Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD Artesia

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

## SUNDRY NOTICES AND REPORTS ON WELLS

***Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.***

***SUBMIT IN TRIPLICATE - Other instructions on reverse side.***

5. Lease Serial No.
NMNM030752

6. If Indian, Allottee or Tribe Name

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

1. Type of Well
☒ Oil Well ☐ Gas Well ☐ Other

8. Well Name and No.
WAR HORSE FEDERAL 1H

2. Name of Operator
MURCHISON OIL & GAS INC
Contact: CINDY COTTRELL
E-Mail: ccottrell@jdmii.com

9. API Well No.
30-015-41013

3a. Address
1100 MIRA VISTA BLVD
PLANO, TX 75093-4698

3b. Phone No. (include area code)
Ph: 972-931-0700 Ext: 109

10. Field and Pool, or Exploratory
WILDCAT G-04 S182927M

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 21 T18S R29E 350FNL 175FEL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

| TYPE OF SUBMISSION | TYPE OF ACTION | | | |
|---|---|---|---|---|
| ☒ Notice of Intent | ☐ Acidize | ☐ Deepen | ☐ Production (Start/Resume) | ☐ Water Shut-Off |
| ☐ Subsequent Report | ☒ Alter Casing | ☐ Fracture Treat | ☐ Reclamation | ☐ Well Integrity |
| ☐ Final Abandonment Notice | ☐ Casing Repair | ☐ New Construction | ☐ Recomplete | ☐ Other |
| | ☐ Change Plans | ☐ Plug and Abandon | ☐ Temporarily Abandon | |
| | ☐ Convert to Injection | ☐ Plug Back | ☐ Water Disposal | |

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

Murchison Oil and Gas is proposing to alter the casing design.

The original casing design was to set the 9-5/8" casing at 2895' in the top of the San Andres formation. Then to set 7" casing at 7000' in the First Bone Spring Sand. And use a 4.5" liner and hanger for completions.

The proposed new casing design will be to run the 9-5/8" casing to a depth of 6500' in the Bone Spring Lime formation. Eliminating the use of the 7" casing string and 4.5" liner and liner hanger. After the the 9-5/8" casing is set, 8.5" hole will be drilled to TD and 5.5" 17# P-110 casing will be run and cemented to surface. Cement volumes will be adjusted accordingly.

Attached are the original WBS and the proposed WBS. Both contain casing and cement. As well as a

2/12/14
ACCEPTED FOR RECORD
SEE ATTACHED FOR CONDITIONS OF APPROVAL

RECEIVED
FEB 12 2014
NMOCD ARTESIA

14. I hereby certify that the foregoing is true and correct.

**Electronic Submission #230861 verified by the BLM Well Information System**
**For MURCHISON OIL & GAS INC, sent to the Carlsbad**
**Committed to AFMSS for processing by JOHNNY DICKERSON on 01/30/2014 ()**

Name *(Printed/Typed)* STEVE MORRIS — Title SENIOR DRILLING ENGINEER

Signature (Electronic Submission) — Date 01/02/2014

APPROVED
FEB 7 2014
BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE

**THIS SPACE FOR FEDERAL OR STATE OFFICE USE**

Approved By _____ Title _____

Conditions of approval, if any, are attached. Approval of this notice 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. Office

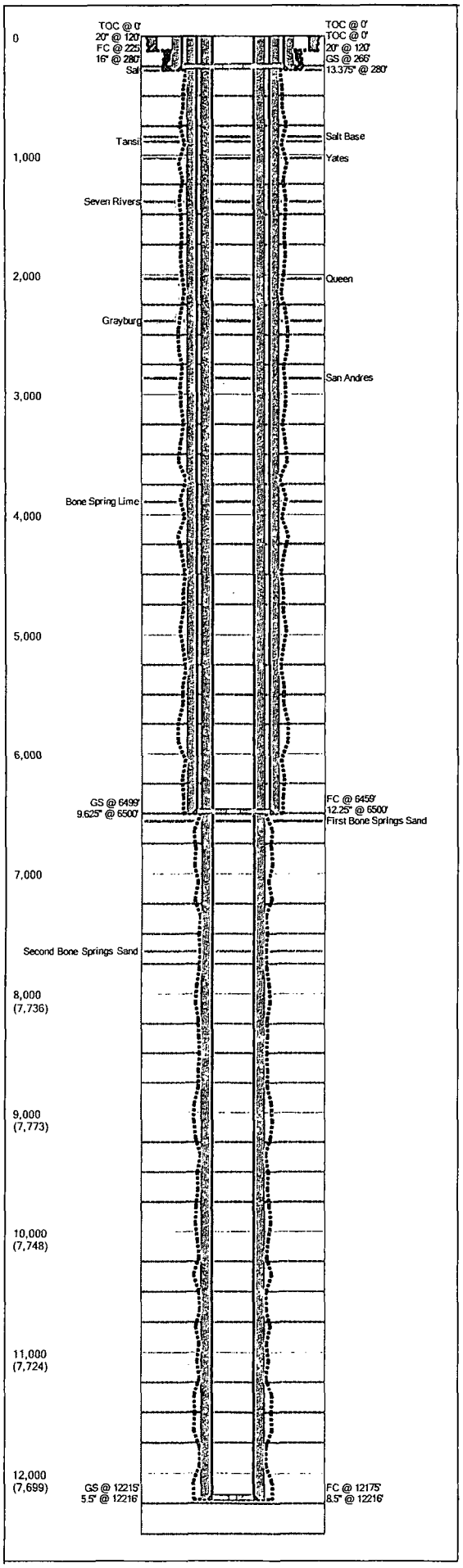
Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ****

## Additional data for EC transaction #230861 that would not fit on the form

**32. Additional remarks, continued**

new drilling prognosis for reference.




## Last Updated: 12/18/2013 11:39 AM

| Field Name | Lease Name | Well No. |
|---|---|---|
| Mustang | War Horse Federal Com | 1H |

| County, State | API No. |
|---|---|
| Eddy, New Mexico | 01111111111000 |

| Version | Version Tag |
|---|---|
| 1 | Planned |

| G.L. (ft) | K.B. (ft) | Sec. | Township/Block | Range/Survey |
|---|---|---|---|---|
| 3,496.0 | 3,418.0 | 21 | 18S | 29E |

| Operator | Well Status | Latitude | Longitude |
|---|---|---|---|
| Murchison Oil & Gas INC. | Planning | 32.739270 | 104.071800 |

**Footage Call**

350' FNL & 175' FEL From Section

| PropNum | Spud Date | Comp. Date |
|---|---|---|
| | | |

**Additional Information**

| Prepared By | Updated By | Last Updated |
|---|---|---|
| Steve Morris | Steve Morris | 12/18/2013 11:39 AM |

**Hole Summary**

| Date | O.D. (in) | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|
| | 20.000 | 0 | 120 | |
| | 16.000 | 120 | 280 | |
| | 12.250 | 280 | 6,500 | |
| | 8.500 | 6,500 | 12,216 | |

**Tubular Summary**

| Date | Description | O.D. (in) | Wt (lb/ft) | Grade | Top (MD ft) | Bottom (MD ft) |
|---|---|---|---|---|---|---|
| | Conductor Casing | 20.000 | 54.50 | J-55 | 0 | 120 |
| | Surface Casing | 13.375 | 54.50 | J-55 | 0 | 280 |
| | Intermediate Casing | 9.625 | 47.00 | L-80 | 0 | 6,500 |
| | Production Casing | 5.500 | 17.00 | P-110 | 0 | 12,216 |

**Casing Cement Summary**

| Date | No. Sx | Csg. O.D. (in) | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|---|
| | 218 | 13.375 | 0 | 280 | 120' Casing in conductor with no excess<br>134.6cuft 24bbls 100sx<br><br>160' casing in open hole with 100% excess<br>123.6cuft 22bbls 92sx<br>Shoe track 40ft with no excess<br>34.7cuft 6.2bbls 26sx |
| | 2,148 | 9.625 | 0 | 6,500 | 267' Lead<br>Casing in casing with no excess<br>96.8cuft 17.2bbls 56sx<br><br>5733' Lead<br>Casing in open hole with 80% excess<br>3231.9cuft 575.6bbls 1868sx<br><br>500' Tail<br>Casing in open hole with 80% excess<br>281.9cuft 50.2bbls 212sx<br><br>40' Tail in Shoe Track with no excess<br>16.2cuft 2.9bbls 12sx |
| | 1,629 | 5.500 | 0 | 12,216 | 6500" Lead<br>Casing in casing with no excess<br>1561.8cuft 278.2bbls 656sx<br><br>1375' Lead<br>Casing in open hole with 80% excess<br>567cuft 101bbls 238sx<br><br>4341' Tail<br>Casing in open hole with 20% excess<br>1193.3cuft 212.5bbls 728sx<br><br>80' Shoe Track with no excess<br>10.8cuft 1.9bbls 7sx |

**Tools/Problems Summary**

| Date | Tool Type | O.D. (in) | I.D. (in) | Top (MD ft) | Bottom (MD ft) |
|---|---|---|---|---|---|
| | FC | 13.375 | 0.000 | 225 | 0 |
| | GS | 13.375 | 0.000 | 266 | 0 |

**Last Updated:** 12/18/2013 11:39 AM

| Date | Tool Type | O.D. (in) | I.D. (in) | Top (MD ft) | Bottom (MD ft) |
|---|---|---|---|---|---|
| | FC | 9.625 | 0.000 | 6,459 | 0 |
| | GS | 9.625 | 0.000 | 6,499 | 0 |
| | FC | 5.500 | 0.000 | 12,175 | 0 |
| | GS | 5.500 | 0.000 | 12,215 | 0 |

**Formation Tops Summary**

| Formation | Top (MD ft) | Comments |
|---|---|---|
| Salt | 284 | |
| Salt Base | 844 | |
| Tansil | 884 | |
| Yates | 1,024 | |
| Seven Rivers | 1,394 | |
| Queen | 2,034 | |
| Grayburg | 2,384 | |
| San Andres | 2,864 | |
| Bone Spring Lime | 3,894 | |
| First Bone Springs Sand | 6,564 | |
| Second Bone Springs Sand | 7,562 | |

**Last Updated:** 12/18/2013 11:39 AM

| Field Name | Lease Name | Well No. | County, State | API No. |
|---|---|---|---|---|
| Mustang | War Horse Federal Com | 1H | Eddy, New Mexico | 01111111111000 |

| Version | Version Tag | Spud Date | Comp. Date | G.L. (ft) | K.B. (ft) |
|---|---|---|---|---|---|
| 1 | Planned | | | 3,496.0 | 3,418.0 |

| Sec. | Township/Block | Range/Survey | Footage Call |
|---|---|---|---|
| 21 | 18S | 29E | 350' FNL & 175' FEL From Section |

| Operator | Well Status | Latitude | Longitude | PropNum |
|---|---|---|---|---|
| Murchison Oil & Gas INC. | Planning | 32.739270 | 104.071800 | |

| Last Updated | Prepared By | Updated By |
|---|---|---|
| 12/18/2013 11:39 AM | Steve Morris | Steve Morris |

**Additional Information**

**Hole Summary**

| Date | O.D. (in) | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|
| | 20.000 | 0 | 120 | |
| | 16.000 | 120 | 280 | |
| | 12.250 | 280 | 6,500 | |
| | 8.500 | 6,500 | 12,216 | |

**Tubular Summary**

| Date | Description | No. Jts | O.D. (in) | Wt (lb/ft) | Grade | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | Conductor Casing | | 20.000 | 54.50 | J-55 | 0 | 120 | |
| | Surface Casing | | 13.375 | 54.50 | J-55 | 0 | 280 | Set above the salt zone Collapse 1130psi S.F. 3.08 Burst2730psi S.F. 3.54 Tension 514,000 S.F. 5.66 |
| | Intermediate Casing | | 9.625 | 47.00 | L-80 | 0 | 6,500 | Set in the Bone Spring Lime Collapse 4760psi S.F. 1.64Burst 6870psi S.F. 2.03 Tension 893,000 S.F. 2.92 |
| | Production Casing | | 5.500 | 17.00 | P-110 | 0 | 12,216 | Collapse 7480psi S.F. 1.55 Burst 10640psi S.F. 1.29Tension 568,000 S.F. 3.06 |

**Casing Cement Summary**

| Date | No. Sx | Csg. O.D. (in) | Top (MD ft) | Bottom (MD ft) | Description | Comments |
|---|---|---|---|---|---|---|
| | 218 | 13.375 | 0 | 280 | 218 sx 14.8ppg Yield 1.35cuft/sk6.35 gpsClass C + 2% CACL2 +0.25# CF + 0.005# SF | 120' Casing in conductor with no excess 134.6cuft 24bbls 100sx<br><br>160' casing in open hole with 100% excess 123.6cuft 22bbls 92sx<br>Shoe track 40ft with no excess 34.7cuft 6.2bbls 26sx |
| | 2,148 | 9.625 | 0 | 6,500 | Lead 1925 sx 12.6ppg Yield1.73cuft/sk 8.8gps(60:40) Poz(Fly Ash):Class C Cement +0.005 lbs/sack Static Free + 5%bwow SodiumChloride + 0.15%bwoc R-3 + 0.125 lbs/sackCelloFlake + 3 lbs/sack LCM-1 +0.25% bwoc FL-52 +0.005 gpsFP-6L + 1% bwoc SodiumMetasilicate Tail 224 sx 14.8ppgYield 1.33cuft 6.31gpsClass CCement + 0.005 lbs/sack StaticFree + 0.1% bwoc R-3 + 0.125lbs/sack Cello Flake | 267' Lead<br>Casing in casing with no excess 96.8cuft 17.2bbls 56sx<br><br>5733' Lead<br>Casing in open hole with 80% excess 3231.9cuft 575.6bbls 1868sx<br><br>500' Tail<br>Casing in open hole with 80% excess 281.9cuft 50.2bbls 212sx<br><br>40' Tail in Shoe Track with no excess 16.2cuft 2.9bbls 12sx |
| | 1,629 | 5.500 | 0 | 12,216 | Lead sx 11.9ppg Yield2.38cuft/sk 13.22gps50/50/10H+.45%FL52+ 5%SALT+.25%R3+3#LCM-1+.005# SFTail sx13ppg Yield 1.64cuft/sk8.49gps(15:61:11) Poz (FlyAsh):Class C Cement:CSE-2 +0.4% bwoc FL-25 + 0.4% bwocFL-52 + 0.5% bwoc BA-10A +0.1% bwoc R-21 | 6500" Lead<br>Casing in casing with no excess 1561.8cuft 278.2bbls 656sx<br><br>1375' Lead<br>Casing in open hole with 80% excess 567cuft 101bbls 238sx<br><br>4341' Tail<br>Casing in open hole with 20% excess 1193.3cuft 212.5bbls 728sx<br><br>80' Shoe Track with no excess 10.8cuft 1.9bbls 7sx |

**Tools/Problems Summary**

| Date | Tool Type | O.D. (in) | I.D. (in) | Top (MD ft) | Bottom (MD ft) | Description | Comments |
|---|---|---|---|---|---|---|---|
| | Float Collar | 13.375 | 0.000 | 225 | 0 | | |
| | Guide Shoe | 13.375 | 0.000 | 266 | 0 | | |
| | Float Collar | 9.625 | 0.000 | 6,459 | 0 | | |
| | Guide Shoe | 9.625 | 0.000 | 6,499 | 0 | | |
| | Float Collar | 5.500 | 0.000 | 12,175 | 0 | | |
| | Guide Shoe | 5.500 | 0.000 | 12,215 | 0 | | |

**Formation Top Summary**

| Formation Name | Top (MD ft) | Comments |
|---|---|---|
| Salt | 284 | |
| Salt Base | 844 | |
| Tansil | 884 | |
| Yates | 1,024 | |
| Seven Rivers | 1,394 | |
| Queen | 2,034 | |

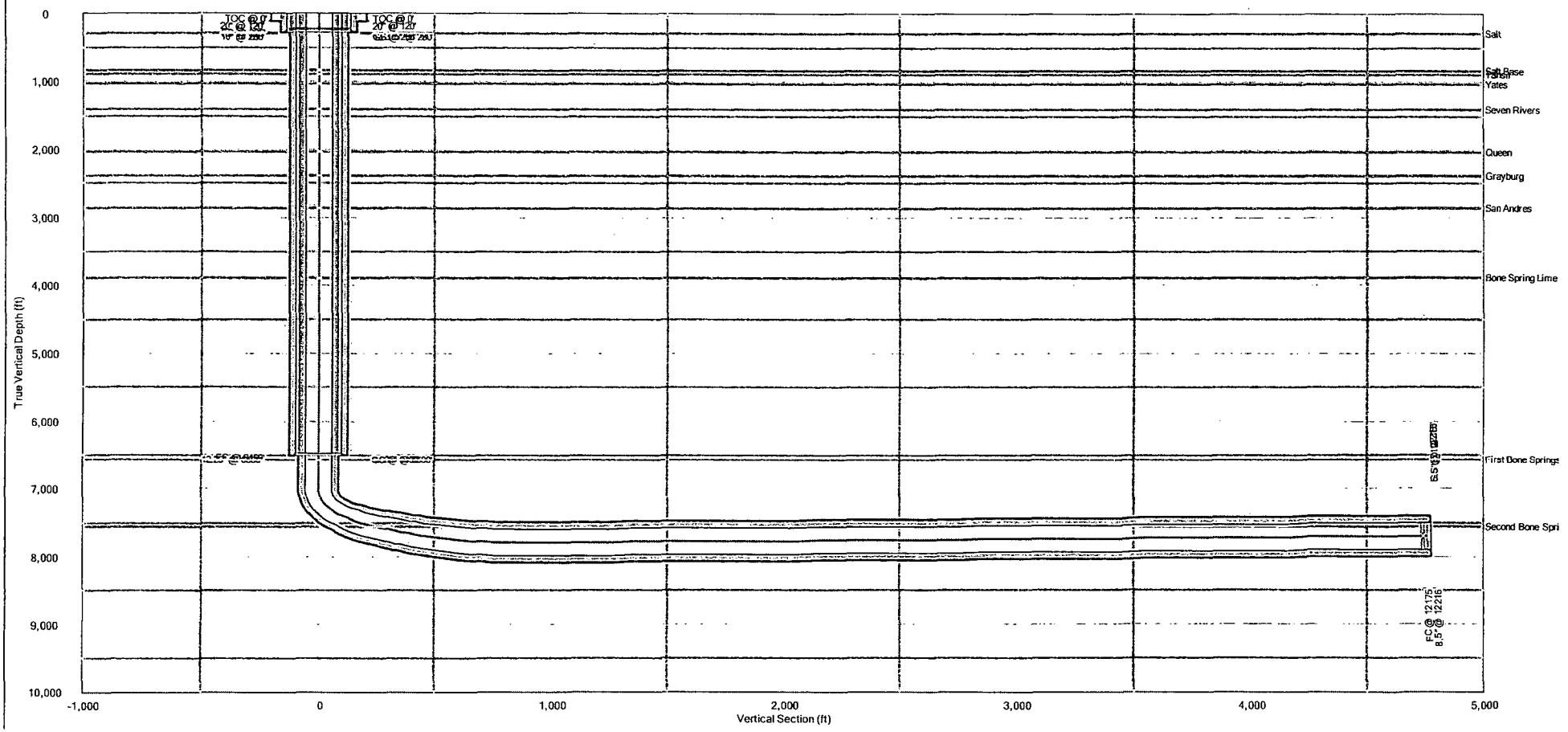
**Last Updated:** 12/18/2013 11:39 AM

| Formation Name | Top (MD ft) | Comments |
|---|---|---|
| Grayburg | 2,384 | |
| San Andres | 2,864 | |
| Bone Spring Lime | 3,894 | |
| First Bone Springs Sand | 6,564 | |
| Second Bone Springs Sand | 7,562 | |

| Field Name | Lease Name | Well No. | County, State | API No. | Version | Version Tag | Spud Date | Comp. Date | G.L. (ft) | K.B. (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| Mustang | War Horse Federal Com | 1H | Eddy, New Mexico | 01111111111000 | 1 | Planned | | | 3,496.0 | 3,418.0 |

| Sec. | Township/Block | Range/Survey | Footage Call | Latitude | Longitude | Well Status | PropNum | Operator |
|---|---|---|---|---|---|---|---|---|
| 21 | 18S | 29E | 350' FNL & 175' FEL From Section | 32.739270 | 104.071800 | Planning | | Murchison Oil & Gas INC. |

| Last Updated | Prepared By | Updated By | Additional Information |
|---|---|---|---|
| 12/18/13 11:39:04 AM | Steve Morris | Steve Morris | |



# Murchison Oil and Gas
# Drilling Prognosis
# War Horse Fed Com #1H

**Revision date: December 18, 2013**

| | |
|---|---|
| Surface Location: | 632,777.8usft N, 621,766.69usft E<br>350' FNL, 175' FEL<br><br>Section 21, T-18-S, R-29-E<br>Eddy County, New Mexico |
| Bottom Hole Target: | 632,762.42usft N, 616,992.79usft E<br>350' FNL, 330' FWL<br><br>Section 21, T-18-S, R-29-E<br>Eddy County, New Mexico |
| Planned Total Depth: | 7800' TVD /12216' MD |
| RKB: 3514.4' | GL: 3496.4' |
| Preparer: | Steve Morris |

# Contents

## *Article I.* ***Well Overview:***

The War Horse Fed Com #1H will be a horizontal well. The well will be drilled to TD with surface casing and intermediate casing. The production casing will be run and then cemented and perforated. The well will then be hydraulically fractured.

## *Article II.* ***Estimated Formation Tops (geoprognosis with TVD's adjusted to actual KB):***

| Formation | TVD | Subsea | Thickness | Type |
|---|---|---|---|---|
| Salt | 284' | -3230' | | |
| Salt Base | 844' | -2670' | | |
| Tansil | 884' | -2630' | | |
| Yates | 1024' | -2490' | | |
| Seven Rivers | 1394' | -2120' | | |
| Queen | 2034' | -1480' | | |
| Grayburg | 2384' | -1130 | | |
| San Andres | 2864' | -650' | | |
| Bone Spring Lime | 3894' | -380' | | |
| 1st Bone Spring | 6564' | 3050' | 200' | Hydrocarbon |
| 2nd Bone Spring | 7562' | 3995' | 400' | Hydrocarbon |

## *Article III.* ***Pressure Control:***

A 13-5/8" 5M BOP and 5M choke manifold will be used. See schematics.
BOP test shall be conducted:

A. when initially installed
B. whenever any seal subject to test pressure is broken
C. following related repairs
D. at 30 day intervals

BOP, choke, kill lines, Kelly cock, inside BOP, etc. will be hydro tested to 250psi(low) and 5,000psi(high). The annular will be tested to 250psi (low) and 2500psi (high).

BOP will be function tested on each trip.

## *Article IV.* ***Casing Program (minimum):***

***All casing is new API casing.***

| Hole Size | Casing | Weight lb/ft | Grade | Conn | MD/RKB | Stage |
|---|---|---|---|---|---|---|
| | 20" | | | | 120' | Conductor |
| 16" | 13.375" | 54.5 | J-55 | STC | 280' | Surface |
| 12.25" | 9.625" | 47 | L-80 | LTC | 6500' | Intermediate |
| 8.5" | 5.5" | 17 | P-110 | BTC | 12216' | Production |
| | | | | | | |

| Size | Collapse psi | SF | Burst psi | SF | Tension Klbs | SF |
|---|---|---|---|---|---|---|
| 13.375 | 1130 | 3.08 | 2730 | 3.54 | 514 | 5.66 |
| 9.625 | 4760 | 1.64 | 6870 | 2.03 | 893 | 2.92 |
| 5.5 | 7480 | 1.55 | 10640 | 1.29 | 568 | 3.06 |
| | | | | | | |
| | | | | | | |

13.375" casing will be set above the salt zone
9.625" casing will be set in the Bone Spring Lime

***Article V.*** ***Cement Program:***

## Section 5.01 13.375" Surface Casing

**Tail: Surface to TD**

| Slurry WT | Yield | Sx | Gallons/Sack | Excess | Additives |
|---|---|---|---|---|---|
| 14.8ppg | 1.35cuft/sk | 218 | 6.35 | 100% | Class C + 2% CACL2 + 0.25# CF + 0.005# SF |

Circulate cement to surface. If cement does not circulate a 1" grout string will be used to perform a top job.

Cement volumes will be adjusted respectively once actual casing depth is determined and washout from a fluid caliper.

## Section 5.02 9.625" Intermediate Casing

**Lead: Surface – 6000'**

| Slurry WT | Yield | Sx | Gallons/Sack | Excess | Additives |
|---|---|---|---|---|---|
| 12.6ppg | 1.73cuft/sk | 1924 | 8.8 | 80% | (60:40) Poz (Fly Ash):Class C Cement + 0.005 lbs/sack Static Free + 5% bwow Sodium Chloride + 0.15% bwoc R-3 + 0.125 lbs/sack Cello Flake + 3 lbs/sack LCM-1 + 0.25% bwoc FL-52 + 0.005 gps FP-6L + 1% bwoc Sodium Metasilicate |

**Tail: 6000'-6500'**

| Slurry WT | Yield | Sx | Gallons/Sack | Excess | Additives |
|---|---|---|---|---|---|
| 14.8ppg | 1.33cuft/sk | 224 | 6.31 | 80% | Class C Cement + 0.005 lbs/sack Static Free + 0.1% bwoc R-3 + 0.125 lbs/sack Cello Flake |

Circulate cement to surface. If cement does not circulate to surface a top squeeze job or casing perforation will be used.
This will be discussed with the BLM prior to commencing remedial cement job. As well, a temperature survey or CBL will be performed. This will be discussed with the BLM prior to either being run.

Cement volumes will be adjusted accordingly once actual casing depth is determined and washout from a fluid caliper.

## Section 5.03 5.5" Production Casing

**Lead: Surface-7875'**

| Slurry WT | Yield | Sx | Gallons/Sack | Excess | Additives |
|---|---|---|---|---|---|
| 11.9ppg | 2.38cuft/sk | 894 | 13.22 | 80% | 50/50/10 H+.45%FL52+5%SALT+.25%R3+3#LCM-1+.005# SF |

**Tail: 7875'-TD**

| Slurry WT | Yield | Sx | Gallons/Sack | Excess | Additives |
|---|---|---|---|---|---|
| 13.0ppg | 1.64cuft/sk | 735 | 8.49 | 20% | (15:61:11) Poz (Fly Ash):Class C Cement:CSE-2 + 0.4% bwoc FL-25 + 0.4% bwoc FL-52 + 0.5% bwoc BA-10A + 0.1% bwoc R-21 |

Circulate cement to surface. If cement does not circulate to surface a top squeeze job or casing perforation will be used.
This will be discussed with the BLM prior to commencing remedial cement job. As well, a temperature survey or CBL will be performed. This will be discussed with the BLM prior to either being run.

Cement volumes will be adjusted accordingly once actual casing depth is determined and washout from a fluid caliper.

## *Article VI.* ***Product Descriptions:***

**Bentonite II**
P105

**CSE-2**
An additive which contributes to low density, high compressive strength development of cement slurries at all temperature ranges. This material also controls free water without the need for standard extenders.

**Calcium Chloride**
A powdered, flaked or pelletized material used to decrease thickening time and increase the rate of strength development.

**Cello Flake**
Graded (3/8 to 3/4 inch) cellophane flakes used as a lost circulation material.

**Class C Cement**
Intended for use from surface to 6000 ft., and for conditions requiring high early strength and/or sulfate resistance.

**Class H Cement**
Class H cement is an API type, all purpose oil well cement which is used without modification in wells up to 8,000 ft. It possesses a moderate sulfate resistance. With the use of accelerators or retarders, it can be used in a wide range of well depths and temperatures.

**FL-25**
An all purpose salt-tolerant fluid loss additive that provides exceptional fluid loss control across a wide range of temperatures and salinity conditions and remedial cementing applications.

**FL-52**
A water soluble, high molecular weight fluid loss additive used in medium to low density slurries. It is functional from low to high temperature ranges.

**FP-6L**
A clear liquid that decreases foaming in slurries during mixing.

**LCM-1**
A graded (8 to 60 mesh) naturally occurring hydrocarbon, asphaltite. It is used as a lost circulation material at low to moderate temperatures and will act as a slurry extender. Cement compressive strength is reduced.

**MPA-5**
Used to enhanced compressive, tensile, fleural strength development and reduced permeability

**Poz (Fly Ash)**
A synthetic pozzolan, (primarily Silicon Dioxide). When blended with cement, Pozzolan can be used to create lightweight cement slurries used as either a filler slurry or a sulfate resistant completion cement.

**Sodium Chloride**
At low concentrations, it is used to protect against clay swelling.

**Sodium Metasilicate**
An extender used to produce economical, low density cement slurry.

**Static Free**
An anti-static additive used to prevent air entrainment due to agglomerated particles. Can be used in Cementing and Fracturing operations to aid in the flow of dry materials.

## *Article VII. Mud Program:*

| Depth | Hole | Type | MW | PV | YP | WL | pH | Sol % |
|---|---|---|---|---|---|---|---|---|
| 0-280 | 16" | Fresh Water | 8.4-8.9 | 10-12 | 12-15 | NC | 9.5 | <3.0 |
| 280-6500 | 12.25" | Brine | 10 | 1 | 1 | NC | 9.5 | <1.0 |
| 6500-KOP | 8.5" | Cut Brine | 8.4-8.6 | 1 | 1 | NC | 9.5 | <1.0 |
| KOP-TD | 8.5" | Cut Brine | 8.9-9.1 | 4-6 | 4-6 | 18-20 | 9.5 | <3.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Sufficient mud will be on location to control any abnormal conditions encountered. Such as but not limited to a kick, lost circulation and hole sloughing.

## *Article VIII. Mud Monitoring System:*
A Pason PVT system will be rigged up prior to spudding the well. A volume monitoring system that measures, calculates, and displays readings from the mud system on the rig to alert the rig crew of impending gas kicks and lost circulation issues.

**Components**

**a) PVT Pit Bull monitor:**
Acts as the heart of the system, containing all the controls, switches, and alarms. Typically, it is mounted near the driller's console.

**b) Junction box:**
Provides a safe, convenient place for making the wiring connections.

**c) Mud probes:**
Measure the volume of drilling fluid in each individual tank.

**d) Flow sensor:**
Measures the relative amount of mud flowing in the return line.

## *Article IX.* ***Logging, Drill stem testing and Coring:***

2 man mud logging will start after surface casing has been set.

8.5" hole will have LWD (Gamma Ray) to section TD.

## *Article X.* ***Bottom Hole:***

Temperature is expected to be 162°F, using a 0.76°/100' gradient. The bottom hole pressure is expected to be 4840psi maximum using a pressure gradient of 0.44psi/ft

## *Article XI.* ***Abnormal Conditions:***

No abnormal conditions are expected. Temperature is expected to be normal. All zones are expected to be normal pressure.

Lost circulation is possible in both the 16" and 12.25" hole sections. 20ppb of LCM will be maintained in the active system at all times while drilling these sections. As well, a 50bbl pill of 50ppb LCM will be premixed in the slug pit in case lost circulation is encountered. If complete loss circulation is encountered in the Capitan Reef the Brine will be switched over to fresh water. The BLM will be notified of this and an inspector requested to witness the drilling fluid swap.

## *Article XII.* ***H2S:***

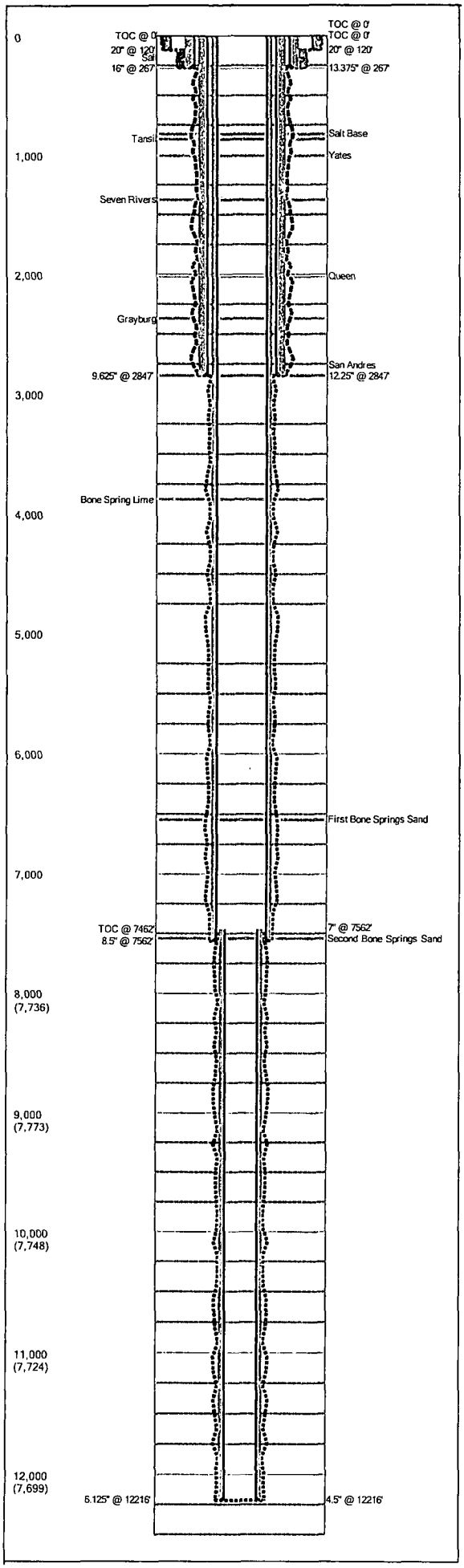
No H2S is expected. But there is the possibility of the presence of H2S. Attached is the H2S response plan.

## *Article XIII.* ***Directional:***

Directional survey plan and plot attached.

## *Article XIV.* ***Drilling Recorder:***

Rig up EDR & PVT prior to spud to record drilling times and other drilling parameters from surface to TD.




## Last Updated: 3/27/2013 02:16 PM

| Field Name | Lease Name | Well No. |
|---|---|---|
| Mustang | War Horse Federal Com | 1H |

| County, State | API No. |
|---|---|
| Eddy, New Mexico | 01111111111000 |

| Version | Version Tag |
|---|---|
| 1 | Planned |

| G.L. (ft) | K.B. (ft) | Sec. | Township/Block | Range/Survey |
|---|---|---|---|---|
| 3,496.0 | 3,418.0 | 21 | 18S | 29E |

| Operator | Well Status | Latitude | Longitude |
|---|---|---|---|
| Murchison Oil & Gas INC. | Planning | 32.739270 | 104.071800 |

**Footage Call**

350' FNL & 175' FEL

| PropNum | Spud Date | Comp. Date |
|---|---|---|
| | | |

**Additional Information**

| Prepared By | Updated By | Last Updated |
|---|---|---|
| Steve Morris | Steve Morris | 3/27/2013 2:16 PM |

**Hole Summary**

| Date | O.D. (in) | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|
| | 20.000 | 0 | 120 | |
| | 16.000 | 120 | 267 | |
| | 12.250 | 267 | 2,847 | |
| | 8.500 | 2,847 | 7,562 | |
| | 6.125 | 7,492 | 12,216 | |

**Tubular Summary**

| Date | Description | O.D. (in) | Wt (lb/ft) | Grade | Top (MD ft) | Bottom (MD ft) |
|---|---|---|---|---|---|---|
| | Conductor Casing | 20.000 | 54.50 | J-55 | 0 | 120 |
| | Surface Casing | 13.375 | 54.50 | J-55 | 0 | 267 |
| | Intermediate Casing | 9.625 | 40.00 | L-80 | 0 | 2,847 |
| | Production Casing | 7.000 | 26.00 | P-110 | 0 | 7,562 |
| | Liner | 4.500 | 11.60 | P-110 | 7,462 | 12,216 |

**Casing Cement Summary**

| Date | No. Sx | Csg. O.D. (in) | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|---|
| | 450 | 13.375 | 0 | 267 | |
| | 775 | 9.625 | 0 | 2,847 | |
| | 850 | 7.000 | 0 | 7,562 | |
| | 400 | 4.500 | 7,462 | 12,216 | |

**Formation Tops Summary**

| Formation | Top (MD ft) | Comments |
|---|---|---|
| Salt | 267 | |
| Salt Base | 827 | |
| Tansil | 867 | |
| Yates | 1,007 | |
| Seven Rivers | 1,377 | |
| Queen | 2,017 | |
| Grayburg | 2,367 | |
| San Andres | 2,847 | |
| Bone Spring Lime | 3,877 | |
| First Bone Springs Sand | 6,547 | |
| Second Bone Springs Sand | 7,492 | |

**Last Updated:** 3/27/2013 02:16 PM

| Field Name | Lease Name | Well No. | County, State | API No. |
|---|---|---|---|---|
| Mustang | War Horse Federal Com | 1H | Eddy, New Mexico, | 01111111111000 |

| Version | Version Tag | Spud Date | Comp. Date | G.L. (ft) | K.B. (ft) |
|---|---|---|---|---|---|
| 1 | Planned | | | 3,496.0 | 3,418.0 |

| Sec. | Township/Block | Range/Survey | Footage Call |
|---|---|---|---|
| 21 | 18S | 29E | 350' FNL & 175' FEL |

| Operator | Well Status | Latitude | Longitude | PropNum |
|---|---|---|---|---|
| Murchison Oil & Gas INC. | Planning | 32.739270 | 104.071800 | |

| Last Updated | Prepared By | Updated By |
|---|---|---|
| 03/27/2013 2:16 PM | Steve Morris | Steve Morris |

**Additional Information**

**Hole Summary**

| Date | O.D. (in) | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|
| | 20.000 | 0 | 120 | |
| | 16.000 | 120 | 267 | |
| | 12.250 | 267 | 2,847 | |
| | 8.500 | 2,847 | 7,562 | |
| | 6.125 | 7,492 | 12,216 | |

**Tubular Summary**

| Date | Description | No. Jts | O.D. (in) | Wt (lb/ft) | Grade | Top (MD ft) | Bottom (MD ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | Conductor Casing | | 20.000 | 54.50 | J-55 | 0 | 120 | |
| | Surface Casing | | 13.375 | 54.50 | J-55 | 0 | 267 | |
| | Intermediate Casing | | 9.625 | 40.00 | L-80 | 0 | 2,847 | |
| | Production Casing | | 7.000 | 26.00 | P-110 | 0 | 7,562 | |
| | Liner | | 4.500 | 11.60 | P-110 | 7,462 | 12,216 | |

**Casing Cement Summary**

| Date | No. Sx | Csg. O.D. (in) | Top (MD ft) | Bottom (MD ft) | Description | Comments |
|---|---|---|---|---|---|---|
| | 450 | 13.375 | 0 | 267 | 14.8ppg Class C+2% CACL2+0.25# Celloflake+0.25% R-38 | |
| | 775 | 9.625 | 0 | 2,847 | Lead 12.8ppg Class C 35/65+6% Bentonite+0.3% C-16A+2# Star Seal+1% CACL2+0.25% R-38+ 5% Salt. Tail 14.8ppg Class C+0.25% R-38 | |
| | 850 | 7.000 | 0 | 7,562 | Lead 11.9ppg Class H 50/50+10% Bentonite+.03% C-16A+2# Star Seal+0.25% R-38+ 5% Salt. Tail 15.6ppg Class H+0.25% R-38 | |
| | 400 | 4.500 | 7,462 | 12,216 | | |

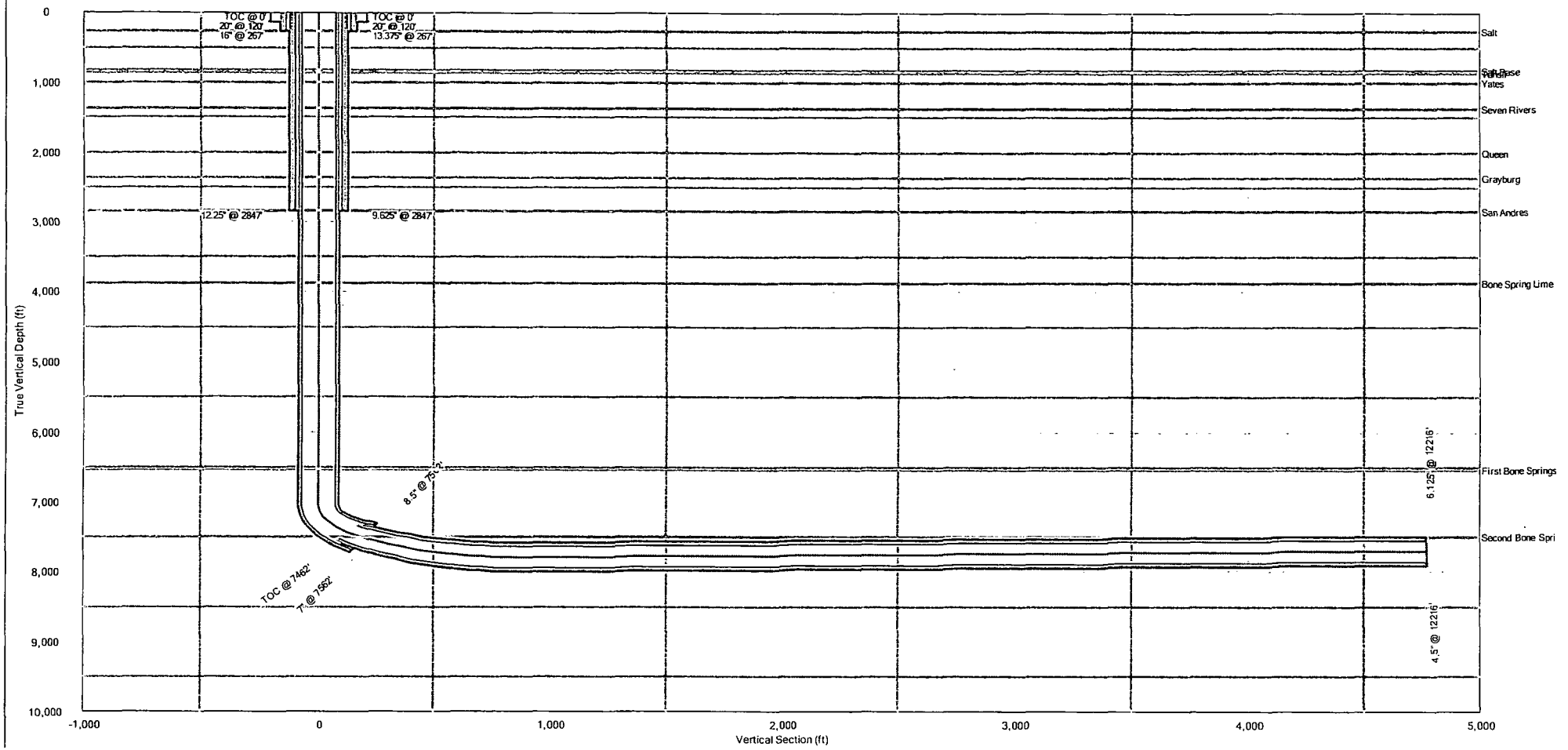
**Formation Top Summary**

| Formation Name | Top (MD ft) | Comments |
|---|---|---|
| Salt | 267 | |
| Salt Base | 827 | |
| Tansil | 867 | |
| Yates | 1,007 | |
| Seven Rivers | 1,377 | |
| Queen | 2,017 | |
| Grayburg | 2,367 | |
| San Andres | 2,847 | |
| Bone Spring Lime | 3,877 | |
| First Bone Springs Sand | 6,547 | |
| Second Bone Springs Sand | 7,492 | |

| Field Name | Lease Name | Well No. | County, State | API No. | Version | Version Tag | Spud Date | Comp. Date | G.L. (ft) | K.B. (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| Mustang | War Horse Federal Com | 1H | Eddy, New Mexico | 01111111111000 | 1 | Planned | | | 3,496.0 | 3,418.0 |

| Sec. | Township/Block | Range/Survey | Footage Call | Latitude | Longitude | Well Status | PropNum | Operator |
|---|---|---|---|---|---|---|---|---|
| 21 | 18S | 29E | 350' FNL & 175' FEL | 32.739270 | 104.071800 | Planning | | Murchison Oil & Gas INC. |

| Last Updated | Prepared By | Updated By | Additional Information |
|---|---|---|---|
| 3/27/13 2:16:55 PM | Steve Morris | Steve Morris | |


TOC @ 0'
20" @ 120'
16" @ 267'
TOC @ 0'
20" @ 120'
13.375" @ 267'
12.25" @ 2847'
9.625" @ 2847'
8.5" @ 7562'
TOC @ 7462'
7" @ 7562'
6.125" @ 12216'
4.5" @ 12216'
Salt
Salt Base
Yates
Seven Rivers
Queen
Grayburg
San Andres
Bone Spring Lime
First Bone Springs
Second Bone Spri
True Vertical Depth (ft)
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
-1,000
0
1,000
2,000
3,000
4,000
5,000
Vertical Section (ft)

# PECOS DISTRICT
# CONDITIONS OF APPROVAL

| | |
|---|---|
| OPERATOR'S NAME: | Murchison Oil & Gas |
| LEASE NO.: | NM030752 |
| WELL NAME & NO.: | 1H War Horse Fed Com |
| SURFACE HOLE FOOTAGE: | 350'/ FNL & 175'/ FEL |
| BOTTOM HOLE FOOTAGE | 350'/ FNL & 330'/ FWL |
| LOCATION: | Section 21, T.18 S., R.29 E., NMPM |
| COUNTY: | Eddy County, New Mexico |
| API: | 30-015-41013 |

**The original COA still stand with the following drilling modifications:**

## A. DRILLING OPERATIONS REQUIREMENTS

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

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

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

1. **Hydrogen Sulfide has been reported as a hazard, but no measurements have been recorded. It is recommended that monitoring equipment be onsite for potential Hydrogen Sulfide. If Hydrogen Sulfide is encountered, please report measurements and formations to the BLM.**

2. 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. **If the drilling rig is removed without approval – an Incident of Non-Compliance will be written and will be a "Major" violation.**

3. 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 is located, this does not include the dog house or stairway area.

4. **The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) will be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.**

B. CASING

**Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size. 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.).**

**Centralizers required on surface casing per Onshore Order 2.III.B.1.f.**

**Wait on cement (WOC) time prior to drilling out for a primary cement job will be a minimum 18 hours for a water basin, 24 hours in the potash area, or 500 pounds compressive strength, whichever is greater for all casing strings. DURING THIS WOC TIME, NO DRILL PIPE, ETC. SHALL BE RUN IN THE HOLE. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. IF OPERATOR DOES NOT HAVE THE WELL SPECIFIC CEMENT DETAILS ONSITE PRIOR TO PUMPING THE CEMENT FOR EACH CASING STRING, THE WOC WILL BE 30 HOURS. See individual casing strings for details regarding lead cement slurry requirements.**

**No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.**

**Possible lost circulation in the Grayburg and San Andres formations.**
**Possible water and brine flows in the Salado and Artesia Groups.**

1. The **13-3/8** inch surface casing shall be set at approximately **280** feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface.

    a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.

**b. Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry.**

c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength, whichever is greater.

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

**Formation below the 13-3/8" shoe to be tested according to Onshore Order 2.III.B.1.i. Test to be done as a mud equivalency test using the mud weight necessary for the pore pressure of the formation below the shoe and the mud weight anticipated to control the formation pressure to the next casing depth. Report results to BLM office.**

2. The minimum required fill of cement behind the **9-5/8** inch intermediate casing, which shall be set at approximately **6500** feet, is:

   ☒ Cement to surface. If cement does not circulate see B.1.a, c-d above.

**Formation below the 9-5/8" shoe to be tested according to Onshore Order 2.III.B.1.i. Test to be done as a mud equivalency test using the mud weight necessary for the pore pressure of the formation below the shoe (not the mud weight required to prevent dissolving the salt formation) and the mud weight anticipated to control the formation pressure to the next casing depth. Report results to BLM office.**

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

   ☒ Cement to surface. If cement does not circulate, contact the appropriate BLM office. **Excess calculates to 14% - Additional cement may be required.**

4. 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.

## C. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.

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

3. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.

    a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

    b. The tests shall be done by an independent service company utilizing a test plug **not a cup or J-packer**. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (18 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).

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

    d. 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.**

    e. 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.

## D. DRILL STEM TEST

If drill stem tests are performed, Onshore Order 2.III.D shall be followed.

## E. 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.

**JAM 020614**