KOLAR Document ID: 1452630

KANSAS CORPORATION COMMISSION
OIL & GAS CONSERVATION DIVISION

Form U3C
June 2015
**Form must be Typed**
**Form must be completed on a per well basis**

# ANNUAL REPORT OF PRESSURE MONITORING, FLUID INJECTION AND ENHANCED RECOVERY

***Complete all blanks - add pages if needed. Copy to be retained for five (5) years after filing date.***

OPERATOR: License # 33999
Name: Riviera Operating, LLC
Address 1: 600 TRAVIS STE 1700
Address 2:
City: HOUSTON State: TX Zip: 77002 + 3009
Contact Person: Michael Foster
Phone: ( 281 ) 840-4375
Lease Name: HCU
Well Number: 3120-E

API No.: 15-075-20703-00-00
Permit No: D27683.0
Reporting Year: 2018
*(January 1 to December 31)*

SW (Q/Q/Q/Q) - SW - SW - NW Sec. 31 Twp. 22 S. R. 40 ☐ E ☑ W
2825 feet from ☐ N / ☑ S Line of Section
5052 feet from ☑ E / ☐ W Line of Section
County: Hamilton

**I. Injection Fluid:**

Type *(Pick one)*: ☐ Fresh Water ☐ Treated Brine ☑ Untreated Brine ☐ Water/Brine
Source: ☑ Produced Water ☐ Other *(Attach list)*
Quality: Total Dissolved Solids: _____ mg/l Specific Gravity: _____ Additives: _____
*(Attach water analysis, if available)*

**II. Well Data:**

Maximum Authorized Injection Pressure: 0 psi Injection Zone: ARBUCKLE
Maximum Authorized Injection Rate: 5000 barrels per day
Total Number of Enhanced Recovery Injection Wells Covered by this Permit: _____ *(Include TA's)*

**III.**

| Month: | Total Fluid Injected BBL | Maximum Fluid Pressure | Total Gas Injected MCF | Maximum Gas Pressure | # Days of Injection |
|---|---|---|---|---|---|
| January | 3020 | | | | 31 |
| February | 2186 | | | | 28 |
| March | 962 | | | | 31 |
| April | 7054 | | | | 30 |
| May | 4854 | | | | 31 |
| June | 4571 | | | | 30 |
| July | 3472 | | | | 31 |
| August | 2326 | | | | 31 |
| September | 886 | | | | 30 |
| October | 425 | | | | 31 |
| November | 43 | | | | 30 |
| December | 859 | | | | 31 |
| ***TOTAL*** | 30658 | | 0 | | |

Submitted Electronically

JACAM LABORATORIES

# DownHole $R_x$

## WATER CHEMISTRY

LINN OPERATING
JEFF SULLIVAN
HAMILTON KS

HCU 3120 E SWD
HOLDING TANK

Report Date: 01-02-2019
Sample #: 3076

Sampled: 12-13-2018
at 0000

Sample ID: 208783

| CATIONS | | ANIONS | |
|---|---|---|---|
| Calcium (as Ca) | 5611 | Chloride (as Cl) | 130200 |
| Magnesium (as Mg) | 1729 | Sulfate (as $SO_4$) | 1475 |
| Barium (as Ba) | 0.341 | Bromine (as Br) | 0.00 |
| Strontium (as Sr) | 125.90 | Dissolved $CO_2$ (as $CO_2$) | 85.00 |
| Sodium (as Na) | 66225 | Bicarbonate (as $HCO_3$) | 48.80 |
| Potassium (as K) | 476.80 | Carbonate (as $CO_3$) | 0.00 |
| Lithium (as Li) | 6.94 | Oxalic acid (as $C_2O_4$) | 0.00 |
| Ammonia (as $NH_3$) | 0.00 | Silica (as $SiO_2$) | 0.00 |
| Aluminum (as Al) | 0.00 | Phosphate(as $PO_4$) | 0.00 |
| Iron (as Fe) | 2.83 | $H_2S$ (as $H_2S$) | 5.00 |
| Manganese (as Mn) | 1.18 | Fluoride (as F) | 0.00 |
| Zinc (as Zn) | 0.187 | Nitrate (as $NO_3$) | 0.00 |
| Lead (as Pb) | 0.00 | Boron (as B) | 10.83 |

### PARAMETERS

| | |
|---|---|
| Calculated T.D.S. | 197159 |
| Molar Conductivity | 329774 |
| Resistivity | 3.03 |
| Sp.Gr.(g/mL) | 1.13 |
| Pressure(atm) | 1.00 |
| $pCO_2$(atm) | 0.00418 |
| $pH_2S$(atm) | 0.00347 |
| Temperature ($^oF$) | 58.30 |
| pH | 6.83 |

### COMMENTS

HAMILTON KS

**JACAM LABORATORIES**
**205 S. Broadway · P.O. Box 96 · Sterling, KS 67579-0096**

JACAM LABORATORIES

# DownHole $R_x$

## DEPOSITION POTENTIAL INDICATORS

LINN OPERATING
JEFF SULLIVAN
HAMILTON KS

HCU 3120 E SWD
HOLDING TANK

Report Date: 01-02-2019
Sample #: 3076

Sampled: 12-13-2018
at 0000

Sample ID: 208783

| SATURATION LEVEL | |
|---|---|
| Calcite ($CaCO_3$) | 0.370 |
| Aragonite ($CaCO_3$) | 0.326 |
| Witherite ($BaCO_3$) | < 0.001 |
| Strontianite ($SrCO_3$) | 0.00958 |
| Calcium oxalate ($CaC_2O_4$) | 0.00 |
| Magnesite ($MgCO_3$) | 0.113 |
| Anhydrite ($CaSO_4$) | 0.630 |
| Gypsum ($CaSO_4*2H_2O$) | 0.864 |
| Barite ($BaSO_4$) | 1.78 |
| Celestite ($SrSO_4$) | 0.323 |
| Fluorite ($CaF_2$) | 0.00 |
| Calcium phosphate | 0.00 |
| Hydroxyapatite | 0.00 |
| Silica ($SiO_2$) | 0.00 |
| Brucite ($Mg(OH)_2$) | < 0.001 |
| Magnesium silicate | 0.00 |
| Iron hydroxide ($Fe(OH)_3$) | < 0.001 |
| Strengite ($FePO_4*2H_2O$) | 0.00 |
| Siderite ($FeCO_3$) | 0.0877 |
| Halite (NaCl) | 0.181 |
| Thenardite ($Na2SO_4$) | < 0.001 |
| Iron sulfide (FeS) | 0.882 |

| MOMENTARY EXCESS (Lbs/1000 Barrels) | |
|---|---|
| Calcite ($CaCO_3$) | -0.0112 |
| Aragonite ($CaCO_3$) | -0.0135 |
| Witherite ($BaCO_3$) | -25.83 |
| Strontianite ($SrCO_3$) | -0.985 |
| Calcium oxalate ($CaC_2O_4$) | -0.00744 |
| Magnesite ($MgCO_3$) | -0.0433 |
| Anhydrite ($CaSO_4$) | -121.64 |
| Gypsum ($CaSO_4*2H_2O$) | -37.28 |
| Barite ($BaSO_4$) | 0.0882 |
| Celestite ($SrSO_4$) | -113.42 |
| Fluorite ($CaF_2$) | -2.69 |
| Calcium phosphate | >-0.001 |
| Hydroxyapatite | -255.88 |
| Silica ($SiO_2$) | -22.93 |
| Brucite ($Mg(OH)_2$) | < 0.001 |
| Magnesium silicate | -82.34 |
| Iron hydroxide ($Fe(OH)_3$) | < 0.001 |
| Strengite ($FePO_4*2H_2O$) | >-0.001 |
| Siderite ($FeCO_3$) | -0.0757 |
| Halite (NaCl) | -85010 |
| Thenardite ($Na2SO_4$) | -85643 |
| Iron sulfide (FeS) | -0.0231 |

| SIMPLE INDICES | |
|---|---|
| Langelier | 0.185 |
| Ryznar | 6.46 |
| Puckorius | 6.64 |
| Larson-Skold Index | 5938 |
| Stiff Davis Index | -0.0931 |
| Oddo-Tomson | -0.968 |

| BOUND IONS | TOTAL | FREE |
|---|---|---|
| Calcium | 5611 | 5406 |
| Barium | 0.341 | 0.341 |
| Carbonate | 1.71 | 0.0113 |
| Phosphate | 0.00 | 0.00 |
| Sulfate | 1475 | 441.65 |

### OPERATING CONDITIONS

| | |
|---|---|
| Temperature ($^oF$) | 58.30 |
| Time(secs) | 0.00 |

**JACAM LABORATORIES**
**205 S. Broadway · P.O. Box 96 · Sterling, KS 67579-0096**

# DownHole SAT™ Water Analysis Report

JACAM LABORATORIES

## SYSTEM IDENTIFICATION

LINN OPERATING
HCU 3120 E SWD
JEFF SULLIVAN
HOLDING TANK
HAMILTON KS

Sample ID#: 3076
ID: 208783
Report Date: 01-02-2019
Sample Date: 12-13-2018
at 0000

## WATER CHEMISTRY

### CATIONS

| | |
|---|---|
| Calcium(as Ca) | 5611 |
| Magnesium(as Mg) | 1729 |
| Barium(as Ba) | 0.341 |
| Strontium(as Sr) | 125.90 |
| Sodium(as Na) | 66225 |
| Potassium(as K) | 476.80 |
| Lithium(as Li) | 6.94 |
| Iron(as Fe) | 2.83 |
| Field Iron(as Fe) | 5.00 |
| Ammonia(as $NH_3$) | 0.00 |
| Aluminum(as Al) | 0.00 |
| Manganese(as Mn) | 1.18 |
| Zinc(as Zn) | 0.187 |
| Lead(as Pb) | 0.00 |
| Sample pH | 6.83 |
| Conductivity: | 329774 |

### ANIONS

| | |
|---|---|
| Chloride(as Cl) | 130200 |
| Sulfate(as $SO_4$) | 1475 |
| Bromine(as Br) | 0.00 |
| Dissolved $CO_2$(as $CO_2$) | 85.00 |
| Bicarbonate(as $HCO_3$) | 48.80 |
| Carbonate(as $CO_3$) | 0.00 |
| Silica(as $SiO_2$) | 0.00 |
| Phosphate(as $PO_4$) | 0.00 |
| $H_2S$ (as $H_2S$) | 5.00 |
| Fluoride(as F) | 0.00 |
| Nitrate(as $NO_3$) | 0.00 |
| Boron(as B) | 10.83 |

### PARAMETERS

| | |
|---|---|
| Temperature(°F) | 58.30 |
| T.D.S. | 197159 |
| Resistivity: | 3.03 |

## SCALE AND CORROSION POTENTIAL

| Temp. (°F) | Press. (atm) | Calcite $CaCO_3$ | | Anhydrite $CaSO_4$ | | Gypsum $CaSO_4*2H_2O$ | | Barite $BaSO_4$ | | Celestite $SrSO_4$ | | Siderite $FeCO_3$ | | Mackawenite FeS | | $CO_2$ (mpy) | $pCO_2$ (atm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50.00 | 0.00 | 0.313 | -0.0130 | 0.669 | -106.24 | 0.931 | -18.42 | 2.34 | 0.116 | 0.351 | -103.79 | 0.0697 | -0.0875 | 4.41 | 0.182 | 0.0265 | 0.00418 |
| 65.45 | 0.00 | 0.421 | -0.00969 | 0.606 | -130.34 | 0.815 | -52.16 | 1.42 | 0.0599 | 0.307 | -119.39 | 0.105 | -0.0669 | 3.74 | 0.168 | 0.0496 | 0.00418 |
| 80.91 | 0.00 | 0.533 | -0.00698 | 0.582 | -135.67 | 0.730 | -79.95 | 0.920 | -0.0177 | 0.285 | -126.82 | 0.149 | -0.0514 | 3.14 | 0.152 | 0.0193 | 0.00418 |
| 96.36 | 0.00 | 0.635 | -0.00495 | 0.587 | -125.35 | 0.665 | -101.96 | 0.628 | -0.119 | 0.274 | -129.58 | 0.196 | -0.0399 | 2.63 | 0.134 | 0.0252 | 0.00418 |
| 111.82 | 0.00 | 0.708 | -0.00362 | 0.619 | -103.66 | 0.663 | -97.25 | 0.449 | -0.248 | 0.267 | -130.24 | 0.240 | -0.0315 | 2.21 | 0.114 | 0.0120 | 0.00418 |
| 127.27 | 0.00 | 0.749 | -0.00289 | 0.681 | -75.22 | 0.700 | -78.04 | 0.325 | -0.418 | 0.260 | -131.41 | 0.278 | -0.0254 | 1.87 | 0.0935 | 0.0176 | 0.00418 |
| 142.73 | 0.00 | 0.750 | -0.00270 | 0.777 | -44.10 | 0.733 | -63.38 | 0.238 | -0.643 | 0.252 | -133.26 | 0.303 | -0.0212 | 1.59 | 0.0714 | 0.0193 | 0.00418 |
| 158.18 | 0.00 | 0.711 | -0.00294 | 0.916 | -13.49 | 0.761 | -52.21 | 0.177 | -0.938 | 0.243 | -135.74 | 0.311 | -0.0183 | 1.36 | 0.0483 | 0.0245 | 0.00418 |
| 173.64 | 0.00 | 0.644 | -0.00346 | 1.11 | 14.47 | 0.786 | -43.73 | 0.132 | -1.32 | 0.233 | -138.83 | 0.302 | -0.0165 | 1.16 | 0.0240 | 0.0292 | 0.00418 |
| 189.09 | 0.00 | 0.560 | -0.00412 | 1.39 | 38.66 | 0.806 | -37.34 | 0.0995 | -1.81 | 0.224 | -142.52 | 0.281 | -0.0154 | 0.991 | -0.00153 | 0.0163 | 0.00418 |
| 204.55 | 0.00 | 0.474 | -0.00481 | 1.77 | 58.73 | 0.822 | -32.63 | 0.0757 | -2.44 | 0.214 | -146.83 | 0.252 | -0.0147 | 0.843 | -0.0284 | 0.0137 | 0.00418 |
| 220.00 | 0.171 | 0.380 | -0.00575 | 2.29 | 76.03 | 0.825 | -31.86 | 0.0574 | -3.27 | 0.202 | -154.86 | 0.213 | -0.0149 | 0.802 | -0.0355 | 0.0186 | 0.00489 |
| | | xSAT | Lbs per 1000 Barrels | xSAT | Lbs per 1000 Barrels | xSAT | Lbs per 1000 Barrels | xSAT | Lbs per 1000 Barrels | xSAT | Lbs per 1000 Barrels | xSAT | Lbs per 1000 Barrels | xSAT | Lbs per 1000 Barrels | | |

Saturation Levels (xSAT) are the ratio of ion activity to solubility, e.g. $\{Ca\}\{CO_3\}/K_{sp}$. $pCO_2$ (atm) is the partial pressure of $CO_2$ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.