KANSAS CORPORATION COMMISSION
OIL & GAS CONSERVATION DIVISION

1294115

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: 1411

API No.: 15-075-20791-00-00
Permit No: D28043.0
Reporting Year: 2015
(January 1 to December 31)

N2 (Q/Q/Q/Q) - NW - NE - NW Sec. 14 Twp. 21 S. R. 41 ☐ E ☑ W
5145 feet from ☐ N / ☑ S Line of Section
3720 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: 182259 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	3724	10	0		31
February	3072	10	0		28
March	2336	10	0		31
April	777	10	0		30
May	970	10	0		18
June	2121	10	0		20
July	1065	10	0		31
August	2670	10	0		31
September	2060	10	0		30
October	1711	10	0		31
November	2621	10	0		30
December	2478	10	0		31
TOTAL	25605		0		

Submitted Electronically

JACAM LABORATORIES

DownHole R_X

WATER CHEMISTRY

LINN OPERATING
DREW LOTT
HAMILTON KS

HCU 1411 SWD
TANK

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

Sampled: 01-19-2016
at 0000

Sample ID: 117232

CATIONS		ANIONS	
Calcium (as Ca)	5745	Chloride (as Cl)	119000
Magnesium (as Mg)	1929	Sulfate (as SO_4)	1950
Barium (as Ba)	0.855	Bromine (as Br)	0.00
Strontium (as Sr)	127.50	Dissolved CO_2 (as CO_2)	140.00
Sodium (as Na)	59819	Bicarbonate (as HCO_3)	120.00
Potassium (as K)	485.50	Carbonate (as CO_3)	0.00
Lithium (as Li)	9.32	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)	84.97	H_2S (as H_2S)	0.00
Manganese (as Mn)	0.0910	Fluoride (as F)	0.00
Zinc (as Zn)	1.31	Nitrate (as NO_3)	0.00
Lead (as Pb)	0.00	Boron (as B)	5.31

PARAMETERS

Calculated T.D.S.	182259
Molar Conductivity	294747
Resistivity	3.39
Sp.Gr.(g/mL)	1.13
Pressure(atm)	1.00
pCO_2(atm)	0.00487
pH_2S(atm)	0.00
Temperature (^oF)	42.00
pH	7.20

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 1411 SWD
TANK

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SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite ($CaCO_3$)	1.47	Calcite ($CaCO_3$)	0.0104
Aragonite ($CaCO_3$)	1.32	Aragonite ($CaCO_3$)	0.00783
Witherite ($BaCO_3$)	< 0.001	Witherite ($BaCO_3$)	-22.91
Strontianite ($SrCO_3$)	0.0550	Strontianite ($SrCO_3$)	-0.816
Calcium oxalate (CaC_2O_4)	0.00	Calcium oxalate (CaC_2O_4)	-0.00776
Magnesite ($MgCO_3$)	0.405	Magnesite ($MgCO_3$)	-0.0404
Anhydrite ($CaSO_4$)	0.933	Anhydrite ($CaSO_4$)	-21.92
Gypsum ($CaSO_4*2H_2O$)	1.33	Gypsum ($CaSO_4*2H_2O$)	87.20
Barite ($BaSO_4$)	11.14	Barite ($BaSO_4$)	0.461
Celestite ($SrSO_4$)	0.564	Celestite ($SrSO_4$)	-53.67
Fluorite (CaF_2)	0.00	Fluorite (CaF_2)	-2.66
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-242.52
Silica (SiO_2)	0.00	Silica (SiO_2)	-18.49
Brucite ($Mg(OH)_2$)	< 0.001	Brucite ($Mg(OH)_2$)	< 0.001
Magnesium silicate	0.00	Magnesium silicate	-76.29
Iron hydroxide ($Fe(OH)_3$)	74.40	Iron hydroxide ($Fe(OH)_3$)	< 0.001
Strengite ($FePO_4*2H_2O$)	0.00	Strengite ($FePO_4*2H_2O$)	>-0.001
Siderite ($FeCO_3$)	10.16	Siderite ($FeCO_3$)	0.0340
Halite (NaCl)	0.150	Halite (NaCl)	-90638
Thenardite ($Na2SO_4$)	< 0.001	Thenardite ($Na2SO_4$)	-85177
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.0108

SIMPLE INDICES		BOUND IONS	TOTAL	FREE
Langelier	0.769	Calcium	5745	5468
Ryznar	5.66	Barium	0.855	0.855
Puckorius	5.62	Carbonate	4.16	0.0561
Larson-Skold Index	2156	Phosphate	0.00	0.00
Stiff Davis Index	0.468	Sulfate	1950	647.66
Oddo-Tomson	-0.382			

OPERATING CONDITIONS

Temperature (^oF)	42.00
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 1411 SWD
DREW LOTT
TANK
HAMILTON KS

Sample ID#: 3076
ID: 117232
Report Date: 01-22-2016
Sample Date: 01-19-2016
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	5745
Magnesium(as Mg)	1929
Barium(as Ba)	0.855
Strontium(as Sr)	127.50
Sodium(as Na)	59819
Potassium(as K)	485.50
Lithium(as Li)	9.32
Iron(as Fe)	84.97
Field Iron(as Fe)	0.00
Ammonia(as NH_3)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0910
Zinc(as Zn)	1.31
Lead(as Pb)	0.00
Sample pH	7.20
Conductivity:	294747

ANIONS

Chloride(as Cl)	119000
Sulfate(as SO_4)	1950
Bromine(as Br)	0.00
Dissolved CO_2(as CO_2)	140.00
Bicarbonate(as HCO_3)	120.00
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)	5.31

PARAMETERS

Temperature(°F)	42.00
T.D.S.	182259
Resistivity:	3.39

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	1.75	0.0154	0.865	-45.79	1.23	63.69	8.39	0.446	0.507	-65.48	12.84	0.0385	0.00	-0.0111	0.0281	0.00487
65.45	0.00	2.31	0.0238	0.783	-75.59	1.08	23.38	5.10	0.407	0.444	-80.64	19.03	0.0461	0.00	-0.0116	0.0526	0.00487
80.91	0.00	2.84	0.0300	0.751	-85.04	0.967	-10.20	3.30	0.353	0.413	-88.51	26.08	0.0515	0.00	-0.0122	0.0213	0.00487
96.36	0.00	3.25	0.0331	0.758	-77.42	0.881	-37.19	2.25	0.281	0.396	-92.08	32.95	0.0537	0.00	-0.0128	0.0278	0.00487
111.82	0.00	3.44	0.0330	0.800	-57.43	0.879	-36.04	1.61	0.191	0.387	-93.69	38.42	0.0524	0.00	-0.0136	0.0292	0.00487
127.27	0.00	3.44	0.0305	0.879	-29.92	0.927	-19.41	1.17	0.0721	0.376	-95.70	41.87	0.0485	0.00	-0.0145	0.0245	0.00487
142.73	0.00	3.25	0.0262	1.00	0.697	0.971	-7.11	0.855	-0.0861	0.364	-98.26	42.83	0.0429	0.00	-0.0156	0.0199	0.00487
158.18	0.00	2.92	0.0212	1.18	31.04	1.01	1.96	0.633	-0.294	0.351	-101.35	41.39	0.0364	0.00	-0.0169	0.0207	0.00487
173.64	0.00	2.52	0.0160	1.44	58.84	1.04	8.59	0.473	-0.563	0.337	-104.92	38.11	0.0300	0.00	-0.0185	0.0214	0.00487
189.09	0.00	2.12	0.0114	1.80	82.91	1.07	13.44	0.357	-0.909	0.324	-108.96	33.75	0.0242	0.00	-0.0205	0.0108	0.00487
204.55	0.00	1.75	0.00738	2.30	102.88	1.09	16.90	0.272	-1.35	0.310	-113.49	28.91	0.0193	0.00	-0.0230	0.00904	0.00487
220.00	0.171	1.38	0.00380	2.97	121.12	1.10	17.80	0.206	-1.94	0.293	-121.01	23.45	0.0153	0.00	-0.0272	0.0123	0.00570
		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.