KANSAS CORPORATION COMMISSION
OIL & GAS CONSERVATION DIVISION

1294318

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: HCU
Well Number: 3211-B

API No.: 15-075-20224-00-01
Permit No: D27899.0
Reporting Year: 2015
(January 1 to December 31)

__ - __ - SW - NE Sec. 32 Twp. 21 S. R. 41 ☐ E ☑ W
(Q/Q/Q/Q)
3316 feet from ☐ N / ☑ S Line of Section
2058 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: 183192 mg/l Specific Gravity: 1.13 Additives: 15% HCL
(Attach water analysis, if available)

II. Well Data:

Maximum Authorized Injection Pressure: 500 psi Injection Zone: Council Grove
Maximum Authorized Injection Rate: 2500 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	4690	15	0		31
February	4112	15	0		28
March	3857	15	0		31
April	3511	15	0		30
May	2231	15	0		31
June	2903	15	0		30
July	3704	15	0		31
August	4886	15	0		31
September	6014	15	0		30
October	4936	15	0		31
November	844	15	0		30
December	844	15	0		31
TOTAL	42532		0		

Submitted Electronically

JACAM LABORATORIES

DownHole R_X

WATER CHEMISTRY

LINN OPERATING
DREW LOTT
HAMILTON KS

HCU 3211 B SWD
TANK

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

Sampled: 01-19-2016
at 0000

Sample ID: 117233

CATIONS		ANIONS	
Calcium (as Ca)	4921	Chloride (as Cl)	119600
Magnesium (as Mg)	1666	Sulfate (as SO_4)	2050
Barium (as Ba)	0.795	Bromine (as Br)	0.00
Strontium (as Sr)	112.30	Dissolved CO_2 (as CO_2)	80.00
Sodium (as Na)	61474	Bicarbonate (as HCO_3)	72.00
Potassium (as K)	425.20	Carbonate (as CO_3)	0.00
Lithium (as Li)	8.37	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)	69.38	H_2S (as H_2S)	0.00
Manganese (as Mn)	0.0120	Fluoride (as F)	0.00
Zinc (as Zn)	1.11	Nitrate (as NO_3)	0.00
Lead (as Pb)	0.00	Boron (as B)	3.72

PARAMETERS

Calculated T.D.S.	183192
Molar Conductivity	296279
Resistivity	3.38
Sp.Gr.(g/mL)	1.13
Pressure(atm)	1.00
pCO_2(atm)	0.00538
pH_2S(atm)	0.00
Temperature (^oF)	43.00
pH	6.90

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
DREW LOTT
HAMILTON KS

HCU 3211 B SWD
TANK

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SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite ($CaCO_3$)	0.439	Calcite ($CaCO_3$)	-0.0145
Aragonite ($CaCO_3$)	0.392	Aragonite ($CaCO_3$)	-0.0176
Witherite ($BaCO_3$)	< 0.001	Witherite ($BaCO_3$)	-23.09
Strontianite ($SrCO_3$)	0.0168	Strontianite ($SrCO_3$)	-0.966
Calcium oxalate (CaC_2O_4)	0.00	Calcium oxalate (CaC_2O_4)	-0.00918
Magnesite ($MgCO_3$)	0.123	Magnesite ($MgCO_3$)	-0.0683
Anhydrite ($CaSO_4$)	0.885	Anhydrite ($CaSO_4$)	-43.57
Gypsum ($CaSO_4*2H_2O$)	1.26	Gypsum ($CaSO_4*2H_2O$)	80.30
Barite ($BaSO_4$)	11.33	Barite ($BaSO_4$)	0.429
Celestite ($SrSO_4$)	0.555	Celestite ($SrSO_4$)	-51.53
Fluorite (CaF_2)	0.00	Fluorite (CaF_2)	-2.89
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-244.43
Silica (SiO_2)	0.00	Silica (SiO_2)	-18.74
Brucite ($Mg(OH)_2$)	< 0.001	Brucite ($Mg(OH)_2$)	< 0.001
Magnesium silicate	0.00	Magnesium silicate	-76.98
Iron hydroxide ($Fe(OH)_3$)	15.74	Iron hydroxide ($Fe(OH)_3$)	< 0.001
Strengite ($FePO_4*2H_2O$)	0.00	Strengite ($FePO_4*2H_2O$)	>-0.001
Siderite ($FeCO_3$)	2.95	Siderite ($FeCO_3$)	0.00869
Halite (NaCl)	0.154	Halite (NaCl)	-90298
Thenardite ($Na2SO_4$)	< 0.001	Thenardite ($Na2SO_4$)	-85086
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.0264

SIMPLE INDICES		BOUND IONS	TOTAL	FREE
Langelier	0.188	Calcium	4921	4660
Ryznar	6.52	Barium	0.795	0.795
Puckorius	6.48	Carbonate	1.48	0.0196
Larson-Skold Index	3476	Phosphate	0.00	0.00
Stiff Davis Index	-0.122	Sulfate	2050	727.28
Oddo-Tomson	-0.963			

OPERATING CONDITIONS

Temperature (^oF)	43.00
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
HCU 3211 B SWD
DREW LOTT
TANK
HAMILTON KS

Sample ID#: 3076
ID: 117233
Report Date: 01-22-2016
Sample Date: 01-19-2016
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	4921
Magnesium(as Mg)	1666
Barium(as Ba)	0.795
Strontium(as Sr)	112.30
Sodium(as Na)	61474
Potassium(as K)	425.20
Lithium(as Li)	8.37
Iron(as Fe)	69.38
Field Iron(as Fe)	0.00
Ammonia(as NH_3)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0120
Zinc(as Zn)	1.11
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	119600
Sulfate(as SO_4)	2050
Bromine(as Br)	0.00
Dissolved CO_2(as CO_2)	80.00
Bicarbonate(as HCO_3)	72.00
Carbonate(as CO_3)	0.00
Silica(as SiO_2)	0.00
Phosphate(as PO_4)	0.00
H_2S (as H_2S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO_3)	0.00
Boron(as B)	3.72

PARAMETERS

Temperature(°F)	43.00
T.D.S.	183192
Sample pH	6.90
Conductivity:	296279
Resistivity:	3.38

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	0.514	-0.0118	0.830	-66.35	1.18	57.58	8.86	0.418	0.508	-61.03	3.64	0.0105	0.00	-0.0269	0.0292	0.00538
65.45	0.00	0.696	-0.00653	0.754	-98.89	1.04	12.89	5.40	0.384	0.446	-75.27	5.54	0.0142	0.00	-0.0281	0.0547	0.00538
80.91	0.00	0.887	-0.00217	0.725	-108.28	0.931	-24.22	3.50	0.336	0.415	-82.68	7.86	0.0172	0.00	-0.0295	0.0227	0.00538
96.36	0.00	1.06	0.00107	0.734	-98.26	0.852	-53.90	2.40	0.275	0.400	-86.03	10.42	0.0193	0.00	-0.0311	0.0297	0.00538
111.82	0.00	1.19	0.00305	0.777	-74.15	0.851	-51.25	1.72	0.197	0.391	-87.54	12.86	0.0202	0.00	-0.0329	0.0311	0.00538
127.27	0.00	1.27	0.00395	0.856	-41.42	0.901	-30.83	1.25	0.0937	0.381	-89.45	14.98	0.0202	0.00	-0.0350	0.0261	0.00538
142.73	0.00	1.28	0.00383	0.979	-5.08	0.945	-15.55	0.917	-0.0425	0.370	-91.92	16.42	0.0191	0.00	-0.0375	0.0212	0.00538
158.18	0.00	1.22	0.00289	1.16	30.97	0.984	-4.14	0.680	-0.221	0.357	-94.91	16.97	0.0173	0.00	-0.0404	0.0220	0.00538
173.64	0.00	1.12	0.00143	1.41	64.08	1.02	4.33	0.509	-0.452	0.344	-98.40	16.61	0.0151	0.00	-0.0438	0.0228	0.00538
189.09	0.00	0.978	>-0.001	1.76	92.78	1.05	10.55	0.385	-0.750	0.331	-102.36	15.52	0.0127	0.00	-0.0479	0.0115	0.00538
204.55	0.00	0.832	-0.00195	2.26	116.66	1.07	15.07	0.293	-1.13	0.317	-106.81	13.96	0.0104	0.00	-0.0528	0.00963	0.00538
220.00	0.171	0.673	-0.00386	2.92	138.07	1.07	16.13	0.222	-1.64	0.299	-114.15	11.85	0.00843	0.00	-0.0610	0.0131	0.00630
		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.