KANSAS CORPORATION COMMISSION
OIL & GAS CONSERVATION DIVISION

1294310

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: 3120-E

API No.: 15-075-20703-00-00
Permit No: D27683.0
Reporting Year: 2015
(January 1 to December 31)

SW (Q) - SW (Q) - SW (Q) - NW (Q) 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: 184323 mg/l Specific Gravity: 1.13 Additives: 15% HCL
(Attach water analysis, if available)

II. Well Data:

Maximum Authorized Injection Pressure: 0 psi Injection Zone: Council Grove
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	17517	20	0		31
February	13970	20	0		28
March	14195	20	0		31
April	14719	20	0		30
May	14753	20	0		31
June	13843	20	0		30
July	10524	20	0		31
August	12607	20	0		31
September	22745	20	0		30
October	25903	20	0		31
November	15956	20	0		30
December	19508	20	0		31
TOTAL	196240		0		

Submitted Electronically

JACAM LABORATORIES

DownHole R_X

WATER CHEMISTRY

LINN OPERATING
DREW LOTT
HAMILTON KS

HCU 3120 E SWD
TANK

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

Sampled: 01-19-2016
at 0000

Sample ID: 117236

CATIONS		ANIONS	
Calcium (as Ca)	5073	Chloride (as Cl)	120600
Magnesium (as Mg)	1708	Sulfate (as SO_4)	1875
Barium (as Ba)	0.841	Bromine (as Br)	0.00
Strontium (as Sr)	114.60	Dissolved CO_2 (as CO_2)	120.00
Sodium (as Na)	61639	Bicarbonate (as HCO_3)	95.00
Potassium (as K)	432.80	Carbonate (as CO_3)	0.00
Lithium (as Li)	8.52	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)	71.81	H_2S (as H_2S)	0.00
Manganese (as Mn)	0.0220	Fluoride (as F)	0.00
Zinc (as Zn)	0.987	Nitrate (as NO_3)	0.00
Lead (as Pb)	0.00	Boron (as B)	4.28

PARAMETERS

Calculated T.D.S.	184323
Molar Conductivity	298834
Resistivity	3.35
Sp.Gr.(g/mL)	1.13
Pressure(atm)	1.00
pCO_2(atm)	0.0103
pH_2S(atm)	0.00
Temperature (^oF)	41.00
pH	6.70

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 3120 E SWD
TANK

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SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite ($CaCO_3$)	0.371	Calcite ($CaCO_3$)	-0.0159
Aragonite ($CaCO_3$)	0.332	Aragonite ($CaCO_3$)	-0.0189
Witherite ($BaCO_3$)	< 0.001	Witherite ($BaCO_3$)	-22.78
Strontianite ($SrCO_3$)	0.0144	Strontianite ($SrCO_3$)	-0.938
Calcium oxalate (CaC_2O_4)	0.00	Calcium oxalate (CaC_2O_4)	-0.00878
Magnesite ($MgCO_3$)	0.101	Magnesite ($MgCO_3$)	-0.0702
Anhydrite ($CaSO_4$)	0.843	Anhydrite ($CaSO_4$)	-56.82
Gypsum ($CaSO_4*2H_2O$)	1.20	Gypsum ($CaSO_4*2H_2O$)	58.65
Barite ($BaSO_4$)	11.50	Barite ($BaSO_4$)	0.455
Celestite ($SrSO_4$)	0.521	Celestite ($SrSO_4$)	-58.17
Fluorite (CaF_2)	0.00	Fluorite (CaF_2)	-2.82
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-240.98
Silica (SiO_2)	0.00	Silica (SiO_2)	-18.14
Brucite ($Mg(OH)_2$)	< 0.001	Brucite ($Mg(OH)_2$)	< 0.001
Magnesium silicate	0.00	Magnesium silicate	-75.92
Iron hydroxide ($Fe(OH)_3$)	6.05	Iron hydroxide ($Fe(OH)_3$)	< 0.001
Strengite ($FePO_4*2H_2O$)	0.00	Strengite ($FePO_4*2H_2O$)	>-0.001
Siderite ($FeCO_3$)	2.43	Siderite ($FeCO_3$)	0.00640
Halite (NaCl)	0.157	Halite (NaCl)	-89207
Thenardite ($Na2SO_4$)	< 0.001	Thenardite ($Na2SO_4$)	-85269
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.0403

SIMPLE INDICES		BOUND IONS	TOTAL	FREE
Langelier	0.101	Calcium	5073	4826
Ryznar	6.50	Barium	0.841	0.841
Puckorius	6.07	Carbonate	1.19	0.0162
Larson-Skold Index	2605	Phosphate	0.00	0.00
Stiff Davis Index	-0.193	Sulfate	1875	659.66
Oddo-Tomson	-1.05			

OPERATING CONDITIONS

Temperature (^oF)	41.00
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 3120 E SWD
DREW LOTT
TANK
HAMILTON KS

Sample ID#: 3076
ID: 117236
Report Date: 01-22-2016
Sample Date: 01-19-2016
at 0000

WATER CHEMISTRY

CATIONS		ANIONS	
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Magnesium(as Mg)	1708	Sulfate(as SO_4)	1875
Barium(as Ba)	0.841	Bromine(as Br)	0.00
Strontium(as Sr)	114.60	Dissolved CO_2(as CO_2)	120.00
Sodium(as Na)	61639	Bicarbonate(as HCO_3)	95.00
Potassium(as K)	432.80	Carbonate(as CO_3)	0.00
Lithium(as Li)	8.52	Silica(as SiO_2)	0.00
Iron(as Fe)	71.81	Phosphate(as PO_4)	0.00
Field Iron(as Fe)	0.00	H_2S (as H_2S)	0.00
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)	0.0220	Boron(as B)	4.28
Zinc(as Zn)	0.987		
Lead(as Pb)	0.00	**PARAMETERS**	
		Temperature(°F)	41.00
Sample pH	6.70	T.D.S.	184323
Conductivity:	298834	Resistivity:	3.35

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
(°F)	(atm)															(mpy)	(atm)
50.00	0.00	0.457	-0.0127	0.774	-85.36	1.10	30.94	8.36	0.438	0.462	-71.33	3.21	0.00853	0.00	-0.0413	0.0374	0.0103
65.45	0.00	0.624	-0.00776	0.703	-115.80	0.966	-11.02	5.10	0.400	0.405	-86.03	4.93	0.0119	0.00	-0.0431	0.0700	0.0103
80.91	0.00	0.808	-0.00355	0.675	-123.93	0.866	-45.77	3.30	0.347	0.377	-93.54	7.10	0.0148	0.00	-0.0452	0.0344	0.0103
96.36	0.00	0.988	>-0.001	0.683	-113.43	0.791	-73.51	2.26	0.277	0.363	-96.84	9.62	0.0171	0.00	-0.0477	0.0450	0.0103
111.82	0.00	1.14	0.00221	0.722	-89.35	0.790	-70.03	1.62	0.190	0.355	-98.20	12.27	0.0186	0.00	-0.0504	0.0472	0.0103
127.27	0.00	1.27	0.00379	0.795	-57.06	0.836	-49.51	1.17	0.0737	0.346	-99.99	14.88	0.0194	0.00	-0.0536	0.0396	0.0103
142.73	0.00	1.34	0.00448	0.909	-21.38	0.876	-34.05	0.862	-0.0800	0.335	-102.37	17.11	0.0193	0.00	-0.0573	0.0321	0.0103
158.18	0.00	1.34	0.00431	1.07	13.91	0.911	-22.43	0.639	-0.281	0.324	-105.30	18.60	0.0184	0.00	-0.0615	0.0334	0.0103
173.64	0.00	1.29	0.00341	1.31	46.26	0.942	-13.73	0.478	-0.543	0.312	-108.74	19.16	0.0168	0.00	-0.0665	0.0346	0.0103
189.09	0.00	1.18	0.00202	1.63	74.28	0.967	-7.31	0.361	-0.879	0.299	-112.70	18.76	0.0148	0.00	-0.0724	0.0174	0.0103
204.55	0.00	1.04	< 0.001	2.09	97.55	0.988	-2.63	0.275	-1.31	0.286	-117.16	17.58	0.0127	0.00	-0.0794	0.0146	0.0103
220.00	0.171	0.863	-0.00155	2.70	118.12	0.992	-1.68	0.208	-1.88	0.270	-124.70	15.49	0.0106	0.00	-0.0909	0.0199	0.0121
		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.