KOLAR Document ID: 1452638

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: JESSICA SWD
Well Number: 1

API No.: 15-067-21408-00-00
Permit No: D27504.0
Reporting Year: 2018
(January 1 to December 31)

____ - SE - NW - NW Sec. 2 Twp. 29 S. R. 35 ☐ E ☑ W
(Q/Q/Q/Q)
4596 feet from ☐ N / ☑ S Line of Section
4406 feet from ☑ E / ☐ W Line of Section
County: Grant

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: LANSING
Maximum Authorized Injection Rate: 1000 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	471				31
February	399				28
March	262				31
April	716				30
May	558				31
June	1012				30
July	1006				31
August	1194				31
September	971				30
October	930				31
November	780				30
December	638				31
TOTAL	8937		0		

Submitted Electronically

JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

LINN OPERATING
KENT MILBURN
GRANT KS

JESSICA SWD
TANK BATTERY

Report Date: 12-31-2018
Sample #: 3076

Sampled: 12-12-2018
at 0000

Sample ID: 208722

CATIONS		ANIONS	
Calcium (as Ca)	7.64	Chloride (as Cl)	1000
Magnesium (as Mg)	4.10	Sulfate (as SO_4)	0.00
Barium (as Ba)	0.0250	Bromine (as Br)	0.00
Strontium (as Sr)	0.228	Dissolved CO_2 (as CO_2)	240.00
Sodium (as Na)	1132	Bicarbonate (as HCO_3)	1385
Potassium (as K)	36.90	Carbonate (as CO_3)	0.00
Lithium (as Li)	0.00	Oxalic acid (as C_2O_4)	0.00
Ammonia (as NH_3)	0.00	Silica (as SiO_2)	0.00
Aluminum (as Al)	0.0670	Phosphate(as PO_4)	0.00
Iron (as Fe)	0.274	H_2S (as H_2S)	5.50
Manganese (as Mn)	0.0610	Fluoride (as F)	0.00
Zinc (as Zn)	0.0820	Nitrate (as NO_3)	0.00
Lead (as Pb)	0.00	Boron (as B)	0.291

PARAMETERS

Calculated T.D.S.	3432
Molar Conductivity	4565
Resistivity	219.05
Sp.Gr.(g/mL)	1.00
Pressure(atm)	1.00
pCO_2(atm)	0.00126
pH_2S(atm)	0.00335
Temperature (^oF)	50.00
pH	9.00

COMMENTS

GRANT KS

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

JACAM LABORATORIES

DownHole R_x

DEPOSITION POTENTIAL INDICATORS

LINN OPERATING
KENT MILBURN
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JESSICA SWD
TANK BATTERY

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SATURATION LEVEL	
Calcite ($CaCO_3$)	5.82
Aragonite ($CaCO_3$)	5.17
Witherite ($BaCO_3$)	0.0187
Strontianite ($SrCO_3$)	1.22
Calcium oxalate (CaC_2O_4)	0.00
Magnesite ($MgCO_3$)	2.02
Anhydrite ($CaSO_4$)	0.00
Gypsum ($CaSO_4*2H_2O$)	0.00
Barite ($BaSO_4$)	0.00
Celestite ($SrSO_4$)	0.00
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 ($Fe(OH)_3$)	142.72
Strengite ($FePO_4*2H_2O$)	0.00
Siderite ($FeCO_3$)	1.20
Halite (NaCl)	< 0.001
Thenardite ($Na2SO_4$)	0.00
Iron sulfide (FeS)	1.75

MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite ($CaCO_3$)	3.80
Aragonite ($CaCO_3$)	3.69
Witherite ($BaCO_3$)	-0.650
Strontianite ($SrCO_3$)	0.0244
Calcium oxalate (CaC_2O_4)	-1.88
Magnesite ($MgCO_3$)	1.81
Anhydrite ($CaSO_4$)	-678.27
Gypsum ($CaSO_4*2H_2O$)	-572.20
Barite ($BaSO_4$)	-1.30
Celestite ($SrSO_4$)	-65.71
Fluorite (CaF_2)	-21.91
Calcium phosphate	-0.00256
Hydroxyapatite	-165.86
Silica (SiO_2)	-28.06
Brucite ($Mg(OH)_2$)	0.0677
Magnesium silicate	-67.53
Iron hydroxide ($Fe(OH)_3$)	< 0.001
Strengite ($FePO_4*2H_2O$)	>-0.001
Siderite ($FeCO_3$)	< 0.001
Halite (NaCl)	-145671
Thenardite ($Na2SO_4$)	-40423
Iron sulfide (FeS)	< 0.001

SIMPLE INDICES	
Langelier	0.993
Ryznar	7.01
Puckorius	7.03
Larson-Skold Index	1.30
Stiff Davis Index	0.858
Oddo-Tomson	0.886

BOUND IONS	TOTAL	FREE
Calcium	7.64	5.40
Barium	0.0250	0.0250
Carbonate	81.49	64.32
Phosphate	0.00	0.00
Sulfate	0.00	0.00

OPERATING CONDITIONS

Temperature (^oF)	50.00
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
JESSICA SWD
KENT MILBURN
TANK BATTERY
GRANT KS

Sample ID#: 3076
ID: 208722
Report Date: 12-31-2018
Sample Date: 12-12-2018
at 0000

WATER CHEMISTRY

CATIONS		ANIONS	
Calcium(as Ca)	7.64	Chloride(as Cl)	1000
Magnesium(as Mg)	4.10	Sulfate(as SO_4)	0.00
Barium(as Ba)	0.0250	Bromine(as Br)	0.00
Strontium(as Sr)	0.228	Dissolved CO_2(as CO_2)	240.00
Sodium(as Na)	1132	Bicarbonate(as HCO_3)	1385
Potassium(as K)	36.90	Carbonate(as CO_3)	0.00
Lithium(as Li)	0.00	Silica(as SiO_2)	0.00
Iron(as Fe)	0.274	Phosphate(as PO_4)	0.00
Field Iron(as Fe)	0.00	H_2S (as H_2S)	5.50
Ammonia(as NH_3)	0.00	Fluoride(as F)	0.00
Aluminum(as Al)	0.0670	Nitrate(as NO_3)	0.00
Manganese(as Mn)	0.0610	Boron(as B)	0.291
Zinc(as Zn)	0.0820		
Lead(as Pb)	0.00	**PARAMETERS**	
		Temperature(°F)	50.00
Sample pH	9.00	T.D.S.	3432
Conductivity:	4565	Resistivity:	219.05

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	5.81	3.80	0.00	-679.07	0.00	-572.88	0.00	-1.30	0.00	-65.79	1.20	< 0.001	9.95	< 0.001	0.00891	0.00126
65.45	0.00	7.59	3.71	0.00	-682.49	0.00	-585.64	0.00	-1.60	0.00	-67.24	2.00	< 0.001	7.83	< 0.001	0.00761	0.00126
80.91	0.00	9.22	3.47	0.00	-666.53	0.00	-592.27	0.00	-1.90	0.00	-66.65	3.12	< 0.001	6.37	< 0.001	0.00538	0.00126
96.36	0.00	10.45	3.13	0.00	-634.34	0.00	-593.05	0.00	-2.20	0.00	-64.94	4.56	< 0.001	5.30	< 0.001	0.00705	0.00126
111.82	0.00	11.14	2.77	0.00	-589.91	0.00	-567.56	0.00	-2.48	0.00	-62.78	6.35	< 0.001	4.55	< 0.001	0.00739	0.00126
127.27	0.00	11.50	2.43	0.00	-537.40	0.00	-527.78	0.00	-2.78	0.00	-60.77	8.55	< 0.001	4.01	< 0.001	0.00620	0.00126
142.73	0.00	11.58	2.14	0.00	-480.52	0.00	-492.74	0.00	-3.10	0.00	-58.93	11.14	< 0.001	3.61	< 0.001	0.00502	0.00126
158.18	0.00	11.44	1.91	0.00	-422.57	0.00	-461.72	0.00	-3.44	0.00	-57.25	14.00	< 0.001	3.31	< 0.001	0.00523	0.00126
173.64	0.00	11.13	1.72	0.00	-366.17	0.00	-434.17	0.00	-3.79	0.00	-55.72	16.79	< 0.001	3.04	< 0.001	0.00541	0.00126
189.09	0.00	10.71	1.58	0.00	-313.23	0.00	-409.75	0.00	-4.17	0.00	-54.34	18.61	< 0.001	2.69	< 0.001	0.00273	0.00126
204.55	0.00	10.23	1.48	0.00	-264.95	0.00	-388.11	0.00	-4.57	0.00	-53.10	17.80	< 0.001	2.14	< 0.001	0.00120	0.00126
220.00	0.171	9.69	1.42	0.00	-223.70	0.00	-371.90	0.00	-5.03	0.00	-52.43	14.86	< 0.001	1.78	< 0.001	0.00276	0.00148
		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.