

Multi-Chem Group, LLC

Multi-Chem Analytical Laboratory

349 PR 4473

Sonora, TX 76950



Water Analysis Report

Production Company: **ANTERO RESOURCES**

Sample ID: **WA-18755**

Well Name: **ROBINSON A-6**

Sample Point: **Separator**

Sample Date: **12/9 /2008**

Sales Rep: **Brian Bernatis**

Lab Tech: **Joseph Sadler**

Sample Specifics	
Test Date:	12/30/2008
Temperature (°F):	68
Sample Pressure (psig):	0
Specific Gravity (g/cm³):	1.0230
pH:	7.86
Turbidity (NTU):	-
Calculated T.D.S. (mg/L)	33877
Molar Conductivity (µS/cm):	51329
Resitivity (Mohm):	0.1948

Analysis @ Properties in Sample Specifics			
Cations	mg/L	Anions	mg/L
Calcium (Ca):	240.00	Chloride (Cl):	19688.00
Magnesium (Mg):	488.00	Sulfate (SO ₄):	7.00
Barium (Ba):	50.39	Dissolved CO ₂ :	79.20
Strontium (Sr):	-	Bicarbonate (HCO ₃):	1482.00
Sodium (Na):	11837.00	Carbonate (CO ₃):	-
Potassium (K):	-	H ₂ S:	1.00
Iron (Fe):	4.22	Phosphate (PO ₄):	-
Manganese (Mn):	0.01	Silica (SiO ₂):	-
Lithium (Li):	-	Fluoride (F):	-
Aluminum (Al):	-	Nitrate (NO ₃):	-
Ammonia NH ₃ :	-	Lead (Pb):	-
		Zinc (Zn):	-
		Bromine (Br):	-
		Boron (B):	-

Test Conditions		Scale Values @ Test Conditions - Potential Amount of Scale in lb/1000bbl										
		Calcium Carbonate CaCO ₃		Gypsum CaSO ₄ · 2H ₂ O		Calcium Sulfate CaSO ₄		Strontium Sulfate SrSO ₄		Barium Sulfate BaSO ₄		Calculated CO ₂
		Sat Index	Scale	Sat Index	Scale	Sat Index	Scale	Sat Index	Scale	Sat Index	Scale	psi
Temp °F	Gauge Press. psi											
68	0	11.33	15.22	0.00	-3175.90	0.00	-3713.30	-	-	5.53	9.82	0.43
80	0	13.83	17.52	0.00	15.31	0.00	-3664.30	-	-	4.14	8.78	0.22
100	0	17.83	20.58	0.00	17.93	0.00	-3460.30	-	-	2.60	6.70	0.27
120	0	21.23	22.55	0.00	19.61	0.00	-3143.60	-	-	1.67	4.11	0.30
140	0	23.95	23.63	0.00	20.51	0.00	-2760.80	-	-	1.10	0.87	0.33
160	0	25.68	23.69	0.00	20.55	0.00	-2352.40	-	-	0.74	-3.14	0.38
180	0	26.25	22.74	0.00	19.73	0.00	-1949.80	-	-	0.50	-8.09	0.41
200	0	25.73	20.99	0.00	18.24	0.00	-1574.60	-	-	0.35	-14.16	0.41
220	2.51	24.08	19.06	0.00	16.60	0.00	-1260.40	-	-	0.24	-22.12	0.41
240	10.3	22.08	16.69	0.00	14.60	0.00	-969.71	-	-	0.17	-31.18	0.42
260	20.76	19.80	14.42	0.00	12.67	0.00	-726.25	-	-	0.12	-41.98	0.42
280	34.54	17.46	12.38	0.00	10.95	0.01	-528.58	-	-	0.09	-54.74	0.43
300	52.34	15.24	10.64	0.00	9.48	0.01	-373.17	-	-	0.06	-69.75	0.43

Conclusions:

Calcium Carbonate scale is indicated at all temperatures from 80°F to 300°F

Gypsum Scaling Index is negative from 80°F to 300°F

Calcium Sulfate Scaling Index is negative from 80°F to 300°F

Strontium Sulfate scaling was not evaluated

Barium Sulfate NO CONCLUSION

Notes:

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Scale Prediction Graphs

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