794.09	0.00	0.00	0.00
15,400.00	91.37	269.68	7,274.54	315.26	-7,895.94	7,894.06	0.00	0.00	0.00
15,500.00	91.37	269.68	7,272.14	314.70	-7,995.91	7,994.03	0.00	0.00	0.00
15,600.00	91.37	269.68	7,269.74	314.13	-8,095.88	8,094.00	0.00	0.00	0.00
15,700.00	91.37	269.68	7,267.34	313.56	-8,195.85	8,193.97	0.00	0.00	0.00
15,800.00	91.37	269.68	7,264.94	313.00	-8,295.82	8,293.95	0.00	0.00	0.00
15,900.00	91.37	269.68	7,262.54	312.43	-8,395.79	8,393.92	0.00	0.00	0.00
16,000.00	91.37	269.68	7,260.14	311.87	-8,495.76	8,493.89	0.00	0.00	0.00
16,100.00	91.37	269.68	7,257.74	311.30	-8,595.73	8,593.86	0.00	0.00	0.00
16,200.00	91.37	269.68	7,255.34	310.74	-8,695.70	8,693.83	0.00	0.00	0.00
16,300.00	91.37	269.68	7,252.94	310.17	-8,795.67	8,793.80	0.00	0.00	0.00
16,400.00	91.37	269.68	7,250.54	309.60	-8,895.64	8,893.77	0.00	0.00	0.00
16,500.00	91.37	269.68	7,248.14	309.04	-8,995.61	8,993.74	0.00	0.00	0.00
16,600.00	91.37	269.68	7,245.74	308.47	-9,095.58	9,093.71	0.00	0.00	0.00
16,700.00	91.37	269.68	7,243.35	307.91	-9,195.55	9,193.69	0.00	0.00	0.00

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Shamrock 34 Fed State Com 122H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3309+25 @ 3334.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3309+25 @ 3334.00usft (Permit)
<b>Site:</b>	Shamrock 34 Fed State Com	<b>North Reference:</b>	Grid
<b>Well:</b>	Shamrock 34 Fed State Com 122H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	122H		
<b>Design:</b>	Plan #2		

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)
16,800.00	91.37	269.68	7,240.95	307.34	-9,295.52	9,293.66	0.00	0.00	0.00
16,900.00	91.37	269.68	7,238.55	306.78	-9,395.49	9,393.63	0.00	0.00	0.00
17,000.00	91.37	269.68	7,236.15	306.21	-9,495.46	9,493.60	0.00	0.00	0.00
17,100.00	91.37	269.68	7,233.75	305.64	-9,595.43	9,593.57	0.00	0.00	0.00
17,200.00	91.37	269.68	7,231.35	305.08	-9,695.40	9,693.54	0.00	0.00	0.00
17,300.00	91.37	269.68	7,228.95	304.51	-9,795.37	9,793.51	0.00	0.00	0.00
17,400.00	91.37	269.68	7,226.55	303.95	-9,895.34	9,893.48	0.00	0.00	0.00
17,500.00	91.37	269.68	7,224.15	303.38	-9,995.31	9,993.46	0.00	0.00	0.00
17,600.00	91.37	269.68	7,221.75	302.82	-10,095.28	10,093.43	0.00	0.00	0.00
17,622.33	91.37	269.68	7,221.21	302.69	-10,117.60	10,115.75	0.00	0.00	0.00
<b>02-LTP(SH34 122H)</b>									
17,700.00	91.37	269.68	7,219.35	302.25	-10,195.25	10,193.40	0.00	0.00	0.00
17,712.55	91.37	269.68	7,219.05	302.18	-10,207.79	10,205.94	0.00	0.00	0.00
<b>TD: 17712.55' MD, 10205.94 VS, 7219.05' TVD - 03-PBHL(SH34 122H)</b>									

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
00-EON(SH34 122H) - hit/miss target - Shape - Point	0.00	0.00	6,400.00	361.00	255.56	588,670.27	595,867.22	32.61818043	-104.15622579
03-PBHL(SH34 122H) - plan hits target center - Point	0.00	0.00	7,219.05	302.18	-10,207.79	588,611.45	585,403.87	32.61806207	-104.19020995
02-LTP(SH34 122H) - plan misses target center by 0.13usft at 17622.33usft MD (7221.21 TVD, 302.69 N, -10117.60 E) - Point	0.00	0.00	7,221.21	302.82	-10,117.60	588,612.09	585,494.07	32.61806350	-104.18991700
01-FTP(SH34 122H) - plan misses target center by 209.60usft at 7400.00usft MD (7323.43 TVD, 359.94 N, 65.10 E) - Point	0.00	0.00	7,479.00	361.05	205.55	588,670.32	595,817.22	32.61818080	-104.15638820

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
100.00	100.00	Rustler		0.00		
352.00	352.00	Top of Salt		0.00		
677.00	677.00	Base of Salt		0.00		
954.00	954.00	Yates		0.00		
2,516.91	2,514.00	Capitan		0.00		
3,052.71	3,047.00	DLWR Mnt. Group		0.00		
3,833.79	3,824.00	Lower Brushy Canyon		0.00		
4,195.68	4,184.00	Bone Spring Lime		0.00		
6,455.96	6,434.00	1st Bone Spring SD		0.00		
6,677.96	6,656.00	2nd Bone Spring LM		0.00		
7,208.10	7,174.00	2nd Bone Spring SD		0.00		

<b>Database:</b>	EDM 5000.14 Single User Db	<b>Local Co-ordinate Reference:</b>	Well Shamrock 34 Fed State Com 122H
<b>Company:</b>	Colgate Energy	<b>TVD Reference:</b>	3309+25 @ 3334.00usft (Permit)
<b>Project:</b>	Eddy County, NM (N83-NME)	<b>MD Reference:</b>	3309+25 @ 3334.00usft (Permit)
<b>Site:</b>	Shamrock 34 Fed State Com	<b>North Reference:</b>	Grid
<b>Well:</b>	Shamrock 34 Fed State Com 122H	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	122H		
<b>Design:</b>	Plan #2		

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,918.80	6,896.84	361.00	255.56	KOP: 6918.80' MD, -257.57 VS, 6896.84' TVD
7,834.80	7,469.57	357.71	-333.39	EOC: 7834.80' MD, 331.38 VS, 7469.57' TVD
9,984.25	7,409.56	345.71	-2,481.97	Start Drop -2.00
12,505.11	7,344.00	331.64	-5,001.93	Start DLS 2.00 TFO -177.91
17,712.55	7,219.05	302.18	-10,207.79	TD: 17712.55' MD, 10205.94 VS, 7219.05' 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**

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## 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**

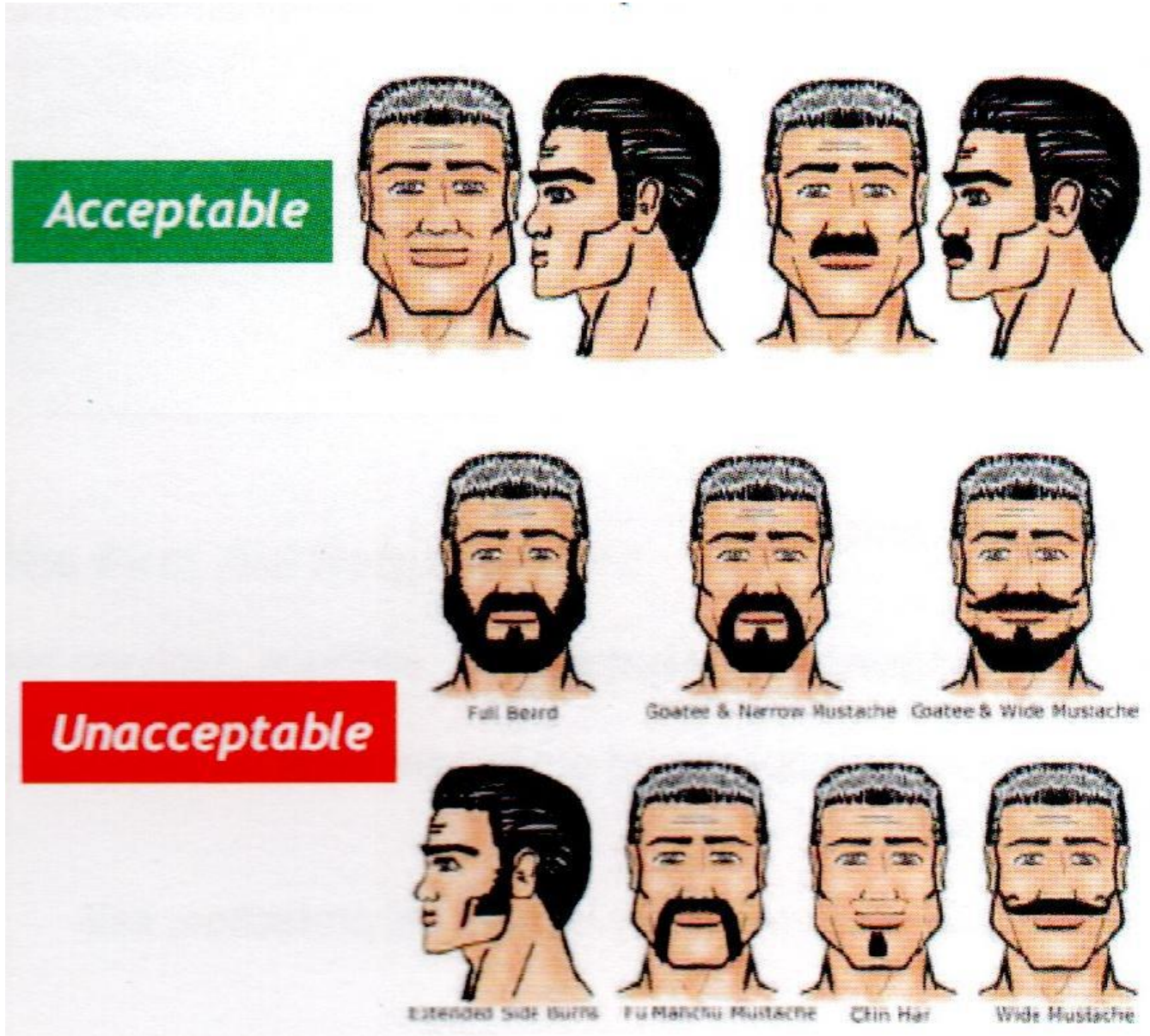
***DO NOT PANIC!!!***

**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.



## SITE MAP



SCALE 1" = 100'

### DIRECTIONS TO LOCATION

FROM CR. 206 AND CR. 237 GO NORTH ON CR. 206 3.9 MILES, TURN RIGHT AND GO SOUTHEAST 0.75 MILES, TURN RIGHT AND GO SOUTH 0.38 MILES, TURN LEFT AND GO EAST 0.35 MILES, TURN RIGHT AND GO SOUTH AND EAST 0.8 MILES, TURN LEFT AND GO NORTHEAST 0.6 MILES, BEND RIGHT AND GO SOUTHEAST 0.45 MILES, BEND LEFT AND GO 0.4 MILES TO A ROAD SURVEY AND FOLLOW THIS ROAD NORTH 624' TO THE SOUTHEAST PAD CORNER FOR THIS LOCATION.

I, FILMON F. SARAMILLO, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR CERTIFY THAT I DIRECTED AND WAS RESPONSIBLE FOR THIS SURVEY, THAT THIS IS A TRUE AND CORRECT STATEMENT OF MY KNOWLEDGE AND BELIEF, AND AS SURVEYOR I HAVE MET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

FILMON F. JARAVILLAS RES. 1979

*JUNE 4, 2020*

*SURVEY NO. 7985B*

MADRON SURVEYING, INC.

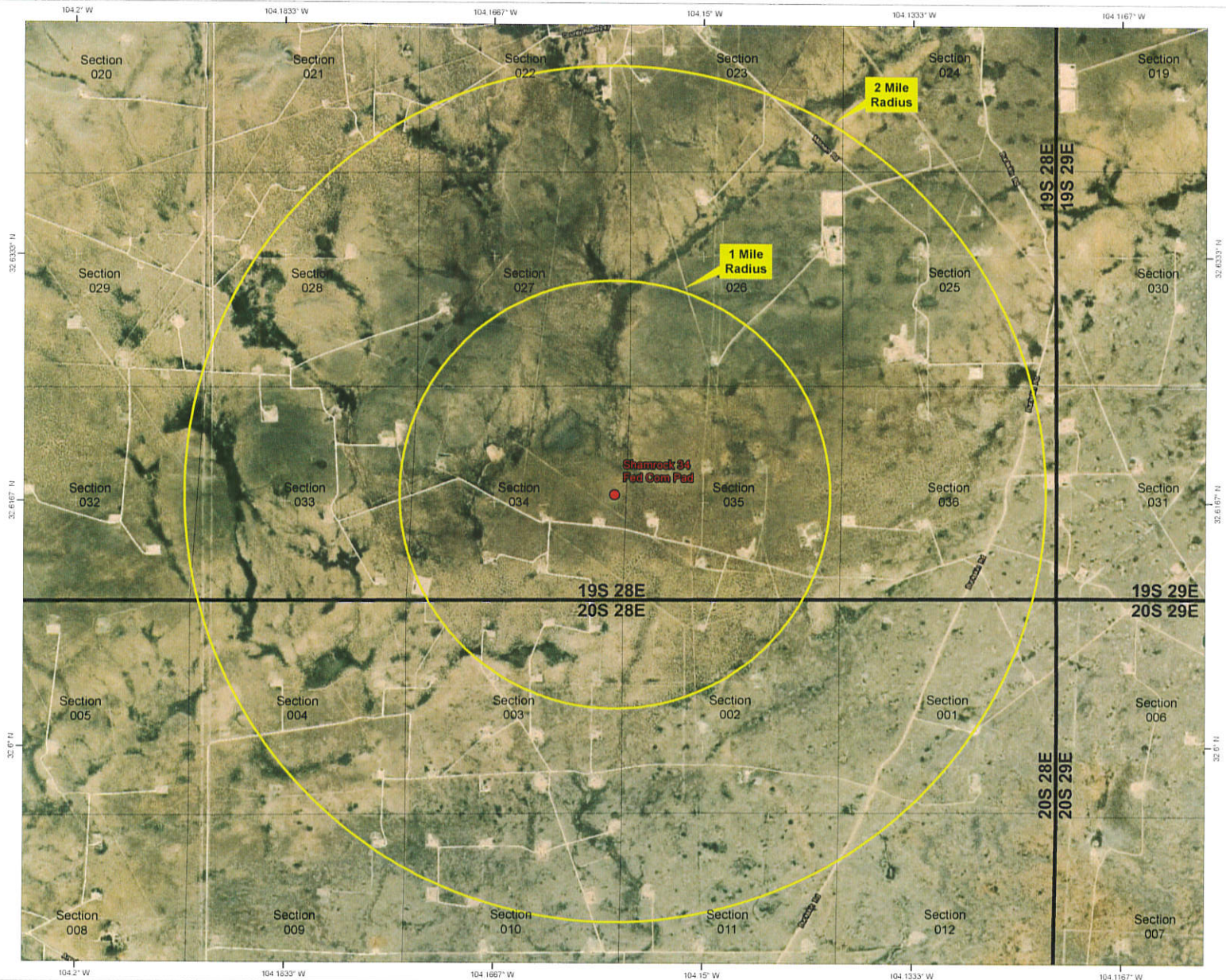
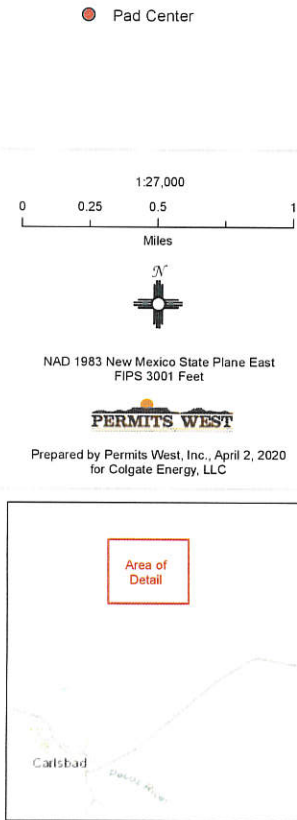
301 SOUTH CANAL  
(575) 234-3341

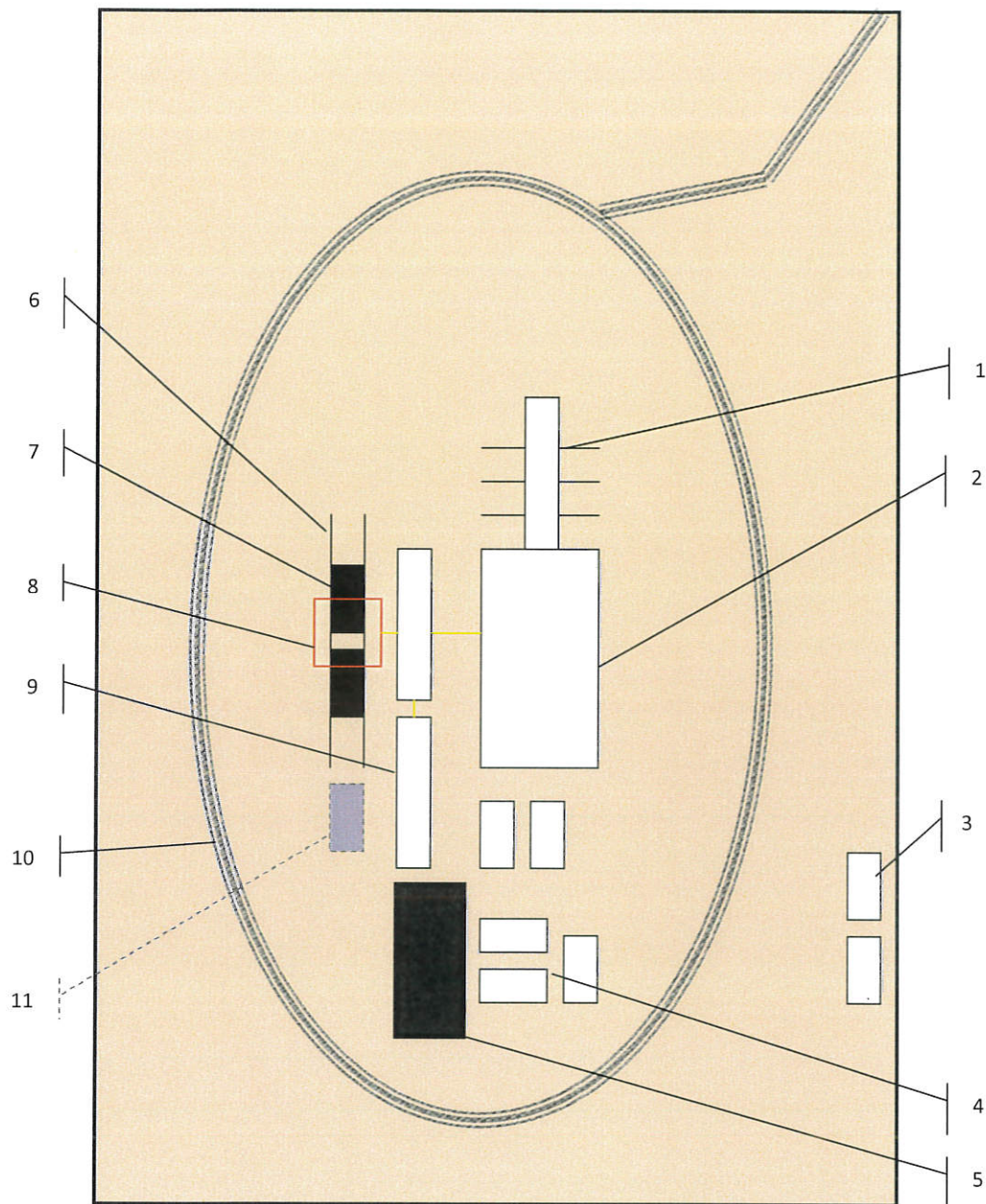
301 SOUTH CANAL  
(575) 234-3341 *CARLSBAD, NEW MEXICO*

Colgate Energy, LLC

Shamrock 34 Fed Com  
122H & 132H  
H2S Contingency Plan:  
Radius Map

Section 34, Township 19S, Range 29E  
Eddy County, New Mexico





**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

