MERIT ENERGY COMPANY

13727 Noel Road · Suite 1200 · Dallas, Texas 75240
**Ph** 972.701.8377 · **Fx** 972.960.1252 · www.meritenergy.com

April 12, 2021

US Environmental Protection Agency
Underground Injection Control, Region 8
1595 Wynkoop Street
Denver, Colorado 80202

RE: Brinkerhoff 3A
Underground Injection Control Permit Application
Sec 9-T3N-R1W
Fremont County, Wyoming

Enclosed is an Underground Injection Control (UIC) permit application for a proposed saltwater disposal well in the Steamboat Butte Field, Fremont County, Wyoming. The well in question is the Brinkerhoff 3A, located in the SENW Section 9 T3N R1W. Merit Energy Company proposes converting the well from a Crow Mountain producer to a Crow Mountain Class II-EOR injector. The purpose is to provide offset Crow Mountain producers with waterflood response.

The Steamboat Butte Field is located within the boundaries of the Wind River Indian Reservation. The injection project for the Nugget, Phosphoria and Tensleep formations was originally authorized by the Bureau of Land Management (BLM). Since that time, the Environmental Protection Agency (EPA) has been granted jurisdiction over all injection activity on the reservation. The Steamboat Butte Field injection projects have been considered to be rule authorized programs. However, EPA procedures require that individual permits be filed for any new injection wells, whether they be grass roots or conversions.

Accordingly, Merit respectfully requests that the EPA review and grant approval of the application to convert the Brinkerhoff 3A into a Class II-EOR. Should any questions arise concerning this matter, or additional information be required, please feel free to contact Michelle Yalung at phone number (972)628-1441.

Sincerely,
MERIT ENERGY COMPANY

Michelle Yalung
Regulatory Analyst

MERIT ENERGY COMPANY

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A. Area of Review Methods.
The area of review for this application is a circle of one-quarter mile radius centered on the surface location of the Brinkerhoff 3A. The Brinkerhoff 3A well is located 330 feet from the south line (FSL) and 660 feet from the east SENW Section 9 T3N R1W, Fremont County, Wyoming. The area of review is contained within the boundaries of the Wind River Indian Reservation. For notification purposes, the Joint Business Council, the Bureau of Indian Affairs, and the Bureau of Land Management were all provided abridged copies of this permit application. These documents were forwarded to the following addresses:

Chairman, Joint Business Council Arapahoe & Shoshone Tribes
P. O. Box 830
Fort Washakie, WY 82514

United States Department of the Interior Bureau of Indian Affairs
Wind River Indian Reservation Fort Washakie, WY 82514

United States Department of the Interior Bureau of Land Management
Lander Resource Area
P. O. Box 589
Lander, WY 82520

Chairman, Richard Brannan. Arapahoe Business Council
P. O. Box 396
Fort Washakie, WY 82514

Shoshone Business Council Chairman, Ivan Posey
P. O. Box 770
Fort Washakie, WY 82514

The State of Wyoming
Oil. & Gas Conservation Comm.
P. O. Box 2640
Casper, WY 82602

B. Map of Well/Area and Area of Review.
Enclosed with this application, as Exhibit A, is a map showing the area within one-quarter mile of the Brinkerhoff 3A well. The map displays the location of all wells drilled within the area. Also enclosed with this application as Exhibit A-1 is a map of the Steamboat Butte Field.

C. Corrective Action Plan and Well Data.
Enclosed with this application as Exhibit B, Exhibit B-1 and B-2 is a tabulation and wellbore diagrams of all pertinent data, reasonably available, on all wells located within the area of review. Merit does not plan on operating Brinkerhoff 3A well at a pressure that exceeds Crow Mountain frac gradient pressures.

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D. Map and Cross Section of USDWs
This is not applicable to Class II wells.

E. Name and Depth of USDWs (Class II)
Within a mile of the subject well there are no permitted water wells. The few water wells within a radius of 5 miles of the Brinkerhoff 3A well consist of Wind River formation wells less than 500 feet deep. The only known underground sources of drinking water (USDWs) in the general area of the well have been identified by the State of Wyoming Oil and Gas Conservation Commission per Martha Horn, as seen in the following table.

Possible USDWs in this area are as follows:

| Name | Depth *1 | TDS mg/L *2 |
|---|---|---|
| Quartermary Sands | 0'-380' | 2430 |
| Wind River Sands | Not Present | 700 to 2800 |
| Cody Shale (Top Eroded) | 380'-3012' | 1750 to 2430 |
| Frontier Sand | 3075'-3660' | 4383 to 7630 |
| Muddy Sand | 4450'-4520' | 6080 |

The USDW intervals are each isolated by thick competent shales (confining zones). The Cody Shale with a gross interval of 2632' contains only thin isolated sands. The Frontier USDW is confined by the overlying Cody, and 506' of underlying Mowry and upper Thermopolis shales. The Muddy sand is confined by overlying Mowry and upper Thermopolis, and 102' of underlying lower Thermopolis shales. The Dakota sand is confined by overlying lower Thermopolis, and 70' of underlying Fuson shale.

All possible USDW intervals encountered in the Brinkerhoff 3A well are currently producing hydrocarbons in this area. The Frontier, Muddy and the Dakota sands have all produced in the Steamboat Butte field and the discontinuous sand lenses in the Cody shale have hydrocarbon shows and are oil productive in the nearby Pilot Butte field.

F. Maps and Cross Sections of Geologic Structure.
This is not applicable to Class II wells.

G. Geological Data on Injection and confining zones.
The proposed zone of injection for the Brinkerhoff 3A well is the Crow Mountain formation. The Crow Mountain consists of 999' of medium to fine grained Sandstone and siltstone laminations. Once the conversion is completed, produced water from the Steamboat butte field will be injected through the following intervals:

Crow Mountain 5802' – 5812' (existing perforations)

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Enclosed with this application as Exhibit C is a copy of the EPA's Acceptable Sand-Face Fracture gradient for the Steamboat Butte Field dated August 12, 1997. The fracture gradients for the proposed Crow Mountain formation are .70 psi/ft, an industry accepted average for consolidated Silty Sandstone.

In Brinkerhoff 3A well, the Crow Mountain formation is encountered at a depth of 5658' KB. The injection fluid for the well will be a mixture of Steamboat Butte Field produced waters, with an estimated specific gravity of 1.00. Given these conditions, the surface fracture pressure for the Crow Mountain formation in the Brinkerhoff 3A has been calculated to be 1955 psig.

**Crow Mountain Fracture Gradient:**

The fracture gradient for the Crow Mountain formation in Brinkerhoff 3A injection well is calculated in the following manner:

| | | | |
|---|---|---|---|
| | Pf | = | [Fg - 0.433 (SG I)]*D |
| Where: | Pf | = | Surface fracture pressure, psig |
| | Fg | = | Fracture gradient, psi/ft. |
| | SGI | = | Specific gravity of injection Fluid |
| | 0.433 | = | Pressure gradient of fresh water, psi/ft. |
| | D | = | Formation Depth, ft, GL. |
| For: | Fg | = | 0.70 psi/ft |
| | SGI | = | 1.00 |
| | D | = | 5802' |
| | Pf | = | 1955 psig |

Enclosed with this application

H. Operating Data.
1) Average rate: 1000 BPD, Maximum rate: 2500 BPD
2) Average pressure 1000-1250 PSIG estimated. Maximum pressure 1955 PSIG, respectively.
3) The annulus fluid for the Brinkerhoff 3A well will be fresh water treated with a corrosion inhibitor and an oxygen scavenger.
4) Not applicable for Class II wells.

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5) The source of water for injection into the Brinkerhoff 3A well will be a mixture of produced water from all producing formations in the Steamboat Butte Field. Enclosed with this application as Exhibit E is a standard analysis of that produced water.

I. Formation Testing Program

Injectivity into the Brinkerhoff 3A well will be monitored by means of a pressure gauge and flow meter located at the wellhead. A mechanical integrity test will be performed prior to the initiation of injection operations in order to verify the integrity of the wellbore and injection equipment. Enclosed with this application as Exhibit F is a standard analysis of the Crow Mountain formations water.

J. Stimulation Program – No stimulation will occur during this conversion.

K. Injection Procedures.

The current water injection system in the Steamboat Butte Field consists of two injection facilities each containing four Quinplex PD pumps. These pumps are installed at the C1-Battery and E-5 batter. This water is separated from the produced oil, then stored in 3 – 3000 bbl tanks at each of the injection plant. The water will then be transferred to the Brinkerhoff 3A through a 4" steel line.

L. Construction Procedures

The Brinkerhoff 3A was drilled and completed as a Phosphoria/Dinwoody producer in 1966 to replace the Brinkerhoff 3 which was plugged in the same year. The Brinkerhoff 3 had many joints of tubing stuck in the hole and the decision was made to plug. The Brinkerhoff 3A IP was a strong production show of 205 BOPD and 379 BWPD from the same zones.

In 1983 the Phosphoria/Dinwoody was plugged and the well converted to a Crow Mountain producer. The Crow Mountain was perforated and frac'd with 5500 lbs of 10/20 sand. The initial production was 23 BOPD / 0 BWPD. Production quickly declined due to lack of pressure and the well was officially filed for Dormant status in 1996. No work has been performed on the Brinkerhoff 3A since.

In January of 2018, the offset Brinkerhoff 4 was recompleted to become a Crow Mountain producer by perfing and frac'ing the Crow Mountain with 50,000# 16/30 mesh sand. The results were very similar to the Brinkerhoff 3A Crow Mountain conversion with the B-4 Crow Mountain initially testing at 30 BOPD & 250 BWPD. The B-4 has lost all reservoir pressure and is now only producing 1 bbl of total fluid per day with about a 30% oilcut.

It is therefore proposed that the Brinkerhoff 3A be converted into a UIC Class II injection – EOR to support production in the Crow Mountain for offset producers within the Steamboat field.

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M. Construction Details
Enclosed with this application as Exhibit G is a schematic diagram of the current Completion. The proposed completion will be the exact same, no well bore construction work will performed in relation to this application unless deemed necessary by the EPA.

N. Changes in Injected Fluid
Injection disposal fluid samples will be submitted to EPA per the COA requirements upon approval.

O. Plans for Well Failures
Annulus pressure will be monitored to detect any leaks in the tubing-packer system. If any leaks are detected, the well will be shut-in and corrective measures will be taken to restore integrity to the wellbore.

P. Monitoring Program
Injection pressure will be monitored by means of a pressure gauge located on the tubing side of the wellhead of the Brinkerhoff 3A well.

Q. Plugging and Abandonment
Enclosed with this application are Exhibit H, I for the plugging and abandonment plan, including EPA Form 7520-19 (4-2022), for the Brinkerhoff 3A well.

R. Necessary Resources
All injection wells in the Steamboat Butte Field are listed on the Financial Assurance Package filed by Marathon October 5, 2005. The filing, available at the EPA Region VIII office, indicates that sufficient financial resources exist to cover the plugging and abandonment costs for the Brinkerhoff 3A well. Conversations with EPA staff indicate that an amended Financial Responsibility filing, incorporating the well, will not be required at this time. Instead, well Brinkerhoff 3A, and its associated abandonment costs, will be included in the 2005 filing.

Aquifer Exemptions
Application for Aquifer Exemption permit request attached separately.

S. Existing EPA Permits
Not required for existing Class II injection projects.

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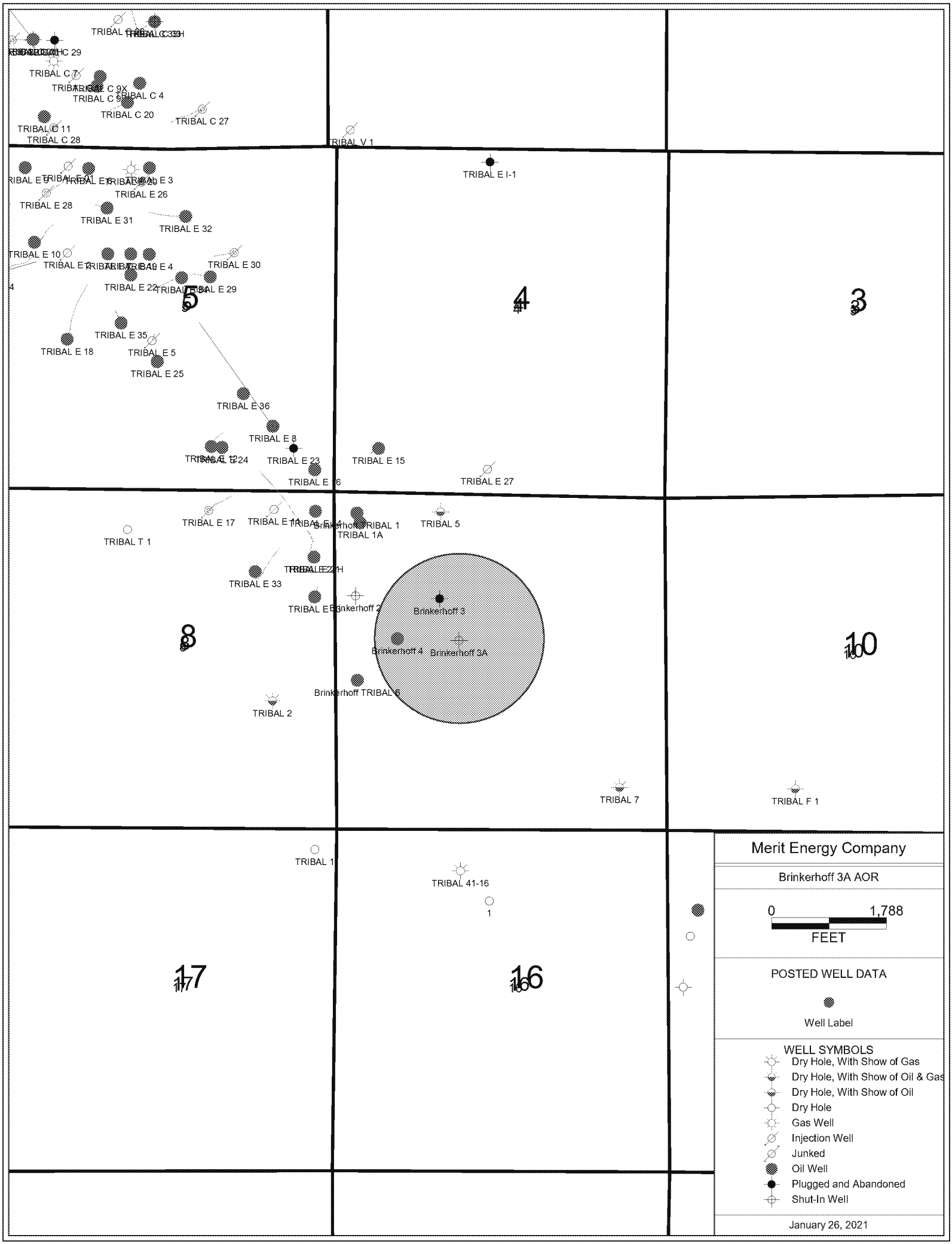
T. Description of Business

Merit Energy Company whose main business is the exploration, development, and production of oil and gas. The Brinkerhoff 3A injection well will be operated by Merit for the purpose of exploiting the oil resources of the Steamboat Butte Field.

Sincerely,
MERIT ENERGY COMPANY

Michelle Yalung

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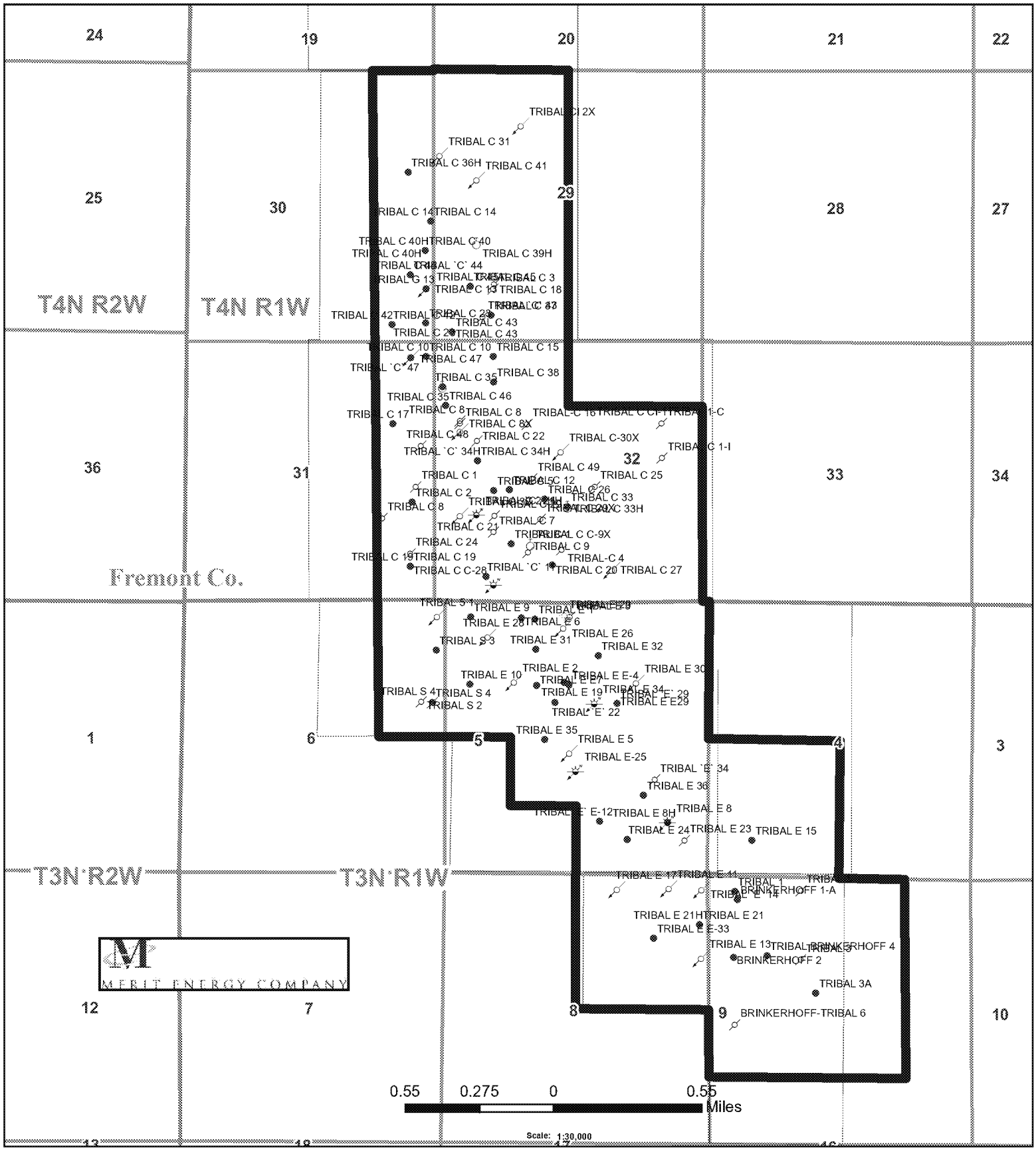


Proposed Exemption Area - Crow Mtn Inj
COUNTIES
TOWNSHIP
SECTIONS
Merit Leases

GAS-WO
OIL WELL
INJECTION WELL
ABAND WELL
CANCEL
MONITOR-OWW

N

**MERIT ENERGY CO.**
**WIND RIVER BASIN PROJECT**
**WYOMING**

Steamboat Butte Field

Crow Mountain Aquifer Exemptions

Map by: Richard Norzagaray
Map Info: Troy Skitt

Date Saved:
Friday, March 26, 2021

Coordinate System:
NAD 1983 StatePlane Wyoming West Central FIPS 4903 Feet

Document Path: Z:\ArcMap Project - Regulatory\A) SUNDRY - Submissions\Sundry MXD\Sundry Submission - JAN 2021\Wind River Ind Resv - Maverick Springs.mxd

**Well Construction**

| | | |
|---|---|---|
| *Ground Elevation* | 5627 | feet |
| *Kelly Bushing* | 5637 | feet |
| *Total Depth of Well (KB)* | 6940 | feet |
| *Plugged Back Total Depth (KB)* | 6180 | feet |
| *Packer Depth (KB)* | | feet |

All Depths Measured in KB

| Casing Type | *Casing Description* | *Hole* Diameter (in.) | *Casing* Diameter (in.) | *Casing Top (ft)* | *Casing Bottom(ft)* | *Cement Top (ft)* | *Cement Bottom(ft)* | *# of Sx* | *Cement Type* |
|---|---|---|---|---|---|---|---|---|---|
| Surface | 8 5/8" 24#/ft J55 | 10.750 | 8.625 | 10 | 505 | 10 | 505 | 500 | Class G |
| Production | 5.5" 17#/ft J55 | 7.875 | 5.500 | 10 | 6939 | 2700 | 6940 | 850 | Class G |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| *# of Sx* | *ment Type* |
|---|---|
| | |
| | |
| | |
| | |
| | |

**Perforations (include as much detail as allowable)**

| | *Perf 1* | *Perf 2* | *Perf 3* | *Perf 4* | *Perf 5* | *Perf 6* | *Perf 7* | *Perf 8* | *Perf 9* | *Perf 10* |
|---|---|---|---|---|---|---|---|---|---|---|
| *Perf Status* | Open | Squeezed | Squeezed | Plugged | | | | | | |
| *Top Depth (ft KB)* | 5802 | 6692 | 6704 | 6774 | | | | | | |
| *Bot Depth (ft KB)* | 5812 | 6696 | 6712 | 6785 | | | | | | |

| | *Value* | | *Source of value* |
|---|---|---|---|
| **Maximum Injection Pressure** | 1950 | *psi* | |
| *Specific Gravity* | 1.00 | | |
| *Fracture Gradient* | 0.77 | *psi/ft* | |
| *Depth (typically depth to top perf)* | 5802 | *ft KB* | |
| *Friction Loss* | 50 | *psi* | 5 |
| *Comments* | These values are requested based on calculations assuming a .70 psi/ft frac gradient and 50 | | |

*Provide "Source of Value" if "Other" selected.*

| Wells Within 1/4 Mile Radius of the Tribal C13 that penetrate the Phosphoria and Tensleep | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| API10 | Well Name | Status | TD | TOC | TOC Source | Top of injection zone | Corrective action ? | Comments |
| 4901306463 | Brinkerhoff 4 | Producing | 6696 | 5040 | CBL | 5631 | Not Needed | CBL ran 1/10/18 |
| 4901306367 | Brinkerhoff 3 | PA | 7076 | 2700 | Calculated | 5539 | Not Needed | 400 sx cemented from D.V. tool at 4708'. Assumed 25% loss. With 7" casing in 9" hole |

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**Field: Steamboat Butte**
**Total Depth 6,996.0**
**Location:**

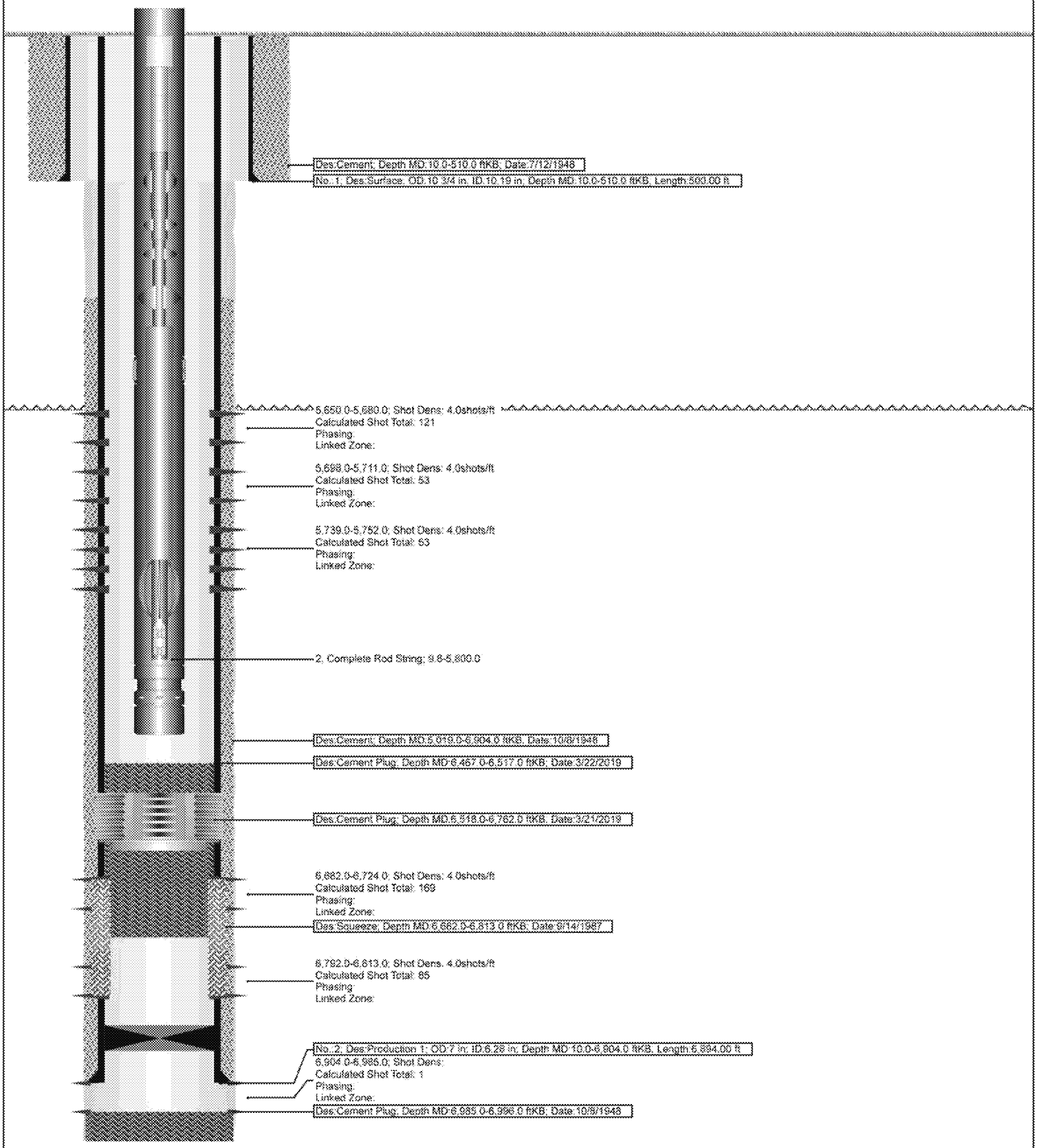
# Well: Brinkerhoff 4

**Status: Producing**
**County, State: FREMONT, WYOMING**
**API: 490130636400**

**CPF: Steamboat Butte**
**Spud Date: 1/1/1900**
**Ground Elevation: 5,636.00**
**KB Elevation: 5,646.00**
**On Production Date:**

BRINKERHOFF 4, 1/22/2021 2:05:31 PM

Vertical schematic (actual)




**Report Printed: 1/22/2021** **Page 1/1**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

AUG 12 1997

Ref: 8ENF-T

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Eugene M. Grant
Regulatory Coordinator
Rocky Mountain Region
Marathon Oil Company
1501 Stampede Avenue
Cody, WY 82414-4721

Re: UNDERGROUND INJECTION CONTROL (UIC)
Allowable Maximum Injection Pressures
Steamboat Butte Field
Fremont County, WY

Dear Mr. Grant:

This letter is being sent as a reminder of the current allowable surface injection pressures for Marathon's injection wells in the Steamboat Butte Field on the Wind River Indian Reservation in Wyoming. The allowable injection pressures are shown below:

| Well Name | EPA Number | Allowable Pressure |
|---|---|---|
| Nugget Injector | | |
| Tribal CI-24 | WY2621-02137 | 1033 psig |
| Tribal CI-1 | WY2000-02145 | 1360 psig |
| Tribal EI-14 | WY2000-02131 | 1400 psig |
| Phosphoria Injector | | |
| Brinkerhoff #6 | WY2000-02134 | 2255 psig |
| Tribal CI-22 | WY2000-02142 | 2200 psig |
| Tribal CI-23 | WY2000-02139 | 2300 psig |
| Tribal EI-26 | WY2000-02129 | 2190 psig |
| Tensleep Injector | | |
| Brinkerhoff #4 | WY2000-02133 | 1835 psig |
| Tribal CI-27 | WY2000-02146 | 1875 psig |
| Tribal CI-15 | WY2000-02140 | 1825 psig |
| Tribal CI-30X | WY2000-02143 | 1865 psig |
| Tribal CI-31 | WY2000-02138 | 1900 psig |
| Tribal EI-30 | WY2000-02141 | 1860 psig |
| Tribal S-1 | WY2000-02130 | 1805 psig |

The pressure limits shown above were calculated using formation fracture gradients of 0.70 psi/ft for the Nugget (except well CI-24 which was permitted using a gradient of 0.638); 0.77 psi/ft for the Phosphoria; and 0.70 psi/ft for the Tensleep. These gradients were obtained from a step rate test of the Nugget; and fracture stimulation treatments of the Phosphoria and Tensleep performed in three separate wells during 1989-1991 by the previous operator of the field, Chevron USA. Maximum pressures were calculated using the formula shown below:

$$Pm = [FG - 0.433\ (SG)]\ d$$

Where: Pm = maximum surface injection pressure at wellhead (psig)
FG = fracture gradient (psi/ft)
SG = specific gravity of injected fluid (1.004)
d = depth to top of injection perforations

These injection pressures are recorded in our computer data base and will be available for use during field inspections in order to verify that allowable injection pressures are not being exceeded, and for comparison with maximum pressures recorded on Annual Monitoring Reports. If you require a higher injection pressure for continued operation of a well(s), you may conduct a step-rate test of the injection zone and request an increase based on the test results. However, this test may, or may not, indicate that a higher injection pressure can be approved for the well(s).

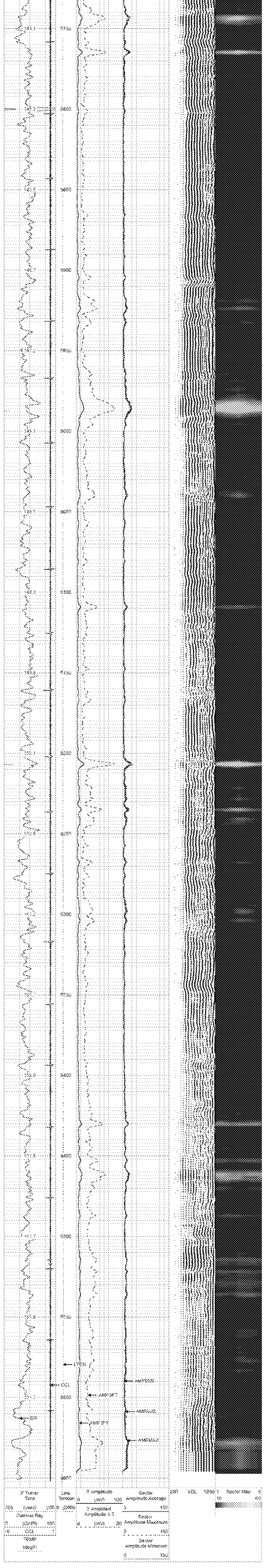
If you have any questions concerning this letter, or do not agree with the listed pressure limits, you may contact John Carson at (303) 312-6203. Also, please direct all correspondence to the attention of John Carson at Mail Code 8ENF-T.

Sincerely,

Sharon L. Kercher, Director
Technical Enforcement Program

cc: Mr. Stuart Cerovski
Bureau of Land Management
Lander resource Area
P.O. Box 589
Lander, WY 82520-0589

Internal Cal Check

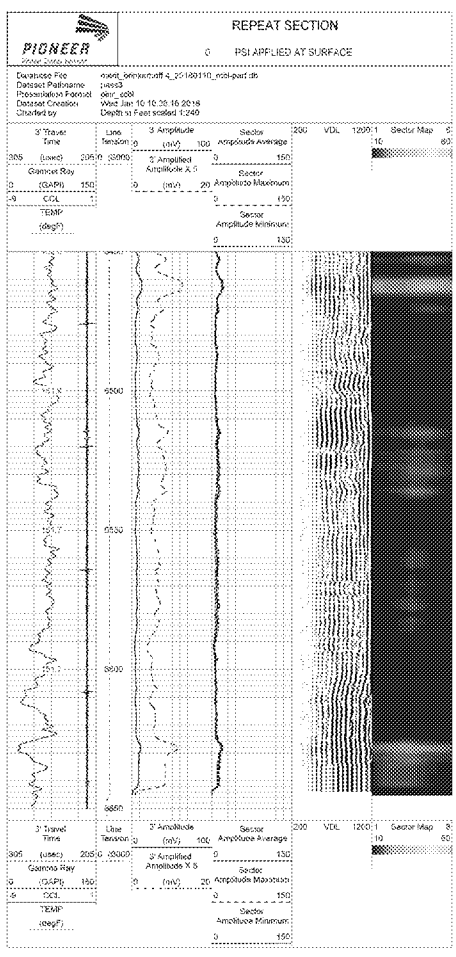



PIONEER
Pioneer Energy Services

## REPEAT SECTION

0 PSI APPLIED AT SURFACE

Database File: meric_brinkerhoff 4_20180110_rptbpert.db
Dataset Pathname: pass3
Presentation Format: perf_cbl
Dataset Creation: Wed Jan 10 10:28:16 2018
Charted by: Depth in Feet scaled 1:240




Calibration Report
Database File: meric_brinkerhoff 4_20180110_rptbpert.db
Dataset Pathname: pass3
Dataset Creation: Wed Jan 10 10:28:16 2018

### Gamma Ray Calibration Report

| | | |
|---|---|---|
| Serial Number: | FW1211-53 | |
| Tool Model: | 275 Probe GR/CCL Combo/Int | |
| Performed: | Wed Jan 10 10:11:20 2018 | |
| Calibrator Value: | 240.0 | GAPI |
| Background Reading: | 55.9 | cps |
| Calibrator Reading: | 439.8 | cps |
| Sensitivity: | 0.6251 | GAPI/cps |

### Segmented Cement Bond Log Calibration Report

| | | |
|---|---|---|
| Serial Number: | FW1210-41 | |
| Tool Model: | 275 Probe w Temp | |
| Calibration Casing Diameter: | 5.500 | in |
| Calibration Depth: | 0.000 | ft |

Master Calibration, performed Wed Jan 10 09:51:47 2018:

| | Raw (v) | | Calibrated (mV) | | Results | |
|---|---|---|---|---|---|---|
| | Zero | Cal | Zero | Cal | Gain | Offset |
| 3' | 0.001 | 1.499 | 1.000 | 71.921 | 50.496 | 0.049 |
| CAL | -0.002 | 1.498 | | | | |
| 5' | -0.000 | 1.376 | 1.000 | 71.921 | 51.449 | 1.025 |
| SUM | | | | | | |
| S1 | -0.002 | 1.427 | 0.000 | 100.000 | 70.095 | 0.133 |
| S2 | 0.001 | 1.425 | 0.000 | 100.000 | 70.092 | -0.046 |
| S3 | -0.000 | 1.434 | 0.000 | 100.000 | 69.736 | 0.008 |
| S4 | -0.001 | 1.434 | 0.000 | 100.000 | 69.705 | 0.037 |
| S5 | -0.001 | 1.420 | 0.000 | 100.000 | 70.380 | 0.051 |
| S6 | 0.001 | 1.415 | 0.000 | 100.000 | 70.713 | 0.044 |
| S7 | 0.000 | 1.418 | 0.000 | 100.000 | 70.525 | -0.026 |
| S8 | -0.000 | 1.436 | 0.000 | 100.000 | 69.623 | 0.022 |

Internal Reference Calibration, performed (Not Performed):

| | Raw (v) | | Calibrated (v) | | Results | |
|---|---|---|---|---|---|---|
| | Zero | Cal | Zero | Cal | Gain | Offset |
| CAL | 0.000 | 0.000 | -0.002 | 1.498 | 1.000 | 0.000 |

Air Zero Calibration, performed Wed Jan 10 09:49:39 2018:

| | Raw (v) | Calibrated (v) | Results |
|---|---|---|---|
| | Zero | Zero | Offset |
| 3' | 0.000 | 0.000 | 0.000 |
| 5' | 0.000 | 0.000 | 0.000 |
| SUM | | | |
| S1 | 0.000 | 0.000 | 0.000 |
| S2 | 0.000 | 0.000 | 0.000 |
| S3 | 0.000 | 0.000 | 0.000 |
| S4 | 0.000 | 0.000 | 0.000 |
| S5 | 0.000 | 0.000 | 0.000 |
| S6 | 0.000 | 0.000 | 0.000 |
| S7 | 0.000 | 0.000 | 0.000 |
| S8 | 0.000 | 0.000 | 0.000 |

### Temperature Calibration Report

| | | | | |
|---|---|---|---|---|
| Serial Number: | FW1210-41 | | | |
| Tool Model: | 275 Probe w Temp | | | |
| Performed: | Wed Jan 10 10:11:27 2018 | | | |
| | Reference | | Reading | |
| Low Reference: | 0.00 | degF | 0.00 | degF |
| High Reference: | 1.00 | degF | 1.00 | degF |
| Gain: | 1.00 | | | |
| Offset: | 0.00 | | | |
| Delta Spacing: | 1 | | | |

PIONEER
Pioneer Energy Services

| | |
|---|---|
| Company | MERIT ENERGY COMP |
| Well | BRINKERHOFF 3RBAL 04 |
| Field | STEAMBOAT BUTTE |
| County | FREMONT |
| State | WYOMING |

CHAMPIONX

# Complete Water Analysis Report

| | | |
|---|---|---|
| Customer: **MERIT ENERGY CO** | Equipment: **E Battery Injection** | Collection Date: **02/03/2021** |
| Region: **Steamboat Field** | Sample Point: **Injection Pump** | Receive Date: **02/11/2021** |
| Location: **Northwest WY** | Sample ID: **AQ71522** | Report Date: **02/17/2021** |
| System: **Water Injection System** | Acct Rep Email: **Jason.Ciz@championx.com** | Location Code: **159188** |

## Field Analysis

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bicarbonate | **195** | mg/L | Carbonate | **Not Detected** | mg/L | Dissolved CO2 | **176** | mg/L |
| Dissolved H2S | **190** | mg/L | Pressure Surface | **80** | psi | Temperature | **117** | ° F |
| pH of Water | **6.8** | | | | | | | |

## Sample Analysis

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Conductivity (Calculated) | **9363** | µS - cm3 | Ionic Strength | **0.12** | mol/L | Resistivity | **1.068** | ohms - m |
| Specific Gravity | **1.007** | | Total Dissolved Solids | **7755** | mg/L | | | |

### Cations

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Iron | **0.779** | mg/L | Manganese | **<0.050** | mg/L | Barium | **<0.050** | mg/L |
| Strontium | **9.600** | mg/L | Calcium | **314.000** | mg/L | Magnesium | **57.000** | mg/L |
| Sodium | **1490.00** | mg/L | Potassium | **77.200** | mg/L | Boron | **5.820** | mg/L |
| Lithium | **0.786** | mg/L | Copper | **<0.050** | mg/L | Nickel | **<0.100** | mg/L |
| Zinc | **<0.100** | mg/L | Lead | **<0.200** | mg/L | Cobalt | **<0.050** | mg/L |
| Chromium | **0.051** | mg/L | Silicon | **12.400** | mg/L | Aluminum | **<0.300** | mg/L |
| Molybdenum | **<0.050** | mg/L | Phosphorus | **<0.200** | mg/L | Sulfur | **1660.000** | mg/L |

### Anions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bromide | **2** | mg/L | Chloride | **2500** | mg/L | Fluoride | **3** | mg/L |
| Nitrate | **<0.05** | mg/L | Phosphate | **<0.05** | mg/L | Sulfate | **1427** | mg/L |

## Scale Type

| | | | |
|---|---|---|---|
| **Anhydrite CaSO4 PTB** | N/A | **Anhydrite CaSO4 SI** | -0.98 |
| **Barite BaSO4 PTB** | N/A | **Barite BaSO4 SI** | N/A |
| **Calcite CaCO3 PTB** | N/A | **Calcite CaCO3 SI** | -0.15 |
| **Celestite SrSO4 PTB** | N/A | **Celestite SrSO4 SI** | -0.28 |
| **Gypsum CaSO4 PTB** | N/A | **Gypsum CaSO4 SI** | -0.92 |
| **Hemihydrate CaSO4 PTB** | N/A | **Hemihydrate CaSO4 SI** | -0.77 |

## Comments

Scaling predictions calculated using Oddo-Tomson model

This document contains the confidential and/or proprietary information of ChampionX. The recipient agrees to maintain the confidentiality of the terms of this document, and shall not reproduce it by any means, disclose the contents of it to any third party, or use the contents of it for any purpose other than the purpose for which it was intended by ChampionX.

CHAMPIONX

# Complete Water Analysis Report

| | | |
|---|---|---|
| Customer: **MERIT ENERGY CO** | Equipment: **C-3 Battery Injection** | Collection Date: **02/03/2021** |
| Region: **Steamboat Butte Field** | Sample Point: **Injection Pump** | Receive Date: **02/11/2021** |
| Location: **Northwest WY** | Sample ID: **AQ71523** | Report Date: **02/15/2021** |
| System: **Water Injection System** | Acct Rep Email: **Jason.Ciz@championx.com** | Location Code: **159191** |

## Field Analysis

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bicarbonate | **146** | mg/L | Carbonate | **Not Detected** | mg/L | Dissolved CO2 | **88** | mg/L |
| Dissolved H2S | **82** | mg/L | Pressure Surface | **120** | psi | Temperature | **108** | ° F |
| pH of Water | **7.6** | | | | | | | |

## Sample Analysis

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Conductivity (Calculated) | **5465** | µS - cm3 | Ionic Strength | **0.08** | mol/L | Resistivity | **1.830** | ohms - m |
| Specific Gravity | **1.005** | | Total Dissolved Solids | **4284** | mg/L | | | |

### Cations

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Iron | **1.630** | mg/L | Manganese | **0.071** | mg/L | Barium | **0.157** | mg/L |
| Strontium | **14.700** | mg/L | Calcium | **386.000** | mg/L | Magnesium | **67.800** | mg/L |
| Sodium | **1060.00** | mg/L | Potassium | **107.000** | mg/L | Boron | **5.150** | mg/L |
| Lithium | **0.889** | mg/L | Copper | **<0.050** | mg/L | Nickel | **<0.100** | mg/L |
| Zinc | **0.226** | mg/L | Lead | **<0.200** | mg/L | Cobalt | **<0.050** | mg/L |
| Chromium | **0.181** | mg/L | Silicon | **13.300** | mg/L | Aluminum | **<0.300** | mg/L |
| Molybdenum | **<0.050** | mg/L | Phosphorus | **<0.200** | mg/L | Sulfur | **653.000** | mg/L |

### Anions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bromide | **1** | mg/L | Chloride | **669** | mg/L | Fluoride | **4** | mg/L |
| Nitrate | **<0.05** | mg/L | Phosphate | **<0.05** | mg/L | Sulfate | **1154** | mg/L |

## Scale Type

| | | | |
|---|---|---|---|
| **Anhydrite CaSO4 PTB** | N/A | **Anhydrite CaSO4 SI** | -1.02 |
| **Barite BaSO4 PTB** | 0.1 | **Barite BaSO4 SI** | 0.77 |
| **Calcite CaCO3 PTB** | 44.2 | **Calcite CaCO3 SI** | 0.71 |
| **Celestite SrSO4 PTB** | N/A | **Celestite SrSO4 SI** | -0.13 |
| **Gypsum CaSO4 PTB** | N/A | **Gypsum CaSO4 SI** | -0.90 |
| **Hemihydrate CaSO4 PTB** | N/A | **Hemihydrate CaSO4 SI** | -0.72 |

## Comments

Scaling predictions calculated using Oddo-Tomson model

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CL1-12A (REV. 1964)

# CHEMICAL & GEOLOGICAL LABORATORIES

P. O. Box 279

Casper, Wyoming

## WATER ANALYSIS REPORT

OPERATOR Gulf Oil Corporation
WELL NO. Tribal C-4
FIELD Steamboat Butte
COUNTY Fremont
STATE Wyoming

DATE May 21, 1969 LAB NO. 1919
LOCATION SE SW 32-4N-1W
FORMATION Curtis
INTERVAL 5602
SAMPLE FROM Bleeder Valve

REMARKS & CONCLUSIONS: 492 barrels net water
Slight calcium chloride contamination noted. Believe this is Curtis water.

| Cations | mg/l | meq/l | Anions | mg/l | meq/l |
|---|---|---|---|---|---|
| Sodium | 12,890 | 560.73 | Sulfate | 5,680 | 118.14 |
| Potassium | 70 | 1.79 | Chloride | 18,000 | 507.60 |
| Lithium | - | - | Carbonate | - | - |
| Calcium | 1,221 | 60.93 | Bicarbonate | 537 | 8.81 |
| Magnesium | 135 | 11.10 | Hydroxide | - | - |
| Iron | Present | - | Hydrogen sulfide | Absent | - |
| Total Cations | | 634.55 | Total Anions | | 634.55 |

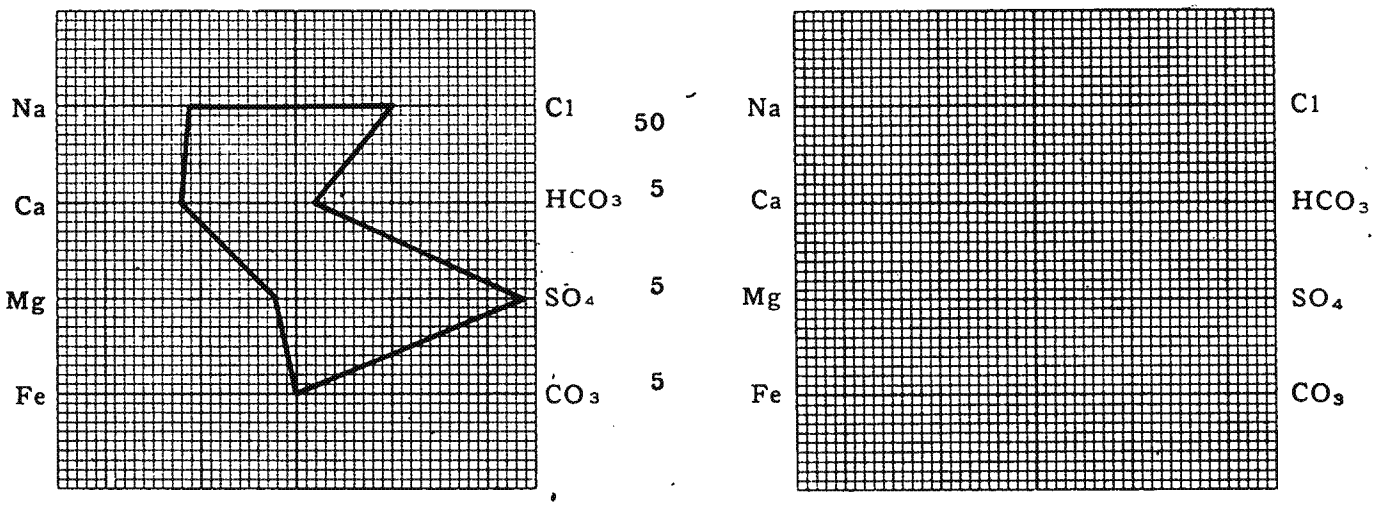
Total dissolved solids, mg/l 38,261
NaCl equivalent, mg/l 35,375
Observed pH 6.7

Specific resistance @ 68°F.:
Observed 0.25 ohm-meters
Calculated 0.21 ohm-meters

### WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit




(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

CL1-12A (REV. 1964)

# CHEMICAL & GEOLOGICAL LABORATORIES

P. O. Box 279

Casper, Wyoming

## WATER ANALYSIS REPORT

| | | | |
|---|---|---|---|
| OPERATOR | Gulf Oil Corporation | DATE | May 21, 1969 LAB NO. 1919 |
| WELL NO. | Tribal C-4 | LOCATION | SE SW 32-4N-1W |
| FIELD | Steamboat Butte | FORMATION | Curtis |
| COUNTY | Fremont | INTERVAL | 5602 |
| STATE | Wyoming | SAMPLE FROM | Bleeder Valve |

REMARKS & CONCLUSIONS: 492 barrels net water
Slight calcium chloride contamination noted. Believe this is Curtis water.

| Cations | mg/1 | meq/1 | Anions | mg/1 | meq/1 |
|---|---|---|---|---|---|
| Sodium | 12,890 | 560.73 | Sulfate | 5,680 | 118.14 |
| Potassium | 70 | 1.79 | Chloride | 18,000 | 507.60 |
| Lithium | - | - | Carbonate | - | - |
| Calcium | 1,221 | 60.93 | Bicarbonate | 537 | 8.81 |
| Magnesium | 135 | 11.10 | Hydroxide | - | - |
| Iron | Present | - | Hydrogen sulfide | Absent | - |
| Total Cations | | 634.55 | Total Anions | | 634.55 |

| | |
|---|---|
| Total dissolved solids, mg/1 | 38,261 |
| NaCl equivalent, mg/1 | 35,375 |
| Observed pH | 6.7 |

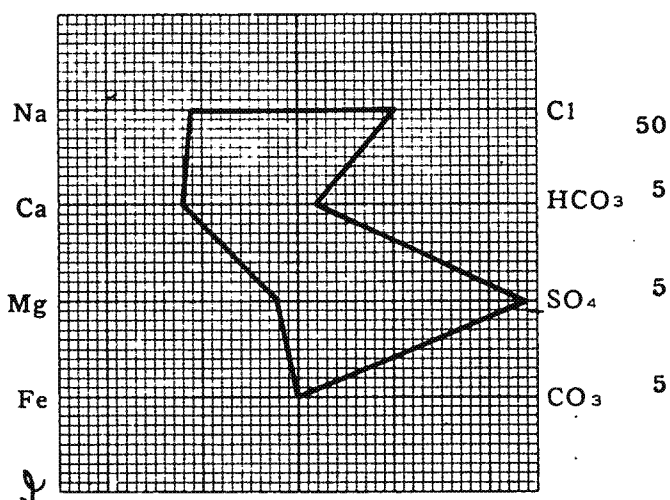
Specific resistance @ 68°F.:

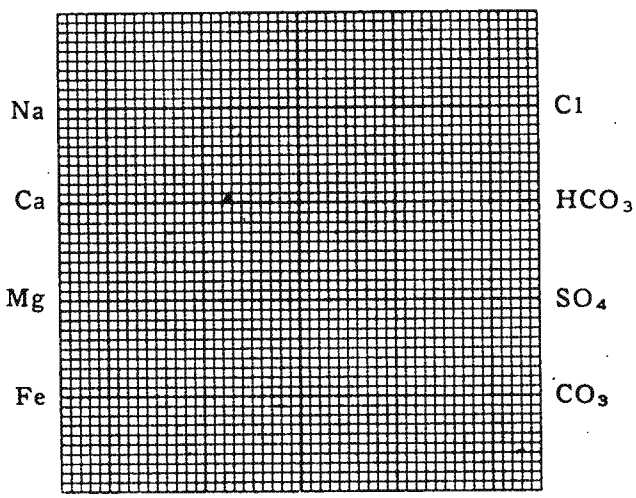
| | | |
|---|---|---|
| Observed | 0.25 | ohm-meters |
| Calculated | 0.21 | ohm-meters |

### WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit




(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/1=Milligrams per liter Meq/1= Milligram equivalents per liter
Sodium chloride equivalent=by Dunlap & Hawthorne calculation from components

2 copies to MT Farrell
1 copy to KHO 5/26/69 [illegible]

RECEIVED
MAY 26 1992
GULF OIL CORPORATION
CASPER AREA

CHAMPIONX

# Complete Water Analysis Report

Customer: **MERIT ENERGY CO**
Region: **Steamboat Butte Field**
Location: **Northwest WY**
System: **Production**

Equipment: **Brinkerhoff 4**
Sample Point: **Wellhead**
Sample ID: **AK24637**
Acct Rep Email: **Jason.Ciz@championx.com**

Collection Date: **02/08/2018**
Receive Date: **02/13/2018**
Report Date: **02/14/2018**
Location Code: **375144**

## Field Analysis

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bicarbonate | **866** | mg/L | Carbonate | **Not Detected** | mg/L | Dissolved CO2 | **229** | mg/L |
| Dissolved H2S | **23** | mg/L | Pressure Surface | **140** | psi | Temperature | **140** | ° F |
| pH of Water | **6.9** | | | | | | | |

## Sample Analysis

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Conductivity (Calculated) | **13073** | µS - cm3 | Ionic Strength | **0.17** | | Resistivity | **0.765** | ohms - m |
| Specific Gravity | **1.016** | | Total Dissolved Solids | **8367.521** | mg/L | | | |

### Cations

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Iron | **0.18** | mg/L | Manganese | **0.445** | mg/L | Barium | **0.046** | mg/L |
| Strontium | **13.35** | mg/L | Calcium | **449.4** | mg/L | Magnesium | **168.5** | mg/L |
| Sodium | **2218.60** | mg/L | | | | | | |

### Anions

| | | | | | |
|---|---|---|---|---|---|
| Chloride | **2996** | mg/L | Sulfate | **1655** | mg/L |

## Scale Type

| | | | |
|---|---|---|---|
| **Anhydrite CaSO4 PTB** | N/A | **Anhydrite CaSO4 SI** | -0.68 |
| **Barite BaSO4 PTB** | N/A | **Barite BaSO4 SI** | -0.01 |
| **Calcite CaCO3 PTB** | 227.2 | **Calcite CaCO3 SI** | 0.90 |
| **Celestite SrSO4 PTB** | N/A | **Celestite SrSO4 SI** | -0.15 |
| **Gypsum CaSO4 PTB** | N/A | **Gypsum CaSO4 SI** | -0.77 |
| **Hemihydrate CaSO4 PTB** | N/A | **Hemihydrate CaSO4 SI** | -0.66 |

## Comments

Scaling predictions calculated using Oddo-Tomson model

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MERIT ENERGY COMPANY

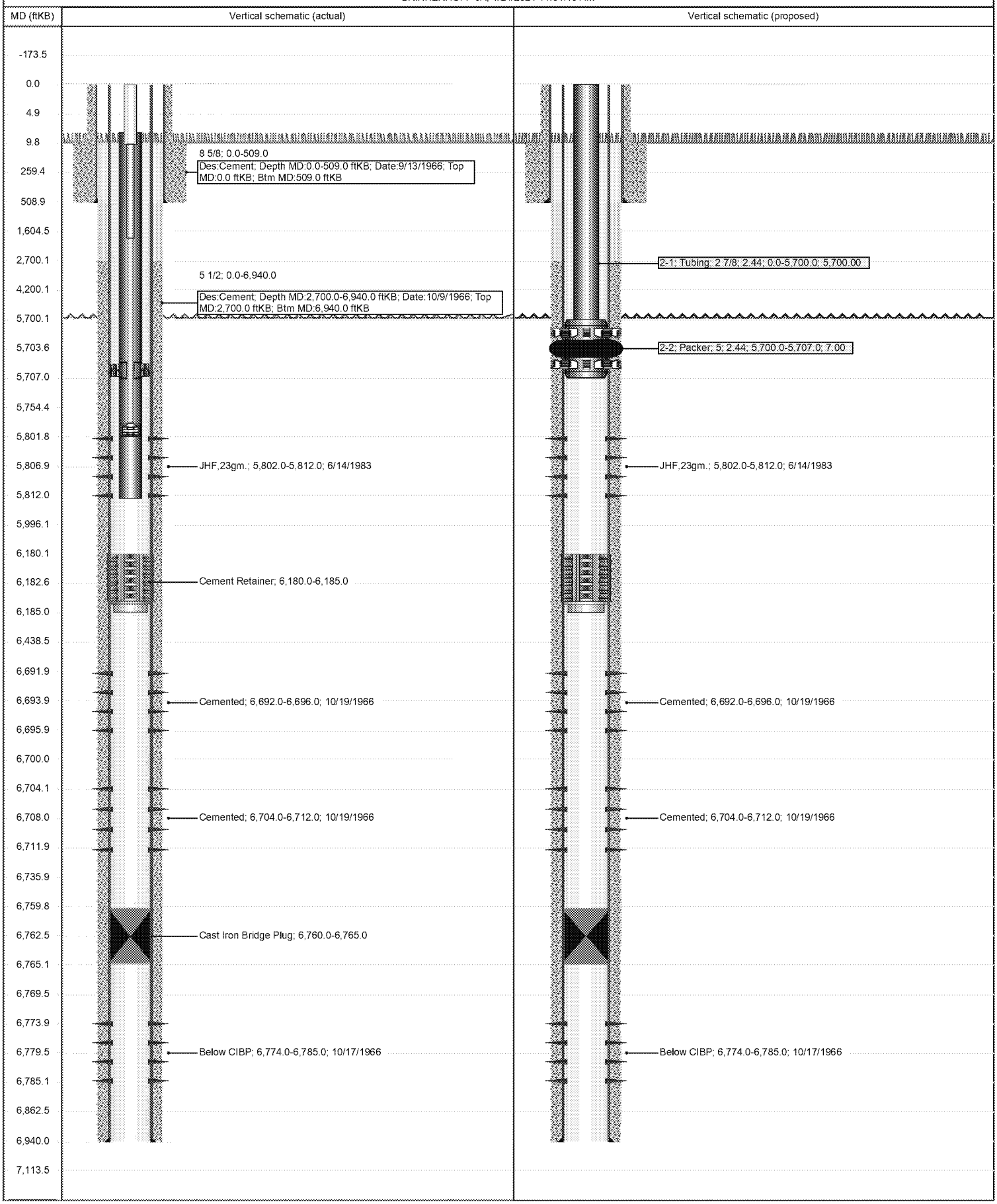
**Field: Steamboat Butte**
**Total Depth 6,940.0**
**Location:**

# Well: Brinkerhoff 3A

**Status: SHUT-IN**
**County, State: FREMONT, WYOMING**
**API: 490130697700**

**CPF: Steamboat Butte**
**Spud Date: 8/1/1966**
**Ground Elevation: 5,627.00**
**KB Elevation: 5,637.00**
**On Production Date:**

BRINKERHOFF 3A, 1/21/2021 11:31:15 AM



March 23rd, 202

**Brinkerhoff 3A Steamboat**
**Butte Field**
**Plugging Plan**

**Well Data:**

**Location:** 330' FSL, 660' FEL, Sec. 9, T3N, R1W Fremont County, Wyoming

**Elevation:** GL: 5627' KB: 5637'

**Depth:** TD: 6940' PBTD: 6180' (cement retainer)

**Casing:**

Surface .....8 5/8", 24#, J-55, set at 505' with 500 sxs cement (cmt to surface)

Production .....5.5", 17#, J55, set at 6939' with 850 sxs cement, cement top at 2700' by calculation from 2 stage job, 400sx from DV at 4708' assuming 25% losses.

**Current Perforations:**

| | |
|---|---|
| Chugwater | 5802' – 5812' 2SPF (Open) |
| Phosphoria | 6692' – 6696' 2 SPF(Cement squeezed) |
| | 6704' – 6712' 2 SPF (Cement squeezed) |
| | 6774' – 6785' 2 SPF (Below CIBP) |

**Current Test:** N/a.
**Current Status:** Dormant Chugwater producer
**Proposed Status:** Active Chugwater Class II-EOR injector
**Estimated P & A Cost:** $64,000

**Plugging Procedure:** Prior to abandonment, the well shall be plugged in a manner that isolates the injection zone and prevents movement of fluid into or between USDWs, and in accordance with any applicable Federal, State or local law or regulation. Procedure will be as follows:

1) MIRU
2) Remove Tubing and packer from Tribal C13.
3) Make a Casing Scraper run to PBTD of 5424'.
4) Set CICR at 5750' – pump 88 sx (one wellbore volume) below CICR 15.5 ppg Class G cement yield 1.15 Cuft/sack.
5) Sting out of CICR & pump 25 sx on top of plug. Shut down and wait on cement.
6) Tag Cement plug and record depth, estimated ~6660'.
7) Circulate 71 bbls 9.0 ppg Bentonite & Barite mud plug up to 2800'
8) Pull out to 2800' – pump balance Plug 50 sx 15.5ppg Class G cement with 1.15 Cuft/sack yield. Wait on cement. Tag plug and record depth, estimated to be 2790'.
9) Pull out to 200' below surface. Pump 25 sx 15.5ppg Class G cement with 1.15 Cuft/sack yield until cement returns to surface. Wait on cement.
10) Cut casing 4' below grade, weld on dry hole plate with legal ID. Remove Rig anchors.
11) RDMO.

| Tribal C13 Itemized P&A Budget | |
|---|---|
| Cement & Cement Crew | $20,000.00 |
| Workover Rig | $10,000.00 |
| Wellsite Reclamation | $10,000.00 |
| Cement retainers (x2) | $15,000.00 |
| Tax | $2,750.00 |
| Contingency | $6,250.00 |
| **Total** | **$64,000.00** |

OMB No. 2040-0042 Approval Expires 4/30/2022

United States Environmental Protection Agency

EPA

# WELL REWORK RECORD, PLUGGING AND ABANDONMENT PLAN, OR PLUGGING AND ABANDONMENT AFFIDAVIT

**Name and Address, Phone Number and/or Email of Permittee**

Merit Energy Company
13727 Noel Rd #1200, Dallas, TX 75240

| Permit or EPA ID Number | API Number | Full Well Name |
|---|---|---|
| | 49-013-06977 | Brinkerhoff 3A |

| State | County |
|---|---|
| WY | Fremont |

**Locate well in two directions from nearest lines of quarter section and drilling unit**

Latitude:

Longitude:

**Surface Location**

SE 1/4 of NW 1/4 of Section 9 Township 3N Range 1W

330 ft. from (N/S) S Line of quarter section

660 ft. from (E/W) E Line of quarter section.

| Well Class | Timing of Action (pick one) | Type of Action (pick one) |
|---|---|---|
| ☐ Class I<br>☑ Class II<br>☐ Class III<br>☐ Class V | ☐ Notice Prior to Work<br>Date Expected to Commence<br>☑ Report After Work<br>Date Work Ended | ☐ Well Rework<br>☑ Plugging and Abandonment<br>☐ Conversion to a Non-Injection Well |

**Provide a narrative description of the work planned to be performed, or that was performed. Use additional pages as necessary. See instructions.**

See attachment:

## Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibliity of fine and imprisonment. (Ref. 40 CFR § 144.32)

| Name and Official Title *(Please type or print)* | Signature | Date Signed |
|---|---|---|
| Michelle Yalung - Regulatory Analyst | | 01/26/2021 |

EPA Form 7520-19 (Rev. 4-19)

March 23rd, 202

**Brinkerhoff 3A Steamboat**
**Butte Field**
**Plugging Plan**

**Well Data:**

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| | |
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**Proposed Status:** Active Chugwater Class II-EOR injector
**Estimated P & A Cost:** $64,000

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| Wellsite Reclamation | $10,000.00 |
| Cement retainers (x2) | $15,000.00 |
| Tax | $2,750.00 |
| Contingency | $6,250.00 |
| **Total** | **$64,000.00** |