KANSAS CORPORATION COMMISSION
OIL & GAS CONSERVATION DIVISION

1294862

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: Linn Operating, Inc.
Address 1: 600 TRAVIS STE 5100
Address 2:
City: HOUSTON State: TX Zip: 77002 + 3018
Contact Person: Shawn Hildreth
Phone: (281) 840-4234
Lease Name: RICHFIELD SWDW (M MONTGOMERY #1)
Well Number: 1

API No.: 15-129-00047-00-02
Permit No: D07473.0
Reporting Year: 2015
(January 1 to December 31)

____ - SE - NW - NW Sec. 24 Twp. 32 S. R. 41 ☐ E ☑ W
(Q/Q/Q/Q)
3960 feet from ☐ N / ☑ S Line of Section
3960 feet from ☑ E / ☐ W Line of Section
County: Morton

I. Injection Fluid:

Type *(Pick one)*: ☐ Fresh Water ☑ Treated Brine ☐ Untreated Brine ☐ Water/Brine
Source: ☑ Produced Water ☐ Other *(Attach list)*
Quality: Total Dissolved Solids: 262973 mg/l Specific Gravity: 1.19 Additives: 15% HCL
(Attach water analysis, if available)

II. Well Data:

Maximum Authorized Injection Pressure: 0 psi Injection Zone: Glorietta
Maximum Authorized Injection Rate: 500 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	2013	-15	0		31
February	1926	-2	0		28
March	2836	-4	0		31
April	3316	-2	0		30
May	1800	-1	0		31
June	3169	-1	0		30
July	3315	0	0		31
August	7685	-1	0		31
September	2360	0	0		30
October	2964	-3	0		31
November	5472	-1	0		30
December	2909	-6	0		31
TOTAL	39765		0		

Submitted Electronically

JACAM LABORATORIES

DownHole R_X

WATER CHEMISTRY

LINN OPERATING
MICHAEL BELLOMY
MORTON KS

RICHFIELD SWDW
FLOWLINE

Report Date: 01-22-2016
Sample #: 3076

Sampled: 01-13-2016
at 0000

Sample ID: 117389

CATIONS		ANIONS	
Calcium (as Ca)	3753	Chloride (as Cl)	181800
Magnesium (as Mg)	1982	Sulfate (as SO_4)	2200
Barium (as Ba)	0.204	Bromine (as Br)	0.00
Strontium (as Sr)	82.24	Dissolved CO_2 (as CO_2)	80.00
Sodium (as Na)	93062	Bicarbonate (as HCO_3)	18.30
Potassium (as K)	495.80	Carbonate (as CO_3)	0.00
Lithium (as Li)	8.27	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)	1.60	H_2S (as H_2S)	0.500
Manganese (as Mn)	0.153	Fluoride (as F)	0.00
Zinc (as Zn)	0.881	Nitrate (as NO_3)	0.00
Lead (as Pb)	0.00	Boron (as B)	0.291

PARAMETERS

Calculated T.D.S.	262973
Molar Conductivity	506310
Resistivity	1.98
Sp.Gr.(g/mL)	1.19
Pressure(atm)	1.00
pCO_2(atm)	0.00645
pH_2S(atm)	< 0.001
Temperature (^oF)	54.00
pH	5.71

COMMENTS

MORTON KS

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

JACAM LABORATORIES

DownHole R_X

DEPOSITION POTENTIAL INDICATORS

LINN OPERATING
MICHAEL BELLOMY
MORTON KS

RICHFIELD SWDW
FLOWLINE

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SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite ($CaCO_3$)	0.00806	Calcite ($CaCO_3$)	-0.0188
Aragonite ($CaCO_3$)	0.00715	Aragonite ($CaCO_3$)	-0.0212
Witherite ($BaCO_3$)	< 0.001	Witherite ($BaCO_3$)	-26.30
Strontianite ($SrCO_3$)	< 0.001	Strontianite ($SrCO_3$)	-1.57
Calcium oxalate (CaC_2O_4)	0.00	Calcium oxalate (CaC_2O_4)	-0.00759
Magnesite ($MgCO_3$)	0.00448	Magnesite ($MgCO_3$)	-0.0286
Anhydrite ($CaSO_4$)	0.726	Anhydrite ($CaSO_4$)	-100.40
Gypsum ($CaSO_4*2H_2O$)	0.897	Gypsum ($CaSO_4*2H_2O$)	-35.06
Barite ($BaSO_4$)	1.30	Barite ($BaSO_4$)	0.0281
Celestite ($SrSO_4$)	0.235	Celestite ($SrSO_4$)	-131.28
Fluorite (CaF_2)	0.00	Fluorite (CaF_2)	-2.65
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-208.16
Silica (SiO_2)	0.00	Silica (SiO_2)	-18.71
Brucite ($Mg(OH)_2$)	< 0.001	Brucite ($Mg(OH)_2$)	< 0.001
Magnesium silicate	0.00	Magnesium silicate	-72.74
Iron hydroxide ($Fe(OH)_3$)	< 0.001	Iron hydroxide ($Fe(OH)_3$)	< 0.001
Strengite ($FePO_4*2H_2O$)	0.00	Strengite ($FePO_4*2H_2O$)	>-0.001
Siderite ($FeCO_3$)	0.00102	Siderite ($FeCO_3$)	-0.153
Halite (NaCl)	0.436	Halite (NaCl)	-43750
Thenardite ($Na2SO_4$)	< 0.001	Thenardite ($Na2SO_4$)	-87931
Iron sulfide (FeS)	< 0.001	Iron sulfide (FeS)	-1.54

SIMPLE INDICES		BOUND IONS	TOTAL	FREE
Langelier	-1.38	Calcium	3753	3532
Ryznar	8.47	Barium	0.204	0.204
Puckorius	8.15	Carbonate	0.116	< 0.001
Larson-Skold Index	20747	Phosphate	0.00	0.00
Stiff Davis Index	-1.40	Sulfate	2200	587.50
Oddo-Tomson	-2.43			

OPERATING CONDITIONS

Temperature (^oF)	54.00
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
RICHFIELD SWDW
MICHAEL BELLOMY
FLOWLINE
MORTON KS

Sample ID#: 3076
ID: 117389
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WATER CHEMISTRY

CATIONS		ANIONS	
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Barium(as Ba)	0.204	Bromine(as Br)	0.00
Strontium(as Sr)	82.24	Dissolved CO_2(as CO_2)	80.00
Sodium(as Na)	93062	Bicarbonate(as HCO_3)	18.30
Potassium(as K)	495.80	Carbonate(as CO_3)	0.00
Lithium(as Li)	8.27	Silica(as SiO_2)	0.00
Iron(as Fe)	1.60	Phosphate(as PO_4)	0.00
Field Iron(as Fe)	0.00	H_2S (as H_2S)	0.500
Ammonia(as NH_3)	0.00	Fluoride(as F)	0.00
Aluminum(as Al)	0.00	Nitrate(as NO_3)	0.00
Manganese(as Mn)	0.153	Boron(as B)	0.291
Zinc(as Zn)	0.881		
Lead(as Pb)	0.00	**PARAMETERS**	
		Temperature(^{O}F)	54.00
Sample pH	5.71	T.D.S.	262973
Conductivity:	506310	Resistivity:	1.98

SCALE AND CORROSION POTENTIAL

Temp.	Press.	Calcite $CaCO_3$		Anhydrite $CaSO_4$		Gypsum $CaSO_4*2H_2O$		Barite $BaSO_4$		Celestite $SrSO_4$		Siderite $FeCO_3$		Mackawenite FeS		CO_2	pCO_2
(^{O}F)	(atm)	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	(mpy)	(atm)
50.00	0.00	0.00736	-0.0195	0.751	-90.07	0.933	-22.51	1.50	0.0401	0.246	-125.66	< 0.001	-0.162	0.00230	-1.52	0.0848	0.00645
65.45	0.00	0.0103	-0.0171	0.673	-121.63	0.808	-68.05	0.899	-0.0136	0.213	-143.43	0.00141	-0.131	0.00224	-1.54	0.283	0.00645
80.91	0.00	0.0136	-0.0152	0.638	-131.81	0.715	-105.70	0.574	-0.0898	0.195	-152.84	0.00207	-0.107	0.00216	-1.56	0.125	0.00645
96.36	0.00	0.0172	-0.0137	0.637	-124.05	0.645	-135.70	0.387	-0.191	0.185	-157.29	0.00290	-0.0888	0.00205	-1.59	0.164	0.00645
111.82	0.00	0.0208	-0.0125	0.665	-103.11	0.636	-132.21	0.273	-0.322	0.178	-159.46	0.00385	-0.0747	0.00192	-1.62	0.177	0.00645
127.27	0.00	0.0244	-0.0115	0.723	-74.02	0.664	-110.33	0.195	-0.498	0.171	-162.07	0.00494	-0.0637	0.00181	-1.65	0.162	0.00645
142.73	0.00	0.0277	-0.0108	0.816	-41.33	0.687	-93.75	0.141	-0.733	0.163	-165.33	0.00610	-0.0550	0.00171	-1.69	0.143	0.00645
158.18	0.00	0.0303	-0.0101	0.953	-8.63	0.707	-81.20	0.103	-1.05	0.156	-169.18	0.00725	-0.0482	0.00161	-1.73	0.130	0.00645
173.64	0.00	0.0318	-0.00966	1.15	21.56	0.723	-71.81	0.0762	-1.46	0.148	-173.64	0.00821	-0.0427	0.00151	-1.77	0.118	0.00645
189.09	0.00	0.0319	-0.00932	1.42	47.85	0.735	-64.89	0.0569	-1.99	0.140	-178.70	0.00887	-0.0384	0.00142	-1.82	0.0468	0.00645
204.55	0.00	0.0305	-0.00908	1.80	69.72	0.743	-59.99	0.0428	-2.68	0.133	-184.41	0.00911	-0.0350	0.00132	-1.87	0.0321	0.00645
220.00	0.171	0.0273	-0.00926	2.31	88.74	0.740	-60.37	0.0321	-3.59	0.124	-194.35	0.00870	-0.0332	0.00138	-1.94	0.0426	0.00755

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.