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.

2. Name of Operator

9. API Well No.
30-025-53834

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

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.

APPROVED WITH CONDITIONS

(Continued on page 2)

*(Instructions on page 2)

Approval Date: 11/08/2024

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: EARTHSTONE OPERATING, LLC **OGRID:** 331165 **Date:** 08/30/2023

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
SEE ATTACHED						

IV. Central Delivery Point Name: ENGLISH BUFFALO [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
SEE ATTACHED						

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.

WELL NAME	API	UL/SECT/T/R	FOOTAGES	ANTICIPATED OIL BBL/D	ANTICIPATED GAS MCF/D	ANTICIPATED WATER BBL/D
ENGLISH BUFFALO 26 35 FED COM	111H	C-26-18S-33E	427 FNL, 1411 FWL	1300 BBL/D	1200 MCF/D	2700 BBL/D
ENGLISH BUFFALO 26 35 FED COM	112H	C-26-18S-33E	420 FNL, 1471 FWL	1300 BBL/D	1200 MCF/D	2700 BBL/D
ENGLISH BUFFALO 26 35 FED COM	221H	C-26-18S-33E	423 FNL, 1441 FWL	1300 BBL/D	1200 MCF/D	2700 BBL/D
ENGLISH BUFFALO 26 35 FED COM	222H	C-26-18S-33E	416 FNL, 1501 FWL	1300 BBL/D	1200 MCF/D	2700 BBL/D
WELL NAME	API	SPUD	TD	COMPLETION DATE	FLOW BACK DATE	FIRST PRODUCTION
ENGLISH BUFFALO 26 35 FED COM	111H	AUG 21, 2024	SEPT 10, 2024	DEC 4, 2024	FEB 19, 2025	FEB 20, 2025
ENGLISH BUFFALO 26 35 FED COM	112H	SEPT 11, 2024	OCT 1, 2024	DEC 4, 2024	FEB 19, 2025	FEB 20, 2025
ENGLISH BUFFALO 26 35 FED COM	221H	OCT 2, 2024	OCT 22, 2024	DEC 4, 2024	FEB 19, 2025	FEB 20, 2025
ENGLISH BUFFALO 26 35 FED COM	222H	OCT 23, 2024	NOV 13, 2024	DEC 4, 2024	FEB 19, 2025	FEB 20, 2025

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

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

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:	
Printed Name:	JENNIFER ELROD
Title:	SR. REGULATORY ANALYST
E-mail Address:	JELROD@EARTHSTONEENERGY.COM
Date:	07/14/2023
Phone:	(940)452-6214

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

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

ESTE Natural Gas Management
Plan Items VI-VIII

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

- Separation equipment will be sized to provide adequate separation for anticipated rates.
- Adequate separation relates to retention time for Liquid – Liquid separation and velocity for Gas-Liquid separation.
- Collection systems are appropriately sized to handle facility production rates on all (3) phases.
- Ancillary equipment and metering are selected to be serviced without flow interruptions or the need to release gas from the well.

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

Drilling Operations

- All flare stacks will be properly sized. The flare stacks will be located at a minimum 100' from the nearest surface hole location on the pad.
- All-natural gas produced during drilling operations will be flared, unless there is an equipment malfunction and/or to avoid risk of an immediate and substantial adverse impact on safety and the environment, at which point the gas will be vented.

Completions/Recompletions Operations

- New wells will not be flowed back until they are connected to a properly sized gathering system.
- The facility will be built/sized for maximum anticipated flowrates and pressures to minimize waste.
- For flowback operations, multiple stages of separation will be used as well as excess VRU and blowers to make sure waste is minimized off the storage tanks and facility.
- During initial flowback, the well stream will be routed to separation equipment.
- At an existing facility, when necessary, post separation natural gas will be flared until it meets pipeline specifications, at which point it will be turned into a collection system.
- At a new facility, post separation natural gas will be vented until storage tanks can safely function, at which point it will be flared until it meets pipeline spec.

Production Operations

- Weekly AVOs will be performed on all facilities.
- All flares will be equipped with auto-ignition systems and continuous pilot operations.
- After a well is stabilized from liquid unloading, the well will be turned back into the collection system.
- All tanks will have sight glasses installed, but no electronic gauging equipment.
- Leaking thief hatches found during AVOs will be cleaned and properly re-sealed.
- There will be no gas re-injection for underground storage, temporary storage, or for enhanced oil recovery; however, gas injection will be used for gas lift applications in which the gas would be circulated through a closed loop system.
- If H2S is encountered, gas will be treated to pipeline spec to avoid shut-in's and/or flaring.

Performance Standards

- Production equipment will be designed to handle maximum anticipated rates and pressure.

- All flared gas will be combusted in a flare stack that is properly sized and designed to ensure proper combustion.
- Weekly AVOs will be performed on all wells and facilities that produce more than 50 MCFPD.

Measurement & Estimation

- All volume that is flared or vented that is not measured will be estimated.
- All measurement equipment for flared volumes will conform to API 14.10.
- No meter bypasses with be installed.
- When metering is not practical due to low pressure/low rate, the vented or flared volume will be estimated.

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

- During downhole well maintenance, ESTE will use best management practices to vent as minimally as possible.
- After downhole well maintenance, natural gas will be flared until it reaches pipeline specification.

PECOS DISTRICT
DRILLING CONDITIONS OF APPROVAL

OPERATOR'S NAME:	Earthstone Operating LLC
WELL NAME & NO.:	English Buffalo 26 35 Fed Com 111H
LOCATION:	Sec 26-18S-22E-NMP
COUNTY:	Lea County, New Mexico

COA

H_2S	○ No		◉ Yes	
Potash / WIPP	◉ None	○ Secretary	○ R-111-Q	☐ Open Annulus ☐ WIPP
Cave / Karst	○ Low	◉ Medium	○ High	○ Critical
Wellhead	○ Conventional	◉ Multibowl	○ Both	○ Diverter
Cementing	☐ Primary Squeeze	☐ Cont. Squeeze	☐ EchoMeter	☐ DV Tool
Special Req	☐ Capitan Reef	☐ Water Disposal	☑ COM	☐ Unit
Waste Prev.	○ Self-Certification	○ Waste Min. Plan	◉ APD Submitted prior to 06/10/2024	
Additional Language	☑ Flex Hose ☐ Four-String	☐ Casing Clearance ☐ Offline Cementing	☐ Pilot Hole ☐ Fluid-Filled	☐ Break Testing

A. HYDROGEN SULFIDE

A Hydrogen Sulfide (H2S) Drilling Plan shall be activated 500 feet prior to drilling into the **Bone Springs** formation. As a result, the Hydrogen Sulfide area must meet all requirements from 43 CFR 3176, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, please provide measured values and formations to the BLM.

B. CASING

1. The **10-3/4** inch surface casing shall be set at approximately **1670** 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. ***Set depth adjusted per BLM geologist.***

    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.

Approval Date: 11/08/2024

d. If cement falls back, remedial cementing will be done prior to drilling out that string.

2. The minimum required fill of cement behind the **9-5/8** inch intermediate casing **(set at 5450 per BLM geologist)** is:

- Cement to surface. If cement does not circulate see B.1.a, c-d above. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to cave/karst, Capitan Reef, or potash.**

❖ In Medium Cave/Karst Areas if cement does not circulate to surface on the first two casing strings, the cement on the 3rd casing string must come to surface.

3. The minimum required fill of cement behind the **5-1/2** inch production casing is:

- Cement should tie-back at least **200 feet** into previous casing string. Operator shall provide method of verification. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to cave/karst, Capitan Reef, or potash.**

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. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **3000 (3M)** psi.

a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.
c. Manufacturer representative shall install the test plug for the initial BOP test.
d. If the cement does not circulate and one-inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.
e. Whenever any seal subject to test pressure is broken, all the tests in 43 CFR 3172 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 43 CFR 3171 and 3172.
- If the operator does not comply with this condition of approval, the BLM may take enforcement actions that include, but are not limited to, those specified in 43 CFR 3163.1.
- In addition, the well sign shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

GENERAL REQUIREMENTS

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

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

Contact Lea County Petroleum Engineering Inspection Staff:
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. In the event the operator has proposed to drill multiple wells utilizing a skid/walking rig. Operator shall secure the wellbore on the current well, after installing and testing the wellhead, by installing a blind flange of like pressure rating to the wellhead and a pressure gauge that can be monitored while drilling is performed on the other well(s).
    b. When the operator proposes to set surface casing with Spudder Rig
        i. Notify the BLM when moving in and removing the Spudder Rig.
        ii. 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.
        iii. BOP/BOPE test to be conducted per **43 CFR 3172** as soon as 2nd Rig is rigged up on well.
2. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works are located, this does not include the dog house or stairway area.
3. For intervals in which cement to surface is required, cement to surface should be verified with a visual check and density or pH check to differentiate cement from spacer and drilling mud. The results should be documented in the driller's log and daily reports.

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 of both lead and tail cement, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. The casing integrity test can be done (prior to the cement setting up) immediately after bumping the plug.

3. Wait on cement (WOC) for Water Basin: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements. The casing integrity test can be done (prior to the cement setting up) immediately after bumping the plug.
4. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. Have well specific cement details onsite prior to pumping the cement for each casing string.
5. No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.
6. On that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.
7. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.
8. Whenever a casing string is cemented in the R-111-Q 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 **43 CFR 3172**.
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:
    i. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
    ii. 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.
    iii. Manufacturer representative shall install the test plug for the initial BOP test.
    iv. Whenever any seal subject to test pressure is broken, all the tests in 43 CFR 3172.6(b)(9) must be followed.
    v. 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.
    i. 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).
    ii. 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.)
    iii. 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 **43 CFR 3172** 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 8 hours or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).

iv. 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.

v. The results of the test shall be reported to the appropriate BLM office.

vi. 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.

vii. 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.

viii. 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 **43 CFR 3172**.

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.

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

Operator Certification Data Report

11/08/2024

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: JENNIFER ELROD **Signed on:** 08/31/2023

Title: Senior Regulatory Analyst

Street Address: 300 N MARIENFIELD STREET SUITE 1000

City: MIDLAND **State:** TX **Zip:** 79701

Phone: (940)452-6214

Email address: JENNIFER.ELROD@PERMIANRES.COM

Field

Representative Name:

Street Address:

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

Phone:

Email address:

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

Application Data
11/08/2024

APD ID: 10400094259
Submission Date: 09/05/2023
Operator Name: EARTHSTONE OPERATING LLC
Well Name: ENGLISH BUFFALO 26 35 FED COM
Well Number: 111H
Well Type: OIL WELL
Well Work Type: Drill

Highlighted data reflects the most recent changes
Show Final Text

Section 1 - General

APD ID: 10400094259
Tie to previous NOS? N
Submission Date: 09/05/2023
BLM Office: Carlsbad
User: JENNIFER ELROD
Title: Senior Regulatory Analyst
Federal/Indian APD: FED
Is the first lease penetrated for production Federal or Indian? FED
Lease number: NMNM128363
Lease Acres:
Surface access agreement in place?
Allotted?
Reservation:
Agreement in place? N
Federal or Indian agreement:
Agreement number:
Agreement name:
Keep application confidential? N
Permitting Agent? NO
APD Operator: EARTHSTONE OPERATING LLC
Operator letter of

Operator Info

Operator Organization Name: EARTHSTONE OPERATING LLC
Operator Address: 300 N MARIENFIELD STREET SUITE 1000
Zip: 79701
Operator PO Box:
Operator City: MIDLAND
State: TX
Operator Phone: (432)695-4222
Operator Internet Address: KANICIA.SCHLICHTING@PERMIANRES.COM

Section 2 - Well Information

Well in Master Development Plan? NO
Master Development Plan name:
Well in Master SUPO? EXISTING
Master SUPO name: ESTE-LEA CO.
Well in Master Drilling Plan? EXISTING
Master Drilling Plan name: ESTE LEA CO. 3 STRING
Well Name: ENGLISH BUFFALO 26 35 FED COM
Well Number: 111H
Well API Number:
Field/Pool or Exploratory? Field and Pool
Field Name: CORBIN
Pool Name: BONE SPRING, SOUTH

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

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?** N **New surface disturbance?**

Type of Well Pad: MULTIPLE WELL **Multiple Well Pad Name:** ENGLISH BUFFALO 26 35 FED COM **Number:** 111H, 112H, 221H, 222H

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: 3 Miles **Distance to nearest well:** 30 FT **Distance to lease line:** 50 FT

Reservoir well spacing assigned acres Measurement: 320 Acres

Well plat: English_Buffalo_26_35_Fed_Com_111H_APD_C_102_20230830115105.pdf

Well work start Date: 04/30/2024 **Duration:** 30 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number: 12177 **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	427	FNL	1411	FWL	18S	33E	26	Aliquot NENW	32.7246964	-103.6377496	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 96242	3838	0	0	N
KOP Leg #1	427	FNL	1411	FWL	18S	33E	26	Aliquot NENW	32.7246964	-103.6377496	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 96242	-4437	8380	8275	N

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

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	FNL	345	FWL	18S	33E	26	Aliquot NWNW	32.7246964	-103.6377496	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 128363	-5010	9266	8848	Y
EXIT Leg #1	100	FSL	345	FWL	18S	33E	35	Aliquot SWSW	32.6971132	-103.6411509	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 01177A	-5247	19138	9085	Y
BHL Leg #1	50	FSL	345	FWL	18S	33E	35	Aliquot SWSW	32.6969757	-103.6411506	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 01177A	-5249	19188	9087	Y

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

Drilling Plan Data Report

11/08/2024

APD ID: 10400094259 **Submission Date:** 09/05/2023

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

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

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Show Final Text

Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical	Measured Depth	Lithologies	Mineral Resources	Producing Formatio
14472094	RUSTLER	3838	1555	1555	ANHYDRITE	NONE	N
14472095	SALADO	2021	1817	1817	SALT	NONE	N
14472096	SEVEN RIVERS	237	3601	3601	ANHYDRITE, DOLOMITE	NATURAL GAS, OIL	N
14472098	QUEEN	-430	4268	4268	DOLOMITE, LIMESTONE, SANDSTONE	NATURAL GAS, OIL	N
14472099	CHERRY CANYON	-1705	5543	5543	SANDSTONE, SHALE, SILTSTONE	NATURAL GAS, OIL	N
14472100	BRUSHY CANYON	-2215	6053	6053	SANDSTONE, SHALE, SILTSTONE	NATURAL GAS, OIL	N
14472101	BONE SPRING	-3585	7423	7423	LIMESTONE, SHALE	NATURAL GAS, OIL	N
14472102	BONE SPRING 1ST	-4862	8700	8700	SANDSTONE, SHALE, SILTSTONE	NATURAL GAS, OIL	Y

Section 2 - Blowout Prevention

Pressure Rating (PSI): 5M **Rating Depth:** 12000

Equipment: Rotating Head, remote kill line, mud-gas sperator

Requesting Variance? YES

Variance request: We propose utilizing a cactus speed head for this well. Please see attached diagram and pressure testing statement. Also we request to use a co flex hose. Please find attached information regarding co flex hose. Earthstone Operating LLC respectfully proposes that if cement is not returned to surface during the primary cement job on the 8-5/8" Intermediate casing, a planned Bradenhead job will be conducted immediately after the primary cement job.

Testing Procedure: BOP will be tested by an independent service company to 250 psi low and 5000 psi high, per onshore order 2. Pipe rams will be operationally checked each 24 hour period. Blind rams will be operationally checked each trip out of the hole.

Choke Diagram Attachment:

5M_Choke_Manifold_Diagram_20230710152638.pdf

BOP Diagram Attachment:

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

5M_Choke_Manifold_Diagram_20230710152638.pdf

5M__BOP_Diagram_2__20230710152650.pdf

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	14.5	10.75	NEW	API	N	0	1580	0	1580	3838	2258	1580	J-55	45.5	BUTT	2.89	2.11	DRY	11.07	DRY	9.95
2	INTERMEDIATE	9.875	8.625	NEW	API	N	0	5618	0	5618	3782	-1780	5618	L-80	32	OTHER - EHC MO-FXL	1.39	1.52	DRY	2.9	DRY	4.19
3	PRODUCTION	7.875	5.5	NEW	API	N	0	19188	0	9087	3782	-5249	19188	P-110	20	OTHER - RY VARN	2.72	3.53	DRY	3.13	DRY	3

Casing Attachments

Casing ID: 1 **String** SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

English_Buffalo_26_35_Fed_Com_111H_CASING_CALCULATOR_20230831132126.pdf

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Casing Attachments

Casing ID: 2 **String** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

English_Buffalo_26_35_Fed_Com_111H_CASING_CALCULATOR_20230831132256.pdf

Casing ID: 3 **String** PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

English_Buffalo_26_35_Fed_Com_111H_CASING_CALCULATOR_20230831132016.pdf

Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	1080	530	1.75	13.5	927	50	CLASS C	Sodium Metasilicate, Defoamer, KCL, Kol-Seal, Cellophane Flakes, ROF, Seal Check
SURFACE	Tail		1080	1580	290	1.34	14.8	388	50	CLASS C	Fluid loss, Dispercent, Retarder
INTERMEDIATE	Lead		0	5118	400	2.3	11.5	920	50	CLASS C	Sodium Metasilicate, Defoamer, KCL, Kol-Seal, Cellophane Flakes, ROF SealCheck

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
INTERMEDIATE	Tail		5118	5618	80	1.34	14.8	107	50	CLASS C	Fluid Loss, Dispercent, Retarder
PRODUCTION	Lead		5118	7792	210	3.05	11.3	640	40	CLASS H	Sodium Metasilicate, Defoamer, KCL, Kol-Seal, Cellophane Flakes, ROF SealCheck
PRODUCTION	Tail		7792	19188	1760	1.27	13.5	2235	25	CLASS H	Fluid Loss, Dispercent, Retarder

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 mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times

Describe the mud monitoring system utilized: Pason PVT system will be in place throughout the well as well as visual checks

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	1580	SPUD MUD	8.6	8.8							VISC: 28-34
1580	5618	SALT SATURATED	10	10.1							VISC: 28-34
5618	19188	OIL-BASED MUD	8.8	9.5							VISC: 28-34

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Section 6 - Test, Logging, Coring

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

NONE

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

CEMENT BOND LOG,MEASUREMENT WHILE DRILLING,GAMMA RAY LOG,DIRECTIONAL SURVEY,

Coring operation description for the well:

NONE

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 4490 **Anticipated Surface Pressure:** 2490

Anticipated Bottom Hole Temperature(F): 150

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

ESTE_Lea_County_H2S_plan_20230724104237.pdf

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

English_Buffalo_26_35_Fed_Com_111H___Plan_1_08_29_23_AC_Report_20230830121725.pdf
English_Buffalo_26_35_Fed_Com_111H___Plan_1_08_29_23_20230830121725.pdf

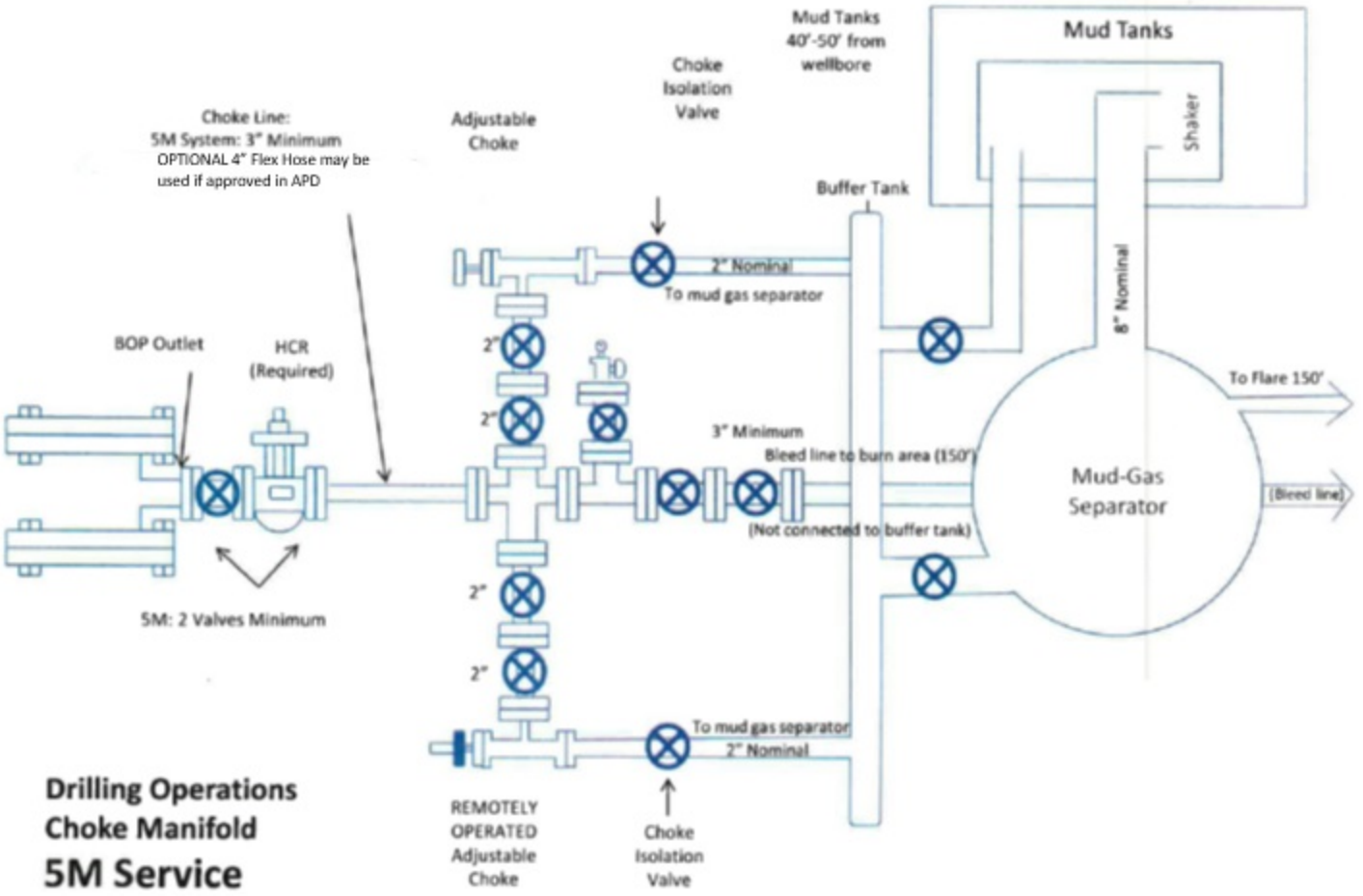
Other proposed operations facets description:

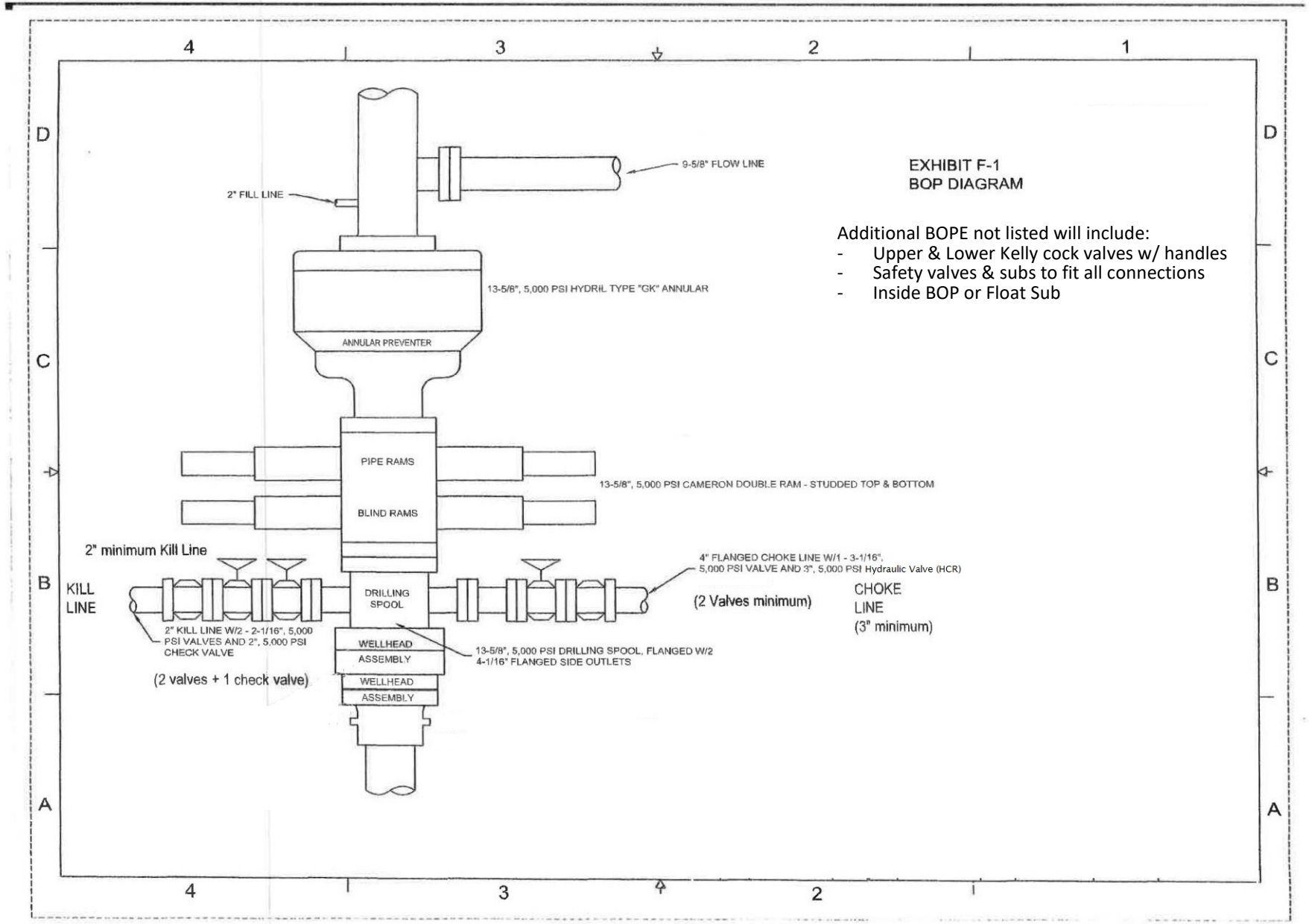
Other proposed operations facets attachment:

10.75_45.5_J55_Surface_Casing_Spec_sheet_20230724115717.pdf
5.50_20__VAHC_P110_RY_VARN_AC__6.300_Cplg__20230724115151.pdf
CDS_FXL_8_625_32_BMP_L80EHC_Feb04_2022_20230724115151.pdf
English_Buffalo_26_35_Fed_Com_111H_APD_20230831133132.pdf

Other Variance attachment:

Cactus_Speed_Head_Installation_Procedure_20230724115909.pdf
Cactus_Speed_Head_Pressure_Testing_Statement_20230724115908.pdf
Choke_Hose_M55_1_07102017_145204_66_1225_04_14_2014__20230724115908.pdf
ESTE_CACTUS_WELLHEAD_3STRING_20230724115908.pdf


Mud Tanks
40'-50' from wellbore
Choke Isolation Valve
Mud Tanks
Shaker
Choke Line:
5M System: 3" Minimum
OPTIONAL 4" Flex Hose may be used if approved in APD
Adjustable Choke
Buffer Tank
2" Nominal
To mud gas separator
8" Nominal
BOP Outlet
HCR (Required)
2"
2"
3" Minimum
Bleed line to burn area (150')
(Not connected to buffer tank)
To Flare 150'
Mud-Gas Separator
(Bleed line)
2"
2"
5M: 2 Valves Minimum
To mud gas separator
2" Nominal
Drilling Operations
Choke Manifold
5M Service
REMOTELY OPERATED Adjustable Choke
Choke Isolation Valve


4
3
2
1
D
C
B
A
9-5/8" FLOW LINE
2" FILL LINE
13-5/8", 5,000 PSI HYDRIL TYPE "GK" ANNULAR
ANNULAR PREVENTER
PIPE RAMS
BLIND RAMS
13-5/8", 5,000 PSI CAMERON DOUBLE RAM - STUDDED TOP & BOTTOM
2" minimum Kill Line
KILL LINE
DRILLING SPOOL
4" FLANGED CHOKE LINE W/1 - 3-1/16", 5,000 PSI VALVE AND 3", 5,000 PSI Hydraulic Valve (HCR)
(2 Valves minimum)
CHOKE LINE (3" minimum)
2" KILL LINE W/2 - 2-1/16", 5,000 PSI VALVES AND 2", 5,000 PSI CHECK VALVE
(2 valves + 1 check valve)
WELLHEAD ASSEMBLY
WELLHEAD ASSEMBLY
13-5/8", 5,000 PSI DRILLING SPOOL, FLANGED W/2 4-1/16" FLANGED SIDE OUTLETS
EXHIBIT F-1
BOP DIAGRAM
Additional BOPE not listed will include:
- Upper & Lower Kelly cock valves w/ handles
- Safety valves & subs to fit all connections
- Inside BOP or Float Sub

Earthstone Operating, LLC - English Buffalo 26 35 Fed Com 111H

1. Geologic Formations

TVD of target	9,087' EOL	KOP	8,380'
MD at TD:	19,188'	Deepest expected fresh water:	220'

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	1555	Water	
Salado	1817	Salt	
7 Rivers	3601	Salt	
Queen	4268	Salt Water	
Cherry Canyon	5543	Salt Water	
Brushy Canyon	6053	Oil/Gas	
Top BSPG Lime	7423	Oil/Gas	
1st BSPG Ss	8700	Target Oil/Gas	

2. Casing Program

Hole Size (in)	Casing Interval From	Casing Interval To	Csg. Size (in)	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Body Tension	SF Joint Tension
14.5	0	1580	10.75	45.5	J 55	BTC	2.89	2.11	9.95	11.07
9.875	0	5618	8.625	32	L80 EHC	MO-FXL	1.39	1.52	4.19	2.90
7.875	0	19,188	5.5	20	P110-RY	VARN	2.72	3.53	3.00	3.13
				BLM Minimum Safety Factor			1.125	1	1.6 Dry 1.8 Wet	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing.to mitigate collapse. Intermediate burst based on 0.7 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.
All casing strings will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.h

Earthstone Operating, LLC - English Buffalo 26 35 Fed Com 111H

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Earthstone Operating, LLC - English Buffalo 26 35 Fed Com 111H

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Earthstone Operating, LLC

1400 Woodloch Forest Drive, Suite 300
The Woodlands, TX 77380
Phone: (281) 298-4246
Fax: (832) 823-0478

H2S Contingency Plan

Lea County, NM

Escape

Crews shall escape upwind of escaping gas in the event of an emergency release of gas. Escape can be facilitated from the location entrance road. Crew should then block entrance to the location from the lease road so as not to allow anyone traversing into a hazardous area. The blockade should be at a safe distance outside of the ROE. There are NO homes or buildings in or near the ROE.

Assumed 100 ppm ROE = 3000'
100 ppm H2S concentration shall trigger activation of this plan

Emergency Procedures

In the event of a release of gas containing H2S, the first responder(s) must:

« Isolate the area and prevent entry by other persons into the 100 ppm ROE.
« Evacuate any public places encompassed by the 100 ppm ROE.
« Be equipped with H2S monitors and air packs in order to control the release.
« Use the "buddy system" to ensure no injuries occur during the response.
« Take precautions to avoid personal injury during this operation.
« Contact operator and/or local officials to aid in operation. See list of phone numbers attached.
« Have received training
in the: Detection of
H2S, and
Measures for protection against the gas,
Equipment used for protection and emergency response.

Ignition of Gas Source

Should control of the well be considered lost and ignition considered, take care to protect against exposure to Sulfur Dioxide (S02). Intentional ignition must be coordinated with the NMOCD and local officials. Additionally, the NM State Police may become involved. NM State Police shall be the Incident Command on scene of any major release. Take care to protect downwind whenever there is an ignition of the gas.

Characteristics of H2S and SO,

Common Name	Chemical Formula	Specific Gravity	Threshold Limit	Hazardous Limit	Lethal Concentration
Hydrogen Sulfide	H2S	1.189 Air=1	10 ppm	100 ppm/hr	600 ppm
Sulfur Dioxide	SO2	2.21 Air=1	2 ppm	N/A	1000 ppm

Contacting Authorities

Earthstone Operating, LLC personnel must liaise with local and state agencies to ensure **a** proper response to a major release. Additionally, the OCD must be notified of the release as soon **as** possible but no later than 4 hours. Agencies will ask for information such as type and volume of release, wind direction, location of release, etc. Be prepared with all information available including directions to sit e. The following call list of essential and potential responders has been prepared for use during a release Earthstone Operating, LLC response must be in coordination with the State of New Mexico's "Hazardous Materials Emergency Response Plan" (HMERP).

Hydrogen Sulfide Drilling Operations Plan

1. All Company and Contract personnel admitted on location must be trained by a qualified H2S safety instructor to the following:
   A. Characteristics of H2S
   B. Physical effects and hazards
   C. Principal and operation of H2S detectors, warning system and briefing areas.
   D. Evacuation procedure, routes and first aid.
   E. Proper use of safety equipment & life support systems
   F. Essential personnel meeting Medical Evaluation criteria will receive additional training on the proper use of 30-minute pressure demand air packs.
2. H2S Detection and Alarm Systems:
   a. H2S sensors/detectors to be located on the drilling rig floor, in the base of the sub structure/cellar area, on the mud pits in the shale shaker area. Additional H2S detectors may play placed as deemed necessary.
   b. An audio alarm system will be installed on the derrick floor and in the top doghouse.
3. Windsock and/or wind streamers:
   a. Windsock at mudpit area should be high enough to be visible.
   b. Windsock on the rig floor and/ or top doghouse should be high enough to be visible.
4. Condition Flags and Signs
   a. Warning sign on access road to location.
   b. Flags to be displayed on sign at entrance to location. Green flag indicates normal safe condition. Yellow flag indicates potential

pressure and danger. Red flag indicates danger (H2S present in dangerous concentration). Only H2S trained and certified personnel admitted to location.

5. Well control equipment:
   a. See exhibit BOP and Choke Diagrams

6. Communication:
   a. While working under masks chalkboards will be used for communication.
   b. Hand signals will be used where chalk board is inappropriate.
   c. Two-way radio will be used to communicate off location in case of emergency help is required. In most cases, cellular telephones will be available at most drilling foreman's trailer or living quarters.

7. Drill stem Testing:
   No DSTs are planned at this time.

8. Drilling contractor supervisor will be required to be familiar with the effects H2S has on tubular goods and other mechanical equipment.
9. If H25 is encountered, mud system will be altered if necessary to maintain control of formation. A mud gas separator will be brought into service along with H2S scavengers if necessary.

Emergency Assistance Telephone List

Earthstone Operating, LLC

The Woodlands Office (Headquarters): 281-298-4246

Midland Office: 432-686-1100

Vice President of Drilling-Nick Goree	Office: 281-771-3201
	Cell: 405-488-7164
Sr. Drilling Engineer/Superintendent- Ben Taylor	Cell: 432-978-3029
Production Superintendent-Paul Martinez	Cell: 325-206-1722

Public Safety:			**911 or**
Lea County Sheriff's Department		Number:	(575)396-3611
Lea County Emergency Management-Lorenzo Velasquez		Number:	(575)391-2983
Lea County Fire Marshal			
Lorenzo Velasquez, Director		Number:	(575)391-2983
Jeff Broom, Deputy Fire Marshal		Number:	(575)391-2988
Fire Department:			
Knowles Fire Department		Number:	(505)392-2810
City of Hobbs Fire Department		Number:	(505)397-9308
Jal Volunteer Fire Department		Number:	(505)395-2221
Lovington Fire Department		Number:	(575)396-2359
Maljamar Fire Department		Number:	(505)676-4100
Tatum Volunteer Fire Department		Number:	(505)398-3473
Eunice Fire Department		Number:	(575)394-3258
Hospital: Lea Regional Medical Center		Number:	(575)492-5000
AirMed: Medevac		Number:	(888)303-9112
Dept. of Public Safety		Number:	(505)827-9000
New Mexico OCD-Dist. 1-Hobbs-	Office	Number:	(575)393-6161
	Emergency	Number:	(575)370-3186
Lea County Road Department		Number:	(575)391-2940
NMDOT		Number:	(505)827-5100
Bureau of Land Management			
Pecos District Office		Number:	(575)627-0272
Carlsbad Field Office		Number:	(575)234-5972
Hobbs Field Station		Number:	(575)393-3612

EARTHSTONE Energy, Inc.

Project: Lea County, NM (Nad 83 NME)
Site: English Buffalo
Well: English Buffalo 26 35 Fed Com 111H
Wellbore: OH
Design: Plan 1 08-29-23
Rig: ICD328

PHOENIX TECHNOLOGY SERVICES

T G M

Azimuths to Grid North
True North: -0.38°
Magnetic North: 5.82°

Magnetic Field
Strength: 47686.5nT
Dip Angle: 60.54°
Date: 10/28/2023
Model: MVHD

WELL DETAILS

Ground Level 3838.00

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	628078.05	755249.15	32° 43' 28.906995 N	103° 38' 15.898834 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	1600.00	0.00	0.00	1600.00	0.00	0.00	0.00	0.000	0.00		KOP, Begin 2.00°/100' Build
3	2142.85	10.86	289.85	2139.61	17.41	-48.23	2.00	289.853	-17.83		Hold 10.86° Inc at 289.85° Azm
4	7636.98	10.86	289.85	7535.39	368.86	-1021.59	0.00	0.000	-377.59		Begin 2.00°/100' Drop
5	8179.83	0.00	0.00	8075.00	386.28	-1069.82	2.00	180.000	-395.41		Begin Vertical Hold
6	8380.07	0.00	0.00	8275.24	386.28	-1069.82	0.00	0.000	-395.41		KOP2, Begin 10.00°/100' Build
7	9266.27	88.62	179.51	8848.03	-172.86	-1065.03	10.00	179.509	163.75		LP, Hold 88.62° Inc at 179.51° Azm
8	19188.81	88.62	179.51	9087.00	-10092.16	-980.08	0.00	0.000	10083.41	BHL - EB 26 35 FC 111H	TD at 19188.81

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
FTP - EB 26 35 FC 111H	8837.00	316.28	-1069.22	628394.33	754179.93	32° 43' 32.105708 N	103° 38' 28.390412 W
LTP - EB 26 35 FC 111H	9085.80	-10042.16	-980.50	618035.89	754268.65	32° 41' 49.607630 N	103° 38' 28.143531 W
BHL - EB 26 35 FC 111H	9087.00	-10092.16	-980.08	617985.89	754269.07	32° 41' 49.112873 N	103° 38' 28.142435 W

Map System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone Name: New Mexico Eastern Zone

Local Origin: Well English Buffalo 26 35 Fed Com 111H, Grid North

Latitude: 32° 43' 28.906995 N
Longitude: 103° 38' 15.898834 W

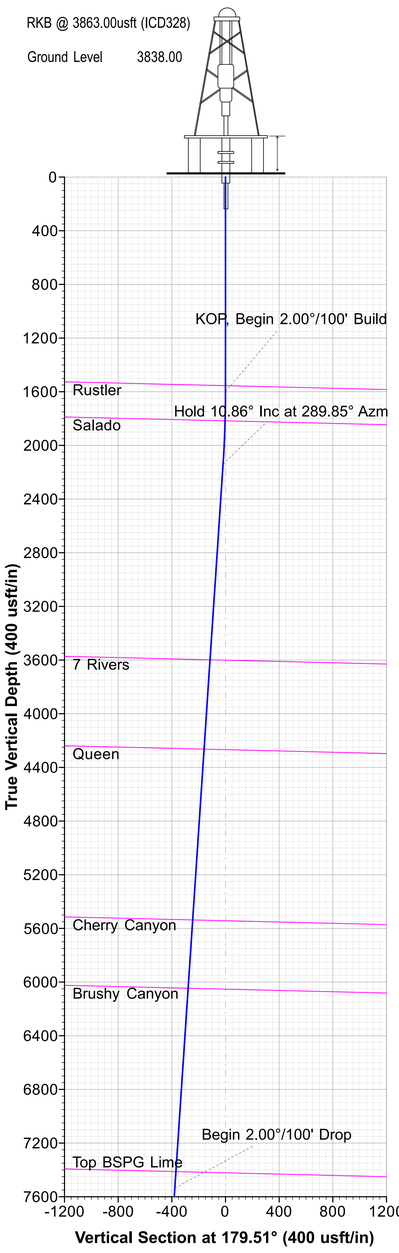
Grid East: 755249.15
Grid North: 628078.05
Scale Factor: 1.000

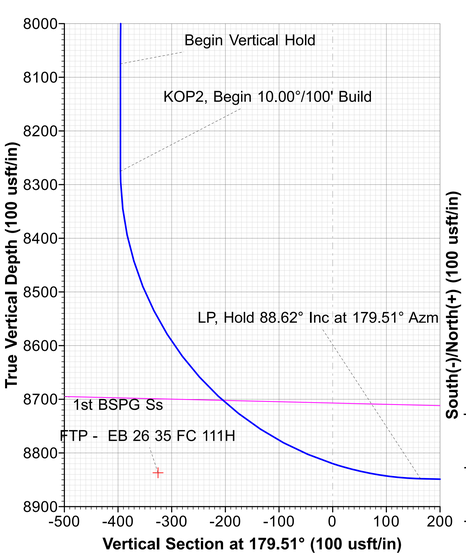
Geomagnetic Model: MVHD
Sample Date: 28-Oct-23
Magnetic Declination: 6.199°
Dip Angle from Horizontal: 60.542°
Magnetic Field Strength: 47686.54902106nT

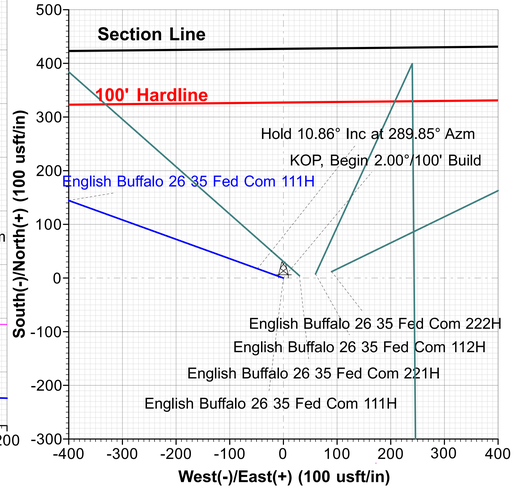
To convert a Magnetic Direction to a Grid Direction, Add 5.823°
To convert a Magnetic Direction to a True Direction, Add 6.199° East
To convert a True Direction to a Grid Direction, Subtract 0.376°

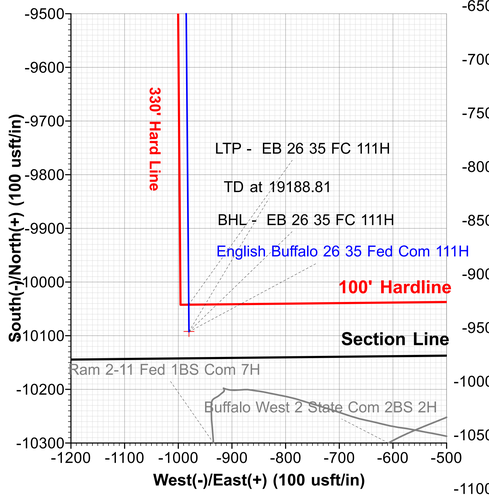
FORMATION TOP DETAILS

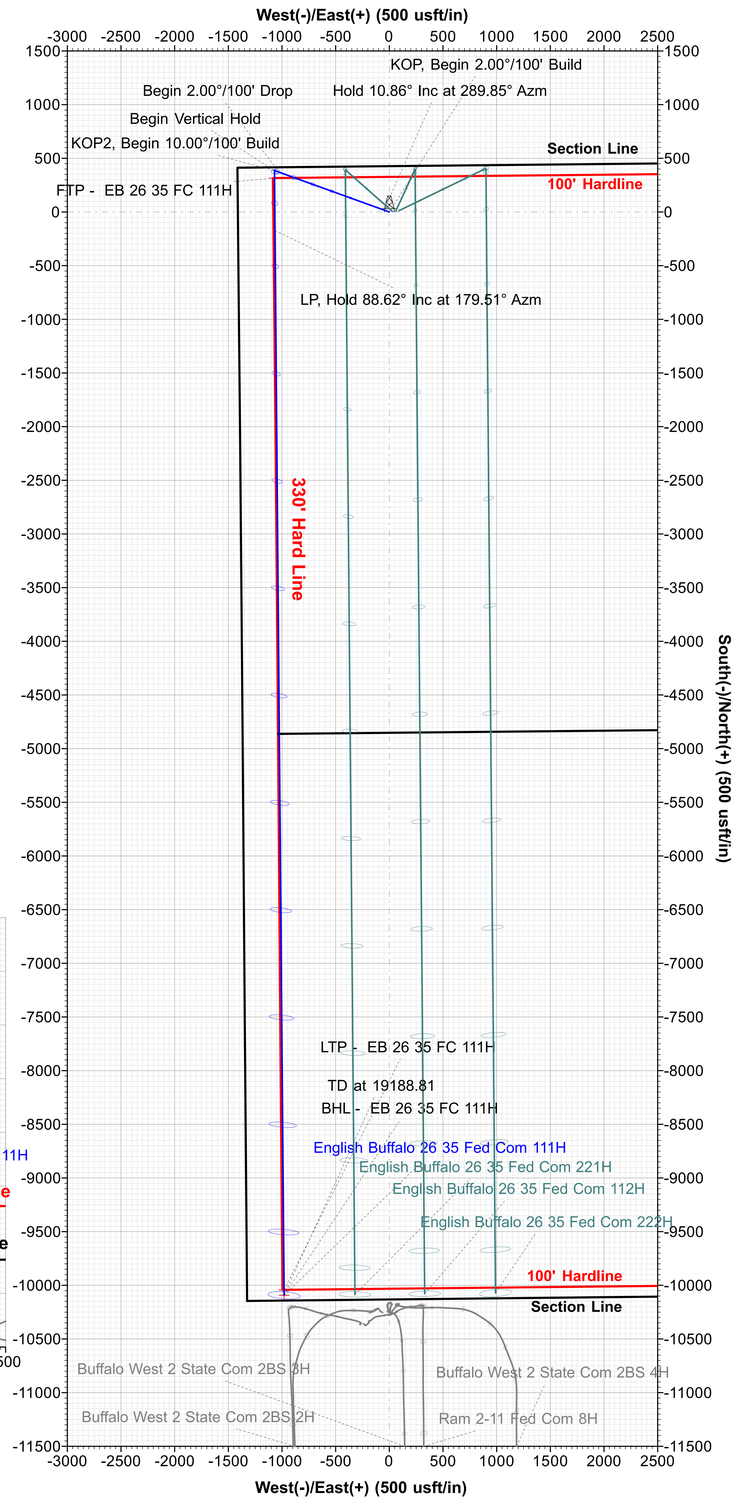
TVDPath	MDPath	Formation
1555.00	1555.00	Rustler
1816.93	1817.14	Salado
3598.23	3628.06	7 Rivers
4264.16	4306.12	Queen
5537.11	5602.28	Cherry Canyon
6046.30	6120.74	Brushy Canyon
7413.10	7512.46	Top BSPG Lime
8702.07	8861.62	1st BSPG Ss

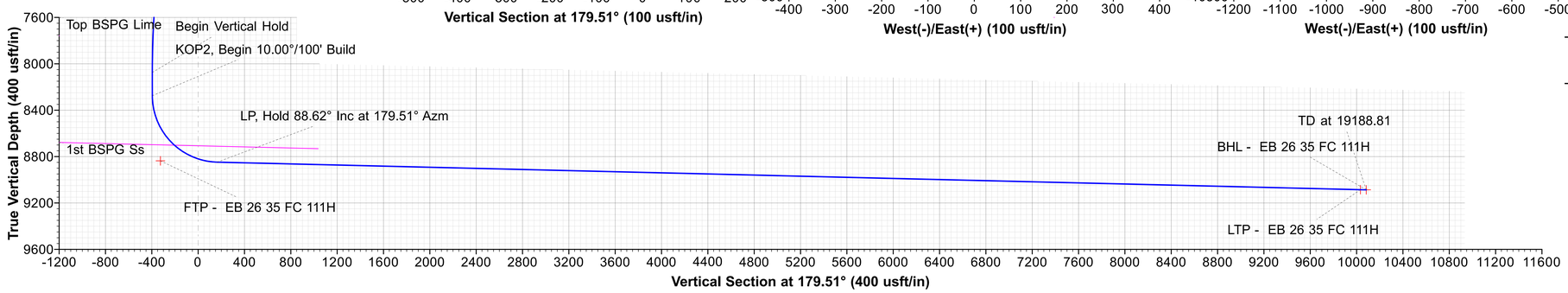












Date: 10:25, August 29 2023

PHOENIX
TECHNOLOGY SERVICES

Earthstone Operating, LLC

Lea County, NM (Nad 83 NME)
English Buffalo
English Buffalo 26 35 Fed Com 111H

OH

Plan: Plan 1 08-29-23

Standard Planning Report

29 August, 2023

EARTHSTONE
Energy, Inc.

PHOENIX TECHNOLOGY SERVICES

Planning Report

EARTHSTONE Energy, Inc.

Database:	USAEDMDB	**Local Co-ordinate Reference:**	Well English Buffalo 26 35 Fed Com 111H
Company:	Earthstone Operating, LLC	**TVD Reference:**	RKB @ 3863.00usft (ICD328)
Project:	Lea County, NM (Nad 83 NME)	**MD Reference:**	RKB @ 3863.00usft (ICD328)
Site:	English Buffalo	**North Reference:**	Grid
Well:	English Buffalo 26 35 Fed Com 111H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-29-23		

Project Lea County, NM (Nad 83 NME)

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site English Buffalo

Site Position:		**Northing:**	628,078.05 usft	**Latitude:**	32° 43' 28.906995 N
From:	Map	**Easting:**	755,249.15 usft	**Longitude:**	103° 38' 15.898834 W
Position Uncertainty:	0.00 usft	**Slot Radius:**	13-3/16 "	**Grid Convergence:**	0.376 °

Well English Buffalo 26 35 Fed Com 111H

Well Position	**+N/-S**	0.00 usft	**Northing:**	628,078.05 usft	**Latitude:**	32° 43' 28.906995 N
	+E/-W	0.00 usft	**Easting:**	755,249.15 usft	**Longitude:**	103° 38' 15.898834 W
Position Uncertainty		0.00 usft	**Wellhead Elevation:**		**Ground Level:**	3,838.00 usft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	MVHD	2023-10-28	6.199	60.542	47,686.54902106

Design Plan 1 08-29-23

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	179.51

Plan Survey Tool Program **Date** 2023-08-29

	Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks
1	0.00	19,188.81	Plan 1 08-29-23 (OH)	MWD+HRGM	
				OWSG MWD + HRGM	

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	
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.000	
2,142.85	10.86	289.85	2,139.61	17.41	-48.23	2.00	2.00	0.00	289.853	
7,636.98	10.86	289.85	7,535.39	368.86	-1,021.59	0.00	0.00	0.00	0.000	
8,179.83	0.00	0.00	8,075.00	386.28	-1,069.82	2.00	-2.00	0.00	180.000	
8,380.07	0.00	0.00	8,275.24	386.28	-1,069.82	0.00	0.00	0.00	0.000	
9,266.27	88.62	179.51	8,848.03	-172.86	-1,065.03	10.00	10.00	0.00	179.509	
19,188.81	88.62	179.51	9,087.00	-10,092.16	-980.08	0.00	0.00	0.00	0.000	BHL - EB 26 35 FC

PHOENIX TECHNOLOGY SERVICES

Planning Report

EARTHSTONE Energy, Inc.

Database:	USAEDMDB	**Local Co-ordinate Reference:**	Well English Buffalo 26 35 Fed Com 111H
Company:	Earthstone Operating, LLC	**TVD Reference:**	RKB @ 3863.00usft (ICD328)
Project:	Lea County, NM (Nad 83 NME)	**MD Reference:**	RKB @ 3863.00usft (ICD328)
Site:	English Buffalo	**North Reference:**	Grid
Well:	English Buffalo 26 35 Fed Com 111H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-29-23		

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
1,555.00	0.00	0.00	1,555.00	0.00	0.00	0.00	0.00	0.00	0.00
Rustler									
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
KOP, Begin 2.00°/100' Build									
1,700.00	2.00	289.85	1,699.98	0.59	-1.64	-0.61	2.00	2.00	0.00
1,800.00	4.00	289.85	1,799.84	2.37	-6.56	-2.43	2.00	2.00	0.00
1,817.14	4.34	289.85	1,816.93	2.79	-7.74	-2.86	2.00	2.00	0.00
Salado									
1,900.00	6.00	289.85	1,899.45	5.33	-14.76	-5.46	2.00	2.00	0.00
2,000.00	8.00	289.85	1,998.70	9.47	-26.22	-9.69	2.00	2.00	0.00
2,100.00	10.00	289.85	2,097.47	14.78	-40.94	-15.13	2.00	2.00	0.00
2,142.85	10.86	289.85	2,139.61	17.41	-48.23	-17.83	2.00	2.00	0.00
Hold 10.86° Inc at 289.85° Azm									
2,200.00	10.86	289.85	2,195.73	21.07	-58.36	-21.57	0.00	0.00	0.00
2,300.00	10.86	289.85	2,293.94	27.47	-76.07	-28.12	0.00	0.00	0.00
2,400.00	10.86	289.85	2,392.15	33.86	-93.79	-34.66	0.00	0.00	0.00
2,500.00	10.86	289.85	2,490.36	40.26	-111.50	-41.21	0.00	0.00	0.00
2,600.00	10.86	289.85	2,588.57	46.66	-129.22	-47.76	0.00	0.00	0.00
2,700.00	10.86	289.85	2,686.78	53.05	-146.94	-54.31	0.00	0.00	0.00
2,800.00	10.86	289.85	2,784.99	59.45	-164.65	-60.86	0.00	0.00	0.00
2,900.00	10.86	289.85	2,883.20	65.85	-182.37	-67.41	0.00	0.00	0.00
3,000.00	10.86	289.85	2,981.41	72.24	-200.09	-73.95	0.00	0.00	0.00
3,100.00	10.86	289.85	3,079.62	78.64	-217.80	-80.50	0.00	0.00	0.00
3,200.00	10.86	289.85	3,177.83	85.04	-235.52	-87.05	0.00	0.00	0.00
3,300.00	10.86	289.85	3,276.04	91.44	-253.24	-93.60	0.00	0.00	0.00
3,400.00	10.86	289.85	3,374.25	97.83	-270.95	-100.15	0.00	0.00	0.00
3,500.00	10.86	289.85	3,472.46	104.23	-288.67	-106.69	0.00	0.00	0.00
3,600.00	10.86	289.85	3,570.67	110.63	-306.38	-113.24	0.00	0.00	0.00
3,628.06	10.86	289.85	3,598.23	112.42	-311.35	-115.08	0.00	0.00	0.00
7 Rivers									
3,700.00	10.86	289.85	3,668.88	117.02	-324.10	-119.79	0.00	0.00	0.00
3,800.00	10.86	289.85	3,767.10	123.42	-341.82	-126.34	0.00	0.00	0.00
3,900.00	10.86	289.85	3,865.31	129.82	-359.53	-132.89	0.00	0.00	0.00
4,000.00	10.86	289.85	3,963.52	136.21	-377.25	-139.43	0.00	0.00	0.00
4,100.00	10.86	289.85	4,061.73	142.61	-394.97	-145.98	0.00	0.00	0.00
4,200.00	10.86	289.85	4,159.94	149.01	-412.68	-152.53	0.00	0.00	0.00
4,300.00	10.86	289.85	4,258.15	155.40	-430.40	-159.08	0.00	0.00	0.00
4,306.12	10.86	289.85	4,264.16	155.79	-431.48	-159.48	0.00	0.00	0.00
Queen									
4,400.00	10.86	289.85	4,356.36	161.80	-448.12	-165.63	0.00	0.00	0.00
4,500.00	10.86	289.85	4,454.57	168.20	-465.83	-172.17	0.00	0.00	0.00
4,600.00	10.86	289.85	4,552.78	174.59	-483.55	-178.72	0.00	0.00	0.00
4,700.00	10.86	289.85	4,650.99	180.99	-501.26	-185.27	0.00	0.00	0.00
4,800.00	10.86	289.85	4,749.20	187.39	-518.98	-191.82	0.00	0.00	0.00
4,900.00	10.86	289.85	4,847.41	193.78	-536.70	-198.37	0.00	0.00	0.00
5,000.00	10.86	289.85	4,945.62	200.18	-554.41	-204.91	0.00	0.00	0.00
5,100.00	10.86	289.85	5,043.83	206.58	-572.13	-211.46	0.00	0.00	0.00
5,200.00	10.86	289.85	5,142.04	212.97	-589.85	-218.01	0.00	0.00	0.00
5,300.00	10.86	289.85	5,240.25	219.37	-607.56	-224.56	0.00	0.00	0.00
5,400.00	10.86	289.85	5,338.46	225.77	-625.28	-231.11	0.00	0.00	0.00
5,500.00	10.86	289.85	5,436.67	232.16	-642.99	-237.66	0.00	0.00	0.00
5,600.00	10.86	289.85	5,534.88	238.56	-660.71	-244.20	0.00	0.00	0.00

PHOENIX TECHNOLOGY SERVICES

Planning Report

EARTHSTONE Energy, Inc.

Database:	USAEDMDB	**Local Co-ordinate Reference:**	Well English Buffalo 26 35 Fed Com 111H
Company:	Earthstone Operating, LLC	**TVD Reference:**	RKB @ 3863.00usft (ICD328)
Project:	Lea County, NM (Nad 83 NME)	**MD Reference:**	RKB @ 3863.00usft (ICD328)
Site:	English Buffalo	**North Reference:**	Grid
Well:	English Buffalo 26 35 Fed Com 111H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-29-23		

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)
5,602.28	10.86	289.85	5,537.11	238.71	-661.11	-244.35	0.00	0.00	0.00
Cherry Canyon									
5,700.00	10.86	289.85	5,633.09	244.96	-678.43	-250.75	0.00	0.00	0.00
5,800.00	10.86	289.85	5,731.30	251.36	-696.14	-257.30	0.00	0.00	0.00
5,900.00	10.86	289.85	5,829.51	257.75	-713.86	-263.85	0.00	0.00	0.00
6,000.00	10.86	289.85	5,927.72	264.15	-731.58	-270.40	0.00	0.00	0.00
6,100.00	10.86	289.85	6,025.93	270.55	-749.29	-276.94	0.00	0.00	0.00
6,120.74	10.86	289.85	6,046.30	271.87	-752.97	-278.30	0.00	0.00	0.00
Brushy Canyon									
6,200.00	10.86	289.85	6,124.14	276.94	-767.01	-283.49	0.00	0.00	0.00
6,300.00	10.86	289.85	6,222.35	283.34	-784.73	-290.04	0.00	0.00	0.00
6,400.00	10.86	289.85	6,320.56	289.74	-802.44	-296.59	0.00	0.00	0.00
6,500.00	10.86	289.85	6,418.77	296.13	-820.16	-303.14	0.00	0.00	0.00
6,600.00	10.86	289.85	6,516.98	302.53	-837.87	-309.68	0.00	0.00	0.00
6,700.00	10.86	289.85	6,615.19	308.93	-855.59	-316.23	0.00	0.00	0.00
6,800.00	10.86	289.85	6,713.40	315.32	-873.31	-322.78	0.00	0.00	0.00
6,900.00	10.86	289.85	6,811.61	321.72	-891.02	-329.33	0.00	0.00	0.00
7,000.00	10.86	289.85	6,909.82	328.12	-908.74	-335.88	0.00	0.00	0.00
7,100.00	10.86	289.85	7,008.03	334.51	-926.46	-342.42	0.00	0.00	0.00
7,200.00	10.86	289.85	7,106.24	340.91	-944.17	-348.97	0.00	0.00	0.00
7,300.00	10.86	289.85	7,204.45	347.31	-961.89	-355.52	0.00	0.00	0.00
7,400.00	10.86	289.85	7,302.66	353.70	-979.60	-362.07	0.00	0.00	0.00
7,500.00	10.86	289.85	7,400.87	360.10	-997.32	-368.62	0.00	0.00	0.00
7,512.46	10.86	289.85	7,413.10	360.90	-999.53	-369.43	0.00	0.00	0.00
Top BSPG Lime									
7,600.00	10.86	289.85	7,499.08	366.50	-1,015.04	-375.16	0.00	0.00	0.00
7,636.98	10.86	289.85	7,535.39	368.86	-1,021.59	-377.59	0.00	0.00	0.00
Begin 2.00°/100' Drop									
7,700.00	9.60	289.85	7,597.41	372.66	-1,032.11	-381.48	2.00	-2.00	0.00
7,800.00	7.60	289.85	7,696.28	377.74	-1,046.17	-386.67	2.00	-2.00	0.00
7,900.00	5.60	289.85	7,795.62	381.64	-1,056.98	-390.67	2.00	-2.00	0.00
8,000.00	3.60	289.85	7,895.29	384.36	-1,064.51	-393.45	2.00	-2.00	0.00
8,100.00	1.60	289.85	7,995.18	385.90	-1,068.77	-395.03	2.00	-2.00	0.00
8,179.83	0.00	0.00	8,075.00	386.28	-1,069.82	-395.41	2.00	-2.00	0.00
Begin Vertical Hold									
8,380.07	0.00	0.00	8,275.24	386.28	-1,069.82	-395.41	0.00	0.00	0.00
KOP2, Begin 10.00°/100' Build									
8,400.00	1.99	179.51	8,295.17	385.93	-1,069.82	-395.07	10.00	10.00	0.00
8,500.00	11.99	179.51	8,394.30	373.77	-1,069.71	-382.91	10.00	10.00	0.00
8,600.00	21.99	179.51	8,489.81	344.58	-1,069.46	-353.72	10.00	10.00	0.00
8,700.00	31.99	179.51	8,578.80	299.26	-1,069.07	-308.39	10.00	10.00	0.00
8,800.00	41.99	179.51	8,658.57	239.16	-1,068.56	-248.29	10.00	10.00	0.00
8,861.62	48.16	179.51	8,702.07	195.56	-1,068.19	-204.68	10.00	10.00	0.00
1st BSPG Ss									
8,900.00	51.99	179.51	8,726.70	166.13	-1,067.93	-175.26	10.00	10.00	0.00
9,000.00	61.99	179.51	8,781.10	82.38	-1,067.22	-91.50	10.00	10.00	0.00
9,100.00	71.99	179.51	8,820.14	-9.55	-1,066.43	0.43	10.00	10.00	0.00
9,200.00	81.99	179.51	8,842.61	-106.85	-1,065.60	97.74	10.00	10.00	0.00
9,266.27	88.62	179.51	8,848.03	-172.86	-1,065.03	163.75	10.00	10.00	0.00
LP, Hold 88.62° Inc at 179.51° Azm									
9,300.00	88.62	179.51	8,848.85	-206.58	-1,064.74	197.47	0.00	0.00	0.00
9,400.00	88.62	179.51	8,851.25	-306.55	-1,063.89	297.44	0.00	0.00	0.00
9,500.00	88.62	179.51	8,853.66	-406.52	-1,063.03	397.41	0.00	0.00	0.00

PHOENIX TECHNOLOGY SERVICES

Planning Report

EARTHSTONE Energy, Inc.

Database:	USAEDMDB	**Local Co-ordinate Reference:**	Well English Buffalo 26 35 Fed Com 111H
Company:	Earthstone Operating, LLC	**TVD Reference:**	RKB @ 3863.00usft (ICD328)
Project:	Lea County, NM (Nad 83 NME)	**MD Reference:**	RKB @ 3863.00usft (ICD328)
Site:	English Buffalo	**North Reference:**	Grid
Well:	English Buffalo 26 35 Fed Com 111H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-29-23		

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)
9,600.00	88.62	179.51	8,856.07	-506.48	-1,062.17	497.38	0.00	0.00	0.00
9,700.00	88.62	179.51	8,858.48	-606.45	-1,061.32	597.35	0.00	0.00	0.00
9,800.00	88.62	179.51	8,860.89	-706.42	-1,060.46	697.32	0.00	0.00	0.00
9,900.00	88.62	179.51	8,863.30	-806.38	-1,059.61	797.29	0.00	0.00	0.00
10,000.00	88.62	179.51	8,865.70	-906.35	-1,058.75	897.26	0.00	0.00	0.00
10,100.00	88.62	179.51	8,868.11	-1,006.32	-1,057.89	997.24	0.00	0.00	0.00
10,200.00	88.62	179.51	8,870.52	-1,106.29	-1,057.04	1,097.21	0.00	0.00	0.00
10,300.00	88.62	179.51	8,872.93	-1,206.25	-1,056.18	1,197.18	0.00	0.00	0.00
10,400.00	88.62	179.51	8,875.34	-1,306.22	-1,055.32	1,297.15	0.00	0.00	0.00
10,500.00	88.62	179.51	8,877.75	-1,406.19	-1,054.47	1,397.12	0.00	0.00	0.00
10,600.00	88.62	179.51	8,880.15	-1,506.16	-1,053.61	1,497.09	0.00	0.00	0.00
10,700.00	88.62	179.51	8,882.56	-1,606.12	-1,052.76	1,597.06	0.00	0.00	0.00
10,800.00	88.62	179.51	8,884.97	-1,706.09	-1,051.90	1,697.03	0.00	0.00	0.00
10,900.00	88.62	179.51	8,887.38	-1,806.06	-1,051.04	1,797.00	0.00	0.00	0.00
11,000.00	88.62	179.51	8,889.79	-1,906.03	-1,050.19	1,896.97	0.00	0.00	0.00
11,100.00	88.62	179.51	8,892.20	-2,005.99	-1,049.33	1,996.95	0.00	0.00	0.00
11,200.00	88.62	179.51	8,894.60	-2,105.96	-1,048.48	2,096.92	0.00	0.00	0.00
11,300.00	88.62	179.51	8,897.01	-2,205.93	-1,047.62	2,196.89	0.00	0.00	0.00
11,400.00	88.62	179.51	8,899.42	-2,305.89	-1,046.76	2,296.86	0.00	0.00	0.00
11,500.00	88.62	179.51	8,901.83	-2,405.86	-1,045.91	2,396.83	0.00	0.00	0.00
11,600.00	88.62	179.51	8,904.24	-2,505.83	-1,045.05	2,496.80	0.00	0.00	0.00
11,700.00	88.62	179.51	8,906.65	-2,605.80	-1,044.19	2,596.77	0.00	0.00	0.00
11,800.00	88.62	179.51	8,909.05	-2,705.76	-1,043.34	2,696.74	0.00	0.00	0.00
11,900.00	88.62	179.51	8,911.46	-2,805.73	-1,042.48	2,796.71	0.00	0.00	0.00
12,000.00	88.62	179.51	8,913.87	-2,905.70	-1,041.63	2,896.68	0.00	0.00	0.00
12,100.00	88.62	179.51	8,916.28	-3,005.67	-1,040.77	2,996.66	0.00	0.00	0.00
12,200.00	88.62	179.51	8,918.69	-3,105.63	-1,039.91	3,096.63	0.00	0.00	0.00
12,300.00	88.62	179.51	8,921.10	-3,205.60	-1,039.06	3,196.60	0.00	0.00	0.00
12,400.00	88.62	179.51	8,923.50	-3,305.57	-1,038.20	3,296.57	0.00	0.00	0.00
12,500.00	88.62	179.51	8,925.91	-3,405.54	-1,037.35	3,396.54	0.00	0.00	0.00
12,600.00	88.62	179.51	8,928.32	-3,505.50	-1,036.49	3,496.51	0.00	0.00	0.00
12,700.00	88.62	179.51	8,930.73	-3,605.47	-1,035.63	3,596.48	0.00	0.00	0.00
12,800.00	88.62	179.51	8,933.14	-3,705.44	-1,034.78	3,696.45	0.00	0.00	0.00
12,900.00	88.62	179.51	8,935.55	-3,805.40	-1,033.92	3,796.42	0.00	0.00	0.00
13,000.00	88.62	179.51	8,937.95	-3,905.37	-1,033.06	3,896.39	0.00	0.00	0.00
13,100.00	88.62	179.51	8,940.36	-4,005.34	-1,032.21	3,996.37	0.00	0.00	0.00
13,200.00	88.62	179.51	8,942.77	-4,105.31	-1,031.35	4,096.34	0.00	0.00	0.00
13,300.00	88.62	179.51	8,945.18	-4,205.27	-1,030.50	4,196.31	0.00	0.00	0.00
13,400.00	88.62	179.51	8,947.59	-4,305.24	-1,029.64	4,296.28	0.00	0.00	0.00
13,500.00	88.62	179.51	8,950.00	-4,405.21	-1,028.78	4,396.25	0.00	0.00	0.00
13,600.00	88.62	179.51	8,952.40	-4,505.18	-1,027.93	4,496.22	0.00	0.00	0.00
13,700.00	88.62	179.51	8,954.81	-4,605.14	-1,027.07	4,596.19	0.00	0.00	0.00
13,800.00	88.62	179.51	8,957.22	-4,705.11	-1,026.22	4,696.16	0.00	0.00	0.00
13,900.00	88.62	179.51	8,959.63	-4,805.08	-1,025.36	4,796.13	0.00	0.00	0.00
14,000.00	88.62	179.51	8,962.04	-4,905.05	-1,024.50	4,896.10	0.00	0.00	0.00
14,100.00	88.62	179.51	8,964.45	-5,005.01	-1,023.65	4,996.08	0.00	0.00	0.00
14,200.00	88.62	179.51	8,966.85	-5,104.98	-1,022.79	5,096.05	0.00	0.00	0.00
14,300.00	88.62	179.51	8,969.26	-5,204.95	-1,021.94	5,196.02	0.00	0.00	0.00
14,400.00	88.62	179.51	8,971.67	-5,304.91	-1,021.08	5,295.99	0.00	0.00	0.00
14,500.00	88.62	179.51	8,974.08	-5,404.88	-1,020.22	5,395.96	0.00	0.00	0.00
14,600.00	88.62	179.51	8,976.49	-5,504.85	-1,019.37	5,495.93	0.00	0.00	0.00
14,700.00	88.62	179.51	8,978.90	-5,604.82	-1,018.51	5,595.90	0.00	0.00	0.00
14,800.00	88.62	179.51	8,981.30	-5,704.78	-1,017.65	5,695.87	0.00	0.00	0.00
14,900.00	88.62	179.51	8,983.71	-5,804.75	-1,016.80	5,795.84	0.00	0.00	0.00

PHOENIX TECHNOLOGY SERVICES

Planning Report

EARTHSTONE Energy, Inc.

Database:	USAEDMDB	**Local Co-ordinate Reference:**	Well English Buffalo 26 35 Fed Com 111H
Company:	Earthstone Operating, LLC	**TVD Reference:**	RKB @ 3863.00usft (ICD328)
Project:	Lea County, NM (Nad 83 NME)	**MD Reference:**	RKB @ 3863.00usft (ICD328)
Site:	English Buffalo	**North Reference:**	Grid
Well:	English Buffalo 26 35 Fed Com 111H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-29-23		

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)
15,000.00	88.62	179.51	8,986.12	-5,904.72	-1,015.94	5,895.81	0.00	0.00	0.00
15,100.00	88.62	179.51	8,988.53	-6,004.69	-1,015.09	5,995.79	0.00	0.00	0.00
15,200.00	88.62	179.51	8,990.94	-6,104.65	-1,014.23	6,095.76	0.00	0.00	0.00
15,300.00	88.62	179.51	8,993.35	-6,204.62	-1,013.37	6,195.73	0.00	0.00	0.00
15,400.00	88.62	179.51	8,995.75	-6,304.59	-1,012.52	6,295.70	0.00	0.00	0.00
15,500.00	88.62	179.51	8,998.16	-6,404.55	-1,011.66	6,395.67	0.00	0.00	0.00
15,600.00	88.62	179.51	9,000.57	-6,504.52	-1,010.81	6,495.64	0.00	0.00	0.00
15,700.00	88.62	179.51	9,002.98	-6,604.49	-1,009.95	6,595.61	0.00	0.00	0.00
15,800.00	88.62	179.51	9,005.39	-6,704.46	-1,009.09	6,695.58	0.00	0.00	0.00
15,900.00	88.62	179.51	9,007.80	-6,804.42	-1,008.24	6,795.55	0.00	0.00	0.00
16,000.00	88.62	179.51	9,010.20	-6,904.39	-1,007.38	6,895.52	0.00	0.00	0.00
16,100.00	88.62	179.51	9,012.61	-7,004.36	-1,006.52	6,995.50	0.00	0.00	0.00
16,200.00	88.62	179.51	9,015.02	-7,104.33	-1,005.67	7,095.47	0.00	0.00	0.00
16,300.00	88.62	179.51	9,017.43	-7,204.29	-1,004.81	7,195.44	0.00	0.00	0.00
16,400.00	88.62	179.51	9,019.84	-7,304.26	-1,003.96	7,295.41	0.00	0.00	0.00
16,500.00	88.62	179.51	9,022.25	-7,404.23	-1,003.10	7,395.38	0.00	0.00	0.00
16,600.00	88.62	179.51	9,024.65	-7,504.20	-1,002.24	7,495.35	0.00	0.00	0.00
16,700.00	88.62	179.51	9,027.06	-7,604.16	-1,001.39	7,595.32	0.00	0.00	0.00
16,800.00	88.62	179.51	9,029.47	-7,704.13	-1,000.53	7,695.29	0.00	0.00	0.00
16,900.00	88.62	179.51	9,031.88	-7,804.10	-999.68	7,795.26	0.00	0.00	0.00
17,000.00	88.62	179.51	9,034.29	-7,904.06	-998.82	7,895.23	0.00	0.00	0.00
17,100.00	88.62	179.51	9,036.69	-8,004.03	-997.96	7,995.21	0.00	0.00	0.00
17,200.00	88.62	179.51	9,039.10	-8,104.00	-997.11	8,095.18	0.00	0.00	0.00
17,300.00	88.62	179.51	9,041.51	-8,203.97	-996.25	8,195.15	0.00	0.00	0.00
17,400.00	88.62	179.51	9,043.92	-8,303.93	-995.39	8,295.12	0.00	0.00	0.00
17,500.00	88.62	179.51	9,046.33	-8,403.90	-994.54	8,395.09	0.00	0.00	0.00
17,600.00	88.62	179.51	9,048.74	-8,503.87	-993.68	8,495.06	0.00	0.00	0.00
17,700.00	88.62	179.51	9,051.14	-8,603.84	-992.83	8,595.03	0.00	0.00	0.00
17,800.00	88.62	179.51	9,053.55	-8,703.80	-991.97	8,695.00	0.00	0.00	0.00
17,900.00	88.62	179.51	9,055.96	-8,803.77	-991.11	8,794.97	0.00	0.00	0.00
18,000.00	88.62	179.51	9,058.37	-8,903.74	-990.26	8,894.94	0.00	0.00	0.00
18,100.00	88.62	179.51	9,060.78	-9,003.71	-989.40	8,994.91	0.00	0.00	0.00
18,200.00	88.62	179.51	9,063.19	-9,103.67	-988.55	9,094.89	0.00	0.00	0.00
18,300.00	88.62	179.51	9,065.59	-9,203.64	-987.69	9,194.86	0.00	0.00	0.00
18,400.00	88.62	179.51	9,068.00	-9,303.61	-986.83	9,294.83	0.00	0.00	0.00
18,500.00	88.62	179.51	9,070.41	-9,403.57	-985.98	9,394.80	0.00	0.00	0.00
18,600.00	88.62	179.51	9,072.82	-9,503.54	-985.12	9,494.77	0.00	0.00	0.00
18,700.00	88.62	179.51	9,075.23	-9,603.51	-984.26	9,594.74	0.00	0.00	0.00
18,800.00	88.62	179.51	9,077.64	-9,703.48	-983.41	9,694.71	0.00	0.00	0.00
18,900.00	88.62	179.51	9,080.04	-9,803.44	-982.55	9,794.68	0.00	0.00	0.00
19,000.00	88.62	179.51	9,082.45	-9,903.41	-981.70	9,894.65	0.00	0.00	0.00
19,100.00	88.62	179.51	9,084.86	-10,003.38	-980.84	9,994.62	0.00	0.00	0.00
19,188.81	88.62	179.51	9,087.00	-10,092.16	-980.08	10,083.41	0.00	0.00	0.00
TD at 19188.81									

PHOENIX TECHNOLOGY SERVICES

Planning Report

EARTHSTONE Energy, Inc.

Database:	USAEDMDB	**Local Co-ordinate Reference:**	Well English Buffalo 26 35 Fed Com 111H
Company:	Earthstone Operating, LLC	**TVD Reference:**	RKB @ 3863.00usft (ICD328)
Project:	Lea County, NM (Nad 83 NME)	**MD Reference:**	RKB @ 3863.00usft (ICD328)
Site:	English Buffalo	**North Reference:**	Grid
Well:	English Buffalo 26 35 Fed Com 111H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	OH		
Design:	Plan 1 08-29-23		

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
FTP - EB 26 35 FC 1	0.00	0.00	8,837.00	316.28	-1,069.22	628,394.33	754,179.93	32° 43' 32.105708 N	3° 38' 28.390412 W
- plan misses target center by 181.06usft at 8861.62usft MD (8702.07 TVD, 195.56 N, -1068.19 E)									
- Point									
LTP - EB 26 35 FC 11	0.00	0.00	9,085.80	-10,042.16	-980.50	618,035.89	754,268.65	32° 41' 49.607630 N	3° 38' 28.143531 W
- plan misses target center by 38.79usft at 19100.00usft MD (9084.86 TVD, -10003.38 N, -980.84 E)									
- Point									
BHL - EB 26 35 FC 1	0.00	0.00	9,087.00	-10,092.16	-980.08	617,985.89	754,269.07	32° 41' 49.112873 N	3° 38' 28.142435 W
- plan hits target center									
- Point									

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,555.00	1,555.00	Rustler		1.380	179.51
1,817.14	1,816.93	Salado		1.380	179.51
3,628.06	3,598.23	7 Rivers		1.380	179.51
4,306.12	4,264.16	Queen		1.380	179.51
5,602.28	5,537.11	Cherry Canyon		1.380	179.51
6,120.74	6,046.30	Brushy Canyon		1.380	179.51
7,512.46	7,413.10	Top BSPG Lime		1.380	179.51
8,861.62	8,702.07	1st BSPG Ss		1.380	179.51

Plan Annotations

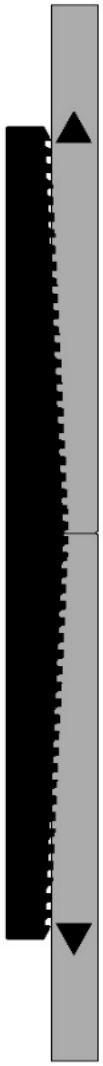
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
1,600.00	1,600.00	0.00	0.00	KOP, Begin 2.00°/100' Build
2,142.85	2,139.61	17.41	-48.23	Hold 10.86° Inc at 289.85° Azm
7,636.98	7,535.39	368.86	-1,021.59	Begin 2.00°/100' Drop
8,179.83	8,075.00	386.28	-1,069.82	Begin Vertical Hold
8,380.07	8,275.24	386.28	-1,069.82	KOP2, Begin 10.00°/100' Build
9,266.27	8,848.03	-172.86	-1,065.03	LP, Hold 88.62° Inc at 179.51° Azm
19,188.81	9,087.00	-10,092.16	-980.08	TD at 19188.81

GB connections
Engineering the Right Connections

GB Connection Performance Properties Sheet

Rev. 0 (06/02/2014)

ENGINEERING THE RIGHT CONNECTIONS™



Casing: 10.75 OD, 45.5 ppf
Casing Grade: J-55

Connection: GB CD Butt 11.750
Coupling Grade: API K-55

PIPE BODY GEOMETRY					
Nominal OD (in.)	10 3/4	Wall Thickness (in.)	0.400	Drift Diameter (in.)	9.794
Nominal Weight (ppf)	45.50	Nominal ID (in.)	9.950	API Alternate Drift Dia. (in.)	9.875
Plain End Weight (ppf)	44.26	Plain End Area (in.^{2})	13.006		

PIPE BODY PERFORMANCE					
Material Specification	J-55	Min. Yield Str. (psi)	55,000	Min. Ultimate Str. (psi)	75,000
Collapse		**Tension**		**Pressure**	
API (psi)	2,090	Pl. End Yield Str. (kips)	715	Min. Int. Yield Press. (psi)	3,580
High Collapse (psi)	N/A	**Torque**		**Bending**	
		Yield Torque (ft-lbs)	171,740	Build Rate to Yield (°/100 ft)	23.5

GB CD Butt 11.750 COUPLING GEOMETRY			
Coupling OD (in.)	11.750	Makeup Loss (in.)	5.0000
Coupling Length (in.)	10.000	Critical Cross-Sect. (in.^{2})	20.574

GB CD Butt 11.750 CONNECTION PERFORMANCE RATINGS/EFFICIENCIES					
Material Specification	API K-55	Min. Yield Str. (psi)	55,000	Min. Ultimate Str. (psi)	95,000
Tension		**Efficiency**		**Bending**	
Thread Str. (kips)	796	Internal Pressure (%)	100%	Build Rate to Yield (°/100 ft)	21.5
Min. Tension Yield (kips)	1,075	External Pressure (%)	100%	**Yield Torque**	
Min. Tension Ult. (kips)	1,857	Tension (%)	100%	Yield Torque (ft-lbs)	47,930
Joint Str. (kips)	796	Compression (%)	100%		
		Ratio of Areas (Cplg/Pipe)	1.58		

MAKEUP TORQUE					
Min. MU Tq. (ft-lbs)	10,000	Max. MU Tq. (ft-lbs)	20,000	Running Tq. (ft-lbs)	See GBT RP
				Max. Operating Tq. (ft-lbs)*	45,530

Units: US Customary (lbm, in., °F, lbf)
1 kip = 1,000 lbs
* See Running Procedure for description and limitations.
See attached: Notes for GB Connection Performance Properties.
GBT Running Procedure (GBT RP): www.gbconnections.com/pdf/RP-GB-DWC-Connections.pdf
Blanking Dimensions: www.gbconnections.com/pdf/GB-DWC-Blanking-Dimensions.pdf

GB connections
Engineering the Right Connections

Notes for GB Connections Performance Properties

Rev. 1 (May, 2018)

ENGINEERING THE RIGHT CONNECTIONS™

1. All dimensions shown are nominal. Plain end weight is calculated in accordance with API TR 5C3. Performance properties are empirical, based on nominal dimensions, minimum material yield and ultimate strengths, and calculated in general accordance with industry standard formula(s) assuming uniaxial loading. All properties are calculated on the basis of materials at room temperature. NOTE: Material properties change with temperature.
2. Joint strength is the lesser of pipe thread strength and minimum coupling tension as calculated in accordance with API TR 5C3. Tensile efficiency is calculated using coupling strength based on ultimate material strength per API TR 5C3 divided by plain end yield strength of the casing. Minimum Coupling Tension based on material *yield* strength is provided *for information only*. Performance values presented for tension do not account for failure by pull-out (which can occur with heavy wall casing), effects of internal and external pressure, thermally induced axial loads, casing curvature (bending), and/or other static and dynamic loads that may occur singularly or in combination during downhole deployment and with subsequent well operations.
3. Drift diameters are based on Standard and Alternate drift sizes per API 5CT. Drift diameters are not specified for API 5L pipe. Drift diameters shown on GB Connection Performance Property Sheets represent the diameter of the drift mandrel used for end-drifting after coupling buck on. When shown, the alternate drift diameter is used for end drifting. Drift testing is performed in accordance with currently applicable API Specifications.
4. Minimum Internal Yield Pressure Performance values for Casing (API 5CT), Line Pipe (API 5L), and mill casing proprietary grades are based on API TR 5C3 formulas and assume 87.5% minimum wall thicknesses. Minimum Internal Yield Pressure efficiency for GB Connections is the lesser of the Minimum Internal Yield Pressure of the coupling and Leak Resistance divided by pipe body Minimum Internal Yield Pressure (all based on API TR 5C3 formulas). GB Connections typically demonstrate pressure resistance exceeding the mating pipe body unless otherwise noted with a pressure efficiency < 100%. Pressure efficiency can only be achieved when connections are properly assembled in strict accordance with GB Connections' Running Procedures (www.gbconnections.com/pdf/RP-GB-DWC-Connections.pdf.
5. Compression efficiency of the Casing/Connection combinations does not consider the axial load that causes pipe body buckling. The compressive load that causes buckling is usually less than the pipe body compressive yield strength and is dependent on a number of factors including, but not limited to, string length (or slenderness ratio; L/D), thermally induced axial loads, and annular clearance that may (or may not) lend side support to the casing string.
6. Bending values assume a constant radius of curvature where the casing is in uniformly intimate contact with the wall of the wellbore (i.e. when the upset at the coupling OD is small compared with wellbore wall irregularities). When the radius of curvature is not constant due to large wellbore wall irregularities, varying trajectory, micro doglegs, wash-outs, rock ledges, and other downhole conditions, unpredictable excessive bending stresses can occur that may be detrimental to casing and connection performance.
7. Fatigue failures are a function of material properties, stress range, and number of stress reversal cycles. API 5CT, API 5L, and mill proprietary casing/coupling materials have a finite fatigue life. Higher stress ranges yield lower fatigue life. So as a general rule of thumb, casing should never be rotated at higher RPMs than needed for task accomplishment. For the same stress range, casing rotated at 25 RPMs will generally last 4 times longer (more rotating hours) than casing rotated at 100 RPMs. However with fatigue, there are opportunities for unexpected higher stress reversal levels associated with vibration, thermally induced axial loads, and bending (see above) in addition to all other stress reversals imparted during running, rotating, reciprocating, pressure testing, pumping, etc. The extent and quality of the cement job is also a factor. Under aggressive, high-volume, multi-stage hydraulic fracturing operations, the casing string (including the connections) is severely taxed such that local stress range(s) and actual number of applied cycles cannot be precisely determined without full string instrumentation.
8. External pressure efficiency (expressed in percent) is the ratio of the lesser of Minimum Internal Yield Pressure and Leak Resistance for coupling (calculated per API TR 5C3) divided by the API collapse rating of the casing. External pressure efficiency has not been verified by testing and does not consider other applied loads. External pressure efficiency does not account for any high collapse rating that may be shown on GB Connection Performance Property Sheets.
9. Maximum Makeup Torque is provided for guidance only. This value is not the same as the Connection Yield Torque shown. Connection Yield Torque is the lesser of yield torque rating for the critical cross-section of pipe body, connector body, and pin nose and the threadform load flank bearing area. Connection Yield Torque does not consider radial buckling of the pipe or connection due to excessive jaw pressure during torque application. Torque in connections can increase or decrease over that applied at makeup (connection tightening/loosening) with rotating and stimulation operations due to slip-stick, shock loads, bending, tight spots, vibration(s), temperature, and other downhole factors that may occur individually or in combination. Due to circumstances beyond the control of GB Connections, User accepts all risks associated with casing and connection related issues that occur during and after rotating operations.
10. **Every** GB Connection requires the proper amount and distribution of thread compound to all pin and coupling threads and careful field make up in strict accordance with GB Connections' Running Procedures to provide expected levels of performance in service.
11. Reactions among water, drilling muds and other fluids, and chemicals introduced by User with downhole formation fluids may result in an environment detrimental to casing and connection performance. User should carefully consider all aspects of the string design including material compatibility with respect to possible corrosion, sour conditions, and other factors that may result in unexpected casing and/or connection failure at or below published ratings.
12. Performance Properties are subject to change without notice. User is advised to obtain the current GB Connection Performance Property Sheet for each application. Please visit **www.gbconnections.com** to download.

Limitations

Data presented in GB Performance Property Sheets and Running Procedures ("GB Information") is provided for informational purposes only and intended to be supplemented by the professional judgment of qualified personnel during design, field handling, deployment, and all subsequent well operations. The use of GB Information is at the User's sole risk.

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GB connections Engineering the Right Connections	**Running Procedure for Casing with GB *Drilling with Casing* Connections**	October 29, 2007
		Rev. 14 (04/09/2020)

OVERVIEW

This field running procedure applies to makeup of **GB *Drilling with Casing*** (GB DwC) Connections which include GB CD, GB CDE, GB RDB, GB EHTQ, and GB RDB WS Connections with GB Butt (Buttress), GB 4P, and GB 3P thread forms. All GBC Connections are suitable for ***Running*** (standard casing applications), ***Rotating*** (to aid string advancement), ***Drilling*** (Drilling with Casing/Drilling with Liners) and ***Driving***. This procedure also applies to the legacy GB Connections known as GB Butt and GB 3P.

Numerous factors impact the makeup torque of Buttress (GB Butt) and Modified Buttress Threads (such as GB 4P and GB 3P). Some of these factors include but are not limited to: allowable threading tolerances, joint characteristics (OD, straightness, hooked ends, and weight), vertical alignment (derrick, top drive, and elevator alignment relative to rotary table), thread compound (type, amount, and distribution), snub line (location and orientation), distance between tongs and backups, temperature/weather, equipment type, efficiencies (electrical, hydraulic and mechanical), grips/dies (type, condition, orientation, location, contact area, and grip distribution), measurement equipment, gauge calibration, personnel, etc. The nature of these types of connections makes it impossible to provide makeup torque values that will yield proper power tight makeup on every rig under all circumstances with the wide variety of existing connection makeup equipment.

This procedure has been designed to determine the ***Running Torque*** required for proper power tight makeup of GB Connections under the circumstances and with the actual equipment, set up conditions, weather, etc. that exist at the time of running. With proper execution of this procedure, GB Connections will be properly and consistently assembled.

LIMITATIONS

This GBC Running Procedure provides the basic recommended practices and is intended to be supplemented by the professional judgment of qualified personnel based on observation of actual makeups throughout the casing run. GB DwC Connections require the proper amount and distribution of thread compound to **all pin and coupling threads** and careful field makeup in strict accordance with GB Connections' Running Procedures to provide expected levels of performance in service.

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DEFINITIONS

1. Minimum Makeup (MU) Torque: Connections must have at least this amount of torque applied and clearly exhibit shoulder engagement.
2. Shoulder Torque: MU torque required to achieve shoulder engagement.
3. Running Torque: Developed at start of casing run per GBC Running Procedure and once established, used for the rest of the joints in the string, using data established with progression of the casing run. The ***Running Torque*** may be adjusted during the casing run as needed to stay within parameters defined here. The ***Running Torque*** will likely vary with each job due to the factors listed in the Overview section.
4. Delta Torque: Difference between ***Shoulder Torque*** and final makeup (or dump) torque.

5. Maximum Makeup (MU) Torque: Final assembly torque including shoulder engagement shall not exceed the ***Maximum MU Torque*** shown on size, weight, and grade-specific GB Performance Property Sheets at the beginning of a casing run when establishing the ***Running Torque***. In the unlikely event that ***Running Torque*** determined by the procedure meets or exceeds the ***Maximum MU Torque***, call GB Connections for assistance.
6. Yield Torque: Torque that causes yielding in the connection (usually yielding of the pin nose). ***Yield Torque*** rating does **NOT** consider the torque that may radially buckle the pipe body at the grip points. ***Yield Torque*** values for the pipe body and connection are based on nominal dimensions and minimum material yield strength.
7. Maximum Operating Torque: The ***Maximum Operating Torque*** shown on the GB Connections Performance Property Sheets includes a 5% safety factor on ***Yield Torque***. As such, it represents the ***limiting torque spike*** that can be applied to the connection during rotating operations. The ***Maximum Operating Torque*** is **NOT** the ***Maximum MU Torque*** and is **NOT** a sustainable rotating torque. Operating at the ***Maximum Operating Torque*** for any length of time may damage connections due to likely random, unexpected torque spikes that occur during rotating operations. USER should carefully consider this value to determine if a higher Safety Factor on ***Yield Torque*** is more suitable for the project-specific application.

   As a general rule of thumb, rotating RPMs and Torque should be *"walked up"* to determine the minimum needed for task accomplishment. Additional information on best practices for rotating casing can be found at http://www.gbconnections.com/pdf/White-Paper-Rotating-Casing.pdf.

KEY INFORMATION

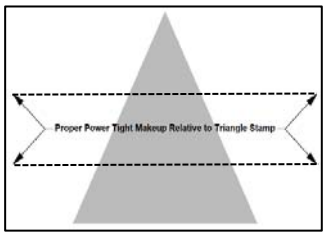
Thread Compound: Best-O-Life 2000, Best-O-Life 2000 Arctic Grade (AG), API Modified, API Modified Hi-Pressure, or any industry recognized equivalent to these products. Thread compound may also be referred to as "dope". User should avoid products that include Metal Free (MF) in the product name. Tool joint compounds are **expressly forbidden** for makeup of any GBC Connections. Thread compound shall be applied to all pin and box threads as described here.

Torque Values: ***Minimum and Maximum MU Torque*** values are provided on individual GB Connections Performance Property Sheets available at the following link: http://www.gbconnectionss.com/connection_selector.php.

Continuous Makeup: Makeup of GB Connections **SHALL START AND CONTINUE WITHOUT STOPPING** until full power tight makeup is achieved.

Makeup Speed: Use of high gear at no more than 20 RPMs is permissible once proper starting thread engagement has occurred. **THE FINAL TWO (2) TURNS, AT A MINIMUM, SHALL BE COMPLETED IN LOW GEAR AT LESS THAN 6 RPMS**.

Pin Nose Engagement: Pin nose engagement is indicated by a spike on an analog torque gauge or a sharp vertical spike on a torque vs. turn plot. As a secondary check, proper power tight makeup is achieved when the coupling covers approximately the **middle third of the API Triangle Stamp** on the pin (see graphic). The triangle will be stamped on the pin member as indicated by a white locator stripe.

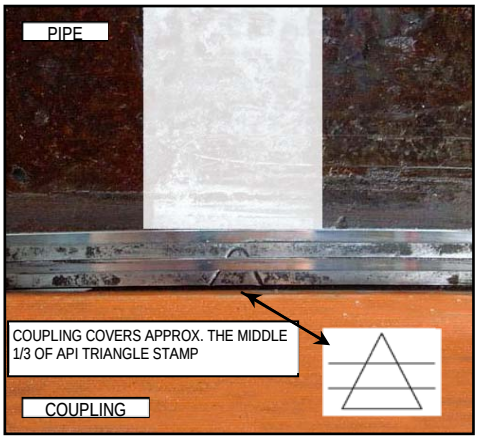


Acceptance Criteria: All GB Connections must exhibit shoulder engagement (achieve pin-to-pin or pin-to-shoulder engagement) with a: (1) ***Delta Torque*** ranging between 10% and 50% of majority of the

Shoulder Torque and (2) final torque not exceeding the ***Running Torque*** as established in this procedure. Outlier joints that require additional attention would be an exception to ***Maximum MU Torque*** limit as discussed under Comments, Troubleshooting.

It is imperative that the following procedure be executed carefully at the beginning of every casing run to determine the ***Running Torque*** (torque to be used for the rest of the string). Torque values established on an individual casing run are never transferrable to other runs.

The ***Running Torque*** is determined while running the first 10 joints after joints assembled with threadlocking compounds are made up. Sometimes more than the first 10 joints will be needed to establish the ***Running Torque*** due to erratic results and/or other run-specific conditions. The ***Running Torque*** may have to be re-established or adjusted during the casing run under certain conditions[1] and observations. Use the size-specific GBC Connections Performance Property Sheets (http://www.gbconnections.com/connection_selector.php) for physical properties for the ***Minimum*** and ***Maximum MU Torque*** values.



Connections shall be made up until shoulder engagement with ***Delta Torque*** between 10% and 50% of the ***Shoulder Torque*** (not to exceed the ***Maximum MU Torque***, see procedure below) using the ***Running Torque*** value established in this procedure. The ***Maximum MU Torque*** at the beginning of the casing run for establishing the ***Running Torque*** shall be limited to the value shown on the applicable GBC Connections Performance Property Sheet. The ***Running Torque*** shall be used thereafter and throughout the run as the limiting makeup torque value. The ***Maximum MU Torque*** on the GBC Performance Property Sheet value is given as a practical limit for avoidance of thread galling, connection damage, and possible tube damage due to excessive jaw pressure that can occur with application of extreme makeup torque. Contact GB Connections if more than the ***Maximum MU Torque*** value is required for shoulder engagement and/or final makeup, or if torque exceeding the ***Maximum Operating Torque*** value is required for the intended service.

PROCEDURE FOR ESTABLISHING ***RUNNING TORQUE***

1. Remove coupling thread protectors only after casing is set in V-Door.
2. ***Always apply fresh thread compound to coupling threads and internal shoulder (where applicable).*** See Comment No. 1 (below) for discussion on proper amount of thread compound.
3. Remove pin thread protectors only after joint is raised in the derrick. Visually inspect pin threads for sufficient thread compound as described in Comment No. 1; ***add fresh compound to pin threads and pin nose***.
4. Fresh thread compound should **NEVER** be added on top of dope contaminated with dust, dirt, and/or debris. Threads observed to have contaminated thread compound shall be thoroughly cleaned and dried before applying fresh thread compound.
5. Stab the pin carefully into the coupling of the joint hanging in the rotary table. A stabbing guide is recommended to protect the pin nose and leading thread from physical damage that may contribute to thread galling. Make up each connection until shoulder engagement plus ***Delta Torque***. Record the ***Shoulder Torque*** observed for the first 10 joints (excluding threadlocked accessory joints). The ***Running Torque*** is (a) the ***Minimum MU Torque*** shown on the GB Connections Performance Property Sheets ***or*** (b) the Maximum ***Shoulder Torque*** recorded from the first 10 makeups + 10%, ***whichever is higher*** (rounded to the next highest 500 ft-lbs.) ***Delta Torque*** should be between 10% and 50% of the ***Shoulder Torque. Running Torque*** shall not exceed the ***Maximum***

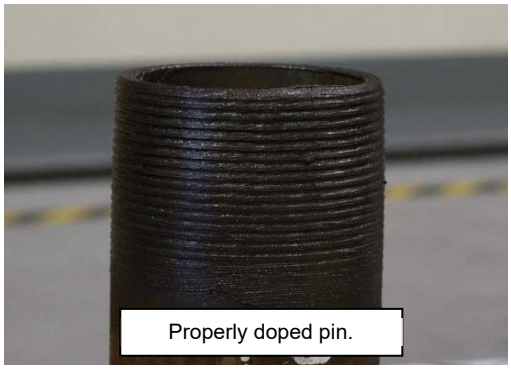
[1] Examples include but are not limited to more than an occasional low or high ***Delta Torque***, string of mixed mills, equipment change, large temperature change, and wobbling or noticeable vibration when joint is turning.

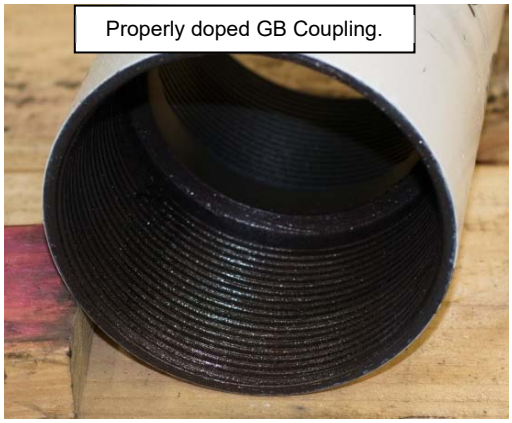
MU Torque. When making up the initial joints for establishing the ***Running Torque*** carefully watch the torque gauge for the ***Shoulder Torque*** and try to manually shut down the tongs before reaching ***Maximum MU Torque*** shown on the GB Connections Performance Property Sheets. Alternately, the dump valve should be set to 80% of the ***Maximum MU Torque*** during this initial process.

6. After the first 10 makeups (more if necessary due to conditions at the time of the run), use the ***"Running Torque"*** established in Step 5 for the remainder of the string. A dump valve is strongly recommended to stop makeup once the established ***Running Torque*** is achieved.
7. All connections made up with the established ***Running Torque*** should achieve shoulder engagement with the small amount of ***Delta Torque***. Carefully watch for the spike on the torque gauge during each make up to verify shoulder engagement. As a ***secondary*** verification, randomly check the makeup position relative to the API Triangle Stamp during the run. Proper power tight makeup position is achieved when the coupling covers the middle 1/3 of the API Triangle Stamp on the pin (see accompanying photo).
8. All connections should achieve shoulder engagement with at least 10% ***Delta Torque*** before the ***Maximum MU Torque*** is achieved.

COMMENTS, TROUBLESHOOTING

1. GB Connections are thread compound friendly. Thread compounds shall be handled, mixed, and applied in strict accordance with the manufacturer's instructions. **THREAD COMPOUND SHALL BE APPLIED TO BOTH PIN AND COUPLING THREADS AND OPPOSING PIN NOSE OR SHOULDER AREA OF EVERY CONNECTION**. Thread compound "transfer" between pin and coupling will not provide proper sealing mechanism for the connection to function properly. Sufficient thread compound has been applied when all threads (pin and coupling), pin nose, and coupling ID surfaces are completely covered **WITH NO GAPS OR BARE SPOTS**. The thread form should be discernible beneath the compound, i.e. when the thread valleys appear half full. Be generous with the thread compound; but avoid over-doping to the point where ***excessive*** amounts are squeezed out during assembly. Use of a mustache brush is the preferred method for applying and distributing thread compounds to GB Connections.


Properly doped pin.

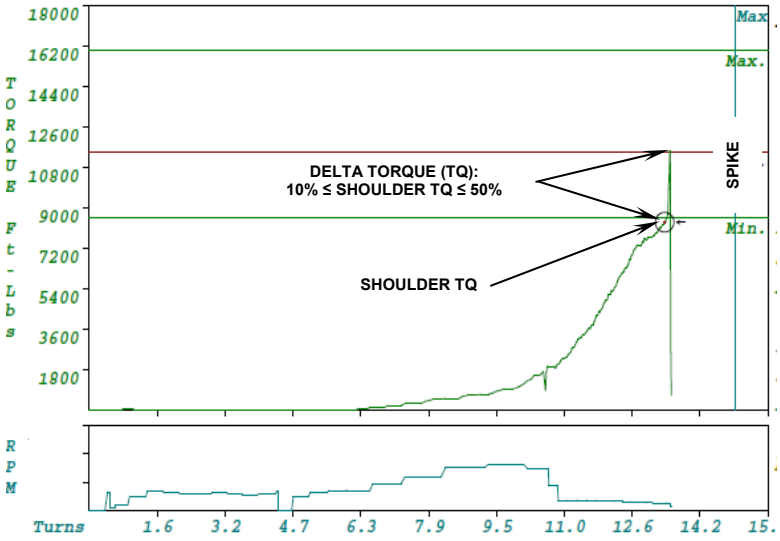

Properly doped GB Coupling.

2. If threads are cleaned on racks, new dope shall be applied in a light, even coat to both pin and coupling threads. See Comment No. 1 above for description of sufficient thread compound. Clean thread protectors shall be re-applied to freshly doped pin and coupling threads unless the casing run is imminent (no more than a few hours) to avoid contaminating exposed thread compound.
3. All connections should achieve shoulder engagement before reaching the "***Running Torque***" value determined by this procedure. Any connection that does not achieve shoulder engagement at the established "***Running Torque"*** value shall be visually inspected for position relative to the API Triangle Stamp.
   a) If the coupling is shy of the API Triangle Stamp Base, the connection shall be broken out, cleaned and inspected visually for thread damage, re-doped, and made-up again (or laid down if threads are damaged). Connections that have not achieved shoulder engagement **SHALL NEVER** be backed up a couple of turns and remade. They shall be completely broken out, cleaned and inspected as described above.

b) If the coupling covers the API Triangle base but does not land in approximately the middle third of the API Triangle Stamp, add additional torque to achieve shouldering and finish the makeup. Except to initiate additional turning, it is common to see high torque (possibly exceeding the ***Maximum MU Torque***) to initiate connection turning. This is acceptable as long as the torque drops off once movement starts and then spikes with shoulder engagement. If acceptable makeup doesn't occur with one additional torque application, the connection shall be broken out (as described in 3a above).

c) Any connection not properly assembled (i.e. not meeting the acceptance criteria) in two (2) attempts (provided threads pass a visual inspection each time) is reject and shall be laid down.

4. At the established ***Running Torque***, the connections will generally shoulder with ***Delta Torque*** between 10% and 50%. High interference connections will tend to have a higher ***Shoulder Torque*** and less ***Delta Torque*** (at least 10% of the ***Shoulder Torque*** is required). Low interference connections will tend to have lower ***Shoulder Torque*** and more ***Delta Torque***. In general, GB Connections makeup consistently but will vary due to any of the factors enumerated in the second paragraph of the Overview section of this procedure. However, wide variability on more than a few joints should be investigated for a root cause and, if necessary, a new ***Running Torque*** should be adjusted as described below.



If a connection appears to have shouldered but doesn't have at least 10% ***Delta Torque***, the position relative to the API Triangle Stamp should be checked. In just about every instance, the position will have covered the triangle base, so additional torque can be added to complete the makeup as discussed in 3.b) above. Expect an instantaneous spike with showing more than 50% ***Delta Torque*** with application of additional torque. Under this condition, this makeup is acceptable.

Similarly, random connections here and there with more than 50% ***Delta Torque*** is generally not cause for concern. However, if overshooting the 50% maximum ***Delta Torque*** target occurs frequently, then the established ***Running Torque*** value should be walked down in 500 ft-lbs. to 1,000 ft-lbs. increments until connection makeup routinely falls in line with the stated acceptance criteria.

5. ***Torque vs. Turn monitoring systems are recommended for field makeup of GB Connections.*** While Torque vs. Turn plots provide good information about makeup, they **SHALL NOT BE SUBSTITUTED FOR DIRECT VISUAL OBSERVATION OF THE CONNECTION DURING ASSEMBLY**. There is no second chance to watch field assembly of a connection. Torque vs. Turn plots can always be viewed for verification purposes once a makeup is finished. When available, torque vs. turn plots shall finish with a clearly defined spike as shown in the graphic to the right. The general character of torque vs. turn plots for good makeups will become evident after the first ten (10) makeups (again, more may be necessary due to rig and/or equipment-specific conditions). Any makeup that results in a plot that is "out-of-character"[2] when compared with most plots from previous good makeups should be checked carefully.

[2] An "out-of-character" plot may initiate with a high torque, show significantly steeper slope from the start of makeup, wide torque undulations as makeup progresses, no clearly defined spike, insufficient/inconsistent turns, etc.

When using Torque vs. Turn monitoring equipment, GB recommends setting a reference torque value of 500 ft-lbs. or 10% of the minimum makeup torque (whichever is lower) to help normalize the turns-to-power-tight variability in the Tq-Tn graphs. Setting a reference torque reduces field stab variability resulting in more consistency in the Tq-Tn data. Plot scales should be set so data spans at least 2/3 of the turns scale on each plot (15 turns will usually be sufficient at the start and can be reduced based on data from the first few joints). **UNDER NO CIRCUMSTANCE SHOULD MAKEUP BE STARTED UNTIL THE MONITORING SYSTEM IS READY TO RECORD DATA**.

6. Occasionally the mill side of a GB Connection may turn during field makeup. When observed, the makeup should continue without stopping per this procedure. It may be helpful to scribe a vertical line across the coupling-pipe interface to aid estimation of mill side turning if it is observed with some frequency. The amount of mill side turn should be carefully observed and estimated. If the mill side turns less than ½ turn and all other aspects of the makeup are good, the connection is acceptable. If the mill side turns more than ½ turn, trouble- shooting should be initiated. Pay particular attention to amount and distribution of thread compound, vertical alignment, weight of joint, hooked end on pipe, and other possible factors that may contribute to possible high torque during field makeup. Counting turns can help to estimate if coupling will need to be stopped to avoid over rotation. It should be noted that mill side turning during field makeup occurs occasionally and should not be concerning. Frequent or persistent mill side turning is a symptom that needs troubleshooting and appropriate corrective action.
7. A double wrap of the pick-up sling should be used when raising casing into the derrick when lifting subs, single joint, side-door, or slip elevators are not being used.
8. Higher torque may be required to achieve shoulder engagement when threadlock compounds are applied. User is advised to carefully follow the manufacturer's instructions with respect to mixing, application, temperature, and time. Torque ranges with threadlock compounds cannot be estimated due to many variables including but not limited to temperature, time, connection tolerances, and surface finish. In these cases, carefully monitor makeup to be sure shouldering occurs. The only exception to the shouldering requirement is with float equipment (float shoe and float collar) that will be assembled with a threadlocking compound. In this case, makeup to a position that covers the base of API Triangle Stamp is considered satisfactory.
9. Manual and automated dump valves can overshoot the established ***Running Torque*** due to several factors. Slightly overshooting the ***Running Torque*** is not cause for concern as long as the final "dump" torque is not excessive, and the equipment used is generally consistent joint-to-joint. Overshooting the ***Running Torque*** with a final makeup speed greater than 10 RPMs is risky and potentially harmful to the connection as discussed below.
10. Attached is a "Worksheet for determining GB Connections ***Running Torque*** at the beginning of a Casing Run" for use at the start of any casing run using GB Connections. GB recommends that this worksheet be filled out and maintained with the casing run records.

MAKEUP SPEED

To reiterate: Use of high gear at no more than 20 RPMs is permissible once proper starting thread engagement has occurred. **THE FINAL TWO (2) FULL TURNS, AT A MINIMUM, SHALL BE COMPLETED IN LOW GEAR AT LESS THAN 6 RPMS**. Be sure that the final 2 turns occur after the tong speed has slowed completely to less than 6 RPMs.

Making up connections at RPM exceeding those listed above may result in unsatisfactory connection performance downhole. Risks associated with excessive makeup RPMs are common for any connection with internal pin nose engagement. High speed makeup can:

1. Impart an unnecessary impulse load at nose contact. Certain materials are more susceptible to cracking under sudden or instantaneously applied loads.
2. Inhibit efficient movement of and trap thread compound under high pressure causing additional and unquantifiable high hoop stresses in the connection.

3. Result in significant overshoot of established dump torque value due to equipment latency between signal and equipment shut down resulting in higher but unknown actual final torque value. Excessive overshoot can result in pin nose yielding.

PROCEDURE SUMMARY

1. Remove coupling protectors after casing is set in V-Door and apply fresh thread compound to coupling threads.
2. Raise joint in derrick, remove pin protectors, and apply fresh thread compound to pin threads and pin nose.
3. Carefully stab pin into coupling and makeup to pin nose engagement. Try to stop makeup without exceeding the ***Maximum MU Torque*** (shown on GB Connections Performance Property Sheets). Carefully watch for and note the ***Shoulder Torque***.
4. Record ***Shoulder Torque*** and Final Torque values, and position relative to API Triangle Stamp for first ten (10) connections, more if necessary due to run/rig-specific conditions.
5. The ***Running Torque*** is (a) the ***Minimum MU Torque*** shown on the GB Connections Performance Property Sheet or (b) the maximum torque required for shoulder engagement + 10% ***Delta Torque*** determined from the first 10 makeups, ***whichever is higher***. Use the attached Worksheet to record this data and determine the ***Running Torque***.
6. Make up the rest of the string at the ***Running Torque*** determined in the previous step verifying each connection has shouldered with between 10% and 50% ***Delta Torque***. Small incremental adjustments to the established Running Torque (500 to 1,000 ft-lbs) are advised if delta torques routinely fall short of the 10% requirement or routinely exceed the 50% requirement.

NOTES:

- *This summary is provided for quick reference and is not a substitute for the comprehensive procedure provided above.*
- *Does not apply to threadlock connections.*

DO's and DONT's

1. **DO** check vertical alignment.
2. **DO** apply thread compound to all pin and coupling threads, pin nose and coupling shoulder area.
3. **DO** establish the ***Running Torque*** in accordance with GB Procedures.
4. **DO** make adjustments to ***Running Torque*** if indicated by inconsistent makeups during the casing run.
5. **DO** check every makeup for a clear indication of shouldering with a minimum ***Delta Torque*** ≥ 10% of the ***Shoulder Torque***.
6. **DO** reject any coupling that is not properly made up after two (2) attempts.
7. **DO** carefully stab pins into coupling (use a stabbing guide for casing smaller than 9 5/8" OD).
8. **DO** finish the makeup with at least two (2) full turns in low gear at 6 RPMs or less.
9. **DO** make up every connection continuously to pin nose engagement without stopping.

10. **DO** make note of anything that occurs with any connection makeup such as backup grips slipped, connection inspected and remade, etc.
11. **Do** check out every connection that appears out of character relative to the population. An example would be a connection that is completed with significantly fewer turns than most others. Check the triangle stamp and record position and take corrective action if needed.
12. **DO** add torque to any connection that appears to achieve pin nose engagement but not 10% delta torque.
13. **DO** adjust the ***Running Torque*** up or down in increments to achieve consistent ***Delta Torque*** between 10% and 50%.
14. **Do** make note of any anomaly during any connection makeup, such as backups slipped, mill side turned, etc.
15. **DO** minimize the weight on the connection, i.e. weight neutral, during break out as much as possible to minimize thread galling.
16. **DO NOT** over dope.
17. **DO NOT** exceed the ***Maximum MU Torque*** as shown on the GB Connections Performance Property Sheets during assembly.
18. **DO NOT** make up any misaligned connection.
19. **DO NOT** exceed 20 RPMs in high gear and 6 RPMs in low gear for the final two (2) full turns.
20. **DO NOT** remove pin thread protectors until pipe is hanging in the derrick.
21. **DO NOT** ever back a connection up a couple of turns and remake. Any connection requiring this type of attention **SHALL** be broken out completely, cleaned, visually inspected, and if OK, re-doped and remade.
22. **DO NOT** hesitate to contact GB Connections with questions before and during any casing run.

RECOMMENDED EQUIPMENT

- Stabbing Guide
- Mustache Brush
- Torque vs. Turn Monitoring Equipment or Dump Valve

Worksheet for determining GB Connection Running Torque at the beginning of a Casing Run

Ignore joints that are assembled with threadlock compounds. See "Addendum Procedure for GB Connections Assembled with Threadlocking Compounds" available at www.gbconnections.com.

Pertinent Excerpt from GB Running Procedure

5. Stab the pin carefully into the coupling of the joint hanging in the rotary table. A stabbing guide is recommended to protect the pin nose and leading thread from physical damage that may contribute to thread galling. Make up each connection until shoulder engagement plus Delta Torque. Record the Shoulder Torque observed for the first 10 joints (excluding threadlocked accessory joints). The Running Torque is (a) the Minimum MU Torque shown on the GB Connections Performance Property Sheets or (b) the Maximum Shoulder Torque recorded from the first 10 makeups + 10%, whichever is higher (rounded to the next highest 500 ft-lbs.) Delta Torque should be between 10% and 50% of the Shoulder Torque. Running Torque shall not exceed the Maximum MU Torque. When making up the initial joints for establishing the Running Torque carefully watch the torque gauge for the Shoulder Torque and try to manually shut down the tongs before reaching Maximum MU Torque shown on the GB Connections Performance Property Sheets. Alternately, the dump valve should be set to **80% of the Maximum MU Torque** during this initial process.

6. After the first 10 makeups (more if necessary due to conditions at the time of the run), use the "Running Torque" established in Step 5 for the remainder of the string. A dump valve is strongly recommended to stop makeup once the established Running Torque is achieved.

Casing Data		Comment
OD (in)		See GBC Performance Property Sheet
Weight (ppf)		See GBC Performance Property Sheet
Grade		See GBC Performance Property Sheet
Min MU Torque (ft-lbs)		See GBC Performance Property Sheet
Max MU Torque (ft-lbs)		See GBC Performance Property Sheet
Max Operating Torque (ft-lbs)		The Maximum Operating Torque is **NOT** the Maximum Makeup Torque and is **NOT** a sustainable rotating torque. Operating at the Maximum Operating Torque for any length of time will likely damage the connection.

Notes	Joint No.	Shoulder Torque (ft-lbs)	Final Torque (ft-lbs)	Triangle Stamp Position Sketch (△)
Required	1			
Required	2			
Required	3			
Required	4			
Required	5			
Required	6			
Required	7			
Required	8			
Required	9			
Required	10			
Optional	11			
Optional	12			
Optional	13			
Optional	14			
Optional	15			
Max. Shoulder Torque				
A Max. Shoulder Torque + 10%				
B Min. Makeup Torque (from GB Conn. Data Sheet)				
Running Torque (ft-lbs)		-	**A** or **B**, whichever is **greater**.	

Optional joints should be added if there is wide variability in shoulder torques recorded during the initial 10 joints. Judgement should be used to determine if more than 10 joints are needed for the purpose of establishing the Running Torque and, if so, how many more should be added.

Wide variations in Shoulder Torque during the first ten (10) joints suggest other issues requiring attention such as poor alignment, improper amount and distribution of thread compound, etc. Refer to 2nd paragraph of GB Running Procedure for possible contributing factors to aid troubleshooting.

GB Connections
950 Threadneedle, Suite 130
Houston TX 77079
Toll Free: 1-888-245-3848
Main: 713-465-3585
Fax: 713-984-1529

For Techincal Information, contact:
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TECHNICAL DATA SHEET

Connection: **VAroughneckAC**
Size: **5 1/2 in X 20.00 lb/ft**
Drift: **standard**
Bevel: **standard**

Grade: **VA-HC-P110-RY**

Material:	US Customary	Metric
Yield Strength Min.	110,000 psi	758 Mpa
Yield Strength Max.	125,000 psi	862 Mpa
Tensile Strength Min.	125,000 psi	862 Mpa

Pipe:

	US Customary	Metric		US Customary	Metric
Nominal OD:	5.500 in	139.70 mm	Wall Thickness:	0.361 in	9.17 mm
Nominal ID:	4.778 in	121.36 mm	Standard Drift:	4.653 in	118.19 mm
Nominal Weight:	20.00 lb/ft	29.76 kg/m	Pipe Body Yield Strength:	641 klb	2,850 kN
Pipe Cross Section:	5.828 in²	3,760.36 mm²			

Connection:

	US Customary	Metric		
OD:	6.300 in	160.02 mm	Threads per inch:	5 Threads
ID:	4.764 in	121.00 mm		
Length:	8.976 in	228.00 mm		

Connection Performance (Uniaxial Load):

	US Customary	Metric		US Customary	Metric
Joint Strength:	641 klb	2,850 kN	Tension Efficiency:	> 100.0 %	
Collapse Resistance:.	13,300 psi	91.70 Mpa	Displacement:	1.242 gal/ft	15.43 l/m
Internal Yield Pressure:	12,640 psi	87.10 Mpa	Production:	0.932 gal/ft	11.57 l/m
Load on Coupling Face:	624 klb	2,783 kN			

Field Make Up (Friction Factor = 1.0):

	US Customary	Metric		US Customary	Metric
Minimum Torque:	14,814 ft.lb	20,085 Nm	Make-Up Loss:	4.370 in	111.00 mm
Optimum Torque:	16,460 ft.lb	22,316 Nm	Yield Torque:	20,600 ft.lb	27,900 Nm
Maximum Torque:	18,106 ft.lb	24,548 Nm			
Min. Torque on Shoulder:	%				

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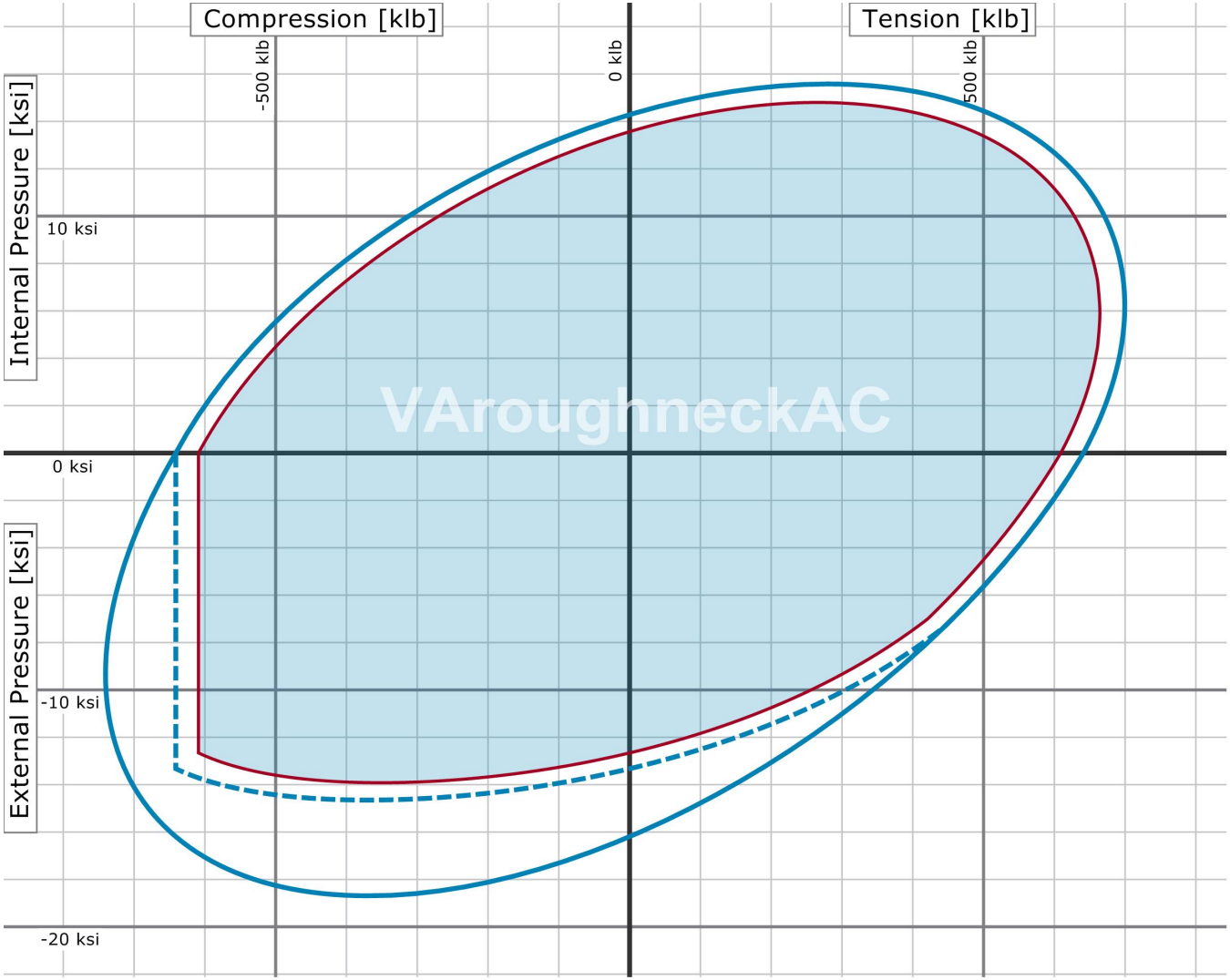
ONE STEP AHEAD.

LOAD ENVELOPE



Recommended Field of Application

Pipe Body Envelope

Pipe Body Collapse

Efficiency (% Pipe Body) under Uniaxial Loads	
Tension:	100.0 %
Compression:	100.0 %
Internal Pressure:	100.0 %
External Pressure:	100.0 %

Sealability Rating (% Efficiency) under Combined Loads	
Tension:	100.0 %
Compression:	100.0 %
Internal Pressure:	100.0 %
External Pressure:	100.0 %

Test Conditions	
Test Medium:	Fluid
Von Mises Envelope:	95.0 %
Bending:	20.00 °/100ft

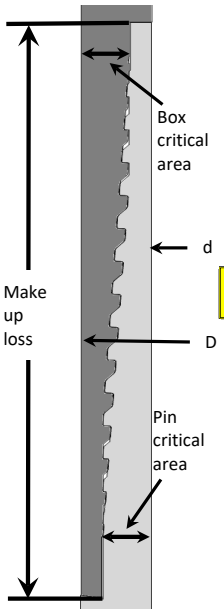
The graph is calculated under consideration of the requirements of EN ISO 13679 and API 5C3. The combined loads are calculated without the consideration of wall thickness tolerances and differ from the values in the data sheet, which are calculated with tolerances determined by API. Any printout is NOT SUBJECT TO REGULAR REVISION. The generated performance envelope shall solely be used as a tool to facilitate the comparison of performance properties under combined loads, of different grades, sizes and connections of voestalpine Tubulars products. Field-specific safety/design factors as well as other loads are not considered. Thus the results shall by no means be used to replace the own string design engineering or to justify any warranty/guaranty cases.

voestalpine
ONE STEP AHEAD.

Metal One Corp.	MO-FXL	CDS#	MO-FXL 8-5/8 32.0
Metal One	Pipe Body: BMP L80 EHC MinYS 82.5ksi *1		L80EHC
	Connection Data Sheet		MinYS82.5ksi
		Date	4-Feb-22

Geometry

MO-FXL



Pipe Body

	Imperial		S.I.	
Grade *1	L80 EHC		L80 EHC	
Min YS *1	82.5	ksi	125	ksi
Pipe OD (D)	8 5/8	in	219.08	mm
Weight	32.00	lb/ft	47.68	kg/m
Actual weight	31.10		46.34	kg/m
Wall Thickness (t)	0.352	in	8.94	mm
Pipe ID (d)	7.921	in	201.19	mm
Pipe body cross section	9.144	in^2	5,899	mm^2
Drift Dia.	7.796	in	198.02	mm
-	-	-	-	-

Connection

Box OD (W)	8.625	in	219.08	mm
PIN ID	7.921	in	201.19	mm
Make up Loss	3.847	in	97.71	mm
Box Critical Area	5.853	in^2	3686	mm^2
Joint load efficiency	69	%	69	%
Thread Taper	1 / 10 (1.2" per ft)			
Number of Threads	5 TPI			

Performance

Performance Properties for Pipe Body

S.M.Y.S. *1	754	kips	3,355	kN
M.I.Y.P. *1	5,890	psi	40.62	MPa
Collapse Strength *1	4,100	psi	28.28	MPa

Note S.M.Y.S.= Specified Minimum YIELD Strength of Pipe body
M.I.Y.P. = Minimum Internal Yield Pressure of Pipe body

*1: BMP L80 EHC grade (Min YS= 82.5ksi), Collapse Strength 4,100psi

Performance Properties for Connection

Tensile Yield load	521 kips (69% of S.M.Y.S.)
Min. Compression Yield	521 kips (69% of S.M.Y.S.)
Internal Pressure	4,120 psi (70% of M.I.Y.P.)
External Pressure	100% of Collapse Strength
Max. DLS (deg. /100ft)	19

Recommended Torque

Min.	10,000	ft-lb	13,500	N-m
Opti.	11,100	ft-lb	15,000	N-m
Max.	12,200	ft-lb	16,500	N-m
Operational Max.	20,300	ft-lb	27,500	N-m

Note : Operational Max. torque can be applied for high torque application

Earthstone Operating, LLC - English Buffalo 26 35 Fed Com 111H

1. Geologic Formations

TVD of target	9,087' EOL	KOP	8,380'
MD at TD:	19,188'	Deepest expected fresh water:	220'

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	1555	Water	
Salado	1817	Salt	
7 Rivers	3601	Salt	
Queen	4268	Salt Water	
Cherry Canyon	5543	Salt Water	
Brushy Canyon	6053	Oil/Gas	
Top BSPG Lime	7423	Oil/Gas	
1st BSPG Ss	8700	Target Oil/Gas	

2. Casing Program

Hole Size (in)	Casing Interval From	Casing Interval To	Csg. Size (in)	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Body Tension	SF Joint Tension
14.5	0	1580	10.75	45.5	J 55	BTC	2.89	2.11	9.95	11.07
9.875	0	5618	8.625	32	L80 EHC	MO-FXL	1.39	1.52	4.19	2.90
7.875	0	19,188	5.5	20	P110-RY	VARN	2.72	3.53	3.00	3.13
				BLM Minimum Safety Factor			1.125	1	1.6 Dry 1.8 Wet	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing.to mitigate collapse. Intermediate burst based on 0.7 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.
All casing strings will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.h

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	Y or N
Is casing new? If used, attach certification as required in Onshore Order #1	Y
Does casing meet API specifications? If no, attach casing specification sheet.	Y
Is premium or uncommon casing planned? If yes attach casing specification sheet.	N
Does the above casing design meet or exceed BLM's minimum standards? If not provide justification (loading assumptions, casing design criteria).	Y
Will the intermediate pipe be kept at a minimum 1/3 fluid filled to avoid approaching the collapse pressure rating of the casing?	Y
Is well located within Capitan Reef?	N
If yes, does production casing cement tie back a minimum of 50' above the Reef?	
Is well within the designated 4 string boundary?	
Is well located in SOPA but not in R-111-P?	N
If yes, are the first 2 strings cemented to surface and 3rd string cement tied back 500' into previous casing?	
Is well located in R-111-P and SOPA?	N
If yes, are the first three strings cemented to surface?	
Is 2nd string set 100' to 600' below the base of salt?	
Is well located in high Cave/Karst?	N
If yes, are there two strings cemented to surface?	
(For 2 string wells) If yes, is there a contingency casing if lost circulation occurs?	
Is well located in critical Cave/Karst?	N
If yes, are there three strings cemented to surface?	

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3. Cementing Program

Casing	# Sks	Wt. lb/ gal	Yld ft3/ sack	H_20 gal/sk	500# Comp. Strength (hours)	Slurry Description
Surf.	530	13.5	1.75	9	12	Lead: Class C + 4% Gel + 1% CaCl2
	290	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl2
Inter.	400	11.5	2.3	9.6	16	Lead: 35:65:6 C Blend
	80	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl
5.5 Prod	210	11.3	3.05	19	72	Lead: 50:50:10 H Blend
	1760	13.5	1.27	5.7	19	Tail: 50:50:2 Class H Blend

Volumes Subject to Observed Hole Conditions and/or Fluid Caliper Results
Lab reports with the 500 psi compressive strength time for the cement will be onsite for review.

Casing String	TOC Lead	TOC Tail	% Excess
Surface	0’	1,080	50%
1st Intermediate	0’	5,118	50%
Production	5,118'	7,880	25% OH in Lateral (KOP to EOL) – 40% OH in Vertical

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4. Pressure Control Equipment

N	A variance is requested for the use of a diverter on the surface casing. See attached for schematic.

BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	x	Tested to:
9-7/8”	13-5/8”	2M	Annular	x	2000 psi
			Blind Ram		2M
			Pipe Ram		
			Double Ram		
			Other*		
7-7/8”	13-5/8”	3M	Annular	x	50% testing pressure
			Blind Ram	x	3M
			Pipe Ram	x	
			Double Ram		
			Other*		

BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all the components installed will be functional and tested.

Pipe rams will be operationally checked each 24 hour period. Blind rams will be operationally checked on each trip out of the hole. These checks will be noted on the daily tour sheets. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold. See attached schematics.

X	Formation integrity test will be performed per Onshore Order #2. On Exploratory wells or 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. Will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.i.
Y	A variance is requested for the use of a flexible choke line from the BOP to Choke Manifold. See attached for specs and hydrostatic test chart.
	N Are anchors required by manufacturer?
N	A multibowl wellhead is being used. The BOP will be tested per Onshore Order #2 after installation on the surface casing which will cover testing requirements for a maximum of 30 days. If any seal subject to test pressure is broken the system must be tested.

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5. Mud Program

Depth		Type	Weight (ppg)	Viscosity	Water Loss
From	To				
0	Surf. Shoe	FW Gel	8.6 - 8.8	28-34	N/C
Surf csg	8-5/8" Int shoe	Saturated Brine	10 - 10.1	28-34	N/C
8-5/8" Int shoe	Lateral TD	OBM	8.8 - 9.5	28-34	N/C

Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times.

What will be used to monitor the loss or gain of fluid?	PVT/Pason/Visual Monitoring

6. Logging and Testing Procedures

Logging, Coring and Testing.	
Y	Will run GR/CNL from TD to surface (horizontal well – vertical portion of hole). Stated logs run will be in the Completion Report and submitted to the BLM.
Y	No Logs are planned based on well control or offset log information.
N	Drill stem test? If yes, explain.
N	Coring? If yes, explain.

Additional logs planned		Interval
N	Resistivity	Pilot Hole TD to ICP
N	Density	Pilot Hole TD to ICP
Y	CBL	Production casing (If cement not circulated to surface)
Y	Mud log	Intermediate shoe to TD
N	PEX	

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7. Drilling Conditions

Condition	Specify what type and where?
BH Pressure at deepest TVD	4490 psi at 9087’ TVD
Abnormal Temperature	NO 150 Deg. F.

No abnormal pressure or temperature conditions are anticipated. Sufficient mud materials to maintain mud properties and weight increase requirements will be kept on location at all times.

Sufficient supplies of Paper/LCM for periodic sweeps to control seepage and losses will be maintained on location.

Hydrogen Sulfide (H2S) monitors will be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the operator will comply with the provisions of Onshore Oil and Gas Order #6. If Hydrogen Sulfide is encountered, measured values and formations will be provided to the BLM.	
N	H2S is present
Y	H2S Plan attached

8. Other Facets of Operation

N	Is it a walking operation?
Y	Is casing pre-set?

x	H2S Plan.
x	BOP & Choke Schematics.
x	Directional Plan

Cactus Wellhead

Installation Procedure Prepared For:

Chisholm Energy

13-3/8” x 9-5/8” x 5-1/2” 5/10M MBU-3T Wellhead System With CTH-HPS-F MOD Tubing Head

Publication # IP0571

May, 2017

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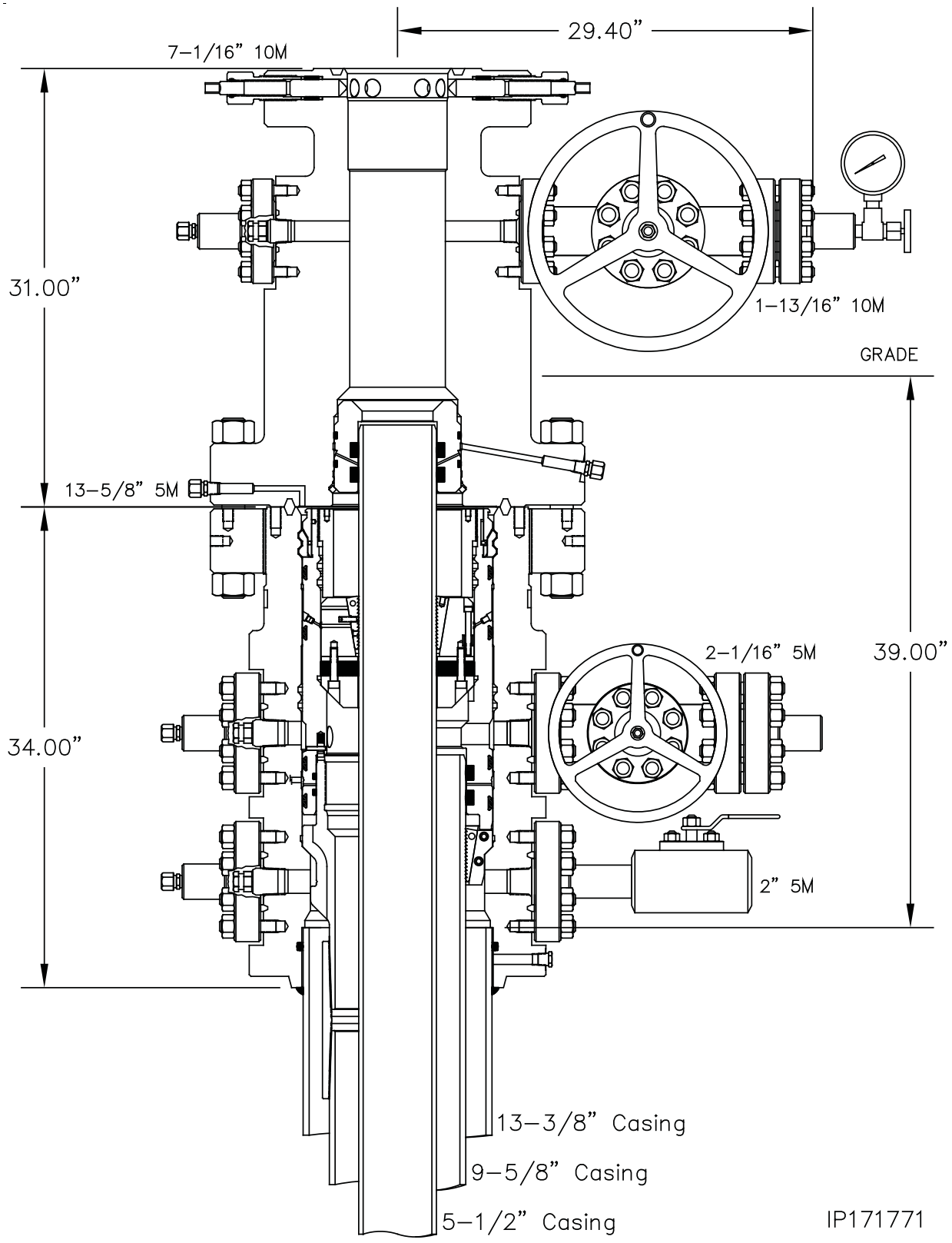
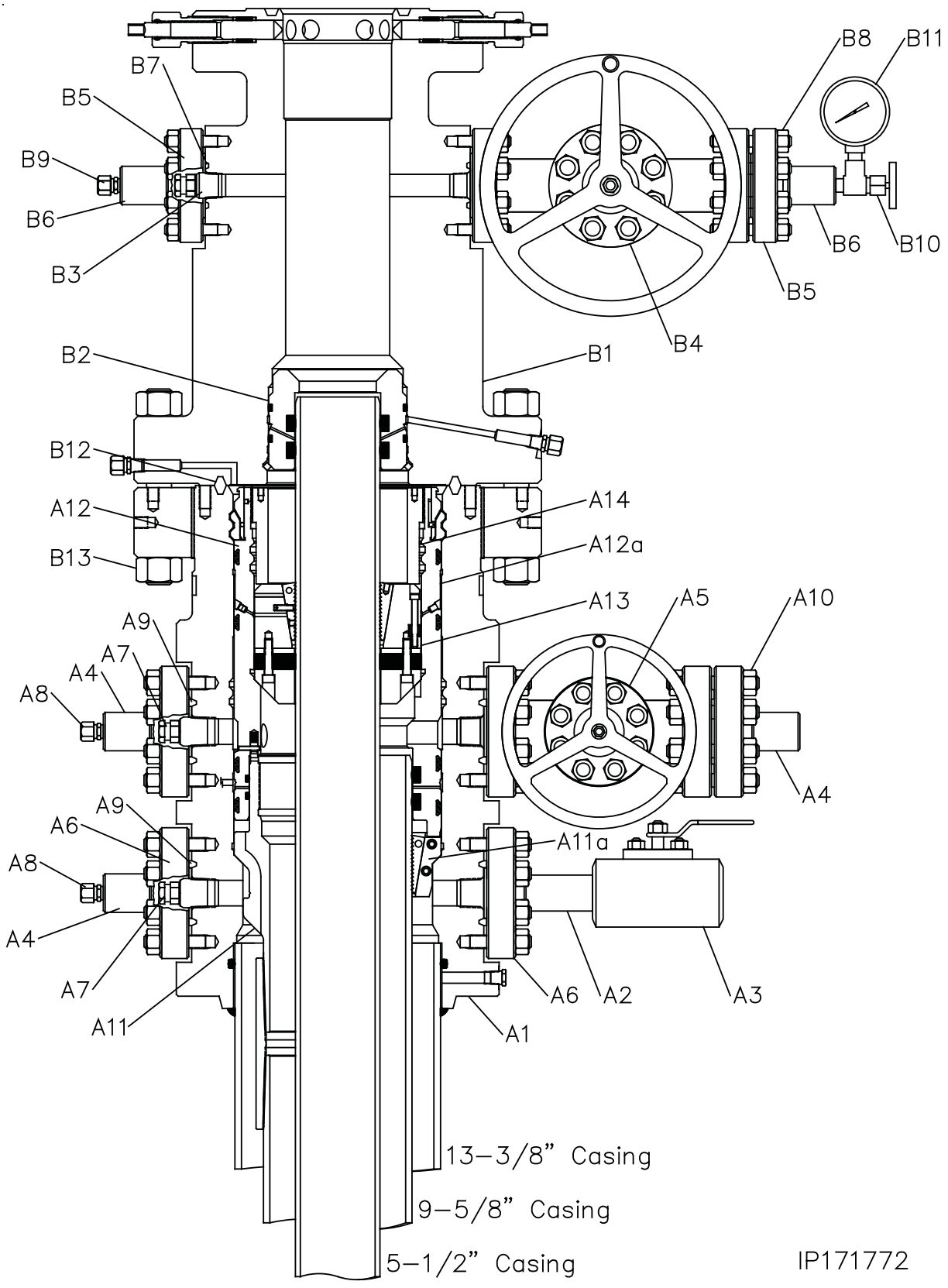
System Drawing



Bill of Materials



MBU-3T HOUSING ASSEMBLY

Item	Qty	Description
A1	1	Housing, CW, MBU-3T, 13.5/8" 5M x 13-3/8" SOW, with two 2-1/16" 5M studded upper and lower outlets with o-ring, 6A-PU-AA-1-2 Part # 117620
A2	1	Nipple, 2" line pipe x 6" long Part # NP6A
A3	1	Ball Valve, TV, 2" RP, 5M x 2" LP, WCB body SS trim, Delrin seats, HNBR seals, nace with locking handle Part # 115184
A4	3	Bull Plug, 2" line pipe x 1/2" line pipe, 4130 60K Part # BP2T
A5	1	Gate valve, CW1, 2-1/16" 3/5M, flanged end, handwheel operated, AA/DD-NL trim, (6A-LU-AA/DD-NL-1-2) Part # 610003
A6	4	Companion Flange, 2-1/16" 5M x 2" line pipe, 4130 CMS-102, CMS-002 Part # 200002
A7	2	VR Plug, 1-1/2" Sharp Vee x 1-1/4" hex Part # VR2
A8	2	Fitting, grease, vented cap, 1/2" NPT alloy non-nace Part # FTG1
A9	5	Ring Gasket, R-24, 2-1/16" 3/5M Part # R24
A10	8	Studs, all thread with two nuts, black, 7/8" x 6-1/2" long, B7/2H Part # 780067

MBU-3T HOUSING ASSEMBLY

Item	Qty	Description
A11	1	Casing Hanger, CW, MBU--3T-LWR-TP, fluted, 13-5/8" x 9-5/8" (40#) LC bottom x 10.250" 4 Stub Acme 2G RH box top, with 11-1/2" OD neck, 6A-U-AA-1-2 Part # 120251
A12	1	Packoff, CW, MBU-3T, Mandrel, 13-5/8" nested x 11" with 11.250" 4 Stub Acme 2G LH box top, 1/8" NPT test ports, 6A-U-AA-1-1 Part # 117152
A13	1	Casing Hanger, C2, 11" x 5-1/2" Part # 108067
A14	1	Hold Down Ring, for C2 hanger, 11" x 7 through 4-1/2", arranged for packoff MBU-3T, 13-5/8" with 11.250" 4 Stub Acme 2G LH pin x 9.06" ID x 6.25" long, with 2.12" thread length, 4140 110K Part # 117418

TUBING HEAD ASSEMBLY

Item	Qty	Description
B1	1	Tubing Head, CW, CTH-HPS-F, 9" (MOD), 13-5/8" 5M x 7-1/16" 10M, with two 1-13/16" 10M studded outlets, round bar, 17-4PH lockscrews, 6A-PU-EE-0,5-2-1 Part #
B2	1	Secondary Seal, CW, HPS-F, 9 MOD x 5-1/2", 6A-PU-DD-NL-1-2 Part # 110503
B3	1	VR Plug, 1-1/4" Sharp Vee x 1-1/4" hex Part # VR1
B4	1	Gate valve, AOZE, 1-13/16" 10M, flanged end, handwheel operated, EE-0,5 trim, (6A-LU-EE-0,5-3-1) Part # 103188
B5	2	Companion Flange, 1-13/16" 10M x 2" LP, 5000 psi max WP, 6A-KU-EE-NL-1 Part # 200010
B6	2	Bull Plug, 2" line pipe x 1/2" line pipe, 4130 60K Part # BP2T
B7	3	Ring Gasket, BX151, 1-13/16" 10M Part # BX-151
B8	8	Studs, all thread with two nuts, black, 3/4" x 5-1/2" long, B7/2H Part # 780080
B9	1	Fitting, grease, vented cap, 1/2" NPT alloy non-nace Part # FTG1
B10	1	Needle Valve, MFA, 1/2" NPT 10M service Part # NVA
B11	1	Pressure Gauge, 5M, 4-1/2" face, liquid filled, 1/2" NPT PG5M
B12	1	Ring Gasket, BX-160, 13-5/8" 15M Part # BX-160
B13	16	Studs, all thread with two nuts, black, 1-5/8" x 12-3/4" long, B7/2H Part # 780087

RECOMMENDED SERVICE TOOLS

Item	Qty	Description
ST1	1	Test Plug/Retrieving Tool, CW, 13-5/8" x 4-1/2" IF (NC-50), 1-1/4" LP bypass and spring loaded lift dogs Part # 104467
ST2	1	Wear Bushing, CW, MBU-3T-LWR, 13-5/8" x 12.31" ID x 27.0" long with 3/8" o-ring Part # 116974
ST3	1	Casing Hanger Running Tool, CW, MBU-3T-LR-TP, 13-5/8" x 9-5/8" LC box top x 10.250" 4 Stub Acme 2G RH pin bottom, max load capacity 1000K, max torque 18000 ft-lbs. spec for rotating casing Part # 105845
ST4	1	Torque Collar, CW, for use with running tool, TP, 10.250 4 stub Acme 2G RH pin bottom and arranged for 11.50" OD x 5.00" long box hanger neck, maximum torque 18,000 ft-lbs Part # 118906
ST5	1	Wash Tool, CW, Casing Hanger, MBU-LR/MBS2, fluted, 13-5/8" x 4-1/2" IF (NC-50) box top threads, with brushes Part # 106277
ST6	1	Packoff Running Tool, CW, MBU-3T UPR, 13-5/8" nested, with 11.250" 4 Stub Acme 2G LH pin bottom x 4-1/2" IF (NC-50) box top with seal sleeve Part # 117310
ST7	1	Test Plug, CW, MBU-2LR Inner, 11" x 4-1/2" IF, 1-1/4" LP bypass Part # 108848
ST8	1	Wear Bushing, MBU-3T-UPR, nested, 13-5/8" x 11" x 9.00" I.D. x 20.0" long, arranged for 13-5/8" tool Part # 117158

RENTAL EQUIPMENT

Item	Qty	Description
R1	1	Threaded Hub, CW, MBU-3T, 13-5/8" 5M With 19.000" 2 Stub Acme-2G Left Hand Box Thread Part # 117268
R2	1	Drilling Adapter, CW, MBU-3T, 13-5/8" 5M Quick Connect Bottom x 13-5/8" 5M Studded Top, Temp Rating PU Part # 117278
R3	1	TA Cap, CW, MBU-3T-HPS, 13-5/8" 5M quick connect, with one 2" LPO & 1/2" NPT port, with 1/2" NPT needle valve and 2" LP nipple and valve, 6A-U-AA-1-1 Part # 117317
	1	Secondary Seal Bushing, CW, HPS, 9" x 5-1/2 Part # 109026
R4	4	Lift Eyes, 3/4", side pull hoist ring Part # 115542

EMERGENCY EQUIPMENT

Item	Qty	Description
A11a	1	Casing Hanger, CW, MBU-3T, 13-5/8" x 9-5/8" 6A-PU-DD-3-1 Part # 116998
A12a	1	Packoff, CW, MBU-3T, Emergency, 13-5/8" nested x 11" with 11.250" 4 Stub Acme 2G LH box top, 1/8" NPT test ports, 6A-U-AA-1-1 Part # 117184

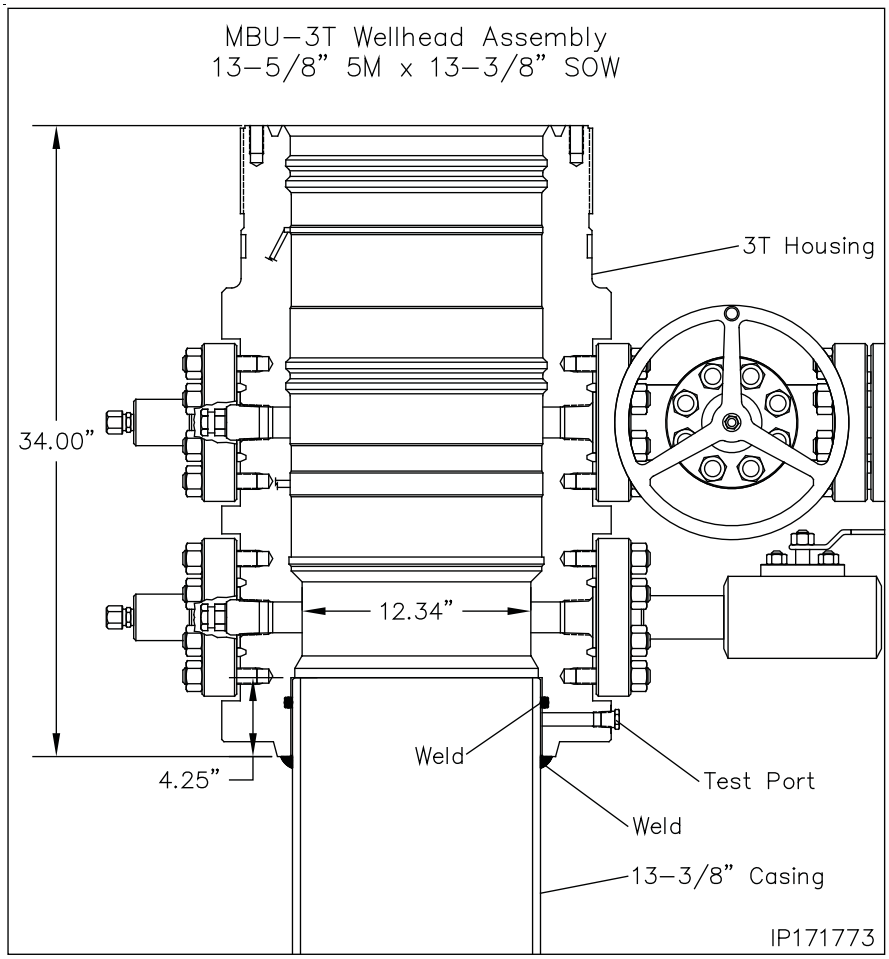
Stage 1 — Install the MBU-3T Housing

1. Run the conductor and 13-3/8" surface casing to the required depth and cement as required.
2. Cut the conductor pipe off level with the cellar floor.
3. Final cut the 13-3/8" surface casing at 39.00" below ground level (grade). Ensure the cut is level and square with the horizon.
4. Place an 3/16" x 3/8" bevel on the OD of the stub.

Note: The slip on and weld preparation is 4.25" in depth.

5. Examine the ***13-5/8" 5M x 13-3/8" SOW x 19.00" 2 Stub Acme LH (Left Hand Thread) MBU-3T Wellhead Housing (Item A1).*** Verify the following:
   - internal bore is clean and in good condition
   - external Acme thread is clean and in good condition
   - thread flange is in place and rotates freely

   valves are intact and in good condition
   - weld socket is clean and free of grease and debris and o-ring is in place and in good condition
6. Align and level the Wellhead Assembly over the casing stub, orienting the outlets so they will be compatible with the drilling equipment.
7. Remove the pipe plug from the port on the bottom of the Head.
8. Slowly and carefully lower the assembly over the casing stub, weld and test the MBU-3T wellhead to the surface casing.
9. Replace the pipe plug in the port on the bottom of the wellhead.



Note: The weld should be a fillet-type weld with legs no less than the wall thickness of the casing. Legs of 1/2" to 5/8" are adequate for most jobs.

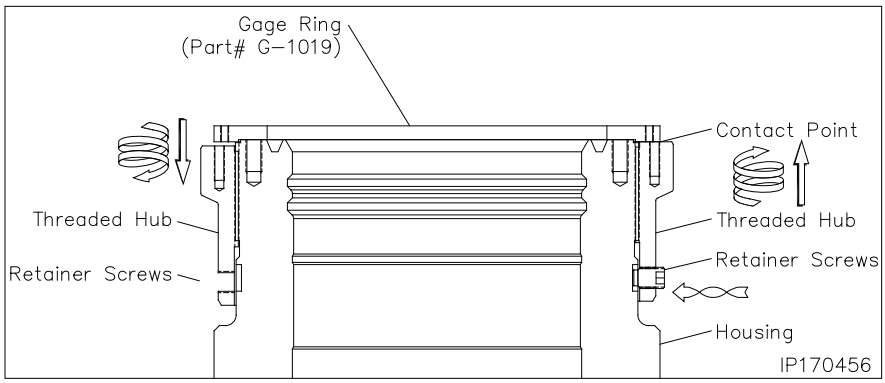
Refer to the back of this publication for the **Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal** and for field testing of the weld connection.

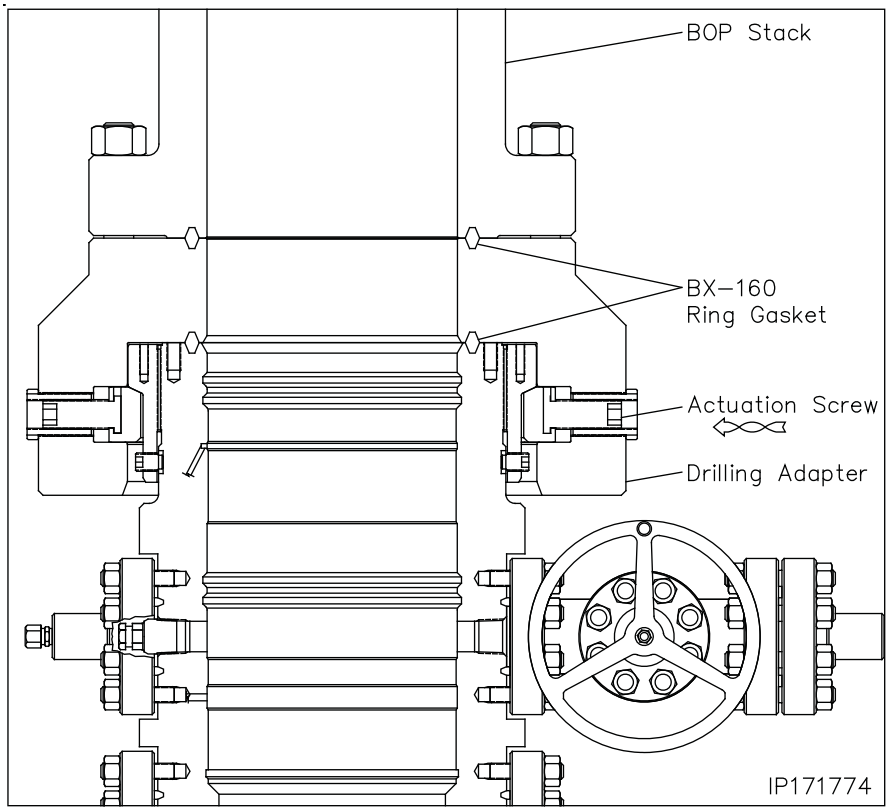
Stage 2 — Nipple Up The BOP Stack

1. Examine the ***13-5/8" 5M x 19.00" 4 Stub Acme Threaded Hub (Item R1)***. Verify the following:
   - Acme thread are clean and in good condition
   - remove the (4) retainer set screws an place them in a safe place
2. Thoroughly clean and lightly lubricate the mating threads of the housing and the Thread Hub with Copper Coat or Never Seize.
3. Pick up the Hub and carefully thread it onto the top of the housing with counter clockwise rotation until the top of the ring is approximately a 1/4" below the top of the housing.
4. Position the hub gage ring on top of the housing with the counter bore down as indicated. Ensure the gage ring is level and straight.
5. Rotate the Hub clockwise (UP) until it contacts the gage ring.

WARNING: Do not off seat the gage ring.

6. Locate the retainer screw holes in the threaded hub.
7. Rotate the Hub up or down to align the holes in the hub with the notches in the housing.
8. Install the set screws and tighten securely. Remove gage ring.
9. Make up the ***13-5/8" 5M Quick Connect x 13-5/8" 5M Studded Adapter (Item R2)*** to the bottom of the BOP stack using a new ***BX-160 Ring Gasket.***
10. Thoroughly clean the MBU-3T hub, ring groove and the mating clamp segments and ring groove of the Adapter attached to the BOP stack.
11. Install a new ***BX-160 Ring Gasket*** into the ring groove of the housing.
12. Pick up the BOP stack and carefully lower it over the top of the housing and land it on the ring gasket.





13. Ensure the BOP is level and then carefully run in all of the drive screws of the upper adapter to contact point.
14. Ensure the assembly remains level, run in one actuation and torque to 100 ft lbs.
15. Locate the screw 180° from the first and torque it to 100 ft lbs.
16. Locate the screws 90° to the right and left and torque them to 100 ft lbs.
17. Position the second 4 point sequence 90° from the first and torque each screw to 200 ft lbs.
18. Run in all remaining screws to contact and then torque each screw to 400 ft lbs.
19. Make one additional round until a stable torque of 400 ft lbs on all (16) screws is achieved.

Stage 3 — Test the BOP Stack

Immediately after making up the BOP stack and periodically during the drilling of the well for the next casing string the BOP stack (connections and rams) must be tested.

1. Examine the ***13-5/8" Nominal x 4-1/2" IF (NC-50) CW Test Plug/ Retrieving Tool (Item ST1)***. Verify the following:
   - 1-1/4" VR plug and weep hole plug are in place and tightened securely
   - elastomer seal is in place and in good condition
   - retractable lift lugs are in place, clean, and free to move
   - drill pipe threads are clean and in good condition

2. Position the test plug with the elastomer seal down and the lift lugs up and make up the tool to a joint of drill pipe.

WARNING: Ensure that the lift lugs are up and the elastomer seal is down

3. Remove the 1/2" NPT pipe plug from the weep hole if pressure is to be supplied through the drill pipe.

4. Open the housing lower side outlet valve.

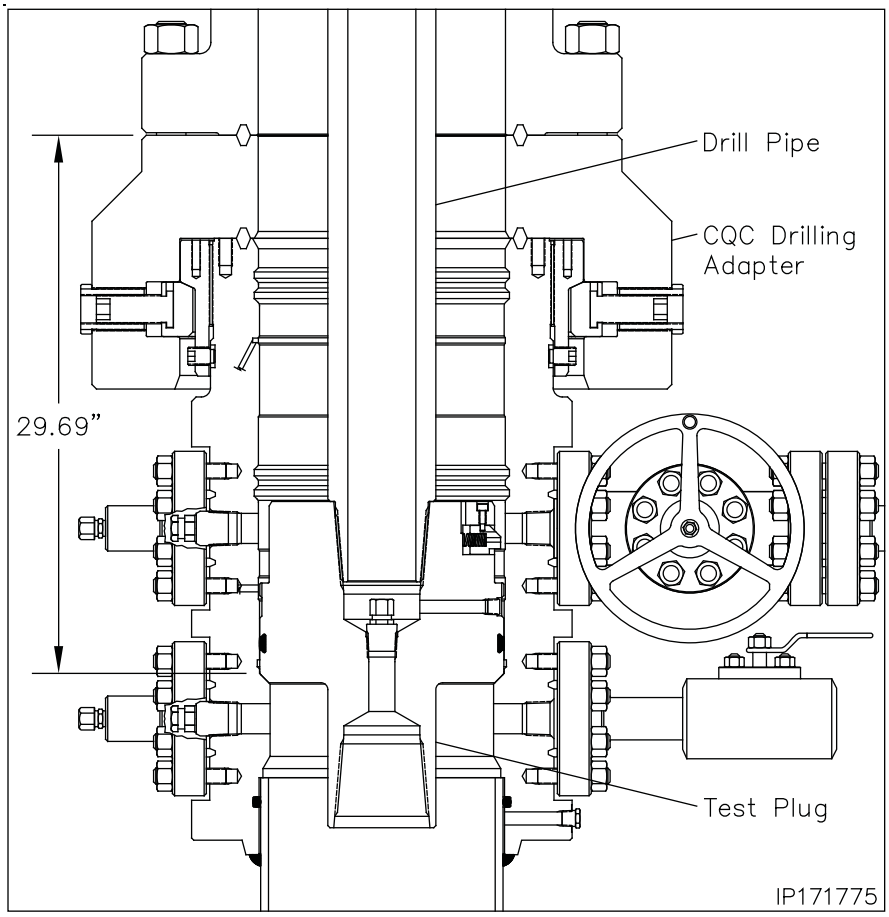
5. Lightly lubricate the test plug seal with oil or light grease.

6. Carefully lower the test plug through the BOP and land it on the load shoulder in the housing, 29.69" below the top of the drilling adapter.

7. Close the BOP rams on the pipe and test the BOP to 5000 psi or as required by site supervisor.

Note: Any leakage past the test plug will be clearly visible at the open side outlet valve.

8. After a satisfactory test is achieved, release the pressure and open the rams.



9. Remove as much fluid as possible from the BOP stack and the retrieve the test plug with a straight vertical lift.

Note: When performing the BOP blind ram test it is highly recommended to suspend a stand of drill pipe below the test plug to ensure the plug stays in place while disconnecting it from the drill pipe.

10. Repeat this procedure as required during the drilling of the hole section.

Stage 4 — Run the Lower Wear Bushing

Note: Always use a Wear Bushing while drilling to protect the load shoulders from damage by the drill bit or rotating drill pipe. The Wear Bushing **must be retrieved** prior to running the casing.

1. Examine the ***13-5/8" Nominal MBU-3T-LWR Wear Bushing (Item ST2).*** Verify the following
   - internal bore is clean and in good condition
   - upper trash o-ring is in place and in good condition
   - shear o-ring cord is in place and in good condition
   - paint anti-rotation lugs white and allow paint to dry

Run the Wear Bushing Before Drilling

2. Orient the ***13-5/8" Nominal x 4-1/2" IF (NC-50) CW Test Plug/Retrieving Tool (Item ST1)*** with drill pipe connection up.

3. Attach the Retrieving Tool to a joint of drill pipe.

WARNING: Ensure that the lift lugs are down and the elastomer seal is up

4. Align the retractable lift lugs of the tool with the retrieval holes of the bushing and carefully lower the tool into the Wear Bushing until the lugs snap into place.

Note: If the lugs did not align with the holes, rotate the tool in either direction until they snap into place.

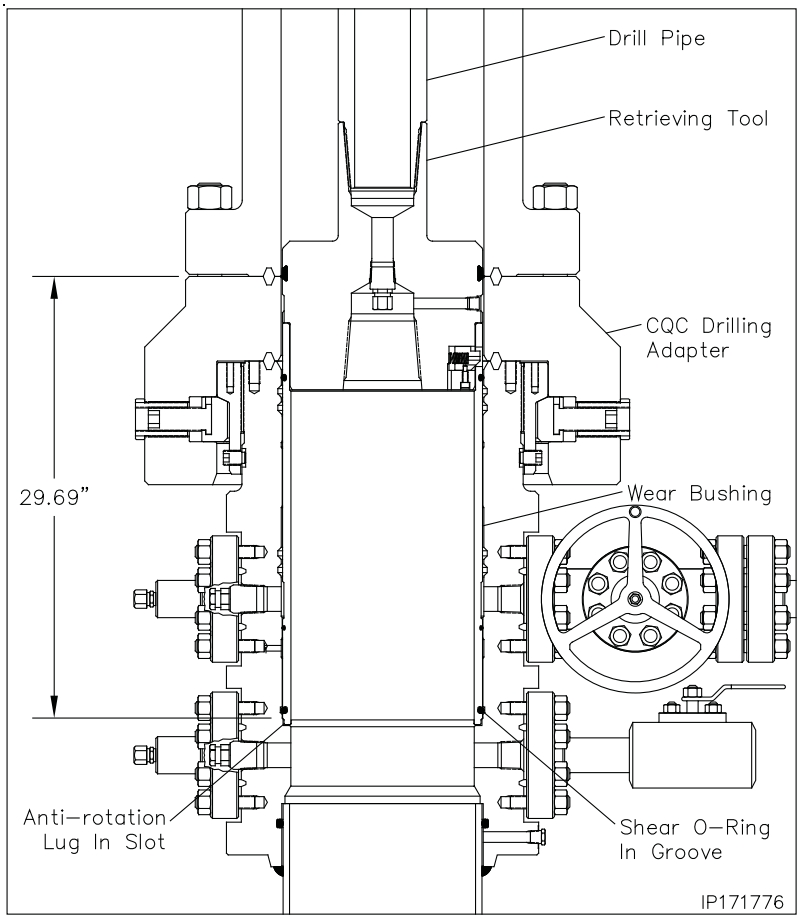
5. **Apply a heavy coat of grease, not dope, to the OD of the bushing.**

6. Ensure the BOP stack is drained and free of any debris from previous test.

7. Slowly lower the Tool/Bushing Assembly through the BOP stack and land it on the load shoulder in the housing, 29.69" below the top of the drilling adapter.

8. Rotate the drill pipe clockwise (right) to locate the stop lugs in their mating notches in the head. When properly aligned the bushing will drop an additional 1/2".

Note: The Shear O-Ring on bottom of the bushing will locate in a groove above the load shoulder in the head to act as a retaining device for the bushing.



9. Remove the tool from the Wear Bushing by rotating the drill pipe counter clockwise (left) 1/4 turn and lifting straight up.

10. Drill as required.

Note: It is highly recommended to retrieve, clean, inspect, grease, and reset the wear bushing each time the hole is tripped during the drilling of the hole section.

Retrieve the Wear Bushing After Drilling

11. Make up the Retrieving Tool to the drill pipe.

12. Drain BOP stack and wash out if necessary.

13. Slowly lower the tool into the Wear Bushing.

14. Rotate the Retrieving Tool clockwise until a positive stop is felt. This indicates the lugs have snapped into the holes in the bushing.

15. Using the top drive, slowly pick up on the landing joint in 1000 lbs increments until the busing starts to rise. This action should take a minimum of 3000 lbs pull. Do Not Exceed 60,000 lbs.

16. Retrieve the Wear Bushing, and remove it and the Retrieving Tool from the drill string.

Stage 5 — Hang Off the 9-5/8” Casing

1. Examine the ***13-5/8” x 9-5/8” CW-MBU-3T-TP4 Casing Hanger Running Tool (Item ST3).*** Verify the following:
   - internal bore and threads are clean and in good condition
   - o-ring seal is clean and in good condition
   - torque dogs are in place, in upper most position and retainer set screws are tightened securely

2. Make up a landing joint to the top of the Running Tool and torque connection to thread manufacturer’s maximum make up torque.

3. Lay down the landing joint on the pipe rack.

4. On the pipe rack, examine the ***13-5/8” x 9-5/8” CW-MBU-3T-TP4 Mandrel Casing Hanger (Item A11).*** Verify the following:
   - internal bore and threads are clean and in good condition
   - neck seal area is clean and undamaged
   - torque slots are clean and in good condition
   - pin threads are clean and in good condition. **Install thread protector**
   - paint indicator groove white as indicated and allow paint to dry

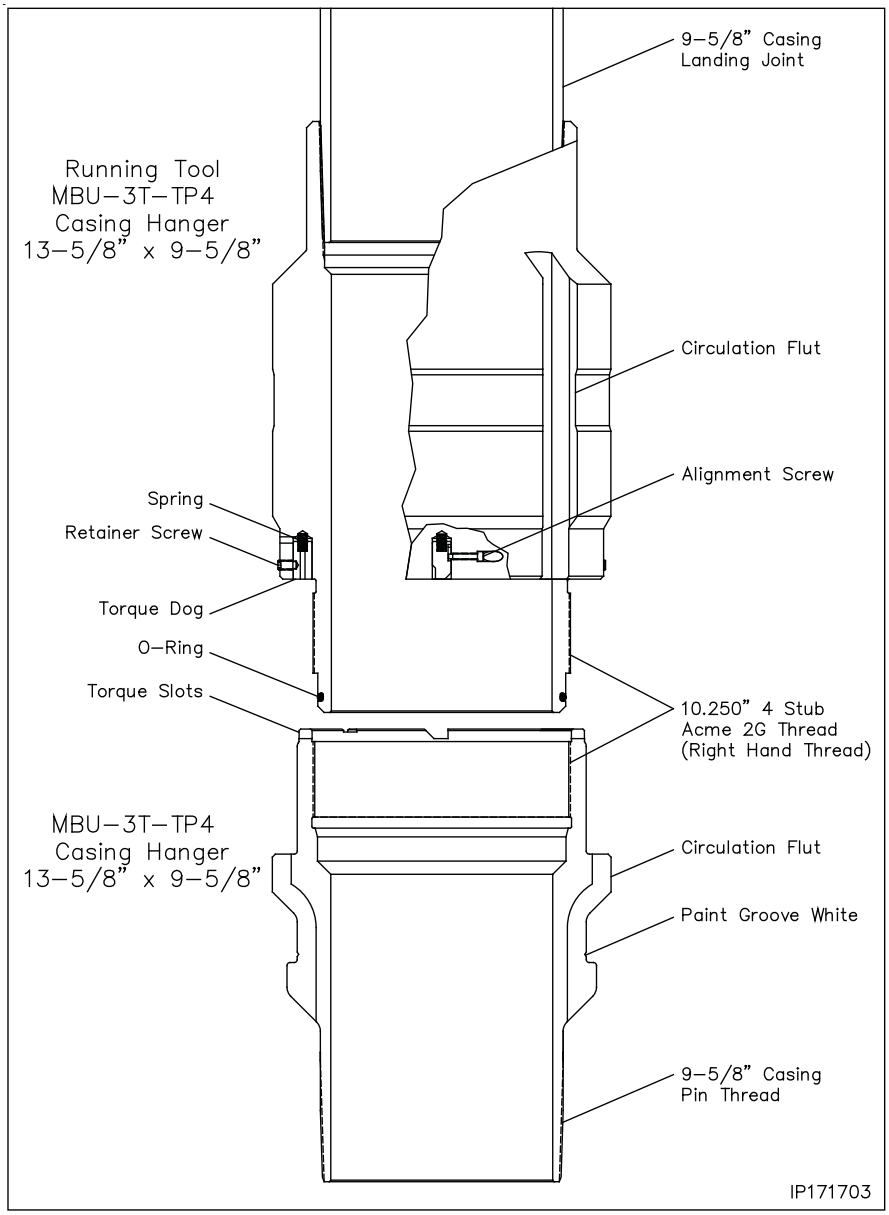
   .

5. Liberally lubricate the mating threads, seal areas and o-ring of the hanger and running tool with a oil or light grease.

6. ***Using chain tongs only,*** thread the Running Tool into the hanger, with right hand rotation, until it shoulders out on the Hanger body.

WARNING: Do Not apply torque to the Hanger/Tool connection.

Note: If steps 1 through 6 were done prior to being shipped to location, the running tool should be backed off 1 turn and made back up to ensure it will back off freely.



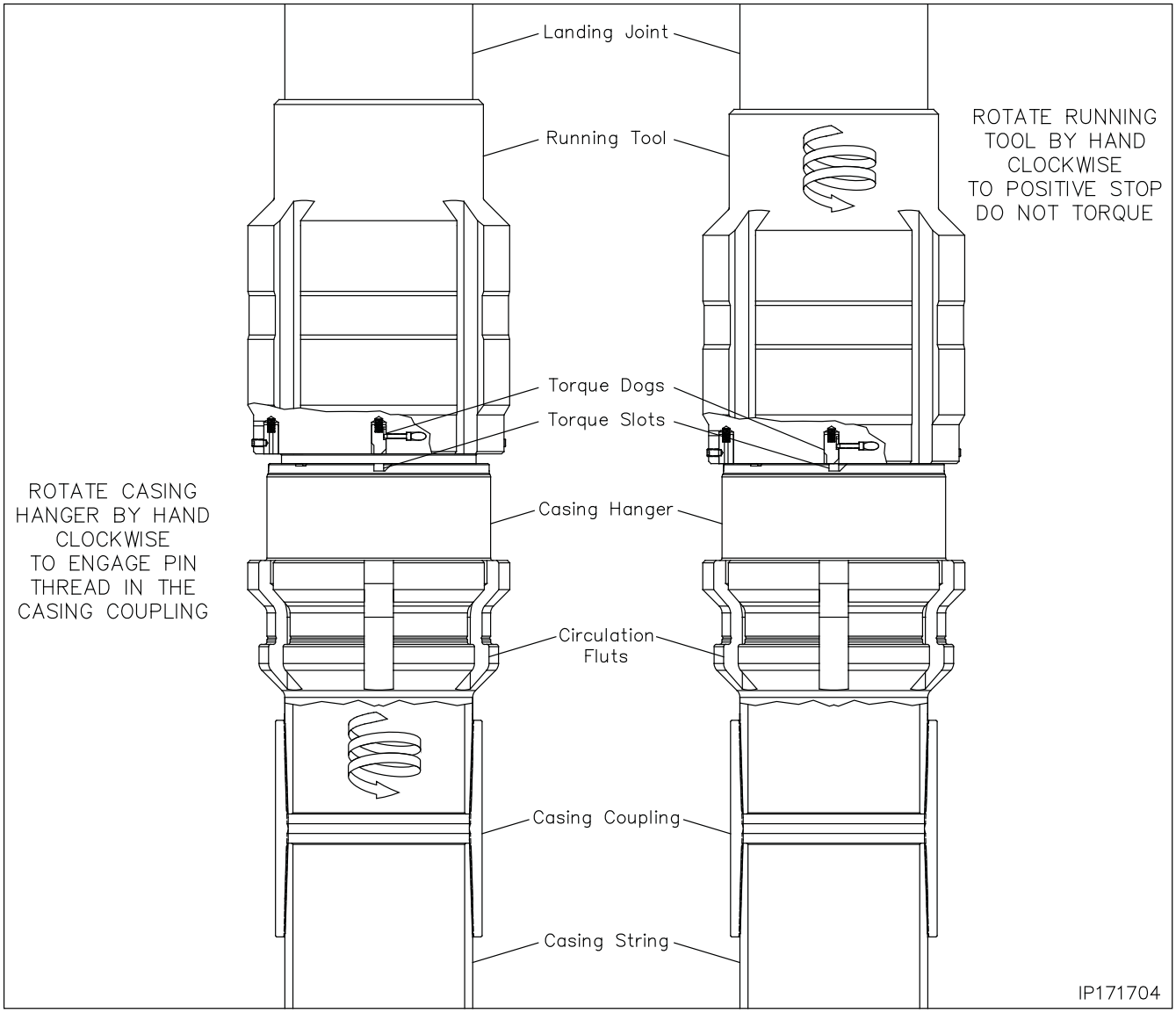
7. Calculate the total landing dimension by adding the previously determined RKB dimension and 29.69”, the depth of the wellhead.

8. Starting at the top of the 45° angle load shoulder of the casing hanger measure up the landing joint and place a paint mark on the joint. Mark **HANGER LANDED**.

9. Place a second mark 30” below the first and mark **STOP ROTATING**.

10. Run the 9-5/8” casing as required and space out appropriately for the mandrel casing hanger.

Stage 5 — Hang Off the 9-5/8” Casing



Note: If the 9-5/8” casing becomes stuck and the mandrel casing hanger cannot be landed, Refer to **Stage 5A** for the emergency slip casing hanger procedure.

11. Pick up the casing hanger/running tool joint assembly.

12. Remove the casing hanger thread protector and carefully thread the hanger into the last joint of casing ran. Rotate the hanger clockwise, by hand, to a positive stop.

13. Rotate the running tool clockwise by hand to a positive stop.

Stage 5 — Hang Off the 9-5/8” Casing

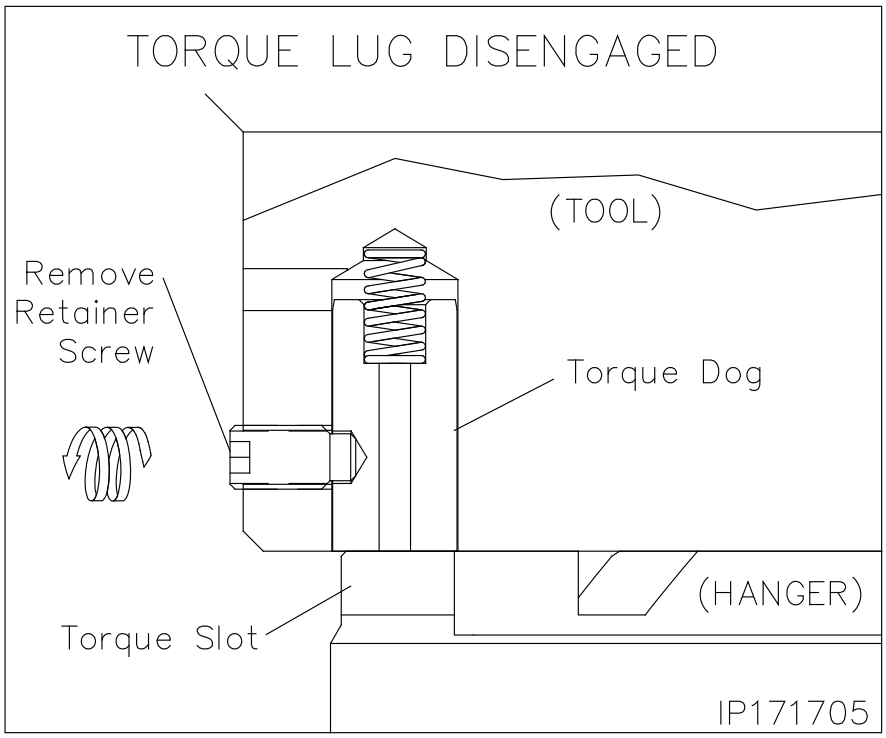
14. Locate the (4) 3/8” socket head set screws in the side of the hanger running tool and remove the screws.

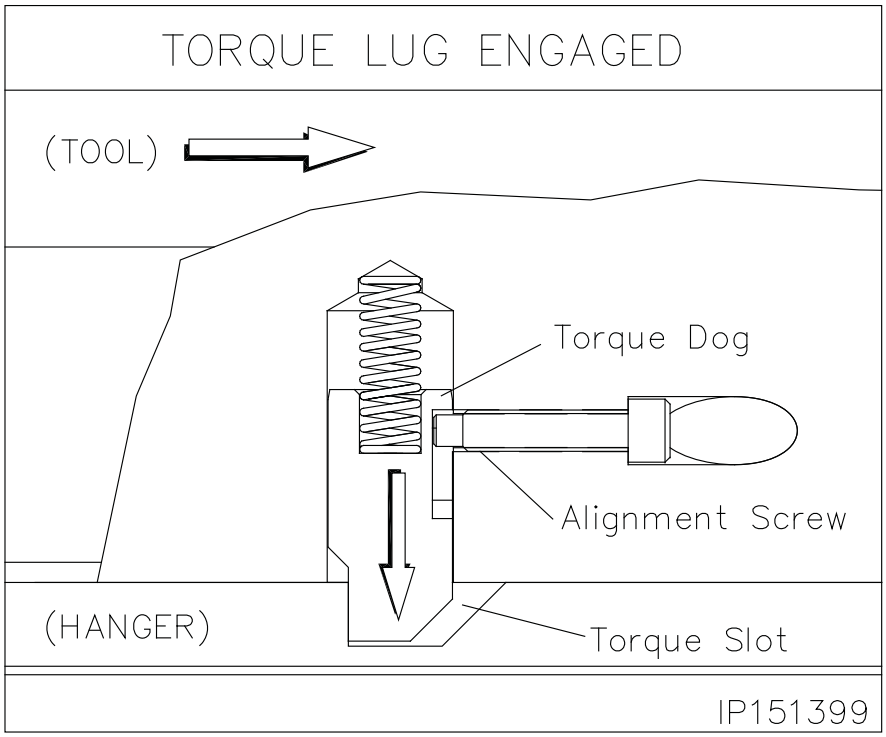
WARNING: Place the screws in a safe place to reinstall in the tool when the job is completed.

Note: This will release the running tool torque dogs allowing them to move downward.

15. Using only chain tongs, rotate the running tool to the left to allow the torque dogs to engage the torque slots in the top of the hanger.

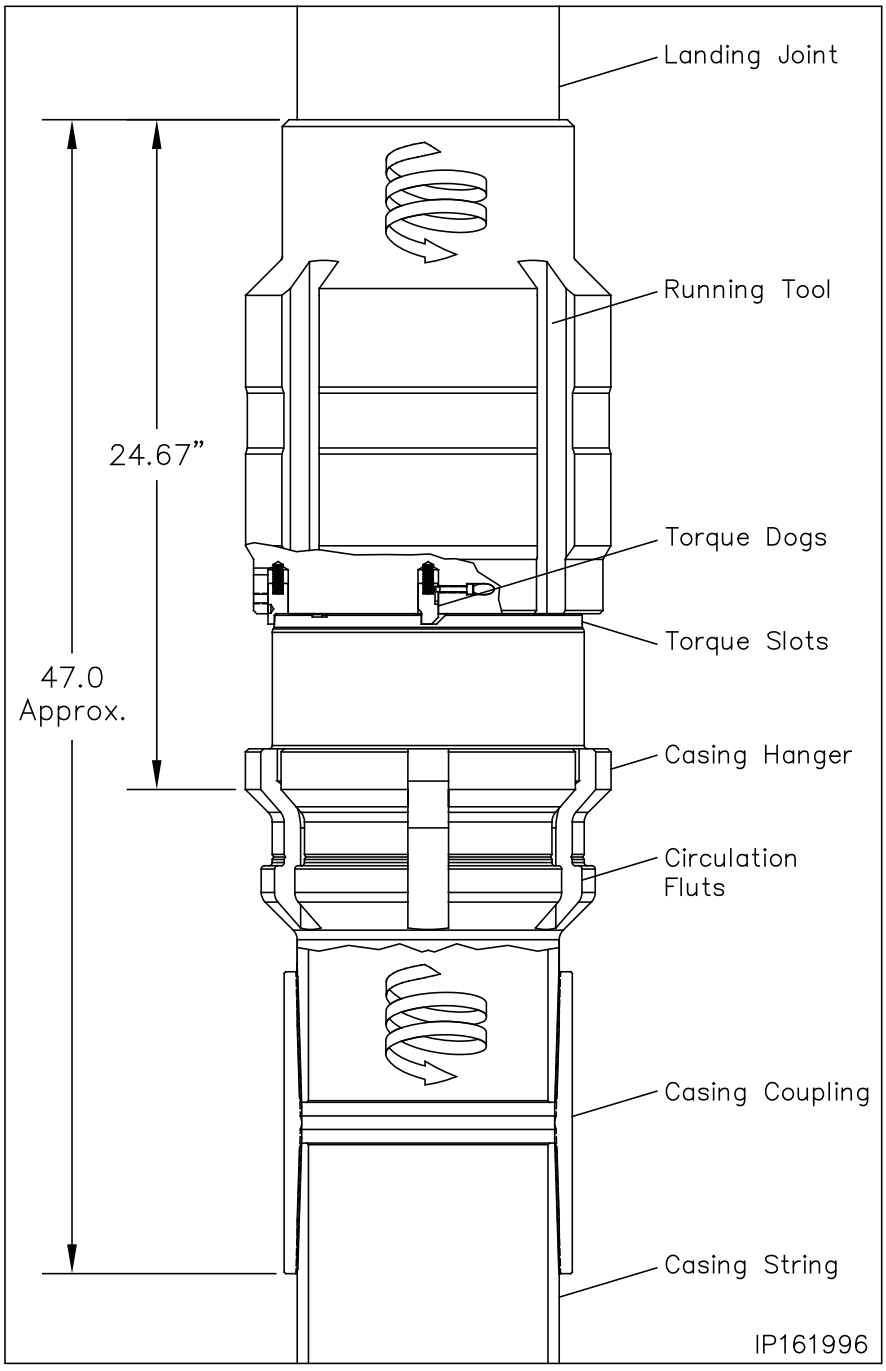
WARNING: Do not rotate the running tool more than 1/4 turn to the left. Doing so will decrease the torque dog engagement





Stage 5 — Hang Off the 9-5/8” Casing

16. Engage the CRT tool on the landing joint and torque the casing hanger in the casing string to thread manufacturer’s maximum make up torque.



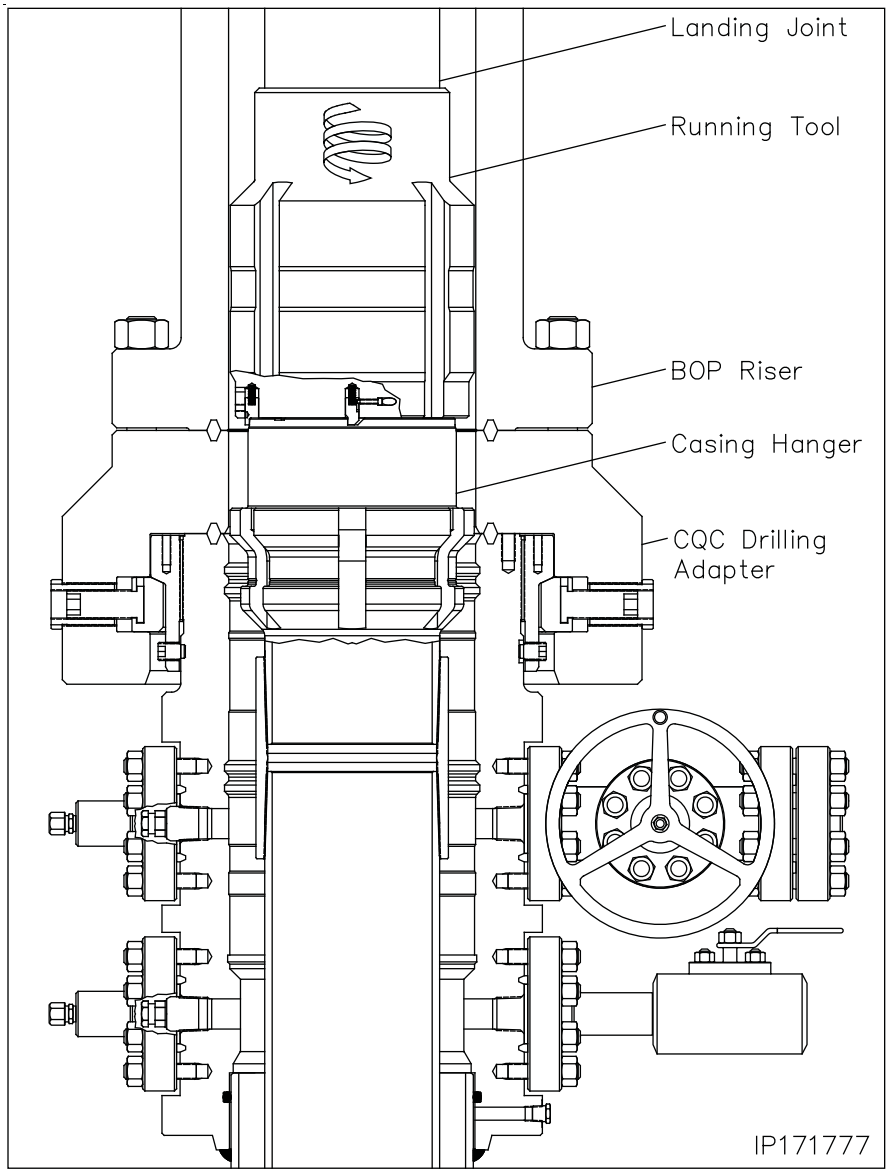
Stage 5 — Hang Off the 9-5/8” Casing

17. Pick up the casing string and remove the floor slips and rotary bushings.

18. Carefully lower the hanger completely through the BOP annular and then engage the top drive to allow the casing to be rotated clockwise.

19. While rotating the casing clockwise, carefully lower the casing string until the **STOP ROTATING** mark on the landing joint is level with the rig floor.

Note: The torque dogs have a maximum rated capacity of 18,000 ft lbs.



Stage 5 — Hang Off the 9-5/8” Casing

WARNING: Torque wrap can build in the casing string as it is rotated. Ensure the string comes to a neutral position, by allowing it to back off slowly counter clockwise, before the casing hanger is fully landed.

20. Cease rotation and continue carefully lowering the hanger through the wellhead and land it on the load shoulder in the MBU-3T housing, 29.69” below the top of the drilling adapter.

21. Slack off all weight on the casing and verify that the **HANGER LANDED** paint mark has aligned with the rig floor.

22. Open the MBU-3T housing lower outlet valve and drain the BOP stack.

23. Sight through the valve bore to confirm the hanger is properly landed. The white painted indicator groove will be clearly visible in the center of the open outlet valve.

24. Close the open valve and place a vertical paint mark on the landing joint to verify if the casing string rotates during the cementing process.

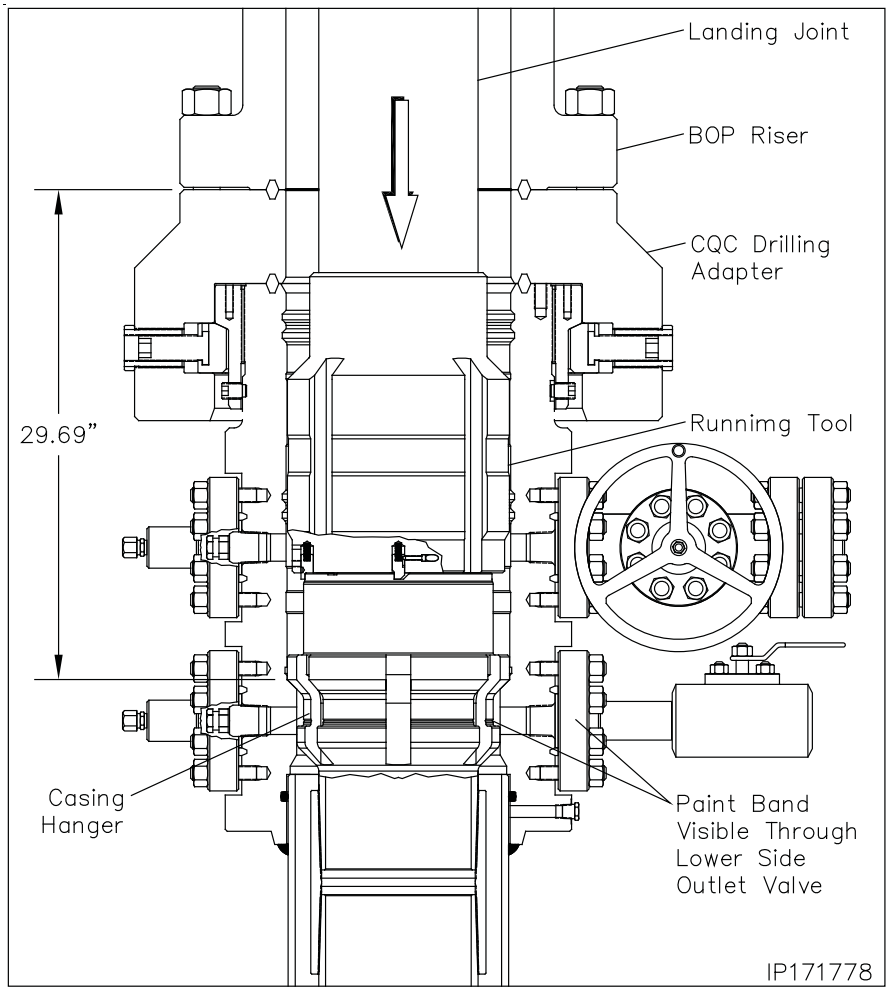
25. Cement the casing as required.

Note: Returns may be taken through the circulation slots and out the BOP or out the side outlets on the housing.

26. With cement in place, bleed off all pressure and remove the cementing head.

27. ***Using Chain Tongs Only located 180° apart,*** retrieve the Running Tool and landing joint by rotating the landing joint counter clockwise (left) approximately 13 turns or until the tool comes free of the hanger.

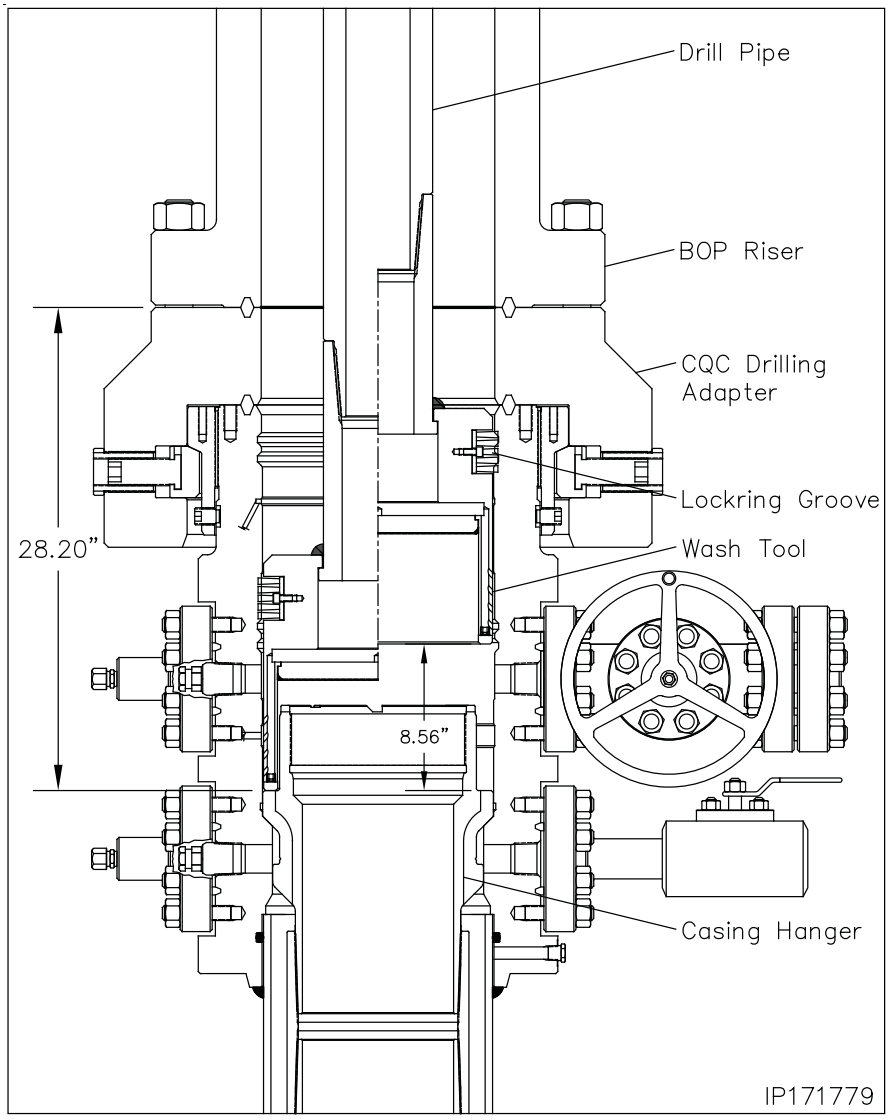
WARNING: The rig floor tong may be used to break the connection but **under no circumstances is the top drive to be used to rotate or remove the casing hanger running tool.**



Stage 5 — Hang Off the 9-5/8” Casing

Running the 13-5/8” Wash Tool

1. Examine the ***13-5/8” x 4-1/2” IF Wash Tool (Item ST5).*** Verify the following:
   - drill pipe threads and bore are clean and in good condition
   - all ports are open and free of debris
2. Orient the Wash Tool with drill pipe box up. Make up a joint of drill pipe to the tool.
3. Carefully lower the Wash Tool through the BOP and land it on top of the 9-5/8” casing hanger, 28.20” below the top flange of the wellhead housing.
4. Place a paint mark on the drill pipe level with the rig floor.
5. Open the housing lower side outlet valve and drain the BOP stack.
6. Using chain tongs, rotate the tool clockwise approximately 6 turns to loosen any debris that may be on top of the hanger flutes.
7. Pick up on the tool approximately 1” and attach a high pressure water line or the top drive to the end of the drill pipe and pump water (at approximately 200 to 300 PSI on the rig pump) through the tool and up the BOP stack.
8. While flushing, raise and lower the tool the full length of the wellhead and BOP stack. The drill pipe should be slowly rotated (approximately 20 RPM) while raising and lowering to wash the inside of the housing and BOP stack to remove all caked on debris.
9. Once washing is complete, land the wash tool on the hanger flutes.
10. Shut down pumps and allow the BOP stack to drain.



11. Reengage the pump and fully wash the inside of the wellhead and the entire BOP one additional cycle ensuring the stopping point is with the was tool resting on top of the hanger flutes.

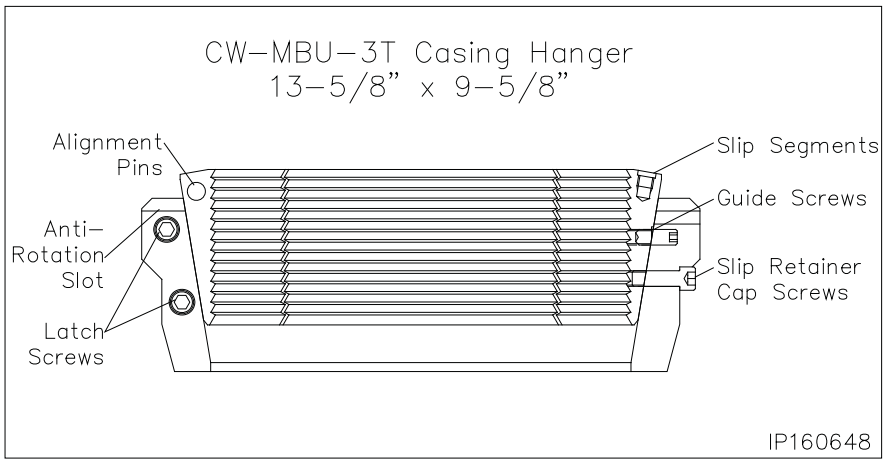
Note: Observe the returns at the open outlet valve. If returns are not clean, continue flushing until they are.

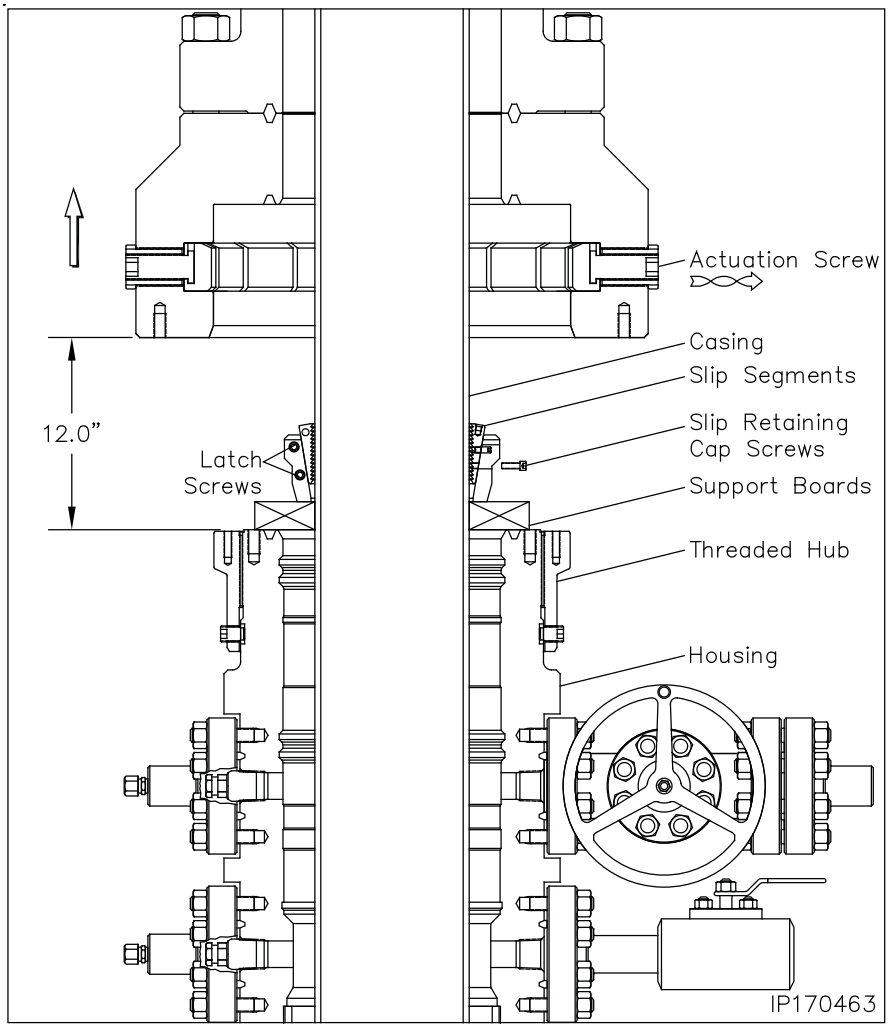
12. Once the returns are clean and free of debris, retrieve the tool to the rig floor.
13. Using a bright light, sight through the bore of the BOP stack and observe the top of the hanger neck and flutes. Ensure that there are no dark areas on top of the flutes of the hanger.

WARNING: Continue washing until all debris is removed.

Stage 5A — Hang Off the 9-5/8” Casing (Emergency)

1. Cement the hole as required.
2. Drain the BOP stack through the housing side outlet valve.
3. Locate the actuation screw on the OD of the drilling adapter.
4. Using a hex drive, fully retract the actuation screws until they are slightly over flush with the glandnuts.
5. Pick up on the BOP stack a minimum of 12” above the housing hub and secure with safety slings.
6. Washout as required.
7. Examine the ***13-5/8” x 9-5/8” MBU-3T Slip Casing Hanger (Item A11a).*** Verify the following:
   - slips and internal bore are clean and in good condition
   - all screws are in place
8. There are two latch screws located in the top of the casing hanger. Using a 5/16” Allen wrench, remove the two latch screws located 180° apart and separate the hanger into two halves.
9. Place two boards on the lower adapter against the casing to support the Hanger.
10. Pick up one half of the hanger and place it around the casing and on top of the boards.
11. Pick up the second hanger half and place it around the casing adjacent the first half.
12. Slide the two hanger halves together ensuring the slip alignment pins properly engage the opposing hanger half.
13. Reinstall the latch screws and tighten securely.
14. Prepare to lower the hanger into the housing bowl.





Stage 5A — Hang Off the 9-5/8” Casing (Emergency)

WARNING: Do Not Drop the Casing Hanger!

15. Grease the Casing Hanger’s body and remove the slip retaining screws.

16. Remove the boards and allow the hanger to slide into the housing bowl. When properly positioned the top of the hanger will be approximately 22.56” below the top of the housing.

17. Pull tension on the casing to the desired hanging weight and then slack off.

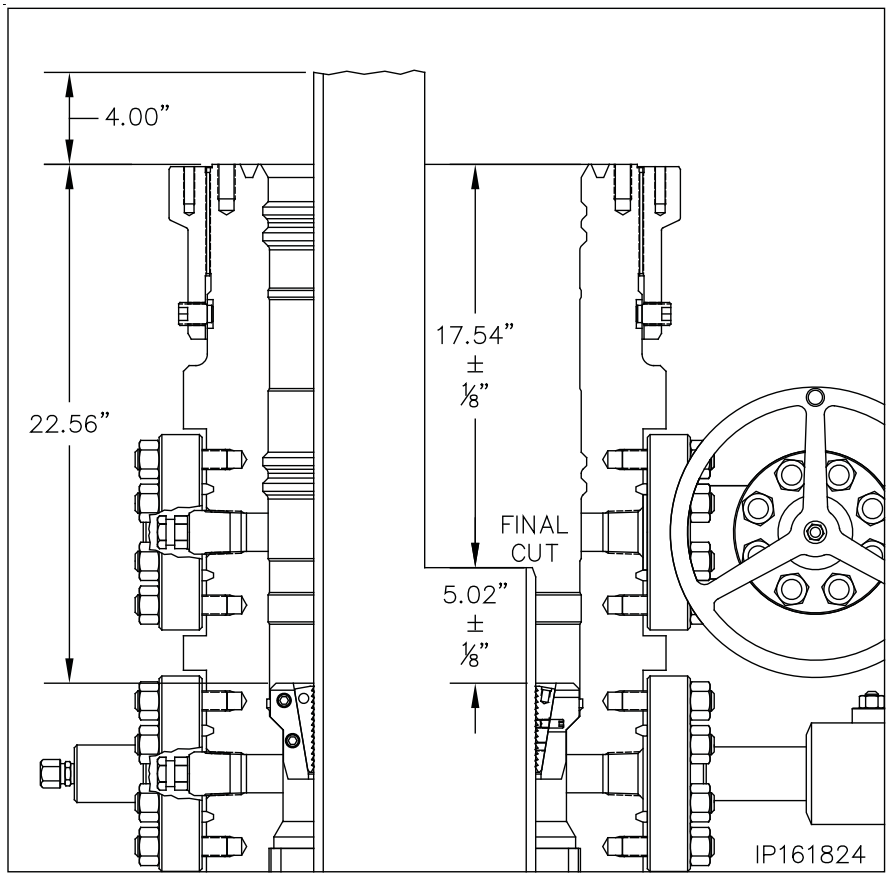
Note: A sharp decrease on the weight indicator will signify that the hanger has taken weight and at what point, If this does not occur, pull tension again and slack off once more.

WARNING: Because of the potential fire hazard and the risk of loss of life and property, It is highly recommended to check the casing annulus and pipe bore for gas with an approved sensing device prior to cutting off the casing. If gas is present, do not use an open flame torch to cut the casing. It will be necessary to use a air driven mechanical cutter which is spark free.

18. Rough cut the casing approximately 4” above the top of the housing and move the excess casing out of the way.

19. Using the Wach’s internal casing cutter, final cut the casing at 17.54” ± 1/8” below the top of the lower adapter or 5.02” ± 1/8” above the hanger body.

20. Remove the internal casing cutter assembly and reconfigure the assembly to bevel the casing. Reinstall the cutter assembly and then place a 3/16” x 3/8” bevel on the O.D. and a I.D. chamfer to match the minimum bore of the packoff to be installed.



Note: There must not be any rough edges on the casing or the seals of the Packoff will be damaged.

21. Thoroughly clean the housing bowl, removing all **CEMENT AND CUTTING DEBRIS.**

22. Locate the two anti-rotation notches in the top of the sip bowl.

23. Place a straight edge on top of the slip bowl and in line with the center of one of the notches.

24. Ensure the straight edge is vertical and then place a paint mark on top of the housing in line with the notch in the slip bowl.

Stage 6 — Install the MBU-3T Mandrel Hanger Packoff

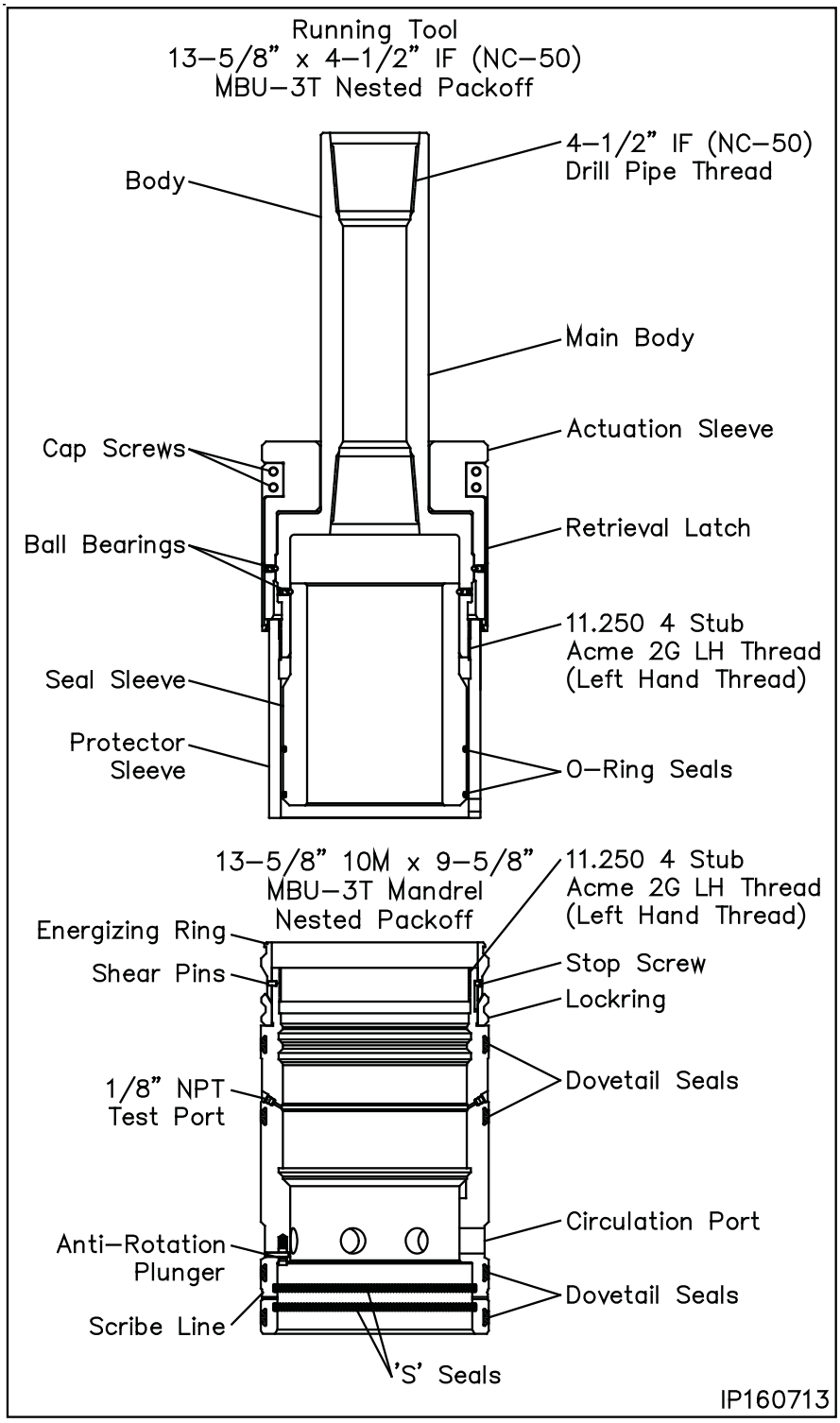
The following steps detail the installation of the MBU-3T Nested Packoff Assembly for the mandrel hanger. If the casing was landed using the emergency slip hanger, skip this step and proceed with Stage 6A for installing the emergency MBU-3T Nested packoff.

1. Examine the ***13-5/8" x 11.250" 4 Stub Acme 2G LH box top MBU-3T Mandrel Hanger Nested Packoff Assembly (Item A12).*** Verify the following:
   - all elastomer seals are in place and undamaged
   - internal bore, and ports, are clean and in good condition
   - lockring is fully retracted
   - energizer ring is in its upper most position and retained with shear pins and stop screws are loose
   - anti-rotation plungers are in place, free to move

2. Inspect the ID and OD seals for any damage and replace as necessary.

3. Examine the ***13-5/8" Nominal x 11.250" 4 Stub Acme 2G LH, MBU-3T Nested Packoff Running Tool (Item ST6).*** Verify the following:
   - Acme threads are clean and in good condition
   - retrieval latch is in position and retained with cap screws
   - Remove seal sleeve protector sleeve
   - seal sleeve is in position and rotates freely
   - seal sleeve o-rings are in place and in good condition
   - reinstall seal sleeve protector

4. Remove the retrieval latch and set aside.

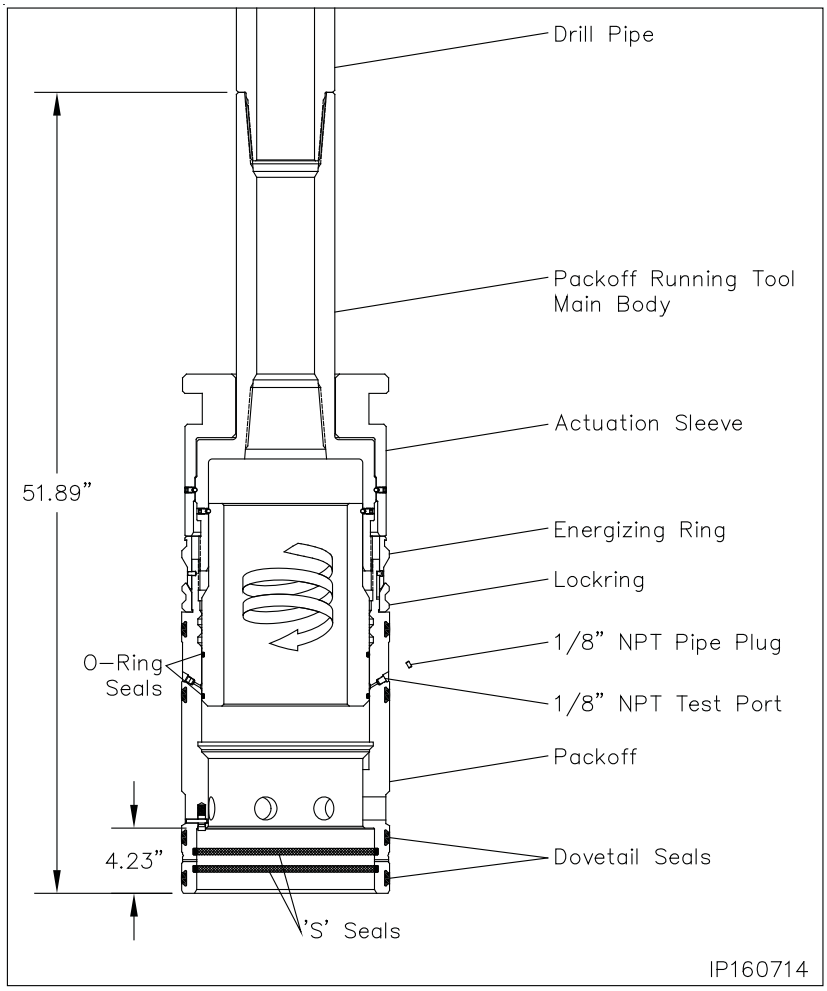


Stage 6 — Install the MBU-3T Mandrel Hanger Packoff

5. Make up the running tool to 4-1/2" IF (NC-50) drill pipe and torque the connection to optimum make up torque.
6. Pick up the Running Tool with landing joint and suspend it above the packoff.
7. Remove the tool protector sleeve with counter clockwise rotation and set the sleeve aside.
8. Thoroughly clean and lightly lubricate the mating Acme threads of the running tool and packoff with oil or light grease.
9. Lightly lubricate the seal sleeve o-rings with oil or a light grease.
10. Carefully lower the tool into the packoff and thread them together by first rotating the tool clockwise (RIGHT) to locate the thread start and then counter clockwise (LEFT) until the tool upper body makes contact with the packoff Energizing Ring. Approximately 4 turns.
11. Install (1) 1/8" NPT pipe plug in the OD test port of the packoff and tighten securely.
12. Attach a test pump to the remaining open port and inject test fluid between the seal sleeve o-rings until a stable test pressure of 5000 psi is achieved.
13. If the test fails, remove the tool and replace the leaking o-rings.
14. After a satisfactory test is achieved remove the test pump and the 1/8" pipe plug from the opposite test port.

WARNING: All 1/8" pipe plugs must be removed prior to installing the packoff

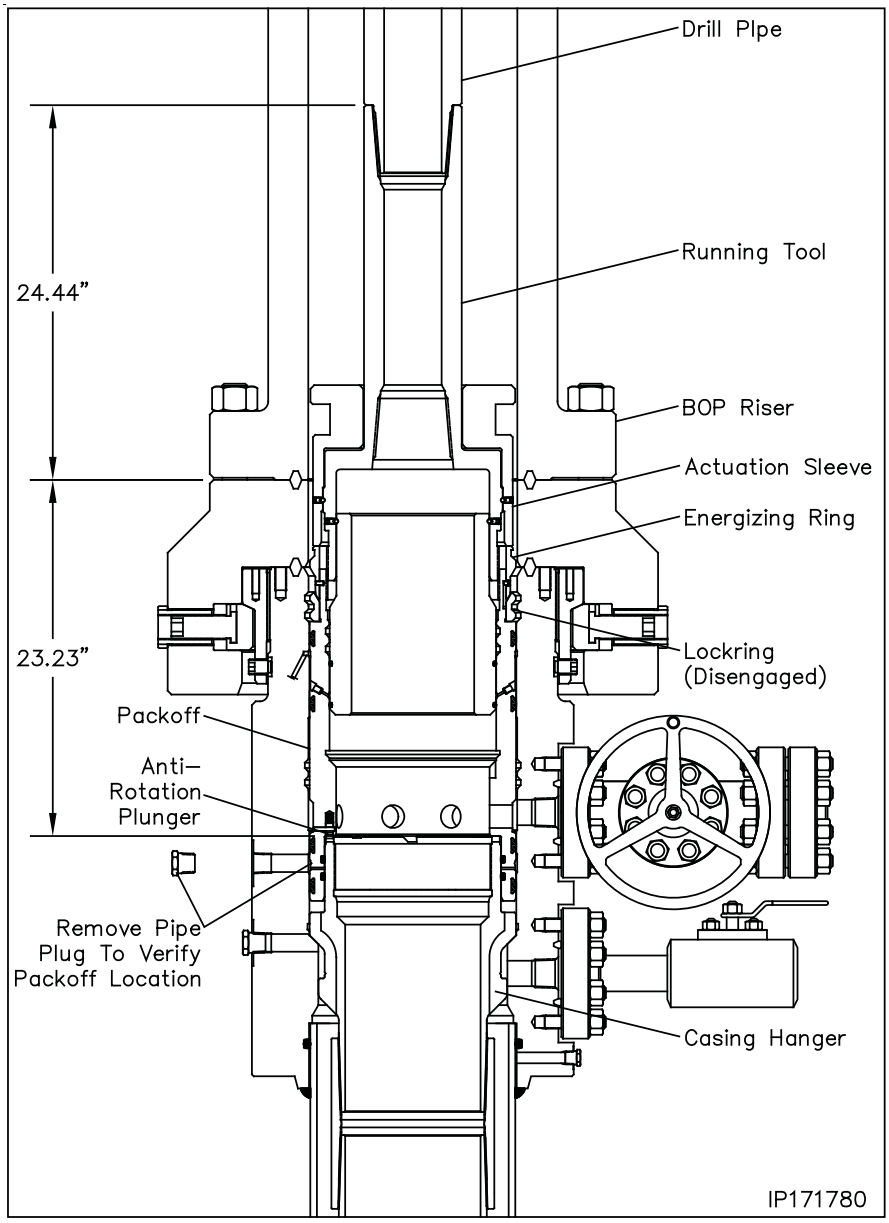
15. Pick up the assembly and thoroughly clean and lightly lubricate the packoff ID 'S' seals and the OD dovetail seals with oil or light grease.



Stage 6 — Install the MBU-3T Mandrel Hanger Packoff

Landing the Packoff

16. Remove the hole cover.
17. Measure up 5 foot from the paint mark on the OD of the packoff and place a paint mark on the drill pipe.
18. Pick up the packoff/running tool assembly and carefully lower the assembly through the BOP marking the landing joint every five feet until the calculated dimension is reached.
19. Place a paint mark on the landing joint at that dimension and mark land off. Place an additional mark 1-1/2” above the first one and mark engaged.
20. Continue lowering the packoff until it passes over the neck of the hanger and lands on the casing hanger neck, 23.23” below the top of the drilling adapter.
21. Locate the upper 1” sight port pipe plug and remove the plug
22. Look through the port to verify that the packoff is properly landed. The white paint scribe line will be clearly visible in the center of the open port.
23. Reinstall the pipe plug and tighten securely.



Stage 6 — Install the MBU-3T Mandrel Hanger Packoff

Seal Test

24. Locate the upper and lower seal test fittings on the O.D. of the housing and remove the dust cap from the fittings.

25. Attach a test pump to the open lower fitting and pump clean test fluid between the seals until a stable test pressure of 5,000 psi is achieved.

26. Hold test pressure for 5 minutes.

27. If a leak develops, bleed off test pressure, remove the packoff from the wellhead and replace the leaking seals.

28. Repeat steps 24 through 27 for the remaining seal test.

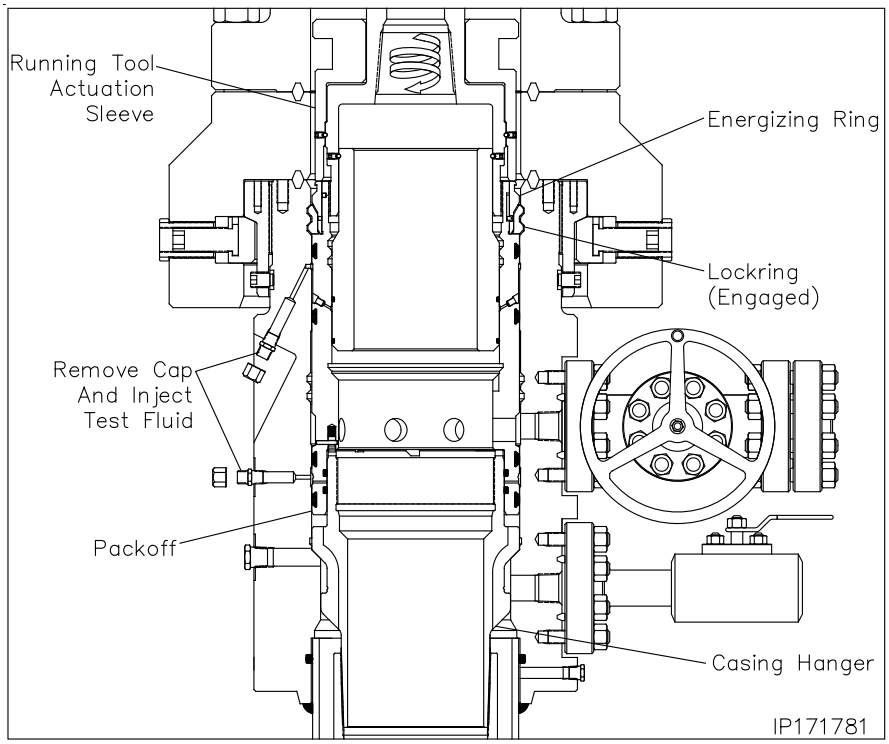
29. After satisfactory tests are achieved, bleed off the test pressure but leave the test manifolds in place.

Engaging the Lockring

30. Using chain tongs only located 180° apart, slowly rotate the drill pipe counter clockwise until the anti-rotation plungers align with the slots in the top of the hanger. Expect torque of approximately 400 ft lbs. to rotate the packoff.

31. Using only chain tongs, rotate the landing joint approximately 6 to 6-1/2 turns counter clockwise to engage the packoff lockring in its mating groove in the bore of the MBU-LR housing.

Note: Approximately 800 to 900 ft. lbs. of torque will be required to break over the shear pins in the packoff. The torque will drop off and then increase slightly when the energizing ring pushes the lockring out. A positive stop will be encountered when the lockring is fully engaged.



Note: When properly engaged the second paint mark on the landing joint will align with the rig floor. VERIFY PAINT MARKS.

WARNING: It is imperative that the landing joint remain concentric with the well bore when rotating to engage the lockring. This can be accomplished with the use of the air hoist.

WARNING: If the required turns to engage the lockring are not achieved or excessive torque is encountered, remove the packoff and first call local branch and then Houston Engineering.

32. Back off the landing joint/running tool approximately three turns. Using the top drive, exert a 40,000 lbs. pull on the landing joint.

33. Reattach the test pump to the open test manifolds and retest the packoff seals to 5,000 psi for 15 minutes. This will also verify that the packoff is in place.

34. After satisfactory test is achieved, bleed off all test pressure, remove test pump and reinstall the dust cap on the open fittings.

35. Using only chain tongs, rotate the landing joint clockwise until the tool comes free of the packoff (approximately 9 to 9-1/2 turns) and then retrieve the tool with a straight vertical lift.

Stage 6 — Install the MBU-3T Mandrel Hanger Packoff

In the event the packoff is required to be removed after the lockring is engaged the following procedure is to be followed.

Retrieving the Packoff

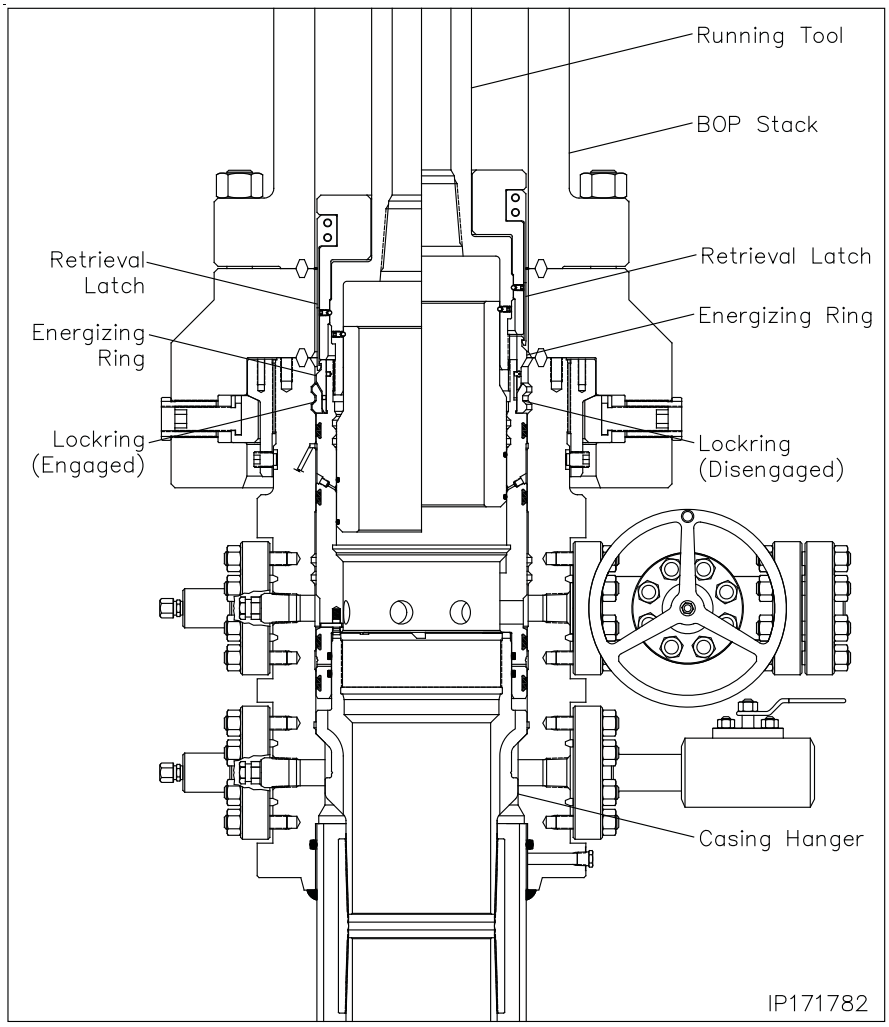
1. Position the retrieval latch so the latch finger extend from the bottom of the running tool body.
2. Reinstall the cap screws and tighten them securely.
3. Ensure the retrieval latch freely rotates on the running tool body.
4. Carefully lower the running tool through the BOP stack and into the packoff.
5. Rotate the drill pipe clockwise (Right) to locate the thread start and then counter clockwise (Left) (approximately 9 to 9-1/2 turns) to a positive stop.

Note: At this point the retrieval latches will have passed over the energizing ring and snapped into place.

6. Rotate the drill pipe clockwise (right) approximately 6 turns to a positive stop. The drill pipe should rise approximately 1-1/2”.

Warning: Do not exceed the 6 turns or the packoff may be seriously damaged.

7. Carefully pick up on the drill pipe and remove the packoff from the MBU-3T wellhead with a straight vertical lift.
8. Rotate the packoff 1 turn clockwise to relax the retrieval latch.
9. Remove the (4) 1/2” cap screws and remove the latch assembly.



10. Redress the Packoff and reset as previously outlined.
11. Once the packoff is properly set, reinstall the retrieval latch on the tool.

Stage 6A — Install the MBU-3T Emergency Packoff

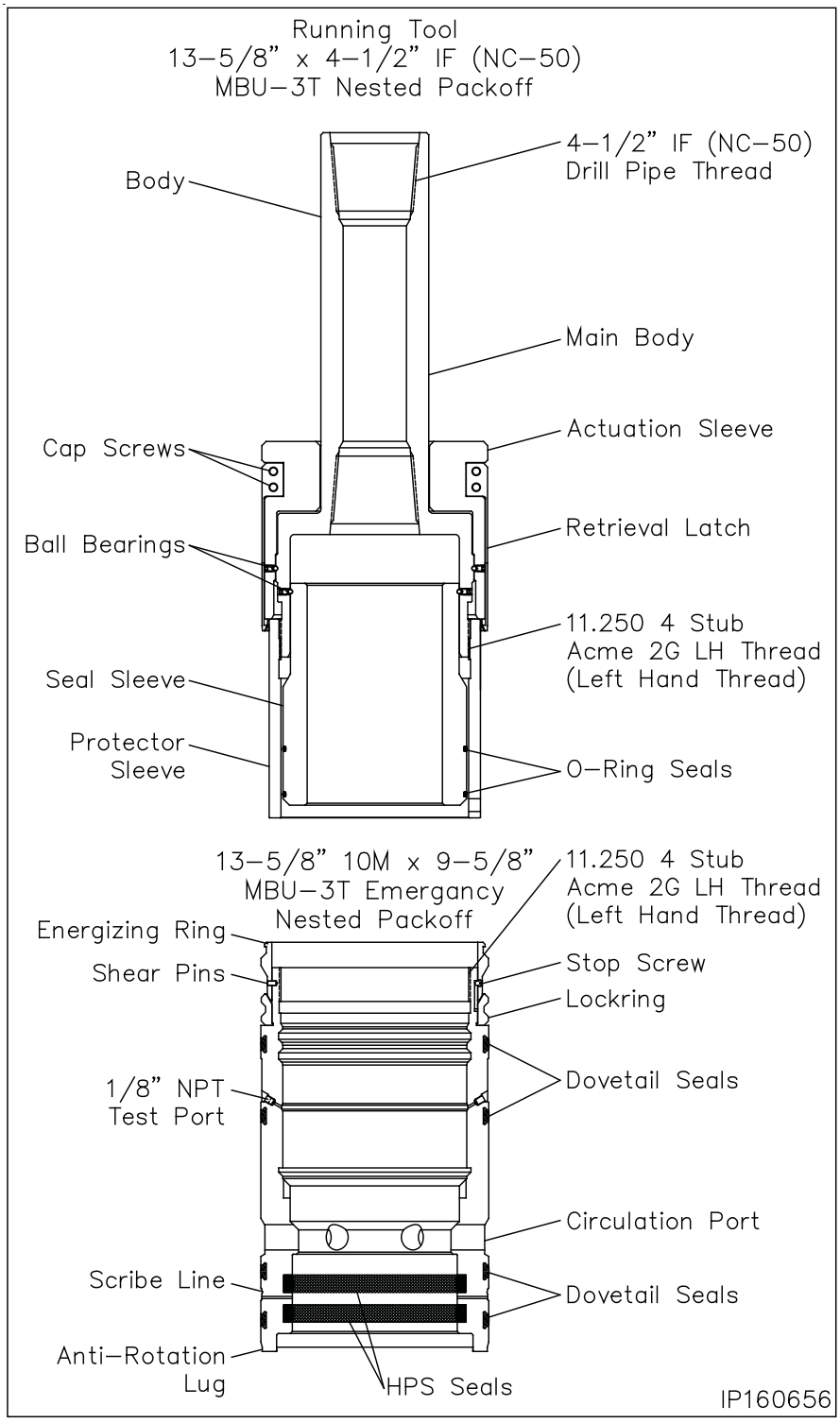
1. Examine the ***13-5/8" 10M x 9-5/8" x 11.250" 4 Stub Acme 2G LH box top MBU-3T Emergency Nested Packoff Assembly (Item A12a).*** Verify the following:
   - all elastomer seals are in place and undamaged
   - internal bore, and ports, are clean and in good condition
   - lockring is fully retracted
   - energizer ring is in its upper most position and retained with shear pins

2. Inspect the ID and OD seals for any damage and replace as necessary.

3. Examine the ***13-5/8" Nominal x 11.250" 4 Stub Acme 2G LH, MBU-3T Nested Packoff Running Tool (Item ST6).*** Verify the following:
   - Acme threads are clean and in good condition
   - retrieval latch is in position and retained with cap screws
   - seal sleeve is in position and rotates freely
   - seal sleeve o-rings are in place and in good condition
   - reinstall seal sleeve protector

4. Make up a joint 4-1/2" IF (NC-50) drill pipe to the top of the Running Tool and tighten connection to thread manufacturer's maximum make up torque.

5. Run in the hole with two stands of drill pipe and set in floor slips.

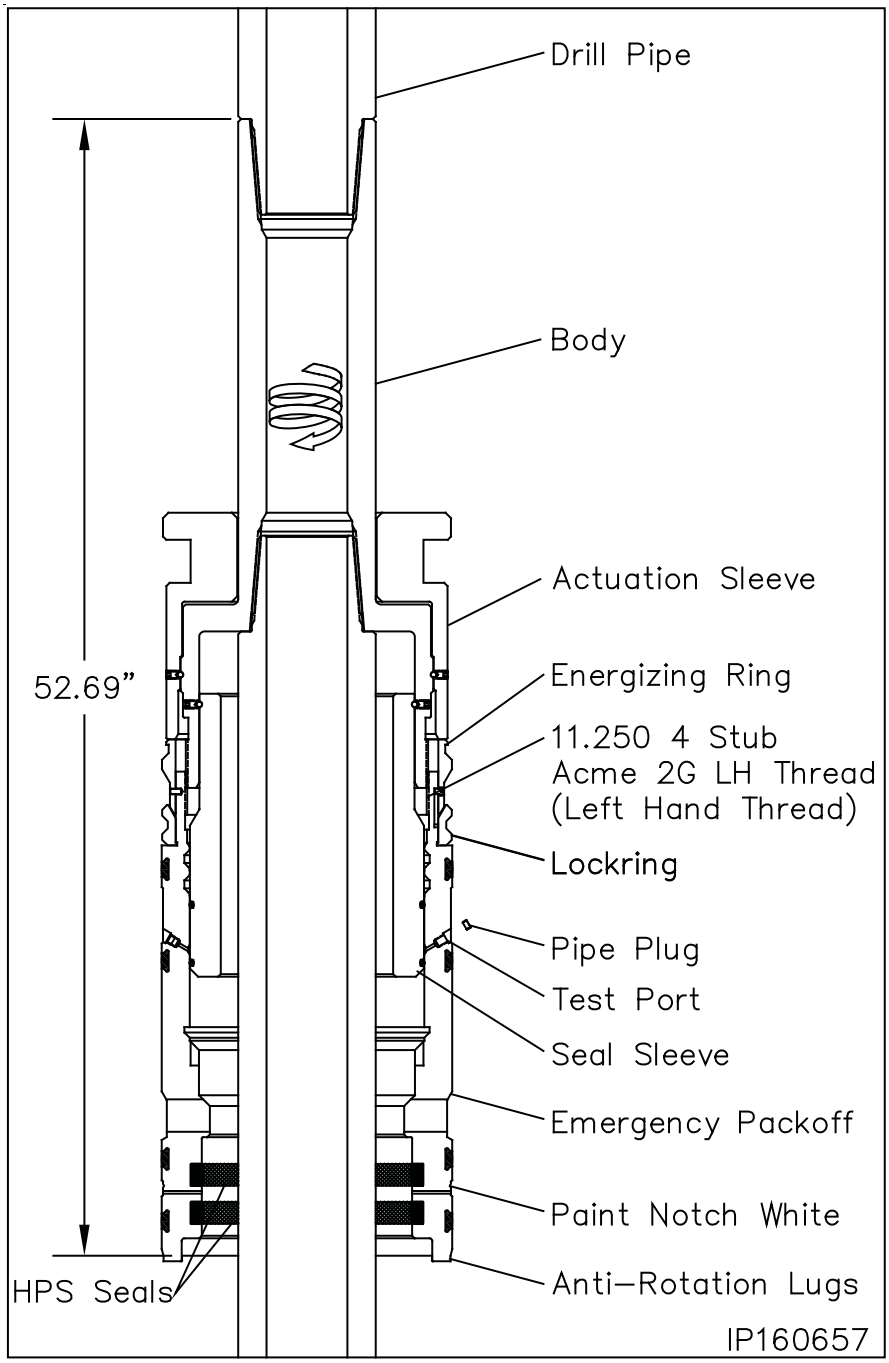


Stage 6A — Install the MBU-2LR Emergency Packoff

6. Pick up the packoff and carefully pass it over the drill pipe and set it on top of the floor slips.
7. Pick up the running tool with landing joint and remove the tool protector sleeve with counter clockwise rotation and set the sleeve aside.
8. Thoroughly clean and lightly lubricate the mating acme threads of the running tool and packoff with oil or light grease.
9. Lightly lubricate the seal sleeve o-rings with oil or a light grease.
10. Make up the running tool to the drill pipe in the floor slips using the appropriate length pip x pin sub.
11. Pick up the packoff and thread it onto the running tool with clockwise (Right) rotation until the Energizing Ring makes contact with the lower body of the tool. (Approximately 4 turns).
12. Install (1) 1/8” NPT pipe plug in the OD test port of the packoff and tighten securely
13. Attach a test pump to the remaining open port and inject test fluid between the seal sleeve o-rings until a stable test pressure of 5,000 psi is achieved.
14. If the test fails, remove the tool and replace the leaking o-rings.
15. After a satisfactory test is achieved remove the test pump and the 1/8” pipe plug from the opposite test port.

WARNING: All 1/8” pipe plugs must be removed prior to installing the packoff

16. Thoroughly clean and lightly lubricate the packoff ID ‘HPS’ seals and the OD dovetail seals with oil or light grease.



17. Using a straight edge positioned vertically and centered on the anti-rotation lug on the bottom of the packoff, place a white paint mark up the side of the packoff in line with the lug.

Note: The line will be used to guide the packoff anti-rotation lug into its mating notch in the slip bowl.

Stage 6A — Install the MBU-2LR Emergency Packoff

Landing the Packoff

18. Pick up the drill string and remove the floor slips.

19. Carefully lower the packoff through the rig floor and position it just above the housing.

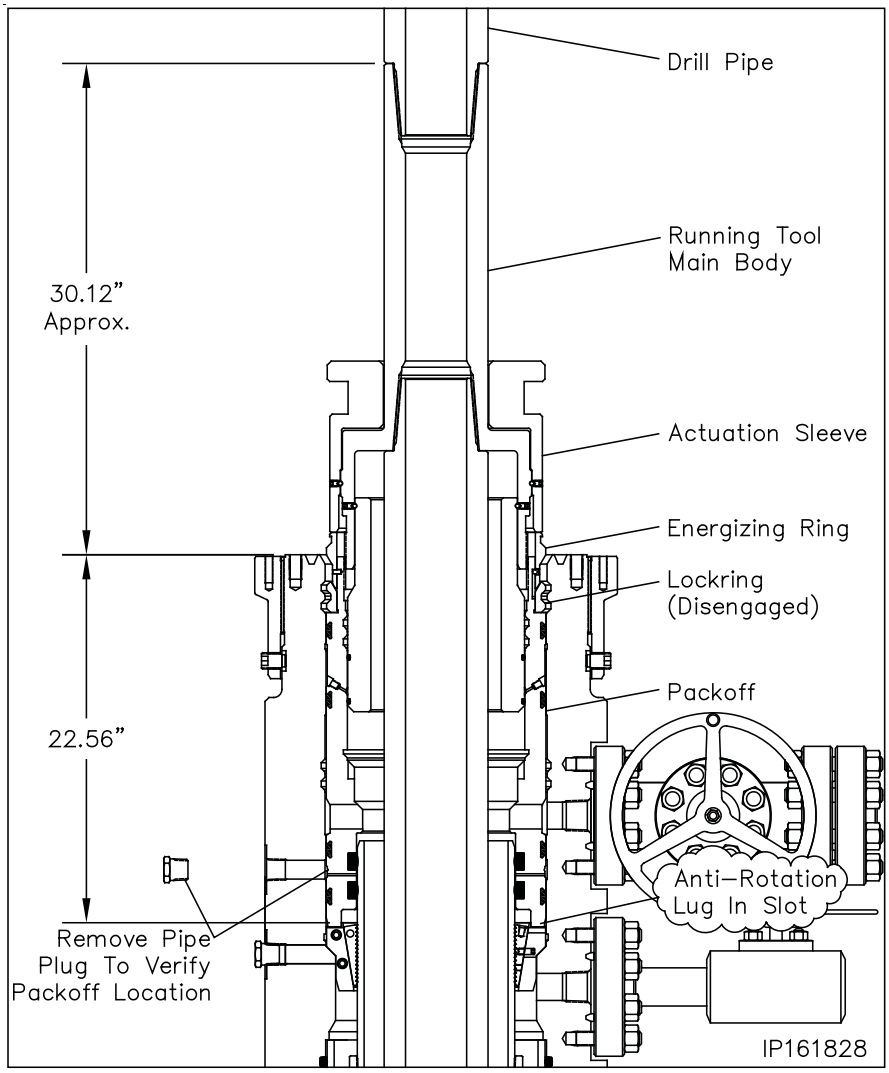
20. Align the white paint line with the existing paint mark on top of the housing.

21. While holding the packoff to maintain alignment, carefully lower the packoff into the housing until it lands on top of the slip hanger.

Note: When properly positioned the top of the running tool will be approximately 30.12” above the top of the MBU-3T Housing.

22. Remove the upper 1” LP pipe plug from the sight port to verify the packoff is properly landed. The 5/16” scribe line should be clearly visible in the center of the port.

With landing verified, reinstall the pipe plug and tighten securely.



Stage 6A — Install the MBU-2LR Emergency Packoff

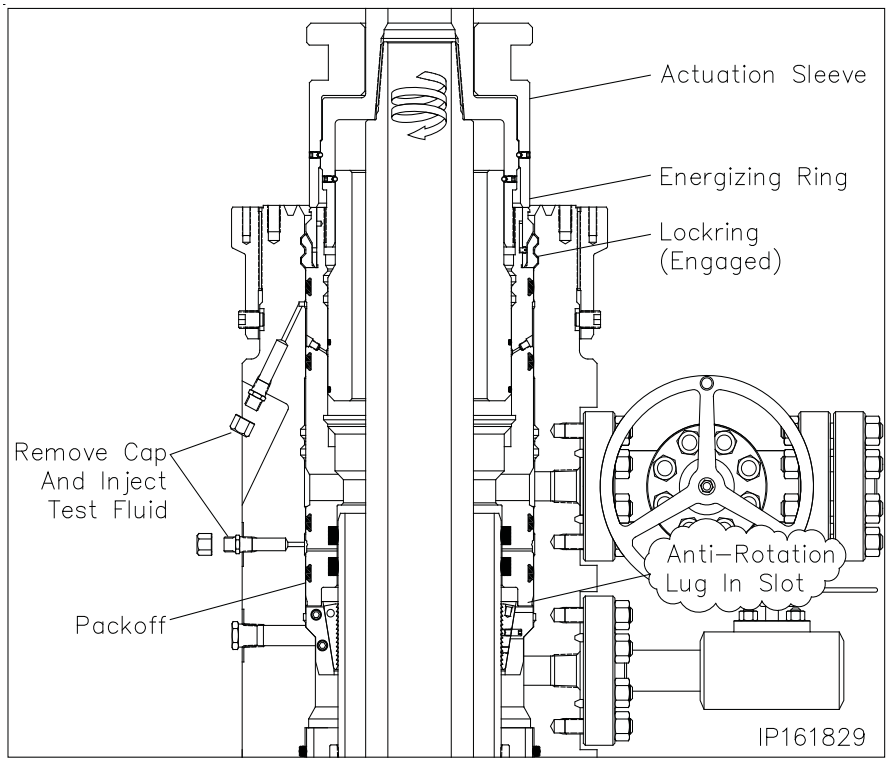
Seal Test

1. Locate the upper and lower seal test fittings on the O.D. of the housing and remove the dust cap from the fittings.
2. Attach a test pump to the open lower fitting and pump clean test fluid between the seals until a stable test pressure of 5,000 psi is achieved.
3. Hold test pressure for 5 minutes.
4. If a leak develops, bleed off test pressure, remove the packoff from the wellhead and replace the leaking seals.
5. After satisfactory test is achieved, bleed off the test pressure but leave the test manifold in place.
6. Repeat steps 1 through 5 for the upper seal test port.

Engaging the Lockring

7. Using only chain tongs, rotate the landing joint approximately 6 to 6-1/2 turns counter clockwise (Left) to engage the packoff lockring in its mating groove in the bore of the MBU-3T housing.

Note: Approximately 800 to 900 ft. lbs. of torque will be required to break over the shear pins in the packoff. The torque will drop off and then increase slightly when the energizing ring pushes the lockring out. A positive stop will be encountered when the lockring is fully engaged.



WARNING: It is imperative that the drill pipe landing joint remain concentric with the well bore when rotating to engage the lockring. This can be accomplished with the use of the air hoist.

WARNING: If the required turns to engage the lockring are not achieved or excessive torque is encountered, remove the packoff and first call local branch and then Houston Engineering.

8. Back off the landing joint/running tool approximately three turns. Using the top drive, exert a 40,000 lbs. pull on the landing joint.
9. Reattach the test pump to the open test manifolds and retest the packoff seals to 5,000 psi for 15 minutes. This will also verify that the packoff is in place.
10. After satisfactory test is achieved, bleed off all test pressure, remove test pump and reinstall the dust cap on the open fittings.
11. Using only chain tongs, rotate the landing joint clockwise until the tool comes free of the packoff (approximately 9 to 9-1/2 turns) and then retrieve the tool with a straight vertical lift.
12. Reinstall and nipple up the BOP stack.

Stage 7 — Test the BOP Stack

Immediately after making up the BOP stack and periodically during the drilling of the well for the next casing string the BOP stack (connections and rams) must be tested.

1. Examine the ***11" Nominal x 4-1/2" IF (NC-50) CW Test Plug/ Retrieving Tool (Item ST7)***. Verify the following:
   - 1-1/4" VR plug and weep hole plug are in place and tightened securely
   - elastomer seal is in place and in good condition
   - retractable lift lugs are in place, clean, and free to move
   - drill pipe threads are clean and in good condition

2. Position the test plug with the elastomer seal down and the lift lugs up and make up the tool to a joint of drill pipe.

WARNING: Ensure that the lift lugs are up and the elastomer seal is down

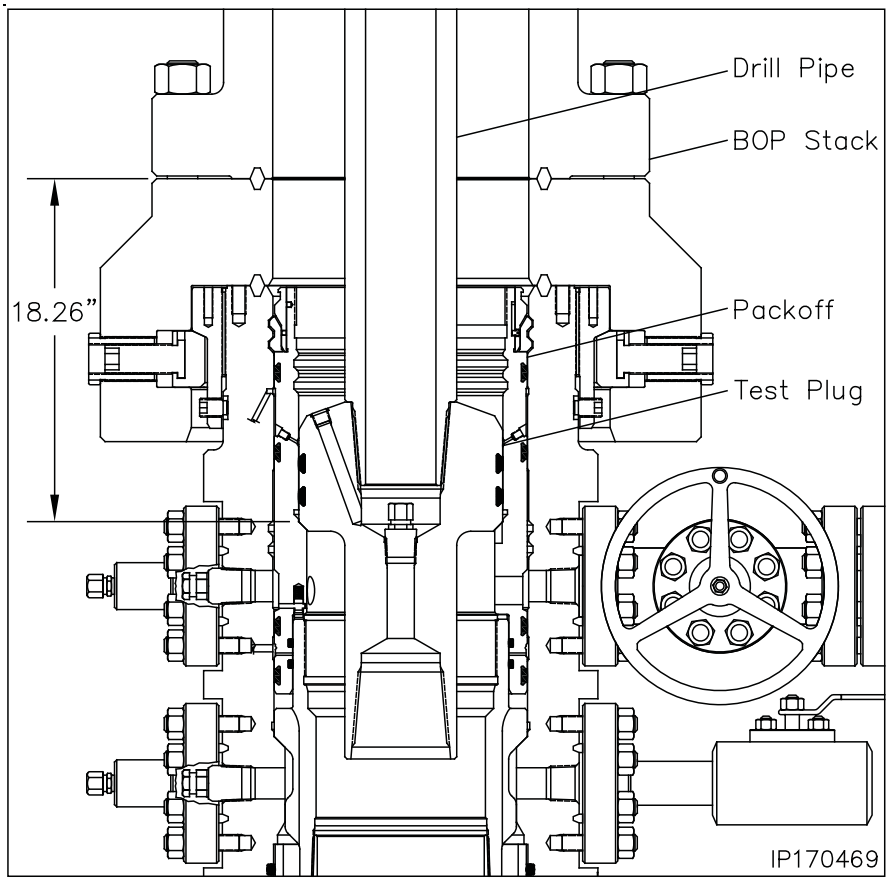
3. Remove the 1/2" NPT pipe plug from the weep hole if pressure is to be supplied through the drill pipe.

4. Open the housing upper side outlet valve.

5. Lightly lubricate the test plug seal with oil or light grease.

6. Carefully lower the test plug through the BOP and land it on the load shoulder in the packoff, 18.26" below the top of the drilling adapter.

7. Close the BOP rams on the pipe and test the BOP to 5,000 psi.



Note: Any leakage past the test plug will be clearly visible at the open side outlet valve.

8. After a satisfactory test is achieved, release the pressure and open the rams.

9. Remove as much fluid as possible from the BOP stack and the retrieve the test plug with a straight vertical lift.

Note: When performing the BOP blind ram test it is highly recommended to suspend a stand of drill pipe below the test plug to ensure the plug stays in place while disconnecting from it with the drill pipe.

10. Repeat this procedure as required during the drilling of the hole section.

Stage 8 — Run the Upper Wear Bushing

Note: Always use a Wear Bushing while drilling to protect the load shoulders from damage by the drill bit or rotating drill pipe. The Wear Bushing **must be retrieved** prior to running the casing.

1. Examine the ***13-5/8" x 11" x 9.00" ID MBU-3T-UPR Wear Bushing (Item ST8).*** Verify the following
   - internal bore is clean and in good condition
   - o-ring is in place and in good condition
   - shear o-ring cord is in place and in good condition
   - paint anti-rotation lugs white and allow paint to dry

Run the Wear Bushing Before Drilling

2. Orient the ***13-5/8" Nominal x 4-1/2" IF (NC-50) CW Test Plug/ Retrieving Tool (Item ST1)*** with drill pipe connection up.

3. Attach the Retrieving Tool to a joint of drill pipe.

WARNING: Ensure that the lift lugs are down and the elastomer seal is up

4. Align the retractable lift lugs of the tool with the retrieval holes of the bushing and carefully lower the tool into the Wear Bushing until the lugs snap into place.

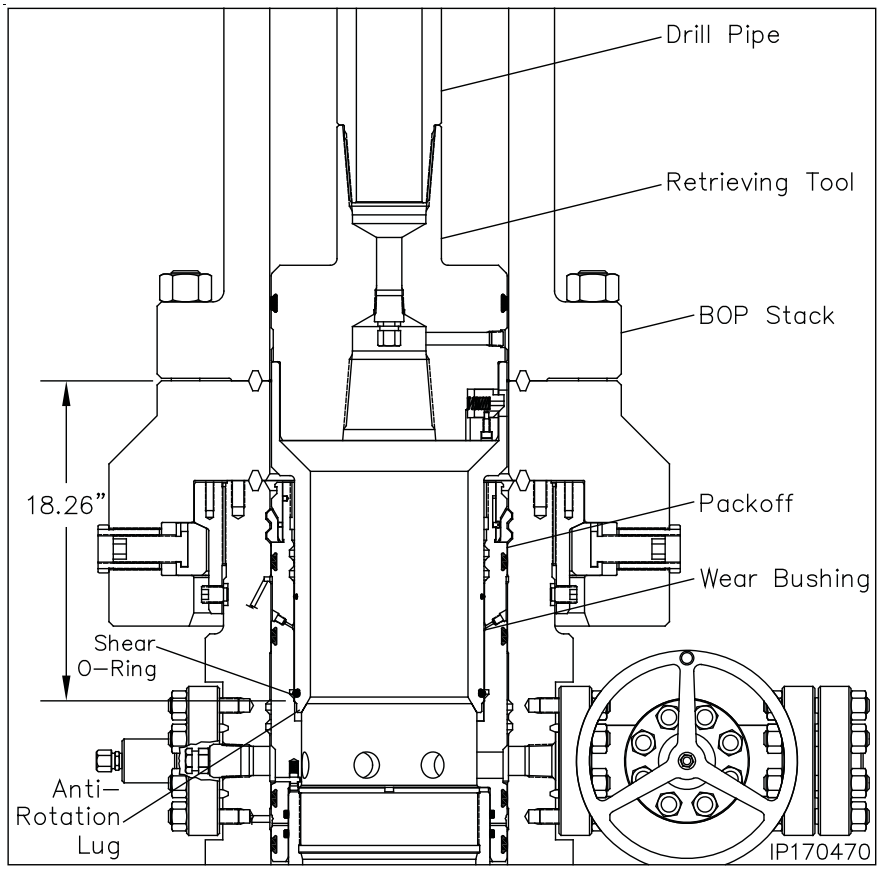
Note: If the lugs did not align with the holes, rotate the tool in either direction until they snap into place.

5. **Apply a heavy coat of grease, not dope, to the OD of the bushing.**

6. Ensure the BOP stack is drained and free of any debris from previous test.

7. Slowly lower the Tool/Bushing Assembly through the BOP stack and land it on the load shoulder in the housing, 18.26" below the top of the drilling adapter.

8. Rotate the drill pipe clockwise (right) to locate the stop lugs in their mating notches in the head. When properly aligned the bushing will drop an additional 1/2".



Note: The Shear O-Ring on bottom of the bushing will locate in a groove above the load shoulder in the head to act as a retaining device for the bushing.

9. Remove the tool from the Wear Bushing by rotating the drill pipe counter clockwise (left) 1/4 turn and lifting straight up.

10. Drill as required.

Note: It is highly recommended to retrieve, clean, inspect, grease, and reset the wear bushing each time the hole is tripped during the drilling of the hole section.

Retrieve the Wear Bushing After Drilling

11. Make up the Retrieving Tool to the drill pipe.

12. Drain BOP stack and wash out if necessary.

13. Slowly lower the tool into the Wear Bushing.

14. Rotate the Retrieving Tool clockwise until a positive stop is felt. This indicates the lugs have snapped into the holes in the bushing.

15. Using the top drive, slowly pick up on the landing joint in 1000 lbs increments until the busing starts to rise. This action should take a minimum of 3000 lbs pull. Do Not Exceed 60,000 lbs.

16. Retrieve the Wear Bushing, and remove it and the Retrieving Tool from the drill string.

Stage 9 — Hang Off the 5-1/2” Casing

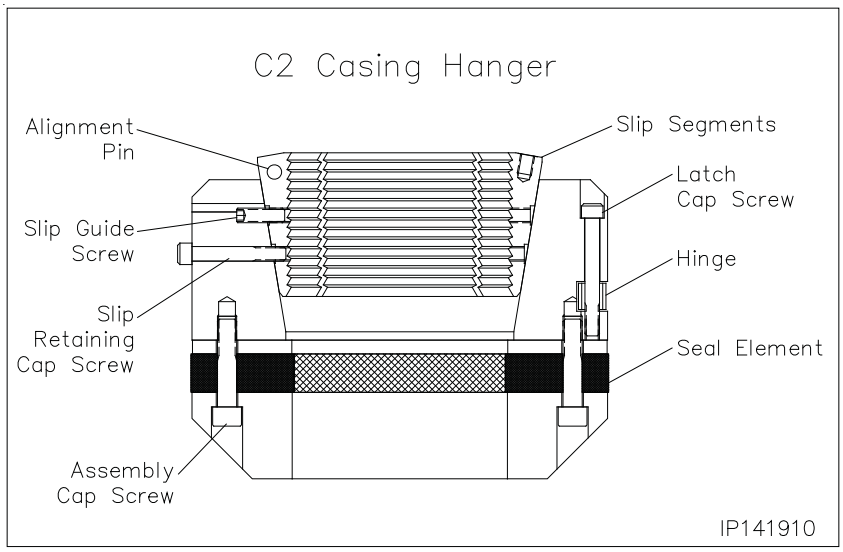
1. Run and cement the 5-1/2” casing string as required.
2. Open the housing upper side outlet valve to drain the BOP stack.
3. Clean the ID of the BOP stack and OD of the casing with a high pressure water hose until returns through the open side outlet valve are clean and free of debris.
4. Thoroughly inspect the BOP stack to ensure all rams are fully retracted into their respective ram bores, the annular rubber is fully relaxed, all drilling adapters/spools are full opening and there are no casing collars between the rig floor and the wellhead.

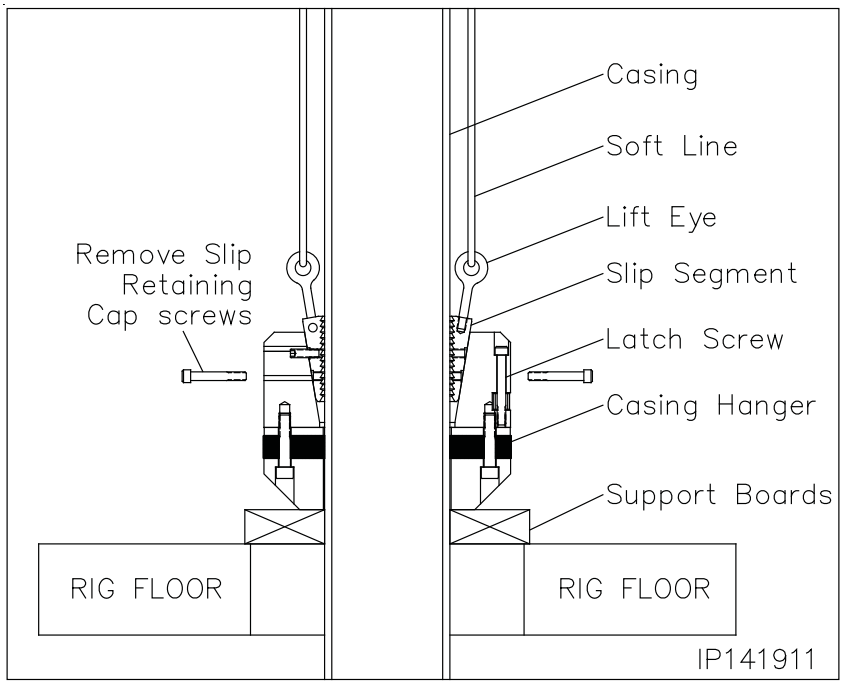
Note: Side outlet valve to remain open while setting the casing hanger.

5. Examine the ***11” x 5-1/2” C2 Slip Casing Hanger (Item A13).*** Verify the following:
   - slips and internal bore are clean and in good condition
   - all screws are in place
   - packoff rubber is in good condition

Note: Ensure that the packoff rubber does not protrude beyond the O.D. of the casing hanger body. If it does, loosen the cap screws in the bottom of the hanger.

6. Measure the distance from the rig floor to the top of the wellhead flange and record this measurement.
7. Pour a light oil through the BOP stack to thoroughly coat the OD of the casing.
8. Using a 5/16” Allen wrench, remove the two latch screws located 180° apart on top of the hanger and separate the hanger into two halves.
9. Place two boards on the housing flange against the casing to support the hanger.
10. Pick up one half of the hanger and place it around the casing and on top of the boards.
11. Pick up the second hanger half and place it around the casing adjacent the first half.





12. Slide the two hanger halves together ensuring the slip guide pins properly engage the opposing hanger half.
13. Reinstall the latch screws and tighten securely.
14. Using a 5/16” allen wrench, remove the slip retainer cap screws and discard them.
15. Lubricate the OD of the Casing Hanger liberally with a light grease or oil.
16. Prepare to lower the hanger through the BOP stack.

Stage 9 — Hang Off the 5-1/2” Casing

WARNING: Do not drop or allow the hanger to fall through the BOP stack.

One method commonly used is to loop or tie four lengths of soft line through the hanger eye bolts as shown. Tie a knot in the soft line at the measurement noted in step six (6).

Note: The soft line may stretch and give an imprecise indication of the Casing Hanger’s location.

17. Remove the boards and allow the Casing Hanger to slide through the BOP and into the MBU-3T packoff bowl using the cat line to center that casing if necessary.

18. When the Casing Hanger is down as indicated by the knots in the soft line, pull tension to the desired hanging weight and slack off.

Note: A sharp decrease on the weight indicator will signify that the Hanger has taken weight and at what point.

19. Untie the soft lines and pull them back through the lift eyes or drop them inside the BOP stack.

20. Prior to nippling down the BOP the integrity of the slip hanger seal can be verified by closing the BOP annular on the casing string and applying customer specific pressure through the kill line.

21. Once a satisfactory test is achieved, bleed off all test pressure, and drain the BOP stack.

22. Locate the actuation screws on the OD of the lower drilling adapter.

23. Using a hex drive, fully retract the (16) actuation screws until they are slightly over flush with the glandnuts.

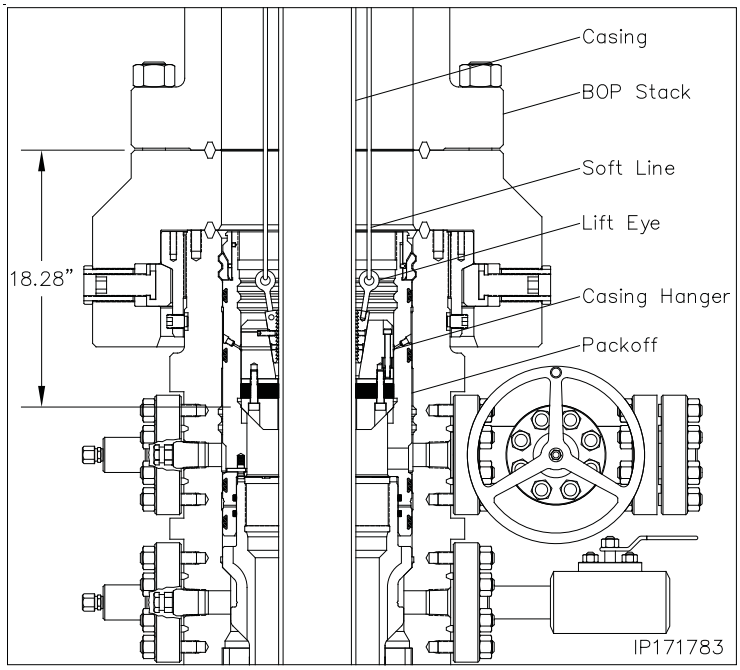
24. Pick up on the BOP stack a minimum of 12” above the housing and secure with safety slings.

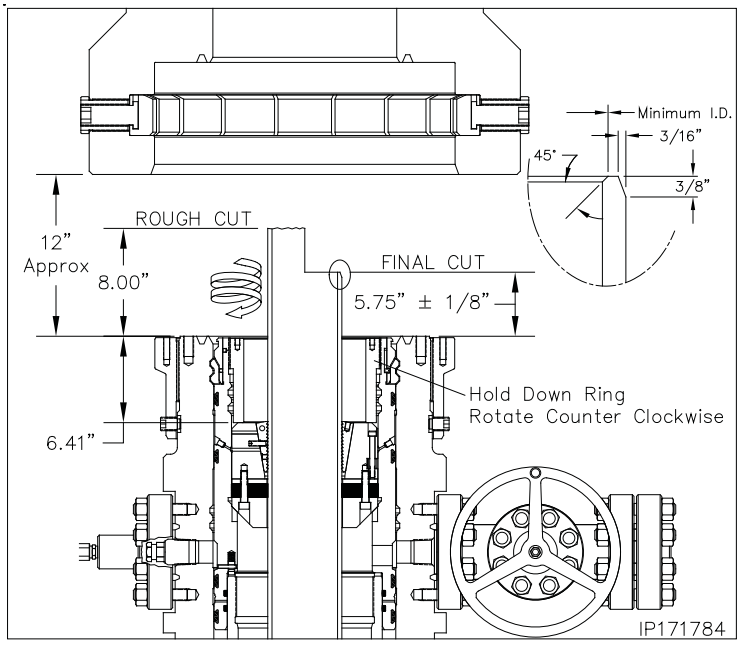
25. Remove the four lift eyes.

26. Rough cut the casing approximately 8” above the top of the housing and move the excess casing out of the way.

27. Final cut the casing at 5-3/4” ± 1/8” above the top flange of the housing.

28. Grind the casing stub level and then place a 3/16” x 3/8” bevel on the O.D. and a I.D. chamfer to match the minimum bore of the tubing head to be installed.





29. Thoroughly clean the top of the housing and Casing Hanger. Ensure all cutting debris are removed.

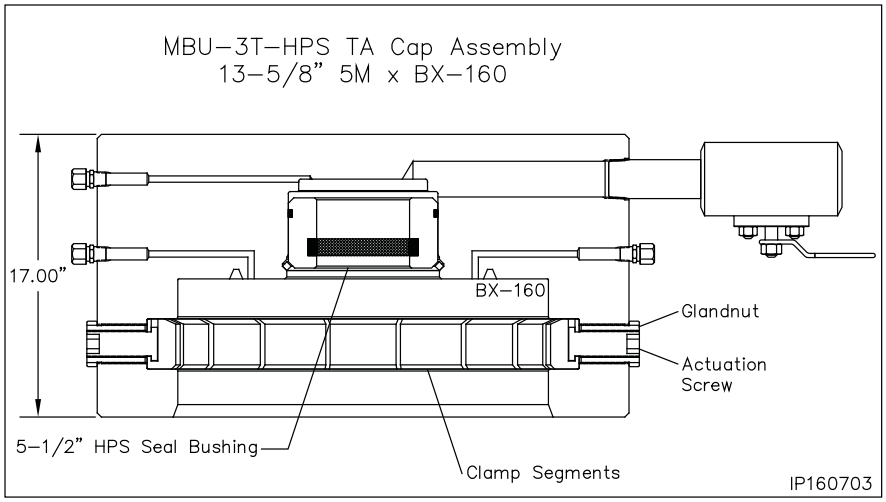
30. Thoroughly clean and lightly lubricate the mating acme threads of the MBU-3T packoff and the slip ***Hold Down Ring (Item A14)***.

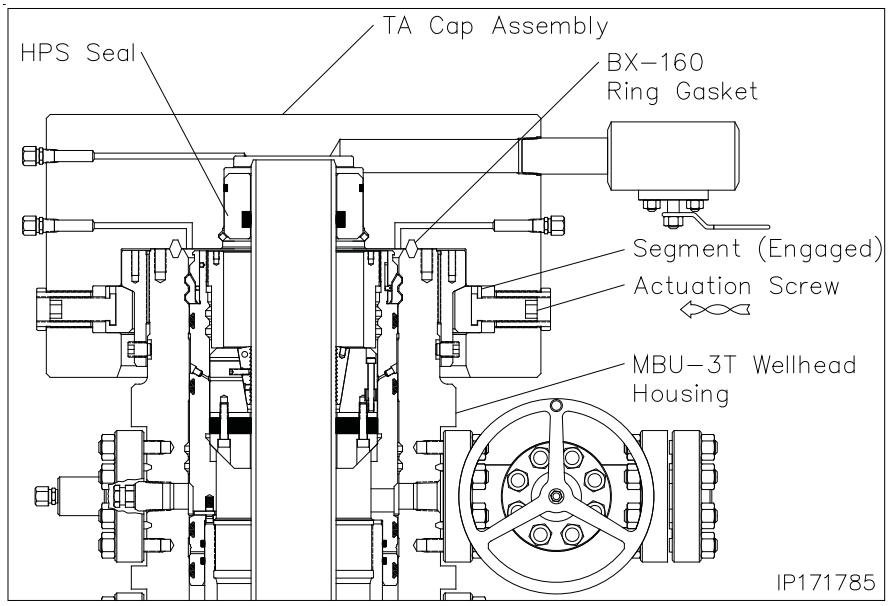
31. Thread the ring into the packoff with counter clockwise rotation to a positive stop on top of the slip hanger.

32. Re-land the BOP stack and prepare to remove the upper adapter with the BOP stack

Stage 10 — Install the 'Quick Connect' TA Cap Assembly

1. Examine the ***13-5/8" 5M 'Quick Connect' TA Cap Assembly (Item R3).*** Verify the following:
   - bore is clean and free of debris
   - ring groove is clean and undamaged
   - (16) drive screws and clamp segments are properly installed and fully retracted
   - 5-1/2" HPS seal bushing is in place and properly retained with the square snap wire
2. Thoroughly clean the top of the MBU-3T housing, thread hub, and the mating seal surfaces of the TA Cap.
3. Install a new ***BX-160 Ring Gasket*** into the ring groove of the housing.
4. Using a suitable lifting devise with weight rated slings, pick up the TA Cap assembly and carefully lower it over the casing stub and land it on the ring gasket.
5. Ensure the TA Cap is level and then carefully run in all of the drive screws of the TA Cap to contact point.
6. Ensure the assembly remains level, run in one actuation and torque to 100 ft lbs.
7. Locate the screw 180° from the first and torque to 100 ft lbs.
8. Locate the screws 90° to the right and left and torque to 100 ft lbs.
9. Position the second 4 point sequence 90° from the first and torque each screw to 200 ft lbs
10. Run in all remaining screws to contact and then torque each screw to 400 ft lbs.
11. Make one additional round until a stable torque of 400 ft lbs on all (16) screws is achieved.

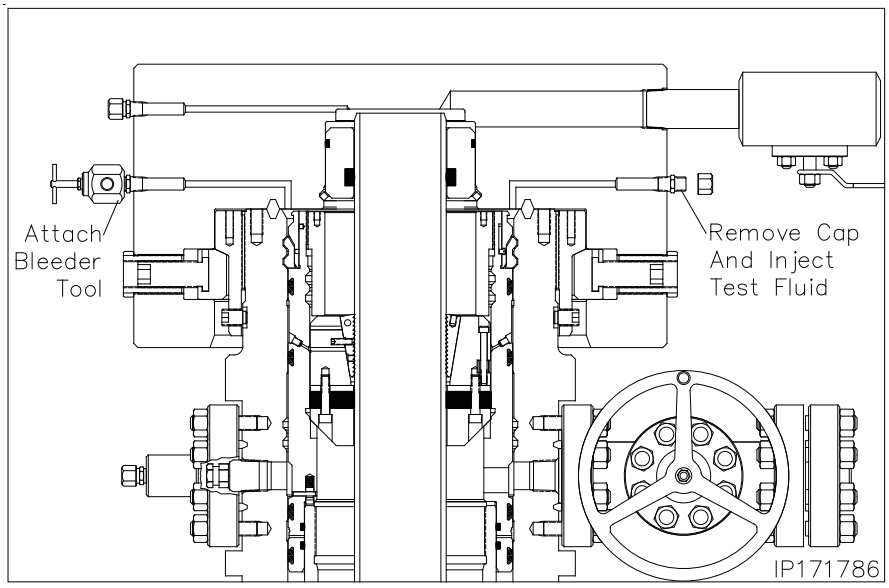




Stage 10 — Install the 'Quick Connect' TA Cap Assembly

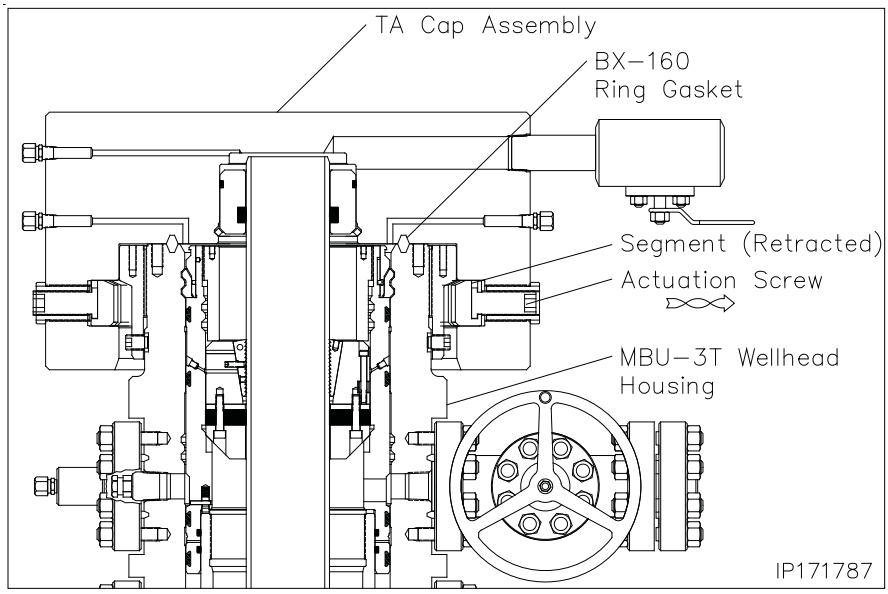
Connection Test

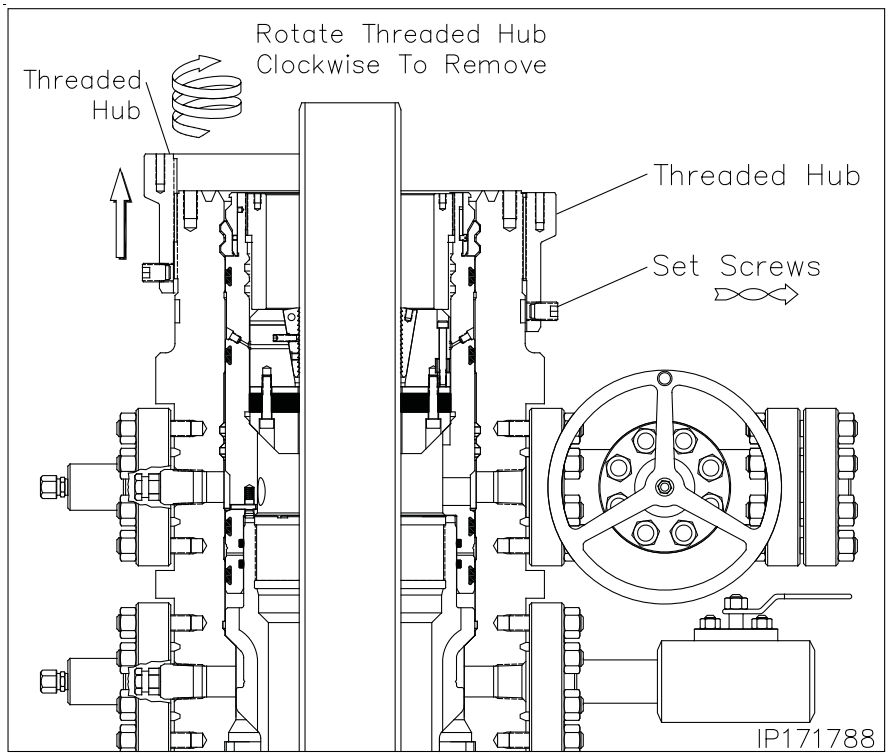
1. Open the TA Cap ball valve and the housing upper side outlet valve to monitor leakage.
2. Locate the two test fittings marked flange test and remove the dust caps from the fittings.
3. Attach a bleeder tool to one of the open fitting and open the tool.
4. Attach a test pump to the remaining open fitting and pump clean test fluid into the void area until a continuous stream flows from the open bleeder tool.
5. Close the tool and continue pumping fluid until a stable test pressure of 5,000 psi or 80% of casing collapse is achieved, whichever is less.
6. Hold test pressure for 15 minutes.
7. After a satisfactory test is achieved, bleed off the test pressure, drain the fluid, remove the bleeder tool and re install the dust cap on the open fittings.
8. Close all open valves.



Stage 11 — Remove the TA Cap Assembly

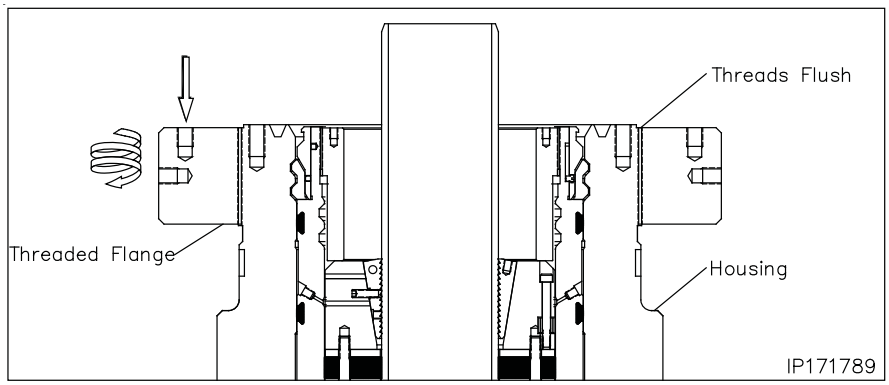
1. Open the ball valve on the TA cap to check for trapped pressure above the casing hanger.
2. Locate the actuation screws on the OD of the TA Cap Assembly.
3. Using a hex drive, fully retract the actuation screws until they are slightly over flush with the glandnuts.
4. Install a lift eye with pick up sling to the top of the TA Cap and lift the cap free of the wellhead.
5. Remove the thread hub set screws.
6. Remove the thread hub from the top of the housing with clockwise rotation.





Stage 11 — Remove the TA Cap Assembly

7. Examine the 13-5/8” 5M Thread Flange. Verify the following:
   - Acme thread are clean and in good condition
8. Thoroughly clean and lightly lubricate the mating threads of the housing and the Thread Flange with Copper Coat or Never Seize.
9. Pick up the flange and carefully thread it onto the top of the housing with counter clockwise rotation until the top of the flange is level with the top of the Acme thread of the housing.
10. Rotate the flange in either direction to two hole.
11. Prepare to install the tubing head.



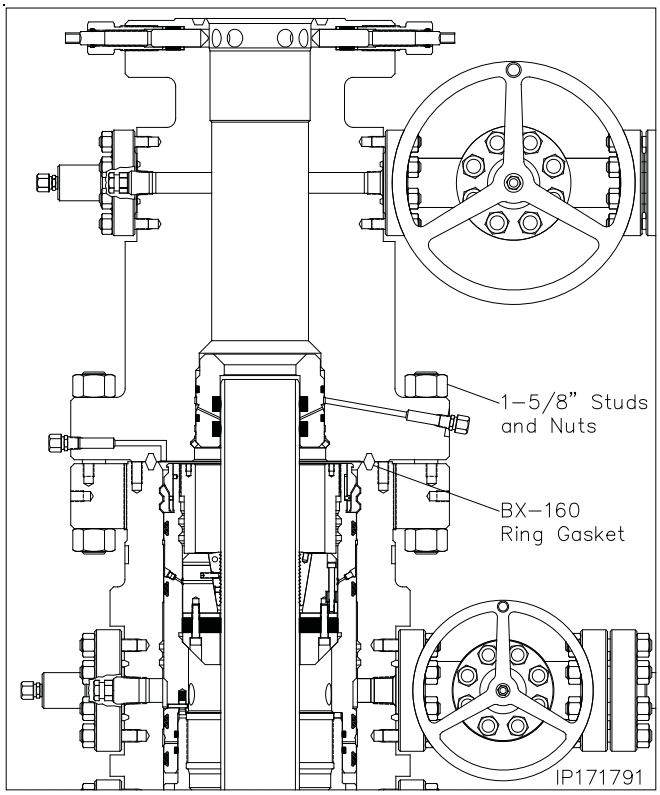
Stage 12 — Install the Tubing Head

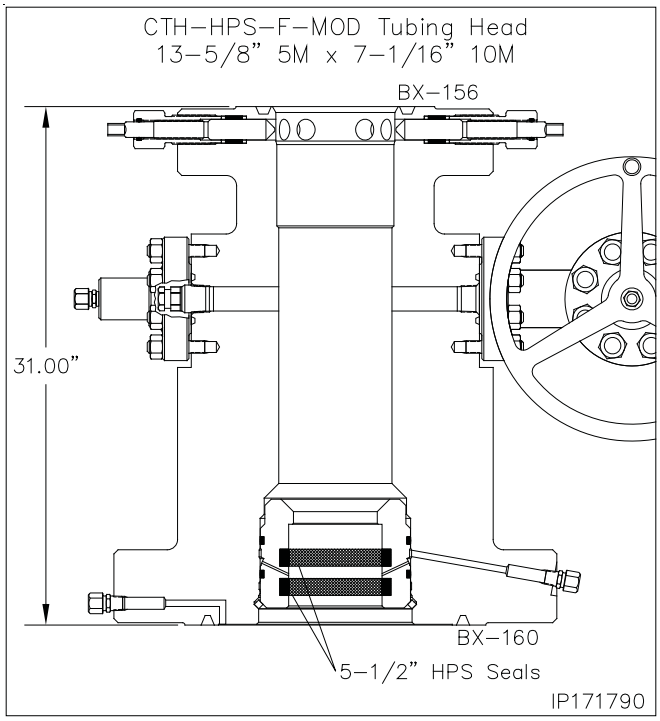
Note: The tubing head may be shipped to location with the lower frac valve pre installed and tested.

1. Examine the ***13-5/8" 5M x 7-1/16" 10M CW, CTH-HPS-F MOD Tubing Head With 5-1/2" DBLHPS Bottom (Item B1)*** Verify the following:
   - seal area and bore are clean and in good condition
   - ***HPS-F MOD Secondary Seal Bushing*** is in place and properly retained with a square snap wire
   - all peripheral equipment is intact and undamaged

2. Clean the mating ring grooves of the MBU-3T Housing and tubing head.

3. Lightly lubricate the I.D. of the tubing head 'HPS' seals and the casing stub with a light oil or grease.





Note: Excessive oil or grease may prevent a good seal from forming!

4. Install a new ***BX-160 Ring Gasket (Item B12)*** in the ring groove of the housing.

5. Pick up the tubing head and suspend it above the housing.

6. Orient the head so that the outlets properly align with the housing upper outlets and then carefully lower the head over the casing stub and then land it on the ring gasket.

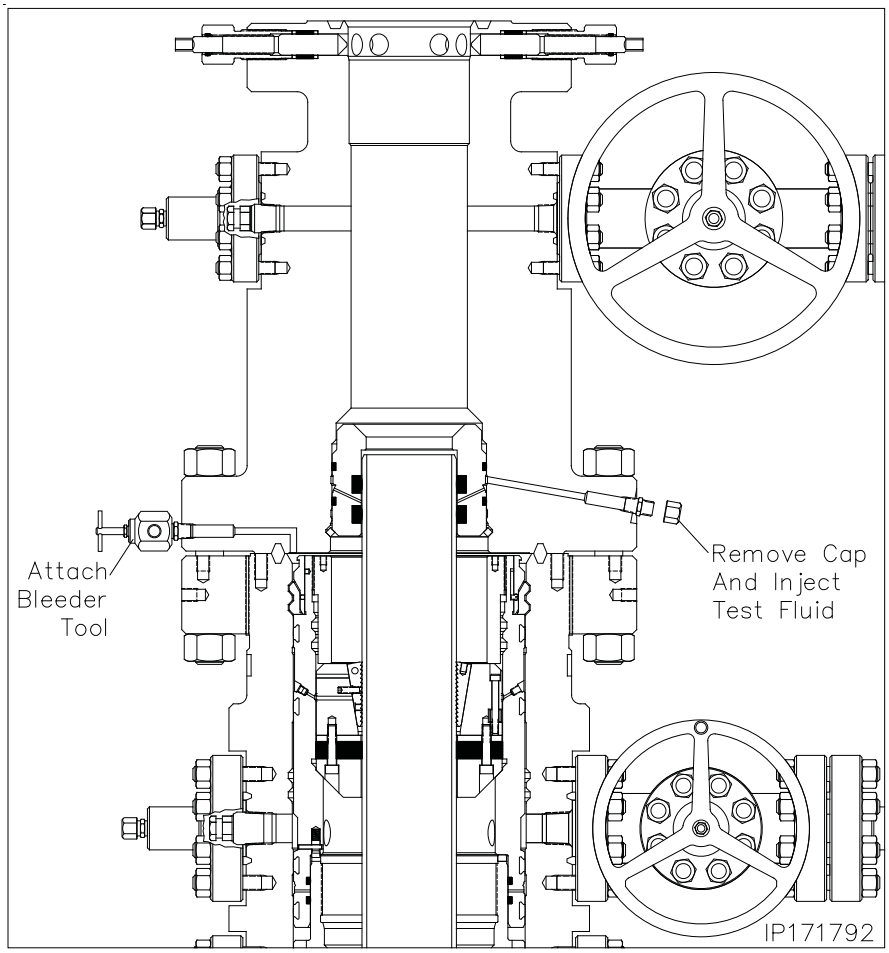
Warning: Do Not damage the 'HPS' seals or their sealing ability will be impaired!

7. Make up the flange connection using the appropriate size ***studs and nuts (Item B13)***, tightening them in an alternating cross pattern.

Stage 12 — Install the Tubing Head

Seal Test

1. Locate the seal test fitting and one flange test fitting on the Tubing Head lower flange and remove the dust cap from both fittings.
2. Attach a Bleeder Tool to one of the open flange test fittings and open the Tool.
3. Attach a test pump to the seal test fitting and pump clean test fluid between the HPS Seals until a test pressure of ***10,000 psi or 80% of casing collapse - Whichever is less.***
4. Hold test pressure for 15 minutes.
5. If pressure drops, a leak has developed. Bleed off test pressure and take the appropriate action in the adjacent table.
6. After a satisfactory test is achieved, remove the Test Pump, drain test fluid and reinstall the dust cap on the open seal test fitting.

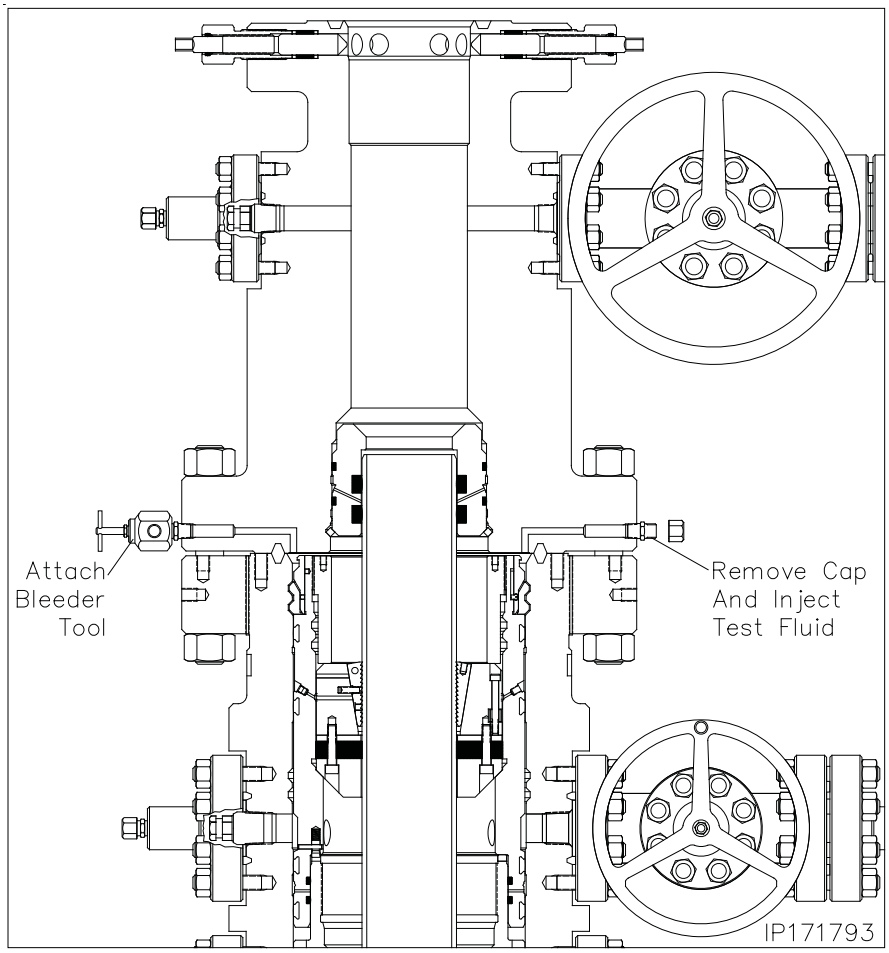


Seal Test	
Leak Location	**Appropriate Action**
Open bleeder tool - Lower HPS seal is leaking	Remove Tubing Head and replace leaking seals. Re land and retest seals
Into the tubing head bore - Upper HPS seal is leaking	

Stage 12 — Install the Tubing Head

Flange Test

1. Locate the remaining flange test fitting on the Tubing Head lower flange and remove the dust cap from the fitting.
2. Attach a test pump to the open flange test fitting and inject test fluid into the flange connection until a continuous stream flows from the opposite flange test bleeder tool.
3. Close the bleeder tool and continue to pumping test fluid to ***5,000 psi or 80% of casing collapse - Whichever is less..***
4. Hold test pressure for 15 minutes.
5. If pressure drops a leak has developed. Take the appropriate action from the adjacent chart.
6. Repeat this procedure until a satisfactory test is achieved.
7. Once a satisfactory test is achieved, remove the test pump and bleeder tool, drain all test fluid, and reinstall the dust caps.



Flange Test	
Leak Location	**Appropriate Action**
Between flanges - Ring gasket is leaking	Verify flange bolt torque. If correct, remove tubing head to clean, inspect and possibly replace damaged ring gasket.

Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal

1. **Introduction and Scope.** The following recommended procedure has been prepared with particular regard to attaining pressure-tight weld when attaching casing heads, flanges, etc., to casing. Although most of the high strength casing used (such as N-80) is not normally considered field weldable, some success may be obtained by using the following or similar procedures.

Caution: In some wellheads, the seal weld is also a structural weld and can be subjected to high tensile stresses. Consideration must therefore be given by competent authority to the mechanical properties of the weld and its heat affected zone.

   a. The steels used in wellhead parts and in casing are high strength steels that are susceptible to cracking when welded. It is imperative that the finished weld and adjacent metal be free from cracks. The heat from welding also affects the mechanical properties. This is especially serious if the weld is subjected to service tension stresses.

   b. This procedure is offered only as a recommendation. The responsibility for welding lies with the user and results are largely governed by the welder's skill. Weldability of the several makes and grades of casing varies widely, thus placing added responsibility on the welder. Transporting a qualified welder to the job, rather than using a less-skilled man who may be at hand, will, in most cases, prove economical. The responsible operating representative should ascertain the welder's qualifications and, if necessary, assure himself by instruction or demonstration, that the welder is able to perform the work satisfactorily.

2. **Welding Conditions.** Unfavorable welding conditions must be avoided or minimized in every way possible, as even the most skilled welder cannot successfully weld steels that are susceptible to cracking under adverse working conditions, or when the work is rushed. Work above the welder on the drilling floor should be avoided. The weld should be protected from dripping mud, water, and oil and from wind, rain, or other adverse weather conditions. The drilling mud, water, or other fluids must be lowered in the casing and kept at a low level until the weld has properly cooled. It is the responsibility of the user to provide supervision that will assure favorable working conditions, adequate time, and the necessary cooperation of the rig personnel.

3. **Welding.** The welding should be done by the shielded metal-arc or other approved process.

4. **Filler Metal.** Filler Metals. For root pass, it's recommended to use E6010, E6011 (AC), E6019 or equivalent electrodes. The E7018 or E7018-A1 electrodes may also be used for root pass operations but has the tendency to trap slag in tight grooves. The E6010, E6011 and E6019 offer good penetration and weld deposit ductility with relatively high intrinsic hydrogen content. Since the E7018 and E7018-A1 are less susceptible to hydrogen induced cracking, it is recommended for use as the filler metal for completion of the weld groove after the root pass is completed. The E6010, E6011 (AC), E6019, E7018 and E7018-A1 are classified under one of the following codes AWS A5.1 (latest edition): Mild Steel covered electrodes or the AWS A5.5 (latest edition): Low Alloy Steel Covered Arc-Welding Electrodes. The low hydrogen electrodes, E7018 and E7018-A1, should not be exposed to the atmosphere until ready for use. It's recommended that hydrogen electrodes remain in their sealed containers. When a job arises, the container shall be opened and all unused remaining electrodes to be stored in heat electrode storage ovens. Low hydrogen electrodes exposed to the atmosphere, except water, for more than two hours should be dried 1 to 2 hours at 600ºF to 700 ºF (316ºC to 371 ºC) just before use. It's recommended for any low hydrogen electrode containing water on the surface should be scrapped.

5. **Preparation of Base Metal.** The area to be welded should be dry and free of any paint, grease/oil and dirt. All rust and heat-treat surface scale shall be ground to bright metal before welding.

Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal

6. **Preheating.** Prior to any heating, the wellhead member shall be inspected for the presence of any o-rings or other polymeric seals. If any o-rings or seals are identified then preheating requires close monitoring as noted in paragraph 6a. Before applying preheat, the fluid should be bailed out of the casing to a point several inches (>6" or 150 mm) below the weld joint/location. Preheat both the casing and wellhead member for a minimum distance of three (3) inches on each side of the weld joint using a suitable preheating torch in accordance with the temperatures shown below in a and b. The preheat temperature should be checked by the use of heat sensitive crayons. Special attention must be given to preheating the thick sections of wellhead parts to be welded, to insure uniform heating and expansion with respect to the relatively thin casing.

   a. Wellhead members containing o-rings and other polymeric seals have tight limits on the preheat and interpass temperatures. Those temperatures must be controlled at 200ºF to 325ºF or 93 ºC to 160ºC and closely monitored to prevent damage to the o-ring or seals.
   b. Wellhead members not containing o-rings and other polymeric seals should be maintained at a preheat and interpass temperature of 400ºF to 600ºF or 200ºC to 300ºC.

7. **Welding Technique.** Use a 1/8 or 5/32-inch (3.2 or 4.0 mm) E6010 or E7018 electrode and step weld the first bead (root pass); that, weld approximately 2 to 4 inches (50 to 100 mm) and then move diametrically opposite this point and weld 2 to 4 inches (50 to 100 mm) halfway between the first two welds, move diametrically opposite this weld, and so on until the first pass is completed. This second pass should be made with a 5/32-inch (4.0 mm) low hydrogen electrode of the proper strength and may be continuous. The balance of the welding groove may then be filled with continuous passes without back stepping or lacing, using a 3/16-inch (4.8 mm) low hydrogen electrode. All beads should be stringer beads with good penetration. There should be no undercutting and weld shall be workmanlike in appearance.

   a. Test ports should be open when welding is performed to prevent pressure buildup within the test cavity.
   b. During welding the temperature of the base metal on either side of the weld should be maintained at 200 to 300°F (93 to 149°C).
   c. Care should be taken to insure that the welding cable is properly grounded to the casing, but ground wire should not be welded to the casing or the wellhead. Ground wire should be firmly clamped to the casing, the wellhead, or fixed in position between pipe slips. Bad contact may cause sparking, with resultant hard spots beneath which incipient cracks may develop. The welding cable should not be grounded to the steel derrick, nor to the rotary-table base.

8. **Cleaning.** All slag or flux remaining on any welding bead should be removed before laying the next bead. This also applies to the completed weld.

9. **Defects.** Any cracks or blow holes that appear on any bead should be removed to sound metal by chipping or grinding before depositing the next bead.

10. **Postheating.** Post-heating should be performed at the temperatures shown below and held at that temperature for no less than one hour followed by a slow cooling. The post-heating temperature should be in accordance with the following paragraphs.

    a. Wellhead members containing o-rings and other polymeric seals have tight limits on the post-heating temperatures. Those temperatures must be controlled at 250ºF to 300ºF or 120 ºC to 150ºC and closely monitored to prevent damage to the o-ring or seals.
    b. Wellhead members not containing o-rings and other polymeric seals should be post-heated at a temperature of 400ºF to 600ºF or 200ºC to 300ºC.

11. **Cooling.** ***Rapid cooling must be avoided.*** To assure slow cooling, welds should be protected from extreme weather conditions (cold, rain, high winds, etc.) by the use of suitable insulating material. (Specially designed insulating blankets are available at many welding supply stores.) Particular attention should be given to maintaining uniform cooling of the thick sections of the wellhead parts and the relatively thin casing, as the relatively thin casing will pull away from the head or hanger if allowed to cool more rapidly. The welds should cool in air to less than 200°F (93°C) (measured with a heat sensitive crayon) prior to permitting the mud to rise in the casing.

12. **Test the Weld.** After cooling, test the weld. The weld must be cool otherwise the test media will crack the weld. The test pressure should be no more than 80% of the casing collapse pressure.

Cactus Speed Head Pressure Testing Statement

Our procedure is to nipple up BOP's to the surface casing, pressure test the BOP's to 5000 psi high and 250 psi low. We do not anticipate breaking any seals on the BOP from that point until rig release, however if we do break any seal, the entire BOP will be retested to 5000 psi high and 250 psi low.

Continental
ContiTech

CONTITECH RUBBER Industrial Kft.	No:QC-DB- 247/ 2014
	Page: 5 / 68

QUALITY CONTROL INSPECTION AND TEST CERTIFICATE

CERT. N°: 702

PURCHASER:	ContiTech Oil & Marine Corp.	P.O. N°:	4500421193
CONTITECH ORDER N°:	538448	HOSE TYPE:	3" ID Choke & Kill Hose
HOSE SERIAL N°:	67554	NOMINAL / ACTUAL LENGTH:	10,67 m / 10,66 m

W.P.	T.P.	Duration:
68,9 MPa 10000 psi	103,4 MPa 15000 psi	60 min.

Pressure test with water at ambient temperature

See attachment. (1 page)

↑ 10 mm = 10 Min.
→ 10 mm = 20 MPa

COUPLINGS Type	Serial N°	Quality	Heat N°
3" coupling with	1525 1519	AISI 4130	A0579N
4 1/16" 10K API Swivel Flange end		AISI 4130	035608
Hub		AISI 4130	A1126U

Not Designed For Well Testing **API Spec 16 C**

Tag No.: 66 – 1225 **Temperature rate:"B"**

All metal parts are flawless

WE CERTIFY THAT THE ABOVE HOSE HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE TERMS OF THE ORDER INSPECTED AND PRESSURE TESTED AS ABOVE WITH SATISFACTORY RESULT.

STATEMENT OF CONFORMITY: We hereby certify that the above items/equipment supplied by us are in conformity with the terms, conditions and specifications of the above Purchaser Order and that these items/equipment were fabricated inspected and tested in accordance with the referenced standards, codes and specifications and meet the relevant acceptance criteria and design requirements.

Date:	Inspector	Quality Control
14. April 2014.		ContiTech Rubber Industrial Kft. Quality Control Dept. (1)

ATTACHMENT OF QUALITY CONTROL INSPECTION AND TEST CERTIFICATE No: 696, 701, 702

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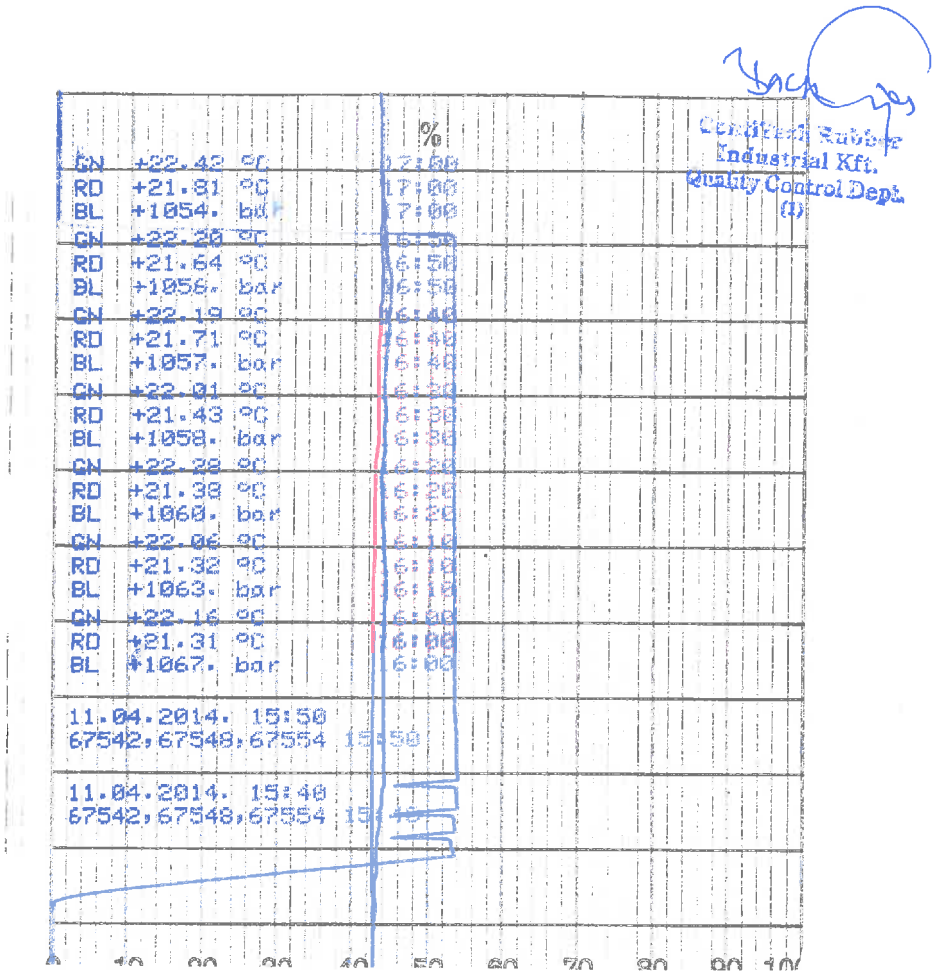
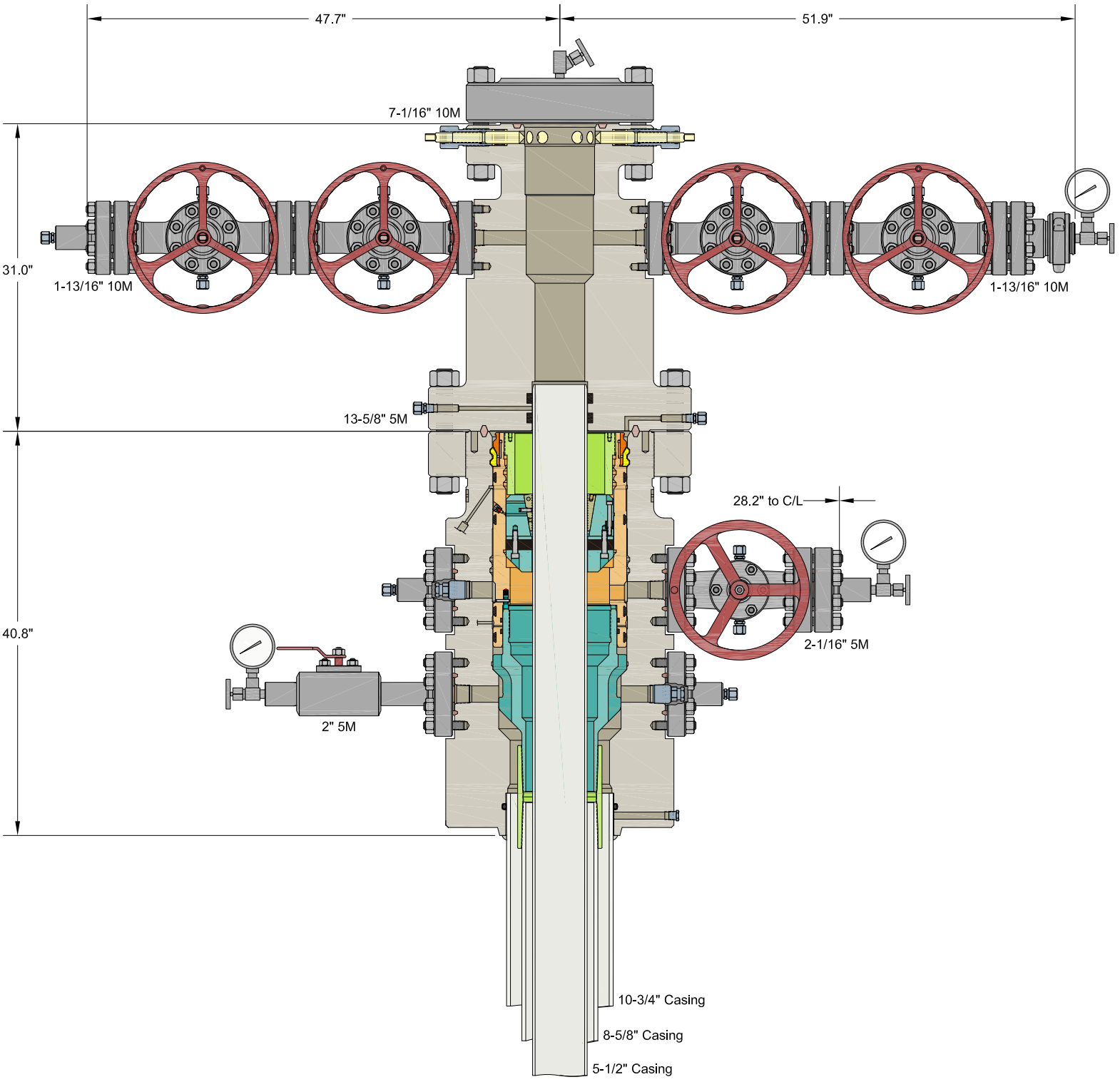


Certified Rubber Industrial Kft. Quality Control Dept. (1)

Hose Data Sheet

CRI Order No.	538448
Customer	ContiTech Oil & Marine Corp.
Customer Order No	CBC557116 4500421193
Item No.	1
Hose Type	Flexible Hose
Standard	**API SPEC 16 C**
Inside dia in inches	3
Length	35 ft
Type of coupling one end	FLANGE 4.1/16" 10KPSI API SPEC 17D SV SWIVEL FLANGE SOURC/W BX155 ST/ST INLAID R.GR.
Type of coupling other end	FLANGE 4.1/16" 10KPSI API SPEC 17D SV SWIVEL FLANGE SOUR C/W BX155 ST/ST INLAID R.GR.
H2S service NACE MR0175	Yes
Working Pressure	10 000 psi
Design Pressure	10 000 psi
Test Pressure	15 000 psi
Safety Factor	2,25
Marking	USUAL PHOENIX
Cover	NOT FIRE RESISTANT
Outside protection	St.steel outer wrap
Internal stripwound tube	No
Lining	OIL + GAS RESISTANT SOUR
Safety clamp	Yes
Lifting collar	Yes
Element C	Yes
Safety chain	Yes
Safety wire rope	No
Max.design temperature [°C]	100
Min.design temperature [°C]	-20
Min. Bend Radius operating [m]	0,90
Min. Bend Radius storage [m]	0,90
Electrical continuity	The Hose is electrically continuous
Type of packing	WOODEN CRATE ISPM-15



ALL DIMENSIONS APPROXIMATE

CACTUS WELLHEAD LLC

EARTHSTONE ENERGY
NEW MEXICO

10-3/4" x 8-5/8" x 5-1/2" MBU-Q Wellhead System
With 13-5/8" 5M x 7-1/16" 10M CTH-DBLHPS Tubing Head
And 8-5/8" Mandrel & 5-1/2" Slip Style Casing Hangers

DRAWN	DLE	24AUG22
APPRV		

DRAWING NO. HBE0000803

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

SUPO Data Report
11/08/2024

APD ID: 10400094259
Submission Date: 09/05/2023
Operator Name: EARTHSTONE OPERATING LLC
Well Name: ENGLISH BUFFALO 26 35 FED COM
Well Number: 111H
Well Type: OIL WELL
Well Work Type: Drill

Highlighted data reflects the most recent changes
Show Final Text

Section 1 - Existing Roads

Will existing roads be used? YES

Existing Road Map:

1_EBM_Existing_Roads_Map_20230830121859.pdf

Existing Road Purpose: ACCESS,FLUID TRANSPORT

Row(s) Exist? NO

ROW ID(s)

ID:

Do the existing roads need to be improved? NO

Existing Road Improvement Description:

Existing Road Improvement Attachment:

Section 2 - New or Reconstructed Access Roads

Will new roads be needed? YES

New Road Map:

2_EBM_New_Access_Roads_Map_Plats_20230830122411.pdf

New road type: RESOURCE

Length: 6426.09 Feet **Width (ft.):** 30

Max slope (%): 2 **Max grade (%):** 2

Army Corp of Engineers (ACOE) permit required? N

ACOE Permit Number(s):

New road travel width: 24

New road access erosion control: All constructed road access will be crowned and ditched to prevent erosion.

New road access plan or profile prepared? N

New road access plan

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Access road engineering design? N

Access road engineering design

Turnout? N

Access surfacing type: OTHER

Access topsoil source: OFFSITE

Access surfacing type description: Caliche

Access onsite topsoil source depth:

Offsite topsoil source description: NO TOPSOIL ANTICIPATED

Onsite topsoil removal process:

Access other construction information:

Access miscellaneous information:

Number of access turnouts: **Access turnout map:**

Drainage Control

New road drainage crossing: OTHER

Drainage Control comments: Drainage control systems shall be constructed on the entire length of the road. The proposed roads will be crowned and ditched with a 2% slope from the tip of the crown to the edge of the driving surface.

Road Drainage Control Structures (DCS) description: No cattle guard, culvert or vehicle turn out is needed.

Road Drainage Control Structures (DCS) attachment:

Access Additional Attachments

Section 3 - Location of Existing Wells

Existing Wells Map? YES

Attach Well map:

3_EBM_Existing_Wells_Map_20230830123643.pdf

Section 4 - Location of Existing and/or Proposed Production Facilities

Submit or defer a Proposed Production Facilities plan? DEFER

Estimated Production Facilities description: One production facility will be constructed on each well pad. The English Buffalo Facility (335 x 100) will be constructed on the west side of the English Buffalo well pad. Flare and/or CBU will be in the northwest corner of the facility. Process equipment (e. g., separators, heater-treaters, meters, compressor) will be in the center of the facility. Tanks will be located in the southwest corner of the facility. Containment berms will be constructed completely around any production facilities designed to hold fluids. The containment berms will be constructed to hold 1.5 times the capacity of the largest tank. No flowlines will be built outside of the well pad footprints.

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Section 5 - Location and Types of Water Supply

Water Source Table

Water source type: GW WELL

Water source use type: SURFACE CASING
INTERMEDIATE/PRODUCTION CASING
STIMULATION

Source latitude: **Source longitude:**

Source datum:

Water source permit type: PRIVATE CONTRACT

Water source transport method: PIPELINE

Source land ownership: PRIVATE

Source transportation land ownership: PRIVATE

Water source volume (barrels): 120000 **Source volume (acre-feet):** 15.46717156

Source volume (gal): 5040000

Water source and transportation

5_EBM_Water_Source_Map_20230830124131.pdf

Water source comments: Water will be trucked from the existing JR Fresh Water Station on private (Caviness) land in NWNW 11-18S-33E.
New water well? N

New Water Well Info

Well latitude: **Well Longitude:** **Well datum:**

Well target aquifer:

Est. depth to top of aquifer(ft): **Est thickness of aquifer:**

Aquifer comments:

Aquifer documentation:

Well depth (ft): **Well casing type:**

Well casing outside diameter (in.): **Well casing inside diameter (in.):**

New water well casing? **Used casing source:**

Drilling method: **Drill material:**

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Grout material:

Grout depth:

Casing length (ft.):

Casing top depth (ft.):

Well Production type:

Completion Method:

Water well additional information:

State appropriation permit:

Additional information attachment:

Section 6 - Construction Materials

Using any construction materials: YES

Construction Materials description: NM One Call (811) will be notified before construction starts. Top 6 of soil and brush will be stockpiled west of the well pads and CTB. Caliche will be hauled from an existing caliche pit on private (Angell LP) land in NWSE 3-18s-33e. All roads and well pads will be constructed of 6 rolled and compacted native caliche.

Construction Materials source location

6_EBM_Caliche_Source_Map_20230830124428.pdf

Section 7 - Methods for Handling

Waste type: DRILLING

Waste content description: DRILLING FLUIDS AND CUTTINGS

Amount of waste: 6000 barrels

Waste disposal frequency : Daily

Safe containment description: STEEL TANKS WILL BE USED

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Disposal type description:

Disposal location description: Contents (drill cuttings, mud, salts, and other chemicals) of the mud tanks will be hauled to R360s state approved (NM-01-0006) disposal site at Halfway.

Waste type: COMPLETIONS/STIMULATION

Waste content description: COMPLETIONS FLUIDS

Amount of waste: 2000 barrels

Waste disposal frequency : Daily

Safe containment description: STEEL TANKS WILL BE USED

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Disposal type description:

Disposal location description: Contents (drill cuttings, mud, salts, and other chemicals) of the mud tanks will be hauled to R360s state approved (NM-01-0006)

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Waste type: SEWAGE

Waste content description: HUMAN WASTE

Amount of waste: 50 pounds

Waste disposal frequency : Weekly

Safe containment description: PORTABLE TOILETS

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Disposal type description:

Disposal location description: Human waste will be disposed of in chemical toilets and hauled to the Hobbs wastewater treatment plant.

Waste type: GARBAGE

Waste content description: TRASH & DEBRIS

Amount of waste: 200 pounds

Waste disposal frequency : One Time Only

Safe containment description: ROLL OFF BIN WITH NETTED TOP

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Disposal type description:

Disposal location description: All trash will be placed in a portable trash cage. It will be hauled to the Lea County landfill. There will be no trash burning.

Reserve Pit

Reserve Pit being used? NO

Temporary disposal of produced water into reserve pit? NO

Reserve pit length (ft.) **Reserve pit width (ft.)**

Reserve pit depth (ft.) **Reserve pit volume (cu. yd.)**

Is at least 50% of the reserve pit in cut?

Reserve pit liner

Reserve pit liner specifications and installation description

Cuttings Area

Cuttings Area being used? NO

Are you storing cuttings on location? Y

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Description of cuttings location Contents (drill cuttings, mud, salts, and other chemicals) of the mud tanks will be hauled to R360s state approved (NM-01-0006)

Cuttings area length (ft.)

Cuttings area width (ft.)

Cuttings area depth (ft.)

Cuttings area volume (cu. yd.)

Is at least 50% of the cuttings area in cut?

WCuttings area liner

Cuttings area liner specifications and installation description

Section 8 - Ancillary

Are you requesting any Ancillary Facilities?: N

Ancillary Facilities

Comments:

Section 9 - Well Site

Well Site Layout Diagram:

9_EnglishBuffalo_Well_Site_Layout_20230830134217.pdf

Comments: See rig layout diagram for depictions of the well pad, trash cage, access onto the location, parking, living facilities, and rig orientation. V-doors will face east on the well pads. Closed loop mud system will be used.

Section 10 - Plans for Surface Reclamation

Type of disturbance: New Surface Disturbance

Multiple Well Pad Name: ENGLISH BUFFALO 26 35 FED COM

Multiple Well Pad Number: 111H, 112H, 221H, 222H

Recontouring

English_Buffalo_IR_Diagram_20240402064508.pdf

Drainage/Erosion control construction: Drainage systems, if an, will be reshaped to the original configuration with provisions made to alleviate erosion.

Drainage/Erosion control reclamation: Any portion of the site that is not needed for future operations will be reclaimed to the original state as much as possible.

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Well pad proposed disturbance (acres): 6.062 **Well pad interim reclamation (acres):** 2.25 **Well pad long term disturbance (acres):** 3.812
Road proposed disturbance (acres): 1.36 **Road interim reclamation (acres):** 0 **Road long term disturbance (acres):** 1.36
Powerline proposed disturbance (acres): 0 **Powerline interim reclamation (acres):** 0 **Powerline long term disturbance (acres):** 0
Pipeline proposed disturbance (acres): **Pipeline interim reclamation (acres):** 0 **Pipeline long term disturbance (acres):** 0
Other proposed disturbance (acres): 0 **Other interim reclamation (acres):** 0 **Other long term disturbance (acres):** 0

Total proposed disturbance: 7.422000000000001 **Total interim reclamation:** 2.25 **Total long term disturbance:** 5.172

Disturbance Comments:

Reconstruction method: Topsoil will be located on the East side of the pad location. After the area has been reshaped and contoured, topsoil from the spoil pile will be placed over the disturbed area to the extent possible.

Topsoil redistribution: Topsoil will be located on the East side of the pad location. After the area has been reshaped and contoured, topsoil from the spoil pile will be placed over the disturbed area to the extent possible.

Soil treatment: No treatment necessary

Existing Vegetation at the well pad: Mesquite & Shinnery Oak

Existing Vegetation at the well pad

Existing Vegetation Community at the road: Mesquite & Shinnery Oak

Existing Vegetation Community at the road

Existing Vegetation Community at the pipeline: Mesquite & Shinnery Oak

Existing Vegetation Community at the pipeline

Existing Vegetation Community at other disturbances: No other disturbance

Existing Vegetation Community at other disturbances

Non native seed used? N

Non native seed description:

Seedling transplant description:

Will seedlings be transplanted for this project? N

Seedling transplant description

Will seed be harvested for use in site reclamation? N

Seed harvest description:

Seed harvest description attachment:

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Seed

Seed Table

Seed type: PERENNIAL GRASS **Seed source:** COMMERCIAL

Seed name: LPC- Seed Mix 2

Source name: **Source address:**

Source phone:

Seed cultivar:

Seed use location: WELL PAD

PLS pounds per acre: 5 **Proposed seeding season:** SPRING

Seed Summary

Total pounds/Acre: 5

Seed Type	Pounds/Acre
PERENNIAL GRASS	5

Seed reclamation

Operator Contact/Responsible Official

First Name: **Last Name:**

Phone: **Email:**

Seedbed prep:

Seed BMP:

Seed method:

Existing invasive species? N

Existing invasive species treatment description:

Existing invasive species treatment

Weed treatment plan description: All areas will be monitored, and weeds will be treated

Weed treatment plan

Monitoring plan description: Monitoring by lease operators during each visit

Monitoring plan

Success standards: N/A

Pit closure description: No pits; Earthstone Operating, LLC will be utilizing a closed loop system.

Pit closure attachment:

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Section 11 - Surface Ownership

Disturbance type: NEW ACCESS ROAD

Describe:

Surface Owner: STATE GOVERNMENT

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office: NM STATE TRUST LANDS

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Disturbance type: NEW ACCESS ROAD

Describe:

Surface Owner: PRIVATE OWNERSHIP

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

USFS Forest/Grassland: **USFS Ranger District:**

Surface use plan certification: NO

Surface use plan certification document:

Surface access agreement or bond: AGREEMENT

Surface Access Agreement Need description: Earthstone Operating, LLC has a surface use agreement with Kenneth Smith Inc., c/o Jaydee Logan, 267 Smith Ranch Rd., Hobbs, NM 88240 for the use of the existing access road in Section 13, T. 18 S., R. 33 E., Lea County, NM. Phone number is (575) 942-3832.

Surface Access Bond BLM or Forest Service:

BLM Surface Access Bond number:

USFS Surface access bond number:

Disturbance type: WELL PAD

Describe:

Surface Owner: BUREAU OF LAND MANAGEMENT

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Disturbance type: NEW ACCESS ROAD

Describe:

Surface Owner: BUREAU OF LAND MANAGEMENT

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Section 12 - Other

Right of Way needed? N **Use APD as ROW?**

ROW Type(s):

ROW

SUPO Additional Information: Gas Management plan attached. Gas Management plan attached Payment was made by Matador for English Buffalo; due to SHL changing more than 660', new APD's were re-filed using original payment method.

Use a previously conducted onsite? Y

Previous Onsite information: Lone Mountain Archaeological conducted a field survey and will submit their report to BLM upon completion. The BLM onsite inspection was performed on July 6th, 2023 with Bob Ballard (BLM), Keely Watland (BLM-NRS) and Cassandra Aguillard (BLM-Wildlife Biologist). A ROW for the proposed access road will be needed.

Other SUPO

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

12a_EBM_SUPO_20230831134040.pdf
Earthstone_English_Buffalo_26_35_Fed_Com_111H_Vicinity_Map_20230831134123.pdf
Earthstone_English_Buffalo_26_35_Fed_Com_111H_Topo_Map_20230831134123.pdf
Earthstone_English_Buffalo_26_35_Fed_Com_111H_Aerial_Map_20230831134124.pdf
ESTE_ENGLISH_BUFFALO_GAS_MANAGEMENT_PLAN_20230831134146.pdf

PROPOSED SURFACE SITE

ENGLISH BUFFALO 26 35 FED COM

SECTION 26, TOWNSHIP 18 SOUTH, RANGE 33 EAST

NEW MEXICO PRINCIPAL MERIDIAN

LEA COUNTY, NEW MEXICO

METES AND BOUNDS DESCRIPTION

BEING, A SURFACE SITE, SITUATED **SECTION 26, TOWNSHIP 18 SOUTH, RANGE 33 EAST, NEW MEXICO PRINCIPAL MERIDIAN, LEA COUNTY, NEW MEXICO**;

BEGINNING AT A POINT HAVING COORDINATES OF **N: 628,226.54', E: 754,918.39' / LAT: 32.725110, LONG: -103.638822, POINT OF BEGINNING (P.O.B.)**, IN SAID SECTION 26, FROM WHICH A FOUND IRON PIPE WITH BRASS CAP FOR THE NORTHWEST CORNER OF SAID SECTION 26, BEARS N 76°18'07" W A DISTANCE OF 1,116.19 FEET;

THENCE N 82°32'19" E, A DISTANCE OF 610.00 FEET TO A POINT;
THENCE S 07°09'52" E, A DISTANCE OF 410.00 FEET TO A POINT;
THENCE S 82°32'16" W, A DISTANCE OF 508.23 FEET TO A POINT;
THENCE N 60°57'56" W, A DISTANCE OF 126.11 FEET TO A POINT;

THENCE N 07°09'52" W, A DISTANCE OF 335.00 FEET TO THE POINT OF BEGINNING.

SAID SURFACE SITE CONTAINING 246,283 SQUARE FEET OR 5.65 ACRES IN SECTION 26, MORE OR LESS.

EARTHSTONE Energy, Inc.

Date: 8/22/2023

MARK J. MURRAY NEW MEXICO 12177 REGISTERED PROFESSIONAL SURVEYOR

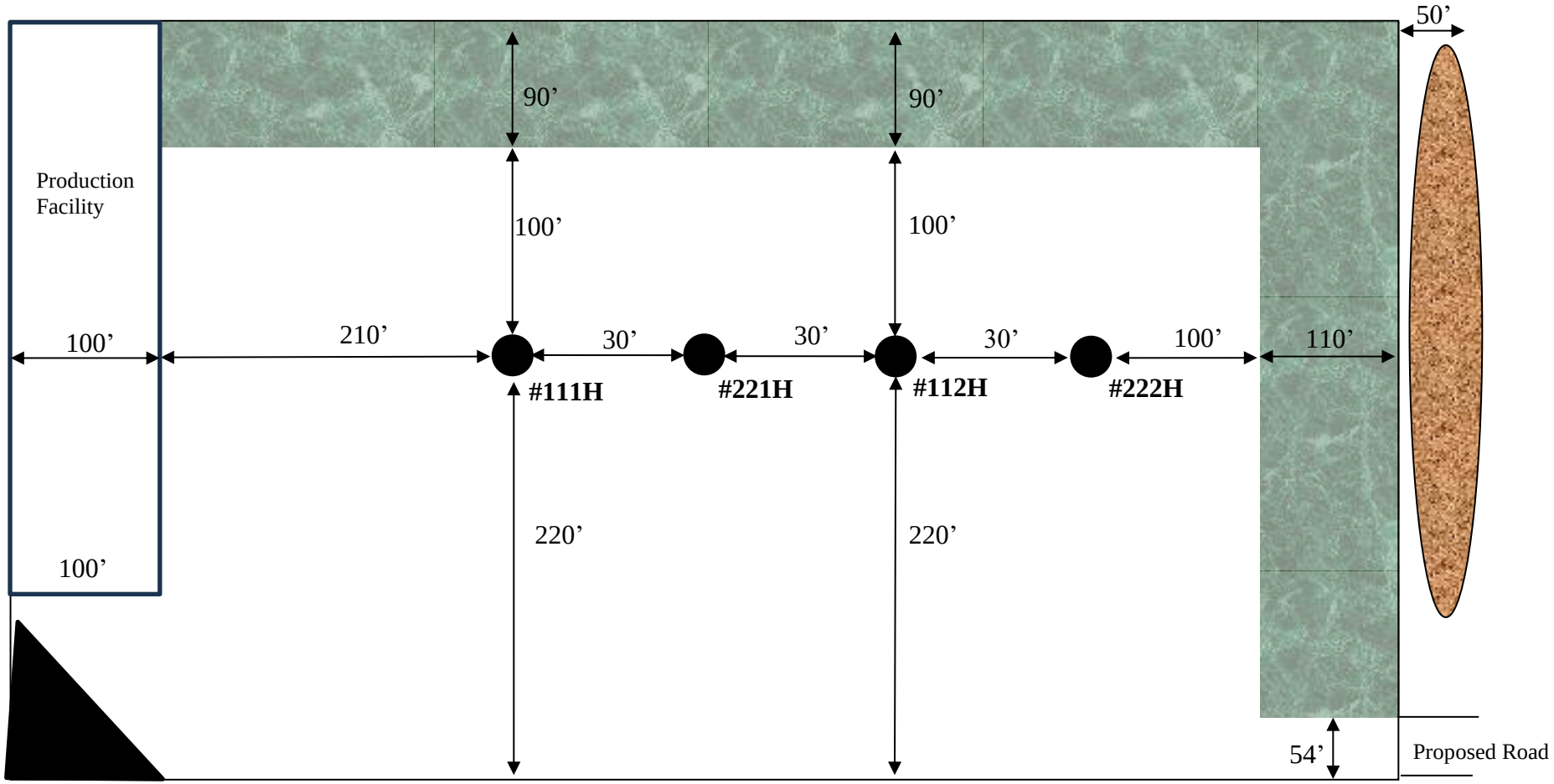
MARK J. MURRAY P.L.S. NO. 12177

NOTES:
1.) BEARINGS AND COORDINATES ARE GRID AS DERIVED FROM GPS OBSERVATION AND ARE BASED ON THE STATE PLANE COORDINATES FOR THE NEW MEXICO EAST ZONE 3001-NAD83.
2.) CERTIFICATION IS MADE ONLY TO THE LOCATION OF THIS EASEMENT. IN RELATION TO THE EVIDENCE DURING A FIELD SURVEY, MADE ON THE GROUND, UNDER MY SUPERVISION, AND USING DOCUMENTATION PROVIDED BY THE CLIENT. ONLY UTILITIES/EASEMENTS THAT WERE VISIBLE ON THE DATE OF THIS SURVEY, WITHIN/ADJOINING THIS EASEMENT, HAVE BEEN LOCATED AS SHOWN HEREON OF WHICH I HAVE KNOWLEDGE. THIS CERTIFICATION IS LIMITED TO THOSE PERSONS OR ENTITIES KNOWN ON THE FACE OF THIS PLAT AND IS NON-TRANSFERABLE, AND MADE FOR THIS TRANSACTION ONLY.

Date: 8/16/23	Date: 8/16/23	Scale: 1"=1000'	DWG: 23-060870_English Buffalo 26 35 Fed Com_SS	
DRAWING PATH: Earthstone\23-060870_English Buffalo 26 35 Fed Com\Drafting\Exhibits\Surface Site	Drawn: CM	Checked: MJM	Job: 23-060870	REVISION NO. 0	PAGE 2 OF 2

Interim Reclamation Diagram

English Buffalo 26 35 Fed Com: 111H, 112H, 221H, 222H



LEGEND

N

Wellbore

Interim Reclamation

Ditch & Berm

Topsoil

***Diagram Not to Scale**

Earthstone Operating, LLC
English Buffalo - Mercury
Section 26, Township 18 South, Range 33 East
Lea County, NM

SURFACE PLAN PAGE 1

Surface Use Plan of Operations

English Buffalo Pad	Mercury Pad
English Buffalo 26 35 Fed Com 111H	Mercury 26 35 Fed Com 113H
English Buffalo 26 35 Fed Com 112H	Mercury 26 35 Fed Com 114H
English Buffalo 26 35 Fed Com 221H	Mercury 26 35 Fed Com 223H
English Buffalo 26 35 Fed Com 222H	Mercury 26 35 Fed Com 224H

1. ROAD DIRECTIONS & DESCRIPTIONS

From the junction of US-62 and NM-529 west of Hobbs, NM
Go west on NM-529 approx. 14.2 miles
Turn left onto caliche road and go southwest approx. 0.13 miles
Turn left onto caliche road and go south approx. 0.33 miles
Turn right onto caliche road and go west approx. 0.99 miles
Turn left onto caliche road and go southwest approx. 0.67 miles
Turn left onto caliche road and go east approx. 0.14 miles
Turn right onto proposed access road and go south approx. 0.76 miles to northwest corner of Mercury Pad.

Non-state and non-county roads will be maintained as needed to Gold Book standards. This includes pulling ditches, preserving the crown, and cleaning culverts. This will be done at least once a year, and more often as needed.

2. ROAD TO BE BUILT OR UPGRADED

The **6,426.09'** of new resource roads will be built to access the English Buffalo and Mercury well pads. The proposed roads will be crowned and ditched with a 2% slope from the tip of the crown to the edge of the driving surface. The ditches will be 1 foot deep with 3:1 slopes. The driving surface will be ≤24' wide and will be made of 6" rolled and compacted native caliche. Pipelines that are crossed will be padded. Maximum disturbed width = 30'. Maximum grade = 2%. Maximum cut or fill = 2'. No cattle guard, culvert or vehicle turn out is needed.

3. EXISTING WELLS

Existing oil, gas, water, injection, and P & A wells are within a mile radius. No disposal wells are within a mile radius.

4. PROPOSED PRODUCTION FACILITIES

One production facility will be constructed on each well pad. The English Buffalo Facility (335' x 100') will be constructed on the west side of the English Buffalo well pad. Flare and/or CBU will be in the northwest corner of the facility. Process equipment (e. g., separators, heater-treaters, meters, compressor) will be in the center of the facility. Tanks will be located in the southwest corner of the facility.

The proposed 510' x 110' Mercury Facility will be constructed on the south side of the Mercury well pad. Flare and/or CBU will be in the southeast corner of the facility. Process equipment (e. g., separators, heater-treaters, meters, compressor) will be in the center of the facility. Tanks will be located in the southwest corner of the facility.

Containment berms will be constructed completely around any production facilities designed to hold fluids. The containment berms will be constructed to hold 1.5 times the capacity of the largest tank.

No flowlines will be built outside of the well pad footprints.

5. WATER SUPPLY

Water will be trucked from the existing JR Fresh Water Station on private (Caviness) land in NWNW 11-18s-33e.

6. CONSTRUCTION MATERIALS & METHODS

NM One Call (811) will be notified before construction starts. Top ≈6" of soil and brush will be stockpiled west of the well pads and CTB. Caliche will be hauled from an existing caliche pit on private (Angell LP) land in NWSE 3-18s-33e. All roads and well pads will be constructed of 6" rolled and compacted native caliche.

7. WASTE DISPOSAL

All trash will be placed in a portable trash cage. It will be hauled to the Lea County landfill. There will be no trash burning. Contents (drill cuttings, mud, salts, and other chemicals) of the mud tanks will be hauled to R360's state approved (NM-01-0006) disposal site at Halfway. Human waste will be disposed of in chemical toilets and hauled to the Hobbs wastewater treatment plant.

8. ANCILLARY FACILITIES

There will be no airstrip or camp. Camper trailers will be on location for the company man, tool pusher, and mud logger.

9. WELL SITE LAYOUT

See rig layout diagram for depictions of the well pad, trash cage, access onto the location, parking, living facilities, and rig orientation. V-doors will face east on the well pads. Closed loop mud system will be used.

10. RECLAMATION

Interim reclamation will be completed within 6 months of completing the last well on the Mercury pad. Interim reclamation will consist of shrinking the well pads by removing caliche and spreading the stockpiled topsoil to reclaim portions of the pad. Disturbed areas will be seeded in accordance with BLM requirements. There will be no interim reclamation on the English Buffalo pad due to the location of the production facilities and pad size.

Final reclamation will occur within 6 months of plugging the last well on the pad. Final reclamation will consist of using any remaining stockpiled topsoil to cover the remainder of the pads and associated roads. Disturbed areas will be contoured to match pre-construction grades. Soil and brush will be evenly spread over disturbed areas and harrowed on the contour. Disturbed areas will be seeded in accordance with BLM requirements. Noxious weeds will be controlled.

See the following breakdown of short-term and long-term disturbance by well pad and facility type.

Earthstone Operating, LLC
English Buffalo - Mercury
Section 26, Township 18 South, Range 33 East
Lea County, NM

New Disturbance (acres)			
Facility	Short-term	Interim Reclamation	Long-term
English Buffalo Pad (610'x410') + Topsoil (356'x50')	6.06	0.00	6.06
Mercury Pad (530'x510') + Topsoil (530'x50')	6.82	0.89	5.94
Proposed Access Roads (6,426.09'x30')	4.43	0.00	4.43
Total	17.31	0.89	16.43

11. SURFACE OWNER

All well pads will be exclusively on BLM Lands. BLM office is the Carlsbad Field Office, 620 E. Greene Street, Carlsbad NM 88220. Phone is 575 234-5972.

All proposed access roads are on BLM and NM State Trust Lands. 310 Old Santa Fe Trail, Santa Fe, NM 87501. Phone is 505-827-5760.

All existing access roads are on BLM, NM State Trust Lands, and Private lands. Private land is owned by Kenneth Smith Inc., 267 Smith Ranch Rd, Hobbs, NM 88240. Phone is (575) 942-3832. Earthstone Operating, LLC has an SUA in place with the private land owner.

12. OTHER INFORMATION

Lone Mountain Archaeological conducted a field survey and will submit their report to BLM upon completion. The BLM onsite inspection was performed on July 6th, 2023 with Bob Ballard (BLM), Keely Watland (BLM-NRS) and Cassandra Aguillard (BLM-Wildlife Biologist).

A ROW for the proposed access road will be needed.

Earthstone Operating, LLC **SURFACE PLAN PAGE 5**
English Buffalo - Mercury
Section 26, Township 18 South, Range 33 East
Lea County, NM

CERTIFICATION

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. **Executed this 29th day of August 2023.**

Cory Walk

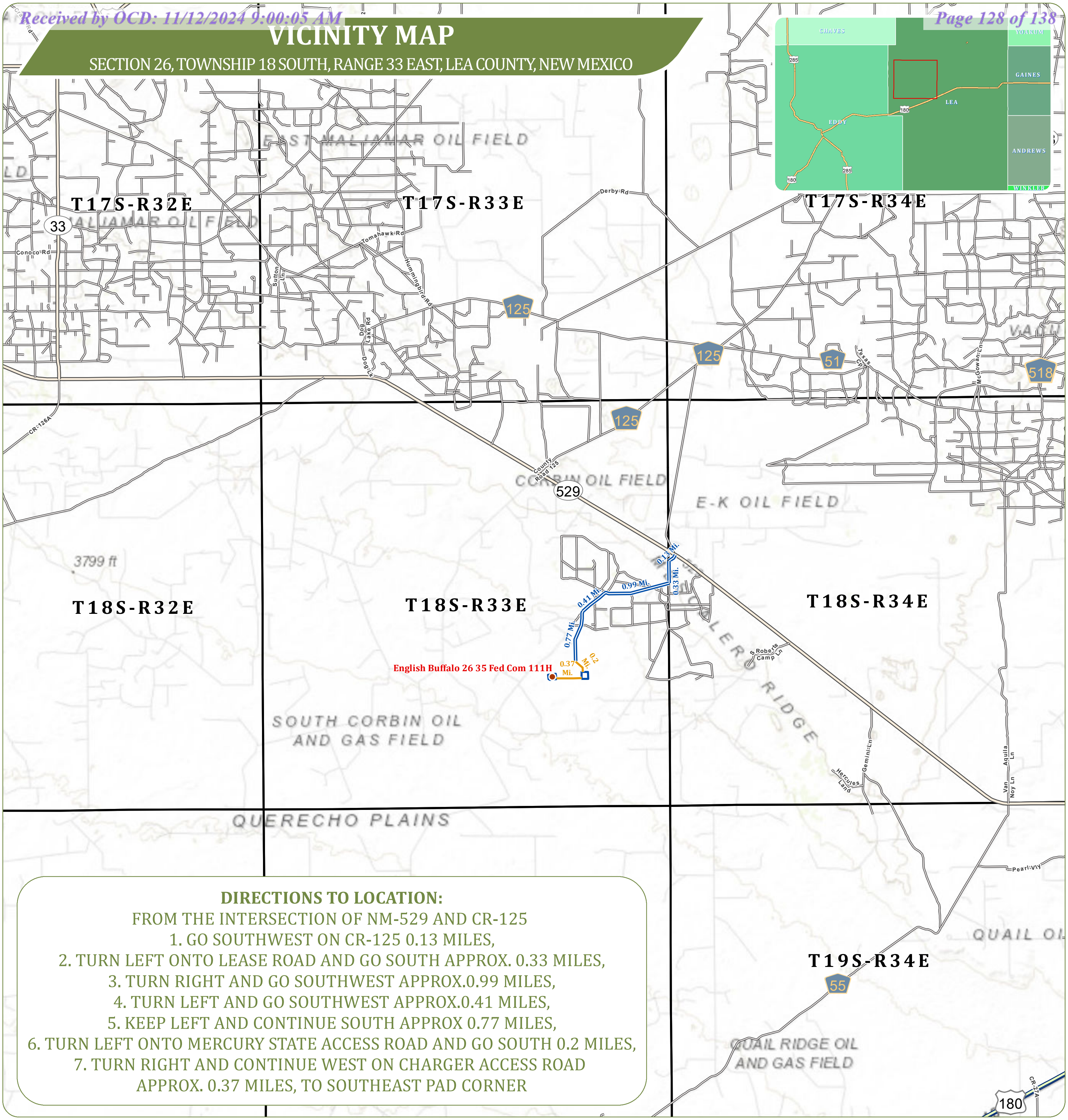
Cory Walk, Agent
Permits West, Inc.
37 Verano Loop, Santa Fe, NM 87508
(505) 466-8120

Field representative will be:

Mikah Thomas, Regulatory Supervisor
Earthstone Operating, LLC
600 N. Marienfeld, Suite 1000
Midland, TX 79701
Office: (432) 661-7106

VICINITY MAP

SECTION 26, TOWNSHIP 18 SOUTH, RANGE 33 EAST, LEA COUNTY, NEW MEXICO



DIRECTIONS TO LOCATION:

FROM THE INTERSECTION OF NM-529 AND CR-125

1. GO SOUTHWEST ON CR-125 0.13 MILES,
2. TURN LEFT ONTO LEASE ROAD AND GO SOUTH APPROX. 0.33 MILES,
3. TURN RIGHT AND GO SOUTHWEST APPROX.0.99 MILES,
4. TURN LEFT AND GO SOUTHWEST APPROX.0.41 MILES,
5. KEEP LEFT AND CONTINUE SOUTH APPROX 0.77 MILES,
6. TURN LEFT ONTO MERCURY STATE ACCESS ROAD AND GO SOUTH 0.2 MILES,
7. TURN RIGHT AND CONTINUE WEST ON CHARGER ACCESS ROAD APPROX. 0.37 MILES, TO SOUTHEAST PAD CORNER

1:120,000 — 0 | 10,000 | 20,000 Feet

COOSA CONSULTING

PERMIAN BASIN
PO Box 1583
Midland, TX 79702
CONTACT
Email: info@coosaconsulting.com
Office : (432) 631-4738

Coordinate System:
NAD 1983 StatePlane New Mexico East FIPS 3001 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 541,337.5000
False Northing: 0.0000
Central Meridian: -104.3333
Scale Factor: 0.9999
Latitude Of Origin: 31.0000
Units: Foot US

N

Legend

- SHL/KOP
- Access Road
- Driving Route
- Freeways Highways
- Major Road
- Local Road
- Well Pad

English Buffalo 26 35 Fed Com 111H

SHL Location & Kick Off Point:
427' FNL & 1411' FEL
Section 26, Township 18 South,
Range 33 East of P.M.
Lea County, New Mexico

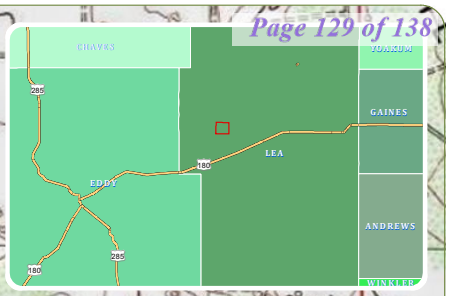
OPERATOR:
EARTHSTONE OPERATING, LLC

EARTHSTONE Energy, Inc.

Rev: 0

TOPO MAP

SECTION 26, TOWNSHIP 18 SOUTH, RANGE 33 EAST, LEA COUNTY, NEW MEXICO



1974.18 Ft., 119.65 Rd.

English Buffalo 26 35 Fed Com 111H

Section 26, T18S-R33E, N.M.P.M

Section 35, T18S-R33E, N.M.P.M

1:24,000

0 2,000 4,000 Feet

Legend

- SHL/KOP, LP/FTP, LTP/BHL
- Wellbore
- Access Road
- Well Pad

COOSA CONSULTING
PERMIAN BASIN
PO Box 1583
Midland, TX 79702
CONTACT
Email: info@coosaconsulting.com
Office : (432) 631-4738

Coordinate System:
NAD 1983 StatePlane New Mexico East FIPS 3001 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 541,337.5000
False Northing: 0.0000
Central Meridian: -104.3333
Scale Factor: 0.9999
Latitude Of Origin: 31.0000
Units: Foot US

English Buffalo 26 35 Fed Com 111H

SHL Location & Kick Off Point:
427' FNL & 1411' FEL
Section 26, Township 18 South,
Range 33 East of P.M.
Lea County, New Mexico

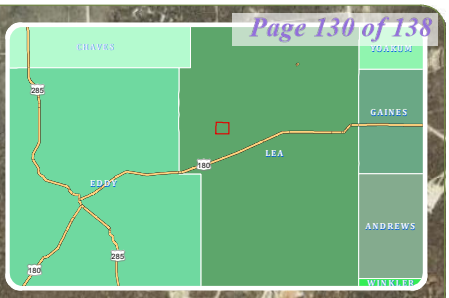
OPERATOR:
EARTHSTONE OPERATING, LLC

EARTHSTONE Energy Inc.

Rev: 0

AERIAL MAP

SECTION 26, TOWNSHIP 18 SOUTH, RANGE 33 EAST, LEA COUNTY, NEW MEXICO



1:24,000

0 2,000 4,000 Feet

COOSA CONSULTING
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PO Box 1583
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False Northing: 0.0000
Central Meridian: -104.3333
Scale Factor: 0.9999
Latitude Of Origin: 31.0000
Units: Foot US

Legend

- SHL/KOP, LP/FTP, LTP/BHL
- Wellbore
- Access Road
- Well Pad

English Buffalo 26 35 Fed Com 111H

SHL Location & Kick Off Point:
427' FNL & 1411' FEL
Section 26, Township 18 South,
Range 33 East of P.M.
Lea County, New Mexico

OPERATOR:
EARTHSTONE OPERATING, LLC

EARTHSTONE Energy Inc.

Rev: 0

AFMSS

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

PWD Data Report

11/08/2024

APD ID: 10400094259 **Submission Date:** 09/05/2023

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

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

Section 1 - General

Would you like to address long-term produced water disposal? NO

Section 2 - Lined

Would you like to utilize Lined Pit PWD options? N

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Lined pit PWD on or off channel:

Lined pit PWD discharge volume (bbl/day):

Lined pit

Pit liner description:

Pit liner manufacturers

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal

Lined pit precipitated solids disposal schedule:

Lined pit precipitated solids disposal schedule

Lined pit reclamation description:

Lined pit reclamation

Leak detection system description:

Leak detection system

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Lined pit Monitor description:

Lined pit Monitor

Lined pit: do you have a reclamation bond for the pit?

Is the reclamation bond a rider under the BLM bond?

Lined pit bond number:

Lined pit bond amount:

Additional bond information

Section 3 - Unlined

Would you like to utilize Unlined Pit PWD options? N

Produced Water Disposal (PWD) Location:

PWD disturbance (acres): **PWD surface owner:**

Unlined pit PWD on or off channel:

Unlined pit PWD discharge volume (bbl/day):

Unlined pit

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal

Unlined pit precipitated solids disposal schedule:

Unlined pit precipitated solids disposal schedule

Unlined pit reclamation description:

Unlined pit reclamation

Unlined pit Monitor description:

Unlined pit Monitor

Do you propose to put the produced water to beneficial use?

Beneficial use user

Estimated depth of the shallowest aquifer (feet):

Does the produced water have an annual average Total Dissolved Solids (TDS) concentration equal to or less than that of the existing water to be protected?

TDS lab results:

Geologic and hydrologic

State

Unlined Produced Water Pit Estimated

Unlined pit: do you have a reclamation bond for the pit?

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Is the reclamation bond a rider under the BLM bond?

Unlined pit bond number:

Unlined pit bond amount:

Additional bond information

Section 4 -

Would you like to utilize Injection PWD options? N

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Injection PWD discharge volume (bbl/day):

Injection well mineral owner:

Injection well type:

Injection well number: **Injection well name:**

Assigned injection well API number? **Injection well API number:**

Injection well new surface disturbance (acres):

Minerals protection information:

Mineral protection

Underground Injection Control (UIC) Permit?

UIC Permit

Section 5 - Surface

Would you like to utilize Surface Discharge PWD options? N

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Surface discharge PWD discharge volume (bbl/day):

Surface Discharge NPDES Permit?

Surface Discharge NPDES Permit attachment:

Surface Discharge site facilities information:

Surface discharge site facilities map:

Section 6 -

Would you like to utilize Other PWD options? N

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Other PWD discharge volume (bbl/day):

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM **Well Number:** 111H

Other PWD type description:

Other PWD type

Have other regulatory requirements been met?

Other regulatory requirements

AFMSS

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

Bond Info Data

11/08/2024

APD ID: 10400094259

Submission Date: 09/05/2023

Operator Name: EARTHSTONE OPERATING LLC

Well Name: ENGLISH BUFFALO 26 35 FED COM

Well Number: 111H

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: NMB002110

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

C-102 Submit Electronically Via OCD Permitting	State of New Mexico Energy, Minerals & Natural Resources Department OIL CONSERVATION DIVISION	Revised July 9, 2024 Submittal Type: ☑ Initial Submittal ☐ Amended Report ☐ As Drilled

WELL LOCATION INFORMATION

API Number	Pool Code	Pool Name
30-025-53834	21650	E-K;BONE SPRING

Property Code	Property Name	Well Number
336490	ENGLISH BUFFALO 26 35 FED COM	111H

OGRID No.	Operator Name	Ground Level Elevation
331165	EARTHSTONE OPERATING, LLC	3,838.00'

Surface Owner: ☐ State ☐ Fee ☐ Tribal ☑ Federal | Mineral Owner: ☐ State ☐ Fee ☐ Tribal ☑ Federal

Surface Location

UL	Section	Township	Range	Lot	Ft. from N/S	Ft. from E/W	Latitude	Longitude	County
C	26	18S	33E		427' FNL	1,411' FWL	32.724696°	-103.637750°	LEA

Bottom Hole Location

UL	Section	Township	Range	Lot	Ft. from N/S	Ft. from E/W	Latitude	Longitude	County
M	35	18S	33E		50' FSL	345' FWL	32.696976°	-103.641151°	LEA

Dedicated Acres	Infill or Defining Well	Defining Well API	Overlapping Spacing Unit (Y/N)	Consolidation Code
640	Infill	Pending	N	

Order Numbers. | Well setbacks are under Common Ownership: ☒ Yes ☐ No

Kick Off Point (KOP)

UL	Section	Township	Range	Lot	Ft. from N/S	Ft. from E/W	Latitude	Longitude	County
C	26	18S	33E		427' FNL	1,411' FWL	32.724696°	-103.637750°	LEA

First Take Point (FTP)

UL	Section	Township	Range	Lot	Ft. from N/S	Ft. from E/W	Latitude	Longitude	County
D	26	18S	33E		100' FNL	345' FWL	32.725585°	-103.641220°	LEA

Last Take Point (LTP)

UL	Section	Township	Range	Lot	Ft. from N/S	Ft. from E/W	Latitude	Longitude	County
M	35	18S	33E		100' FSL	345' FWL	32.697113°	-103.641151°	LEA

Unitized Area or Area of Uniform Interest	Spacing Unit Type ☒ Horizontal ☐ Vertical	Ground Floor Elevation:

OPERATOR CERTIFICATIONS

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and, if the well is a vertical or directional well, 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 a working interest or unleased mineral interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

If this well is a horizontal well, I further certify that this organization has received the consent of at least one lessee or owner of a working interest or unleased mineral interest in each tract (in the target pool or formation) in which any part of the well's completed interval will be located or obtained a compulsory pooling order from the division.

Jennifer Elrod 11/12/2024

Signature Date

Jennifer Elrod

Printed Name

jennifer.elrod@permianres.com

Email Address

SURVEYOR CERTIFICATIONS

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.

MARY J. MURRAY NEW MEXICO 12177 REGISTERED PROFESSIONAL SURVEYOR

Date: 11/11/2024

Signature and Seal of Professional Surveyor

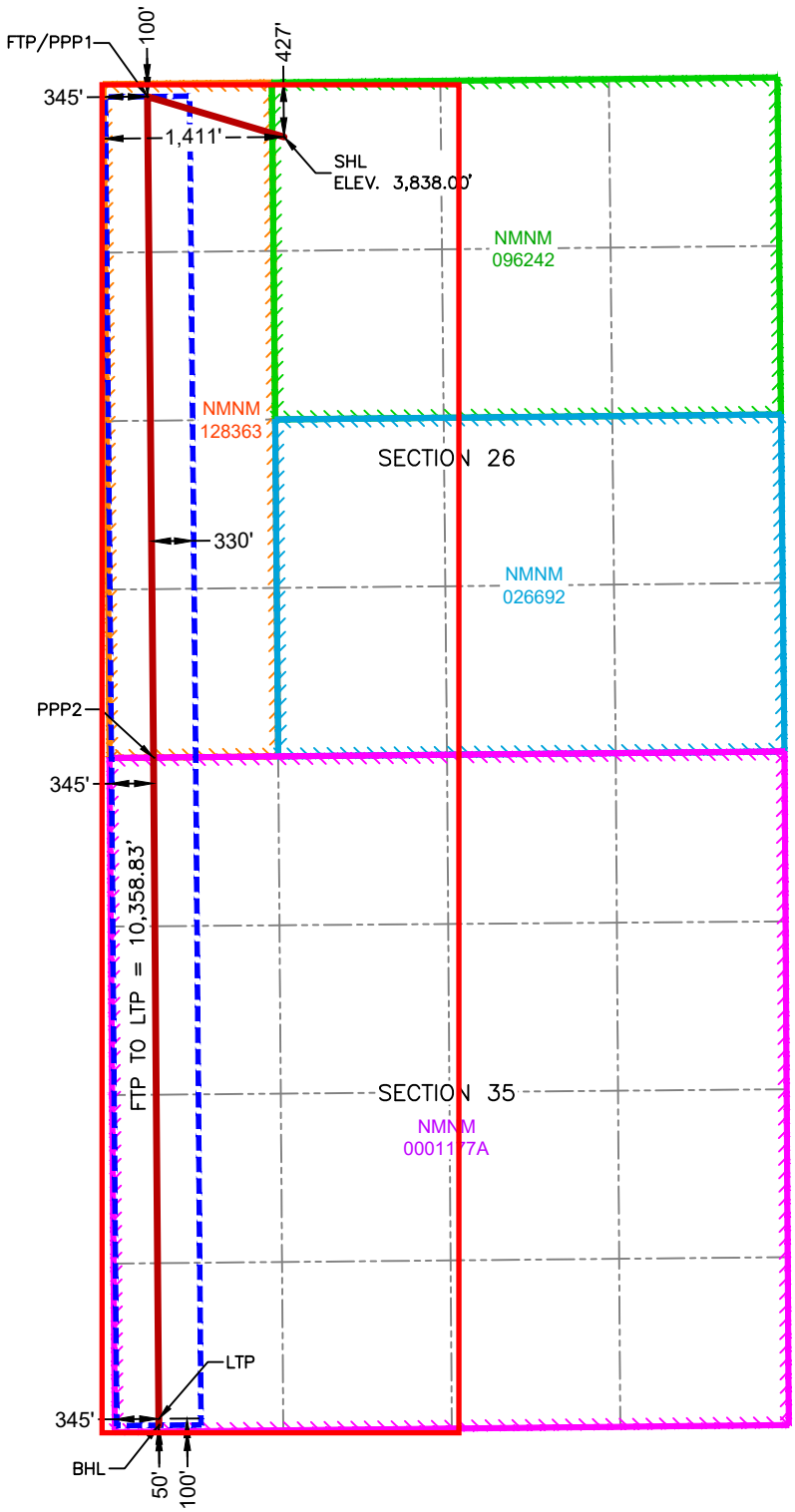
Certificate Number	Date of Survey
12177	11/11/2024

Note: 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.

ACREAGE DEDICATION PLATS

This grid represents a standard section. You may superimpose a non-standard section, or larger area, over this grid. Operators must outline the dedicated acreage in a red box, clearly show the well surface location and bottom hole location, if it is directionally drilled, with the dimensions from the section lines in the cardinal directions. If this is a horizontal wellbore show on this plat the location of the First Take Point and Last Take Point, and the point within the Completed interval (other than the First Take Point or Last Take Point) that is closest to any outer boundary of the tract.

Surveyors shall use the latest United States government survey or dependent resurvey. Well locations will be in reference to the New Mexico Principal Meridian. If the land is not surveyed, contact the OCD Engineering Bureau. Independent subdivision surveys will not be acceptable.



SURFACE HOLE LOCATION
& KICK-OFF POINT
427' FNL & 1,411' FWL
ELEV. = 3,838.00'

NAD 83 X = 755,249.15'
NAD 83 Y = 628,078.05'
NAD 83 LAT = 32.724696°
NAD 83 LONG = -103.637750°
NAD 27 X = 714,069.99'
NAD 27 Y = 628,014.05'
NAD 27 LAT = 32.724574°
NAD 27 LONG = -103.637251°

FIRST TAKE POINT &
PENETRATION POINT 1
100' FNL & 345' FWL

NAD 83 X = 754,179.93'
NAD 83 Y = 628,394.33'
NAD 83 LAT = 32.725585°
NAD 83 LONG = -103.641220°
NAD 27 X = 713,000.79'
NAD 27 Y = 628,330.33'
NAD 27 LAT = 32.725463°
NAD 27 LONG = -103.640721°

PENETRATION POINT 2
0' FNL & 345' FWL

NAD 83 X = 754,227.24'
NAD 83 Y = 623,215.95'
NAD 83 LAT = 32.711351°
NAD 83 LONG = -103.641176°
NAD 27 X = 713,047.96'
NAD 27 Y = 623,152.10'
NAD 27 LAT = 32.711229°
NAD 27 LONG = -103.640677°

LAST TAKE POINT
100' FSL & 345' FWL

NAD 83 X = 754,268.65'
NAD 83 Y = 618,035.89'
NAD 83 LAT = 32.697113°
NAD 83 LONG = -103.641151°
NAD 27 X = 713,089.23'
NAD 27 Y = 617,972.18'
NAD 27 LAT = 32.696991°
NAD 27 LONG = -103.640653°

BOTTOM HOLE LOCATION
50' FSL & 345' FWL

NAD 83 X = 754,269.07'
NAD 83 Y = 617,985.89'
NAD 83 LAT = 32.696976°
NAD 83 LONG = -103.641151°
NAD 27 X = 713,089.64'
NAD 27 Y = 617,922.19'
NAD 27 LAT = 32.696854°
NAD 27 LONG = -103.640653°

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 400901

CONDITIONS

Operator: Earthstone Operating, LLC 300 N. Marienfeld St Ste 1000 Midland, TX 79701	OGRID: 331165
	Action Number: 400901
	Action Type: [C-101] BLM - Federal/Indian Land Lease (Form 3160-3)

CONDITIONS

Created By	Condition	Condition Date
jelrod32	Cement is required to circulate on both surface and intermediate1 strings of casing.	11/12/2024
jelrod32	If cement does not circulate on any string, a Cement Bond Log (CBL) is required for that string of casing.	11/12/2024
pkautz	File As Drilled C-102 and a directional Survey with C-104 completion packet.	11/12/2024
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.	11/12/2024
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.	11/12/2024