

Application

Part III

Produced Water Samples

1. Lybrook M35-2308-01H/02H

UL M & N, Section 35-23N-8W

API: 030-45-35526 – 01H

API: 030-45-35527 – 02H

2. Lybrook O35-2308-01H/02H

UL O, Section 35-23N-8W

API: 030-45-35525-01H

API: 030-45-35524-02H

Multi-Chem Analytical Laboratory

1553 East Highway 40

Vernal, UT 84078

multi-chem®

A HALLIBURTON SERVICE

Units of Measurement: Standard

Water Analysis Report

Production Company: DJR Operating, LLC
 Well Name: LYBROOK M35-2308-01H/02H
 Sample Point: SEPARATOR
 Sample Date: 4/9/2019
 Sample ID: WA-385502

Sales Rep: Craig Smith
 Lab Tech: Amanda Harvey

Scaling potential predicted using ScaleSoftPitzer from
 Brine Chemistry Consortium (Rice University)

Sample Specifics		Analysis @ Properties in Sample Specifics			
Test Date:	4/19/2019	Cations	mg/L	Anions	mg/L
System Temperature 1 (°F):	50	Sodium (Na):	9648.38	Chloride (Cl):	15500.00
System Pressure 1 (psig):	15	Potassium (K):	28.17	Sulfate (SO ₄):	16.00
System Temperature 2 (°F):	200	Magnesium (Mg):	42.98	Bicarbonate (HCO ₃):	335.50
System Pressure 2 (psig):	200	Calcium (Ca):	280.55	Carbonate (CO ₃):	
Calculated Density (g/ml):	1.0152	Strontium (Sr):	72.84	Hydroxide (HO):	
pH:	7.00	Barium (Ba):	23.43	Acetic Acid (CH ₃ COO)	
Calculated TDS (mg/L):	26049.70	Iron (Fe):	84.00	Propionic Acid (C ₂ H ₅ COO)	
CO ₂ in Gas (%):		Zinc (Zn):	0.96	Butanoic Acid (C ₃ H ₇ COO)	
Dissolved CO ₂ (mg/L):	99.00	Lead (Pb):	0.00	Isobutyric Acid ((CH ₃) ₂ CHCOO)	
H ₂ S in Gas (%):		Ammonia NH ₃ :		Fluoride (F):	
H ₂ S in Water (mg/L):	0.00	Manganese (Mn):	1.38	Bromine (Br):	
Tot. Suspended Solids (mg/L):		Aluminum (Al):	0.04	Silica (SiO ₂):	15.51
Corrosivity (Langlier Sat. Indx)	0.00	Lithium (Li):	1.23	Calcium Carbonate (CaCO ₃):	
Alkalinity:		Boron (B):	3.05	Phosphates (PO ₄):	1.50
		Silicon (Si):	7.25	Oxygen (O ₂):	

Notes:

(PTB = Pounds per Thousand Barrels)

		Calcium Carbonate		Barium Sulfate		Iron Sulfide		Iron Carbonate		Gypsum CaSO ₄ ·2H ₂ O		Celestite SrSO ₄		Halite NaCl		Zinc Sulfide	
Temp (°F)	PSI	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB
200.00	200.00	0.62	26.38	0.21	2.97	0.00	0.00	2.01	54.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
183.00	179.00	0.50	20.91	0.25	3.42	0.00	0.00	1.89	53.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
167.00	159.00	0.38	15.78	0.30	4.00	0.00	0.00	1.77	51.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150.00	138.00	0.28	11.13	0.36	4.68	0.00	0.00	1.65	49.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
133.00	118.00	0.18	6.99	0.44	5.46	0.00	0.00	1.53	47.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
117.00	97.00	0.09	3.36	0.53	6.32	0.00	0.00	1.40	44.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	77.00	0.01	0.26	0.65	7.24	0.00	0.00	1.28	41.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
83.00	56.00	0.00	0.00	0.78	8.19	0.00	0.00	1.15	38.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67.00	36.00	0.00	0.00	0.95	9.14	0.00	0.00	1.03	34.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	15.00	0.00	0.00	1.14	10.06	0.00	0.00	0.93	32.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

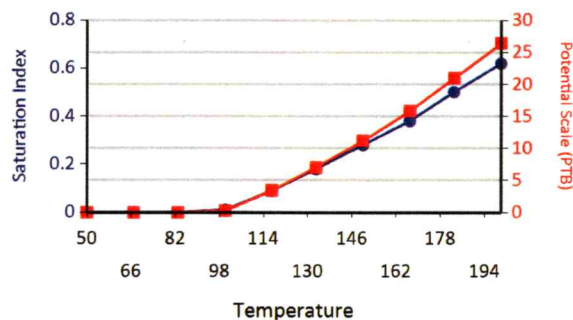
Water Analysis Report

Temp (°F)	PSI	Hemihydrate CaSO ₄ ~0.5H ₂ O		Anhydrate CaSO ₄		Calcium Fluoride		Zinc Carbonate		Lead Sulfide		Mg Silicate		Ca Mg Silicate		Fe Silicate	
		SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB
200.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.11	0.00	0.00	0.28	1.62	0.00	0.00	7.49	34.44
183.00	179.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.78	33.06
167.00	159.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.09	31.01
150.00	138.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.41	28.37
133.00	118.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.75	25.32
117.00	97.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.11	22.00
100.00	77.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	18.62
83.00	56.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.93	15.35
67.00	36.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.41	12.41
50.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.06	10.45

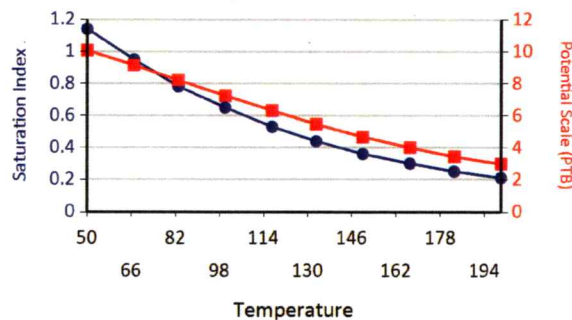
These scales have positive scaling potential under initial temperature and pressure: Calcium Carbonate Barium Sulfate Iron Carbonate Zinc Carbonate Mg Silicate Fe Silicate

These scales have positive scaling potential under final temperature and pressure: Barium Sulfate Iron Carbonate Fe Silicate

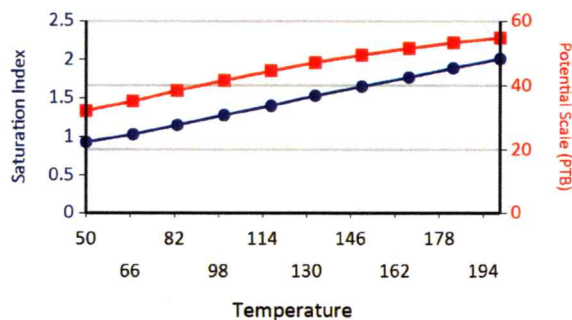
Calcium Carbonate



Barium Sulfate

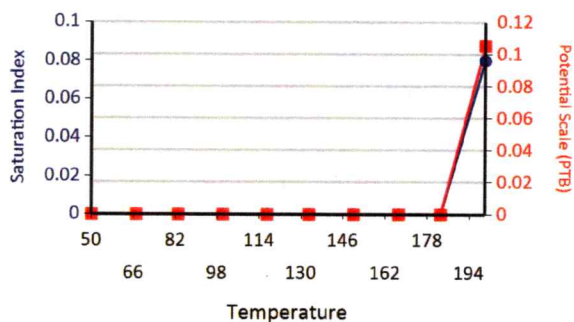


Iron Carbonate

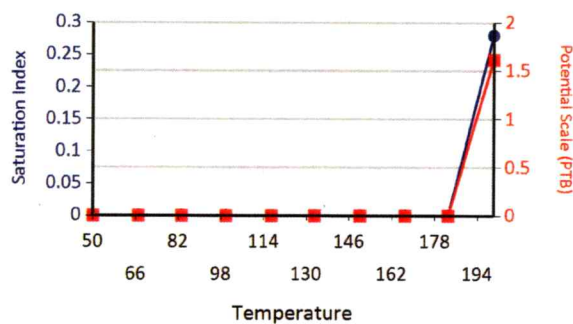


Water Analysis Report

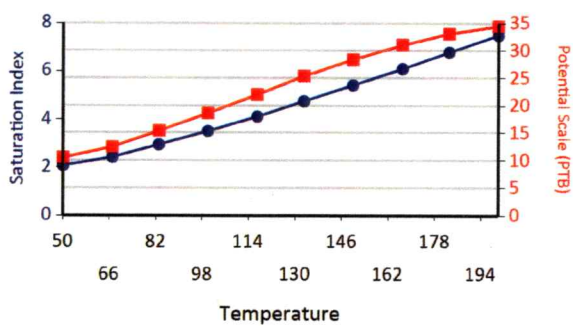
Zinc Carbonate



Mg Silicate



Fe Silicate



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Units of Measurement: Standard

Water Analysis Report

Production Company: **DJR Operating, LLC**
 Well Name: **LYBROOK O35-2308-01H/02H**
 Sample Point: **SEPARATOR**
 Sample Date: **4/9/2019**
 Sample ID: **WA-385478**

Sales Rep: **Craig Smith**
 Lab Tech: **Amanda Harvey**

Scaling potential predicted using ScaleSoftPitzer from
 Brine Chemistry Consortium (Rice University)

Sample Specifics		Analysis @ Properties in Sample Specifics			
Test Date:	4/19/2019	Cations	mg/L	Anions	mg/L
System Temperature 1 (°F):	50	Sodium (Na):	13492.45	Chloride (Cl):	21500.00
System Pressure 1 (psig):	15	Potassium (K):	47.70	Sulfate (SO ₄):	0.00
System Temperature 2 (°F):	200	Magnesium (Mg):	56.95	Bicarbonate (HCO ₃):	335.50
System Pressure 2 (psig):	200	Calcium (Ca):	323.89	Carbonate (CO ₃):	
Calculated Density (g/ml):	1.0218	Strontium (Sr):	89.20	Hydroxide (OH):	
pH:	7.30	Barium (Ba):	29.22	Acetic Acid (CH ₃ COO)	
Calculated TDS (mg/L):	35921.58	Iron (Fe):	13.86	Propionic Acid (C ₂ H ₅ COO)	
CO ₂ in Gas (%):		Zinc (Zn):	0.10	Butanoic Acid (C ₃ H ₇ COO)	
Dissolved CO ₂ (mg/L):	99.00	Lead (Pb):	0.00	Isobutyric Acid ((CH ₃) ₂ CHCOO)	
H ₂ S in Gas (%):		Ammonia NH ₃ :		Fluoride (F):	
H ₂ S in Water (mg/L):	0.00	Manganese (Mn):	0.45	Bromine (Br):	
Tot. Suspended Solids (mg/L):		Aluminum (Al):	0.05	Silica (SiO ₂):	32.26
Corrosivity (Langlier Sat. Indx)	0.00	Lithium (Li):	1.68	Calcium Carbonate (CaCO ₃):	
Alkalinity:		Boron (B):	5.64	Phosphates (PO ₄):	0.98
		Silicon (Si):	15.08	Oxygen (O ₂):	

Notes:

(PTB = Pounds per Thousand Barrels)

		Calcium Carbonate		Barium Sulfate		Iron Sulfide		Iron Carbonate		Gypsum CaSO ₄ ·2H ₂ O		Celestite SrSO ₄		Halite NaCl		Zinc Sulfide	
Temp (°F)	PSI	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB
200.00	200.00	0.87	30.69	0.00	0.00	0.00	0.00	1.38	9.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
183.00	179.00	0.76	26.00	0.00	0.00	0.00	0.00	1.29	9.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
167.00	159.00	0.66	21.66	0.00	0.00	0.00	0.00	1.18	8.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150.00	138.00	0.57	17.81	0.00	0.00	0.00	0.00	1.08	8.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
133.00	118.00	0.48	14.40	0.00	0.00	0.00	0.00	0.97	8.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
117.00	97.00	0.40	11.44	0.00	0.00	0.00	0.00	0.86	7.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	77.00	0.33	8.93	0.00	0.00	0.00	0.00	0.74	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
83.00	56.00	0.27	6.86	0.00	0.00	0.00	0.00	0.62	6.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67.00	36.00	0.21	5.24	0.00	0.00	0.00	0.00	0.51	5.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	15.00	0.18	4.41	0.00	0.00	0.00	0.00	0.41	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

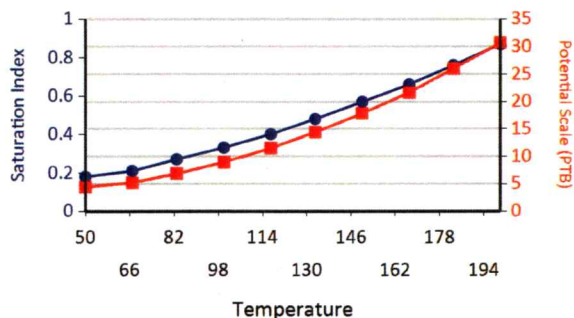
Water Analysis Report

Temp (°F)	PSI	Hemihydrate CaSO ₄ ~0.5H ₂ O		Anhydrate CaSO ₄		Calcium Fluoride		Zinc Carbonate		Lead Sulfide		Mg Silicate		Ca Mg Silicate		Fe Silicate	
		SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB	SI	PTB
200.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.73	13.64	1.61	8.91	7.12	10.52
183.00	179.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.90	8.47	1.12	5.60	6.51	10.34
167.00	159.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	4.20	0.62	2.80	5.91	10.07
150.00	138.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.81	0.12	0.55	5.31	9.67
133.00	118.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.72	9.11
117.00	97.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.14	8.37
100.00	77.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.57	7.48
83.00	56.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	6.48
67.00	36.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.55	5.48
50.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.21	4.76

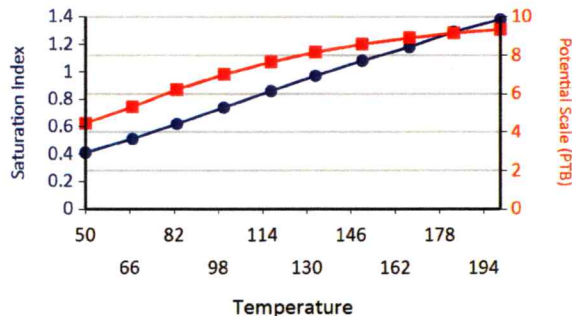
These scales have positive scaling potential under initial temperature and pressure: Calcium Carbonate Iron Carbonate Mg Silicate Ca Mg Silicate Fe Silicate

These scales have positive scaling potential under final temperature and pressure: Calcium Carbonate Iron Carbonate Fe Silicate

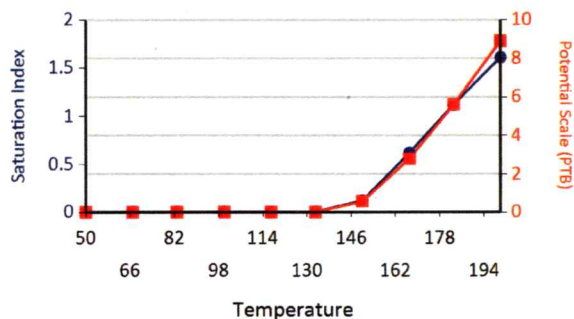
Calcium Carbonate



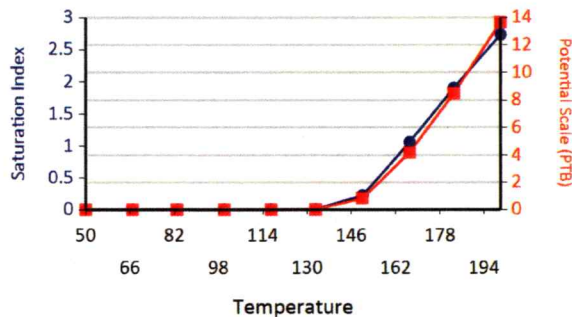
Iron Carbonate



Ca Mg Silicate



Mg Silicate



Water Analysis Report

