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

5. Lease Serial No.

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☐ DRILL ☐ REENTER

1b. Type of Well: ☐ Oil Well ☐ Gas Well ☐ Other

1c. Type of Completion: ☐ Hydraulic Fracturing ☐ Single Zone ☐ Multiple Zone

7. If Unit or CA Agreement, Name and No.

8. Lease Name and Well No.

[318010]

2. Name of Operator PERMIAN RESOURCES OPERATING, LLC

9. API Well No.

30-025-51621

[372165]

3a. Address	3b. Phone No. *(include area code)*	10. Field and Pool, or Exploratory **[96434]**

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface

At proposed prod. zone

11. Sec., T. R. M. or Blk. and Survey or Area

14. Distance in miles and direction from nearest town or post office*	12. County or Parish	13. State

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No of acres in lease	17. Spacing Unit dedicated to this well

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	19. Proposed Depth	20. BLM/BIA Bond No. in file

21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22. Approximate date work will start*	23. Estimated duration

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.
2. A Drilling Plan.
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).
5. Operator certification.
6. Such other site specific information and/or plans as may be requested by the BLM.

25. Signature	Name *(Printed/Typed)*	Date

Title

Approved by *(Signature)*	Name *(Printed/Typed)*	Date

Title	Office

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.

NGMP Rec 06/15/2023

KZ
06/15/2023

SL

APPROVED WITH CONDITIONS

(Continued on page 2)

*(Instructions on page 2)

Approval Date: 05/31/2023

PECOS DISTRICT
DRILLING CONDITIONS OF APPROVAL

OPERATOR'S NAME:	**Centennial**
LEASE NO.:	**NMNM126971**
LOCATION:	Section 21, T.24 S., R.34 E., NMPM
COUNTY:	Lea County, New Mexico

WELL NAME & NO.:	Raider Fed Com 102H
SURFACE HOLE FOOTAGE:	355'/S & 1730'/E
BOTTOM HOLE FOOTAGE	100'/N & 2308'/E

COA

H2S	○ Yes	◉ No	
Potash	◉ None	○ Secretary	○ R-111-P
Cave/Karst Potential	◉ Low	○ Medium	○ High
Cave/Karst Potential	○ Critical		
Variance	○ None	◉ Flex Hose	○ Other
Wellhead	○ Conventional	◉ Multibowl	○ Both
Wellhead Variance	○ Diverter		
Other	☐ 4 String	☐ Capitan Reef	☐ WIPP
Other	☑ Fluid Filled	☐ Pilot Hole	☐ Open Annulus
Cementing	☐ Contingency Cement Squeeze	☐ EchoMeter	☐ Primary Cement Squeeze
Special Requirements	☐ Water Disposal	☑ COM	☐ Unit
Special Requirements	☐ Batch Sundry		
Special Requirements Variance	☐ Break Testing	☑ Offline Cementing	☐ Casing Clearance

A. HYDROGEN SULFIDE

Hydrogen Sulfide (H2S) monitors shall be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the Hydrogen Sulfide area shall meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, provide measured values and formations to the BLM.

B. CASING

1. The **13-3/8** inch surface casing shall be set at approximately **1325** feet (a minimum of 25 feet (Lea County) into the Rustler Anhydrite, above the salt, and below usable fresh water) and cemented to the surface. The surface hole shall be **17 1/2** inch in diameter. **Excess calculates to 14%. Additional cement maybe required.**

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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.

Intermediate casing must be kept 1/3rd fluid filled to meet BLM minimum collapse requirement.

2. The minimum required fill of cement behind the **9-5/8** inch intermediate casing 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 tail cement slurry due to cave/karst.

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 **13-3/8** inch surface casing. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **5000 (5M)** psi.

Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.

a. 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.
b. Manufacturer representative shall install the test plug for the initial BOP test.

c. 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.
d. 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.
- The operator will submit an as-drilled survey well plat of the well completion, but are not limited to, those specified in Onshore Order 1 and 2.
- 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.

Offline Cementing

Contact the BLM prior to the commencement of any offline cementing procedure.

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) 689-5981

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. Operator is approved 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. Operator is approved 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 2nd 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 doghouse 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.

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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 cement), 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 cement plug. The BOPE test can be initiated after bumping the cement plug with the casing valve open. (only applies to single stage cement jobs, prior to the cement setting up.)

    c. The tests shall be done by an independent service company utilizing a test plug not a cup or J-packer and can be initiated immediately with the casing valve open. 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.

ZS 5/22/2023

Approval Date: 05/31/2023

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Operator Certification Data Report

06/15/2023

Operator

I hereby certify that I, or someone under my direct supervision, have inspected the drill site and access route proposed herein; that I am familiar with the conditions which currently exist; that I have full knowledge of state and Federal laws applicable to this operation; that the statements made in this APD package are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed in conformity with this APD package and the terms and conditions under which it is approved. I also certify that I, or the company I represent, am responsible for the operations conducted under this application. These statements are subject to the provisions of 18 U.S.C. 1001 for the filing of false statements.

NAME: MEGHAN TWELE **Signed on:** 09/27/2022

Title: Sr Regulatory Analyst

Street Address: 1001 17TH STREET SUITE 1800

City: DENVER **State:** CO **Zip:** 80202

Phone: (720)499-1531

Email address: MEGHAN.TWELE@CDEVINC.COM

Field

Representative Name:

Street Address:

City: **State:** **Zip:**

Phone:

Email address:

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BUREAU OF LAND MANAGEMENT

Application Data
06/15/2023

APD ID: 10400088284 **Submission Date:** 09/27/2022

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes
Show Final Text

Section 1 - General

APD ID: 10400088284 **Tie to previous NOS?** N **Submission Date:** 09/27/2022

BLM Office: Carlsbad **User:** MEGHAN TWELE **Title:** Sr Regulatory Analyst

Federal/Indian APD: FED **Is the first lease penetrated for production Federal or Indian?** FED

Lease number: NMNM126971 **Lease Acres:**

Surface access agreement in place? **Allotted?** **Reservation:**

Agreement in place? NO **Federal or Indian agreement:**

Agreement number:

Agreement name:

Keep application confidential? Y

Permitting Agent? NO **APD Operator:** CENTENNIAL RESOURCE PRODUCTION LLC

Operator letter of

Operator Info

Operator Organization Name: CENTENNIAL RESOURCE PRODUCTION LLC

Operator Address: 1001 17TH STREET, SUITE 1800 **Zip:** 80202

Operator PO Box:

Operator City: DENVER **State:** CO

Operator Phone: (720)499-1400

Operator Internet Address:

Section 2 - Well Information

Well in Master Development Plan? NO **Master Development Plan name:**

Well in Master SUPO? NO **Master SUPO name:**

Well in Master Drilling Plan? NO **Master Drilling Plan name:**

Well Name: RAIDER FEDERAL COM **Well Number:** 102H **Well API Number:**

Field/Pool or Exploratory? Field and Pool **Field Name:** AVALON A **Pool Name:** ANTELOPE RIDGE; BONE SPRING

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Is the proposed well in an area containing other mineral resources? NATURAL GAS,OIL

Is the proposed well in a Helium production area? N **Use Existing Well Pad?** Y **New surface disturbance?** N

Type of Well Pad: MULTIPLE WELL **Multiple Well Pad Name:** RAIDER FEDERAL COM SWSE **Number:** 1

Well Class: HORIZONTAL **Number of Legs:** 1

Well Work Type: Drill

Well Type: OIL WELL

Describe Well Type:

Well sub-Type: INFILL

Describe sub-type:

Distance to town: 20 Miles **Distance to nearest well:** 30 FT **Distance to lease line:** 355 FT

Reservoir well spacing assigned acres Measurement: 320 Acres

Well plat: Raider_Fed_Com_102H_Plat_Lease_Plat_SBMT_20220926152748.pdf

Raider_Fed_Com_102H_LPP_SBMT_20220926152756.pdf

Well work start Date: 06/30/2023 **Duration:** 25 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number: 23782 **Reference Datum:** GROUND LEVEL

Wellbore	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD	Will this well produce from this
SHL Leg #1	355	FSL	1730	FEL	24S	24E	21	Aliquot SWSE	32.19677	-103.471963	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 126971	3500	0	0	N
KOP Leg #1	355	FSL	1730	FEL	24S	34E	21	Aliquot SWSE	32.19677	-103.471963	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 126971	-5379	8929	8879	N

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Wellbore	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD	Will this well produce from this
PPP Leg #1-1	100	FSL	330	FWL	34S	34E	21	Aliquot SWSE	32.196071	-103.47383	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 126971	-5857	9679	9357	Y
PPP Leg #1-2	0	FSL	2303	FEL	34S	34E	16	Aliquot SWSE	32.196071	-103.47383	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 126971	-5857	14858	9357	Y
EXIT Leg #1	100	FNL	2308	FEL	24S	34E	16	Aliquot NWNE	32.22453	-103.473841	LEA	NEW MEXICO	NEW MEXICO	S	STATE	-5857	20035	9357	Y
BHL Leg #1	100	FNL	2308	FEL	24S	34E	16	Aliquot NWNE	32.22453	-103.473841	LEA	NEW MEXICO	NEW MEXICO	S	STATE	-5857	20035	9357	N

AFMSS

U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT

Drilling Plan Data Report

06/15/2023

APD ID: 10400088284 **Submission Date:** 09/27/2022

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Well Type: OIL WELL **Well Work Type:** Drill

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Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical	Measured Depth	Lithologies	Mineral Resources	Producing Formatio
9247766	LAMAR	3524	5340	5340	SANDSTONE	NONE	N
9247767	BELL CANYON	-1861	5385	5385	SANDSTONE	NATURAL GAS, OIL	N
9247768	CHERRY CANYON	-2780	6304	6304	SANDSTONE	NATURAL GAS, OIL	N
9247769	BRUSHY CANYON	-4274	7798	7798	SANDSTONE	NATURAL GAS, OIL	N
9247770	BONE SPRING LIME	-5637	9161	9161	OTHER : Carbonate	NATURAL GAS, OIL	N
9247771	AVALON SAND	-5703	9227	9227	SHALE	CO2, NATURAL GAS, OIL	Y
9247772	BONE SPRING 1ST	-6713	10237	10237	SANDSTONE	NATURAL GAS, OIL	N
9247773	BONE SPRING 2ND	-7276	10800	10800	OTHER, SHALE : Carbonate	NATURAL GAS, OIL	Y

Section 2 - Blowout Prevention

Pressure Rating (PSI): 5M **Rating Depth:** 9356

Equipment: The BOP and related equipment will meet or exceed the requirements of a 5M-psi system as set forth in On Shore Order No. 2. See attached BOP Schematic. A. Casinghead: 13 5/8 5,000 psi SOW x 13 5,000 psi WP Intermediate Spool: 13 5,000 psi WP x 11 5,000 psi WP Tubinghead: 11 5,000 psi WP x 7 1/16" 15,000 psi WP B. Minimum Specified Pressure Control Equipment Annular preventer One Pipe ram, One blind ram Drilling spool, or blowout preventer with 2 side outlets. Choke side will be a 3-inch minimum diameter, kill line shall be at least 2-inch diameter 3 inch diameter choke line 2 3 inch choke line valves 2 inch kill line 2 chokes with 1 remotely controlled from rig floor (see Figure 2) 2 2 inch kill line valves and a check valve Upper kelly cock valve with handle available When the expected pressures approach working pressure of the system, 1 remote kill line tested to stack pressure (which shall run to the outer edge of the substructure and be unobstructed) Lower kelly cock valve with handle available Safety valve(s) and subs to fit all drill string connections in use Inside BOP or float sub available Pressure gauge on choke manifold All BOPE connections subjected to well pressure shall be flanged, welded, or clamped Fill-up line above the uppermost preventer. C. Auxiliary Equipment Audio and visual mud monitoring equipment shall be placed to detect volume changes indicating loss or gain of circulating fluid volume. (OOS 1, III.C.2) Gas Buster will be used below intermediate casing setting depth. Upper and lower kelly cocks with handles, safety valve and subs to fit all drill string connections and a pressure gauge installed on choke manifold.

Requesting Variance? YES

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Variance request: Flex hose, well control and offline cement variances, see attachments in section 8.

Testing Procedure: The BOP test shall be performed before drilling out each section and will occur at a minimum: a. when initially installed b. whenever any seal subject to test pressure is broken c. following related repairs d. at 30 day intervals e. checked daily as to mechanical operating conditions. The ram type preventer(s) will be tested using a test plug to 250 psi (low) and 5,000 psi (high) (casinghead WP) with a test plug upon its installation onto the 13 surface casing. If a test plug is not used, the ram type preventer(s) shall be tested to 70% of the minimum internal yield pressure of the casing. The annular type preventer(s) shall be tested to 50% of its working pressure. Pressure will be maintained for at least 10 minutes or until provisions of the test are met, whichever is longer. A Sundry Notice (Form 3160 5), along with a copy of the BOP test report, shall be submitted to the local BLM office within 5 working days following the test. If the bleed line is connected into the buffer tank (header), all BOP equipment including the buffer tank and associated valves will be rated at the required BOP pressure. The BLM office will be provided with a minimum of four (4) hours notice of BOP testing to allow witnessing. The BOP Configuration, choke manifold layout, and accumulator system, will be in compliance with Onshore Order 2 for a 5,000 psi system. A remote accumulator will be used. Pressures, capacities, and specific placement and use of the manual and/or hydraulic controls, accumulator controls, bleed lines, etc., will be identified at the time of the BLM 'witnessed BOP test. Any remote controls will be capable of both opening and closing all preventers and shall be readily accessible

Choke Diagram Attachment:

10M_Choke_Manifold_20220921134231.pdf

BOP Diagram Attachment:

BOP_Schematic_CoFlex_Choke_5K_20220921134241.pdf

CDEV_Well_Control_Plan_Bonesprings_20210901163333_20220927111541.pdf

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	CONDUCTOR	26	20.0	NEW	API	N	0	120	0	120	0	-120	120	H-40	94	OTHER - WELD						
2	SURFACE	17.5	13.375	NEW	API	N	0	1325	0	1325	0	-1325	1325	J-55	54.5	OTHER - BTC	1.73	4.17	DRY	11.81	DRY	11.81
3	INTERMEDIATE	12.25	9.625	NEW	API	N	0	5365	0	5365	3461	-5365	5365	J-55	40	LT&C	1.3	1.42	DRY	2.42	DRY	2.42
4	PRODUCTION	8.75	5.5	NEW	API	N	0	8929	0	8879	3461	-8879	8929	OTHER	20	OTHER - TCBC-HT	2.41	2.74	DRY	3.61	DRY	3.61
5	PRODUCTION	8.5	5.5	NEW	API	N	8929	19955	8879	9356	-8879	-9356	11026	OTHER	20	OTHER - TCBC-HT	2.29	2.6	DRY	67.19	DRY	67.19

Casing Attachments

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Casing Attachments

Casing ID: 1 **String** CONDUCTOR

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Casing ID: 2 **String** SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CASING_ASSUMPTIONS_WORKSHEET_20220921134816.pdf

Casing ID: 3 **String** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CASING_ASSUMPTIONS_WORKSHEET_20220921134515.pdf

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Casing Attachments

Casing ID: 4 **String** PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CASING_ASSUMPTIONS_WORKSHEET_20220921134619.pdf

Technical_Data_Sheet_HIS_TCBC_HT_5.5_20__P110RY_20220921134626.pdf

Casing ID: 5 **String** PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

CASING_ASSUMPTIONS_WORKSHEET_20220921134759.pdf

Technical_Data_Sheet_HIS_TCBC_HT_5.5_20__P110RY_20220921134804.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
CONDUCTOR	Lead		0	120	121	1.49	12.9	181		Grout	Bentonite 4% BWOC, Cellophane #sx, CaCl2 2% BWOC
SURFACE	Lead		0	825	250	1.8	13.5	1146	100	Class C Premium	Premium Gel Bentonite 4%, C-45 Econolite 0.25%,

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
											Phenoseal 0.25#/sk, CaCl 1%, Defoamer C-41P 0.75%
SURFACE	Tail		825	1325	445	1.34	14.8	695	100	Class C Premium	C-45 Econolite 0.10%, CaCl 1.0%
INTERMEDIATE	Lead		0	4865	665	3.42	10.7	3178	100	TXI Lightweight	Salt 1.77/sk, C-45 Econolite 2.25%, STE 6.00%, Citric Acid 0.18%, C-19 0.10%, CSA-1000 0.20%, C-530P 0.30%, CTB-15 LCM 7#/sk, Gyp Seal 8#/sk
INTERMEDIATE	Tail		4865	5365	210	1.34	14.8	188	20	Class C Premium	C-45 Econolite 0.10%, Citric acid 0.05%, C503P 0.25%
PRODUCTION	Lead		0	8929	876	3.41	10.6	2989	30	TXI Lightweight	Salt 8.98#/sk, STE 6.00%, Citric acid 0.20%, CSA-1000 0.23%, C47B 0.10%, C-503P 0.30%
PRODUCTION	Tail		8929	1955	2454	1.24	14.2	3043	25	50:25:25 Class H: Poz: CPO18	Citric acid 0.03%, CSA-1000 0.05%, C47B 0.25%, C-503P 0.30%
PRODUCTION	Lead		0	8929	876	3.41	10.6	2989	30	TXI Lightweight	Salt 8.98#/sk, STE 6.00%, Citric acid 0.20%, CSA-1000 0.23%, C47B 0.10%, C-503P 0.30%
PRODUCTION	Tail		8929	1955	2454	1.24	14.2	3043	25	50:25:25 Class H: Poz: CPO18	Citric acid 0.03%, CSA-1000 0.05%, C47B 0.25%, C-503P 0.30%

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

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: Sufficient quantities of mud materials will be on the well site at all times for the purpose of assuring well control and maintaining wellbore integrity. Surface interval will employ fresh water mud. The intermediate hole will utilize a diesel emulsified brine fluid to inhibit salt washout and prevent severe fluid losses. The production hole will employ oil base fluid to inhibit formation reactivity and of the appropriate density to maintain well control.
Describe the mud monitoring system utilized: Centrifuge separation system. Open tank monitoring with EDR will be used for drilling fluids and return volumes. Open tank monitoring will be used for cement and cuttings return volumes. Mud properties will be monitored at least every 24 hours using industry accepted mud check practices.

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	1325	OTHER : FW	8.6	9.5							
1325	5365	OTHER : Brine	9	10							
0	19555	OTHER : Brine/OBM	8.8	10							

Section 6 - Test, Logging, Coring

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

Will utilize MWD/LWD (Gamma ray logging) from intermediate hole to TD of the well.

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

GAMMA RAY LOG,DIRECTIONAL SURVEY,

Coring operation description for the well:

N/A

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 4865 **Anticipated Surface Pressure:** 2806

Anticipated Bottom Hole Temperature(F): 170

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

Describe:

Contingency Plans geoharzards description:

Contingency Plans geohazards

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations

H2S_Contingency_Plan_Raider_Fed_Com_102H___103H_20220921135636.pdf

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

Raider_Federal_Com_102H___Plan_1_08_17_22_20220921142419.pdf
Raider_Federal_Com_102H___Plan_1_08_17_22_AC_Report_20220921142425.pdf

Other proposed operations facets description:

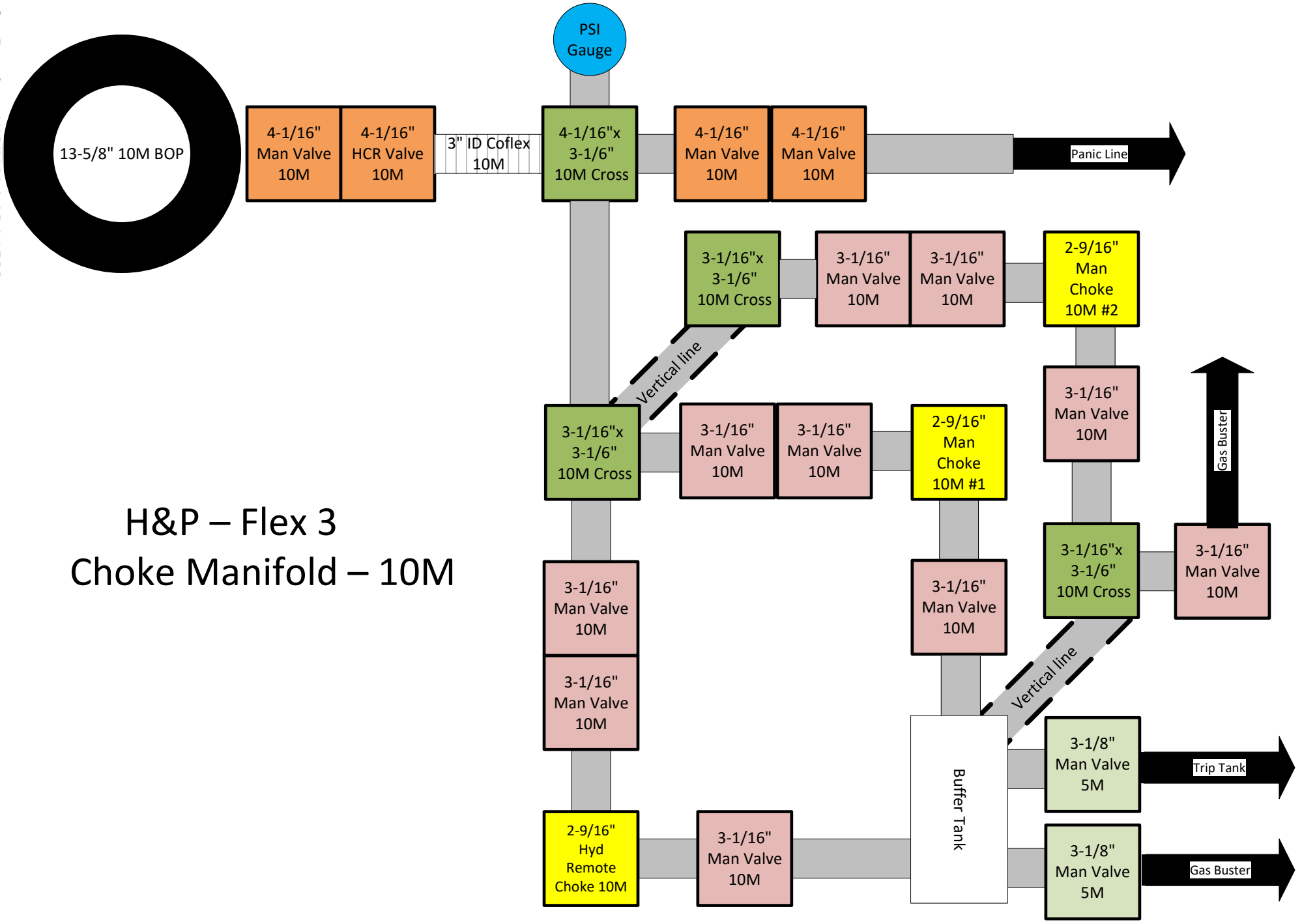
Other proposed operations facets attachment:

CDEV_Multi_Bowl_Procedure_Raider_Fed_Com_102H_20220921141012.pdf
Raider_Fed_Com_102H_Geoprog_20220921141021.pdf
Raider_Fed_Com_102H_Batch_Setting___Aug_2022_20220921141054.pdf
Raider_Fed_Com_102H_WBD__Proposed__20220921141158.pdf

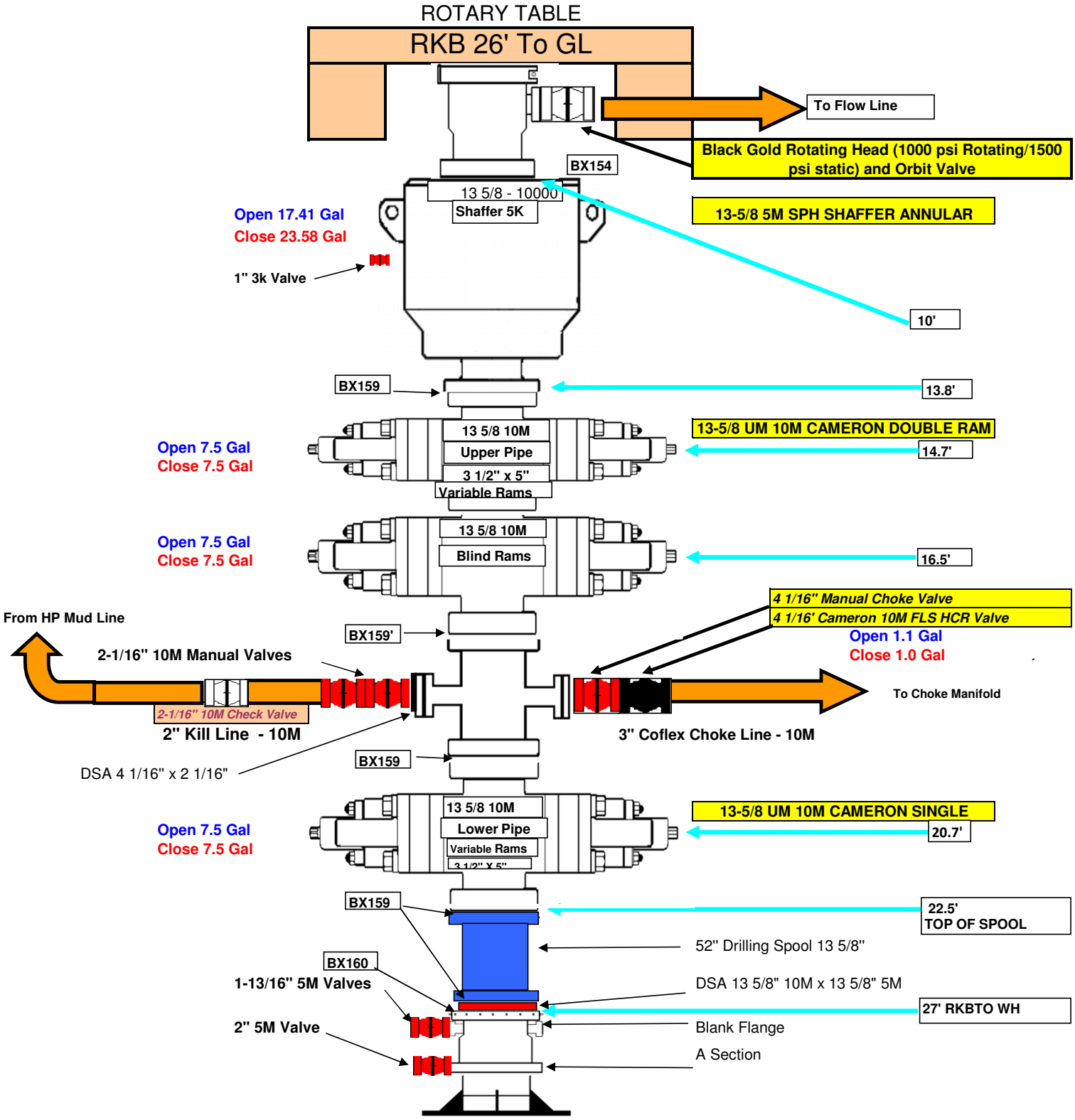
Other Variance attachment:

Flex_Hose_Variance_Request___Raider_Fed_Com_102H_20220921141242.pdf
Raider_Fed_Com_102H_Offline_Cementing_Procedure___Aug_2022_20220921142511.pdf
CDEV_Well_Control_Plan_Bonesprings_20210901163333_20220927111349.pdf

H&P – Flex 3
Choke Manifold – 10M



H&P Rig


ROTARY TABLE
RKB 26' To GL
To Flow Line
Black Gold Rotating Head (1000 psi Rotating/1500 psi static) and Orbit Valve
BX154
13 5/8 - 10000
Shaffer 5K
13-5/8 5M SPH SHAFFER ANNULAR
Open 17.41 Gal
Close 23.58 Gal
1" 3k Valve
10'
BX159
13.8'
13 5/8 10M
Upper Pipe
3 1/2" x 5"
Variable Rams
13-5/8 UM 10M CAMERON DOUBLE RAM
14.7'
Open 7.5 Gal
Close 7.5 Gal
13 5/8 10M
Blind Rams
16.5'
Open 7.5 Gal
Close 7.5 Gal
4 1/16" Manual Choke Valve
4 1/16' Cameron 10M FLS HCR Valve
Open 1.1 Gal
Close 1.0 Gal
From HP Mud Line
BX159'
2-1/16" 10M Manual Valves
2-1/16" 10M Check Valve
2" Kill Line - 10M
To Choke Manifold
3" Coflex Choke Line - 10M
DSA 4 1/16" x 2 1/16"
BX159
13 5/8 10M
Lower Pipe
Variable Rams
3 1/2" X 5"
13-5/8 UM 10M CAMERON SINGLE
20.7'
Open 7.5 Gal
Close 7.5 Gal
BX159
22.5'
TOP OF SPOOL
52" Drilling Spool 13 5/8"
BX160
1-13/16" 5M Valves
DSA 13 5/8" 10M x 13 5/8" 5M
27' RKBTO WH
2" 5M Valve
Blank Flange
A Section

Centennial Resource Development - Well Control Plan

A. Component and Preventer Compatibility Table

Component	OD (inches)	Preventer	RWP
Drillpipe	5	Upper VBR: 3.5 – 5.5 Lower VBR: 3.5 – 5.5	10M
Heavyweight Drillpipe	5	Upper VBR: 3.5 – 5.5 Lower VBR: 3.5 – 5.5	10M
Drill collars and MWD tools	6 ¾	Annular	5M
Mud Motor	6 ¾	Annular	5M
Production Casing	5-1/2	Upper VBR: 3.5 – 5.5 Lower VBR: 3.5 – 5.5	10M
All	0 – 13 5/8	Annular	5M
Open-hole	-	Blind rams	10M

VBR = Variable Bore Rams

RWP = Rated Working Pressure

MWD = Measurement While Drilling (directional tools)

B. Well Control Procedures

I. General Procedures While Drilling:

1. Sound alarm (alert crew).
2. Space out drill-string.
3. Shut down pumps and stop rotary.
4. Open HCR
5. Shut-in well – utilizing upper VBRs.
6. Close choke
7. Confirm shut-in.
8. Notify rig manager and Centennial company representative.
9. Call Centennial drilling engineer
10. Read and record
    - I. Shut-in drillpipe pressure (SIDPP) and shut-in casing pressure (SCIP).
    - II. Pit gain
    - III. Time
11. Regroup, identify forward plan

II. General Procedure While Tripping

1. Sound alarm (alert crew).
2. Stab full opening safety valve and close
3. Space out drillstring.
4. Open HCR
5. Shut-in well – utilizing upper VBRs
6. Close choke
7. Confirm shut-in.
8. Notify rig manager and Centennial company representative.
9. Call Centennial drilling engineer
10. Read and record:
    I. SIDPP AND SICP
    II. Pit gain
    III. Time
11. Regroup and identify forward plan.

III. General Procedure While Running Casing

1. Sound alarm (alert crew)
2. Stab full opening safety valve and close
3. Space out string.
4. Open HCR
5. Shut-in well – utilizing upper VBRs.
6. Close choke
7. Confirm shut-in.
8. Notify rig manager and Centennial company representative.
9. Call Centennial drilling engineer
10. Read and record:
    I. SIDPP AND SICP
    II. Pit gain
    III. Time
11. Regroup and identify forward plan.

IV. General Procedure With No Pipe In Hole (Open Hole)

1. Sound alarm (alert crew)
2. Open HCR
3. Shut-in with blind rams
4. Close choke
5. Confirm shut-in
6. Notify rig manager and Centennial company representative.
7. Call Centennial drilling engineer
8. Read and record:
    I. SIDPP AND SICP
    II. Pit gain
    III. Time
9. Regroup and identify forward plan.

V. General Procedures While Pulling BHA Thru BOP Stack

1. **Prior to pulling last joint of drillpipe thru stack**:
   - I. Perform flow check, if flowing
     - a. Sound alarm, alert crew
     - b. Stab full opening safety valve and close
     - c. Space out drillstring with tool joint just beneath the upper pipe ram.
     - d. Open HCR
     - e. Shut-in utilizing upper VBRs
     - f. Close choke
     - g. Confirm shut-in
     - h. Notify rig manager and Centennial company representative.
     - i. Call Centennial drilling engineer
     - j. Read and record:
       - i. SIDPP and SICP
       - ii. Pit gain
       - iii. Time
   - II. Regroup and identify forward plan

2. **With BHA in the BOP stack and compatible ram preventer and pipe combo immediately available**:
   - a. Sound alarm, alert crew
   - b. Stab full opening safety valve and close
   - c. Space out drillstring with tool joint just beneath the upper pipe ram.
   - d. Open HCR
   - e. Shut-in utilizing upper VBRs
   - f. Close choke
   - g. Confirm shut-in
   - h. Notify rig manager and Centennial company representative.
   - i. Call Centennial drilling engineer
   - j. Read and record:
     - i. SIDPP and SICP
     - ii. Pit gain
     - iii. Time
   - II. Regroup and identify forward plan

3. **With BHA in the BOP stack and no compatible ram preventer and pipe combo immediately availiable**:
    I. Sound alarm, alert crew.
    II. If possible to pick up high enough, pull string clear of the stack and follow Open Hole (III) scenario.
    III. If impossible to pick up high enough to pull the string clear of the stack:
        a. Stab crossover, make up one joint/stand of drill pipe and full opening safety valve and close.
        b. Space out drillstring with tool joint just beneath the upper pipe ram.
        c. Open HCR
        d. Shut-in utilizing upper VBRs.
        e. Close choke
        f. Confirm shut-in
        g. Notify rig manager and Centennial company representative.
        h. Call Centennial drilling engineer
        i. Read and record:
            i. SIDPP and SICP
            ii. Pit gain
            iii. Time
    IV. Regroup and identify forward plan.

** **If annular is used to shut-in well and pressure builds to OR is expected to get to 50% of RWP, confirm space-out and swap to upper VBRs for shut-in.**

CASING ASSUMPTIONS WORKSHEET:

Centralizer Program:

Surface: - 3 welded bow spring centralizers, one on each of the bottom 3 joints, plus one on the shoe joint (4 minimum)
- No Cement baskets will be run

Production: - 1 welded bow spring centralizer on a stop ring 6' above float shoe
- 1 centralizer every other joint to the top of the tail cement
- 1 centralizer every 4 joints to 500' below the top of the lead cement
- The actual number and placement of centralizers will be determined from hole deviation and potential production zones. Centralizers will be run for maximum practical standoff and through all potential productive zones.

- All casing strings below the conductor shall be tested, prior to drilling out the casing shoe, to 0.22 psi/ft of casing string length or 1500 psi, whichever is greater, but not to exceed 70% of the internal yield pressure of the casing. If pressure declines more than 10 percent in 30 minutes, corrective action will be taken.

No freshly hard banded pipe will be rotated in the surface casing

- CENTENNIAL RESOURCE DEVELOPOMENT will not employ an air-drill rig for the surface casing. The casing shoe will be tested by drilling 5'-10' out from under the shoe and pressure testing to the maximum expected mud weight equivalent as shown in the mud program listed in the drilling plan.

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H.I.S.
HOUSTON INTERNATIONAL SPECIALTY, INC
PREMIUM CONNECTIONS

Size	5.5
Grade	P110 RY
Weight	20

TCBC-HT

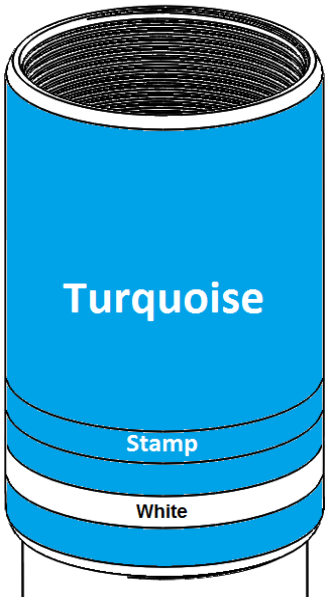
SeAH Steel

	Coupling and Pipe Dimensions (in)					
	Outer Diameter	Inner Diameter	Coupling Length	Make-up Loss	Wall Thickness	Drift Diameter
Coupling	6.300	5.383	8.250	4.125	0.361	4.653
Pipe		4.778				
Pin		4.778				

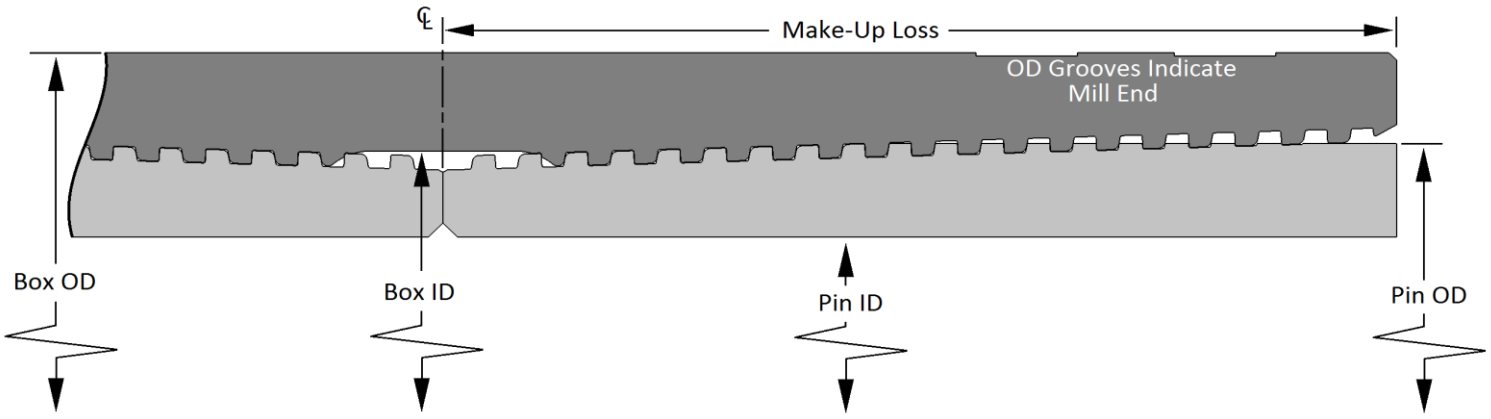
Torque Values (ft-lbs)				
Field End Make-Up			Max. Working Torque [1.]	Yield Torque
Minimum	Optimum [2.]	Maximum		
10,000	13,500	18,500	22,250	25,200

Yield Stress (x1000 lbs.)	
Tensile	Compressive
100%	100%

Maximum Pressure (psi)	
Internal	External
100%	100%



[1.] Max. Working Torque value is not to be exceeded during operation.
[2.] If Optimum Torque does not meet the Base of Triangle Stamp, M/U to the Base of Triangle.



*Data are for information purposes only. Though HIS has made efforts to ensure accuracy, HIS makes no warranty for loss or damage due to its use.

Rev 0

19996 Hickory Twig Way Spring, TX 77388
Phone: (281) 602-7550
Fax: (281) 602-7557

SeAH

5.5" 20# .361" P-110 Restricted Yield (RY)

Dimensions (Nominal)

Outside Diameter	5.500	in.
Wall	0.361	in.
Inside Diameter	4.778	in.
Drift	4.653	in.
Weight, T&C	20.000	lbs/ft
Weight, PE	19.830	lbs/ft

Performance Properties (Minimum)

Minimum Yield Strength	110000	psi
Maximum Yield Strength	125000	psi
Collapse, PE	11100	psi
Internal Yield Pressure		
PE	12630	psi
LTC	12360	psi
BTC	12360	psi
Yield Strength, Pipe Body	641	1000 lbs
Joint Strength		
LTC	548	1000 lbs
BTC	667	1000 lbs

CASING ASSUMPTIONS WORKSHEET:

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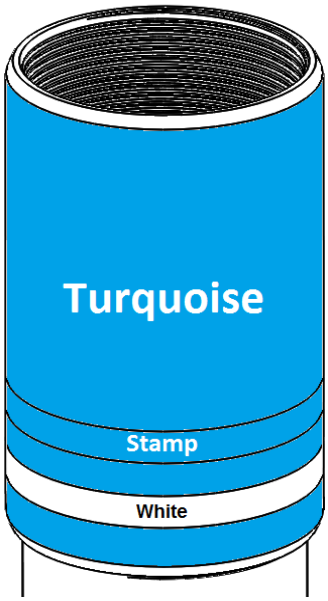

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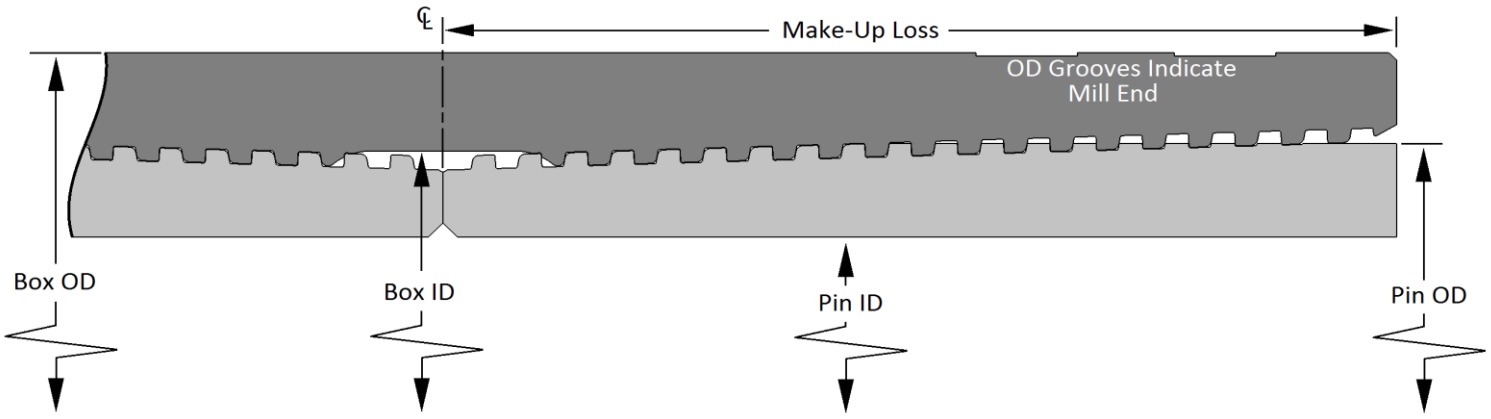

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Rev 0

19996 Hickory Twig Way Spring, TX 77388
Phone: (281) 602-7550
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SeAH

5.5" 20# .361" P-110 Restricted Yield (RY)

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Weight, T&C	20.000	lbs/ft
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Performance Properties (Minimum)

Minimum Yield Strength	110000	psi
Maximum Yield Strength	125000	psi
Collapse, PE	11100	psi
Internal Yield Pressure		
PE	12630	psi
LTC	12360	psi
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Yield Strength, Pipe Body	641	1000 lbs
Joint Strength		
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H_2S CONTINGENCY PLAN

FOR

CENTENNIAL RESOURCE PRODUCTION, LLC.

Raider Federal Com 102H & 103H

Lea County, New Mexico

07-18-2022
This plan is subject to updating

Table of Contents

Section 1.0 – Introduction

I. Purpose

The purpose of this contingency plan (Plan) is to provide Centennial Resource Production, LLC. (Centennial) with an organized plan of action for alerting and protecting Centennial employees, the general public, and any potential first responders prior to any intentional release or immediately following the accidental / unintentional release of a potentially hazardous volume / concentration of Hydrogen Sulfide Gas (H2S).

II. Scope & Applicability

This Plan applies to all planned, unplanned, uncontrolled and/or unauthorized releases of hazardous concentrations of H_2S or any associated hazardous byproducts of combustion, occurring at any Centennial owned or operated facilities including but not limited to: wells, flowlines, pipelines, tank batteries, production facilities, SWD facilities, compressor stations, gas processing plants, drilling / completions / workover operations, and any other applicable company owned property.

Section 2.0 - Plan Implementation

I. Activation Requirements

In accordance with the requirements of Bureau of Land Management Onshore Order #6 and NMAC 19.15.11, this Plan shall be activated in advance of any authorized, planned, unplanned, uncontrolled, or unauthorized release of a hazardous volume / concentration of H_2S gas, or SO^2, which could potentially adversely impact the workers, general public or the environment.

II. Emergency Evacuation

In the event of an unplanned, uncontrolled, or unauthorized release of a hazardous volume / concentration of H_2S gas, the first priority is to ensure the safety of the workers and general public. Upon discovery and subsequent determination of an applicable release, which cannot be quickly mitigated, immediately by using 911, notify local authorities to begin the process of alerting the general public, evacuate any residents within the Radius of Exposure (ROE), and limit any general public or employee access to any areas within the ROE of the affected facility.

III. Emergency Response Activities

The purpose of emergency response actions is to take steps to quickly mitigate / stop the ongoing release of the hazardous source of H_2S. Upon discovery of any hazardous release, immediately notify Centennial management to activate the Emergency Response Team (ERT). Once Centennial supervision arrives and assesses the situation, a work plan identifying the proper procedures shall be developed to stop the release.

Section 3.0 - Potential Hazardous Conditions & Response Actions

During a planned or unplanned release of H_2S, there are several hazardous conditions that are presented both to employees, the general public, and emergency responders. These specific hazardous conditions are identified in the tables below.

H2S OPERATING CONDITIONS – RESPONSE ACTIONS TO CONSIDER	✓
H_2S CONDITION 1: POTENTIAL DANGER TO LIFE AND HEALTH –> WARNING SIGN GREEN	
H_2S concentration <10 ppm detected by location monitors	❑
General Actions During Condition 1	❑
Notify Site Supervisor / Centennial Person-in-Charge (PIC) of any observed increase in ambient H_2S concentrations	❑
All personnel check safety equipment is in adequate working order & store in accessible location	❑
Sensitize crews with safety meetings.	❑
Limit visitors and non-essential personnel on location	❑
Continuously monitor H_2S concentrations and check calibration of sensors	❑
Ensure H_2S scavenger is on location.	❑
H_2S CONDITION 2: MODERATE DANGER TO LIFE AND HEALTH → WARNING SIGN YELLOW	
H_2S concentration >10 ppm and < 30 ppm in atmosphere detected by location monitors:	❑
General Actions During Condition 2	❑
Sound H_2S alarm and/or display yellow flag.	❑
Account for on-site personnel	❑
Upon sounding of an area or personal H_2S monitor alarm when 10 ppm is reached, proceed to a safe briefing area upwind of the location immediately (see **MA-4**, **Figure 5-1**).	❑
Don proper respiratory protection.	❑
Alert other affected personnel	❑
If trained and safe to do so undertake measures to control source H2S discharge and eliminate possible ignition sources. Initiate Emergency Shutdown procedures as deemed necessary to correct or control the specific situation.	❑
Account for on-site personnel at safe briefing area.	❑
Stay in safe briefing area if not working to correct the situation.	❑
Keep Site Supervisor / Centennial PIC informed. Notify applicable government agencies **(Appendix A)** If off-site impact; notify any neighbors within Radius of Exposure **(ROE)**, **Fig 5.11**	❑
Continuously monitor H_2S until readings below 10 ppm.	❑
Evacuated area shall not be re-entered except by trained and authorized personnel utilizing appropriate respiratory protection; or until "all clear" sounded by Centennial PIC / Site Supervisor.	

H_2S CONDITION 3: EXTREME DANGER TO LIFE AND HEALTH → WARNING SIGN RED	
> **30 ppm H_2S** concentration in air detected by location monitors: Extreme danger to life	❑
General Actions During Condition 3	❑
Sound H_2S alarm and/or display red flag.	❑
Account for on-site personnel	❑
Move away from H_2S source and get out of the affected area.	❑
Proceed to designated safe briefing area; alert other affected personnel.	❑
Account for personnel at safe briefing area.	❑
If trained and safe to do so undertake measures to control source H2S discharge and eliminate possible ignition sources. Initiate Emergency Shutdown procedures as deemed necessary to correct or control the specific situation.	❑
Notify vehicles or situation and divert all traffic away from location.	❑
Centennial Peron-in-Charge will make appropriate community notifications.	❑
Red warning flag must be on display until the situation has been corrected and the Centennial Person-in-Charge determines it is safe to resume operations under **Condition 1**.	❑
Notify management of the condition and action taken. If H_2S concentration is increasing and steps to correct the situation are not successful – or at any time if well control is questionable – alert all responsible parties for possible activation of the H_2S Contingency Plan. If well control at the surface is lost, determine if situation warrants igniting the well.	❑
If uncontrolled flow at the surface occurs, the Centennial PIC, with approval, if possible, from those coordinating the emergency **(as specified in the site-specific H_2S Contingency Plan)** are responsible for determining if the situation warrants igniting the flow of the uncontrolled well. This decision should be made only as a last resort and in a situation where it is obvious that human life is in danger and there is no hope of controlling the flow under prevailing conditions.	❑
If the flow is ignited, burning H_2S will be converted to sulfur dioxide (SO_2), which is also highly toxic. Do not assume that area is safe after the flow is ignited. If the well is ignited, evacuation of the area is mandatory, because SO_2 will remain in low-lying places under no-wind conditions.	❑
Keep Site Supervisor / Centennial PIC informed. Notify applicable government agencies and local law enforcement **(Appendix A)** If off-site impact; notify any neighbors within the Radius of Exposure **(ROE)**, see example in **Figure 5-11.**	❑
Continuously monitor H_2S until readings fall below 10 ppm.	❑
Evacuated area shall not be re-entered except by trained and authorized personnel utilizing appropriate respiratory protection; or until "all clear" sounded by Centennial PIC / Site Supervisor.	❑
IF ABOVE ACTIONS CANNOT BE ACCOMPLISHED IN TIME TO PREVENT EXPOSURE TO THE PUBLIC	
Alert public (directly or through appropriate government agencies) who may be subject to potentially harmful exposure levels.	❑
Make recommendations to public officials regarding blocking unauthorized access to the unsafe area and assist as appropriate.	❑

Make recommendations to public officials regarding evacuating the public and assist as appropriate.	❑
Monitor ambient air in the area of exposure (after following abatement measures) to determine when it is safe for re-entry.	❑

Section 4.0 - Notification of H_2S Release Event

I. Local & State Law Enforcement

Prior to the planned / controlled release of a hazardous concentration of H_2S gas or any associated byproducts of the combustion of H_2S gas, notify local law enforcement agencies regarding the contents of this plan.

In the event of the discovery of an unplanned/uncontrolled release of a hazardous concentration of H_2S gas or any associated byproducts of combustion, immediately notify local and/or state law enforcement agencies of the situation and ask for their assistance.

II. General Public

In the event of a planned or unplanned release of a hazardous concentration of H_2S gas or any associated byproducts of combustion, notify local law enforcement agencies and ask for their assistance in alerting the general public and limiting access to any public roads that may be impacted by such a release.

III. New Mexico Oil Conservation Division

The Centennial HSE Department will make any applicable notification to the New Mexico OCD regarding any release of a hazardous concentration of H_2S Gas or any associated byproducts of combustion.

IV. New Mexico Environment Department

The Centennial HSE Department will make any applicable notifications to the NMED regarding any release of a hazardous concentration of H_2S gas or any associated byproducts of combustion.

V. **Bureau of Land Management**

The Centennial Regulatory Department will make any applicable notifications to the BLM regarding any release of a hazardous concentration of H_2S gas or any associated byproducts of combustion.

Section 5.0 - Emergency Contact List

EMERGENCY CONTACT LIST				
CENTENNIAL RESOURCE PRODUCTION, LLC.				
POSITION	**NAME**	**OFFICE**	**CELL**	**ALT PHONE**
Operations				
Operations Superintendent	Cory Lewis	432.305.1009	432.557.4274	
TX Operations Assistant Superintendent	Josh Graham	432.940.3191	432.940.3191	
Drilling Superintendent	Jason Fitzgerald	432.315.0146	318-347-3916	
NM Operations Assistant Superintendent	Manual Mata	432.664.0278	575.408.0216	
Drilling Engineer	Ronny Hise	432.315.0144	432.770.4786	
Production Engineer	Travis Donnely	432.315.0143	661.246.5725	
Vice President Operations	Clayton Smith	720.499.1416	361.215.2494	
HSE & Regulatory				
H&S Manager	Adam Hicks	720.499.2377	903.426.4556	
Regulatory Manager	Sarah Ferreyros	720.499.1454	720.854.9020	
Environmental Manager	Montgomery Floyd	432-315-0123	432-425-8321	
Environmental	Nikki Mishler	432-315-0134	432-634-8722	
HSE Consultant	Blake Wisdom		918-323-2343	
Local, State, & Federal Agencies				
Lea County Sheriff		575-396-3611		911
New Mexico State Highway Patrol		505-757-2297		911
Eunice Fire / EMS		575-394-3258		911
Lea County Hospital		575-492-5000		
Secorp – Safety Contractor	Ricky Stephens		(325)-262-0707	
New Mexico Oil Conservation Division – District 1 Office – Hobbs, NM.		575-393-6161		
New Mexico Environment Department – District III Office – Hobbs, NM		575-397-6910		
New Mexico Oil Conservation Division – Hobbs, NM	24 Hour Emergency	575-393-6161		
Bureau of Land Management – Carlsbad, NM		575-234-5972		
U.S. Fish & Wildlife		502-248-6911		

Section 6.0 – Drilling Location Information

I. Site Safety Information

1. Safe Briefing Area
   a. There shall be two areas that will be designated as "SAFE BRIEFING AREAs". If H_2S is detected in concentrations equal to or in excess of 10 ppm all personnel not assigned emergency duties are to assemble in the designated Safe Briefing area for instructions. These two areas shall be positioned in accessible locations to facilitate the availability of self-contained breathing air devices. The briefing areas shall be positioned no less than 250' from the wellhead and in such locations that at least one briefing area will be up-wind from the well at all times.

2. Wind Indicators
    a. 4 Windsocks will be installed at strategic points on the facility.
3. Danger Signs
    a. A warning sign indicating the possible well conditions will be displayed at the location entrance.

DANGER
POISONOUS GAS
HYDROGEN SULFIDE
DO NOT APPROACH IF AMBER LIGHTS ARE FLASHING

4. H_2S Detectors and Alarms
    a. Continuous monitoring type H_2S detectors, capable of sensing a minimum of 5ppm H_2S in air will be located centrally located at the tanks, heater treater, and combustor. Continuous monitoring type SO_2 detector will also be located at the combustor. The automatic H_2S alarm/flashing light will be located at the site entrance and in front of tank battery.

5. Safety Trailer
    a. A safety trailer equipped with an emergency cascade breathing air system with 2 ea. Work/escape packs, a stretcher, 2 OSHA approved full body harnesses, and a 20# Class ABC fire extinguisher shall be available at the site in close proximity to the safe briefing area. The cascade system shall be able to be deployed to the drill floor when needed to provide safe breathing air to the workers as needed.

6. Well Control Equipment
    a. The location shall have a flare line to a remote automatic ignitor and back up flare gun, placed 150' from the wellhead.
    b. The location shall be equipped with a remotely operated choke system and a mud gas separator.

7. Mud Program
    a. Company shall have a mud program that contains sufficient weight and additives to control H_2S.

8. Metallurgy
    a. All drill strings, casing, tubing, wellhead, BOP, spools, kill lines, choke manifold and lines, and valves shall be suitable for anticipated H_2S volume and pressure.

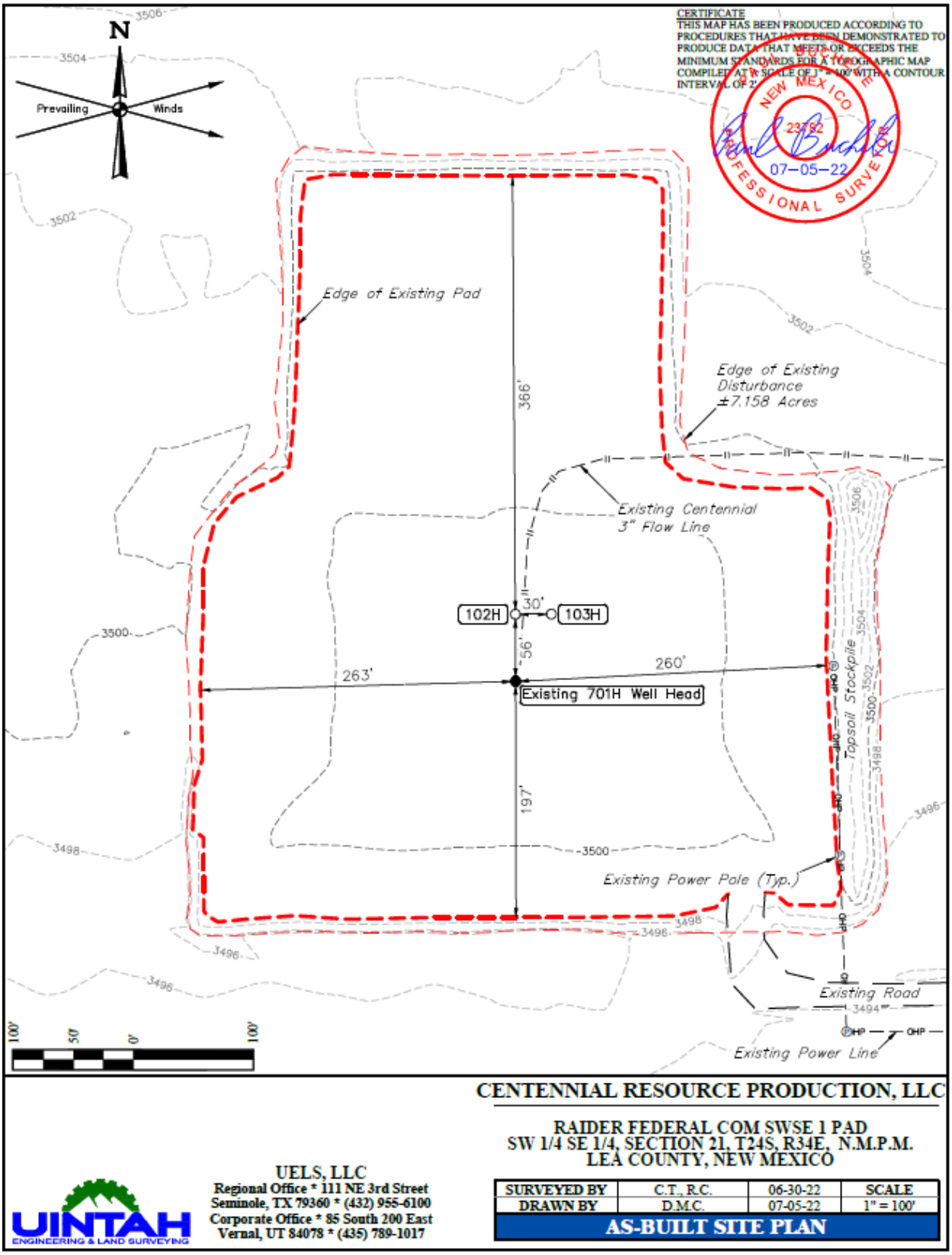
9. Communication
    a. The location shall be equipped with a means of effective communication such as a cell phones, intercoms, satellite phones or landlines.

II. Directions to Location

From intersection of 3rd Street and Hwy 128 in Jal, turn west on Hwy 128 and travel 17.76 miles on Hwy 128 to Co Road 2B on left. Turn left and travel 1.13 miles down Co Road 2B until you reach lease road for Raider locations. Turn right to head to Raider 102H location.

Centennial Resource Production, LLC.	H_2S Contingency Plan Raider Federal Com 102H & 103H	Lea County, New Mexico

Plat of Location

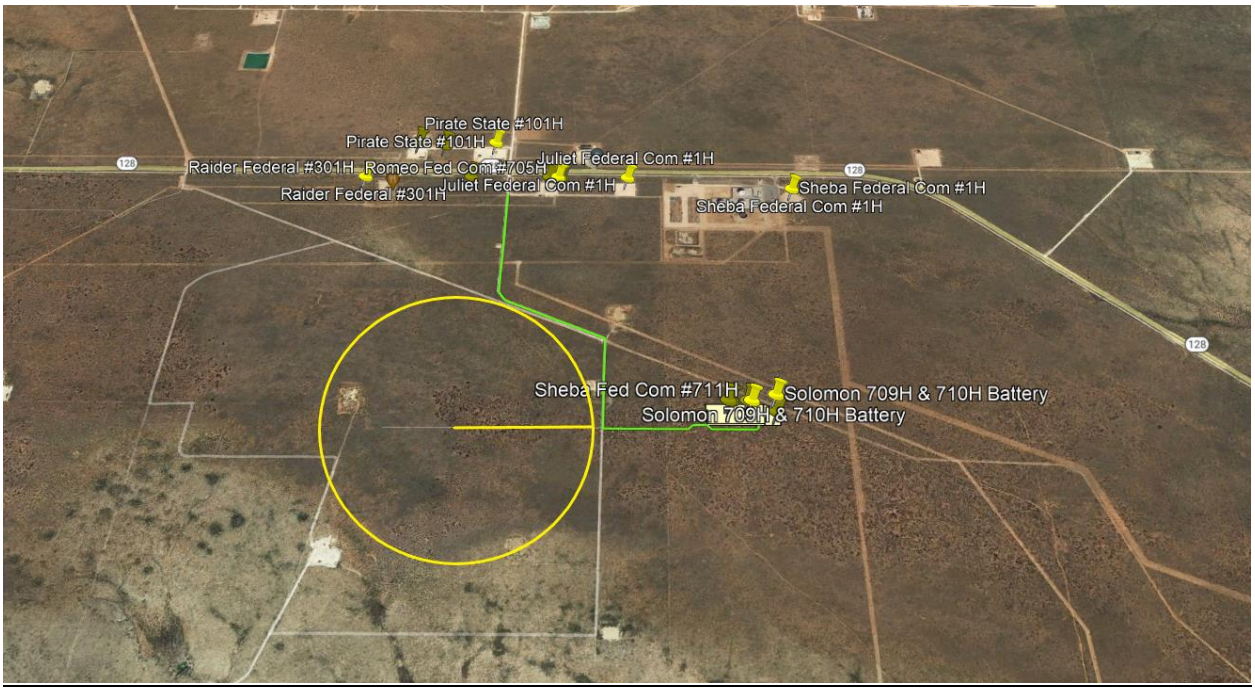


1. Routes of Ingress & Egress (MAP)

2. Residences in proximity to the 3000’ Radius of Exposure (ROE) (MAP)

There are no residences or public gathering places with the 3000’ ROE, 100 PPM, 300 PPM, or 500 PPM ROE.

Map of 3000' ROE Perimeter



100 PPM, 300 PPM, & 500 PPM Max ROE under worst case scenario

Enter H_2S in PPM	1500	
Enter Gas flow in mcf/day (maximum worst case conditions)	2500	
500 ppm radius of exposure (public road)	**105**	feet
300 ppm radius of exposure	**146**	feet
100 ppm radius of exposure (public area)	**230**	feet

- Location GPS Coordinates ***Lat: 32.196770, Long: -103.471963***

3. Public Roads in proximity of the Radius of Exposure (ROE)

There are no public roads that would be within the 500 PPM ROE. The closest public road is New Mexico Highway 128, which is 1.13 miles from the location. County Road 2B is 2554' from this location.

Section 7.0 – Hazard Communication

I. Physical Characteristics of Hydrogen Sulfide Gas

Hydrogen sulfide (H_2S) is a colorless, poisonous gas that is soluble in water. It can be present in crude oils, condensates, natural gas and wastewater streams.

H_2S is heavier than air with a vapor density of 1.189 (air = 1.0); however, H_2S is most often mixed with other gases. These mixtures of H_2S and other gases can be heavier or lighter than air. If the H_2S-containing

mixture is heavier, it can collect in low areas such as ditches, ravines, firewalls, and pits; in storage tanks; and in areas of poor ventilation. Please see physical properties in **Table 7.0.**

With H_2S the sense of smell is rapidly lost allowing lethal concentrations to be accumulated without warning. The toxicity of hydrogen sulfide at varying concentrations is indicated in the **Table 7.1.**

Warning: Do not use the mouth-to-mouth method if a victim ingested or inhaled hydrogen sulfide. Give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Table 7.0. Physical Properties of H_2S

Properties of H2S	Description
Vapor Density > 1 = 1.189 Air = 1	▪ H2S gas is slightly heavier than air, which can cause it to settle in low places and build in concentration. ▪ Produced as a mixture with other gases associated with oil and gas production.
Flammable Range 4.3%-46% 43000 ppm – 460000 ppm	▪ H2S can be extremely flammable / explosive when these concentrations are reached by volume in air.

Although H_2S is primarily a respiratory hazard, it is also flammable and forms an explosive mixture at concentrations of 4.3%–46.0% (40,000ppm – 460,000 ppm) by volume in air.

H_2S can be encountered when:

- Venting and draining equipment.
- Opening equipment (separators, pumps, and tanks).
- Opening piping connections ("line breaking").
- Gauging and sampling storage tanks.
- Entering confined spaces.
- Working around wastewater pits, skimmers, and treatment facilities.

II. Human Health Hazards - Toxicological Information

Table 7.1. Hazards & Toxicity

Concentration (ppm)	Symptoms/Effects
0.00011-0.00033 ppm	Typical background concentrations
0.01-1.5 ppm	Odor threshold (when rotten egg smell is first noticeable to some). Odor becomes more offensive at 3-5 ppm. Above 30 ppm, odor described as sweet or sickeningly sweet.

2-5 ppm	Prolonged exposure may cause nausea, tearing of the eyes, headaches or loss of sleep. Airway problems (bronchial constriction) in some asthma patients.
20 ppm	Possible fatigue, loss of appetite, headache, irritability, poor memory, dizziness.
50-100 ppm	Slight conjunctivitis ("gas eye") and respiratory tract irritation after 1 hour. May cause digestive upset and loss of appetite.
100 ppm	Coughing, eye irritation, loss of smell after 2-15 minutes (olfactory fatigue). Altered breathing, drowsiness after 15-30 minutes. Throat irritation after 1 hour. Gradual increase in severity of symptoms over several hours. Death may occur after 48 hours.
100-150 ppm	Loss of smell (olfactory fatigue or paralysis).
200-300 ppm	Marked conjunctivitis and respiratory tract irritation after 1 hour. Pulmonary edema may occur from prolonged exposure.
500-700 ppm	Staggering, collapse in 5 minutes. Serious damage to the eyes in 30 minutes. Death after 30-60 minutes.
700-1000 ppm	Rapid unconsciousness, "knockdown" or immediate collapse within 1 to 2 breaths, breathing stops, death within minutes.
1000-2000 ppm	Nearly instant death

III. Environmental Hazards

H_2S and its associated byproducts from combustion presents a serious environmental hazard. Sulphur Dioxide SO_2 is produced as a constituent of flaring H_2S Gas and can present hazards associated, which are similar to H_2S. Although SO_2 is heavier than air, it will be picked up by a breeze and carried downwind at elevated temperatures. Since Sulfur Dioxide is extremely irritating to the eyes and mucous membranes of the upper respiratory tract, it has exceptionally good warning powers in this respect. The following table indicates the toxic nature of the gas. Please see the attached SDS in Appendix B for reference.

SULFUR DIOXIDE TOXICITY		
Concentration		Effects
$\%SO_2$	PPM	
0.0005	3 to 5	Pungent odor-normally a person can detect SO_2 in this range.
0.0012	12	Throat irritation, coughing, and constriction of the chest tearing and smarting of eyes.
0.15	150	So irritating that it can only be endured for a few minutes.

0.05	500	Causes a sense of suffocation, even with first breath.

Section 8.0 - Regulatory Information

I. OSHA & NIOSH Information

II. Table 8.0. OSHA & NIOSH H_2S Information

PEL, IDLH, TLV	Description
NIOSH PEL 10 PPM	▪ PEL is the Permissible Exposure Limit that an employee may be exposed up to 8 hr / day.
OSHA General Industry Ceiling PEL – 20 PPM	▪ The maximum exposure limit, which cannot be exceeded for any length of time.
IDLH 100 PPM	▪ Immediately Dangerous to Life and Health
Centennial PEL 10 PPM	▪ Centennial Policy Regarding H2S for employee safety

III. New Mexico OCD & BLM – H_2S Concentration Threshold Requirements

New Mexico NMAC 19.15.11 and Onshore Order #6 identify two Radii of Exposure (ROE) that identify potential danger to the public and require additional compliance measures. Centennial is required to install safety devices, establish safety procedures and develop a written H_2S contingency plan for sites where the H_2S concentrations are as follows.

Table 8.1. Calculating H_2S Radius of Exposure

H_2S Radius of Exposure	Description	Control and Equipment Requirements
100 ppm	Distance from a release to where the H_2S concentration in the air will dilute below 100ppm	ROE > 50-ft and includes any part of a "public area" (residence, school, business, etc., or any area that can be expected to be populated). ROE > 3,000-ft
500 ppm	Distance from a release to where the H_2S concentration in the air will dilute below 500ppm	ROE > 50-ft and includes any part of a public road (public roads are tax supported roads or any road used for public access or use)

Calculating H_2S Radius of Exposure

The ROE of an H_2S release is calculated to determine if a potentially hazardous volume of H_2S gas at 100 or 500 parts per million (ppm) is within a regulated distance requiring further action. If information about the concentration of H_2S and the potential gas release volume is known, the location of the Muster Areas will be set, and safety measures will be implemented based on the calculated radius of exposure (ROE). NMAC 19.15.11 – Hydrogen Sulfide Safety defines the ROE as the radius constructed with the gas's point

of escape as its center and its length calculated by the following Pasquill-Gifford equations:

To determine the extent of the **100 ppm ROE**:

$x = [(1.589)(\text{mole fraction } H_2S)(Q)]^{(.6258)}$.

To determine the extent of the **500 ppm ROE**:

$x = [(0.4546)(\text{mole fraction } H_2S)(Q)]^{(.6258)}$.

Table 8.2. Calculating H2S Radius of Exposure

ROE Variable	Description
X =	ROE in feet
Q =	**Max volume of gas released determined to be released in cubic feet per day (ft^3/d)** normalized to standard temperature and pressure, 60°F and 14.65 psia
Mole fraction H_2S =	Mole fraction of H_2S in the gaseous mixture released.

The volume used as the escape rate in determining the ROE is specified in the rule as follows:

- The maximum daily volume rate of gas containing H_2S handled by that system element for which the ROE is calculated.
- For existing gas wells, the current adjusted open-flow rate, or the operator's estimate of the well's capacity to flow against zero back-pressure at the wellhead.

New Mexico Oil Conservation Division & BLM Site Requirements under NMAC 19.15.11 & Onshore Order #6

- Two cleared areas will be designated as Safe Briefing Areas. During an emergency, personnel will assemble in one of these areas for instructions from the Centennial Person-in-Charge. Prevailing wind direction should be considered in locating the briefing areas 200' or more on either side of the well head. One area should offset the other at an angle of 45° to 90° with respect to prevailing wind direction to allow for wind shifts during the work period.
- In the event of either an intentional or accidental releases of hydrogen sulfide, safeguards to protect the general public from the harmful effects of hydrogen sulfide must be in place for operations. A summary of the provisions in each of three H_2S ROE cases is included in **Table 8.3**.
    - **CASE 1** -100 ppm ROE < 50'
    - **CASE 2** - 100 ppm ROE is 50' or greater, but < 3000' and does not penetrate public area.
    - **CASE 3** -100 ppm ROE is 50' or greater and penetrates a public area or 500 ppm ROE includes a public road. Also if 100 ppm ROE > 3000' regardless of public area.

Table 8.3. NMAC 19.15.11 Compliance Requirements Drilling & Production

NMAC 19.15.11 & BLM COMPLIANCE REQUIREMENTS - DRILLING & PRODUCTION			
PROVISION	**CASE 1**	**CASE 2**	**CASE 3**
H_2S Concentration Test	X	X	X
H-9	X	X	X
Training	X	X	X
District Office Notification	X	X	X
Drill Stem Tests Restricted	X*	X*	X
BOP Test	X*	X*	X

Materials		X	X
Warning and Marker		X	X
Security		X	X
Contingency Plan			X
Control and Equipment Safety			X
Monitors		X**	X**
Mud (ph Control or Scavenger)			X*
Wind Indicators		X**	X
Protective Breathing Equipment		X**	X
Choke Manifold, Secondary Remote Control, and Mud-Gas Separator			X
Flare Stacks			X*

Section 9.0 - Training Requirements

Training

The following elements are considered a minimum level of training for personnel assigned to operations who may encounter H_2S as part of routine or maintenance work.

- The hazards, characteristics, and properties of hydrogen sulfide (H_2S) and (SO_2).
- Sources of H_2S and SO_2.
- Proper use of H_2S and SO_2 detection methods used at the workplace.
- Recognition of, and proper response to, the warning signals initiated by H_2S and SO_2 detection systems in use at the workplace.
- Symptoms of H_2S exposure; symptoms of SO_2 exposure
- Rescue techniques and first aid to victims of H_2S and SO_2 exposure.
- Proper use and maintenance of breathing equipment for working in H_2S and SO_2 atmospheres, as appropriate theory and hands-on practice, with demonstrated proficiency (29 *CFR* Part 1910.134).
- Workplace practices and relevant maintenance procedures that have been established to protect personnel from the hazards of H_2S and SO_2.
- Wind direction awareness and routes of egress.
- Confined space and enclosed facility entry procedures (if applicable).
- Emergency response procedures that have been developed for the facility or operations.
- Locations and use of safety equipment.
- Locations of safe briefing areas.

Refresher training will be conducted annually.

Section 10.0 - Personal Protective Equipment

I. Personal H_2S Monitors

All personnel engaged in planned or unplanned work activity to mitigate the release of a hazardous concentration of H_2S shall have on their person a personal H2S monitor.

II. Fixed H_2S Detection and Alarms

- 4 channel H_2S monitor

- 4 wireless H_2S monitors
- H_2S alarm system (Audible/Red strobe)
- Personal gas monitor for each person on location
- Gas sample tubes

III. Flame Resistant Clothing

All personnel engaged in planned or unplanned work activity associated with this Plan shall have on the appropriate level of FRC clothing.

IV. Respiratory Protection

The following respiratory protection equipment shall be available at each drilling location.

- Working cascade system available on rig floor and pit system & 750' of air line hose
- Four (4) breathing air manifolds
- Four (4) 30-minute rescue packs
- Five (5) work/Escape units
- Five (5) escape units
- One (1) filler hose for the work/escape/rescue units

Supplied air (airline or SCBA) respiratory protection against hydrogen sulfide exposure is required in the following situations:

- When routine or maintenance work tasks involve exposure to H_2S concentrations of 10 ppm or greater.
- When a fixed location area monitor alarms, and re-entry to the work area is required to complete a job.
- When confined spaces are to be entered without knowledge of H_2S levels present, or if initial measurements are to be taken of H_2S levels.
- During rescue of employees suspected of H_2S overexposure.
- For specific tasks identified with significant exposure potential and outlined in local program guidelines.
- All respiratory equipment for hydrogen sulfide must be of the supplied-air type, equipped with pressure-demand regulators and operated in the pressure-demand mode only. This is the only type of respiratory protection recommended for hydrogen sulfide application. Equipment should be approved by NIOSH/MSHA or other recognized national authority as required. If airline units are used, a five-minute egress bottle should also be carried.
- Gas masks or other air-purifying respirators MUST NEVER BE USED FOR HYDROGEN SULFIDE due to the poor warning properties of the gas.
- Use of respiratory protection should be accompanied by a written respiratory protection program.

Appendix A
H_2S SDS

PRAXAIR

Hydrogen sulfide

Safety Data Sheet E-4611

according to the Hazardous Products Regulation (February 11, 2015)

Date of issue: 10-15-1979 Revision date: 08-10-2016 Supersedes: 10-15-2013

SECTION 1: Identification

1.1. Product identifier

Product form	:	Substance
Name	:	Hydrogen sulfide
CAS No	:	7783-06-4
Formula	:	H2S
Other means of identification	:	Hydrogen sulfide
Product group	:	Core Products

1.2. Recommended use and restrictions on use

Recommended uses and restrictions	:	Industrial use Use as directed

1.3. Supplier

Praxair Canada inc.
1200 – 1 City Centre Drive
Mississauga - Canada L5B 1M2
T 1-905-803-1600 - F 1-905-803-1682
www.praxair.ca

1.4. Emergency telephone number

Emergency number	:	1-800-363-0042 Call emergency number 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-CA classification

Flam. Gas 1	H220
Liquefied gas	H280
Acute Tox. 2 (Inhalation: gas)	H330
STOT SE 3	H335

2.2. GHS Label elements, including precautionary statements

GHS-CA labelling

Hazard pictograms :

GHS02 GHS04 GHS06 GHS07

Signal word : DANGER

Hazard statements : **EXTREMELY FLAMMABLE GAS**
CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
FATAL IF INHALED
MAY CAUSE RESPIRATORY IRRITATION
MAY FORM EXPLOSIVE MIXTURES WITH AIR
SYMPTOMS MAY BE DELAYED
EXTENDED EXPOSURE TO GAS REDUCES THE ABILITY TO SMELL SULFIDES

Precautionary statements : Do not handle until all safety precautions have been read and understood
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

PRAXAIR

Hydrogen sulfide

Safety Data Sheet E-4611

according to the Hazardous Products Regulation (February 11, 2015)

Date of issue: 10-15-1979 Revision date: 08-10-2016 Supersedes: 10-15-2013

Do not breathe gas
Use and store only outdoors or in a well-ventilated area
Avoid release to the environment
Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection
Leaking gas fire: Do not extinguish, unless leak can be stopped safely
In case of leakage, eliminate all ignition sources
Store locked up
Dispose of contents/container in accordance with container Supplier/owner instructions
Protect from sunlight when ambient temperature exceeds 52°C (125°F)
Close valve after each use and when empty
Do not open valve until connected to equipment prepared for use
When returning cylinder, install leak tight valve outlet cap or plug
Do not depend on odour to detect the presence of gas

2.3. Other hazards

Other hazards not contributing to the classification : Contact with liquid may cause cold burns/frostbite.

2.4. Unknown acute toxicity (GHS-CA)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	CAS No.	% (Vol.)	Common Name (synonyms)
Hydrogen sulfide (Main constituent)	(CAS No) 7783-06-4	100	Hydrogen sulfide (H2S) / Hydrogen sulphide / Sulfur hydride / Sulfureted hydrogen / Dihydrogen sulphide / Hydrogensulfide

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.

First-aid measures after skin contact : The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects (acute and delayed)

No additional information available

4.3. Immediate medical attention and special treatment, if necessary

Other medical advice or treatment : Obtain medical assistance. Treat with corticosteroid spray as soon as possible after inhalation.

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog. Use extinguishing media appropriate for surrounding fire.

5.2. Unsuitable extinguishing media

No additional information available

5.3. Specific hazards arising from the hazardous product

Fire hazard	:	**EXTREMELY FLAMMABLE GAS**. If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.
Explosion hazard	:	**EXTREMELY FLAMMABLE GAS**. Forms explosive mixtures with air and oxidizing agents.
Reactivity	:	No reactivity hazard other than the effects described in sub-sections below.
Reactivity in case of fire	:	No reactivity hazard other than the effects described in sub-sections below.

5.4. Special protective equipment and precautions for fire-fighters

Firefighting instructions	:	**DANGER! Toxic, flammable liquefied gas** Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with their provincial and local fire code regulations.
Special protective equipment for fire fighters	:	Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Other information	:	Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by TC.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	:	**DANGER! Toxic, flammable liquefied gas** . Forms explosive mixtures with air and oxidizing agents. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if safe to do so. Reduce vapors with fog or fine water spray, taking care not to spread liquid with water. Shut off flow if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable vapors may spread from leak and could explode if reignited by sparks or flames. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

6.2. Methods and materials for containment and cleaning up

Methods for cleaning up	:	Try to stop release. Reduce vapour with fog or fine water spray. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Reference to other sections

For further information refer to section 8: Exposure controls/personal protection

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Leak-check system with soapy water; never use a flame All piped systems and associated equipment must be grounded Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g, wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store only where temperature will not exceed 125°F (52°C). Post "No Smoking/No Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g, NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Hydrogen sulfide (7783-06-4)		
USA - ACGIH	ACGIH TLV-TWA (ppm)	1 ppm
USA - ACGIH	ACGIH TLV-STEL (ppm)	5 ppm
USA - OSHA	OSHA PEL (Ceiling) (ppm)	20 ppm
Canada (Quebec)	VECD (mg/m³)	21 mg/m³
Canada (Quebec)	VECD (ppm)	15 ppm
Canada (Quebec)	VEMP (mg/m³)	14 mg/m³
Canada (Quebec)	VEMP (ppm)	10 ppm
Alberta	OEL Ceiling (mg/m³)	21 mg/m³
Alberta	OEL Ceiling (ppm)	15 ppm
Alberta	OEL TWA (mg/m³)	14 mg/m³
Alberta	OEL TWA (ppm)	10 ppm
British Columbia	OEL Ceiling (ppm)	10 ppm
Manitoba	OEL STEL (ppm)	5 ppm
Manitoba	OEL TWA (ppm)	1 ppm
New Brunswick	OEL STEL (mg/m³)	21 mg/m³
New Brunswick	OEL STEL (ppm)	15 ppm
New Brunswick	OEL TWA (mg/m³)	14 mg/m³
New Brunswick	OEL TWA (ppm)	10 ppm
New Foundland & Labrador	OEL STEL (ppm)	5 ppm
New Foundland & Labrador	OEL TWA (ppm)	1 ppm
Nova Scotia	OEL STEL (ppm)	5 ppm
Nova Scotia	OEL TWA (ppm)	1 ppm
Nunavut	OEL Ceiling (mg/m³)	28 mg/m³
Nunavut	OEL Ceiling (ppm)	20 ppm
Nunavut	OEL STEL (mg/m³)	21 mg/m³
Nunavut	OEL STEL (ppm)	15 ppm
Nunavut	OEL TWA (mg/m³)	14 mg/m³
Nunavut	OEL TWA (ppm)	10 ppm
Northwest Territories	OEL STEL (ppm)	15 ppm

Hydrogen sulfide (7783-06-4)		
Northwest Territories	OEL TWA (ppm)	10 ppm
Ontario	OEL STEL (ppm)	15 ppm
Ontario	OEL TWA (ppm)	10 ppm
Prince Edward Island	OEL STEL (ppm)	5 ppm
Prince Edward Island	OEL TWA (ppm)	1 ppm
Québec	VECD (mg/m³)	21 mg/m³
Québec	VECD (ppm)	15 ppm
Québec	VEMP (mg/m³)	14 mg/m³
Québec	VEMP (ppm)	10 ppm
Saskatchewan	OEL STEL (ppm)	15 ppm
Saskatchewan	OEL TWA (ppm)	10 ppm
Yukon	OEL STEL (mg/m³)	27 mg/m³
Yukon	OEL STEL (ppm)	15 ppm
Yukon	OEL TWA (mg/m³)	15 mg/m³
Yukon	OEL TWA (ppm)	10 ppm

8.2. Appropriate engineering controls

Appropriate engineering controls : Use corrosion-resistant equipment. Use an explosion-proof local exhaust system. Local exhaust and general ventilation must be adequate to meet exposure standards. MECHANICAL (GENERAL): **Inadequate - Use only in a closed system.** Use explosion proof equipment and lighting.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment : Safety glasses. Face shield. Gloves.

Hand protection : Wear work gloves when handling containers. Wear heavy rubber gloves where contact with product may occur.

Eye protection : Wear goggles and a face shield when transfilling or breaking transfer connections. Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

Respiratory protection : **Respiratory protection:** Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select in accordance with provincial regulations, local bylaws or guidelines. Selection should be based on the current CSA standard Z94.4, "Selection, Care, and Use of Respirators." Respirators should also be approved by NIOSH and MSHA. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves when transfilling or breaking transfer connections. Standard EN 511 - Cold insulating gloves.

Other information : **Other protection :** Safety shoes for general handling at customer sites. Metatarsal shoes and cuffless trousers for cylinder handling at packaging and filling plants. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines. For working with flammable and oxidizing materials, consider the use of flame resistant anti-static safety clothing.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Gas

Appearance : Colorless gas. Colorless liquid at low temperature or under high pressure.

Molecular mass : 34 g/mol

Colour : Colourless.

Odour : Odour can persist. Poor warning properties at low concentrations. Rotten eggs.

Odour threshold : Odour threshold is subjective and inadequate to warn of overexposure.

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pH	:	Not applicable.
pH solution	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Relative evaporation rate (ether=1)	:	Not applicable.
Melting point	:	-86 °C
Freezing point	:	-82.9 °C
Boiling point	:	-60.3 °C
Flash point	:	Not applicable.
Critical temperature	:	100.4 °C
Auto-ignition temperature	:	260 °C
Decomposition temperature	:	No data available
Vapour pressure	:	1880 kPa
Vapour pressure at 50 °C	:	No data available
Critical pressure	:	8940 kPa
Relative vapour density at 20 °C	:	>=
Relative density	:	No data available
Relative density of saturated gas/air mixture	:	No data available
Density	:	No data available
Relative gas density	:	1.2
Solubility	:	Water: 3980 mg/l
Log Pow	:	Not applicable.
Log Kow	:	Not applicable.
Viscosity, kinematic	:	Not applicable.
Viscosity, dynamic	:	Not applicable.
Viscosity, kinematic (calculated value) (40 °C)	:	No data available
Explosive properties	:	Not applicable.
Oxidizing properties	:	None.
Flammability (solid, gas)	:	4.3 - 46 vol %

9.2. Other information

Gas group	:	Liquefied gas
Additional information	:	Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity	:	No reactivity hazard other than the effects described in sub-sections below.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	May react violently with oxidants. Can form explosive mixture with air.
Conditions to avoid	:	Avoid moisture in installation systems. Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Incompatible materials	:	Ammonia. Bases. Bromine pentafluoride. Chlorine trifluoride. chromium trioxide. (and heat). Copper. (powdered). Fluorine. Lead. Lead oxide. Mercury. Nitric acid. Nitrogen trifluoride. nitrogen sulfide. Organic compounds. Oxidizing agents. Oxygen difluoride. Rubber. Sodium. (and moisture). Water.
Hazardous decomposition products	:	Thermal decomposition may produce : Sulfur. Hydrogen.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	:	Not classified
Acute toxicity (dermal)	:	Not classified

Acute toxicity (inhalation) : Inhalation:gas: FATAL IF INHALED.

Hydrogen sulfide (\f)7783-06-4	
LC50 inhalation rat (mg/l)	0.99 mg/l (Exposure time: 1 h)
LC50 inhalation rat (ppm)	356 ppm/4h
ATE CA (gases)	356.00000000 ppmv/4h
ATE CA (vapours)	0.99000000 mg/l/4h
ATE CA (dust,mist)	0.99000000 mg/l/4h

Skin corrosion/irritation : Not classified
pH: Not applicable.

Serious eye damage/irritation : Not classified
pH: Not applicable.

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : MAY CAUSE RESPIRATORY IRRITATION.

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : VERY TOXIC TO AQUATIC LIFE.

Hydrogen sulfide (7783-06-4)	
LC50 fish 1	0.0448 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [flow-through])
LC50 fish 2	0.016 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

12.2. Persistence and degradability

Hydrogen sulfide (7783-06-4)	
Persistence and degradability	Not applicable for inorganic gases.

12.3. Bioaccumulative potential

Hydrogen sulfide (7783-06-4)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No data available.

12.4. Mobility in soil

Hydrogen sulfide (7783-06-4)	
Mobility in soil	No data available.
Log Pow	Not applicable.
Log Kow	Not applicable.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Other adverse effects : May cause pH changes in aqueous ecological systems.

Effect on the ozone layer : None

Effect on global warming : No known effects from this product

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SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

14.1. Basic shipping description

In accordance with TDG

TDG

UN-No. (TDG)	: UN1053
TDG Primary Hazard Classes	: 2.3 - Class 2.3 - Toxic Gas.
TDG Subsidiary Classes	: 2.1
Proper shipping name	: HYDROGEN SULPHIDE
ERAP Index	: 500
Explosive Limit and Limited Quantity Index	: 0
Passenger Carrying Ship Index	: Forbidden
Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index	: Forbidden

14.3. Air and sea transport

IMDG

UN-No. (IMDG)	: 1053
Proper Shipping Name (IMDG)	: HYDROGEN SULPHIDE
Class (IMDG)	: 2 - Gases
MFAG-No	: 117

IATA

UN-No. (IATA)	: 1053
Proper Shipping Name (IATA)	: Hydrogen sulphide
Class (IATA)	: 2

SECTION 15: Regulatory information

15.1. National regulations

Hydrogen sulfide (7783-06-4)

Listed on the Canadian DSL (Domestic Substances List)

15.2. International regulations

Hydrogen sulfide (7783-06-4)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on INSQ (Mexican national Inventory of Chemical Substances)

SECTION 16: Other information

Date of issue	: 15/10/1979
Revision date	: 10/08/2016
Supersedes	: 15/10/2013

Indication of changes:

Training advice : Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard. Ensure operators understand the flammability hazard.

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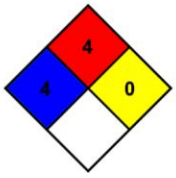
Other information	: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information The opinions expressed herein are those of qualified experts within Praxair Canada Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair Canada Inc, it is the user's obligation to determine the conditions of safe use of the product. Praxair Canada Inc, SDSs are furnished on sale or delivery by Praxair Canada Inc, or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.ca. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write Praxair Canada Inc, (Phone: 1-888-257-5149; Address: Praxair Canada Inc, 1 City Centre Drive, Suite 1200, Mississauga, Ontario, L5B 1M2). PRAXAIR and the Flowing Airstream design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.
NFPA health hazard	: 4 - Very short exposure could cause death or serious residual injury even though prompt medical attention was given.
NFPA fire hazard	: 4 - Will rapidly or completely vaporize at normal pressure and temperature, or is readily dispersed in air and will burn readily.
NFPA reactivity	: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating	
Health	: 2 Moderate Hazard - Temporary or minor injury may occur
Flammability	: 4 Severe Hazard - Flammable gases, or very volatile flammable liquids with flash points below 73 F, and boiling points below 100 F. Materials may ignite spontaneously with air. (Class IA)
Physical	: 2 Moderate Hazard - Materials that are unstable and may undergo violent chemical changes at normal temperature and pressure with low risk for explosion. Materials may react violently with water or form peroxides upon exposure to air.

SDS Canada (GHS) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Appendix B

SO_2 SDS

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name
SULFUR DIOXIDE
Synonyms
MTG MSDS 80; SULFUROUS ACID ANHYDRIDE; SULFUROUS OXIDE; SULPHUR DIOXIDE; SULFUROUS ANHYDRIDE; FERMENTICIDE LIQUID; SULFUR DIOXIDE(SO2); SULFUR OXIDE; SULFUR OXIDE(SO2)
Chemical Family
inorganic, gas
Product Description
Classification determined in accordance with Compressed Gas Association standards.
Product Use
Industrial and Specialty Gas Applications.
Restrictions on Use
None known.
Details of the supplier of the safety data sheet
MATHESON TRI-GAS, INC.
3 Mountainview Road
Warren, NJ 07059
General Information: 1-800-416-2505
Emergency #: 1-800-424-9300 (CHEMTREC)
Outside the US: 703-527-3887 (Call collect)

Section 2 - HAZARDS IDENTIFICATION

Classification in accordance with paragraph (d) of 29 CFR 1910.1200.
Gases Under Pressure - Liquefied gas
Acute Toxicity - Inhalation - Gas - Category 3
Skin Corrosion/Irritation - Category 1B
Serious Eye Damage/Eye Irritation - Category 1
Simple Asphyxiant
GHS Label Elements
Symbol(s)

Signal Word
Danger
Hazard Statement(s)
Contains gas under pressure; may explode if heated.
Toxic if inhaled.
Causes severe skin burns and eye damage.
May displace oxygen and cause rapid suffocation.
Precautionary Statement(s)
Prevention
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

Wash thoroughly after handling.
Do not breathe dusts or mists.

Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
Immediately call a POISON CENTER or doctor.
Specific treatment (see label).

Storage

Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Protect from sunlight.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

Other Hazards

Contact with liquified gas may cause frostbite.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
7446-09-5	Sulfur dioxide	100.0

Section 4 - FIRST AID MEASURES

Inhalation

IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical attention.

Skin

IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115°F; 41-46°C). If warm water is not available, gently wrap affected parts in blankets. DO NOT induce vomiting. Get immediate medical attention.

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical attention.

Ingestion

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Get immediate medical attention.

Most Important Symptoms/Effects

Acute

Toxic if inhaled, frostbite, suffocation, respiratory tract burns, skin burns, eye burns

Delayed

No information on significant adverse effects.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically and supportively.

Note to Physicians

For inhalation, consider oxygen.

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

Section 5 - FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media

carbon dioxide, regular dry chemical, Large fires: Use regular foam or flood with fine water spray.

Unsuitable Extinguishing Media

None known.

Special Hazards Arising from the Chemical

Negligible fire hazard.

Hazardous Combustion Products

sulfur oxides

Fire Fighting Measures

Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. Keep unnecessary people away, isolate hazard area and deny entry.

Special Protective Equipment and Precautions for Firefighters

Wear full protective fire fighting gear including self contained breathing apparatus (SCBA) for protection against possible exposure.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Wear personal protective clothing and equipment, see Section 8.

Methods and Materials for Containment and Cleaning Up

Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Evacuation radius: 150 feet. Stop leak if possible without personal risk. Reduce vapors with water spray. Do not get water directly on material.

Environmental Precautions

Avoid release to the environment.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Do not get in eyes, on skin, or on clothing. Do not breathe gas, fumes, vapor, or spray. Wash hands thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. Contaminated work clothing should not be allowed out of the workplace. Do not eat, drink or smoke when using this product. Keep only in original container. Avoid release to the environment.

Conditions for Safe Storage, Including any Incompatibilities

Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Protect from sunlight.
Store and handle in accordance with all current regulations and standards. Protect from physical damage. Store outside or in a detached building. Keep separated from incompatible substances.

Incompatible Materials

bases, combustible materials, halogens, metal carbide, metal oxides, metals, oxidizing materials, peroxides, reducing agents

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

Sulfur dioxide	**7446-09-5**
ACGIH:	0.25 ppm STEL

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

NIOSH:	2 ppm TWA ; 5 mg/m3 TWA
	5 ppm STEL ; 13 mg/m3 STEL
	100 ppm IDLH
OSHA (US):	5 ppm TWA ; 13 mg/m3 TWA
Mexico:	0.25 ppm STEL [PPT-CT]

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)
There are no biological limit values for any of this product's components.
Engineering Controls
Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.
Individual Protection Measures, such as Personal Protective Equipment
Eye/face protection
Wear splash resistant safety goggles with a faceshield. Contact lenses should not be worn. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.
Skin Protection
Wear appropriate chemical resistant clothing. Wear chemical resistant clothing to prevent skin contact.
Respiratory Protection
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Glove Recommendations
Wear appropriate chemical resistant gloves.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	colorless gas	**Physical State**	gas
Odor	irritating odor	**Color**	colorless
Odor Threshold	3 - 5 ppm	**pH**	(Acidic in solution)
Melting Point	-73 °C (-99 °F)	**Boiling Point**	-10 °C (14 °F)
Boiling Point Range	Not available	**Freezing point**	Not available
Evaporation Rate	>1 (Butyl acetate = 1)	**Flammability (solid, gas)**	Not available
Autoignition Temperature	Not available	**Flash Point**	(Not flammable)
Lower Explosive Limit	Not available	**Decomposition temperature**	Not available
Upper Explosive Limit	Not available	**Vapor Pressure**	2432 mmHg @ 20 °C
Vapor Density (air=1)	2.26	**Specific Gravity (water=1)**	1.462 at -10 °C

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

Water Solubility	22.8 % (@ 0 °C)	**Partition coefficient: n-octanol/water**	Not available
Viscosity	Not available	**Kinematic viscosity**	Not available
Solubility (Other)	Not available	**Density**	Not available
Physical Form	liquified gas	**Molecular Formula**	S-O2
Molecular Weight	64.06		

Solvent Solubility
Soluble
alcohol, acetic acid, sulfuric acid, ether, chloroform, Benzene, sulfuryl chloride, nitrobenzenes, Toluene, acetone

Section 10 - STABILITY AND REACTIVITY

Reactivity
No reactivity hazard is expected.
Chemical Stability
Stable at normal temperatures and pressure.
Possibility of Hazardous Reactions
Will not polymerize.
Conditions to Avoid
Minimize contact with material. Containers may rupture or explode if exposed to heat.
Incompatible Materials
bases, combustible materials, halogens, metal carbide, metal oxides, metals, oxidizing materials, peroxides, reducing agents
Hazardous decomposition products
oxides of sulfur

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure
Inhalation
Toxic if inhaled. Causes damage to respiratory system, burns, difficulty breathing
Skin Contact
skin burns
Eye Contact
eye burns
Ingestion
burns, nausea, vomiting, diarrhea, stomach pain
Acute and Chronic Toxicity
Component Analysis - LD50/LC50
The components of this material have been reviewed in various sources and the following selected endpoints are published:
Sulfur dioxide (7446-09-5)
Inhalation LC50 Rat 965 - 1168 ppm 4 h
Product Toxicity Data
Acute Toxicity Estimate
No data available.
Immediate Effects

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

Toxic if inhaled, frostbite, suffocation, respiratory tract burns, skin burns, eye burns

Delayed Effects
No information on significant adverse effects.

Irritation/Corrosivity Data
respiratory tract burns, skin burns, eye burns

Respiratory Sensitization
No data available.

Dermal Sensitization
No data available.

Component Carcinogenicity

Sulfur dioxide	**7446-09-5**
ACGIH:	A4 - Not Classifiable as a Human Carcinogen
IARC:	Monograph 54 [1992] (Group 3 (not classifiable))

Germ Cell Mutagenicity
No data available.

Tumorigenic Data
No data available

Reproductive Toxicity
No data available.

Specific Target Organ Toxicity - Single Exposure
No target organs identified.

Specific Target Organ Toxicity - Repeated Exposure
No target organs identified.

Aspiration hazard
Not applicable.

Medical Conditions Aggravated by Exposure
respiratory disorders

Section 12 - ECOLOGICAL INFORMATION

Component Analysis - Aquatic Toxicity
No LOLI ecotoxicity data are available for this product's components.

Persistence and Degradability
No data available.

Bioaccumulative Potential
No data available.

Mobility
No data available.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Methods
Dispose of contents/container in accordance with local/regional/national/international regulations.

Component Waste Numbers
The U.S. EPA has not published waste numbers for this product's components.

Section 14 - TRANSPORT INFORMATION

US DOT Information:
Shipping Name: SULFUR DIOXIDE

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

Hazard Class: 2.3
UN/NA #: UN1079
Required Label(s): 2.3

IMDG Information:
Shipping Name: SULPHUR DIOXIDE
Hazard Class: 2.3
UN#: UN1079
Required Label(s): 2.3

TDG Information:
Shipping Name: SULFUR DIOXIDE
Hazard Class: 2.3
UN#: UN1079
Required Label(s): 2.3

International Bulk Chemical Code
This material does not contain any chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations
This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

Sulfur dioxide	**7446-09-5**
SARA 302:	500 lb TPQ
OSHA (safety):	1000 lb TQ (Liquid)
SARA 304:	500 lb EPCRA RQ

SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories
Gas Under Pressure; Acute toxicity; Skin Corrosion/Irritation; Serious Eye Damage/Eye Irritation; Simple Asphyxiant

U.S. State Regulations
The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
Sulfur dioxide	**7446-09-5**	Yes	Yes	Yes	Yes	Yes

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

WARNING

This product can expose you to chemicals including Sulfur dioxide , which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

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Safety Data Sheet

Material Name: SULFUR DIOXIDE **SDS ID: MAT22290**

Sulfur dioxide	**7446-09-5**
Repro/Dev. Tox	developmental toxicity , 7/29/2011

Component Analysis - Inventory
Sulfur dioxide (7446-09-5)

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW, CN	VN (Draft)
No	Yes	Yes	Yes	Yes	Yes	Yes

Section 16 - OTHER INFORMATION

NFPA Ratings
Health: 3 Fire: 0 Instability: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes
SDS update: 02/10/2016

Key / Legend
ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC – European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; F - Background (for Venezuela Biological Exposure Indices); IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL) , KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; KR REACH CCA - Korea Registration and Evaluation of Chemical Substances Chemical Control Act; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX – Mexico; Ne- Non-specific; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; Nq - Non-quantitative; NSL – Non-Domestic Substance List (Canada); NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL- Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH- Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; Sc - Semi-quantitative; STEL - Short-term Exposure Limit;

CENTENNIAL
RESOURCE DEVELOPMENT, INC

Project: Lea County, NM (NAD83 - UTM Zone 13)
Site: Raider
Well: Raider Federal Com 102H
Wellbore: OH
Design: Plan 1 08-17-22
Rig: TBD

PHOENIX TECHNOLOGY SERVICES

Azimuths to True North
Magnetic North: 6.27°

Magnetic Field
Strength: 47476.3nT
Dip Angle: 59.74°
Date: 10/17/2022
Model: MVHD

RKB @ 3526.80usft (TBD)
Ground Level: 3500.80

WELL DETAILS

Ground Level: 3500.80

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	11690494.87	2112953.70	32° 11' 48.371058 N	103° 28' 19.068090 W

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00		
2	2000.00	0.00	0.00	2000.00	0.00	0.00	0.00	0.000	0.00		KOP, Begin 1.00°/100' Build
3	3000.00	10.00	246.24	2994.93	-35.08	-79.67	1.00	246.237	-30.44		Hold 10.00° Inc at 246.24° Azm
4	5631.81	10.00	246.24	5586.76	-219.23	-497.93	0.00	0.000	-190.29		Begin 1.00°/100' Drop
5	6631.81	0.00	0.00	6581.69	-254.30	-577.60	1.00	180.000	-220.73		Begin Vertical Hold
6	8929.46	0.00	0.00	8879.34	-254.30	-577.60	0.00	0.000	-220.73		KOP2, Begin 12.00°/100' Build
7	9679.46	90.00	359.98	9356.80	223.16	-577.74	12.00	359.983	255.95		LP, Hold 90.00° Inc at 359.98° Azm
8	19555.90	90.00	359.98	9356.80	10099.60	-580.64	0.00	0.000	10116.28	BHL - Raider Federal Com 102H	TD at 19555.90

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
BHL - Raider Federal Com 102H	9356.80	10099.60	-580.64	11700583.74	2112229.67	32° 13' 28.308475 N	103° 28' 25.826727 W
FTP - Raider Federal Com 102H	9356.80	-254.30	-577.60	11690232.42	2112379.86	32° 11' 45.854609 N	103° 28' 25.789641 W

FORMATION TOP DETAILS

TVDPath	MDPath	Formation	DipAngle	DipDir
5342.80	5384.09	Lamar		
5387.80	5429.78	Bell Canyon		
6306.80	6356.82	Cherry Canyon		
6491.80	6541.92	Manzanita Lime		
7800.80	7850.92	Brushy Canyon		
9163.80	9234.19	Bone Spring Lime		
9229.80	9322.99	Avalon		
9229.80	9322.99	Target Top at 0' VS		

Map System: Universal Transverse Mercator (US Survey Feet)
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone Name: Zone 13N (108 W to 102 W)

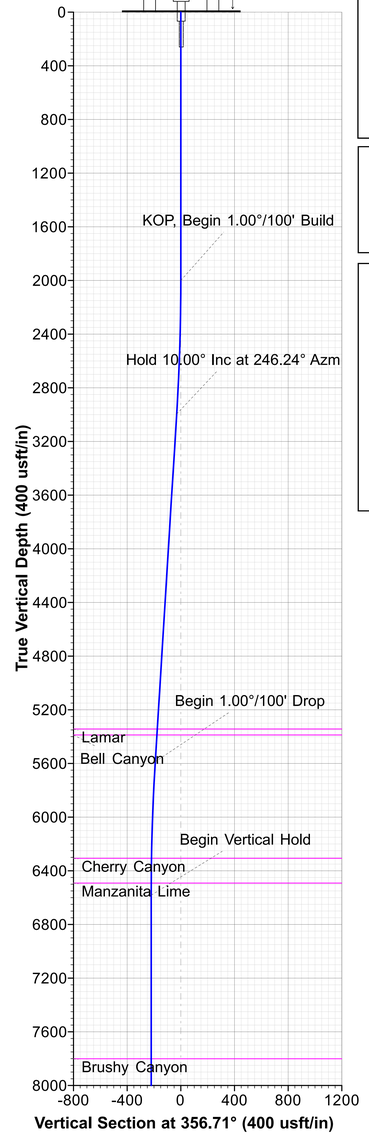
Local Origin: Well Raider Federal Com 102H, True North

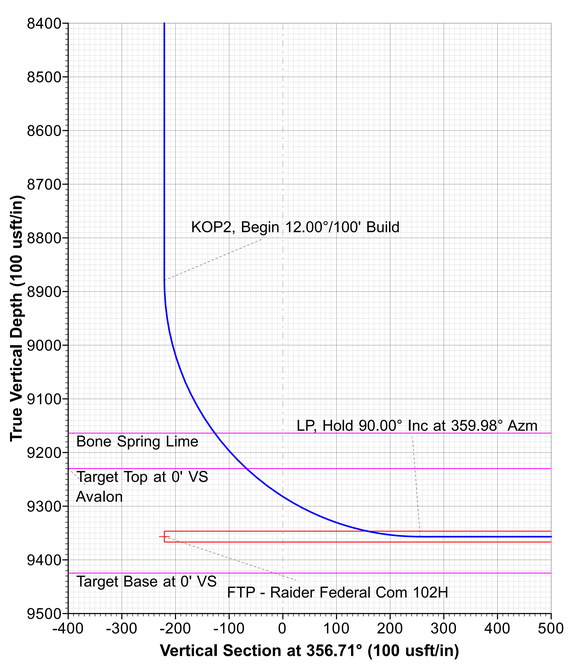
Latitude: 32° 11' 48.371058 N
Longitude: 103° 28' 19.068090 W

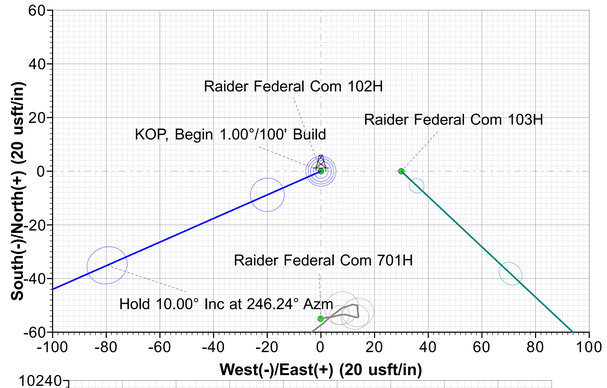
Grid East: 2112953.70
Grid North: 11690494.87
Scale Factor: 1.000

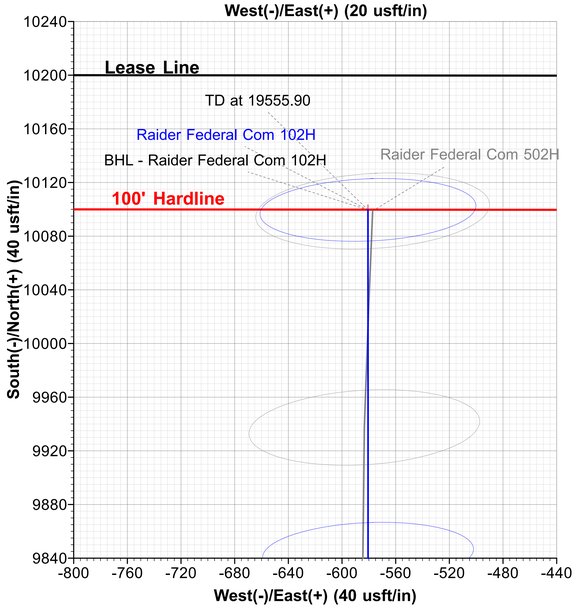
Geomagnetic Model: MVHD
Sample Date: 17-Oct-22
Magnetic Declination: 6.272°
Dip Angle from Horizontal: 59.739°
Magnetic Field Strength: 47476.26283601nT

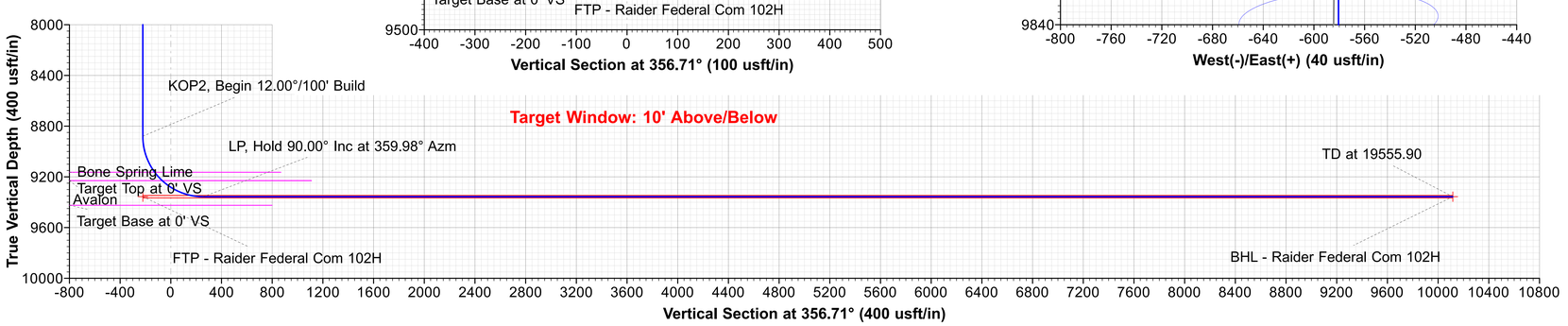
To convert a Magnetic Direction to a Grid Direction, Add 5.458°
To convert a Magnetic Direction to a True Direction, Add 6.272° East
To convert a True Direction to a Grid Direction, Subtract 0.814°

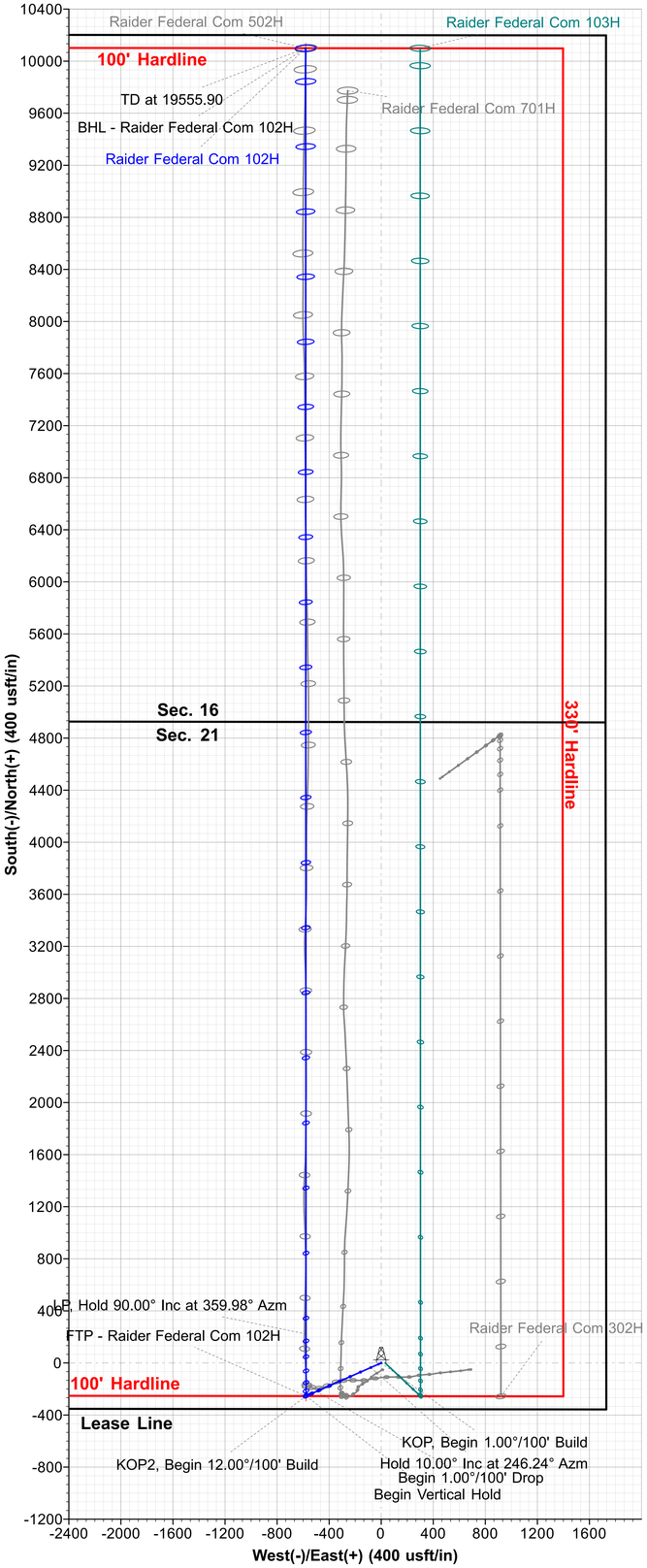












Date: 13:24, August 17 2022

PHOENIX
TECHNOLOGY SERVICES

Centennial Resources Development, Inc.

Lea County, NM (NAD83 - UTM Zone 13)
Raider
Raider Federal Com 102H

OH

Plan: Plan 1 08-17-22

Standard Planning Report

17 August, 2022

CENTENNIAL
RESOURCE DEVELOPMENT, INC

PHOENIX TECHNOLOGY SERVICES

Planning Report

CENTENNIAL RESOURCE DEVELOPMENT, INC

Database:	USA Compass	**Local Co-ordinate Reference:**	Well Raider Federal Com 102H
Company:	Centennial Resources Development, Inc.	**TVD Reference:**	RKB @ 3526.80usft (TBD)
Project:	Lea County, NM (NAD83 - UTM Zone 13)	**MD Reference:**	RKB @ 3526.80usft (TBD)
Site:	Raider	**North Reference:**	True
Well:	Raider Federal Com 102H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-17-22		

Project Lea County, NM (NAD83 - UTM Zone 13)

Map System:	Universal Transverse Mercator (US Survey Fee	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Zone 13N (108 W to 102 W)		Using geodetic scale factor

Site Raider

Site Position:		**Northing:**	11,690,439.89 usft	**Latitude:**	32° 11' 47.826895 N
From:	Map	**Easting:**	2,112,954.42 usft	**Longitude:**	103° 28' 19.068805 W
Position Uncertainty:	0.00 usft	**Slot Radius:**	13-3/16 "		

Well Raider Federal Com 102H

Well Position	**+N/-S**	54.99 usft	**Northing:**	11,690,494.87 usft	**Latitude:**	32° 11' 48.371058 N
	+E/-W	0.06 usft	**Easting:**	2,112,953.70 usft	**Longitude:**	103° 28' 19.068090 W
Position Uncertainty		1.00 usft	**Wellhead Elevation:**		**Ground Level:**	3,500.80 usft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	MVHD	10/17/2022	6.272	59.739	47,476.26283600

Design Plan 1 08-17-22

Audit Notes:

Version:		**Phase:**	PLAN	**Tie On Depth:**	0.00

Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	356.71

Plan Survey Tool Program **Date** 8/17/2022

	Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks
1	0.00	19,555.90	Plan 1 08-17-22 (OH)	MWD+IFR1+MS	
				OWSG MWD + IFR1 + Mult	

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	0.000	
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.000	
3,000.00	10.00	246.24	2,994.93	-35.08	-79.67	1.00	1.00	0.00	246.237	
5,631.81	10.00	246.24	5,586.76	-219.23	-497.93	0.00	0.00	0.00	0.000	
6,631.81	0.00	0.00	6,581.69	-254.30	-577.60	1.00	-1.00	0.00	180.000	
8,929.46	0.00	0.00	8,879.34	-254.30	-577.60	0.00	0.00	0.00	0.000	
9,679.46	90.00	359.98	9,356.81	223.16	-577.74	12.00	12.00	0.00	359.983	
19,555.90	90.00	359.98	9,356.80	10,099.60	-580.64	0.00	0.00	0.00	0.000	BHL - Raider Feder

PHOENIX TECHNOLOGY SERVICES

Planning Report

CENTENNIAL RESOURCE DEVELOPMENT, INC

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Company:	Centennial Resources Development, Inc.	**TVD Reference:**	RKB @ 3526.80usft (TBD)
Project:	Lea County, NM (NAD83 - UTM Zone 13)	**MD Reference:**	RKB @ 3526.80usft (TBD)
Site:	Raider	**North Reference:**	True
Well:	Raider Federal Com 102H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-17-22		

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
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Begin 1.00°/100' Build									
2,100.00	1.00	246.24	2,099.99	-0.35	-0.80	-0.31	1.00	1.00	0.00
2,200.00	2.00	246.24	2,199.96	-1.41	-3.19	-1.22	1.00	1.00	0.00
2,300.00	3.00	246.24	2,299.86	-3.16	-7.19	-2.75	1.00	1.00	0.00
2,400.00	4.00	246.24	2,399.68	-5.62	-12.77	-4.88	1.00	1.00	0.00
2,500.00	5.00	246.24	2,499.37	-8.79	-19.95	-7.63	1.00	1.00	0.00
2,600.00	6.00	246.24	2,598.90	-12.65	-28.73	-10.98	1.00	1.00	0.00
2,700.00	7.00	246.24	2,698.26	-17.21	-39.09	-14.94	1.00	1.00	0.00
2,800.00	8.00	246.24	2,797.40	-22.47	-51.03	-19.50	1.00	1.00	0.00
2,900.00	9.00	246.24	2,896.30	-28.42	-64.56	-24.67	1.00	1.00	0.00
3,000.00	10.00	246.24	2,994.93	-35.08	-79.67	-30.44	1.00	1.00	0.00
Hold 10.00° Inc at 246.24° Azm									
3,100.00	10.00	246.24	3,093.41	-42.07	-95.56	-36.52	0.00	0.00	0.00
3,200.00	10.00	246.24	3,191.89	-49.07	-111.45	-42.59	0.00	0.00	0.00
3,300.00	10.00	246.24	3,290.37	-56.07	-127.34	-48.67	0.00	0.00	0.00
3,400.00	10.00	246.24	3,388.85	-63.06	-143.24	-54.74	0.00	0.00	0.00
3,500.00	10.00	246.24	3,487.33	-70.06	-159.13	-60.81	0.00	0.00	0.00
3,600.00	10.00	246.24	3,585.82	-77.06	-175.02	-66.89	0.00	0.00	0.00
3,700.00	10.00	246.24	3,684.30	-84.06	-190.91	-72.96	0.00	0.00	0.00
3,800.00	10.00	246.24	3,782.78	-91.05	-206.81	-79.03	0.00	0.00	0.00
3,900.00	10.00	246.24	3,881.26	-98.05	-222.70	-85.11	0.00	0.00	0.00
4,000.00	10.00	246.24	3,979.74	-105.05	-238.59	-91.18	0.00	0.00	0.00
4,100.00	10.00	246.24	4,078.22	-112.04	-254.48	-97.25	0.00	0.00	0.00
4,200.00	10.00	246.24	4,176.70	-119.04	-270.38	-103.33	0.00	0.00	0.00
4,300.00	10.00	246.24	4,275.18	-126.04	-286.27	-109.40	0.00	0.00	0.00
4,400.00	10.00	246.24	4,373.66	-133.04	-302.16	-115.47	0.00	0.00	0.00
4,500.00	10.00	246.24	4,472.14	-140.03	-318.06	-121.55	0.00	0.00	0.00
4,600.00	10.00	246.24	4,570.62	-147.03	-333.95	-127.62	0.00	0.00	0.00
4,700.00	10.00	246.24	4,669.10	-154.03	-349.84	-133.69	0.00	0.00	0.00
4,800.00	10.00	246.24	4,767.58	-161.03	-365.73	-139.77	0.00	0.00	0.00
4,900.00	10.00	246.24	4,866.07	-168.02	-381.63	-145.84	0.00	0.00	0.00
5,000.00	10.00	246.24	4,964.55	-175.02	-397.52	-151.91	0.00	0.00	0.00
5,100.00	10.00	246.24	5,063.03	-182.02	-413.41	-157.99	0.00	0.00	0.00
5,200.00	10.00	246.24	5,161.51	-189.01	-429.30	-164.06	0.00	0.00	0.00
5,300.00	10.00	246.24	5,259.99	-196.01	-445.20	-170.14	0.00	0.00	0.00
5,384.09	10.00	246.24	5,342.80	-201.90	-458.56	-175.24	0.00	0.00	0.00
Lamar									
5,400.00	10.00	246.24	5,358.47	-203.01	-461.09	-176.21	0.00	0.00	0.00
5,429.78	10.00	246.24	5,387.80	-205.09	-465.82	-178.02	0.00	0.00	0.00
Bell Canyon									
5,500.00	10.00	246.24	5,456.95	-210.01	-476.98	-182.28	0.00	0.00	0.00
5,600.00	10.00	246.24	5,555.43	-217.00	-492.87	-188.36	0.00	0.00	0.00
5,631.81	10.00	246.24	5,586.76	-219.23	-497.93	-190.29	0.00	0.00	0.00
Begin 1.00°/100' Drop									
5,700.00	9.32	246.24	5,653.98	-223.84	-508.40	-194.29	1.00	-1.00	0.00
5,800.00	8.32	246.24	5,752.80	-230.02	-522.43	-199.65	1.00	-1.00	0.00
5,900.00	7.32	246.24	5,851.87	-235.50	-534.88	-204.41	1.00	-1.00	0.00
6,000.00	6.32	246.24	5,951.16	-240.28	-545.75	-208.56	1.00	-1.00	0.00
6,100.00	5.32	246.24	6,050.64	-244.37	-555.02	-212.11	1.00	-1.00	0.00
6,200.00	4.32	246.24	6,150.29	-247.75	-562.71	-215.04	1.00	-1.00	0.00
6,300.00	3.32	246.24	6,250.06	-250.43	-568.80	-217.37	1.00	-1.00	0.00

PHOENIX TECHNOLOGY SERVICES

Planning Report

CENTENNIAL RESOURCE DEVELOPMENT, INC

Database:	USA Compass	**Local Co-ordinate Reference:**	Well Raider Federal Com 102H
Company:	Centennial Resources Development, Inc.	**TVD Reference:**	RKB @ 3526.80usft (TBD)
Project:	Lea County, NM (NAD83 - UTM Zone 13)	**MD Reference:**	RKB @ 3526.80usft (TBD)
Site:	Raider	**North Reference:**	True
Well:	Raider Federal Com 102H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-17-22		

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)
6,356.82	2.75	246.24	6,306.80	-251.65	-571.56	-218.42	1.00	-1.00	0.00
Cherry Canyon									
6,400.00	2.32	246.24	6,349.94	-252.41	-573.30	-219.09	1.00	-1.00	0.00
6,500.00	1.32	246.24	6,449.89	-253.69	-576.21	-220.20	1.00	-1.00	0.00
6,541.92	0.90	246.24	6,491.80	-254.02	-576.95	-220.49	1.00	-1.00	0.00
Manzanita Lime									
6,600.00	0.32	246.24	6,549.88	-254.27	-577.51	-220.70	1.00	-1.00	0.00
6,631.81	0.00	0.00	6,581.69	-254.30	-577.60	-220.73	1.00	-1.00	0.00
Begin Vertical Hold									
6,700.00	0.00	0.00	6,649.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
6,800.00	0.00	0.00	6,749.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
6,900.00	0.00	0.00	6,849.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,000.00	0.00	0.00	6,949.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,100.00	0.00	0.00	7,049.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,200.00	0.00	0.00	7,149.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,300.00	0.00	0.00	7,249.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,400.00	0.00	0.00	7,349.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,500.00	0.00	0.00	7,449.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,600.00	0.00	0.00	7,549.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,700.00	0.00	0.00	7,649.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,800.00	0.00	0.00	7,749.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
7,850.92	0.00	0.00	7,800.80	-254.30	-577.60	-220.73	0.00	0.00	0.00
Brushy Canyon									
7,900.00	0.00	0.00	7,849.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,000.00	0.00	0.00	7,949.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,100.00	0.00	0.00	8,049.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,200.00	0.00	0.00	8,149.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,300.00	0.00	0.00	8,249.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,400.00	0.00	0.00	8,349.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,500.00	0.00	0.00	8,449.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,600.00	0.00	0.00	8,549.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,700.00	0.00	0.00	8,649.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,800.00	0.00	0.00	8,749.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,900.00	0.00	0.00	8,849.88	-254.30	-577.60	-220.73	0.00	0.00	0.00
8,929.46	0.00	0.00	8,879.34	-254.30	-577.60	-220.73	0.00	0.00	0.00
KOP2, Begin 12.00°/100' Build									
9,000.00	8.46	359.98	8,949.62	-249.10	-577.60	-215.54	12.00	12.00	0.00
9,100.00	20.46	359.98	9,046.28	-224.17	-577.60	-190.65	12.00	12.00	0.00
9,200.00	32.46	359.98	9,135.63	-179.69	-577.62	-146.24	12.00	12.00	0.00
9,234.19	36.57	359.98	9,163.80	-160.32	-577.62	-126.90	12.00	12.00	0.00
Bone Spring Lime									
9,300.00	44.46	359.98	9,213.79	-117.60	-577.64	-84.25	12.00	12.00	0.00
9,322.99	47.22	359.98	9,229.80	-101.11	-577.64	-67.79	12.00	12.00	0.00
Avalon - Target Top at 0' VS									
9,400.00	56.46	359.98	9,277.33	-40.62	-577.66	-7.39	12.00	12.00	0.00
9,500.00	68.46	359.98	9,323.47	47.89	-577.68	80.97	12.00	12.00	0.00
9,600.00	80.46	359.98	9,350.21	144.07	-577.71	176.99	12.00	12.00	0.00
9,679.46	90.00	359.98	9,356.81	223.16	-577.74	255.95	12.00	12.00	0.00
LP, Hold 90.00° Inc at 359.98° Azm									
9,700.00	90.00	359.98	9,356.81	243.70	-577.74	276.46	0.00	0.00	0.00
9,800.00	90.00	359.98	9,356.80	343.70	-577.77	376.29	0.00	0.00	0.00
9,900.00	90.00	359.98	9,356.80	443.70	-577.80	476.13	0.00	0.00	0.00
10,000.00	90.00	359.98	9,356.80	543.70	-577.83	575.97	0.00	0.00	0.00

PHOENIX TECHNOLOGY SERVICES

Planning Report

CENTENNIAL RESOURCE DEVELOPMENT, INC

Database:	USA Compass	**Local Co-ordinate Reference:**	Well Raider Federal Com 102H
Company:	Centennial Resources Development, Inc.	**TVD Reference:**	RKB @ 3526.80usft (TBD)
Project:	Lea County, NM (NAD83 - UTM Zone 13)	**MD Reference:**	RKB @ 3526.80usft (TBD)
Site:	Raider	**North Reference:**	True
Well:	Raider Federal Com 102H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-17-22		

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)
10,100.00	90.00	359.98	9,356.80	643.70	-577.86	675.81	0.00	0.00	0.00
10,200.00	90.00	359.98	9,356.80	743.70	-577.89	775.64	0.00	0.00	0.00
10,300.00	90.00	359.98	9,356.80	843.70	-577.92	875.48	0.00	0.00	0.00
10,400.00	90.00	359.98	9,356.80	943.70	-577.95	975.32	0.00	0.00	0.00
10,500.00	90.00	359.98	9,356.80	1,043.70	-577.98	1,075.15	0.00	0.00	0.00
10,600.00	90.00	359.98	9,356.80	1,143.70	-578.01	1,174.99	0.00	0.00	0.00
10,700.00	90.00	359.98	9,356.80	1,243.70	-578.04	1,274.83	0.00	0.00	0.00
10,800.00	90.00	359.98	9,356.80	1,343.70	-578.07	1,374.66	0.00	0.00	0.00
10,900.00	90.00	359.98	9,356.80	1,443.70	-578.10	1,474.50	0.00	0.00	0.00
11,000.00	90.00	359.98	9,356.80	1,543.70	-578.13	1,574.34	0.00	0.00	0.00
11,100.00	90.00	359.98	9,356.80	1,643.70	-578.15	1,674.17	0.00	0.00	0.00
11,200.00	90.00	359.98	9,356.80	1,743.70	-578.18	1,774.01	0.00	0.00	0.00
11,300.00	90.00	359.98	9,356.80	1,843.70	-578.21	1,873.85	0.00	0.00	0.00
11,400.00	90.00	359.98	9,356.80	1,943.70	-578.24	1,973.68	0.00	0.00	0.00
11,500.00	90.00	359.98	9,356.80	2,043.70	-578.27	2,073.52	0.00	0.00	0.00
11,600.00	90.00	359.98	9,356.80	2,143.70	-578.30	2,173.36	0.00	0.00	0.00
11,700.00	90.00	359.98	9,356.80	2,243.70	-578.33	2,273.19	0.00	0.00	0.00
11,800.00	90.00	359.98	9,356.80	2,343.70	-578.36	2,373.03	0.00	0.00	0.00
11,900.00	90.00	359.98	9,356.80	2,443.70	-578.39	2,472.87	0.00	0.00	0.00
12,000.00	90.00	359.98	9,356.80	2,543.70	-578.42	2,572.71	0.00	0.00	0.00
12,100.00	90.00	359.98	9,356.80	2,643.70	-578.45	2,672.54	0.00	0.00	0.00
12,200.00	90.00	359.98	9,356.80	2,743.70	-578.48	2,772.38	0.00	0.00	0.00
12,300.00	90.00	359.98	9,356.80	2,843.70	-578.51	2,872.22	0.00	0.00	0.00
12,400.00	90.00	359.98	9,356.80	2,943.70	-578.54	2,972.05	0.00	0.00	0.00
12,500.00	90.00	359.98	9,356.80	3,043.70	-578.57	3,071.89	0.00	0.00	0.00
12,600.00	90.00	359.98	9,356.80	3,143.70	-578.60	3,171.73	0.00	0.00	0.00
12,700.00	90.00	359.98	9,356.80	3,243.70	-578.63	3,271.56	0.00	0.00	0.00
12,800.00	90.00	359.98	9,356.80	3,343.70	-578.66	3,371.40	0.00	0.00	0.00
12,900.00	90.00	359.98	9,356.80	3,443.70	-578.68	3,471.24	0.00	0.00	0.00
13,000.00	90.00	359.98	9,356.80	3,543.70	-578.71	3,571.07	0.00	0.00	0.00
13,100.00	90.00	359.98	9,356.80	3,643.70	-578.74	3,670.91	0.00	0.00	0.00
13,200.00	90.00	359.98	9,356.80	3,743.70	-578.77	3,770.75	0.00	0.00	0.00
13,300.00	90.00	359.98	9,356.80	3,843.70	-578.80	3,870.58	0.00	0.00	0.00
13,400.00	90.00	359.98	9,356.80	3,943.70	-578.83	3,970.42	0.00	0.00	0.00
13,500.00	90.00	359.98	9,356.80	4,043.70	-578.86	4,070.26	0.00	0.00	0.00
13,600.00	90.00	359.98	9,356.80	4,143.70	-578.89	4,170.09	0.00	0.00	0.00
13,700.00	90.00	359.98	9,356.80	4,243.70	-578.92	4,269.93	0.00	0.00	0.00
13,800.00	90.00	359.98	9,356.80	4,343.70	-578.95	4,369.77	0.00	0.00	0.00
13,900.00	90.00	359.98	9,356.80	4,443.70	-578.98	4,469.61	0.00	0.00	0.00
14,000.00	90.00	359.98	9,356.80	4,543.70	-579.01	4,569.44	0.00	0.00	0.00
14,100.00	90.00	359.98	9,356.80	4,643.70	-579.04	4,669.28	0.00	0.00	0.00
14,200.00	90.00	359.98	9,356.80	4,743.70	-579.07	4,769.12	0.00	0.00	0.00
14,300.00	90.00	359.98	9,356.80	4,843.70	-579.10	4,868.95	0.00	0.00	0.00
14,400.00	90.00	359.98	9,356.80	4,943.70	-579.13	4,968.79	0.00	0.00	0.00
14,500.00	90.00	359.98	9,356.80	5,043.70	-579.16	5,068.63	0.00	0.00	0.00
14,600.00	90.00	359.98	9,356.80	5,143.70	-579.19	5,168.46	0.00	0.00	0.00
14,700.00	90.00	359.98	9,356.80	5,243.70	-579.21	5,268.30	0.00	0.00	0.00
14,800.00	90.00	359.98	9,356.80	5,343.70	-579.24	5,368.14	0.00	0.00	0.00
14,900.00	90.00	359.98	9,356.80	5,443.70	-579.27	5,467.97	0.00	0.00	0.00
15,000.00	90.00	359.98	9,356.80	5,543.70	-579.30	5,567.81	0.00	0.00	0.00
15,100.00	90.00	359.98	9,356.80	5,643.70	-579.33	5,667.65	0.00	0.00	0.00
15,200.00	90.00	359.98	9,356.80	5,743.70	-579.36	5,767.48	0.00	0.00	0.00
15,300.00	90.00	359.98	9,356.80	5,843.70	-579.39	5,867.32	0.00	0.00	0.00
15,400.00	90.00	359.98	9,356.80	5,943.70	-579.42	5,967.16	0.00	0.00	0.00

PHOENIX TECHNOLOGY SERVICES

Planning Report

CENTENNIAL RESOURCE DEVELOPMENT, INC

Database:	USA Compass	**Local Co-ordinate Reference:**	Well Raider Federal Com 102H
Company:	Centennial Resources Development, Inc.	**TVD Reference:**	RKB @ 3526.80usft (TBD)
Project:	Lea County, NM (NAD83 - UTM Zone 13)	**MD Reference:**	RKB @ 3526.80usft (TBD)
Site:	Raider	**North Reference:**	True
Well:	Raider Federal Com 102H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-17-22		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
15,500.00	90.00	359.98	9,356.80	6,043.70	-579.45	6,066.99	0.00	0.00	0.00
15,600.00	90.00	359.98	9,356.80	6,143.70	-579.48	6,166.83	0.00	0.00	0.00
15,700.00	90.00	359.98	9,356.80	6,243.70	-579.51	6,266.67	0.00	0.00	0.00
15,800.00	90.00	359.98	9,356.80	6,343.70	-579.54	6,366.50	0.00	0.00	0.00
15,900.00	90.00	359.98	9,356.80	6,443.70	-579.57	6,466.34	0.00	0.00	0.00
16,000.00	90.00	359.98	9,356.80	6,543.70	-579.60	6,566.18	0.00	0.00	0.00
16,100.00	90.00	359.98	9,356.80	6,643.70	-579.63	6,666.02	0.00	0.00	0.00
16,200.00	90.00	359.98	9,356.80	6,743.70	-579.66	6,765.85	0.00	0.00	0.00
16,300.00	90.00	359.98	9,356.80	6,843.70	-579.69	6,865.69	0.00	0.00	0.00
16,400.00	90.00	359.98	9,356.80	6,943.70	-579.72	6,965.53	0.00	0.00	0.00
16,500.00	90.00	359.98	9,356.80	7,043.70	-579.74	7,065.36	0.00	0.00	0.00
16,600.00	90.00	359.98	9,356.80	7,143.70	-579.77	7,165.20	0.00	0.00	0.00
16,700.00	90.00	359.98	9,356.80	7,243.70	-579.80	7,265.04	0.00	0.00	0.00
16,800.00	90.00	359.98	9,356.80	7,343.70	-579.83	7,364.87	0.00	0.00	0.00
16,900.00	90.00	359.98	9,356.80	7,443.70	-579.86	7,464.71	0.00	0.00	0.00
17,000.00	90.00	359.98	9,356.80	7,543.70	-579.89	7,564.55	0.00	0.00	0.00
17,100.00	90.00	359.98	9,356.80	7,643.70	-579.92	7,664.38	0.00	0.00	0.00
17,200.00	90.00	359.98	9,356.80	7,743.70	-579.95	7,764.22	0.00	0.00	0.00
17,300.00	90.00	359.98	9,356.80	7,843.70	-579.98	7,864.06	0.00	0.00	0.00
17,400.00	90.00	359.98	9,356.80	7,943.70	-580.01	7,963.89	0.00	0.00	0.00
17,500.00	90.00	359.98	9,356.80	8,043.70	-580.04	8,063.73	0.00	0.00	0.00
17,600.00	90.00	359.98	9,356.80	8,143.70	-580.07	8,163.57	0.00	0.00	0.00
17,700.00	90.00	359.98	9,356.80	8,243.70	-580.10	8,263.40	0.00	0.00	0.00
17,800.00	90.00	359.98	9,356.80	8,343.70	-580.13	8,363.24	0.00	0.00	0.00
17,900.00	90.00	359.98	9,356.80	8,443.70	-580.16	8,463.08	0.00	0.00	0.00
18,000.00	90.00	359.98	9,356.80	8,543.70	-580.19	8,562.92	0.00	0.00	0.00
18,100.00	90.00	359.98	9,356.80	8,643.70	-580.22	8,662.75	0.00	0.00	0.00
18,200.00	90.00	359.98	9,356.80	8,743.70	-580.25	8,762.59	0.00	0.00	0.00
18,300.00	90.00	359.98	9,356.80	8,843.70	-580.28	8,862.43	0.00	0.00	0.00
18,400.00	90.00	359.98	9,356.80	8,943.70	-580.30	8,962.26	0.00	0.00	0.00
18,500.00	90.00	359.98	9,356.80	9,043.70	-580.33	9,062.10	0.00	0.00	0.00
18,600.00	90.00	359.98	9,356.80	9,143.70	-580.36	9,161.94	0.00	0.00	0.00
18,700.00	90.00	359.98	9,356.80	9,243.70	-580.39	9,261.77	0.00	0.00	0.00
18,800.00	90.00	359.98	9,356.80	9,343.70	-580.42	9,361.61	0.00	0.00	0.00
18,900.00	90.00	359.98	9,356.80	9,443.70	-580.45	9,461.45	0.00	0.00	0.00
19,000.00	90.00	359.98	9,356.80	9,543.70	-580.48	9,561.28	0.00	0.00	0.00
19,100.00	90.00	359.98	9,356.80	9,643.70	-580.51	9,661.12	0.00	0.00	0.00
19,200.00	90.00	359.98	9,356.80	9,743.70	-580.54	9,760.96	0.00	0.00	0.00
19,300.00	90.00	359.98	9,356.80	9,843.70	-580.57	9,860.79	0.00	0.00	0.00
19,400.00	90.00	359.98	9,356.80	9,943.70	-580.60	9,960.63	0.00	0.00	0.00
19,500.00	90.00	359.98	9,356.80	10,043.70	-580.63	10,060.47	0.00	0.00	0.00
19,555.90	90.00	359.98	9,356.80	10,099.60	-580.64	10,116.28	0.00	0.00	0.00
TD at 19555.90									

PHOENIX TECHNOLOGY SERVICES

Planning Report

CENTENNIAL RESOURCE DEVELOPMENT, INC

Database:	USA Compass	**Local Co-ordinate Reference:**	Well Raider Federal Com 102H
Company:	Centennial Resources Development, Inc.	**TVD Reference:**	RKB @ 3526.80usft (TBD)
Project:	Lea County, NM (NAD83 - UTM Zone 13)	**MD Reference:**	RKB @ 3526.80usft (TBD)
Site:	Raider	**North Reference:**	True
Well:	Raider Federal Com 102H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-17-22		

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BHL - Raider Federal - plan hits target center - Rectangle (sides W0.00 H10,353.90 D20.00)	0.00	356.71	9,356.80	10,099.60	-580.64	11,700,583.74	2,112,229.67	32° 13' 28.308475 N	3° 28' 25.826727 W
FTP - Raider Federal - plan misses target center by 197.80usft at 9301.55usft MD (9214.89 TVD, -116.51 N, -577.64 E) - Point	0.00	0.00	9,356.80	-254.30	-577.60	11,690,232.42	2,112,379.86	32° 11' 45.854609 N	3° 28' 25.789642 W

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
5,384.09	5,342.80	Lamar			
5,429.78	5,387.80	Bell Canyon			
6,356.82	6,306.80	Cherry Canyon			
6,541.92	6,491.80	Manzanita Lime			
7,850.92	7,800.80	Brushy Canyon			
9,234.19	9,163.80	Bone Spring Lime			
9,322.99	9,229.80	Avalon			
9,322.99	9,229.80	Target Top at 0' VS			

Plan Annotations

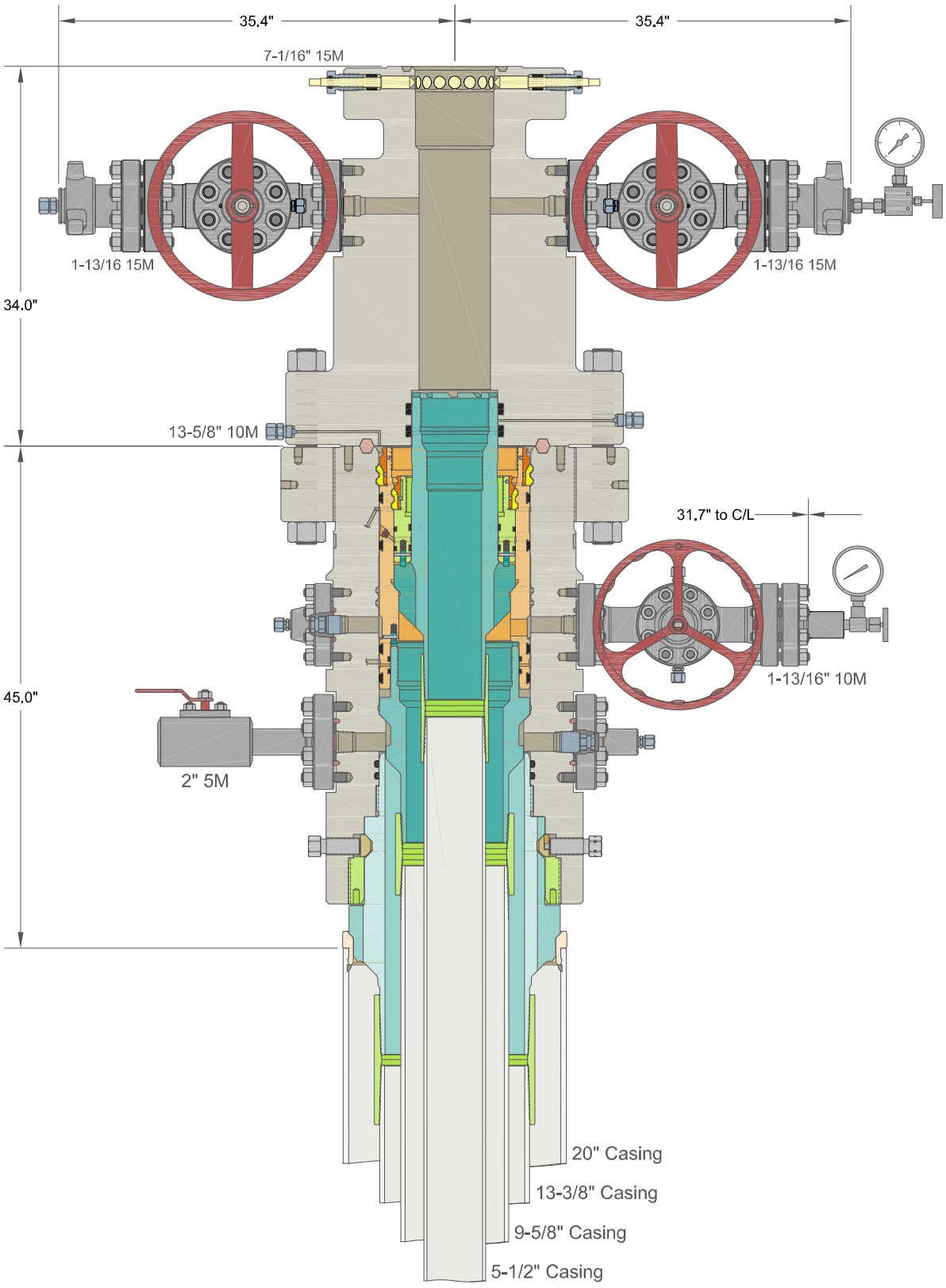
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
2,000.00	2,000.00	0.00	0.00	KOP, Begin 1.00°/100' Build
3,000.00	2,994.93	-35.08	-79.67	Hold 10.00° Inc at 246.24° Azm
5,631.81	5,586.76	-219.23	-497.93	Begin 1.00°/100' Drop
6,631.81	6,581.69	-254.30	-577.60	Begin Vertical Hold
8,929.46	8,879.34	-254.30	-577.60	KOP2, Begin 12.00°/100' Build
9,679.46	9,356.81	223.16	-577.74	LP, Hold 90.00° Inc at 359.98° Azm
19,555.90	9,356.80	10,099.60	-580.64	TD at 19555.90

Raider Fed Com 102H

Centennial Drilling Plan for 3-Casing String Bone Springs Formation

13-3/8" x 9-5/8" x 5-1/2" Casing Design

1. Drill 17-1/2" surface hole to Total Depth with Rig and perform wellbore cleanup cycles. 2. Run and land 13-3/8" casing to Depth.
3. Cement 13-3/8" casing – cement to surface.
4. Cut / Dress Conductor and 13-3/8" casing as needed, weld on Multi-bowl system with baseplate supported by 20" conductor.
5. Test Weld to 70% of 13-3/8" casing collapse. Place nightcap with Pressure Gauge on wellhead and test seals to 70% of Casing Collapse.
6. Bleed Pressure if necessary and remove nightcap. Nipple up and test BOPE with test plug per Onshore Order 2.
7. Test casing per COA WOC timing (.22 psi/ft or 1500 psi whichever is greater) - not to exceed 70% casing burst. Cement must have achieved 500psi compressive strength prior to test.
8. Install wear bushing then drill out 13-3/8" shoe-track plus 20' and conduct FIT to minimum of the MW equivalent anticipated to control the formation pressure to the next casing point.
9. Drill 12-1/4" Intermediate hole to 9-5/8" casing point. (Base Capitan Reef).
10. Remove wear bushing then run and land 9-5/8" Intermediate Casing with mandrel hanger in wellhead.
11. Cement 9-5/8 casing – cement to surface.
12. Washout stack then run wash tool in wellhead and wash hanger and pack-off setting area.
13. Install pack-off and test to 5000 psi for 15 minutes.
    a. Test casing per COA WOC timing (.22 psi/ft or 1500 psi whichever is greater) - not to exceed 70% casing burst. Cement must have achieved 500psi compressive strength prior to test.
14. Install wear bushing then drill out 9-5/8" shoe-track plus 20' and conduct FIT to minimum MW equivalent to control the formation pressure to TD of well.
15. Drill 8-3/4" Vertical hole to KOP – Trip out for Curve BHA.
16. Drill 8-3/4" Curve, landing in production interval – Trip for Lateral BHA.
17. Drill 7-7/8" Lateral to Permitted BHL, perform cleanup cycles and trip out to run 5-1/2" Production Casing.
18. Remove wear bushing then run 5-1/2" production casing to TD landing casing mandrel in wellhead.
19. Cement 5-1/2" Production string to surface.
20. Run in with wash tool and wash wellhead area – install pack-off and test to 5000psi for 15 minutes.
21. Install BPV in 5-1/2" mandrel hanger – Nipple down BOPE and install nightcap.
22. Test nightcap void to 5000psi for 30 minutes.



ALL DIMENSIONS APPROXIMATE

CACTUS WELLHEAD LLC

CENTENNIAL RESOURCE DEVELOPMENT
LEE CO, NM

20" x 13-3/8" x 9-5/8" x 5-1/2" 10M MBU-3T-CFL-R-DBLO System
With 13-5/8" 10M x 7-1/16" 15M CTH-DBLHPS Tubing Head,
20" Landing Ring & Pin Down Mandrel Casing Hangers

DRAWN	DLE	10JUN20
APPRV		

DRAWING NO. HBE0000338

GEOLOGIC PROG

CENTENNIAL RESOURCE DEVELOPMENT, LLC

WELL NAME	Raider Fed Com 102H					8/8/2022		
AREA	Solomon			API				
HZ TARGET	Avalon A Shale			WI %				
LAT LENGTH	10,000			AFE#				
TRRC PERMIT				COUNTY		Lea		

	TWNP	RNG	SECTION	FOOTAGE	COMMENT
SHL	24S	34E	21	355' FSL 1730' FEL	On lease. Drill S to N.
FTP/PP	24S	34E	21	100' FSL 2308' FEL	
LTP	24S	34E	16	100' FNL 2308' FEL	
BHL	24S	34E	16	100' FNL 2308' FEL	

GROUND LEVEL	3,498'	RIG KB	26'	KB ELEV	3,524'		
GEOLOGIST	Isabel Harper	isabel.harper@cdevinc.com		(303) 589-8841			
LOGGING	No open hole logging. MWD GR from drill out of surface casing to TD.						
MUDLOGGING	None						

FORMATION	TVD	SSTVD	THICKNESS	FINAL MD	FINAL TVD	DELTA
Rustler						
Salado						
BX BLM (Fletcher Anhydrite)						
Lamar	5,340'	-1,816'	45'			
Bell Canyon	5,385'	-1,861'	919'			
Cherry Canyon	6,304'	-2,780'	185'			
Manzanita Lime	6,489'	-2,965'	1,309'			
Brushy Canyon	7,798'	-4,274'	1,363'			
Bone Spring Lime	9,161'	-5,637'	66'			
Avalon	9,227'	-5,703'	1,010'			
First Bone Spring Sand	10,237'	-6,713'	216'			
Second Bone Spring Shale	10,453'	-6,929'	347'			
Second Bone Spring Sand	10,800'	-7,276'	413'			
Third Bone Spring Carb	11,213'	-7,689'	551'			
Third Bone Spring Sand	11,764'	-8,240'	268'			
Wolfcamp	12,032'	-8,508'				
Target Top at 0' VS	9,227'	-5703	195'			
Target Base at 0' VS	9,422'	-5,898'				
HZ TARGET AT 0' VS	9,354'	-5,830'				

TARGET: KBTVD = 9,354' at 0 VS, INC = 90 deg
Target Window +10/-10'

COMMENT:

GEOLOGIC PROG

OFFSET TYPE WELLS

CENTENNIAL RESOURCE DEVELOPMENT, LLC

	DRILLING WELL	Raider Fed Com 102H			8/8/2022	
	HZ TARGET	Avalon A Shale		AREA	Solomon	
	PRIMARY TYPE LOG				SECONDARY TYPE LOG	
	VACA RIDGE `21` FED 1				RAIDER FEDERAL COM 701H	
	30-025-28641				30-025-46427	
LOCATION	24S 34E Sec21/660' FSL 1980' FEL				24S 34E Sec 21/300' FSL 1730' FEL	
DISTANCE	435' NW of SHL				55' S of SHL (SAME PAD)	
DIRECTION SURVEY	No				Yes	
KB ELEV	3,532'				3,523'	
FORMATION	TVD	SSTVD	DELTA	TVD	SSTVD	DELTA
Rustler						
Salado				2,051'	1,473'	
BX BLM (Fletcher Anhydrite)						
Lamar	5,340'	-1,808'	46'	5,339'	-1,816'	45'
Bell Canyon	5,386'	-1,854'	914'	5,384'	-1,861'	919'
Cherry Canyon	6,300'	-2,768'	182'	6,303'	-2,780'	185'
Manzanita Lime	6,482'	-2,950'	1,297'	6,488'	-2,965'	1,309'
Brushy Canyon	7,779'	-4,247'	1,382'	7,797'	-4,274'	1,363'
Bone Spring Lime	9,161'	-5,629'	58'	9,160'	-5,637'	66'
Avalon	9,219'	-5,687'	1,004'	9,226'	-5,703'	1,010'
First Bone Spring Sand	10,223'	-6,691'	207'	10,236'	-6,713'	216'
Second Bone Spring Shale	10,430'	-6,898'	351'	10,452'	-6,929'	347'
Second Bone Spring Sand	10,781'	-7,249'	433'	10,799'	-7,276'	413'
Third Bone Spring Carb	11,214'	-7,682'	554'	11,212'	-7,689'	551'
Third Bone Spring Sand	11,768'	-8,236'	354'	11,763'	-8,240'	268'
Wolfcamp	12,122'	-8,590'		12,031'	-8,508'	
Reservoir Top	9,219'	-5,687'	195'	9,231'	-5,708'	202'
Reservoir Base	9,414'	-5,882'		9,433'	-5,910'	

Comments

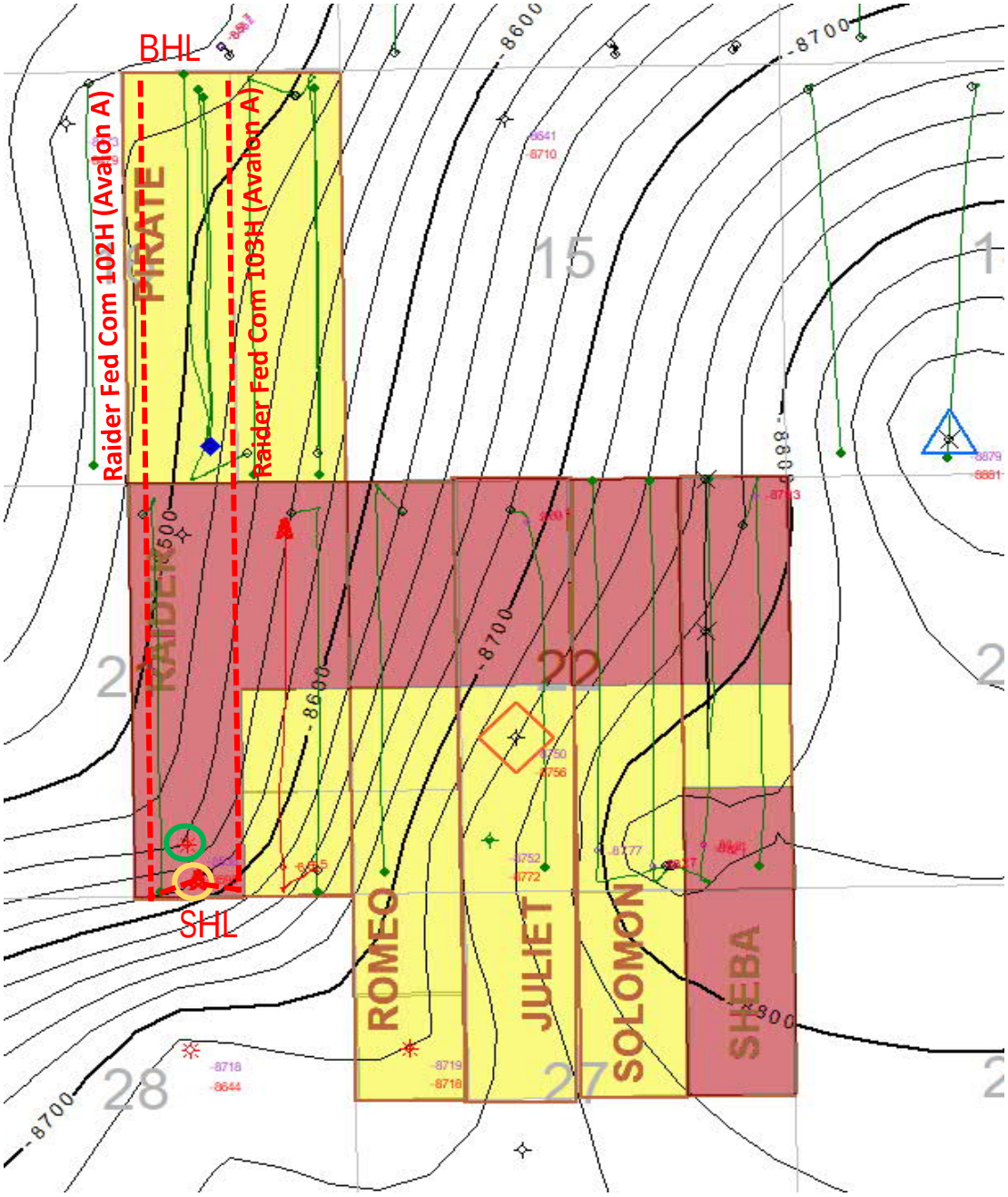
GEOLOGIC PROG

OFFSET TYPE WELLS

CENTENNIAL RESOURCE DEVELOPMENT, LLC

	DRILLING WELL	Raider Fed Com 102H		8/8/2022
	HZ TARGET	Avalon A Shale	AREA	Solomon
	PRIMARY TYPE LOG			SECONDARY TYPE LOG
	VACA RIDGE `21` FED 1			RAIDER FEDERAL COM 701H
	30-025-28641			30-025-46427
LOCATION	24S 34E Sec21/660' FSL 1980' FEL			24S 34E Sec 21/300' FSL 1730' FE
DISTANCE	435' NW of SHL			55' S of SHL (SAME PAD)
DIRECTION SURVEY	No			Yes
KB ELEV	3,532'			3,523'

LOCATION & WFMP STRUCTURE MAP



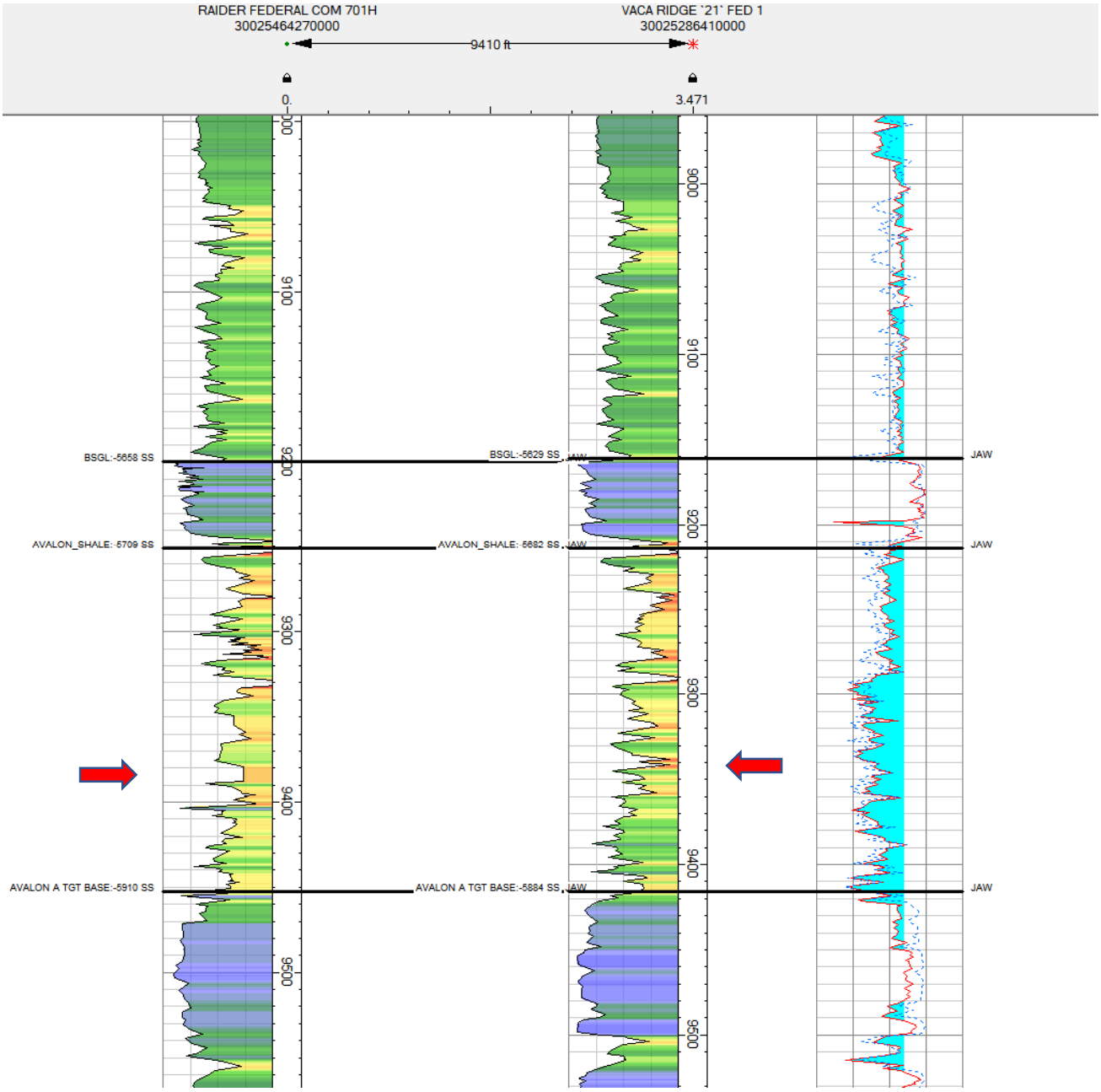
GEOLOGIC PROG

OFFSET TYPE SECTION

CENTENNIAL RESOURCE DEVELOPMENT, LLC

DRILLING WELL	Raider Fed Com 102H			8/8/2022
HZ TARGET	Avalon A Shale		AREA	Avalon A Shale
PRIMARY TYPE LOG			SECONDARY TYPE LOG	
VACA RIDGE `21` FED 1			RAIDER FEDERAL COM 701H	
30-025-28641			30-025-46427	
LOCATION	24S 34E Sec21/660' FSL 1980' FEL		24S 34E Sec 21/300' FSL 1730' FEL	
DISTANCE	435' NW of SHL		55' S of SHL (SAME PAD)	
DIRECTION SURVEY	No		Yes	
KB ELEV	3,532'		3,523'	

Type Log and Target Zone



GEOLOGIC PROG

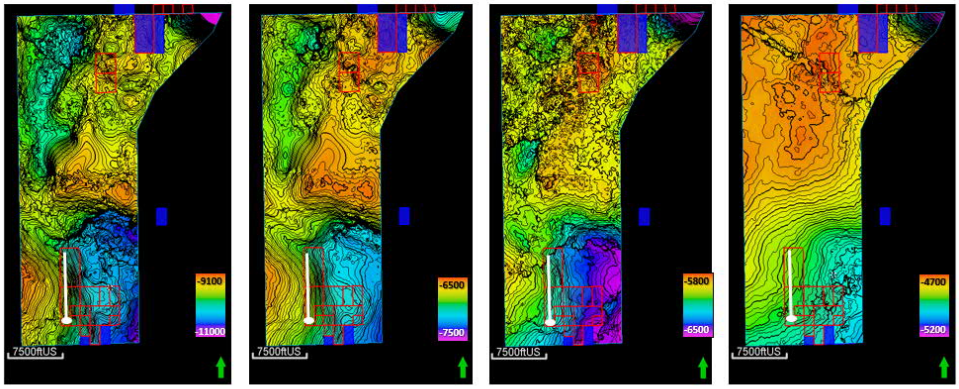
GEOPHYSICAL DATA

POTENTIAL GEOHAZARDS

Syndepositional faulting is no exception in this well. Map below shows effect of structure being much more prominent the deeper you go. Development moving east from here should have less of effect. Apparent faults in this well exist at MD 13850', 18650', 20600', and maybe right at the toe. Previous targets down here were higher in the section, chance these are fault shadow from large dip change to north. Proceed with caution.

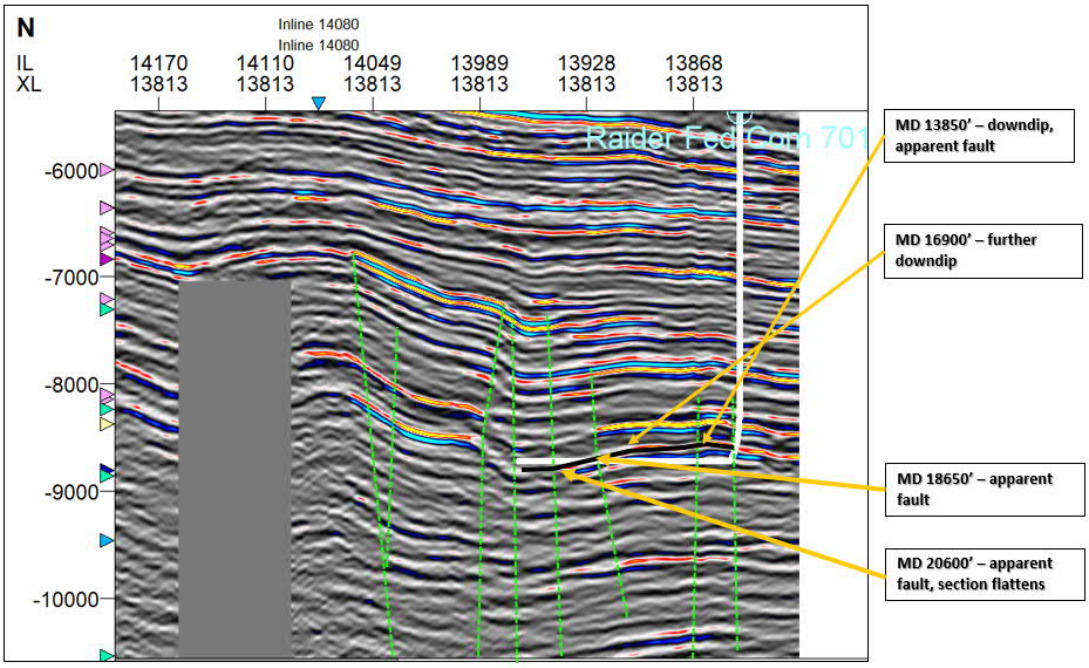
SEISMIC DISPLAYS

SSTVD Structure Depth Surfaces – Syndepositional Faulting



Take a Look at Antelope Ridge Fault for quick reference of severity and associated healing.

Raider Fed Com 701H on Seismic Depth Profile (Plan in White, Steered on Structure in Black)



CENTENNIAL 2

GEOLOGIC PROG

MUD LOG DISTRIBUTION DETAILS

CENTENNIAL RESOURCE DEVELOPMENT, LLC

WELL NAME	Raider Fed Com 102H		8/8/2022
AREA	Solomon	API	
HZ TARGET	Avalon A Shale	WI %	
LAT LENGTH	10000	AFE#	
TRRC PERMIT		COUNTY	Lea

GEOLOGIST	Isabel Harper	isabel.harper@cdevinc.com	(303) 589-8841

Mud Logging Company		
None		
TBD	TBD	TBD
Contact 2	email	phone
Contact 3	email	phone

Daily distribution data requirements and protocol

geodata@cdevinc.com; joe.woodske@cdevinc.com; drilling@cdevinc.com; dawn.billesbach@cdevinc.com, Andrew.welshhans@cdevinc.com; liam.kaltenback@cdevinc.com; nick.daniele@cdevinc.com;Isabel.Harper@cdevinc.com

Daily email distribution list

Final distribution data requirements

Final distribution list

Contact Information	Reports	Hard Copies	Digital data	Cuttings
Centennial Resource Development, c/o Joe Woodske, 1001 17th street, Suite 1800,			email final set	
				No Dried Samples to be Collected
MWD Only: Centennial Resource Development, c/o Sarah Ferreyros, 1001 17th street, Suite	email final set	2 copies of the 5" MD vertical logs 2 copies of the 5"	email final set	

Project Geologist:	Ali Sloan	Production:	Jessica Stibor
Operations Geologist:	Joe Woodske	Surface Land:	Bailey Joplim
Drilling:	Ronny Hise	Mineral Land:	Gavin Smith

Centennial Resource Development
New Mexico Multi-Well Pad Drilling
Batch Setting Procedures

13-3/8" Surface Casing - CRD intends to Batch set all 13-3/8" casing to a depth approved in the APD. 17-1/2" Surface Holes will be batch drilled by a rig. Appropriate notifications will be made prior to spudding the well, running and cementing casing and prior to skidding to the rig to the next well on pad.

1. Drill 17-1/2" Surface hole to Approved Depth with Rig and perform wellbore cleanup cycles. Trip out and rack back drilling BHA.
2. Run and land 13-3/8" 54.5# J55 BTC casing see Illustration 1-1 Below to depth approved in APD.
3. Set packoff and test to 5k psi
4. Offline Cement
5. Install nightcap with Pressure Gauge on wellhead. Nightcap is shown on final wellhead Stack up Illustration #2-2 page 3.
6. Skid Rig to adjacent well to drill Surface hole.
7. Surface casing test will be performed by the rig in order to allow ample time for Cement to develop 500psi compressive strength. Casing test to 0.22 psi/ft or 1500 psi whichever is greater - not to exceed 70% casing burst.

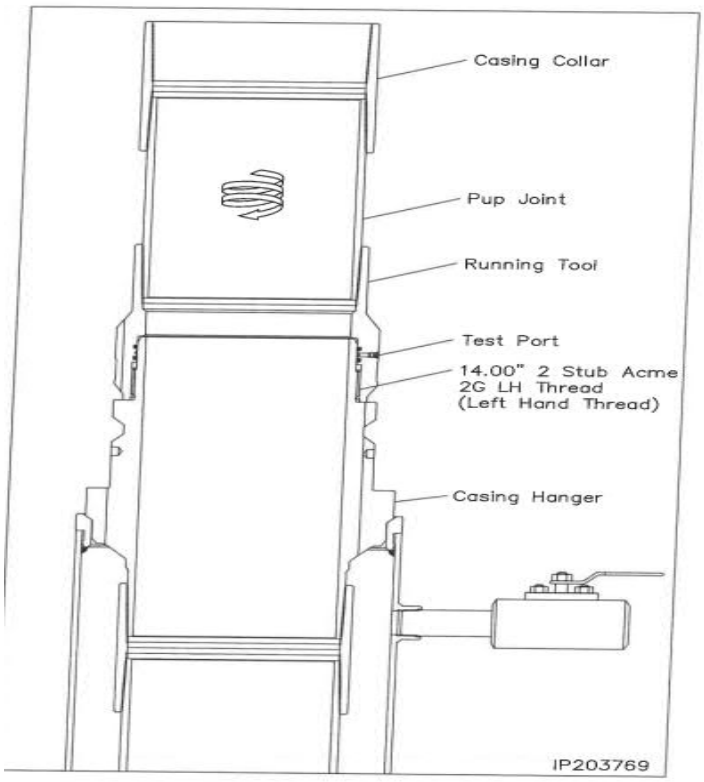


Illustration 1-1

Intermediate Casing – CRD intends to Batch set all intermediate casing strings to a depth approved in the APD, typically set into Lamar. 12-1/4" Intermediate Holes will be batch drilled by the rig. Appropriate notifications will be made prior Testing BOPE, and prior to running/cementing all casing strings.

1. Rig will remove the nightcap and install and test BOPE.
2. Test Surface casing per COA WOC timing (.22 psi/ft or 1500 psi whichever is greater) - not to exceed 70% casing burst. Cement must have achieved 500psi compressive strength prior to test.
3. Install wear bushing then drill out 13-3/8" shoe-track plus 20' and conduct FIT to minimum of the MW equivalent anticipated to control the formation pressure to the next casing point.
4. Drill Intermediate hole to approved casing point. Trip out of hole with BHA to run Casing.
5. Remove wear bushing then run and land Intermediate Casing with mandrel hanger in wellhead.
6. Cement casing to surface with floats holding.
7. Washout stack then run wash tool in wellhead and wash hanger and pack-off setting area.
8. Install pack-off and test void to 5,000 psi for 15 minutes. Nightcap shown on final wellhead stack up illustration 2-2 on page 3.
9. Test casing per COA WOC timing (.22 psi/ft or 1500 psi whichever is greater) - not to exceed 70% casing burst. Cement must have achieved 500psi compressive strength prior to test.
10. Install nightcap – skid rig to adjacent well to drill Intermediate hole.

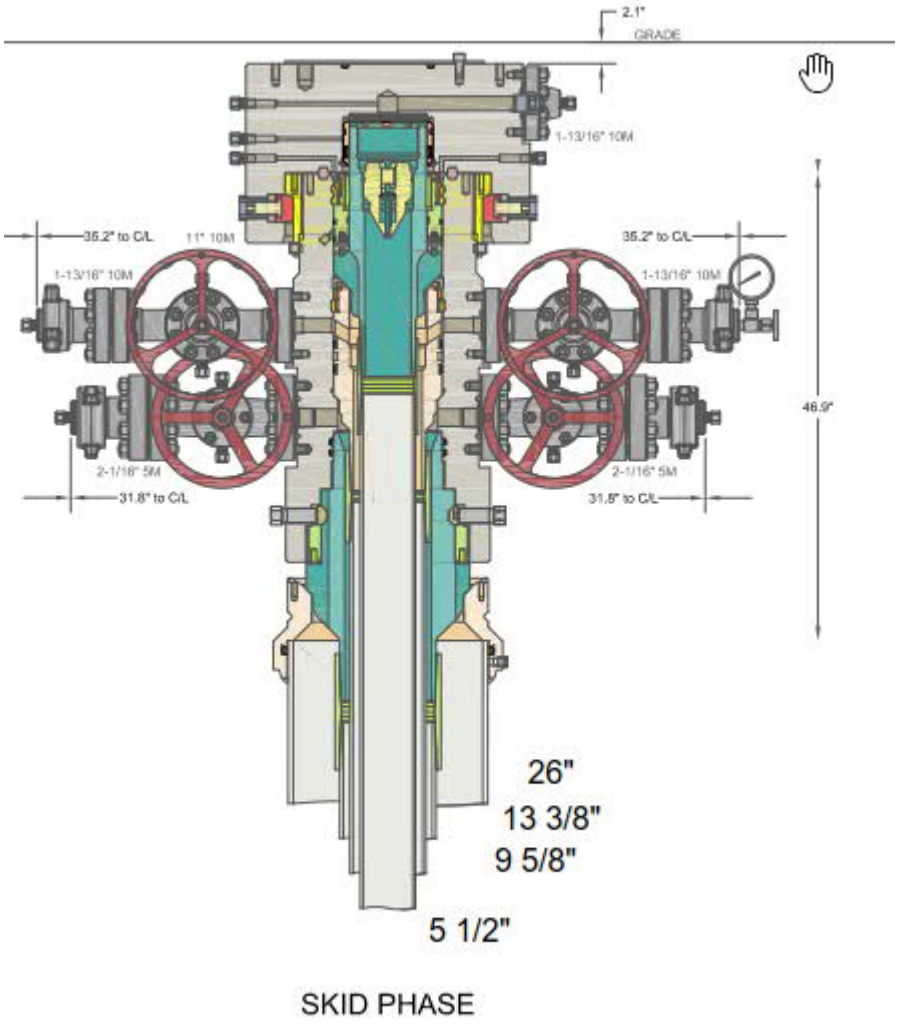


Illustration 2-2

Production Casing – CRD intends to Batch set all Production casings with Rig. Appropriate notifications will be made prior Testing BOPE, and prior to running/cementing all casing strings.

1. Big Rig will remove the nightcap and install and test BOPE.
2. Install wear bushing then drill Intermediate shoe-track plus 20' and conduct FIT to minimum MW equivalent to control the formation pressure to TD of well.
3. Drill Vertical hole to KOP – Trip out for Curve BHA.
4. Drill Curve, landing in production interval – Trip for Lateral BHA.
5. Drill Lateral / Production hole to Permitted BHL, perform cleanup cycles and trip out to run 5-1/2" Production Casing.
6. Remove wear bushing then run 5-1/2" production casing to TD landing casing mandrel in wellhead.
7. Cement 5-1/2" Production string to surface with floats holding.

8. Run in with wash tool and wash wellhead area – install pack-off and test void to 5,000psi for 15 minutes.
9. Install BPV in 5-1/2" mandrel hanger – Nipple down BOPE and install nightcap.
10. Test nightcap void to 5,000psi for 30 minutes per illustration 2-2 page 3.
11. Skid rig to adjacent well on pad to drill production hole.

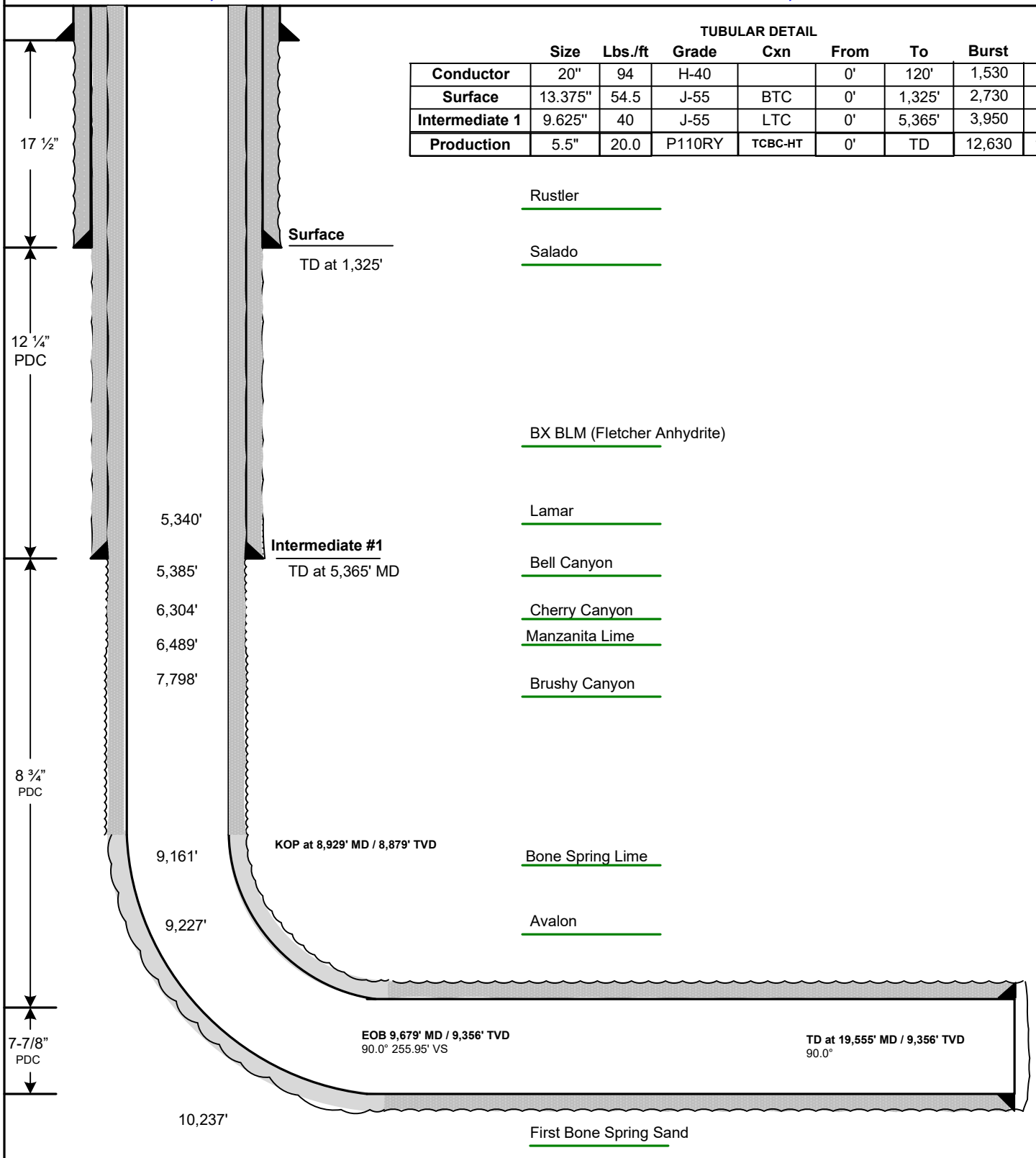
CENTENNIAL | WBD

Well : Raider Fed Com 102H
Area : Solomon **FM tgt :** Avalon A Shale
County : Lea **State** : NM
Location : Lot O Section 21, T24S, R34E; 355' FSL & 1730' FEL
BHL : Lot B, Section 16, T24S, R34E; 100' FNL & 2308' FEL
KB Elev : 3,524' MSL **KB** : 26' AGL **GL Elev** : 3,498' MSL

CENTENNIAL RESOURCE DEVELOPMENT, INC

TUBULAR DETAIL

	Size	Lbs./ft	Grade	Cxn	From	To	Burst	Cllps
Conductor	20"	94	H-40		0'	120'	1,530	520
Surface	13.375"	54.5	J-55	BTC	0'	1,325'	2,730	1,130
Intermediate 1	9.625"	40	J-55	LTC	0'	5,365'	3,950	2,570
Production	5.5"	20.0	P110RY	TCBC-HT	0'	TD	12,630	11,110



Centennial Resource Production, LLC hereby requests to use a flex hose on H&P choke manifold for the Raider Fed Com 102H well. The Flex Hose specifications are listed on the following pages.

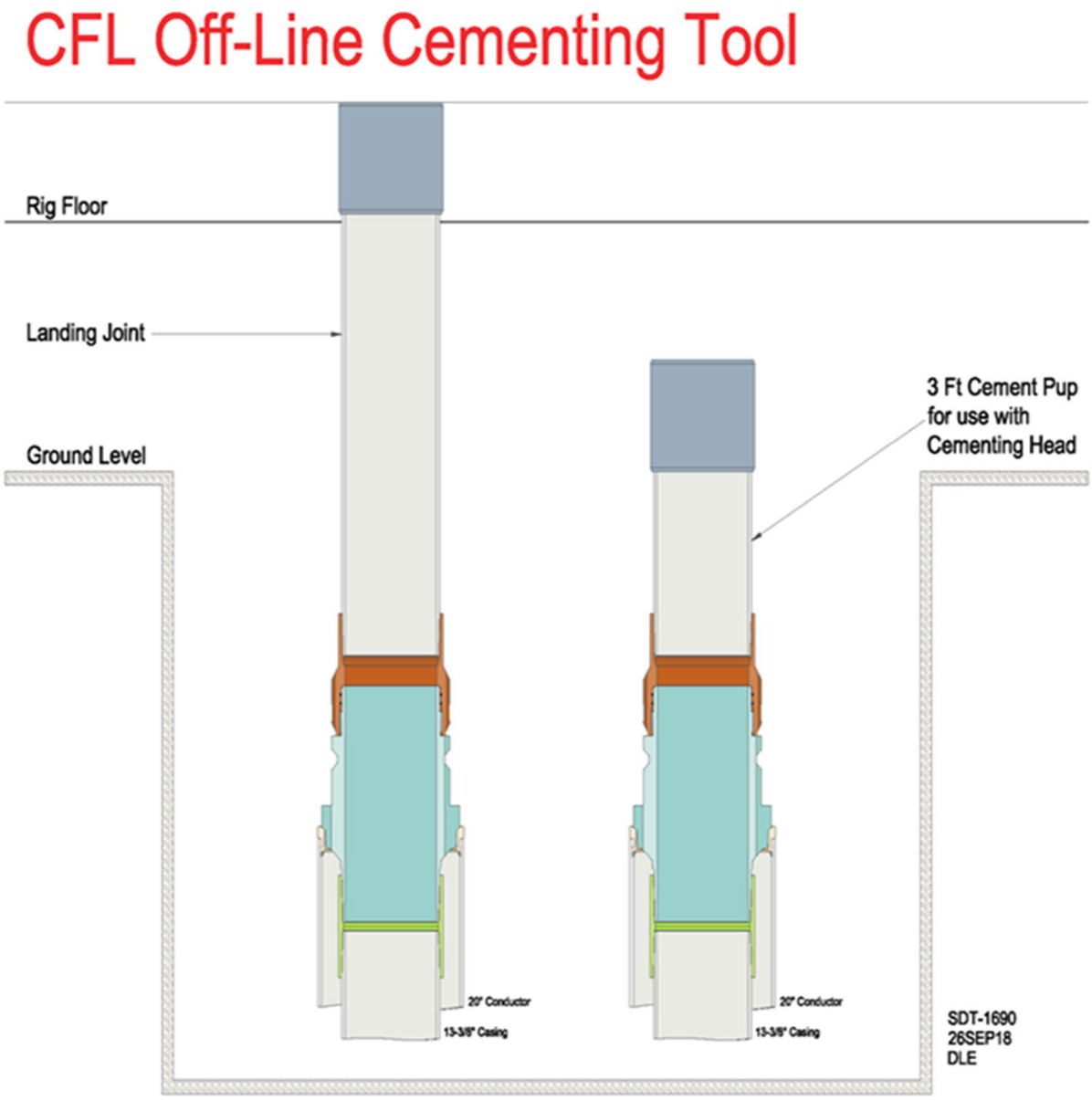
Raider Fed Com 102H

Centennial Offline Cementing Procedure

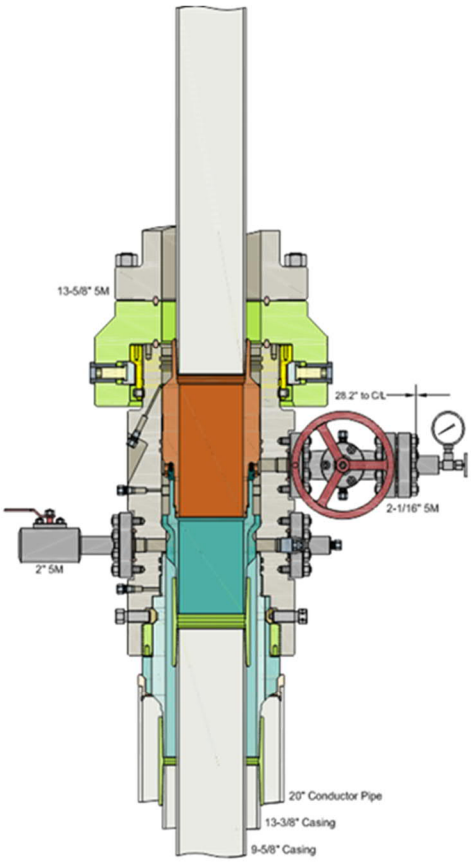
13-3/8" & 9-5/8" Casing

1. Drill hole to Total Depth with Rig and perform wellbore cleanup cycles.
2. Run and casing to Depth.
3. Land casing with mandrel.
4. Circulate 1.5 csg capacity.
5. Flow test – Confirm well is static and floats are holding.
6. Set Annular packoff and pressure test. Test to 5k.
7. Nipple down BOP and install cap flange.
8. Skid rig to next well on pad
9. Remove cap flange (confirm well is static before removal)
    a. If well is not static use the casing outlet valves to kill well
    b. Drillers method will be used in well control event
    c. High pressure return line will be rigged up to lower casing valve and run to choke manifold to control annular pressure
    d. Kill mud will be circulated once influx is circulated out of hole
    e. Confirm well is static and remove cap flange to start offline cement operations
10. Install offline cement tool.
11. Rig up cementers.
12. Circulate bottoms up with cement truck
13. Commence planned cement job, take returns through the annulus wellhead valve
14. After plug is bumped confirm floats hold and well is static
15. Rig down cementers and equipment
16. Install night cap with pressure gauge to monitor.
17. Will only offline surface and intermediate casing.

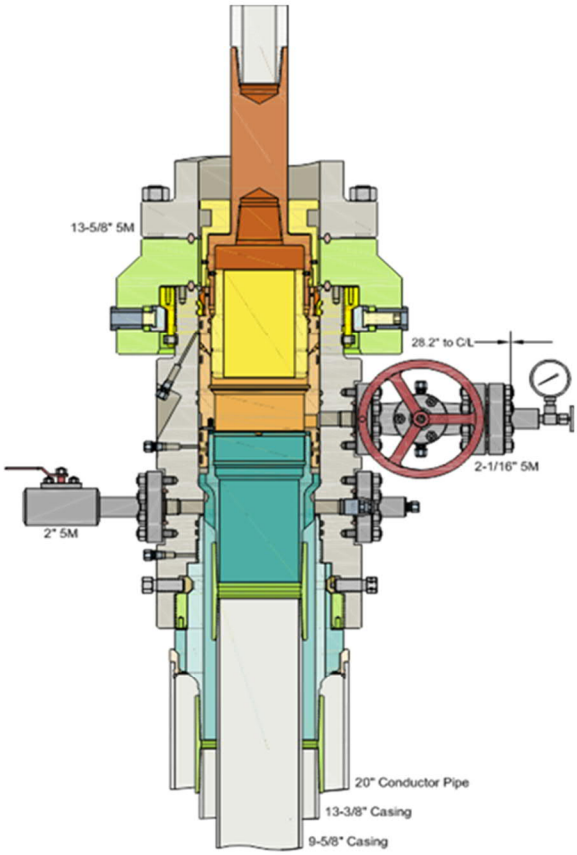
13 3/8” Surface job



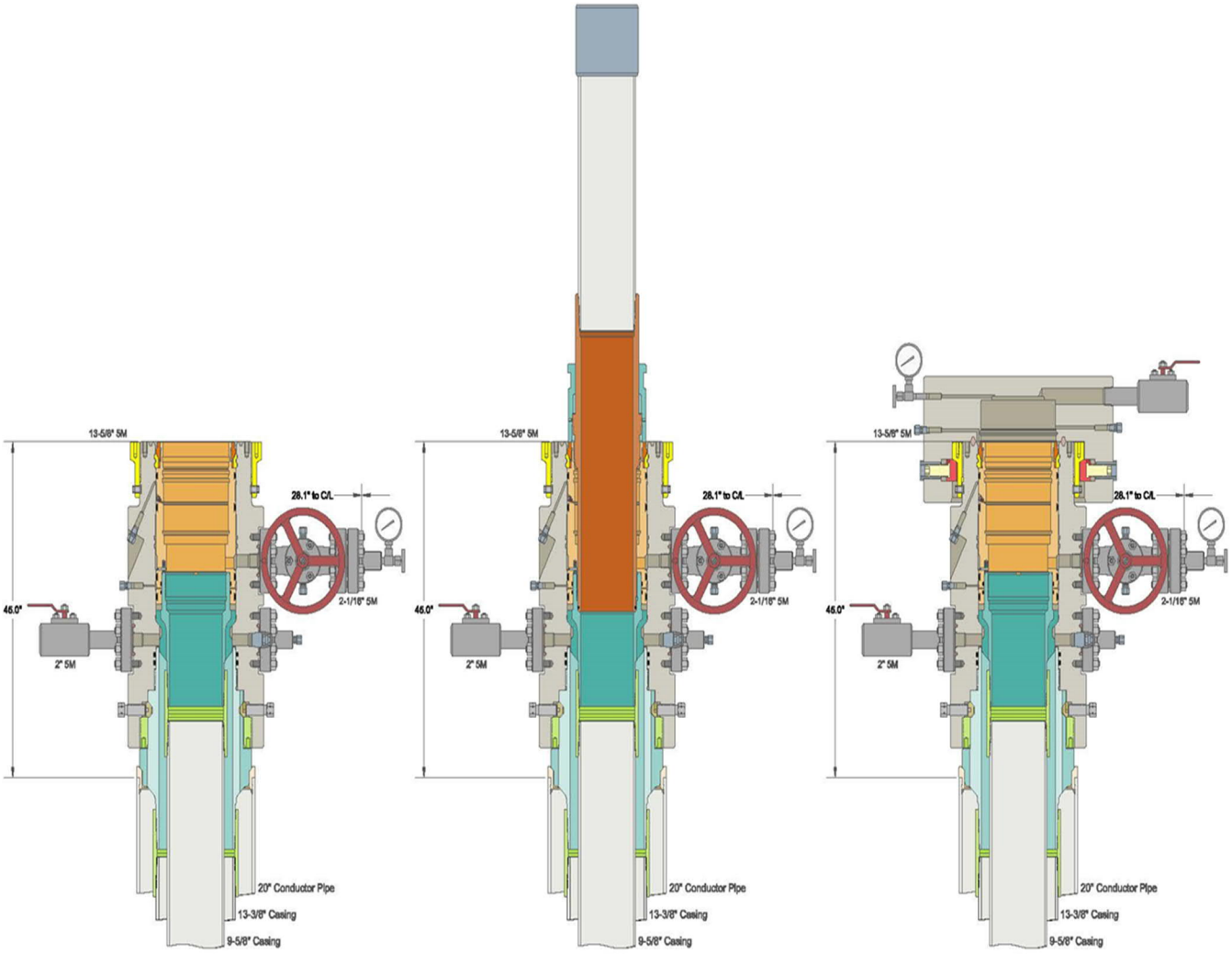
9 5/8” Intermediate Job



Run 9-5/8” Casing
Land Casing on 9-5/8” Mandrel Hanger
Cement 9-5/8” Casing
Retrieve Running Tool



Run 13-5/8” Packoff
Test Upper and Lower Seals
Engage Lockring
Retrieve Running Tool


13-5/8" 5M
28.1° to C/L
2-1/16" 5M
46.0°
2" 5M
20" Conductor Pipe
13-3/8" Casing
9-5/8" Casing
13-5/8" 5M
28.1° to C/L
2-1/16" 5M
46.0°
2" 5M
20" Conductor Pipe
13-3/8" Casing
9-5/8" Casing
13-5/8" 5M
28.1° to C/L
2-1/16" 5M
46.0°
2" 5M
20" Conductor Pipe
13-3/8" Casing
9-5/8" Casing

Centennial Resource Development - Well Control Plan

A. Component and Preventer Compatibility Table

Component	OD (inches)	Preventer	RWP
Drillpipe	5	Upper VBR: 3.5 – 5.5 Lower VBR: 3.5 – 5.5	10M
Heavyweight Drillpipe	5	Upper VBR: 3.5 – 5.5 Lower VBR: 3.5 – 5.5	10M
Drill collars and MWD tools	6 ¾	Annular	5M
Mud Motor	6 ¾	Annular	5M
Production Casing	5-1/2	Upper VBR: 3.5 – 5.5 Lower VBR: 3.5 – 5.5	10M
All	0 – 13 5/8	Annular	5M
Open-hole	-	Blind rams	10M

VBR = Variable Bore Rams

RWP = Rated Working Pressure

MWD = Measurement While Drilling (directional tools)

B. Well Control Procedures

I. General Procedures While Drilling:

1. Sound alarm (alert crew).
2. Space out drill-string.
3. Shut down pumps and stop rotary.
4. Open HCR
5. Shut-in well – utilizing upper VBRs.
6. Close choke
7. Confirm shut-in.
8. Notify rig manager and Centennial company representative.
9. Call Centennial drilling engineer
10. Read and record
    - I. Shut-in drillpipe pressure (SIDPP) and shut-in casing pressure (SCIP).
    - II. Pit gain
    - III. Time
11. Regroup, identify forward plan

II. General Procedure While Tripping

1. Sound alarm (alert crew).
2. Stab full opening safety valve and close
3. Space out drillstring.
4. Open HCR
5. Shut-in well – utilizing upper VBRs
6. Close choke
7. Confirm shut-in.
8. Notify rig manager and Centennial company representative.
9. Call Centennial drilling engineer
10. Read and record:
    I. SIDPP AND SICP
    II. Pit gain
    III. Time
11. Regroup and identify forward plan.

III. General Procedure While Running Casing

1. Sound alarm (alert crew)
2. Stab full opening safety valve and close
3. Space out string.
4. Open HCR
5. Shut-in well – utilizing upper VBRs.
6. Close choke
7. Confirm shut-in.
8. Notify rig manager and Centennial company representative.
9. Call Centennial drilling engineer
10. Read and record:
    I. SIDPP AND SICP
    II. Pit gain
    III. Time
11. Regroup and identify forward plan.

IV. General Procedure With No Pipe In Hole (Open Hole)

1. Sound alarm (alert crew)
2. Open HCR
3. Shut-in with blind rams
4. Close choke
5. Confirm shut-in
6. Notify rig manager and Centennial company representative.
7. Call Centennial drilling engineer
8. Read and record:
    I. SIDPP AND SICP
    II. Pit gain
    III. Time
9. Regroup and identify forward plan.

V. General Procedures While Pulling BHA Thru BOP Stack

1. **Prior to pulling last joint of drillpipe thru stack**:
   - I. Perform flow check, if flowing
     - a. Sound alarm, alert crew
     - b. Stab full opening safety valve and close
     - c. Space out drillstring with tool joint just beneath the upper pipe ram.
     - d. Open HCR
     - e. Shut-in utilizing upper VBRs
     - f. Close choke
     - g. Confirm shut-in
     - h. Notify rig manager and Centennial company representative.
     - i. Call Centennial drilling engineer
     - j. Read and record:
       - i. SIDPP and SICP
       - ii. Pit gain
       - iii. Time
   - II. Regroup and identify forward plan

2. **With BHA in the BOP stack and compatible ram preventer and pipe combo immediately available**:
   - a. Sound alarm, alert crew
   - b. Stab full opening safety valve and close
   - c. Space out drillstring with tool joint just beneath the upper pipe ram.
   - d. Open HCR
   - e. Shut-in utilizing upper VBRs
   - f. Close choke
   - g. Confirm shut-in
   - h. Notify rig manager and Centennial company representative.
   - i. Call Centennial drilling engineer
   - j. Read and record:
     - i. SIDPP and SICP
     - ii. Pit gain
     - iii. Time
   - II. Regroup and identify forward plan

3. **With BHA in the BOP stack and no compatible ram preventer and pipe combo immediately availiable**:
    I. Sound alarm, alert crew.
    II. If possible to pick up high enough, pull string clear of the stack and follow Open Hole (III) scenario.
    III. If impossible to pick up high enough to pull the string clear of the stack:
        a. Stab crossover, make up one joint/stand of drill pipe and full opening safety valve and close.
        b. Space out drillstring with tool joint just beneath the upper pipe ram.
        c. Open HCR
        d. Shut-in utilizing upper VBRs.
        e. Close choke
        f. Confirm shut-in
        g. Notify rig manager and Centennial company representative.
        h. Call Centennial drilling engineer
        i. Read and record:
            i. SIDPP and SICP
            ii. Pit gain
            iii. Time
    IV. Regroup and identify forward plan.

** **If annular is used to shut-in well and pressure builds to OR is expected to get to 50% of RWP, confirm space-out and swap to upper VBRs for shut-in.**

AFMSS
U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT

Bond Info Data
06/15/2023

APD ID: 10400088284 **Submission Date:** 09/27/2022

Operator Name: CENTENNIAL RESOURCE PRODUCTION LLC

Well Name: RAIDER FEDERAL COM **Well Number:** 102H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes
Show Final Text

Bond

Federal/Indian APD: FED

BLM Bond number: NMB001841

BIA Bond number:

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond

Reclamation bond number:

Reclamation bond amount:

Reclamation bond rider amount:

Additional reclamation bond information

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
372165
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

RED HILLS; BONE SPRING, NORTH

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
30-025-51621	~~2220~~ 96434	~~Antelope Ridge; Bone Spring~~

[4] Property Code	[5] Property Name	[6] Well Number
318010	RAIDER FEDERAL COM	102H

[7] OGRID No.	[8] Operator Name	[9] Elevation
372165	PERMIAN RESOURCES OPERATING, LLC	3500.8'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
O	21	24S	34E		355	SOUTH	1730	EAST	LEA

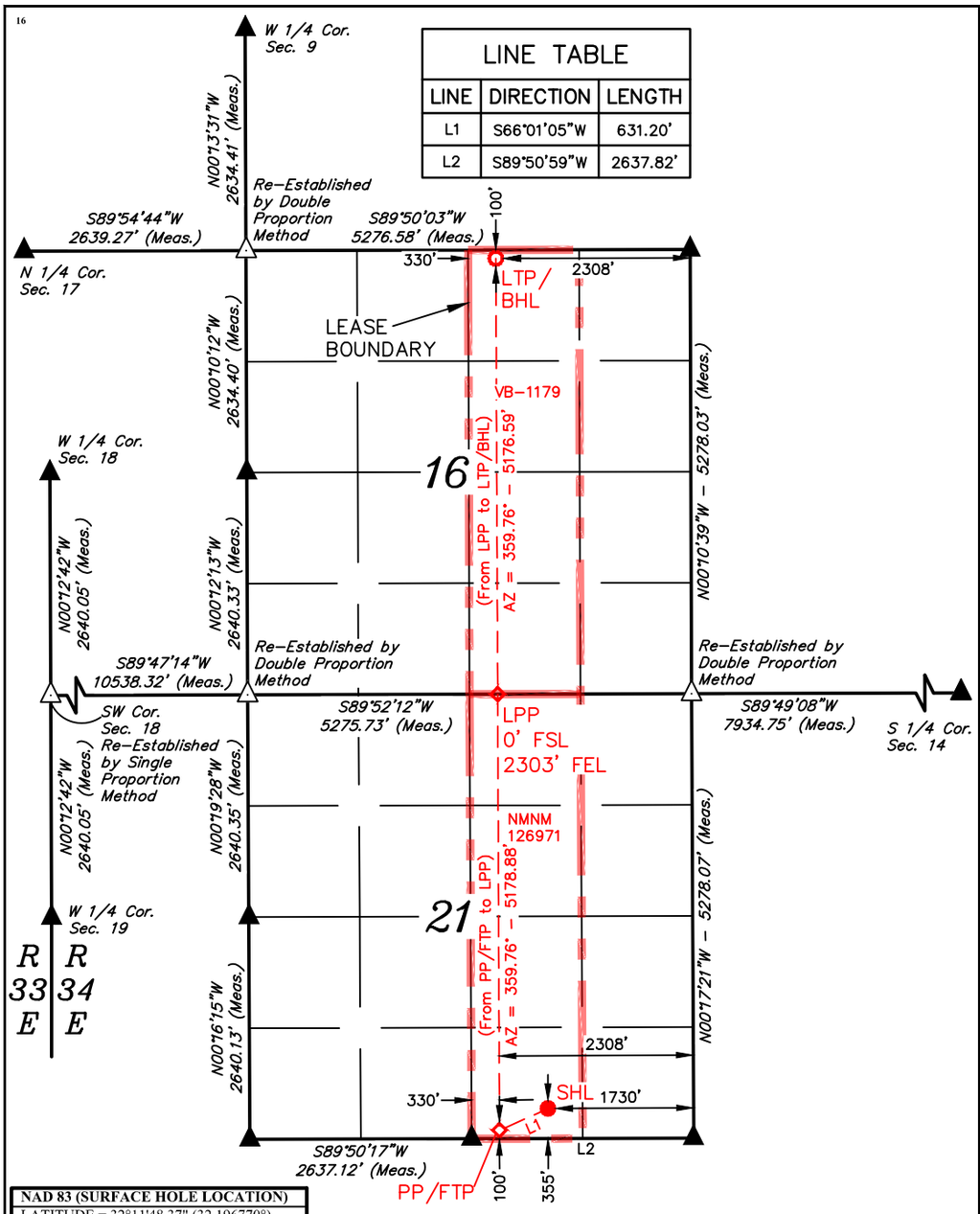
[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
B	16	24S	34E		100	NORTH	2308	EAST	LEA

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
320.00			

No allowable will be assigned to this completion until all interests have been consolidated or a non-standard unit has been approved by the division.

16



LINE TABLE		
LINE	DIRECTION	LENGTH
L1	S66°01'05"W	631.20'
L2	S89°50'59"W	2637.82'

NAD 83 (SURFACE HOLE LOCATION)
LATITUDE = 32°11'48.37" (32.196770°)
LONGITUDE = 103°28'19.07" (103.471963°)
STATE PLANE NAD 83 (N.M. EAST)
Y: 436386.41' X: 807784.47'
UTM, NAD 83 (ZONE 13)
Y: 11690494.87' X: 2112953.70'

NAD 83 (PP/FTP)
LATITUDE = 32°11'45.85" (32.196071°)
LONGITUDE = 103°28'25.79" (103.473830°)
STATE PLANE NAD 83 (N.M. EAST)
Y: 436127.49' X: 807208.93'
UTM, NAD 83 (ZONE 13)
Y: 11690232.42' X: 2112379.86'

NAD 83 (LPP)
LATITUDE = 32°11'45.85" (32.196071°)
LONGITUDE = 103°28'25.79" (103.473830°)
STATE PLANE NAD 83 (N.M. EAST)
Y: 436127.49' X: 807208.93'
UTM, NAD 83 (ZONE 13)
Y: 11690232.42' X: 2112379.86'

NAD 83 (LTP/BHL)
LATITUDE = 32°13'28.31" (32.224530°)
LONGITUDE = 103°28'25.83" (103.473841°)
STATE PLANE NAD 83 (N.M. EAST)
Y: 446480.94' X: 807122.96'
UTM, NAD 83 (ZONE 13)
Y: 11700583.74' X: 2112229.67'

NOTE:
- Distances referenced on plat to section lines are perpendicular.
- Basis of Bearing is a Transverse Mercator Projection with a Central Meridian of W103°53'00" (NAD 83)

2000' 1000' 0' 2000'

SCALE
DRAWN BY: D.M.C. 07-05-22
REVISED BY: T.J.S. 07-29-22
(ADDED LEASE BOUNDARY & LPP)

● = SURFACE HOLE LOCATION
◇ = PP/FTP/LPP
○ = LTP/BHL
▲ = SECTION CORNER LOCATED
△ = SECTION CORNER RE-ESTABLISHED. (Not Set on Ground.)

[17] OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature 9/26/22 Date

Meghan Twele
Printed Name

meghan.twele@cdevinc.com
E-mail Address

[18] SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

JUNE 24, 2022
Date of Survey
Signature and Seal of Professional Surveyor:

PAUL BUCHELE NEW MEXICO 23782 PROFESSIONAL SURVEYOR 07-29-22

Certificate Number:

State of New Mexico
Energy, Minerals and Natural Resources Department

Submit Electronically
Via E-permitting

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

NATURAL GAS MANAGEMENT PLAN

This Natural Gas Management Plan must be submitted with each Application for Permit to Drill (APD) for a new or recompleted well.

Section 1 – Plan Description

Effective May 25, 2021

I. Operator: PERMIAN RESOURCES OPERATING, LLC **OGRID:** 372165 **Date:** 06 / 12 / 2023

II. Type: ☑ Original ☐ Amendment due to ☐ 19.15.27.9.D(6)(a) NMAC ☐ 19.15.27.9.D(6)(b) NMAC ☐ Other.

If Other, please describe: _____

III. Well(s): Provide the following information for each new or recompleted well or set of wells proposed to be drilled or proposed to be recompleted from a single well pad or connected to a central delivery point.

Well Name	API	ULSTR	Footages	Anticipated Oil BBL/D	Anticipated Gas MCF/D	Anticipated Produced Water BBL/D
SHEBA FEDERAL COM 107H		H-27-24S-34E	2349 FNL & 1030 FEL	1622 BBL/D	2437 MCF/D	10891 BBL/D
RAIDER FEDERAL COM 102H		O-21-24S-34E	355 FSL & 1730 FEL	1611 BBL/D	2420 MCF/D	10818 BBL/D
SOLOMON FEDERAL COM 105H		G-27-24S-34E	2299 FNL & 1965 FEL	1366 BBL/D	2052 MCF/D	9171 BBL/D

IV. Central Delivery Point Name: RAIDER CDP [See 19.15.27.9(D)(1) NMAC]

V. Anticipated Schedule: Provide the following information for each new or recompleted well or set of wells proposed to be drilled or proposed to be recompleted from a single well pad or connected to a central delivery point.

Well Name	API	Spud Date	TD Reached Date	Completion Commencement Date	Initial Flow Back Date	First Production Date
SHEBA FEDERAL COM 107H		07/07/2023	07/22/2023	10/01/2023	10/16/2023	10/16/2023
RAIDER FEDERAL COM 102H		07/24/2023	08/10/2023	10/04/2023	10/16/2023	10/16/2023
SOLOMON FEDERAL COM 105H		07/29/2023	08/13/2023	09/26/2023	10/16/2023	10/16/2023

VI. Separation Equipment: ☑ Attach a complete description of how Operator will size separation equipment to optimize gas capture.

VII. Operational Practices: ☑ Attach a complete description of the actions Operator will take to comply with the requirements of Subsection A through F of 19.15.27.8 NMAC.

VIII. Best Management Practices: ☑ Attach a complete description of Operator's best management practices to minimize venting during active and planned maintenance.

Section 2 – Enhanced Plan

EFFECTIVE APRIL 1, 2022

Beginning April 1, 2022, an operator that is not in compliance with its statewide natural gas capture requirement for the applicable reporting area must complete this section.

☐ Operator certifies that it is not required to complete this section because Operator is in compliance with its statewide natural gas capture requirement for the applicable reporting area.

IX. Anticipated Natural Gas Production:

Well	API	Anticipated Average Natural Gas Rate MCF/D	Anticipated Volume of Natural Gas for the First Year MCF
SHEBA FEDERAL COM 107H		1216 MCF/D	460356 MCF
RAIDER FEDERAL COM 102H		1150 MCF/D	430429 MCF
SOLOMON FEDERAL COM 105H		1024 MCF/D	387668 MCF

X. Natural Gas Gathering System (NGGS):

Operator	System	ULSTR of Tie-in	Anticipated Gathering Start Date	Available Maximum Daily Capacity of System Segment Tie-in
TARGA	LUCID-TARGA GATHERING SYSTEM	I-21-24S-34E	10/16/2023	21 MMSCFD

XI. Map. ☑ Attach an accurate and legible map depicting the location of the well(s), the anticipated pipeline route(s) connecting the production operations to the existing or planned interconnect of the natural gas gathering system(s), and the maximum daily capacity of the segment or portion of the natural gas gathering system(s) to which the well(s) will be connected.

XII. Line Capacity. The natural gas gathering system ☑ will ☐ will not have capacity to gather 100% of the anticipated natural gas production volume from the well prior to the date of first production.

XIII. Line Pressure. Operator ☑ does ☐ does not anticipate that its existing well(s) connected to the same segment, or portion, of the natural gas gathering system(s) described above will continue to meet anticipated increases in line pressure caused by the new well(s).

☑ Attach Operator's plan to manage production in response to the increased line pressure.

XIV. Confidentiality: ☑ Operator asserts confidentiality pursuant to Section 71-2-8 NMSA 1978 for the information provided in Section 2 as provided in Paragraph (2) of Subsection D of 19.15.27.9 NMAC, and attaches a full description of the specific information for which confidentiality is asserted and the basis for such assertion.

Section 3 - Certifications

Effective May 25, 2021

Operator certifies that, after reasonable inquiry and based on the available information at the time of submittal:

☑ Operator will be able to connect the well(s) to a natural gas gathering system in the general area with sufficient capacity to transport one hundred percent of the anticipated volume of natural gas produced from the well(s) commencing on the date of first production, taking into account the current and anticipated volumes of produced natural gas from other wells connected to the pipeline gathering system; or

☐ Operator will not be able to connect to a natural gas gathering system in the general area with sufficient capacity to transport one hundred percent of the anticipated volume of natural gas produced from the well(s) commencing on the date of first production, taking into account the current and anticipated volumes of produced natural gas from other wells connected to the pipeline gathering system. ***If Operator checks this box, Operator will select one of the following:***

Well Shut-In. ☐ Operator will shut-in and not produce the well until it submits the certification required by Paragraph (4) of Subsection D of 19.15.27.9 NMAC; or

Venting and Flaring Plan. ☐ Operator has attached a venting and flaring plan that evaluates and selects one or more of the potential alternative beneficial uses for the natural gas until a natural gas gathering system is available, including:

- **(a)** power generation on lease;
- **(b)** power generation for grid;
- **(c)** compression on lease;
- **(d)** liquids removal on lease;
- **(e)** reinjection for underground storage;
- **(f)** reinjection for temporary storage;
- **(g)** reinjection for enhanced oil recovery;
- **(h)** fuel cell production; and
- **(i)** other alternative beneficial uses approved by the division.

Section 4 - Notices

1. If, at any time after Operator submits this Natural Gas Management Plan and before the well is spud:

(a) Operator becomes aware that the natural gas gathering system it planned to connect the well(s) to has become unavailable or will not have capacity to transport one hundred percent of the production from the well(s), no later than 20 days after becoming aware of such information, Operator shall submit for OCD's approval a new or revised venting and flaring plan containing the information specified in Paragraph (5) of Subsection D of 19.15.27.9 NMAC; or

(b) Operator becomes aware that it has, cumulatively for the year, become out of compliance with its baseline natural gas capture rate or natural gas capture requirement, no later than 20 days after becoming aware of such information, Operator shall submit for OCD's approval a new or revised Natural Gas Management Plan for each well it plans to spud during the next 90 days containing the information specified in Paragraph (2) of Subsection D of 19.15.27.9 NMAC, and shall file an update for each Natural Gas Management Plan until Operator is back in compliance with its baseline natural gas capture rate or natural gas capture requirement.

2. OCD may deny or conditionally approve an APD if Operator does not make a certification, fails to submit an adequate venting and flaring plan which includes alternative beneficial uses for the anticipated volume of natural gas produced, or if OCD determines that Operator will not have adequate natural gas takeaway capacity at the time a well will be spud.

I certify that, after reasonable inquiry, the statements in and attached to this Natural Gas Management Plan are true and correct to the best of my knowledge and acknowledge that a false statement may be subject to civil and criminal penalties under the Oil and Gas Act.

Signature:	Elise Taunton
Printed Name:	Elise Taunton
Title:	Midstream & Marketing Representative
E-mail Address:	elise.taunton@permianres.com
Date:	06/12/2023
Phone:	(512) 567-9474

OIL CONSERVATION DIVISION
(Only applicable when submitted as a standalone form)

Approved By:	
Title:	
Approval Date:	
Conditions of Approval:	

Centennial Resource Production, LLC (372165)

Natural Gas Management Plan Descriptions

VI. Separation Equipment:

Centennial utilizes a production forecast from our Reservoir Engineering team to appropriately size each permanent, 3-phase separator and heater treater utilized for production operations. Our goal is to maintain 5 minutes of retention time in the test vessel and 20 minutes in the heater treater at peak production rates. The gas produced is routed from the separator to the gas sales line.

VII. Operational Practices:

Drilling

During Centennial's drilling operations it is uncommon for venting or flaring to occur. If flaring is needed due to safety concerns, gas will be routed to a flare and volumes will be estimated.

Flowback

During completion/recompletion flowback operations, after separation flowback begins and as soon as it is technically feasible, Centennial routes gas though a permanent separator and the controlled facility where the gas is either sold or flared through a high-pressure flare if needed.

Production

Per 19.15.27.8.D, Centennial's facilities are designed to minimize waste. Our produced gas will only be vented or flared in an emergency or malfunction situation, except as allowed for normal operations noted in 19.15.27.8.D(2) & (4). All gas that is flared is metered. All gas that may be vented will be estimated.

Performance Standards

Centennial utilizes a production forecast from our Reservoir Engineering team to appropriately size each permanent, 3-phase separator and heater treater utilized for production operations.

All of Centennial's permanent storage tanks associated with production operations which are routed to a flare or control device are equipped with an automatic gauging system.

All of Centennial's flare stacks, both currently installed and for future installation, are:

1) Appropriately sized and designed to ensure proper combustion efficiency.
2) Equipped with an automatic ignitor or continuous pilot.
3) Anchored and located at least 100 feet from the well and storage tanks.

Centennial's field operations and HSE teams have implemented an AVO inspection schedule that adheres to the requirements of 19.15.27.8.E(5).

All of our operations and facilities are designed to minimize waste. We routinely employ the following methods and practices:

- Closed-loop systems
- Enclosed and properly sized tanks

- Vapor recovery units to maximize recovery of low-pressure gas streams and potential unauthorized emissions
- Low-emitting or electric engines whenever practical
- Combustors and flare stacks in the event of a malfunction or emergency
- Routine facility inspections to identify leaking components, functioning control devices, such as flares and combustors, and repair / replacement of malfunctioning components where applicable

Measurement or estimation

Centennial measures or estimates the volumes of natural gas vented, flared and/or beneficially used for all of our drilling, completing and producing wells. We utilize accepted industry standards and methodology which can be independently verified. Annual GOR testing is completed on our wells and will be submitted as required by the OCD. None of our equipment is designed to allow diversion around metering elements except during inspection, maintenance and repair operations.

VIII. Best Management Practices:

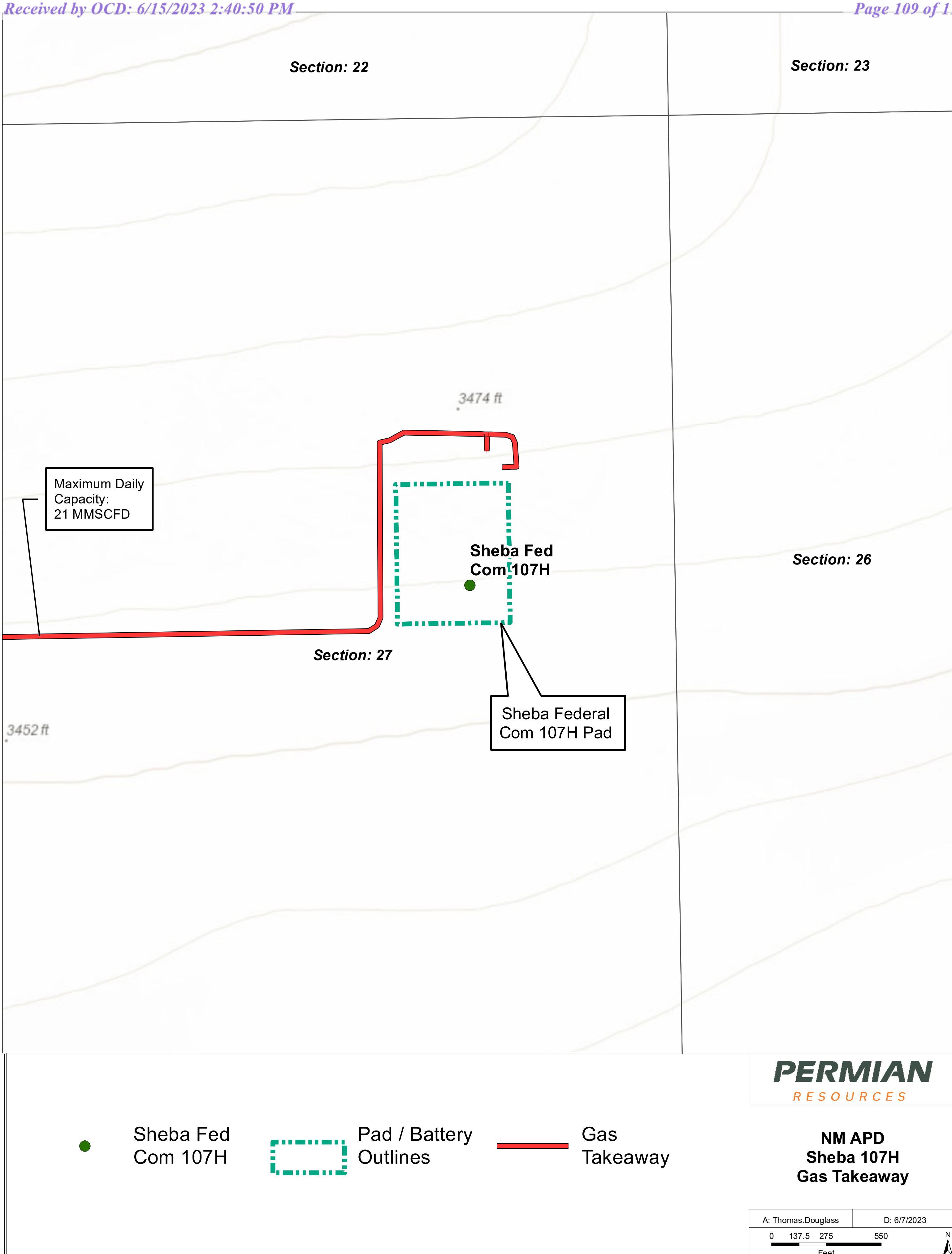
Centennial utilizes the following BMPs to minimize venting during active and planned maintenance activities:

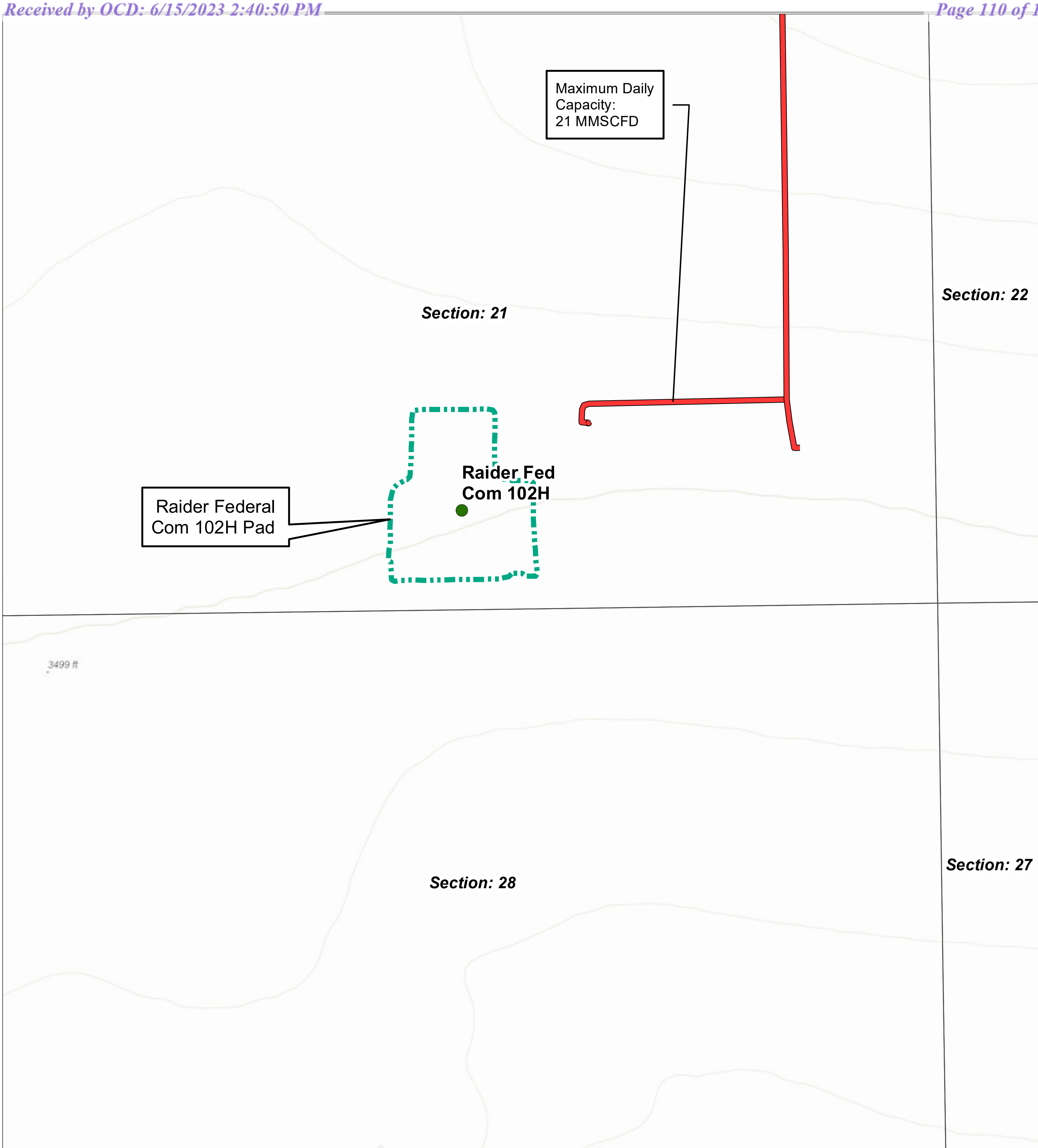
- Use a closed-loop process wherever possible during planned maintenance activities, such as blowdowns, liquid removal, and work over operations.
- Employ low-emitting or electric engines for equipment, such as compressors
- Adhere to a strict preventative maintenance program which includes routine facility inspections, identification of component malfunctions, and repairing or replacing components such as hatches, seals, valves, etc. where applicable
- Utilize vapor recovery units (VRU's) to maximize recovery of volumes of low-pressure gas streams and potential unauthorized emissions
- Route low pressure gas and emissions streams to a combustion device to prevent venting where necessary

Enhanced Natural Gas Management Plan

Operator's Plan to Manage Production in Response to Increased Line Pressure

Permian Resources Operating, LLC (Permian) anticipates that its existing wells connected to the same portion of the natural gas gathering system will continue to meet anticipated increases in line pressure caused by the new wells. Permian will actively monitor line pressure throughout the field and will make necessary adjustments to existing production separators' pressures to send gas to sales. Permian also plans to implement automated alarms on all flare meters to alert of flaring events as they occur. The alarms will send notifications to field operations and engineering staff via text message and email at every occurrence of flaring. In addition, Permian plans to implement automated alarms on all flare meters to alert of any continuous flaring event that has continued for at least 4 hours. The alarms will send notifications to field operations and engineering management. Permian personnel will promptly respond to these alarms, communicate with midstream partners, and take the appropriate action to reduce flaring caused by high line pressure from new well production.


Section: 22
Section: 23
Section: 26
Section: 27
3474 ft
3452 ft
Maximum Daily Capacity: 21 MMSCFD
Sheba Fed Com 107H
Sheba Federal Com 107H Pad
Sheba Fed Com 107H
Pad / Battery Outlines
Gas Takeaway
PERMIAN RESOURCES
NM APD
Sheba 107H
Gas Takeaway
A: Thomas.Douglass
D: 6/7/2023
0 137.5 275 550
Feet
N



Raider Fed Com 102H

Pad / Battery Outlines

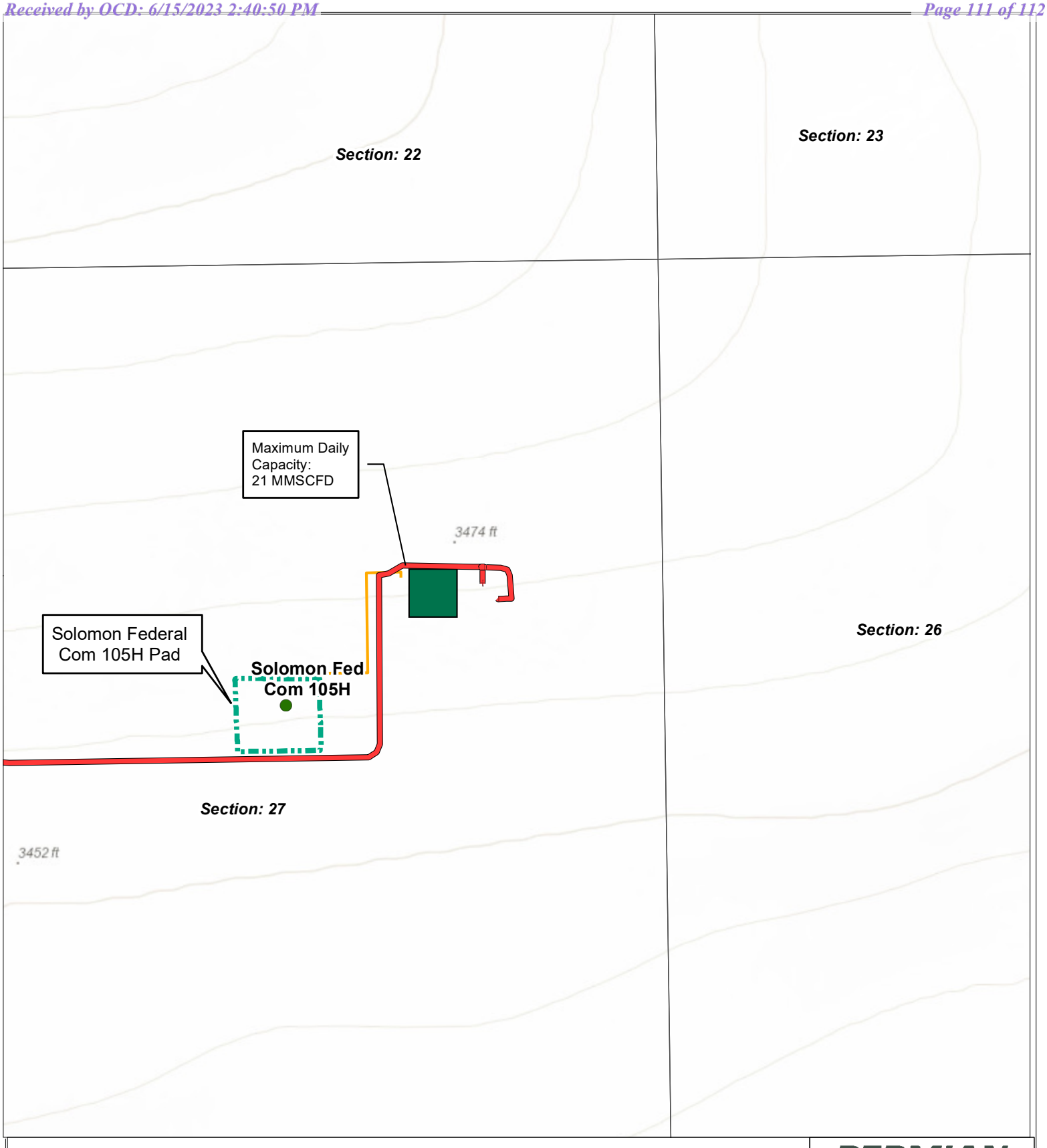
Gas Takeaway

PERMIAN RESOURCES

NM APD
Raider 102H
Gas Takeaway

A: Thomas.Douglass | D: 6/7/2023

0 110 220 440
Feet
N


Section: 22
Section: 23
Maximum Daily Capacity: 21 MMSCFD
3474 ft
Solomon Federal Com 105H Pad
Solomon Fed Com 105H
Section: 26
Section: 27
3452 ft
Solomon Fed Com 105H
Pad / Battery Outlines
Gas Takeaway
Flowline
Production Facility
PERMIAN RESOURCES
NM APD
Solomon105H
Gas Takeaway
A: Thomas.Douglass
D: 6/7/2023
0 155 310 620
Feet
N

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 Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

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

CONDITIONS

Action 228839

CONDITIONS

Operator: Permian Resources Operating, LLC 1001 17th Street, Suite 1800 Denver, CO 80202	OGRID: 372165
	Action Number: 228839
	Action Type: [C-101] BLM - Federal/Indian Land Lease (Form 3160-3)

CONDITIONS

Created By	Condition	Condition Date
pkautz	Will require a File As Drilled C-102 and a Directional Survey with the C-104	6/15/2023
pkautz	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	6/15/2023
pkautz	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	6/15/2023
pkautz	Cement is required to circulate on both surface and intermediate1 strings of casing	6/15/2023