# Initial Application Part I

Received on 3/24/20

*This application is placed in file for record. It MAY or MAY NOT have been reviewed to be determined Administratively Complete*

CIMAREX ENERGY COMPANY
600 N. Marienfeld Street
Suite 600
Midland, TX 79701

2/20/2020

Attn: New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

Subject: C-108 Application: Patriot 9 State SWD #1

Dear Sir or Madam,

Cimarex Energy Co. is seeking administrative approval to dispose of produced water into the Devonian-Silurian formation. Please find the following documents in our application package:

- Administrative Application Checklist
- Form C-108 (Application for Authorization to Inject)
- C-108 Supporting information
- C-102
- Injection Well Data Sheets
- Proposed wellbore schematic
- ½ mile & 2 mile AOR Maps
- ½ mile AOR table- No wells penetrate the Injection Interval
- Water analysis
- Geological Description
- Water Well Search Information
- Newspaper Clipping and Affidavit
- Notification Requirements and Proof of Notice

Please contact me with any questions, concerns, or if any additional paperwork is needed.
Thank you,

Amithy Crawford
Regulatory Analyst
432-620-1909
acrawford@cimarex.com

Revised March 23, 2017

| RECEIVED: | REVIEWER: | TYPE: | APP NO: |
|---|---|---|---|

ABOVE THIS TABLE FOR OCD DIVISION USE ONLY

**NEW MEXICO OIL CONSERVATION DIVISION**
- Geological & Engineering Bureau –
1220 South St. Francis Drive, Santa Fe, NM 87505

## ADMINISTRATIVE APPLICATION CHECKLIST

THIS CHECKLIST IS MANDATORY FOR ALL ADMINISTRATIVE APPLICATIONS FOR EXCEPTIONS TO DIVISION RULES AND REGULATIONS WHICH REQUIRE PROCESSING AT THE DIVISION LEVEL IN SANTA FE

**Applicant:** Cimarex Energy Co. **OGRID Number:** 162683
**Well Name:** Patriot 9 State SWD #1 **API:**
**Pool:** SWD; Devonian-Silurian **Pool Code:** 97869

**SUBMIT ACCURATE AND COMPLETE INFORMATION REQUIRED TO PROCESS THE TYPE OF APPLICATION INDICATED BELOW**

1) **TYPE OF APPLICATION:** Check those which apply for [A]
A. Location – Spacing Unit – Simultaneous Dedication
☐ NSL ☐ NSP (PROJECT AREA) ☐ NSP (PRORATION UNIT) ☐ SD

B. Check one only for [ I ] or [ II ]
[ I ] Commingling – Storage – Measurement
☐ DHC ☐ CTB ☐ PLC ☐ PC ☐ OLS ☐ OLM
[ II ] Injection – Disposal – Pressure Increase – Enhanced Oil Recovery
☐ WFX ☐ PMX ☒ SWD ☐ IPI ☐ EOR ☐ PPR

**FOR OCD ONLY**
☐ Notice Complete
☐ Application Content Complete

2) **NOTIFICATION REQUIRED TO:** Check those which apply.
A. ☒ Offset operators or lease holders
B. ☐ Royalty, overriding royalty owners, revenue owners
C. ☒ Application requires published notice
D. ☐ Notification and/or concurrent approval by SLO
E. ☐ Notification and/or concurrent approval by BLM
F. ☒ Surface owner
G. ☒ For all of the above, proof of notification or publication is attached, and/or,
H. ☐ No notice required

3) **CERTIFICATION:** I hereby certify that the information submitted with this application for administrative approval is **accurate** and **complete** to the best of my knowledge. I also understand that **no action** will be taken on this application until the required information and notifications are submitted to the Division.

**Note: Statement must be completed by an individual with managerial and/or supervisory capacity.**

Amithy Crawford
Print or Type Name

Amithy Crawford
Signature

2/20/2020
Date

432-620-1909
Phone Number

acrawford@cimarex.com
e-mail Address

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

**Oil Conservation Division**
**1220 South St. Francis Dr.**
**Santa Fe, New Mexico 87505**

FORM C-108
Revised June 10, 2003

## APPLICATION FOR AUTHORIZATION TO INJECT

I. PURPOSE: _____Secondary Recovery _____Pressure Maintenance __X__Disposal _____Storage
Application qualifies for administrative approval? __X__Yes _____No

II. OPERATOR: Cimarex Energy Co.

ADDRESS: 600 N. Marienfeld, Suite 600, Midland TX 79701

CONTACT PARTY: Amithy Crawford PHONE: 432-620-1909

III. WELL DATA: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? _____Yes __X__No
If yes, give the Division order number authorizing the project: _____

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and,
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).

*VIII. Attach appropriate geologic data on the injection zone including appropriate lithologic detail, geologic name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such sources known to be immediately underlying the injection interval.

IX. Describe the proposed stimulation program, if any.

*X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted).

*XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

XIV. Certification: I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: Amithy Crawford TITLE: Regulatory Analyst

SIGNATURE: Amithy Crawford DATE: 2/20/2020

E-MAIL ADDRESS: acrawford@cimarex.com

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be resubmitted. Please show the date and circumstances of the earlier submittal: _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate District Office

Side 2

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District Offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and the name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the Section, Township, and Range location of multiple wells;

(3) The formation name and depth with expected maximum injection rates and pressures; and,

(4) A notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505, within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

# C-108 Application For Authorization to Inject

**Patriot 9 State SWD #1**
671' FSL & 142' FWL
Sec 09, 25S, 27E
Eddy County, NM

III. Well Data Attached

V. Maps area attached

VI. Table of wells with the ½-mile AOR is attached. No wells penetrate the proposed Disposal Interval.

VII. 1. Proposed Average Daily injection rate= 25,000 BWPD
Proposed Maximum Daily injection rate= 40,000 BWPD

2. System will be Open. Water will both be piped and trucked.

3. Proposed Maximum pressure= 2,547 psi
Proposed Average max pressure= 2,000 psi

4. Source of injected water will be Bone Spring, Cherry Canyon, and Wolfcamp produced water. No compatibility problems are expected. Analysis of the waters are attached.

5. No Devonian receiving formation water samples directly offset. Deepest TVD (7618') well (30-015-41120) within a half-mile is in the Bone Spring formation.

VIII. Geologic data attached

IX. Stimulation on this well will be to acidize open hole with 20,000 gallons of 20% NeFe HCL

X. Logs will be filed upon completion

XI. No water wells found within 1-mile search

XII. See attached affirmative statement from Geologist

XIII. See attached Proof of Notice and Publication

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

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

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

☐ AMENDED REPORT

# WELL LOCATION AND ACREAGE DEDICATION PLAT

| [1] API Number | [2] Pool Code | [3] Pool Name |
|---|---|---|
| 30-015- | 97869 | SWD; Devonian- Silurian |

| [4] Property Code | [5] Property Name | [6] Well Number |
|---|---|---|
| | PATRIOT 9 STATE SWD | #1 |

| [7] OGRID No. | [8] Operator Name | [9] Elevation |
|---|---|---|
| 215099 | CIMAREX ENERGY CO. | 3238.0' |

## [10] Surface Location

| UL or lot no. | Section | Township | Range | Lot Idn | Feet from the | North/South line | Feet from the | East/West line | County |
|---|---|---|---|---|---|---|---|---|---|
| M | 9 | 25S | 27E | | 671 | SOUTH | 142 | WEST | EDDY |

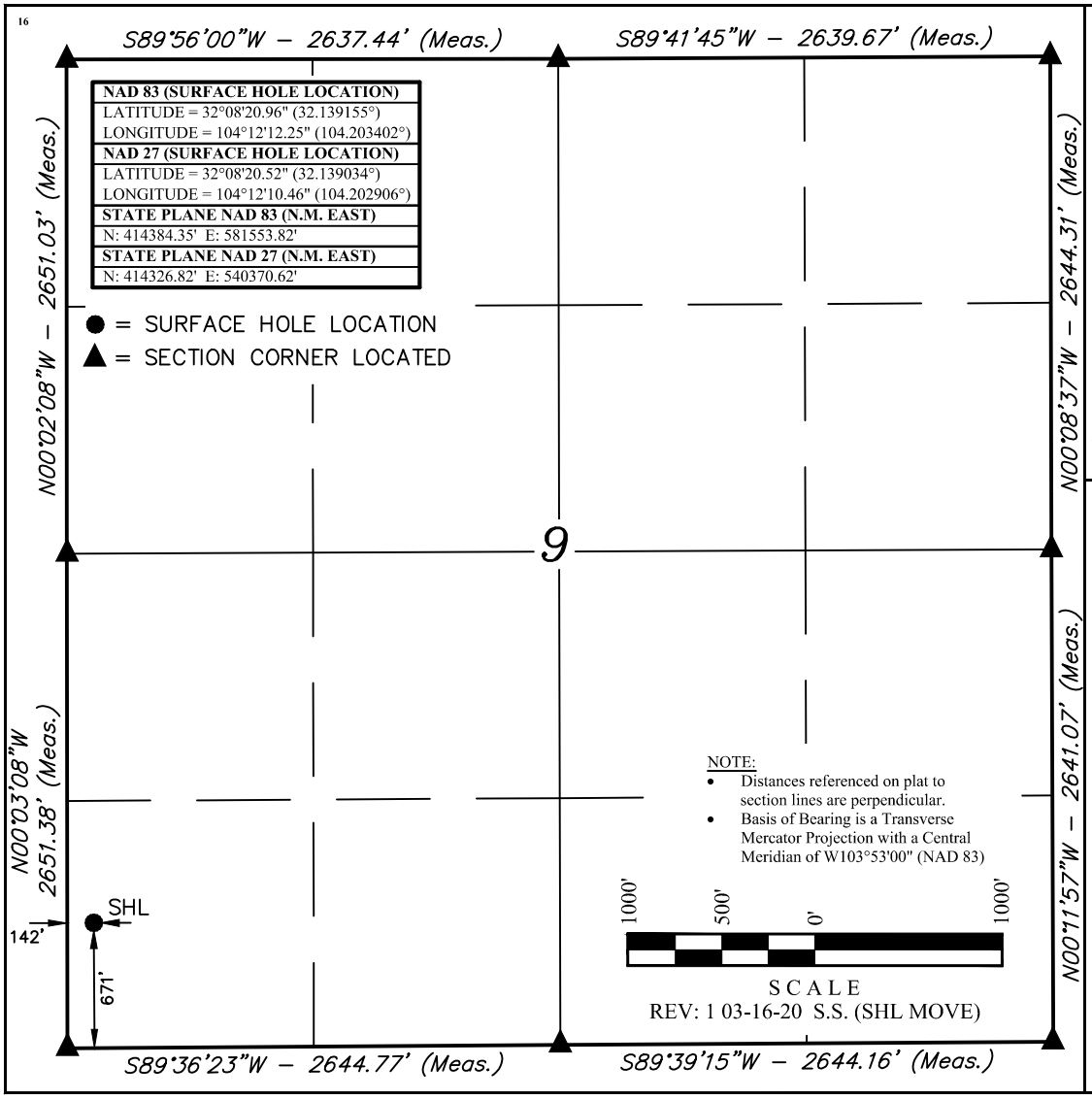
## [11] Bottom Hole Location If Different From Surface

| UL or lot no. | Section | Township | Range | Lot Idn | Feet from the | North/South line | Feet from the | East/West line | County |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

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

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

[16]




## [17] OPERATOR CERTIFICATION

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

Amithy Crawford 3/24/20
Signature Date

Amithy Crawford
Printed Name

acrawford@cimarex.com
E-mail Address

## [18] SURVEYOR CERTIFICATION

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

October 07, 2019
Date of Survey

Signature and Seal of Professional Surveyor:


Certificate Number:

Side 1

# INJECTION WELL DATA SHEET

OPERATOR: Cimarex Energy Co.

WELL NAME & NUMBER: Patriot 9 SWD #1

WELL LOCATION: 671' FSL & 142' FWL | M | 9 | 25S | 27E

FOOTAGE LOCATION | UNIT LETTER | SECTION | TOWNSHIP | RANGE

***WELLBORE SCHEMATIC***

*See Attached Wellbore Schematic*

***WELL CONSTRUCTION DATA***

Surface Casing

Hole Size: 26" Casing Size: 20"

Cemented with: 603 sx. *or* _____ ft³

Top of Cement: Surface Method Determined: Circulation

Intermediate Casing 1

Hole Size: 17 1/2" Casing Size: 13 3/8"

Cemented with: 1250 sx. *or* _____ ft³

Top of Cement: Surface Method Determined: Circulation

Intermediate Casing 2

Hole Size: 12 1/4" Casing Size: 9 5/8"

Cemented with: 1700 sx. *or* _____ ft³

Top of Cement: Surface Method Determined: Circulation

Production Casing

Hole Size: 8 3/4" Casing Size: 7"

Cemented with: 1860 sx. *or* _____ ft³

Top of Cement: Surface Method Determined: Circulation

Total Depth: 14238'

Injection Interval

12738' feet to 14738'

(Perforated or Open Hole; indicate which)

## INJECTION WELL DATA SHEET

Tubing Size: 5.5" Lining Material: Fiberglass

Type of Packer: Inconel Permanent Packer

Packer Setting Depth: 13238'

Other Type of Tubing/Casing Seal (if applicable): N/A

Additional Data

1. Is this a new well drilled for injection? X Yes ____ No

   If no, for what purpose was the well originally drilled? N/A

2. Name of the Injection Formation: Devonian-Silurian

3. Name of Field or Pool (if applicable): SWD; Devonian-Silurian (97869)

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e. sacks of cement or plug(s) used.

   N/A

5. Give the name and depths of any oil or gas zones underlying or overlying the proposed injection zone in this area:

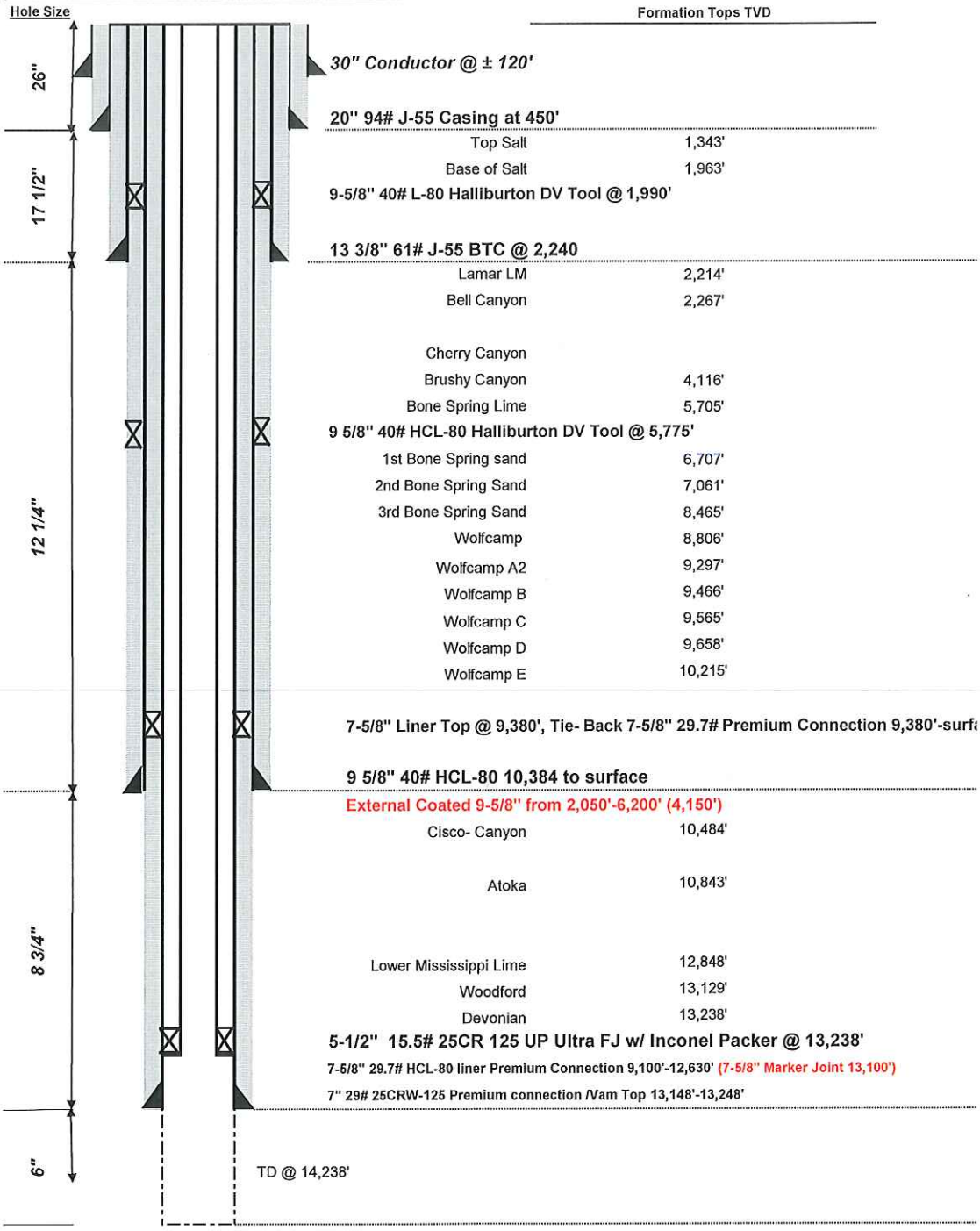
   Over: Bone Spring (7460') Morrow (11952')

   Under: None

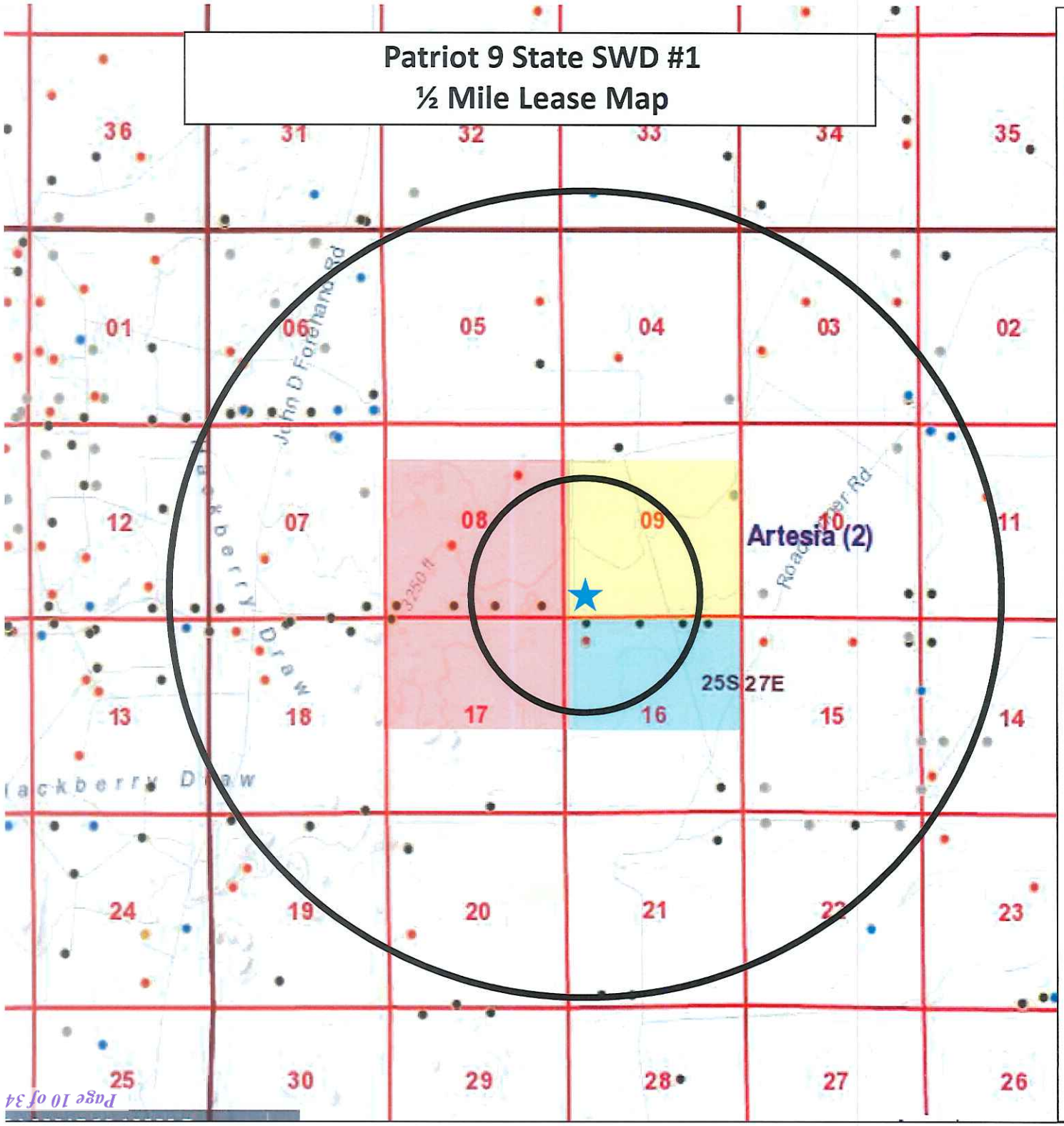
CIMAREX

# DRILLING PROGNOSIS
## Cimarex Energy Co.

| | |
|---|---|
| **Well:** | **Patriot 9 Sate SWD (SWD) 1** |
| **Date:** | 8/19/2019 |
| **Co., State** | Eddy Co, NM |
| **Surf. Loc:** | 671' FSL & 142' FWL Sec 9, 25S, 27E |
| **Bottomhole Loc:** | Vertical |

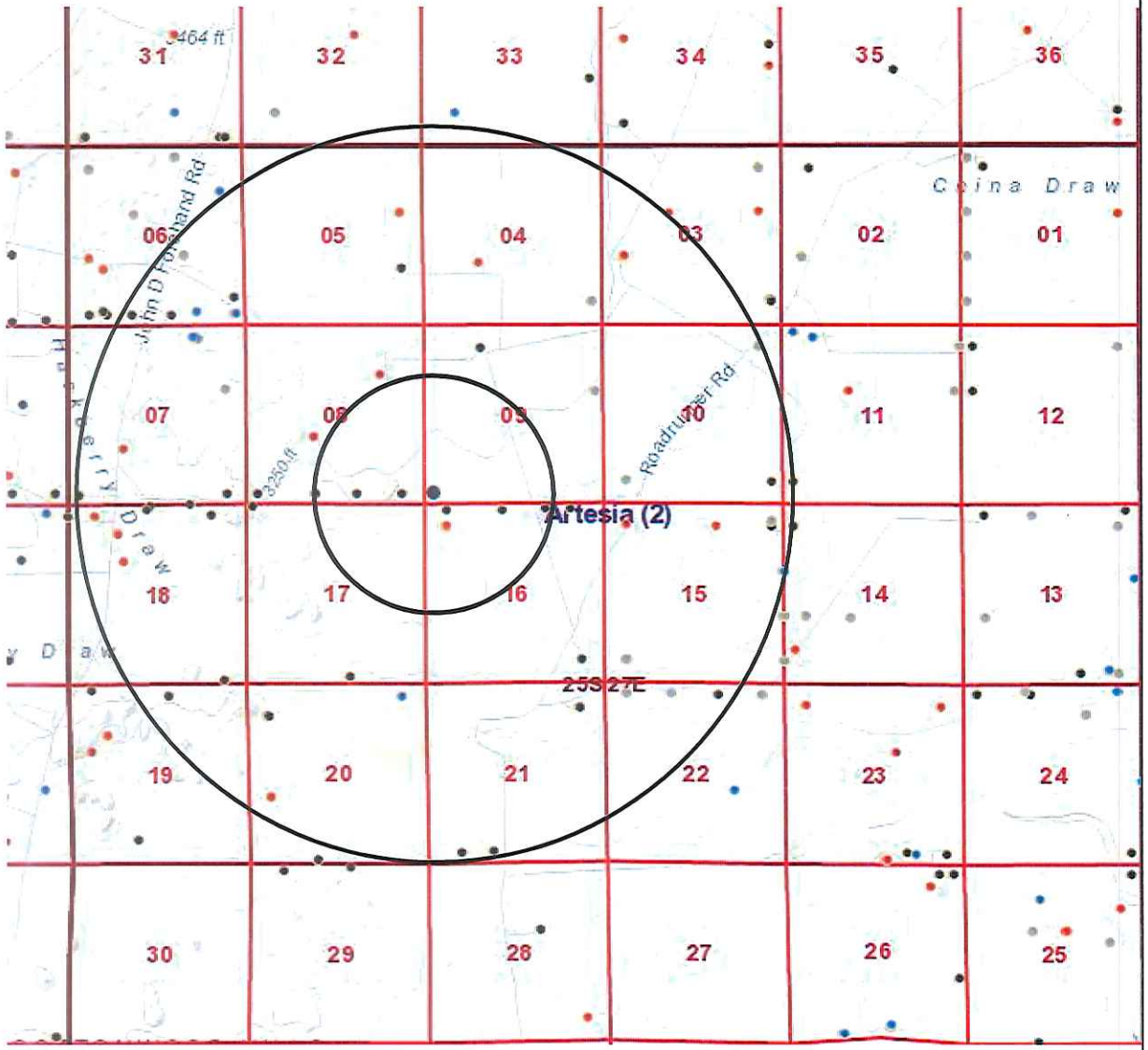


# Patriot 9 State SWD #1
## ½ Mile Lease Map




- Cimarex Energy Co.
- EOG Resources, Inc
- Chevron USA, Inc

# Patriot 9 State SWD #1
# 2 Mile & ½ Mile AOR Map




## ½ Mile Wells

**Section 8 25S 27E**
White City 8 Federal #3H 30-015-42160
White City 8 Federal #4H 30-015-42161
White City 8 Federal #5H 30-015-41610

**Section 9 25S 27E**
-None-

**Section 17 25S 27E**
-None-

**Section 16 25S 27E**
P&A Well 30-015-01142
Matthews 16 State #1D 30-015-36855
Hayhurst 16 25 27 State #3H 30-015-42491
Hayhurst 16 25 27 State #1H 30-015-41120
Hayhurst 16 25 27 State #2H 30-015-41121

# VI.

## Table of AOR Wells

***** No Wells Penetrate the Proposed Disposal Interval*****

| API | WELL NAME | WELL NO | OPERATOR | SECTION | TOWNSHIP | RANGE | SPUD | TVD | RECORD OF COMPLETION | STATUS |
|---|---|---|---|---|---|---|---|---|---|---|
| 30-015-42160 | White City 8 Federal | 3H | Cimarex Energy Co. | 8 | 25S | 27E | 7/18/2014 | 7419 | Single | Active |
| 30-015-42161 | White City 8 Federal | 4H | Cimarex Energy Co. | 8 | 25S | 27E | 9/23/2015 | 7490 | Single | Active |
| 30-015-41610 | White City 8 Federal | 5H | Cimarex Energy Co. | 8 | 25S | 27E | 9/7/2015 | 7524 | Single | Active |
| 30-015-42491 | Hayhurst 16 25 27 State | 3H | Chevron USA Inc | 16 | 25S | 27E | 8/15/2014 | 7474 | Single | Active |
| 30-015-41120 | Hayhurst 16 25 27 State | 1H | Chevron USA Inc | 16 | 25S | 27E | 5/18/2014 | 7618 | Single | Active |
| 30-015-41121 | Hayhurst 16 25 27 State | 2H | Chevron USA Inc | 16 | 25S | 27E | 3/24/2014 | 6907 | Single | Active |
| 30-015-36855 | Matthews 16 State | 1D | EOG Resources Inc | 16 | 25S | 27E | N/A | N/A | N/A | Expired Permit |
| 30-015-01142 | Humble State | 1 | R.E. Sutton | 16 | 25S | 27E | 8/1/1959 | 2320 | P&A | P&Ad Well |
| | | | | | | | | | | |

NALCO Champion
An Ecolab Company

# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delaware Basin**
Location: **White City**
System: **Production System**

Equipment: **Bonnie 35 Fed Com 4H**
Sample Point: **Separator**
Sample ID: **AN23184**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **06/20/2019**
Receive Date: **07/08/2019**
Report Date: **07/10/2019**
Location Code: **395754**

## Field Analysis

| | | | | | |
|---|---|---|---|---|---|
| Bicarbonate | 45 mg/L | Dissolved CO2 | 358 mg/L | Dissolved H2S | 0 mg/L |
| Pressure Surface | 110 psi | Temperature | 82 ° F | pH of Water | 6.65 |
| Oil per Day | 111.41 B/D | Gas per Day | 1088.33 Mcf/D | Water per Day | 370.62 B/D |

## Sample Analysis

| | | | | | |
|---|---|---|---|---|---|
| Calculated Gaseous CO2 | 0.38 % | Calculated pH | 6.65 | Conductivity (Calculated) | 283111 µS - cm3 |
| Ionic Strength | 3.30 | Resistivity | 0.035 ohms - m | Specific Gravity | 1.128 |
| Total Dissolved Solids | 183350 mg/L | | | | |

### Cations

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Iron | 3.24 | mg/L | Manganese | 0.436 | mg/L | Barium | 1.84 | mg/L |
| Strontium | 840 | mg/L | Calcium | 5300 | mg/L | Magnesium | 908 | mg/L |
| Sodium | 63900.00 | mg/L | Potassium | 1060 | mg/L | Boron | 17.2 | mg/L |
| Lithium | 44.1 | mg/L | Copper | 0.006 | mg/L | Nickel | 0.008 | mg/L |
| Zinc | 0.002 | mg/L | Lead | 0.118 | mg/L | Cobalt | 0.049 | mg/L |
| Chromium | 0.005 | mg/L | Silicon | 6.18 | mg/L | Aluminum | Not Detected | mg/L |
| Molybdenum | 0.004 | mg/L | Phosphorus | 0.263 | mg/L | | | |

### Anions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bromide | 1027.368 | mg/L | Chloride | 109898 | mg/L | Sulfate | 297.907 | mg/L |

## PTB Value

| | Barite PTB | Calcite PTB | Celestite PTB | Gypsum PTB | Halite PTB | Iron Carbonate PTB | Iron Sulfide PTB |
|---|---|---|---|---|---|---|---|
| 50° | 0.79 | 0.00 | 23.30 | 0.00 | 0.00 | 0.00 | 0.00 |
| 75° | 0.58 | 0.00 | 25.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| 100° | 0.28 | 0.00 | 33.15 | 0.00 | 0.00 | 0.00 | 0.00 |
| 125° | 0.00 | 0.00 | 44.69 | 0.00 | 0.00 | 0.00 | 0.00 |
| 150° | 0.00 | 1.09 | 57.72 | 0.00 | 0.00 | 0.00 | 0.00 |
| 175° | 0.00 | 3.39 | 70.90 | 0.00 | 0.00 | 0.00 | 0.00 |
| 200° | 0.00 | 5.13 | 83.34 | 0.00 | 0.00 | 0.00 | 0.00 |
| 225° | 0.00 | 6.46 | 94.62 | 0.00 | 0.00 | 0.00 | 0.00 |
| 250° | 0.00 | 7.49 | 104.59 | 0.00 | 0.00 | 0.00 | 0.00 |
| 275° | 0.00 | 8.29 | 113.29 | 0.00 | 0.00 | 0.00 | 0.00 |
| 300° | 0.00 | 8.89 | 120.88 | 0.00 | 0.00 | 0.00 | 0.00 |
| 325° | 0.00 | 9.34 | 127.55 | 0.00 | 0.00 | 0.00 | 0.00 |
| 350° | 0.00 | 9.64 | 133.48 | 0.00 | 0.00 | 0.00 | 0.00 |
| 375° | 0.00 | 9.83 | 138.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| 400° | 0.00 | 9.90 | 143.33 | 0.00 | 0.00 | 0.00 | 0.00 |

## Saturation Index

| | Barite SI | Calcite SI | Celestite SI | Gypsum SI | Halite SI | Iron Carbonate SI |
|---|---|---|---|---|---|---|
| 50° | 0.56 | -0.88 | 0.07 | -0.82 | -0.83 | -2.82 |
| 75° | 0.33 | -0.60 | 0.08 | -0.84 | -0.84 | -2.44 |
| 100° | 0.13 | -0.35 | 0.10 | -0.83 | -0.86 | -2.11 |
| 125° | -0.04 | -0.13 | 0.14 | -0.82 | -0.86 | -1.82 |
| 150° | -0.18 | 0.08 | 0.19 | -0.81 | -0.87 | -1.57 |
| 175° | -0.29 | 0.26 | 0.24 | -0.82 | -0.88 | -1.35 |
| 200° | -0.39 | 0.44 | 0.24 | -0.85 | -0.89 | -1.16 |
| 225° | -0.48 | 0.60 | 0.35 | -0.88 | -0.89 | -1.01 |
| 250° | -0.56 | 0.75 | 0.40 | -0.93 | -0.90 | -0.89 |
| 275° | -0.63 | 0.88 | 0.45 | -0.98 | -0.90 | -0.79 |
| 300° | -0.70 | 1.00 | 0.50 | -1.02 | -0.91 | -0.73 |
| 325° | -0.78 | 1.10 | 0.54 | -1.03 | -0.91 | -0.70 |
| 350° | -0.85 | 1.18 | 0.59 | -0.99 | -0.91 | -0.71 |
| 375° | -0.94 | 1.23 | 0.63 | -0.89 | -0.90 | -0.76 |
| 400° | -1.03 | 1.25 | 0.66 | -0.70 | -0.90 | -0.86 |

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

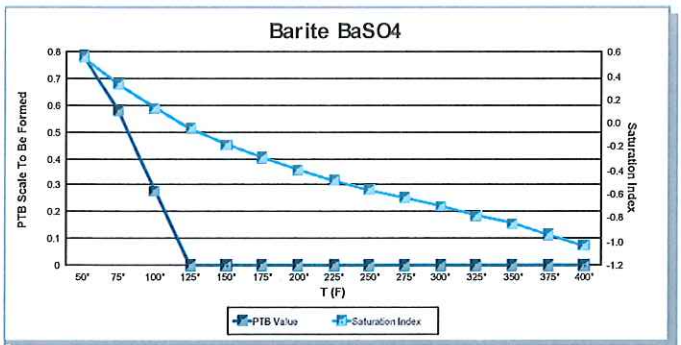
NALCO Champion
An Ecolab Company

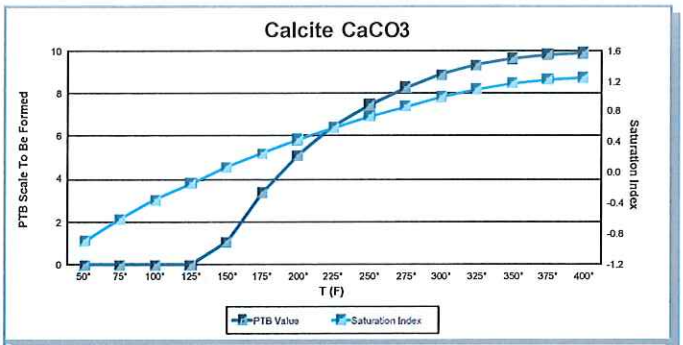
# Complete Water Analysis Report

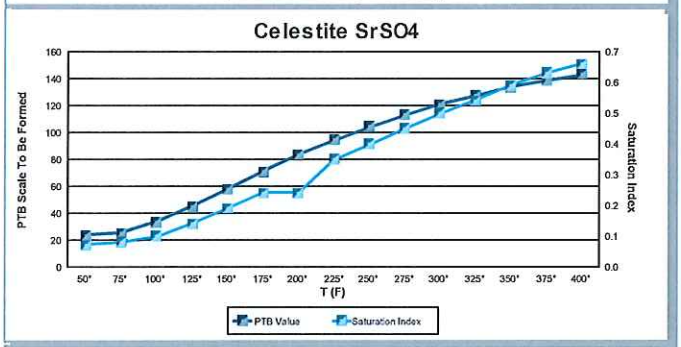
Customer: **CIMAREX ENERGY CO**
Region: **Delaware Basin**
Location: **White City**
System: **Production System**

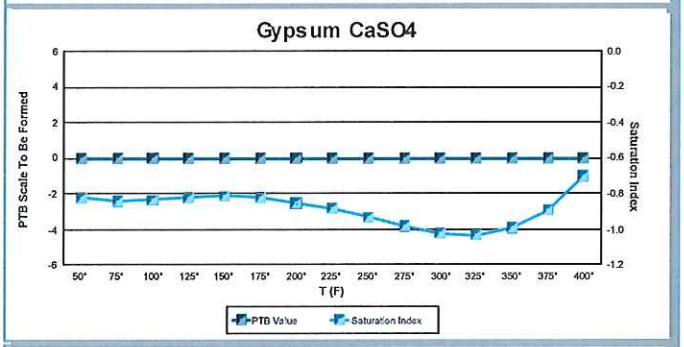
Equipment: **Bonnie 35 Fed Com 4H**
Sample Point: **Separator**
Sample ID: **AN23184**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

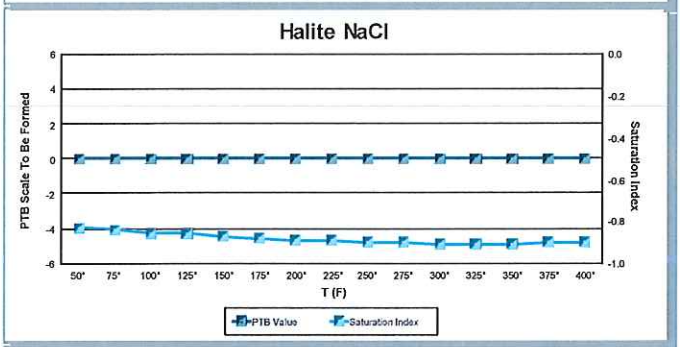
Collection Date: **06/20/2019**
Receive Date: **07/08/2019**
Report Date: **07/10/2019**
Location Code: **395754**

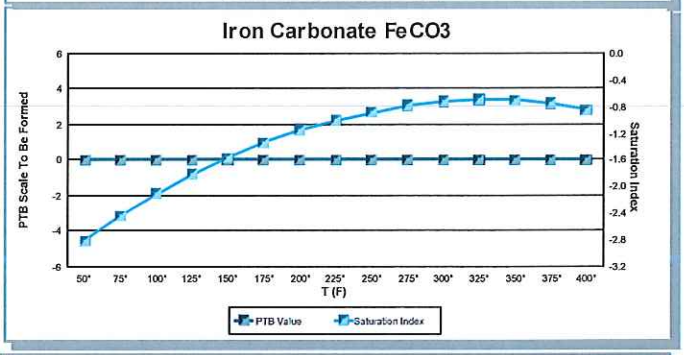


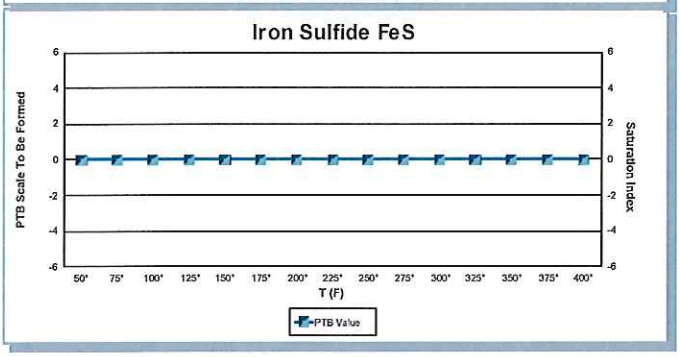




## Comments

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

NALCO Champion
An Ecolab Company

# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

Equipment: **White City 14 Fed 7**
Sample Point: **Separator**
Sample ID: **AN13821**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **06/12/2019**
Receive Date: **06/19/2019**
Report Date: **06/20/2019**
Location Code: **325285**

## Field Analysis

| | | | | | |
|---|---|---|---|---|---|
| Bicarbonate | 427.0 mg/L | Dissolved CO2 | 40 mg/L | Dissolved H2S | 735.3 mg/L |
| Pressure Surface | 75 psi | Temperature | 92 ° F | pH of Water | 7.3 |
| Oil per Day | 20.57 B/D | Water per Day | 105.12 B/D | | |

## Sample Analysis

| | | | | | |
|---|---|---|---|---|---|
| Calculated Gaseous CO2 | 0.00 % | Calculated pH | 7.30 | Conductivity (Calculated) | 257609 µS - cm3 |
| Ionic Strength | 3.47 | Resistivity | 0.039 ohms - m | Specific Gravity | 1.125 |
| Total Dissolved Solids | 166206 mg/L | | | | |

### Cations

| | | | | | |
|---|---|---|---|---|---|
| Iron | 0.163 mg/L | Manganese | 1.41 mg/L | Barium | 0.501 mg/L |
| Strontium | 337 mg/L | Calcium | 14300 mg/L | Magnesium | 3530 mg/L |
| Sodium | 50200.00 mg/L | Potassium | 611 mg/L | Boron | 26.1 mg/L |
| Lithium | Not Detected mg/L | Copper | 0.002 mg/L | Nickel | 0.066 mg/L |
| Zinc | 0.065 mg/L | Lead | 0.064 mg/L | Cobalt | 0.062 mg/L |
| Chromium | <.25 mg/L | Silicon | 3.39 mg/L | Aluminum | Not Detected mg/L |
| Molybdenum | 0.017 mg/L | Phosphorus | 1.79 mg/L | | |

### Anions

| | | | | | |
|---|---|---|---|---|---|
| Bromide | 692.141 mg/L | Chloride | 95352 mg/L | Sulfate | 722.582 mg/L |

## PTB Value

| | Barite PTB | Calcite PTB | Celestite PTB | Gypsum PTB | Halite PTB | Iron Carbonate PTB | Iron Sulfide PTB |
|---|---|---|---|---|---|---|---|
| 50° | 0.18 | 0.00 | 5.70 | 0.00 | 0.00 | 0.00 | 0.08 |
| 75° | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 |
| 100° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 |
| 125° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 150° | 0.00 | 0.00 | 2.38 | 0.00 | 0.00 | 0.00 | 0.00 |
| 175° | 0.00 | 0.00 | 14.31 | 0.00 | 0.00 | 0.00 | 0.00 |
| 200° | 0.00 | 0.00 | 26.92 | 0.00 | 0.00 | 0.00 | 0.00 |
| 225° | 0.00 | 0.00 | 39.22 | 0.00 | 0.00 | 0.00 | 0.00 |
| 250° | 0.00 | 0.00 | 50.64 | 0.00 | 0.00 | 0.00 | 0.00 |
| 275° | 0.00 | 0.00 | 60.90 | 0.00 | 0.00 | 0.00 | 0.00 |
| 300° | 0.00 | 0.00 | 69.97 | 0.00 | 0.00 | 0.00 | 0.00 |
| 325° | 0.00 | 0.00 | 77.94 | 0.00 | 0.00 | 0.00 | 0.00 |
| 350° | 0.00 | 0.00 | 84.89 | 0.00 | 0.00 | 0.00 | 0.00 |
| 375° | 0.00 | 0.00 | 90.79 | 0.00 | 0.00 | 0.00 | 0.01 |
| 400° | 0.00 | 0.00 | 95.42 | 0.00 | 0.00 | 0.00 | 0.03 |

## Saturation Index

| | Barite SI | Celestite SI | Gypsum SI | Halite SI | Iron Sulfide SI |
|---|---|---|---|---|---|
| 50° | 0.39 | 0.02 | -0.03 | -0.98 | 0.82 |
| 75° | 0.10 | -0.02 | -0.10 | -1.00 | 0.46 |
| 100° | -0.13 | -0.03 | -0.13 | -1.02 | 0.17 |
| 125° | -0.32 | -0.02 | -0.14 | -1.03 | -0.04 |
| 150° | -0.49 | 0.01 | -0.16 | -1.04 | -0.20 |
| 175° | -0.63 | 0.04 | -0.19 | -1.05 | -0.30 |
| 200° | -0.75 | 0.04 | -0.23 | -1.06 | -0.36 |
| 225° | -0.85 | 0.11 | -0.29 | -1.06 | -0.39 |
| 250° | -0.95 | 0.15 | -0.35 | -1.07 | -0.37 |
| 275° | -1.04 | 0.18 | -0.42 | -1.07 | -0.33 |
| 300° | -1.12 | 0.21 | -0.47 | -1.08 | -0.27 |
| 325° | -1.21 | 0.24 | -0.50 | -1.08 | -0.18 |
| 350° | -1.31 | 0.27 | -0.48 | -1.07 | -0.08 |
| 375° | -1.41 | 0.29 | -0.40 | -1.07 | 0.04 |
| 400° | -1.52 | 0.31 | -0.22 | -1.06 | 0.16 |

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

NALCO Champion
An Ecolab Company

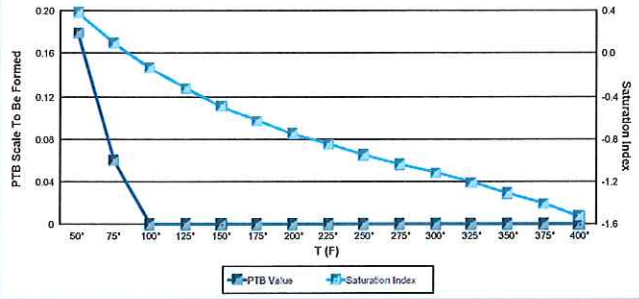
# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

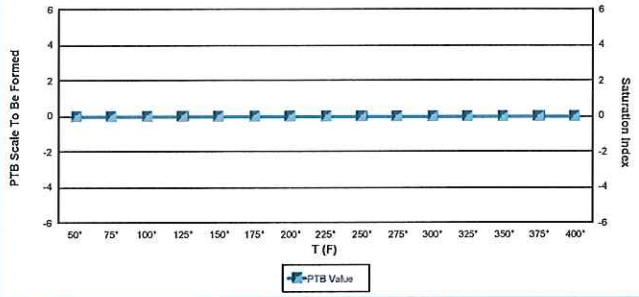
Equipment: **White City 14 Fed 7**
Sample Point: **Separator**
Sample ID: **AN13821**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **06/12/2019**
Receive Date: **06/19/2019**
Report Date: **06/20/2019**
Location Code: **325285**

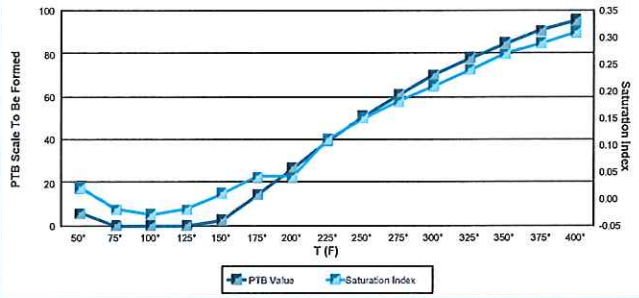
## Barite BaSO4



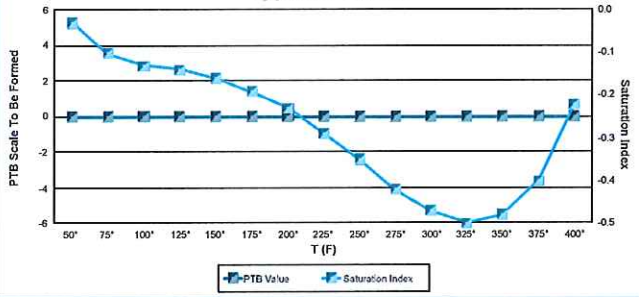

## Calcite CaCO3



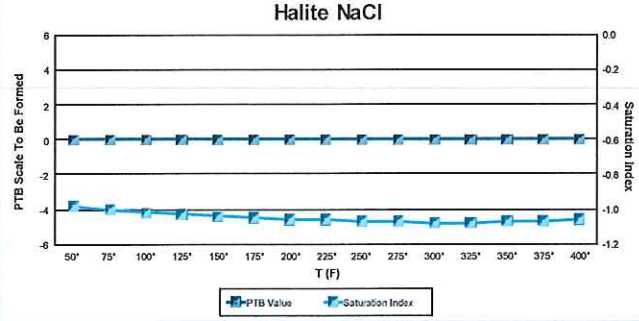

## Celestite SrSO4



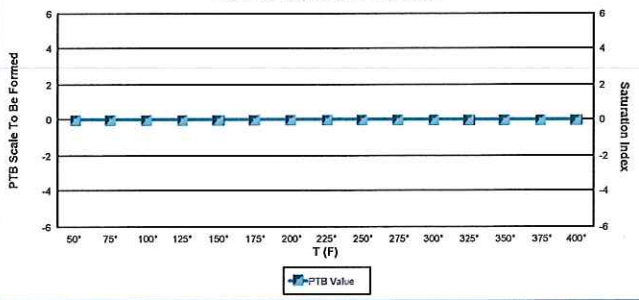

## Gypsum CaSO4



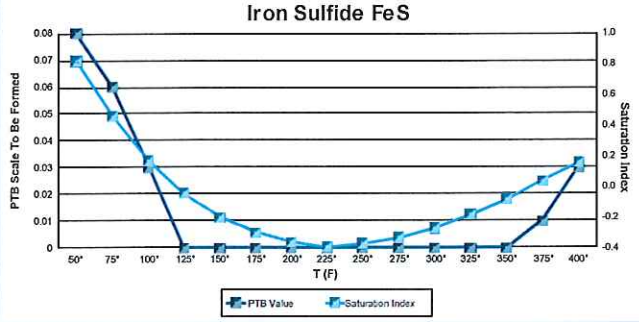

## Halite NaCl




## Iron Carbonate FeCO3




## Iron Sulfide FeS




## Comments

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NALCO Champion
An Ecolab Company

# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

Equipment: **Scoter 6 Fed Com 7H**
Sample Point: **Separator**
Sample ID: **AM40752**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **02/01/2019**
Receive Date: **02/07/2019**
Report Date: **02/12/2019**
Location Code: **399185**

## Field Analysis

| | | | | | |
|---|---|---|---|---|---|
| Bicarbonate | 45 mg/L | Dissolved CO2 | 324 mg/L | Dissolved H2S | 0 mg/L |
| Pressure Surface | 140 psi | Temperature | 112 ° F | pH of Water | 6.7 |
| Oil per Day | 700 B/D | Water per Day | 3990 B/D | | |

## Sample Analysis

| | | | | | |
|---|---|---|---|---|---|
| Calculated Gaseous CO2 | 0.36 % | Calculated pH | 6.70 | Conductivity (Calculated) | 174237 µS - cm3 |
| Ionic Strength | 2.07 | Resistivity | 0.057 ohms - m | Specific Gravity | 1.077 |
| Total Dissolved Solids | 112582 mg/L | | | | |

### Cations

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Iron | 5.38 | mg/L | Manganese | 0.602 | mg/L | Barium | 6.96 | mg/L |
| Strontium | 1170 | mg/L | Calcium | 3480 | mg/L | Magnesium | 463 | mg/L |
| Sodium | 43600.00 | mg/L | Potassium | 579 | mg/L | Boron | 83 | mg/L |
| Lithium | Not Detected | mg/L | Copper | 0.002 | mg/L | Nickel | 0.004 | mg/L |
| Zinc | <.25 | mg/L | Lead | 0.064 | mg/L | Cobalt | 0.062 | mg/L |
| Chromium | 0.005 | mg/L | Silicon | 12.6 | mg/L | Aluminum | Not Detected | mg/L |
| Molybdenum | Not Detected | mg/L | Phosphorus | 0.087 | mg/L | | | |

### Anions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bromide | 388.356 | mg/L | Chloride | 62580 | mg/L | Fluoride | 1.266 | mg/L |
| Sulfate | 166.021 | mg/L | | | | | | |

## PTB Value

| | Barite PTB | Calcite PTB | Celestite PTB | Gypsum PTB | Halite PTB | Iron Carbonate PTB | Iron Sulfide PTB |
|---|---|---|---|---|---|---|---|
| 50° | 3.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 75° | 3.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 100° | 2.86 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 125° | 2.31 | 0.75 | 5.88 | 0.00 | 0.00 | 0.00 | 0.00 |
| 150° | 1.70 | 1.68 | 19.25 | 0.00 | 0.00 | 0.00 | 0.00 |
| 175° | 1.05 | 2.64 | 31.87 | 0.00 | 0.00 | 0.00 | 0.00 |
| 200° | 0.41 | 3.60 | 43.24 | 0.00 | 0.00 | 0.00 | 0.00 |
| 225° | 0.00 | 4.54 | 53.20 | 0.00 | 0.00 | 0.00 | 0.00 |
| 250° | 0.00 | 5.43 | 61.77 | 0.00 | 0.00 | 0.00 | 0.00 |
| 275° | 0.00 | 6.26 | 69.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| 300° | 0.00 | 7.00 | 75.17 | 0.00 | 0.00 | 0.00 | 0.00 |
| 325° | 0.00 | 7.66 | 80.36 | 0.00 | 0.00 | 0.00 | 0.00 |
| 350° | 0.00 | 8.21 | 84.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| 375° | 0.00 | 8.67 | 88.44 | 0.00 | 0.00 | 0.00 | 0.00 |
| 400° | 0.00 | 9.02 | 91.51 | 0.00 | 0.00 | 0.00 | 0.00 |

## Saturation Index

| | Barite SI | Calcite SI | Celestite SI | Gypsum SI | Halite SI | Iron Carbonate SI |
|---|---|---|---|---|---|---|
| 50° | 0.92 | -0.30 | -0.11 | -1.30 | -1.34 | -1.78 |
| 75° | 0.70 | -0.16 | -0.08 | -1.30 | -1.37 | -1.53 |
| 100° | 0.52 | -0.02 | -0.03 | -1.28 | -1.38 | -1.31 |
| 125° | 0.36 | 0.12 | 0.03 | -1.26 | -1.39 | -1.11 |
| 150° | 0.23 | 0.25 | 0.09 | -1.24 | -1.40 | -0.94 |
| 175° | 0.13 | 0.37 | 0.16 | -1.24 | -1.40 | -0.79 |
| 200° | 0.05 | 0.49 | 0.16 | -1.25 | -1.40 | -0.66 |
| 225° | -0.02 | 0.60 | 0.31 | -1.27 | -1.40 | -0.56 |
| 250° | -0.08 | 0.71 | 0.38 | -1.30 | -1.40 | -0.48 |
| 275° | -0.14 | 0.80 | 0.46 | -1.33 | -1.40 | -0.43 |
| 300° | -0.19 | 0.88 | 0.53 | -1.35 | -1.39 | -0.41 |
| 325° | -0.24 | 0.95 | 0.60 | -1.35 | -1.38 | -0.41 |
| 350° | -0.29 | 1.02 | 0.67 | -1.29 | -1.37 | -0.44 |
| 375° | -0.35 | 1.07 | 0.73 | -1.17 | -1.35 | -0.49 |
| 400° | -0.41 | 1.11 | 0.80 | -0.96 | -1.33 | -0.57 |

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

NALCO Champion
An Ecolab Company

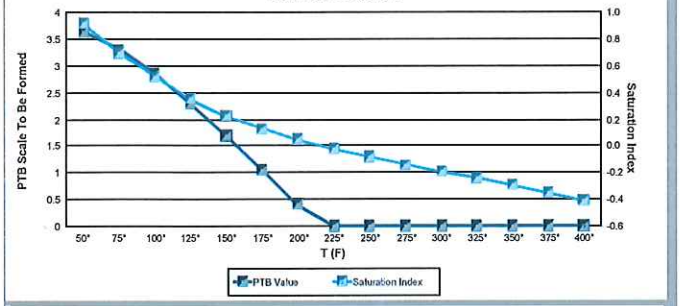
# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

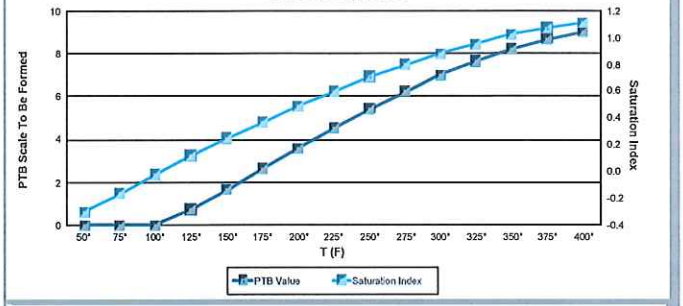
Equipment: **Scoter 6 Fed Com 7H**
Sample Point: **Separator**
Sample ID: **AM40752**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **02/01/2019**
Receive Date: **02/07/2019**
Report Date: **02/12/2019**
Location Code: **399185**

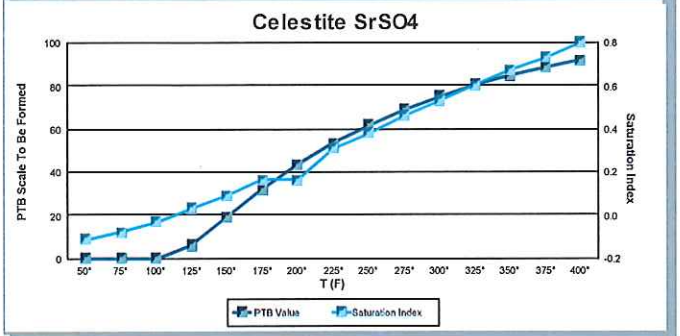
## Barite BaSO4



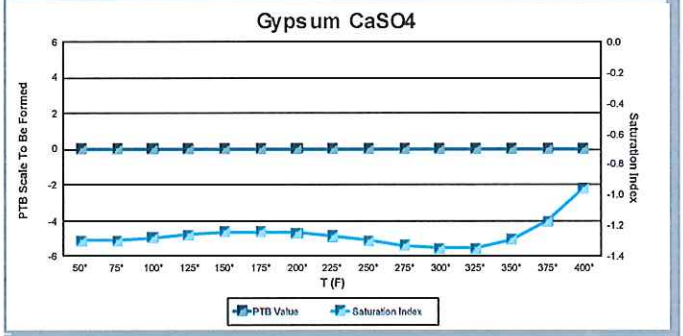

## Calcite CaCO3



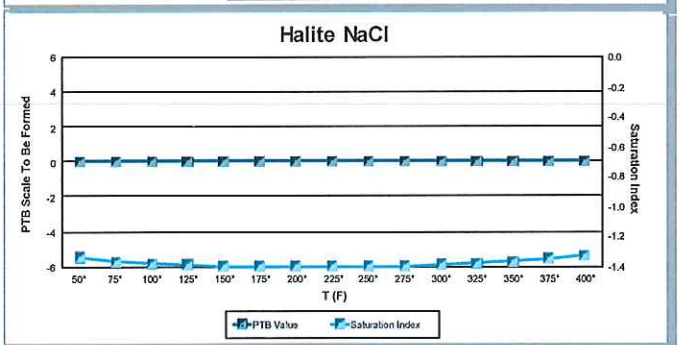

## Celestite SrSO4



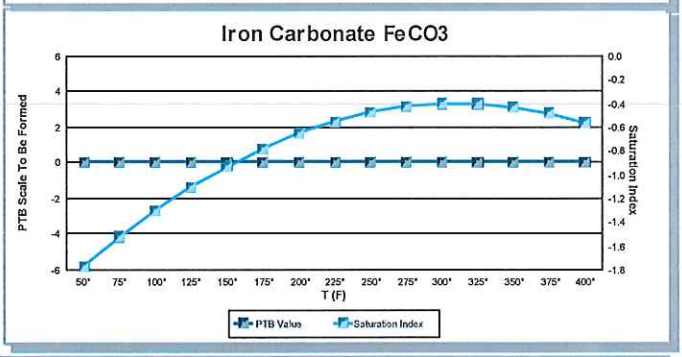

## Gypsum CaSO4



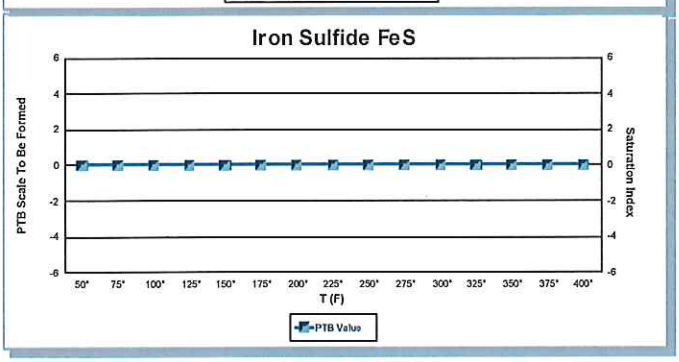

## Halite NaCl




## Iron Carbonate FeCO3




## Iron Sulfide FeS




## Comments

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Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

NALCO Champion
An Ecolab Company

# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

Equipment: **Scoter 6-31 Fed Com 44H**
Sample Point: **Separator**
Sample ID: **AM40753**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **02/04/2019**
Receive Date: **02/07/2019**
Report Date: **02/12/2019**
Location Code: **401486**

## Field Analysis

| | | | | | |
|---|---|---|---|---|---|
| Bicarbonate | 85 mg/L | Dissolved CO2 | 480 mg/L | Dissolved H2S | 0 mg/L |
| Pressure Surface | 133 psi | Temperature | 123 ° F | pH of Water | 6.5 |
| Oil per Day | 400 B/D | Water per Day | 4000 B/D | | |

## Sample Analysis

| | | | | | |
|---|---|---|---|---|---|
| Calculated Gaseous CO2 | 1.09 % | Calculated pH | 6.50 | Conductivity (Calculated) | 160380 µS - cm3 |
| Ionic Strength | 1.88 | Resistivity | 0.062 ohms - m | Specific Gravity | 1.078 |
| Total Dissolved Solids | 103724 mg/L | | | | |

### Cations

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Iron | 5.15 | mg/L | Manganese | 0.608 | mg/L | Barium | 6.2 mg/L |
| Strontium | 1060 | mg/L | Calcium | 3100 | mg/L | Magnesium | 419 mg/L |
| Sodium | 36900.00 | mg/L | Potassium | 583 | mg/L | Boron | 74.5 mg/L |
| Lithium | Not Detected | mg/L | Copper | <.25 | mg/L | Nickel | 0.017 mg/L |
| Zinc | 0.015 | mg/L | Lead | 0.132 | mg/L | Cobalt | 0.045 mg/L |
| Chromium | 0.003 | mg/L | Silicon | 12.6 | mg/L | Aluminum | Not Detected mg/L |
| Molybdenum | 0.005 | mg/L | Phosphorus | 0.098 | mg/L | | |

### Anions

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bromide | 402.638 | mg/L | Chloride | 60818 | mg/L | Fluoride | 1.763 mg/L |
| Sulfate | 254.48 | mg/L | | | | | |

## PTB Value

| | Barite PTB | Calcite PTB | Celestite PTB | Gypsum PTB | Halite PTB | Iron Carbonate PTB | Iron Sulfide PTB |
|---|---|---|---|---|---|---|---|
| 50° | 3.41 | 0.00 | 27.46 | 0.00 | 0.00 | 0.00 | 0.00 |
| 75° | 3.22 | 0.00 | 32.61 | 0.00 | 0.00 | 0.00 | 0.00 |
| 100° | 2.95 | 0.73 | 42.63 | 0.00 | 0.00 | 0.00 | 0.00 |
| 125° | 2.62 | 2.63 | 54.99 | 0.00 | 0.00 | 0.00 | 0.00 |
| 150° | 2.25 | 4.60 | 68.11 | 0.00 | 0.00 | 0.00 | 0.00 |
| 175° | 1.85 | 6.61 | 80.96 | 0.00 | 0.00 | 0.00 | 0.00 |
| 200° | 1.45 | 8.58 | 92.87 | 0.00 | 0.00 | 0.00 | 0.00 |
| 225° | 1.07 | 10.48 | 103.56 | 0.00 | 0.00 | 0.00 | 0.00 |
| 250° | 0.68 | 12.26 | 112.92 | 0.00 | 0.00 | 0.00 | 0.00 |
| 275° | 0.30 | 13.90 | 121.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| 300° | 0.00 | 15.36 | 127.94 | 0.00 | 0.00 | 0.00 | 0.00 |
| 325° | 0.00 | 16.65 | 133.88 | 0.00 | 0.00 | 0.00 | 0.00 |
| 350° | 0.00 | 17.75 | 138.96 | 0.00 | 0.00 | 0.00 | 0.00 |
| 375° | 0.00 | 18.68 | 143.26 | 0.00 | 0.00 | 0.00 | 0.00 |
| 400° | 0.00 | 19.42 | 146.86 | 0.00 | 0.00 | 0.00 | 0.00 |

## Saturation Index

| | Barite SI | Calcite SI | Celestite SI | Gypsum SI | Halite SI | Iron Carbonate SI |
|---|---|---|---|---|---|---|
| 50° | 1.12 | -0.20 | 0.09 | -1.09 | -1.44 | -1.64 |
| 75° | 0.90 | -0.08 | 0.11 | -1.10 | -1.46 | -1.42 |
| 100° | 0.70 | 0.05 | 0.15 | -1.09 | -1.48 | -1.20 |
| 125° | 0.54 | 0.19 | 0.20 | -1.07 | -1.49 | -1.00 |
| 150° | 0.41 | 0.32 | 0.26 | -1.05 | -1.50 | -0.82 |
| 175° | 0.31 | 0.46 | 0.33 | -1.05 | -1.50 | -0.65 |
| 200° | 0.22 | 0.60 | 0.33 | -1.06 | -1.50 | -0.50 |
| 225° | 0.15 | 0.74 | 0.47 | -1.08 | -1.50 | -0.37 |
| 250° | 0.09 | 0.88 | 0.54 | -1.12 | -1.50 | -0.26 |
| 275° | 0.04 | 1.01 | 0.61 | -1.15 | -1.49 | -0.17 |
| 300° | -0.01 | 1.14 | 0.68 | -1.17 | -1.48 | -0.10 |
| 325° | -0.06 | 1.26 | 0.75 | -1.16 | -1.47 | -0.06 |
| 350° | -0.11 | 1.36 | 0.82 | -1.10 | -1.46 | -0.04 |
| 375° | -0.17 | 1.46 | 0.88 | -0.98 | -1.44 | -0.05 |
| 400° | -0.24 | 1.54 | 0.95 | -0.76 | -1.42 | -0.08 |

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

NALCO Champion
An Ecolab Company

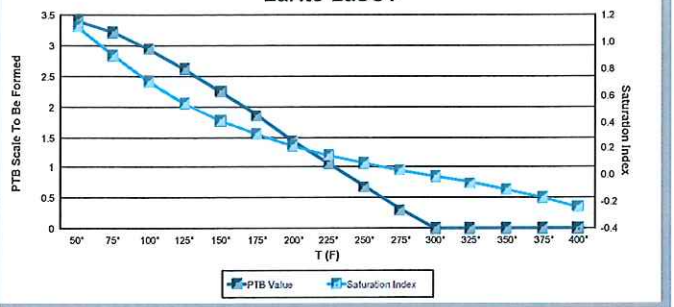
# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

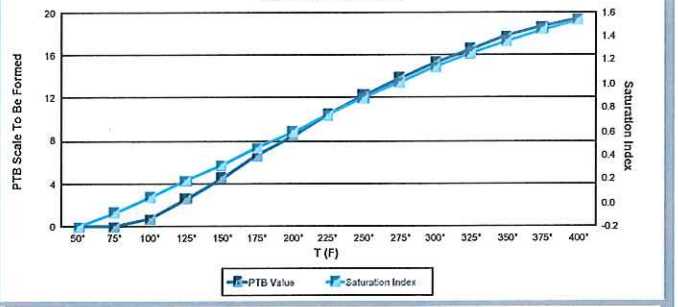
Equipment: **Scoter 6-31 Fed Com 44H**
Sample Point: **Separator**
Sample ID: **AM40753**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **02/04/2019**
Receive Date: **02/07/2019**
Report Date: **02/12/2019**
Location Code: **401486**

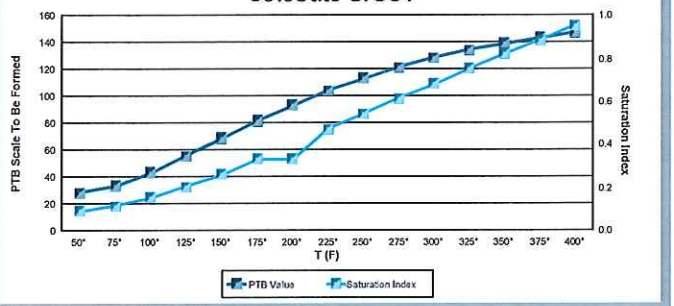
## Barite BaSO4



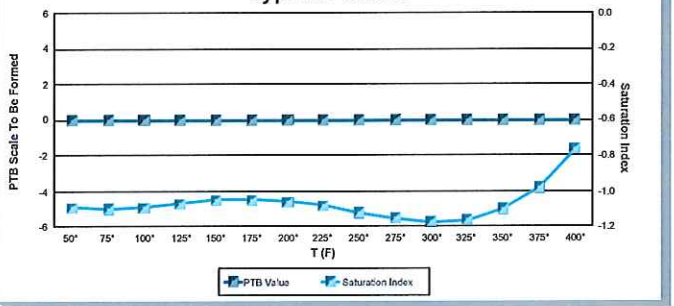

## Calcite CaCO3



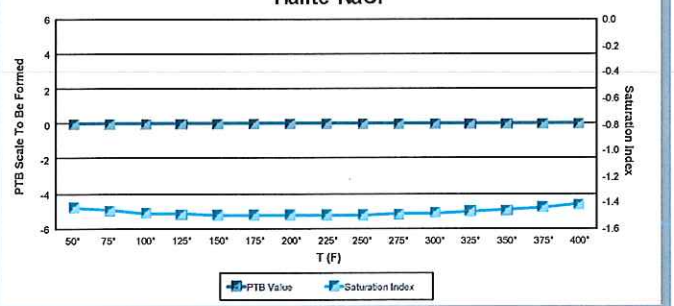

## Celestite SrSO4



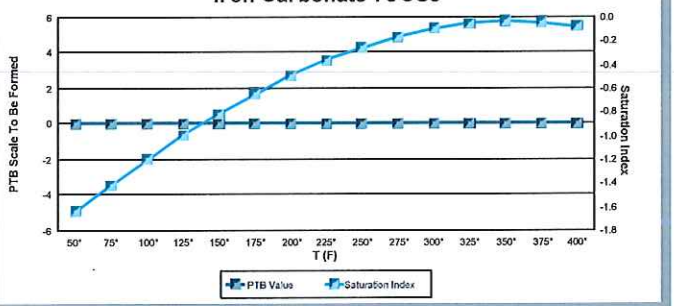

## Gypsum CaSO4



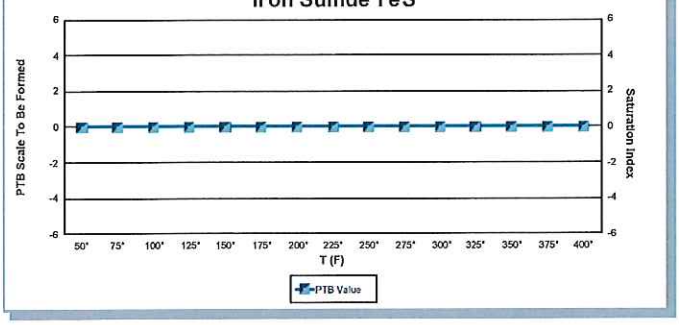

## Halite NaCl




## Iron Carbonate FeCO3




## Iron Sulfide FeS




## Comments

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

NALCO Champion
An Ecolab Company

# Water Analysis Report

Attention:**Stephen.Medvigy@ecolab.com**

Location Code: **320640**

Sample ID: **AM09546**

Login Batch: **2018-12-12-08**

Collection Date: **12/05/2018**

Receive Date: **12/12/2018**

Report Date: **12/28/2018**

Customer: **CIMAREX ENERGY CO**

Region: **Delware Basin**

Location: **White City**

System: **Production System**

Equipment: **Marquardt Fed 1 14H**

Lab ID: **ABU-1031**

Sample Point: **Separator**

| Analyses | Result | Unit |
|---|---|---|
| Dissolved CO2 | 392 | mg/L |
| Dissolved H2S | 6.8 | mg/L |
| pH | 6.35 | |
| Pressure | 90 | psi |
| Temperature | 52 | ° F |

| Analyses | Result | Unit |
|---|---|---|
| Bicarbonate | 55 | mg/L |
| Conductivity (Calculated) | 251558 | µS - cm3 |
| Ionic Strength | 3.11 | |
| Resistivity | 0.040 | ohms - m |
| Specific Gravity | 1.137 | |
| Total Dissolved Solids | 162923 | mg/L |

| Cations | Result | Unit |
|---|---|---|
| Iron | 27.7 | mg/L |
| Manganese | 0.738 | mg/L |
| Barium | 3.2 | mg/L |
| Strontium | 1750 | mg/L |
| Calcium | 7570 | mg/L |
| Magnesium | 1100 | mg/L |
| Sodium | 62400.00 | mg/L |
| Potassium | 1010 | mg/L |
| Boron | 17.8 | mg/L |
| Lithium | Not Detected | mg/L |
| Copper | 0.018 | mg/L |
| Zinc | 0.044 | mg/L |
| Lead | 0.133 | mg/L |
| Cobalt | 0.036 | mg/L |
| Chromium | 0.006 | mg/L |
| Silicon | 5.08 | mg/L |
| Aluminum | 0.027 | mg/L |
| Molybdenum | 0.007 | mg/L |
| Phosphorus | <.25 | mg/L |

| Anions | Result | Unit |
|---|---|---|
| Bromide | 864 | mg/L |
| Chloride | 88008 | mg/L |
| Sulfate | 111 | mg/L |

NALCO Champion
An Ecolab Company

# Water Analysis Report

Attention:**Stephen.Medvigy@ecolab.com**

Location Code: **320640**

Sample ID: **AM09546**

Login Batch: **2018-12-12-08**

Collection Date: **12/05/2018**

Receive Date: **12/12/2018**

Report Date: **12/28/2018**

Customer: **CIMAREX ENERGY CO**

Region: **Delware Basin**

Location: **White City**

System: **Production System**

Equipment: **Marquardt Fed 1 14H**

Lab ID: **ABU-1031**

Sample Point: **Separator**

| Scale Type | Result |
|---|---|
| Anhydrite CaSO4 SI | **-1.39** |
| Barite BaSO4 PTB | **0.4** |
| Barite BaSO4 SI | **0.12** |
| Calcite CaCO3 SI | **-1.44** |
| Celestite SrSO4 PTB | **12.6** |
| Celestite SrSO4 SI | **0.09** |
| Gypsum CaSO4 SI | **-1.17** |
| Hemihydrate CaSO4 SI | **-1.20** |

Saturation Index Calculation (Tomson-Oddo Model)

**Comments**

NALCO Champion
An Ecolab Company

# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

Equipment: **Chosa Draw 27 Fed Com 2H**
Sample Point: **Separator**
Sample ID: **AM50831**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **02/18/2019**
Receive Date: **02/25/2019**
Report Date: **02/28/2019**
Location Code: **329426**

## Field Analysis

| | | | | | |
|---|---|---|---|---|---|
| Bicarbonate | 85 mg/L | Dissolved CO2 | 326 mg/L | Dissolved H2S | 259 mg/L |
| Pressure Surface | 50 psi | Temperature | 50 ° F | pH of Water | 6.25 |
| Oil per Day | 4 B/D | Gas per Day | 0 Mcf/D | Water per Day | 51 B/D |

## Sample Analysis

| | | | | | |
|---|---|---|---|---|---|
| Calculated Gaseous CO2 | 0.00 % | Calculated pH | 6.25 | Conductivity (Calculated) | 146962 µS - cm3 |
| Ionic Strength | 1.95 | Resistivity | 0.068 ohms - m | Specific Gravity | 1.079 |
| Total Dissolved Solids | 94970 mg/L | | | | |

### Cations

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Iron | 0.843 | mg/L | Manganese | 1.61 | mg/L | Barium | 0.613 | mg/L |
| Strontium | 382 | mg/L | Calcium | 6350 | mg/L | Magnesium | 2180 | mg/L |
| Sodium | 32200.00 | mg/L | Potassium | 402 | mg/L | Boron | 36.8 | mg/L |
| Lithium | Not Detected | mg/L | Copper | <.25 | mg/L | Nickel | Not Detected | mg/L |
| Zinc | <.25 | mg/L | Lead | 0.181 | mg/L | Cobalt | 0.075 | mg/L |
| Chromium | 0.015 | mg/L | Silicon | 3.48 | mg/L | Aluminum | <.25 | mg/L |
| Molybdenum | 0.009 | mg/L | Phosphorus | 0.113 | mg/L | | | |

### Anions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bromide | 469.418 | mg/L | Chloride | 52530 | mg/L | Sulfate | 327.234 | mg/L |

## PTB Value

| | Barite PTB | Calcite PTB | Celestite PTB | Gypsum PTB | Halite PTB | Iron Carbonate PTB | Iron Sulfide PTB |
|---|---|---|---|---|---|---|---|
| 50° | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 |
| 75° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 |
| 100° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 125° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 150° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 175° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 200° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 225° | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 250° | 0.00 | 0.00 | 13.67 | 0.00 | 0.00 | 0.00 | 0.00 |
| 275° | 0.00 | 0.00 | 28.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 300° | 0.00 | 0.00 | 41.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| 325° | 0.00 | 0.00 | 52.84 | 0.00 | 0.00 | 0.00 | 0.00 |
| 350° | 0.00 | 0.00 | 63.45 | 0.00 | 0.00 | 0.00 | 0.00 |
| 375° | 0.00 | 0.00 | 72.87 | 0.00 | 0.00 | 0.00 | 0.00 |
| 400° | 0.00 | 0.00 | 80.96 | 0.00 | 0.00 | 0.00 | 0.10 |

## Saturation Index

| | Barite SI | Celestite SI | Gypsum SI | Halite SI | Iron Sulfide SI |
|---|---|---|---|---|---|
| 50° | 0.22 | -0.27 | -0.71 | -1.55 | 0.49 |
| 75° | -0.03 | -0.27 | -0.74 | -1.58 | 0.14 |
| 100° | -0.24 | -0.25 | -0.74 | -1.60 | -0.14 |
| 125° | -0.41 | -0.21 | -0.73 | -1.61 | -0.34 |
| 150° | -0.56 | -0.17 | -0.73 | -1.62 | -0.48 |
| 175° | -0.68 | -0.12 | -0.74 | -1.62 | -0.57 |
| 200° | -0.78 | -0.12 | -0.77 | -1.62 | -0.61 |
| 225° | -0.87 | -0.01 | -0.80 | -1.62 | -0.61 |
| 250° | -0.94 | 0.05 | -0.85 | -1.62 | -0.57 |
| 275° | -1.01 | 0.10 | -0.89 | -1.61 | -0.51 |
| 300° | -1.08 | 0.16 | -0.93 | -1.60 | -0.42 |
| 325° | -1.14 | 0.21 | -0.94 | -1.59 | -0.31 |
| 350° | -1.21 | 0.26 | -0.90 | -1.58 | -0.18 |
| 375° | -1.29 | 0.31 | -0.79 | -1.56 | -0.04 |
| 400° | -1.37 | 0.35 | -0.60 | -1.54 | 0.11 |

Scaling predictions calculated using Scale Soft Pitzer 2017
Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

NALCO Champion
An Ecolab Company

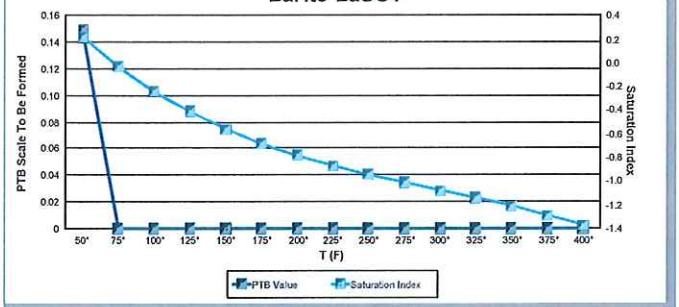
# Complete Water Analysis Report

Customer: **CIMAREX ENERGY CO**
Region: **Delware Basin**
Location: **White City**
System: **Production System**

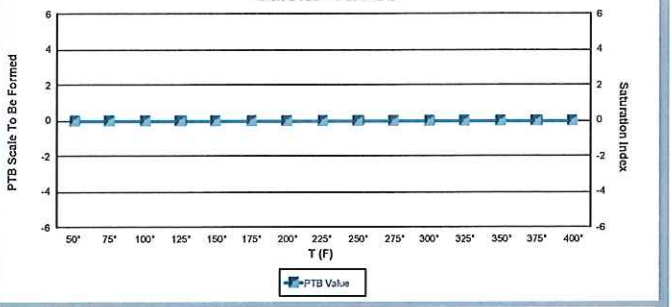
Equipment: **Chosa Draw 27 Fed Com 2H**
Sample Point: **Separator**
Sample ID: **AM50831**
Acct Rep Email: **Stephen.Medvigy@ecolab.com**

Collection Date: **02/18/2019**
Receive Date: **02/25/2019**
Report Date: **02/28/2019**
Location Code: **329426**

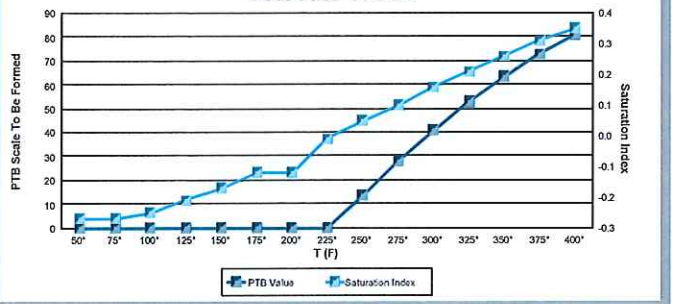
## Barite BaSO4



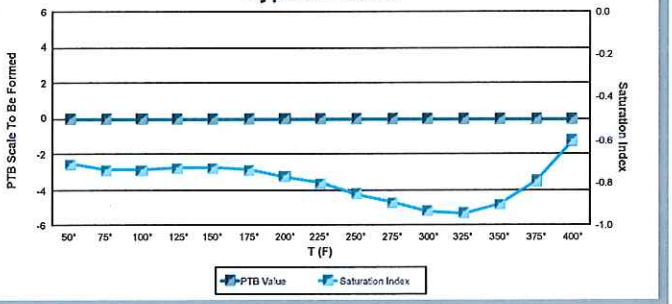

## Calcite CaCO3



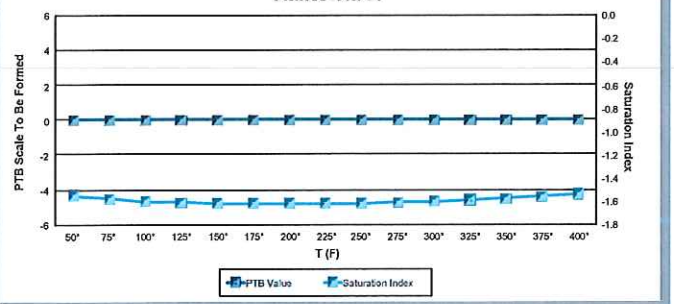

## Celestite SrSO4



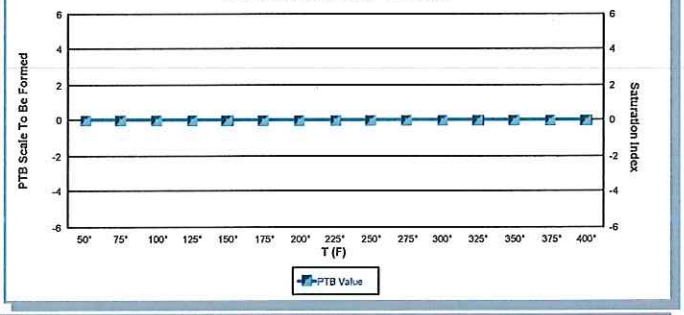

## Gypsum CaSO4



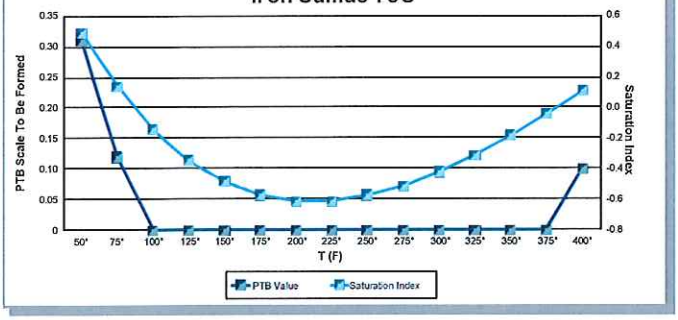

## Halite NaCl




## Iron Carbonate FeCO3




## Iron Sulfide FeS




## Comments

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Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software.

Geological Description

Patriot (SWD) 1

Formation(s) for injection: Devonian-Silurian

Injection Interval: Top 1000' of Devonian-Silurian (12738'-14738'). Logs will be ran to pinpoint the exact top of the Devonian-Silurian while drilling.

Lithological Description: Highly porous and vugular dolomitized carbonate

Thickness: 1,000'+ of gross interval thickness

Porosity: 6% to over 20%

Permeability: Highly permeable 50+ md (estimated)

Estimated Geological Formation Tops for the Freedom 36 State (SWD) 1

| | | | |
|---|---|---|---|
| Top of Salt | 1,343' | Atoka | 10,860' |
| Base of Salt | 1,963' | Morrow | 11,473' |
| Delaware Group | 2,214 | Barnett | 12,578' |
| Bone Spring | 5,705' | Mississippian | 12,860' |
| Wolfcamp | 8,806 | Woodford | 13,090' |
| Cisco/Canyon | 10,460' | Devonian | 13,200' |
| Strawn | 10,780' | | |

The injection depths are more than 10,500' below the deepest potential source of brackish water that might be economically used as a source for drinking water.

After examining the available geological data, no evidence was found of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water.

Harrison R. Hastings

Geologist

Cimarex Energy Company

# New Mexico Office of the State Engineer
# Water Column/Average Depth to Water

No records found.

**PLSS Search:**

**Section(s):** 16 **Township:** 25S **Range:** 27E

# New Mexico Office of the State Engineer
# Water Column/Average Depth to Water

No records found.

**PLSS Search:**

**Section(s):** 9 **Township:** 25S **Range:** 27E

# New Mexico Office of the State Engineer
# Water Column/Average Depth to Water

No records found.

**PLSS Search:**

**Section(s):** 8 **Township:** 25S **Range:** 27E

# New Mexico Office of the State Engineer
# Water Column/Average Depth to Water

No records found.

**PLSS Search:**

**Section(s):** 17 **Township:** 25S **Range:** 27E

Carlsbad Current Argus.
PART OF THE USA TODAY NETWORK

## Affidavit of Publication

**Ad # 0004073805**

**This is not an invoice**

**CIMAREX ENERGY CO.**
600 N. MARIENFELD ST. SUITE 600

**MIDLAND, TX 79701**

I, a legal clerk of the **Carlsbad Current Argus**, a newspaper published daily at the City of Carlsbad, in said county of Eddy, state of New Mexico and of general paid circulation in said county; that the same is a duly qualified newspaper under the laws of the State wherein legal notices and advertisements may be published; that the printed notice attached hereto was published in the regular and entire edition of said newspaper and not in supplement thereof on the date as follows, to wit:

**February 25, 2020**

Legal Clerk

Subscribed and sworn before me this February 25, 2020:

State of WI, County of Brown
NOTARY PUBLIC

8-25-23
My commission expires

SHELLY HORA
Notary Public
State of Wisconsin

Ad # 0004073805
PO #: Patriot 9 State SWD #1
# of Affidavits2

**This is not an invoice**

**Legal Notice**

Cimarex Energy Co., 600 N. Marienfeld Suite 600, Midland TX 79701, (432-571-7800), has filed form C-108 (Application for Authorization to Inject) with the New Mexico Oil Conservation Division seeking administrative approval to drill the Patriot 9 State SWD #1 as a salt water disposal well. The well is staked at 330' FSL & 262' FWL of Section 9, T25S, R27E, Eddy County NM. The well is located approximately 11.8 miles southwest of Loving, NM. The proposed open hole Disposal/injection interval is in the Devonian-Silurian formation from 12,738'-14,738'. Disposal fluid would be produced water from Cimarex's leases. Cimarex plans to dispose a maximum of 40000 BWPD with a maximum pressure of 2547 psi or as allowed by depth.
Parties with questions regarding this proposal can contact Cimarex at the address or phone number listed above.
Interested parties must file objections or requests for hearing within 15 days of publication to the New Mexico Oil Conservation Division, 1220 South St. Frances Dr., Santa Fe NM 87505.
#4073805, Current Argus, February 25, 2020

XIII.

Notification Requirements:

| | | |
|---|---|---|
| **Surface Owner** | **New Mexico State Land Office**<br>PO BOX 1148<br>Santa Fe, NM 87504 | **Certified # 9414 8108 9876 5055 0666 95** |
| **Offset Operator Within ½ mile** | **Chevron USA INC**<br>6301 Deauville BLVD<br>Midland, TX 79706 | **Certified # 9414 8108 9876 5055 0672 96** |
| | **EOG Resources Inc**<br>1111 Bagby Street<br>Sky Hobby 2<br>Houston, TX 77002 | **Certified # 9414 8108 9876 5055 0684 22** |

A copy of the application was sent certified mail to the above addresses on 3/2/2020. Proof of certification and delivery receipt attached.

Thank you,

Amithy Crawford

Cimarex Energy

Cimarex Energy Co
600 N MARIENFELD ST STE 600
MIDLAND TX 79701-4405

**USPS CERTIFIED MAIL**

**9414 8108 9876 5055 0684 22**

EOG Resources Inc
1111 BAGBY ST
SKY HOBBY 2
HOUSTON TX 77002-2551

US POSTAGE AND FEES PAID
**FIRST-CLASS**
Mar 02 2020
Mailed from ZIP 79701
9 oz First-Class Mail Flats Rate


071S00777793

Cimarex Energy Co
600 N MARIENFELD ST STE 600
MIDLAND TX 79701-4405

**USPS CERTIFIED MAIL**

**9414 8108 9876 5055 0672 96**

Chevron USA Inc
6301 DEAUVILLE
MIDLAND TX 79706-2964

US POSTAGE AND FEES PAID
**FIRST-CLASS**
Mar 02 2020
Mailed from ZIP 79701
9 oz First-Class Mail Flats Rate


071S00777793

Cimarex Energy Co
600 N MARIENFELD ST STE 600
MIDLAND TX 79701-4405

**USPS CERTIFIED MAIL**

**9414 8108 9876 5055 0666 95**

New Mexico State Land Office
PO BOX 1148
SANTA FE NM 87504-1148

US POSTAGE AND FEES PAID
FIRST-CLASS
Mar 02 2020
Mailed from ZIP 79701
8 oz First-Class Mail Flats Rate

endicia

071S00777793