



JACAM LABORATORIES

## DownHole R<sub>x</sub>

### WATER CHEMISTRY

GREAT WESTERN OPERATING    SCHMUNK 31-31, 05-123-25563;  
32-41, & 42-51    RYAN GROLL  
SEPARATOR

Report Date:    10-25-2013    Sampled:    10-10-2013  
Sample #:    4311    at    0000

Sample ID:    55027

#### CATIONS

Calcium (as Ca)	706.90
Magnesium (as Mg)	106.40
Barium (as Ba)	45.62
Strontium (as Sr)	107.10
Sodium (as Na)	12197
Potassium (as K)	294.40
Lithium (as Li)	17.62
Ammonia (as NH <sub>3</sub> )	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	196.40
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

#### ANIONS

Chloride (as Cl)	21200
Sulfate (as SO <sub>4</sub> )	0.00
Bromine (as Br)	0.00
Dissolved CO <sub>2</sub> (as CO <sub>2</sub> )	240.00
Bicarbonate (as HCO <sub>3</sub> )	524.00
Carbonate (as CO <sub>3</sub> )	0.00
Oxalic acid (as C <sub>2</sub> O <sub>4</sub> )	0.00
Silica (as SiO <sub>2</sub> )	0.00
Phosphate(as PO <sub>4</sub> )	0.00
H <sub>2</sub> S (as H <sub>2</sub> S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO <sub>3</sub> )	0.00
Boron (as B)	20.51

#### PARAMETERS

Calculated T.D.S.	35394
Molar Conductivity	48052
Resistivity	20.81
Sp.Gr.(g/mL)	1.02
Pressure(atm)	1.00
pCO <sub>2</sub> (atm)	0.0745
pH <sub>2</sub> S(atm)	0.00
Temperature (°F)	120.00
pH	6.60

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

**JACAM LABORATORIES****DownHole R<sub>x</sub>****DEPOSITION POTENTIAL INDICATORS**GREAT WESTERN OPERATING  
RYAN GROLLSCHMUNK 31-31, 32-41, 42-51  
SEPARATORReport Date: 10-25-2013  
Sample #: 4311Sampled: 10-10-2013  
at 0000

Sample ID: 55027

**SATURATION LEVEL**

Calcite (CaCO <sub>3</sub> )	1.79
Aragonite (CaCO <sub>3</sub> )	1.51
Witherite (BaCO <sub>3</sub> )	0.0306
Strontianite (SrCO <sub>3</sub> )	0.671
Calcium oxalate (CaC <sub>2</sub> O <sub>4</sub> )	0.00
Magnesite (MgCO <sub>3</sub> )	0.339
Anhydrite (CaSO <sub>4</sub> )	0.00
Gypsum (CaSO <sub>4</sub> *2H <sub>2</sub> O)	0.00
Barite (BaSO <sub>4</sub> )	0.00
Celestite (SrSO <sub>4</sub> )	0.00
Fluorite (CaF <sub>2</sub> )	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO <sub>2</sub> )	0.00
Brucite (Mg(OH) <sub>2</sub> )	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) <sub>3</sub> )	1548
Strengite (FePO <sub>4</sub> *2H <sub>2</sub> O)	0.00
Siderite (FeCO <sub>3</sub> )	1044
Halite (NaCl)	0.00322
Thenardite (Na <sub>2</sub> SO <sub>4</sub> )	0.00
Iron sulfide (FeS)	0.00

**MOMENTARY EXCESS (Lbs/1000 Barrels)**

Calcite (CaCO <sub>3</sub> )	0.0942
Aragonite (CaCO <sub>3</sub> )	0.0725
Witherite (BaCO <sub>3</sub> )	-9.33
Strontianite (SrCO <sub>3</sub> )	-0.154
Calcium oxalate (CaC <sub>2</sub> O <sub>4</sub> )	-0.0908
Magnesite (MgCO <sub>3</sub> )	-0.349
Anhydrite (CaSO <sub>4</sub> )	-889.32
Gypsum (CaSO <sub>4</sub> *2H <sub>2</sub> O)	-840.30
Barite (BaSO <sub>4</sub> )	-1.46
Celestite (SrSO <sub>4</sub> )	-114.13
Fluorite (CaF <sub>2</sub> )	-11.27
Calcium phosphate	>-0.001
Hydroxyapatite	-414.67
Silica (SiO <sub>2</sub> )	-69.37
Brucite (Mg(OH) <sub>2</sub> )	0.00592
Magnesium silicate	-130.47
Iron hydroxide (Fe(OH) <sub>3</sub> )	< 0.001
Strengite (FePO <sub>4</sub> *2H <sub>2</sub> O)	>-0.001
Siderite (FeCO <sub>3</sub> )	0.247
Halite (NaCl)	-189340
Thenardite (Na <sub>2</sub> SO <sub>4</sub> )	-64362
Iron sulfide (FeS)	-0.00894

**SIMPLE INDICES**

Langelier	0.357
Ryznar	5.89
Puckorius	4.11
Larson-Skold Index	70.82
Stiff Davis Index	0.129
Oddo-Tomson	-0.151

**BOUND IONS**

Calcium	706.90	688.65
Barium	45.62	45.62
Carbonate	5.25	0.367
Phosphate	0.00	0.00
Sulfate	0.00	0.00

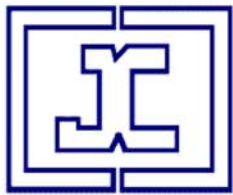
**TOTAL****FREE****OPERATING CONDITIONS**

Temperature (°F)	120.00
Time(secs)	0.00

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# DownHole SAT™ Water Analysis Report



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## SYSTEM IDENTIFICATION

GREAT WESTERN OPERATING  
SCHMUNK 31-31, 32-41, 42 51  
RYAN GROLL  
SEPARATOR

Sample ID#: 4311  
ID: 55027  
Report Date: 10-25-2013  
Sample Date: 10-10-2013  
at 0000

## WATER CHEMISTRY

### CATIONS

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Sodium(as Na)	12197
Potassium(as K)	294.40
Lithium(as Li)	17.62
Iron(as Fe)	196.40
Field Iron(as Fe)	0.00
Ammonia(as NH <sub>3</sub> )	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0120
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

### ANIONS

Chloride(as Cl)	21200
Sulfate(as SO <sub>4</sub> )	0.00
Bromine(as Br)	0.00
Dissolved CO <sub>2</sub> (as CO <sub>2</sub> )	240.00
Bicarbonate(as HCO <sub>3</sub> )	524.00
Carbonate(as CO <sub>3</sub> )	0.00
Silica(as SiO <sub>2</sub> )	0.00
Phosphate(as PO <sub>4</sub> )	0.00
H <sub>2</sub> S (as H <sub>2</sub> S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO <sub>3</sub> )	0.00
Boron(as B)	20.51

### PARAMETERS

Temperature(°F)	120.00
T.D.S.	35394
Resistivity:	20.81
Sample pH	6.60
Conductivity:	48052

## SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO <sub>3</sub>		Anhydrite CaSO <sub>4</sub>		Gypsum CaSO <sub>4</sub> *2H <sub>2</sub> O		Barite BaSO <sub>4</sub>		Celestite SrSO <sub>4</sub>		Siderite FeCO <sub>3</sub>		Mackawenite FeS		CO <sub>2</sub> (mpy)	pCO <sub>2</sub> (atm)
50.00	0.00	0.506	-0.0967	0.00	-1070	0.00	-844.84	0.00	-0.340	0.00	-117.17	183.59	0.114	0.00	-0.00736	0.0793	0.0745
65.45	0.00	0.721	-0.0480	0.00	-1087	0.00	-879.29	0.00	-0.516	0.00	-121.48	293.97	0.143	0.00	-0.00763	0.149	0.0745
80.91	0.00	0.980	-0.00302	0.00	-1067	0.00	-902.93	0.00	-0.734	0.00	-121.40	446.00	0.173	0.00	-0.00794	0.122	0.0745
96.36	0.00	1.28	0.0379	0.00	-1014	0.00	-916.52	0.00	-0.990	0.00	-118.98	643.49	0.203	0.00	-0.00830	0.160	0.0745
111.82	0.00	1.60	0.0749	0.00	-937.22	0.00	-877.61	0.00	-1.28	0.00	-115.69	888.94	0.231	0.00	-0.00870	0.167	0.0745
127.27	0.00	1.97	0.111	0.00	-843.83	0.00	-809.84	0.00	-1.63	0.00	-112.89	1199	0.261	0.00	-0.00916	0.140	0.0745
142.73	0.00	2.38	0.147	0.00	-741.43	0.00	-752.54	0.00	-2.05	0.00	-110.68	1582	0.294	0.00	-0.00969	0.114	0.0745
158.18	0.00	2.84	0.183	0.00	-636.49	0.00	-704.09	0.00	-2.57	0.00	-109.01	2043	0.328	0.00	-0.0103	0.119	0.0745
173.64	0.00	3.33	0.219	0.00	-534.30	0.00	-663.29	0.00	-3.18	0.00	-107.85	2579	0.363	0.00	-0.0110	0.123	0.0745
189.09	0.00	3.86	0.256	0.00	-438.64	0.00	-628.91	0.00	-3.91	0.00	-107.15	3191	0.400	0.00	-0.0118	0.0619	0.0745
204.55	0.00	4.37	0.290	0.00	-352.34	0.00	-600.29	0.00	-4.76	0.00	-106.93	3849	0.436	0.00	-0.0128	0.0518	0.0745
220.00	0.171	4.80	0.326	0.00	-283.22	0.00	-588.55	0.00	-5.90	0.00	-109.09	4455	0.476	0.00	-0.0144	0.0706	0.0872
		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<sub>3</sub>}/K<sub>sp</sub>. pCO<sub>2</sub> (atm) is the partial pressure of CO<sub>2</sub> in the gas phase.

Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.

