

Rule 908.b(6) Waste Profile

**LINN Operating Inc.
O-29 Centralized E&P Waste
Management Facility**

OA Project No. 014-1565

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Representative Mass Flow Balance
Linn Operating Company, Inc.
O-29 Centralized E&P Waste Management Facility
Garfield County, Colorado

Total Water Feed (Influent)			
Type	Percent	BPM	MGM
Water	100	16064	0.674688
Condensate	0	0	0
Total	100	16064	0.674688



Onsite			
Type	Percent	BPM	MGM
Water	100	16064	0.674688
Condensate	0	0	0
Total	100	16064	0.674688



Disposal/Pond Evaporation			
Type	Percent	BPM	MGM
Water	100	16064	0.674688
Condensate	0	0	0
Total	100	16064	0.674688

Explanation

BPM Barrels Per Month
MGM Million Gallons Per Month

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Source of Produced Water and Analytical Data for Selected Wells
 014-1565

Sample Location			CATIONS												ANIONS												PARAMETERS							CRP	
			Calcium	Magnesium	Barium	Strontium	Sodium	Potassium	Lithium	Ammonia	Aluminum	Iron	Manganese	Zinc	Lead	Chloride	Sulfate	Bromine	Dissolved CO2	Bicarbonate	Carbonate	Silica	Phosphate	H2S	Fluoride	Nitrate	Boron	pH	Temperature	Density	Pressure	Calculated TDS	Molar Conductivity	Field Fe	Co2 - H2S Rate
Chevron D20 Pad																																			
Contributing Wells & API Nos.	18-344D	05-045-11035																																	
	18-441D	05-045-11036																																	
	18-434D	05-045-11037	239.00	52.55	7.25	18.67	4689	155.70	11.73	0.00	0.000	29.42	1.970	0.0820	0.00	7500	0.00	0.00	150.00	1098.00	0.00	0.00	0.00	0.00	0.00	0.291	7.10	190.00	1.01	1.00	13810	18877	0.00	0.00	
	18-444D	05-045-11038																																	
Chevron C19 Separators																																			
Contributing Wells & API Nos.	19-18D	05-045-19572																																	
	19-19D	05-045-19573																																	
	19-20D	05-045-19574																																	
	19-17D	05-045-19575																																	
	19-21D	05-045-19591	350.20	61.18	69.76	21.22	4879	121.60	8.88	0.00	0.790	487.70	2.630	2.7700	0.00	8900	25.00	0.00	625.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	19.320	6.70	190.00	1.01	1.00	15504	20910	0.00	0.00
Chevron C20 Separators																																			
Contributing Wells & API Nos.	242-20D	05-045-09079																																	
	20-6D	05-045-12652																																	
	20-1D	05-045-12653	344.60	64.04	29.37	21.88	3823	131.80	7.47	0.00	0.626	338.20	6.430	0.8630	0.00	7000	0.00	0.00	375.00	610.00	0.00	0.00	0.00	0.00	0.00	0.00	16.970	6.50	190.00	1.01	1.00	12520	17020	0.00	0.00
	20-4D	05-045-12654																																	
	20-5D	05-045-12655																																	
	20-3D	05-045-12656																																	
Chevron O06 Pad Separator																																			
Contributing Wells & API Nos.	6-18D	05-045-17270																																	
	6-17D	05-045-17271																																	
	6-5D	05-045-17272																																	
	6-6D	05-045-17273																																	
	6-7-D	05-045-17274																																	
	6-8D	05-045-17275	247.70	48.71	27.85	19.50	3918	130.50	8.78	0.00	0.000	50.23	0.278	2.5800	0.00	6700	25.00	0.00	400.00	366.00	0.00	0.00	0.00	0.00	0.00	0.00	4.900	6.00	190.00	1.01	1.00	11630	16539	0.00	0.00
	6-13D	05-045-17276																																	
	6-12D	05-045-17277																																	
	6-14D	05-045-17278																																	
	6-15D	05-045-17279																																	
6-16D	05-045-17280																																		
Chevron F06 Pad Separator																																			
Contributing Wells & API Nos.	6-22D	05-045-15123																																	
	6-37D	05-045-15289																																	
	6-38D	05-045-15290																																	
	6-35D	05-045-15291																																	
	6-36D	05-045-15292																																	
	6-19D	05-045-15293																																	
	6-23D	05-045-15294																																	
	6-20D	05-045-15295																																	
	6-32D	05-045-17231																																	
	6-21D	05-045-17232																																	
	6-25D	05-045-17233	257.80	50.48	45.80	23.90	4634	143.70	9.49	0.00	0.000	17.68	0.012	1.3700	0.00	7800	150.00	0.00	145.00	244.00	0.00	0.00	0.00	0.00	0.00	0.00	6.090	6.40	190.00	1.01	1.00	13415	18969	0.00	0.00
	6-34D	05-045-17234																																	
	6-33D	05-045-17235																																	

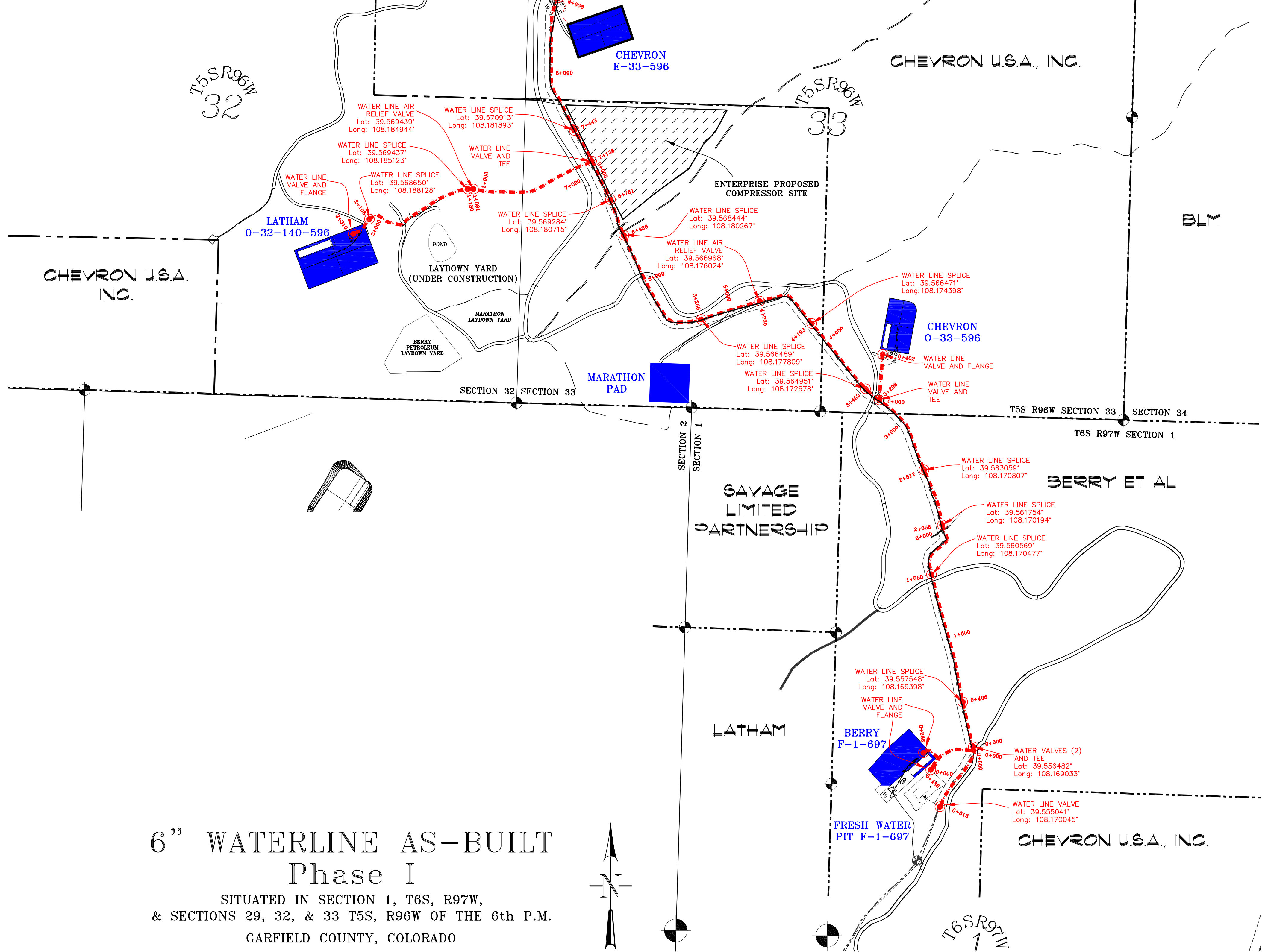
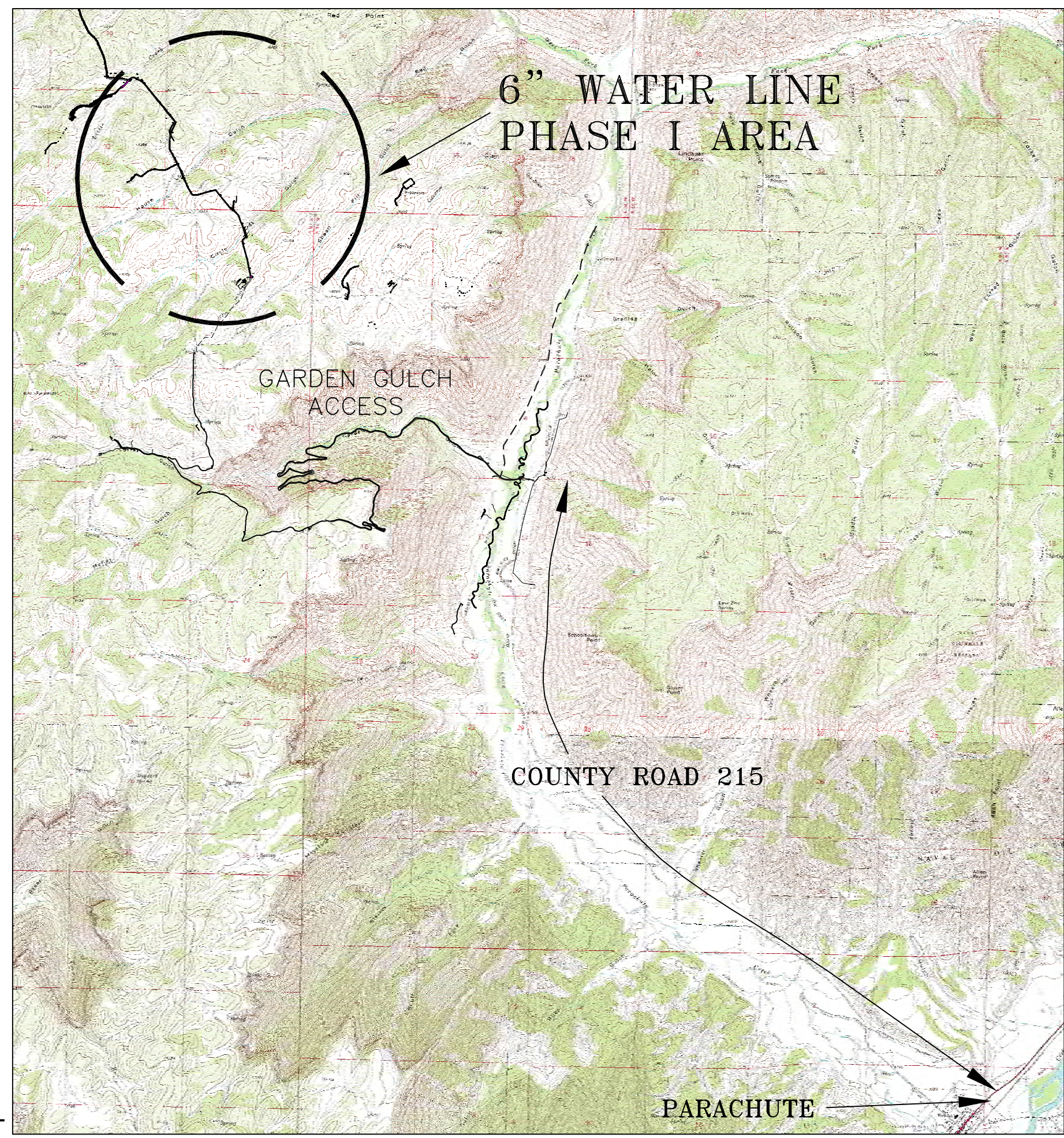
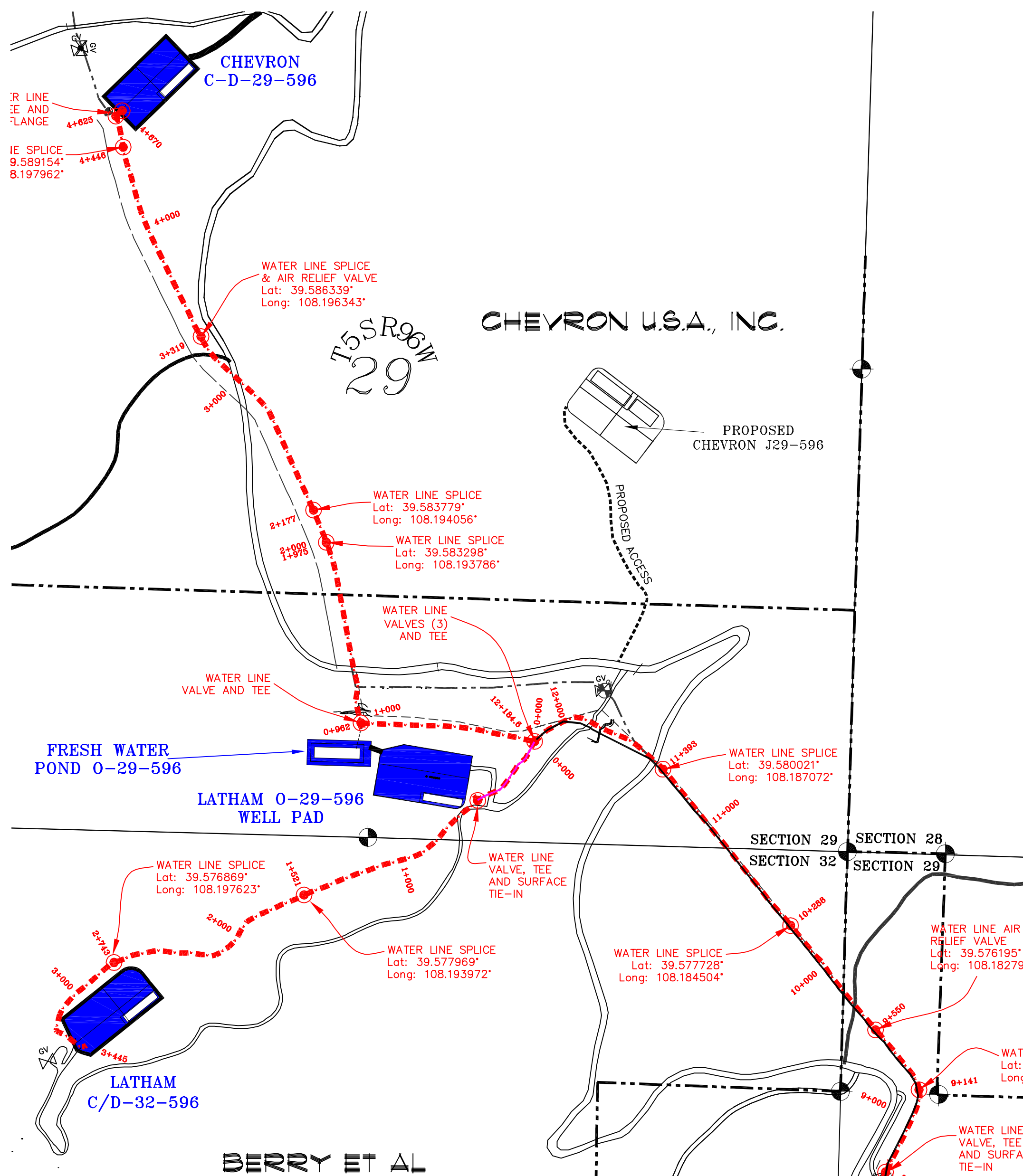
Sample Location			CATIONS												ANIONS												PARAMETERS								CRP
			Calcium	Magnesium	Barium	Strontium	Sodium	Potassium	Lithium	Ammonia	Aluminum	Iron	Manganese	Zinc	Lead	Chloride	Sulfate	Bromine	Dissolved CO2	Bicarbonate	Carbonate	Silica	Phosphate	H2S	Fluoride	Nitrate	Boron	pH	Temperature	Density	Pressure	Calculated TDS	Molar Conductivity	Field Fe	Co2 - H2S Rate
Chevron CD29 Pad																																			
Contributing Wells & API Nos.	29-11D	05-045-12871																																	
	29-12D	05-045-12872																																	
	29-8D	05-045-12873																																	
	29-7D	05-045-12874																																	
	29-16D	05-045-12875																																	
	29-15D	05-045-12876																																	
	29-14D	05-045-12877																																	
	29-13D	05-045-12878																																	
	29-3D	05-045-17201																																	
	29-5D	05-045-17202																																	
29-6D	05-045-17203																																		
Chevron I-31 Pad Separators																																			
Contributing Wells & API Nos.	31-3D	05-045-15698																																	
	31-2D	05-045-15699																																	
	31-1D	05-045-15700																																	
	31-17D	05-045-15701																																	
	31-4D	05-045-15702																																	
	31-6D	05-045-15703	244.20	47.72	37.88	21.08	4958	135.80	9.66	0.00	0.000	19.60	0.012	0.1010	0.00	8100	175.00	0.00	295.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	6.210	6.20	190.00	1.01	1.00	14323	19886	0.00	0.00
	31-7D	05-045-15704																																	
	31-8D	05-045-15705																																	
Chevron J13 Pad Separators																																			
Contributing Wells & API Nos.	33B-13R	05-045-10414																																	
	13-16D	05-045-12717																																	
	13-14D	05-045-12718																																	
	13-13D	05-045-12719																																	
	33B-13R	05-045-15112	255.10	51.51	13.80	18.68	2391	119.00	8.78	0.00	0.000	356.60	2.590	0.0820	0.00	4600	75.00	0.00	550.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	1.080	6.50	190.00	1.01	1.00	8436	11694	0.00	0.00
	275-13	05-045-15113																																	
	13-8D	05-045-15114																																	
	13-7D	05-045-15115																																	
Chevron F30 Pad Separators																																			
Contributing Wells & API Nos.	234-30	05-045-09076																																	
	33D-30	05-045-11404	280.90	52.00	36.62	25.34	4080	182.70	9.74	0.00	0.000	409.80	2.050	0.0820	0.00	7400	25.00	0.00	350.00	610.00	0.00	0.00	0.00	0.00	0.00	0.00	8.910	6.30	190.00	1.01	1.00	13232	17937	0.00	0.00
	30-4D	05-045-12659																																	
	30-1D	05-045-12660																																	
	30-2D	05-045-12661																																	
30-26D	05-045-12699																																		
Chevron O13 Pad Separator																																			
API	34B-13	05-045-13345	350.00	50.87	7.72	22.35	4275	158.80	9.12	0.00	0.000	27.20	0.012	0.0820	0.00	7500	25.00	0.00	175.00	244.00	0.00	0.00	0.00	0.00	0.00	0.00	1.850	6.30	190.00	1.01	1.00	12691	18115	0.00	0.00
Chevron O36A Pad Separators																																			
Contributing Wells & API Nos.	36-42D	05-045-10625	109.70	42.71	1.44	8.68	48	86.26	7.98	0.00	0.000	177.10	2.140	3.4200	0.00	600	100.00	0.00	366.00	125.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.60	190.00	1.01	1.00	1330	1862	0.00	0.00
	36-32D	05-045-10626																																	
	36-123D	05-045-11087																																	
	36-322D	05-045-11088																																	
	36-422D	05-045-11089																																	
	36-412D	05-045-11090																																	
	36-323D	05-045-11091																																	
	36-9D	05-045-14281																																	
	36-8D	05-045-14282																																	
	36-7D	05-045-14283																																	

			CATIONS												ANIONS												PARAMETERS							CRP	
Sample Location			Calcium	Magnesium	Barium	Strontium	Sodium	Potassium	Lithium	Ammonia	Aluminum	Iron	Manganese	Zinc	Lead	Chloride	Sulfate	Bromine	Dissolved CO2	Bicarbonate	Carbonate	Silica	Phosphate	H2S	Fluoride	Nitrate	Boron	pH	Temperature	Density	Pressure	Calculated TDS	Molar Conductivity	Field Fe	Co2 - H2S Rate
Chevron O36B Pad																																			
Contributing Wells & API Nos.	36-1D	05-045-11969	226.00	16.32	19.62	14.41	6731	48.83	1.91	0.00	2.290	166.80	1.430	2.5600	0.00	10561	5.00	0.00	500.00	876.00	0.00	7.02	0.00	0.00	0.00	0.00	0.291	6.70	120.00	1.01	1.00	19183	26489	0.00	0.00
	36-3D	05-045-11973																																	
	36-2D	05-045-11974																																	
	36-4D	05-045-12066																																	
	36-5D	05-045-12067																																	
	36-6D	05-045-12068																																	
Chevron E13 Pad Separators																																			
API Nos	13-213	05-045-10937	190.00	16.75	6.70	8.95	1026	87.57	3.02	0.00	0.346	79.88	0.012	0.0820	0.00	1800	175.00	0.00	150.00	427.00	0.00	0.00	0.00	0.00	0.00	0.00	1.990	6.80	190.00	1.00	1.00	3866	5445	0.00	0.00
	14-342D	05-045-11016																																	
Chevron E18 Pad Separators																																			
Contributing Wells & API Nos.	18-13D	05-045-12900																																	
	18-12D	05-045-12901																																	
	18-22D	05-045-12902																																	
	18-21D	05-045-12903	279.80	25.99	20.60	17.57	4521	85.53	3.83	0.00	0.000	142.00	0.012	0.0820	0.00	7500	25.00	0.00	350.00	671.00	0.00	0.00	0.00	0.00	0.00	0.00	2.850	6.80	190.00	1.01	1.00	13326	18468	0.00	0.00
	18-23D	05-045-12904																																	
	18-24D	05-045-12905																																	
	18-26D	05-045-12906																																	
	18-25D	05-045-12907																																	
	18-15D	05-045-14348																																	
	18-14D	05-045-14349																																	
Chevron EL12 Pad Separators																																			
Contributing Wells & API Nos.	12-213D	05-045-10938	138.70	29.63	13.77	14.71	4335	135.70	8.17	0.00	0.266	88.19	0.936	0.0820	0.00	6700	0.00	0.00	360.00	817.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.90	120.00	1.01	1.00	12979	18680	0.00	0.00
	12-11D	05-045-13651																																	
	11-342D	05-045-13652																																	
	11-8D	05-045-13653																																	
	12-9D	05-045-13654																																	
Latham I02 Pad Separators																																			
Contributing Wells & API Nos.	2-14D	05-045-19069	195.70	15.17	20.76	11.88	2916	65.92	4.56	0.00	0.000	48.10	0.012	1.2600	0.00	4700	125.00	0.00	225.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	3.190	6.50	190.00	1.00	1.00	8658	12375	0.00	0.00
	2-8D	05-045-19073																																	
	2-12D	05-045-19075																																	
	2-7D	05-045-19081																																	
	2-16D	05-045-19090																																	
	2-13D	05-045-19091																																	
	2-15D	05-045-19097																																	
	2-6D	05-045-19103																																	
	2-17D	05-045-19104	231.00	44.15	32.28	18.79	4675	125.30	9.85	0.00	0.000	21.91	0.012	0.0820	0.00	7800	175.00	0.00	175.00	183.00	0.00	0.00	0.00	0.00	0.00	0.00	7.070	6.50	190.00	1.01	1.00	13347	18953	0.00	0.00
Chevron H07A Pad																																			
Contributing Wells & API Nos.	6-44D	05-045-10896	237.00	47.19	8.35	20.78	5050	154.10	10.25	0.00	0.507	380.40	6.010	0.5310	0.00	8700	75.00	0.00	120.00	610.00	0.00	0.00	0.00	0.00	0.00	0.00	15.670	7.00	120.00	1.01	1.00	15395	21592	0.00	0.00
	6-43D	05-145-10897																																	
	6-444D	05-045-11161																																	
	6-442D	05-045-11211																																	

Sample Location			CATIONS												ANIONS												PARAMETERS								CRP
			Calcium	Magnesium	Barium	Strontium	Sodium	Potassium	Lithium	Ammonia	Aluminum	Iron	Manganese	Zinc	Lead	Chloride	Sulfate	Bromine	Dissolved CO2	Bicarbonate	Carbonate	Silica	Phosphate	H2S	Fluoride	Nitrate	Boron	pH	Temperature	Density	Pressure	Calculated TDS	Molar Conductivity	Field Fe	Co2 - H2S Rate
Chevron I19 Pad Separators																																			
Contributing Wells & API Nos.	20-9D	05-045-12657																																	
	20-10D	05-045-12658																																	
	19-342D	05-045-12695																																	
	19-1D	05-045-12696	269.50	52.54	23.72	11.27	40	95.74	6.40	0.00	0.716	370.40	2.570	0.9110	0.00	1000	25.00	0.00	450.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	21.020	6.90	190.00	1.00	1.00	2546	2924	0.00	0.00
	19-16D	05-045-12697																																	
	19-15D	05-045-12698																																	
	19-3D	05-045-14299																																	
	19-4D	05-045-14697																																	
Chevron J20 Pad Separators																																			
Contributing Wells & API Nos.	20-17D	05-045-12766																																	
	20-18D	05-045-12767																																	
	20-19D	05-045-12768																																	
	20-30D-ST	05-045-12769																																	
	20-21D	05-045-12770																																	
	20-28D	05-045-12771																																	
	20-32D	05-045-14044																																	
	20-31D	05-045-14045	313.90	58.59	41.17	20.77	4683	123.00	8.06	0.00	0.242	43.40	0.012	0.4120	0.00	8000	150.00	0.00	190.00	244.00	0.00	0.00	0.00	0.00	0.00	0.00	16.220	6.20	190.00	1.01	1.00	13790	19301	0.00	0.00
Chevron K17 Pad Separators																																			
Contributing Wells & API Nos.	18-1D	05-045-12344	7.82	31.63	0.20	6.42	388	63.26	4.70	0.00	0.573	94.31	0.901	0.8920	0.00	700	0.00	0.00	150.00	366.00	0.00	0.00	0.00	0.00	0.00	0.00	12.770	6.50	190.00	1.00	1.00	1788	2462	0.00	0.00
	18-2D	05-045-12345																																	
	18-5D	05-045-12346																																	
	18-4D	05-045-12347																																	
	18-3D	05-045-12348																																	
Chevron L04 Pad Separator																																			
Contributing Wells & API Nos.	5-2D	05-045-12343																																	
	5-3D	05-045-12349																																	
	5-1D	05-045-12350	456.90	41.23	28.87	33.35	3835	101.40	6.37	0.00	0.396	139.70	2.110	0.0880	0.00	6800	10.00	0.00	425.00	732.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	7.00	190.00	1.01	1.00	12236	17161	0.00	0.00
	5-4D	05-045-12352																																	
Latham O32 Separators																																			
Contributing Wells & API Nos.	32-3D	05-045-13636																																	
	32-14D	05-045-13637																																	
	32-2D	05-045-13638																																	
	32-10D	05-045-13639																																	
	32-9D	05-045-13640																																	
	32-11D	05-045-13641																																	
	32-12D	05-045-13642																																	
	32-1D	05-045-14192	235.20	46.07	31.47	20.09	3939	154.30	10.19	0.00	0.000	76.45	0.228	0.4240	0.00	6700	25.00	0.00	395.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	8.300	6.30	190.00	1.01	1.00	11826	16631	0.00	0.00
Chevron M04 Pad Separator																																			
Contributing Wells & API Nos.	5-333D	05-045-11254																																	
	5-432D	05-045-11255																																	
	5-433D	05-045-11256	233.00	15.31	18.56	15.23	4379	38.29	1.24	0.00	0.289	35.99	0.858	0.6440	0.00	6700	45.00	0.00	854.00	275.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.40	120.00	1.01	1.00	13435	18567	0.00	0.00
	5-332D	05-045-11257																																	

Sample Location			CATIONS												ANIONS												PARAMETERS								CRP
			Calcium	Magnesium	Barium	Strontium	Sodium	Potassium	Lithium	Ammonia	Aluminum	Iron	Manganese	Zinc	Lead	Chloride	Sulfate	Bromine	Dissolved CO2	Bicarbonate	Carbonate	Silica	Phosphate	H2S	Fluoride	Nitrate	Boron	pH	Temperature	Density	Pressure	Calculated TDS	Molar Conductivity	Field Fe	Co2 - H2S Rate
Berry F01 Pad Separators																																			
Contributing Wells & API Nos.	1-21D	05-045-14204																																	
	1-36D	05-045-14619																																	
	1-35D	05-045-14620																																	
	1-34D	05-045-14621																																	
	1-33D	05-045-14622																																	
	1-32D	05-045-14623																																	
	1-31D	05-045-14624																																	
	1-22D	05-045-14625																																	
	1-17D	05-045-14626																																	
	1-18D	05-045-14627	338.60	20.51	31.08	24.40	6232	128.70	8.12	0.00	0.000	55.72	0.012	0.0820	0.00	10500	0.00	0.00	432.00	225.00	0.00	0.00	0.00	0.00	0.00	0.00	5.430	6.90	190.00	1.01	1.00	17555	24594	0.00	0.00
1-19D	05-045-14628	276.40	32.29	32.58	22.42	5454	133.80	8.05	0.00	0.206	402.60	3.930	0.0820	0.00	9000	35.00	0.00	490.00	854.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.98	120.00	1.01	1.00	17200	22959	0.00	0.00	
1-20D	05-045-14629																																		
Chevron Q33 Pad Separators																																			
Contributing Wells & API Nos.	1-30D	05-045-14585	156.70	34.38	32.71	21.48	6854	168.40	9.01	0.00	0.20	54.61	0.402	0.0820	0.00	10800	10.00	0.00	390.00	598.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.70	120.00	1.01	1.00	19496	27122	0.00	0.00
	1-29D	05-045-14586																																	
	33-13D	05-045-14587																																	
	33-12D	05-045-14588																																	
	33-11D	05-045-14589																																	
	33-10D	05-045-14590																																	
	33-9D	05-045-14591	214.80	45.35	41.96	22.27	6248	128.10	4.21	0.00	0.000	340.30	1.980	0.0820	0.00	10500	25.00	0.00	350.00	610.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.40	190.00	1.01	1.00	18209	24732	0.00	0.00
	33-3D	05-045-14592																																	
	33-2D	05-045-14593																																	
33-1D	05-045-14594																																		
Chevron E33 Pad Separators																																			
Contributing Wells & API Nos.	33-18D	05-045-15279	228.60	42.82	37.64	22.56	4818	114.70	10.79	0.00	0.000	64.66	0.012	0.0820	0.00	8100	0.00	0.00	325.00	366.00	0.00	0.00	0.00	0.00	0.00	0.00	11.930	6.30	190.00	1.01	1.00	13896	19578	0.00	0.00
	33-19D	05-045-15280																																	
	33-22D	05-045-15281																																	
	33-24D	05-045-15282																																	
	33-23D	05-045-15283	123.90	28.34	33.70	21.19	5755	134.50	10.30	0.00	0.000	34.23	0.313	0.0820	0.00	8900	5.00	0.00	450.00	647.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.60	120.00	1.01	1.00	16566	23457	0.00	0.00
	33-21D	05-145-15284																																	
	33-21D	05-145-15285																																	
	33-20D	05-145-15286																																	
	33-17D	05-145-15287																																	

			CATIONS												ANIONS												PARAMETERS							CRP	
Sample Location			Calcium	Magnesium	Barium	Strontium	Sodium	Potassium	Lithium	Ammonia	Aluminum	Iron	Manganese	Zinc	Lead	Chloride	Sulfate	Bromine	Dissolved CO2	Bicarbonate	Carbonate	Silica	Phosphate	H2S	Fluoride	Nitrate	Boron	pH	Temperature	Density	Pressure	Calculated TDS	Molar Conductivity	Field Fe	Co2 - H2S Rate
Latham CD32 Pad Separators																																			
Contributing Wells & API Nos.	32-21D	05-045-13686																																	
	32-32D	05-045-13687																																	
	32-31D	05-045-13688																																	
	32-30D	05-045-13689																																	
	32-29D	05-045-13690	109.30	27.98	36.47	19.35	6273	138.00	10.27	0.00	0.000	13.22	0.024	0.0820	0.00	9600	5.00	0.00	325.00	854.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.70	120.00	1.01	1.00	17713	25061	0.00	0.00
	32-22D	05-045-13691																																	
	32-23D	05-045-13692																																	
	32-24D	05-045-13693	206.00	41.66	37.33	21.23	3963	119.40	11.00	0.00	0.000	42.48	0.012	0.3410	0.00	6600	25.00	0.00	310.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	13.870	6.40	190.00	1.01	1.00	11677	16485	0.00	0.00
Latham O29 Pad Separators																																			
Contributing Wells & API Nos.	29-26D	05-045-13643																																	
	29-25D	05-045-13644	116.90	27.92	21.64	16.51	6359	138.40	9.35	0.00	0.000	66.27	0.604	0.0820	0.00	9990	5.00	0.00	410.00	598.00	0.00	0.00	0.00	0.00	0.00	0.00	0.291	6.40	120.00	1.01	1.00	18056	25459	0.00	0.00
	29-29D	05-045-13645																																	
	29-30D	05-045-13646																																	
	29-19D	05-045-13647																																	
	29-17D	05-045-13648																																	
	29-18D	05-045-13649	226.10	52.67	35.14	28.16	4969	154.90	11.46	0.00	0.000	53.63	0.012	0.0820	0.00	8300	25.00	0.00	225.00	488.00	0.00	0.00	0.00	0.00	0.00	0.00	6.360	6.30	190.00	1.01	1.00	14420	20147	0.00	0.00
	29-27D	05-045-13650																																	



6" WATERLINE AS-BUILT Phase I

SITUATED IN SECTION 1, T6S, R97W,
& SECTIONS 29, 32, & 33 T5S, R96W OF THE 6th P.M.
GARFIELD COUNTY, COLORADO

PREPARED FOR: BERRY PETROLEUM COMPANY



CONSTRUCTION SURVEYS, INC.
2012 SUNRISE BLVD.
SILT, CO 81652
970-876-5753

SURVEYED BY: BW	DRAFTED BY: BM	CHECKED BY: GB
DATE: 09/25/2009	DWG: BERRY\2006\6 WATERLINE ASB.dwg	SHEET 1 OF 1



02171071

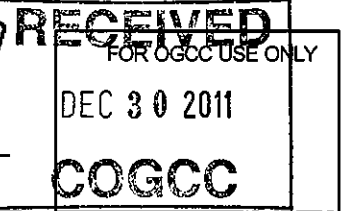
FORM

26

Rev 6/99

State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109



SOURCE OF PRODUCED WATER FOR DISPOSAL

This form must be completed for any new disposal site and for any change in sources of produced water for an existing disposal site.

Complete the
Attachment Checklist

OGCC Operator Number: 10091
 Name of Operator: BERRY PETROLEUM COMPANY
 Address: 1999 BROADWAY SUITE 3700
 City: DENVER State: CO Zip: 80202
 Contact Name and Telephone:
HEIDI BANG
 No: 303-999-4262
 Fax: 303-999-4362

Chemical Analysis of fluid	Oper. OGCC

OGCC Disposal Facility Number: _____
 Operator's Disposal Facility Name: LATHAM Operator's Disposal Facility Number: 29-17D
 Location (QtrQtr, Sec, Twp, Rng, Meridian): SWSE 29 5S 96W 6 PM
 Address: 235 CALLAHAN AVE
 City: PARACHUTE State: CO Zip: 81635 County: GARFIELD

If more space is required,
attach additional sheet.

Add Source: OGCC Lease No: 335872 API No: SEE ATTACHED Well Name & No: SEE ATTACHED
☒ Operator Name: BERRY PETROLEUM COMPANY Operator No: 10091
Delete Source: Location: QtrQtr: SWSE Section: 33 Township: 5S Range: 96W Producing Formation: WILLIAMS FORK
☐ Analysis Attached? ☒ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: 19,496

Add Source: OGCC Lease No: 335917 API No: SEE ATTACHED Well Name & No: SEE ATTACHED
☒ Operator Name: BERRY PETROLEUM COMPANY Operator No: 10091
Delete Source: Location: QtrQtr: SWNW Section: 33 Township: 5S Range: 96W Producing Formation: WILLIAMS FORK
☐ Analysis Attached? ☒ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: 16,566

Add Source: OGCC Lease No: 335716 API No: SEE ATTACHED Well Name & No: SEE ATTACHED
☒ Operator Name: BERRY PETROLEUM COMPANY Operator No: 10091
Delete Source: Location: QtrQtr: SENW Section: 1 Township: 6S Range: 97W Producing Formation: WILLIAMS FORK
☐ Analysis Attached? ☒ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: 17,200

Add Source: OGCC Lease No: 335842 API No: SEE ATTACHED Well Name & No: SEE ATTACHED
☒ Operator Name: BERRY PETROLEUM COMPANY Operator No: 10091
Delete Source: Location: QtrQtr: NWNW Section: 32 Township: 5S Range: 96W Producing Formation: WILLIAMS FORK
☐ Analysis Attached? ☒ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: 17,713

Add Source: OGCC Lease No: 335836 API No: SEE ATTACHED Well Name & No: SEE ATTACHED
☒ Operator Name: BERRY PETROLEUM COMPANY Operator No: 10091
Delete Source: Location: QtrQtr: SWSE Section: 29 Township: 5S Range: 96W Producing Formation: WILLIAMS FORK
☐ Analysis Attached? ☒ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: 18,056

Add Source: OGCC Lease No: _____ API No: _____ Well Name & No: _____
☐ Operator Name: _____ Operator No: _____
Delete Source: Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: _____
☐ Analysis Attached? ☐ Yes ☒ No Transported to disposal site via: ☐ Pipeline ☐ Truck TDS: _____

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: HEIDI BANGSigned: Heidi BangTitle: REGULATORY COMPLIANCE ASSTDate: 12/30/11OGCC Approved: David AndersonTitle: FE IIDate: 8/13/2012

CONDITIONS OF APPROVAL, IF ANY:

COGIS - LOCATION Information**RECEIVED**

DEC 30 2011

COGCC



 Related ● GIS Doc 
CHEVRON - #335872 InformationLocation ID: **335872**Location Status: **AC**Operator Name: **BERRY PETROLEUM COMPANY**County: **GARFIELD - #045**Facility Type: **LOCATION**

Form 2A Document #:

Status: ACLocation Name/No: **CHEVRON /O33 596**Status Date: **4/14/2009**Operator Number: **10091**Location: **SWSE 33 5S 96W**Lat/Long: **39.566414/-108.171781**Form 2A Expiration: **N/A****Location Inventory**

Special Purpose Pits: Drilling Pits:

Condensate Tanks: Water Tanks:

Gas or Diesel Motors: Cavity Pumps:

Electric Generators: Gas Pipeline:

Gas Compressors: VOC Combustor:

Multi-Well Pits: Pigging Station:

:

Wells:

Separators:

LACT Unit:

Oil Pipeline:

Oil Tanks:

Flare:

Production Pits:

Electric Motors:

Pump Jacks:

Water Pipeline:

Dehydrator Units:

Fuel Tanks:

Facility Well(s)API Number: **05-045-14585**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-14586**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-14587**Well Status: **XX**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-14588**Well Status: **XX**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-14589**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-14590**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-14591**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-14592**Operator Name: **BERRY PETROLEUM COMPANY #**

Well Status: **XX**

API Number: **05-045-14593**

Well Status: **XX**

Operator Name: **BERRY PETROLEUM COMPANY #**

API Number: **05-045-14594**

Well Status: **PR**

Operator Name: **BERRY PETROLEUM COMPANY #**



JACAM LABORATORIES

DownHole Rx
WATER CHEMISTRY

RECEIVED
DEC 30 2011
COGCC

BERRY PETROLEUM
ROB SIMEONE

O-33 CHEVRON 1-30D
SEPARATOR

Report Date: 10-19-2011 Sampled: 10-04-2011
Sample #: 9647 at 0000

CATIONS

Calcium (as Ca)	156.70
Magnesium (as Mg)	34.38
Barium (as Ba)	32.71
Strontium (as Sr)	21.48
Sodium (as Na)	6854
Potassium (as K)	168.40
Lithium (as Li)	9.01
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.197
Iron (as Fe)	54.61
Manganese (as Mn)	0.402
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	10800
Sulfate (as SO ₄)	10.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	390.00
Bicarbonate (as HCO ₃)	598.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	0.00
Phosphate (as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

pH	6.70
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	19496
Molar Conductivity	27122
Field Fe	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
--	------

JACAM LABORATORIES
205 S. Broadway • P.O. Box 96 • Sterling, KS 67579-0096

COGIS - LOCATION Information

DEC 30 2011

COGCC

   **CHEVRON E33 596 - #335917 Information****Status: XX**

Location ID:	335917	Location Name/No:	CHEVRON E33 596 /
Location Status:	XX	Status Date:	4/14/2009
Operator Name:	BERRY PETROLEUM COMPANY	Operator Number:	10091
County:	GARFIELD - #045	Location:	SWNW 33 5S 96W
Facility Type:	LOCATION	Lat/Long:	39.573411/-108.18135
Form 2A Document #:		Form 2A Expiration:	N/A

Location Inventory

Special Purpose Pits:	Drilling Pits:	Wells:	Production Pits:
Condensate Tanks:	Water Tanks:	Separators:	Electric Motors:
Gas or Diesel Motors:	Cavity Pumps:	LACT Unit:	Pump Jacks:
Electric Generators:	Gas Pipeline:	Oil Pipeline:	Water Pipeline:
Gas Compressors:	VOC Combustor:	Oil Tanks:	Dehydrator Units:
Multi-Well Pits:	Pigging Station:	Flare:	Fuel Tanks:

:

Facility Well(s)

API Number:	<u>05-045-15279</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-15280</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-15281</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-15282</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-15283</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-15284</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-15285</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	AL		
API Number:	<u>05-045-15286</u>	Operator Name:	BERRY PETROLEUM COMPANY #

Well Status: **PR**

API Number: **05-045-15287**

Operator Name: **BERRY PETROLEUM COMPANY #**

Well Status: **DG**



JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

RECEIVED

DEC 30 2011

COGCC

BERRY PETROLEUM
RON SIMEONE

E-33 CHEVRON 33-23D
SEPARATOR

Report Date: 10-19-2011 Sampled: 10-04-2011
Sample #: 9610 at 0000

CATIONS

Calcium (as Ca)	123.90
Magnesium (as Mg)	28.34
Barium (as Ba)	33.70
Strontium (as Sr)	21.19
Sodium (as Na)	5755
Potassium (as K)	134.50
Lithium (as Li)	10.30
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	34.23
Manganese (as Mn)	0.313
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	8900
Sulfate (as SO ₄)	5.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	450.00
Bicarbonate (as HCO ₃)	647.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	0.00
Phosphate (as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

pH	6.60
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	16566
Molar Conductivity	23457
Field Fe	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
--	------

JACAM LABORATORIES

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COGIS - LOCATION Information

DEC 30 2011

COGCC

 [Related](#)  [GIS](#)  [Doc](#) **BERRY F01 697 - #335716 Information****Status: AC**

Location ID:	335716	Location Name/No:	BERRY F01 697 /
Location Status:	AC	Status Date:	4/14/2009
Operator Name:	BERRY PETROLEUM COMPANY	Operator Number:	10091
County:	GARFIELD - #045	Location:	SEW 1 6S 97W
Facility Type:	LOCATION	Lat/Long:	39.556015/-108.171068
Form 2A Document #:		Form 2A Expiration:	N/A

Location Inventory

Special Purpose Pits:	Drilling Pits:	Wells:	Production Pits:
Condensate Tanks:	Water Tanks:	Separators:	Electric Motors:
Gas or Diesel Motors:	Cavity Pumps:	LACT Unit:	Pump Jacks:
Electric Generators:	Gas Pipeline:	Oil Pipeline:	Water Pipeline:
Gas Compressors:	VOC Combustor:	Oil Tanks:	Dehydrator Units:
Multi-Well Pits:	Pigging Station:	Flare:	Fuel Tanks:

:

Facility Well(s)

API Number:	<u>05-045-14204</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-14619</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-14620</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	XX		
API Number:	<u>05-045-14621</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	XX		
API Number:	<u>05-045-14622</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	XX		
API Number:	<u>05-045-14623</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	XX		
API Number:	<u>05-045-14624</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	XX		
API Number:	<u>05-045-14625</u>	Operator Name:	BERRY PETROLEUM COMPANY #

Well Status: **PR**

API Number: **05-045-14626**
Well Status: **XX**

Operator Name: **BERRY PETROLEUM COMPANY #**

API Number: **05-045-14627**
Well Status: **PR**

Operator Name: **BERRY PETROLEUM COMPANY #**

API Number: **05-045-14628**
Well Status: **PR**

Operator Name: **BERRY PETROLEUM COMPANY #**

API Number: **05-045-14629**
Well Status: **PR**

Operator Name: **BERRY PETROLEUM COMPANY #**



JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

RECEIVED

DEC 30 2011

COGCC

BERRY PETROLEUM
ROB SIMEONE

F-1 BERRY 1-19D
SEPARATOR

Report Date: 10-19-2011
Sample #: 9649

Sampled: 10-04-2011
at 0000

CATIONS

Calcium (as Ca)	276.40
Magnesium (as Mg)	32.29
Barium (as Ba)	32.58
Strontium (as Sr)	22.42
Sodium (as Na)	5454
Potassium (as K)	133.80
Lithium (as Li)	8.05
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.206
Iron (as Fe)	402.60
Manganese (as Mn)	3.93
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	9000
Sulfate (as SO ₄)	35.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	490.00
Bicarbonate (as HCO ₃)	854.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	0.00
Phosphate (as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

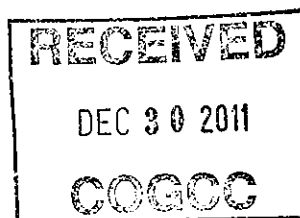
pH	6.98
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	17200
Molar Conductivity	22959
Field Fe	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
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JACAM LABORATORIES

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COGIS - LOCATION Information

[Related](#) [GIS](#) [Doc](#)

Latham - #335842 Information**Status: XX**

Location ID: **335842** Location Name/No: **Latham /CD-32 596**
Location Status: **XX** Status Date: **4/14/2009**
Operator Name: **BERRY PETROLEUM COMPANY** Operator Number: **10091**
County: **GARFIELD - #045** Location: **NWNW 32 5S 96W**
Facility Type: **LOCATION** Lat/Long: **39.57626/-108.197481**
Form 2A Document #: **400133999** Form 2A Expiration: **3/31/2014**

Location Inventory

Special Purpose Pits:	Drilling Pits:	Wells:	8	Production Pits:	1
Condensate Tanks:	4	Water Tanks:	1	Electric Motors:	
Gas or Diesel Motors:		Cavity Pumps:		Pump Jacks:	
Electric Generators:		Gas Pipeline:	1	Water Pipeline:	1
Gas Compressors:		VOC Combustor:		Dehydrator Units:	
Multi-Well Pits:		Pigging Station:		Fuel Tanks:	
:					

Facility Well(s)

API Number:	<u>05-045-13686</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-13687</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-13688</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-13689</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-13690</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-13691</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-13692</u>	Operator Name:	BERRY PETROLEUM COMPANY #
Well Status:	PR		
API Number:	<u>05-045-13693</u>	Operator Name:	BERRY PETROLEUM COMPANY #

Well Status: **PR**



JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

RECEIVED

DEC 30 2011

COGCC

BERRY PETROLEUM
RON SIMEONE

CD-32 LATHAM 32-29D
SEPARATOR

Report Date: 10-19-2011
Sample #: 9626

Sampled: 10-04-2011
at 0000

CATIONS

Calcium (as Ca)	109.30
Magnesium (as Mg)	27.98
Barium (as Ba)	36.47
Strontium (as Sr)	19.35
Sodium (as Na)	6273
Potassium (as K)	138.00
Lithium (as Li)	10.27
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	13.22
Manganese (as Mn)	0.0240
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	9600
Sulfate (as SO ₄)	5.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	325.00
Bicarbonate (as HCO ₃)	854.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	0.00
Phosphate (as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

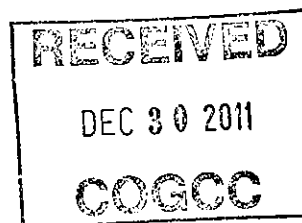
pH	6.70
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	17713
Molar Conductivity	25061
Field Fe	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
--	------

JACAM LABORATORIES

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

COGIS - LOCATION Information

Related
 GIS
 Doc

LATHAM - #335836 InformationLocation ID: **335836**Location Status: **AC**Operator Name: **BERRY PETROLEUM COMPANY**County: **GARFIELD - #045**Facility Type: **LOCATION**

Form 2A Document #:

Status: ACLocation Name/No: **LATHAM /O29 696**Status Date: **4/14/2009**Operator Number: **10091**Location: **SWSE 29 5S 96W**Lat/Long: **39.57987/-108.191671**Form 2A Expiration: **N/A****Location Inventory**

Special Purpose Pits: Drilling Pits:

Condensate Tanks: Water Tanks:

Gas or Diesel Motors: Cavity Pumps:

Electric Generators: Gas Pipeline:

Gas Compressors: VOC Combustor:

Multi-Well Pits: Pigging Station:

:

Wells:

Separators:

LACT Unit:

Oil Pipeline:

Oil Tanks:

Flare:

Production Pits:

Electric Motors:

Pump Jacks:

Water Pipeline:

Dehydrator Units:

Fuel Tanks:

Facility Well(s)API Number: **05-045-13643**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-13644**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-13645**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-13646**Well Status: **DA**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-13647**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-13648**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-13649**Well Status: **PR**Operator Name: **BERRY PETROLEUM COMPANY #**API Number: **05-045-13650**Operator Name: **BERRY PETROLEUM COMPANY #**

Well Status: **PR**



JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

RECEIVED

DEC 30 2011

COGCC

BERRY PETROLEUM
ROB SIMEONE

O-29 LATHAM 29-25D
SEPARATOR

Report Date: 10-19-2011 Sampled: 10-04-2011
Sample #: 9631 at 0000

CATIONS

Calcium (as Ca)	116.90
Magnesium (as Mg)	27.92
Barium (as Ba)	21.64
Strontium (as Sr)	16.51
Sodium (as Na)	6359
Potassium (as K)	138.40
Lithium (as Li)	9.35
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	66.27
Manganese (as Mn)	0.604
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	9900
Sulfate (as SO ₄)	5.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	410.00
Bicarbonate (as HCO ₃)	598.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	0.00
Phosphate (as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

pH	6.40
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	18056
Molar Conductivity	25459
Field Fe	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
--	------

JACAM LABORATORIES

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

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109



FOR OGCC USE ONLY

SOURCE OF PRODUCED WATER FOR DISPOSAL

This form must be completed for any new disposal site and for any change in sources of produced water for an existing disposal site.

**Complete the
Attachment Checklist**

OGCC Operator Number: _____	Contact Name and Telephone: _____
Name of Operator: _____	_____
Address: _____	No: _____
City: _____ State: _____ Zip: _____	Fax: _____

Oper OGCC	
Chemical Analysis of fluid	

OGCC Disposal Facility Number: _____
Operator's Disposal Facility Name: _____ Operator's Disposal Facility Number: _____
Location (QtrQtr, Sec, Twp, Rng, Meridian): _____
Address: _____
City: _____ State: _____ Zip: _____ County: _____

If more space is required,
attach additional sheet.

Add Source: OGCC Lease No: _____ API No: _____ Well Name & No: _____
Operator Name: _____ Operator No: _____

Delete Source: Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: _____
Analysis Attached? Yes No Transported to disposal site via: Pipeline Truck TDS: _____

Add Source: OGCC Lease No: _____ API No: _____ Well Name & No: _____
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Delete Source: Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: _____
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I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: _____ Signed: _____

Title: _____ Date: _____

OGCC Approved: _____ Title: _____ Date: _____

CONDITIONS OF APPROVAL, IF ANY:

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109



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	Oper	OGCC
Chemical Analysis of fluid		

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Operator's Disposal Facility Name: _____ Operator's Disposal Facility Number: _____
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	Oper	OGCC
Chemical Analysis of fluid		

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Print Name: _____ Signed: _____

Title: _____ Date: _____

OGCC Approved: _____ Title: _____ Date: _____

CONDITIONS OF APPROVAL, IF ANY:



JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

C-19 CHEVRON 19-21D
SEPARATOR

Report Date: 11-18-2013 Sampled: 10-29-2013
Sample #: 2580 at 0000

Sample ID: 56542

CATIONS

Calcium (as Ca)	350.20
Magnesium (as Mg)	61.18
Barium (as Ba)	36.76
Strontium (as Sr)	21.22
Sodium (as Na)	4879
Potassium (as K)	121.60
Lithium (as Li)	8.88
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.790
Iron (as Fe)	487.70
Manganese (as Mn)	2.63
Zinc (as Zn)	2.77
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	8900
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	625.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	19.32

PARAMETERS

Calculated T.D.S.	15504
Molar Conductivity	20910
Resistivity	47.82
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0615
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.70

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM
ROB SIMEONEC-19 CHEVRON 19-21D
SEPARATOR

Report Date: 11-18-2013 Sampled: 10-29-2013
Sample #: 2580 at 0000

Sample ID: 56542

SATURATION LEVEL

Calcite (CaCO ₃)	3.25
Aragonite (CaCO ₃)	2.65
Witherite (BaCO ₃)	0.0755
Strontianite (SrCO ₃)	0.462
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	1.12
Anhydrite (CaSO ₄)	0.0101
Gypsum (CaSO ₄ *2H ₂ O)	0.00740
Barite (BaSO ₄)	4.80
Celestite (SrSO ₄)	0.0164
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	25574
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	14547
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.258
Aragonite (CaCO ₃)	0.232
Witherite (BaCO ₃)	-6.47
Strontianite (SrCO ₃)	-0.587
Calcium oxalate (CaC ₂ O ₄)	-0.149
Magnesite (MgCO ₃)	0.0343
Anhydrite (CaSO ₄)	-395.00
Gypsum (CaSO ₄ *2H ₂ O)	-550.95
Barite (BaSO ₄)	9.00
Celestite (SrSO ₄)	-88.84
Fluorite (CaF ₂)	-16.34
Calcium phosphate	>-0.001
Hydroxyapatite	-483.09
Silica (SiO ₂)	-151.08
Brucite (Mg(OH) ₂)	0.0480
Magnesium silicate	-165.85
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.431
Halite (NaCl)	-206732
Thenardite (Na ₂ SO ₄)	-55877
Iron sulfide (FeS)	-0.00208

SIMPLE INDICES

Langelier	0.593
Ryznar	5.51
Puckorius	3.86
Larson-Skold Index	31.09
Stiff Davis Index	1.35
Oddo-Tomson	0.678

BOUND IONS

Calcium	350.20	335.44
Barium	36.76	36.76
Carbonate	13.34	0.641
Phosphate	0.00	0.00
Sulfate	25.00	16.50

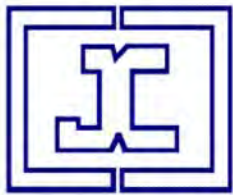
TOTAL**FREE****OPERATING CONDITIONS**

Temperature (°F)	190.00
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

BERRY PETROLEUM
C-19 CHEVRON 19-21D
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 56542
Report Date: 11-18-2013
Sample Date: 10-29-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	350.20
Magnesium(as Mg)	61.18
Barium(as Ba)	36.76
Strontium(as Sr)	21.22
Sodium(as Na)	4879
Potassium(as K)	121.60
Lithium(as Li)	8.88
Iron(as Fe)	487.70
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.790
Manganese(as Mn)	2.63
Zinc(as Zn)	2.77
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	8900
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	625.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
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Boron(as B)	19.32

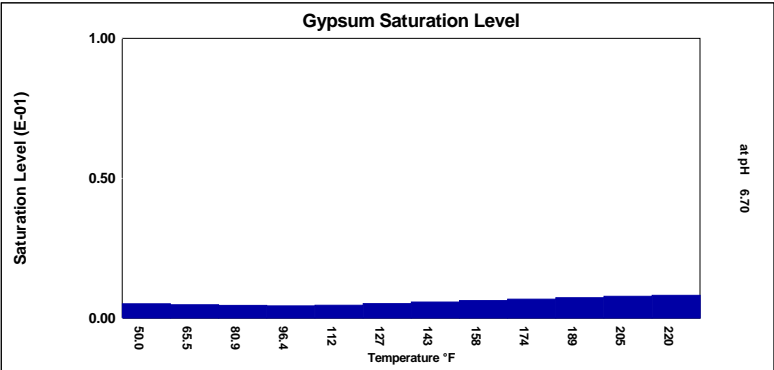
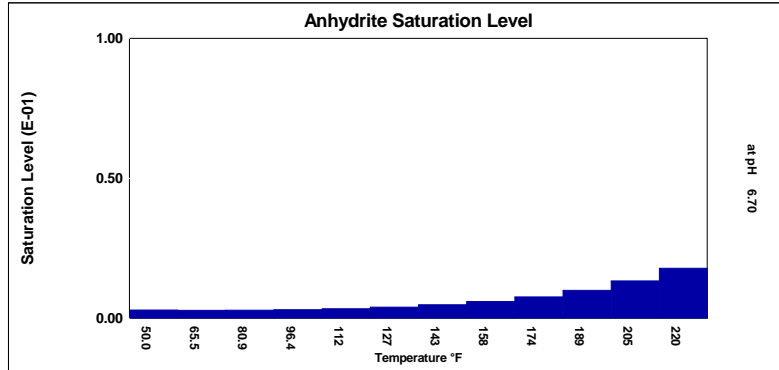
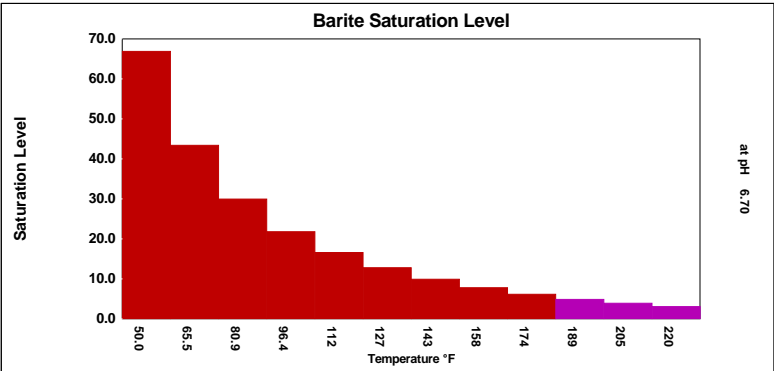
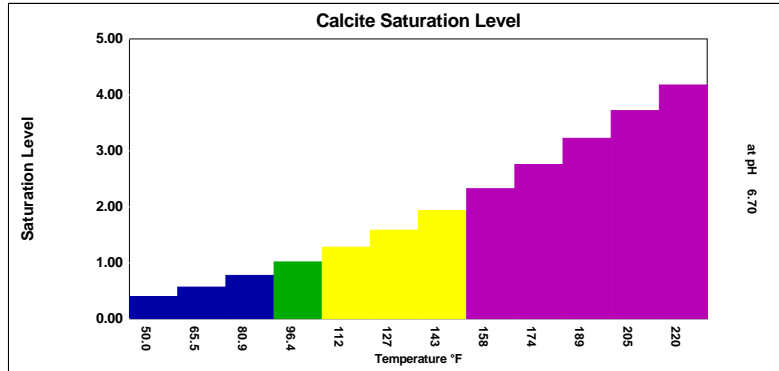
PARAMETERS

Temperature(°F)	190.00
T.D.S.	15504
Resistivity:	47.82

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.397	-0.160	0.00292	-942.98	0.00517	-755.08	66.85	15.09	0.0151	-99.36	786.43	0.122	0.00	-0.00136	0.0737	0.0615
65.45	0.00	0.568	-0.101	0.00281	-954.18	0.00481	-780.72	43.40	14.53	0.0141	-102.49	1265	0.153	0.00	-0.00140	0.138	0.0615
80.91	0.00	0.776	-0.0462	0.00286	-934.20	0.00457	-797.16	29.93	13.94	0.0139	-102.19	1928	0.185	0.00	-0.00145	0.108	0.0615
96.36	0.00	1.01	0.00270	0.00306	-888.18	0.00442	-805.11	21.79	13.34	0.0143	-100.07	2796	0.217	0.00	-0.00150	0.141	0.0615
111.82	0.00	1.28	0.0464	0.00343	-822.36	0.00468	-770.41	16.57	12.74	0.0148	-97.25	3880	0.246	0.00	-0.00157	0.148	0.0615
127.27	0.00	1.58	0.0886	0.00399	-743.24	0.00522	-712.37	12.76	12.10	0.0153	-94.81	5260	0.278	0.00	-0.00164	0.124	0.0615
142.73	0.00	1.93	0.130	0.00480	-656.80	0.00577	-662.77	9.92	11.42	0.0157	-92.79	6982	0.313	0.00	-0.00172	0.101	0.0615
158.18	0.00	2.32	0.172	0.00597	-568.17	0.00632	-620.31	7.76	10.69	0.0160	-91.15	9075	0.349	0.00	-0.00182	0.105	0.0615
173.64	0.00	2.76	0.214	0.00762	-481.47	0.00686	-583.95	6.12	9.90	0.0162	-89.87	11545	0.388	0.00	-0.00193	0.108	0.0615
189.09	0.00	3.22	0.256	0.00996	-399.77	0.00737	-552.86	4.86	9.06	0.0163	-88.92	14367	0.429	0.00	-0.00207	0.0547	0.0615
204.55	0.00	3.72	0.298	0.0133	-325.15	0.00786	-526.36	3.89	8.15	0.0164	-88.28	17473	0.471	0.00	-0.00224	0.0458	0.0615
220.00	0.171	4.18	0.341	0.0178	-263.44	0.00819	-511.92	3.07	7.12	0.0161	-89.13	20547	0.519	0.00	-0.00250	0.0624	0.0720
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

C-20 CHEVRON 20-1D
SEPARATOR

Report Date: 11-18-2013 Sampled: 10-29-2013
Sample #: 2580 at 0000

Sample ID: 56541

CATIONS

Calcium (as Ca)	344.60
Magnesium (as Mg)	64.04
Barium (as Ba)	29.37
Strontium (as Sr)	21.88
Sodium (as Na)	3823
Potassium (as K)	131.80
Lithium (as Li)	7.47
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.626
Iron (as Fe)	338.20
Manganese (as Mn)	6.43
Zinc (as Zn)	0.863
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	7000
Sulfate (as SO ₄)	0.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	375.00
Bicarbonate (as HCO ₃)	610.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	16.97

PARAMETERS

Calculated T.D.S.	12520
Molar Conductivity	17020
Resistivity	58.75
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.107
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.50

JACAM LABORATORIES

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



DEPOSITION POTENTIAL INDICATORS

C-20 CHEVRON 20-1D
SEPARATOR

Report Date:	11-18-2013	Sampled:	10-29-2013
Sample #:	2580		at 0000
Sample ID:	56541		

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	2.79	Calcite (CaCO ₃)	0.182
Aragonite (CaCO ₃)	2.27	Aragonite (CaCO ₃)	0.159
Witherite (BaCO ₃)	0.0541	Witherite (BaCO ₃)	-6.59
Strontianite (SrCO ₃)	0.426	Strontianite (SrCO ₃)	-0.526
Calcium oxalate (CaC ₂ O ₄)	0.00	Calcium oxalate (CaC ₂ O ₄)	-0.132
Magnesite (MgCO ₃)	1.02	Magnesite (MgCO ₃)	0.00396
Anhydrite (CaSO ₄)	0.00	Anhydrite (CaSO ₄)	-364.41
Gypsum (CaSO ₄ *2H ₂ O)	0.00	Gypsum (CaSO ₄ *2H ₂ O)	-506.85
Barite (BaSO ₄)	0.00	Barite (BaSO ₄)	-2.66
Celestite (SrSO ₄)	0.00	Celestite (SrSO ₄)	-86.04
Fluorite (CaF ₂)	0.00	Fluorite (CaF ₂)	-15.60
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-456.53
Silica (SiO ₂)	0.00	Silica (SiO ₂)	-151.76
Brucite (Mg(OH) ₂)	< 0.001	Brucite (Mg(OH) ₂)	0.0295
Magnesium silicate	0.00	Magnesium silicate	-161.28
Iron hydroxide (Fe(OH) ₃)	7981	Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	0.00	Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	9064	Siderite (FeCO ₃)	0.328
Halite (NaCl)	< 0.001	Halite (NaCl)	-203415
Thenardite (Na ₂ SO ₄)	0.00	Thenardite (Na ₂ SO ₄)	-53264
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.00394

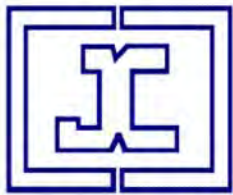
BOUND IONS

Langelier	0.520	Calcium	344.60	327.13
Ryznar	5.46	Barium	29.37	29.37
Puckorius	3.47	Carbonate	8.98	0.488
Larson-Skold Index	19.70	Phosphate	0.00	0.00
Stiff Davis Index	1.29	Sulfate	0.00	0.00
Oddo-Tomson	0.655			

Temperature (°F)	190.00
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

BERRY PETROLEUM
C-20 CHEVRON 20-1D
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 56541
Report Date: 11-18-2013
Sample Date: 10-29-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	344.60
Magnesium(as Mg)	64.04
Barium(as Ba)	29.37
Strontium(as Sr)	21.88
Sodium(as Na)	3823
Potassium(as K)	131.80
Lithium(as Li)	7.47
Iron(as Fe)	338.20
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.626
Manganese(as Mn)	6.43
Zinc(as Zn)	0.863
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	7000
Sulfate(as SO ₄)	0.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	375.00
Bicarbonate(as HCO ₃)	610.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	16.97

PARAMETERS

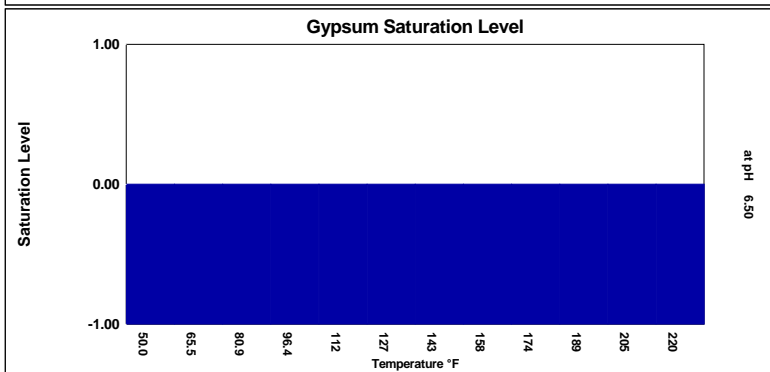
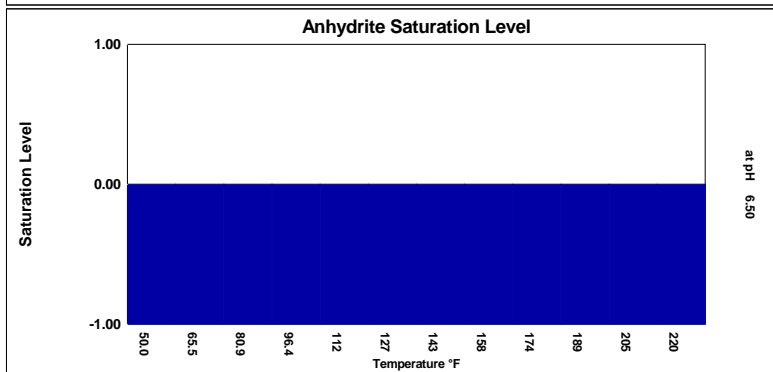
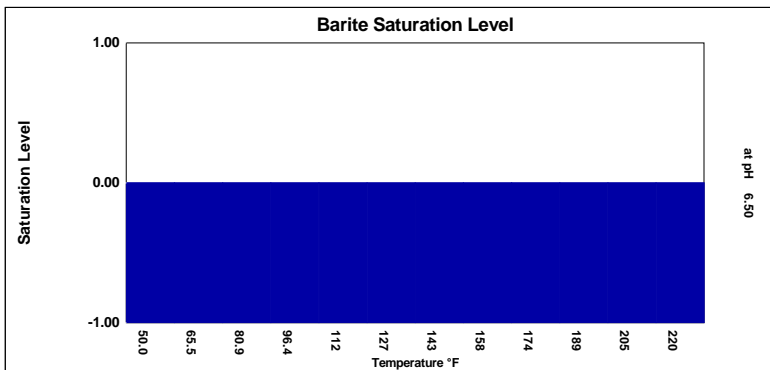
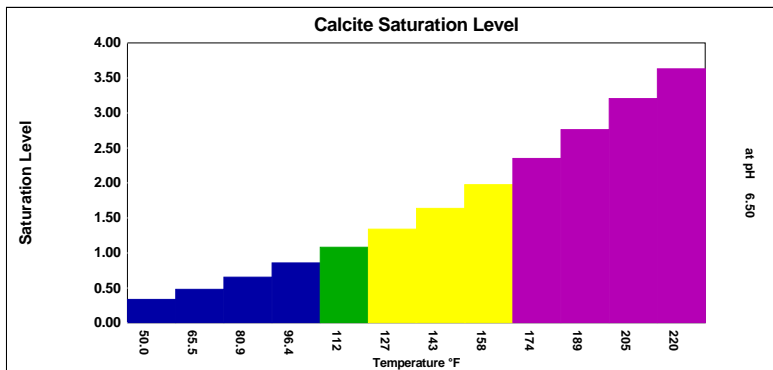
Temperature(°F)	190.00
T.D.S.	12520
Resistivity:	58.75

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.335	-0.159	0.00	-878.94	0.00	-702.36	0.00	-0.250	0.00	-97.30	474.34	0.0927	0.00	-0.00265	0.0909	0.107
65.45	0.00	0.479	-0.109	0.00	-888.71	0.00	-725.63	0.00	-0.376	0.00	-100.01	763.94	0.116	0.00	-0.00273	0.170	0.107
80.91	0.00	0.653	-0.0643	0.00	-869.31	0.00	-740.21	0.00	-0.532	0.00	-99.55	1165	0.140	0.00	-0.00282	0.153	0.107
96.36	0.00	0.855	-0.0240	0.00	-825.62	0.00	-746.78	0.00	-0.711	0.00	-97.42	1691	0.164	0.00	-0.00293	0.201	0.107
111.82	0.00	1.08	0.0118	0.00	-763.53	0.00	-713.76	0.00	-0.909	0.00	-94.65	2353	0.187	0.00	-0.00304	0.211	0.107
127.27	0.00	1.34	0.0461	0.00	-689.19	0.00	-659.15	0.00	-1.15	0.00	-92.22	3198	0.211	0.00	-0.00317	0.177	0.107
142.73	0.00	1.64	0.0796	0.00	-608.20	0.00	-612.43	0.00	-1.43	0.00	-90.18	4258	0.237	0.00	-0.00332	0.143	0.107
158.18	0.00	1.97	0.113	0.00	-525.41	0.00	-572.38	0.00	-1.77	0.00	-88.50	5563	0.265	0.00	-0.00349	0.149	0.107
173.64	0.00	2.35	0.146	0.00	-444.65	0.00	-538.03	0.00	-2.16	0.00	-87.15	7123	0.295	0.00	-0.00369	0.154	0.107
189.09	0.00	2.76	0.180	0.00	-368.80	0.00	-508.60	0.00	-2.63	0.00	-86.11	8946	0.327	0.00	-0.00393	0.0778	0.107
204.55	0.00	3.20	0.214	0.00	-299.79	0.00	-483.45	0.00	-3.16	0.00	-85.37	11015	0.360	0.00	-0.00421	0.0652	0.107
220.00	0.171	3.63	0.250	0.00	-242.76	0.00	-469.10	0.00	-3.86	0.00	-85.97	13179	0.399	0.00	-0.00464	0.0888	0.125
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 29-3D CD-29 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67203

CATIONS

Calcium (as Ca)	223.90
Magnesium (as Mg)	43.76
Barium (as Ba)	35.98
Strontium (as Sr)	21.09
Sodium (as Na)	3964
Potassium (as K)	116.90
Lithium (as Li)	9.57
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	15.38
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	6700
Sulfate (as SO ₄)	75.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	250.00
Bicarbonate (as HCO ₃)	244.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	8.63

PARAMETERS

Calculated T.D.S.	11519
Molar Conductivity	16529
Resistivity	60.50
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0626
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.20

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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



DEPOSITION POTENTIAL INDICATORS

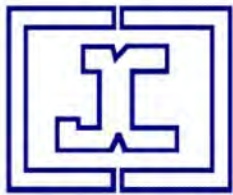
Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000
Sample ID: 67203

Calcium	223.90	216.38
Barium	35.98	35.98
Carbonate	1.75	0.0975
Phosphate	0.00	0.00
Sulfate	75.00	54.48

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 29-3D CD-29 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67203
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	223.90
Magnesium(as Mg)	43.76
Barium(as Ba)	35.98
Strontium(as Sr)	21.09
Sodium(as Na)	3964
Potassium(as K)	116.90
Lithium(as Li)	9.57
Iron(as Fe)	15.38
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	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)	6700
Sulfate(as SO ₄)	75.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	250.00
Bicarbonate(as HCO ₃)	244.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	8.63

PARAMETERS

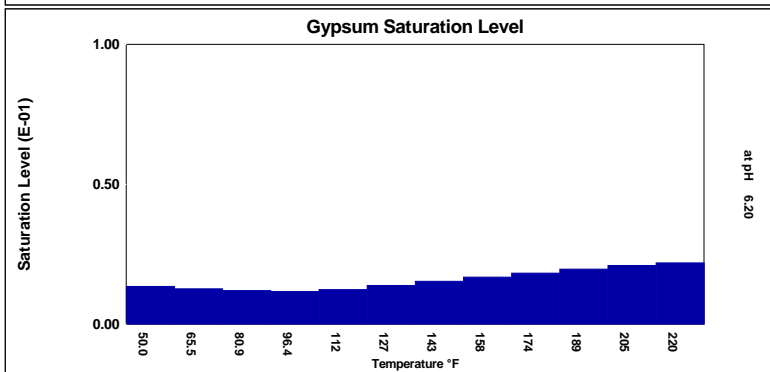
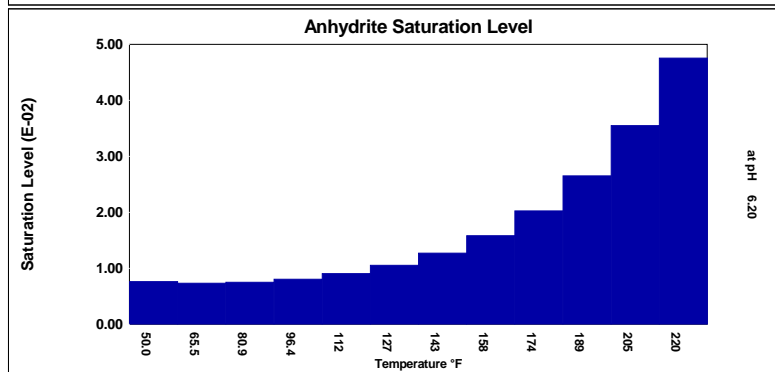
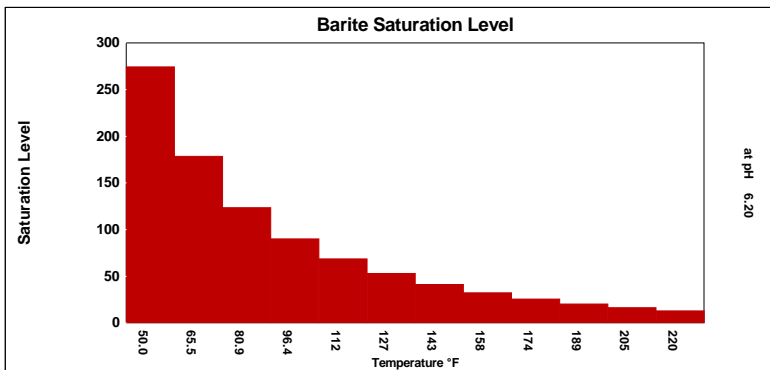
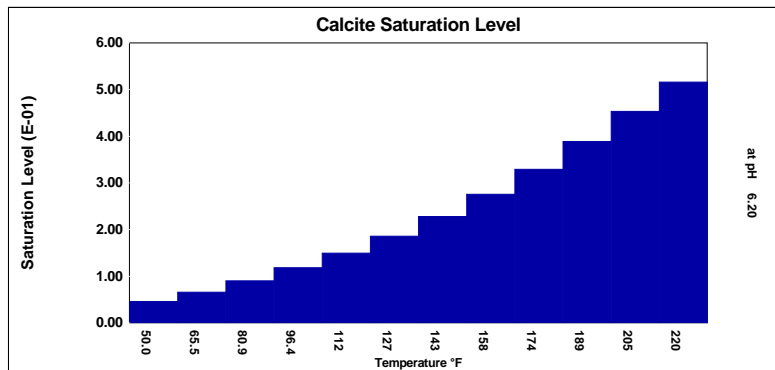
Temperature(°F)	190.00
T.D.S.	11519
Resistivity:	60.50
Sample pH	6.20
Conductivity:	16529

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0456	-0.331	0.00760	-888.50	0.0135	-717.46	274.25	21.18	0.0625	-73.73	4.48	0.0142	0.00	-0.106	0.0895	0.0626
65.45	0.00	0.0656	-0.282	0.00734	-897.49	0.0126	-739.93	178.43	21.11	0.0585	-76.59	7.23	0.0198	0.00	-0.109	0.230	0.0626
80.91	0.00	0.0899	-0.243	0.00750	-877.96	0.0120	-753.88	123.32	21.01	0.0581	-76.41	11.05	0.0253	0.00	-0.112	0.182	0.0626
96.36	0.00	0.118	-0.210	0.00805	-834.69	0.0117	-759.98	89.97	20.90	0.0596	-74.60	16.07	0.0305	0.00	-0.116	0.239	0.0626
111.82	0.00	0.149	-0.182	0.00903	-773.41	0.0124	-727.11	68.52	20.77	0.0619	-72.17	22.40	0.0354	0.00	-0.120	0.252	0.0626
127.27	0.00	0.186	-0.158	0.0105	-700.02	0.0139	-672.91	52.85	20.61	0.0640	-70.07	30.53	0.0405	0.00	-0.124	0.216	0.0626
142.73	0.00	0.228	-0.138	0.0127	-619.94	0.0153	-626.40	41.11	20.41	0.0657	-68.33	40.80	0.0459	0.00	-0.129	0.177	0.0626
158.18	0.00	0.276	-0.120	0.0158	-537.83	0.0168	-586.42	32.22	20.16	0.0671	-66.92	53.54	0.0517	0.00	-0.135	0.170	0.0626
173.64	0.00	0.329	-0.103	0.0202	-457.38	0.0183	-552.02	25.43	19.85	0.0681	-65.82	68.96	0.0579	0.00	-0.142	0.162	0.0626
189.09	0.00	0.389	-0.0886	0.0265	-381.31	0.0197	-522.47	20.20	19.48	0.0687	-65.01	87.28	0.0644	0.00	-0.149	0.0759	0.0626
204.55	0.00	0.453	-0.0751	0.0355	-311.48	0.0210	-497.15	16.14	19.04	0.0689	-64.46	108.56	0.0714	0.00	-0.158	0.0601	0.0626
220.00	0.171	0.516	-0.0649	0.0475	-252.90	0.0219	-482.36	12.74	18.48	0.0677	-65.10	131.64	0.0795	0.00	-0.171	0.0808	0.0733
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 31-6 1-31 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67202

CATIONS

Calcium (as Ca)	244.20
Magnesium (as Mg)	47.72
Barium (as Ba)	37.88
Strontium (as Sr)	21.08
Sodium (as Na)	4958
Potassium (as K)	135.80
Lithium (as Li)	9.66
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	19.60
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.101
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	8100
Sulfate (as SO ₄)	175.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	295.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	6.21

PARAMETERS

Calculated T.D.S.	14323
Molar Conductivity	19886
Resistivity	50.29
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.125
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.20

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 31-6 1-31 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67202

SATURATION LEVEL

Calcite (CaCO ₃)	0.761
Aragonite (CaCO ₃)	0.620
Witherite (BaCO ₃)	0.0270
Strontianite (SrCO ₃)	0.159
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.283
Anhydrite (CaSO ₄)	0.0576
Gypsum (CaSO ₄ *2H ₂ O)	0.0421
Barite (BaSO ₄)	41.66
Celestite (SrSO ₄)	0.137
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	110.42
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	204.40
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0372
Aragonite (CaCO ₃)	-0.0727
Witherite (BaCO ₃)	-6.28
Strontianite (SrCO ₃)	-0.855
Calcium oxalate (CaC ₂ O ₄)	-0.203
Magnesite (MgCO ₃)	-0.251
Anhydrite (CaSO ₄)	-385.93
Gypsum (CaSO ₄ *2H ₂ O)	-539.56
Barite (BaSO ₄)	21.76
Celestite (SrSO ₄)	-53.55
Fluorite (CaF ₂)	-18.75
Calcium phosphate	>-0.001
Hydroxyapatite	-468.93
Silica (SiO ₂)	-151.26
Brucite (Mg(OH) ₂)	0.0149
Magnesium silicate	-163.46
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.137
Halite (NaCl)	-204602
Thenardite (Na ₂ SO ₄)	-54482
Iron sulfide (FeS)	-0.140

SIMPLE INDICES

Langelier	-0.0432
Ryznar	6.29
Puckorius	4.14
Larson-Skold Index	29.07
Stiff Davis Index	0.726
Oddo-Tomson	0.0687

BOUND IONS

Calcium	244.20
Barium	37.88
Carbonate	4.20
Phosphate	0.00
Sulfate	175.00

TOTAL**FREE**

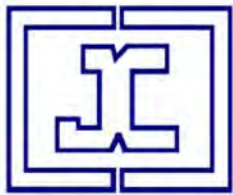
228.93
37.88
0.204
0.00
126.82

OPERATING CONDITIONS

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 31-6 1-31 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67202
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	244.20
Magnesium(as Mg)	47.72
Barium(as Ba)	37.88
Strontium(as Sr)	21.08
Sodium(as Na)	4958
Potassium(as K)	135.80
Lithium(as Li)	9.66
Iron(as Fe)	19.60
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0120
Zinc(as Zn)	0.101
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	8100
Sulfate(as SO ₄)	175.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	295.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	6.21

PARAMETERS

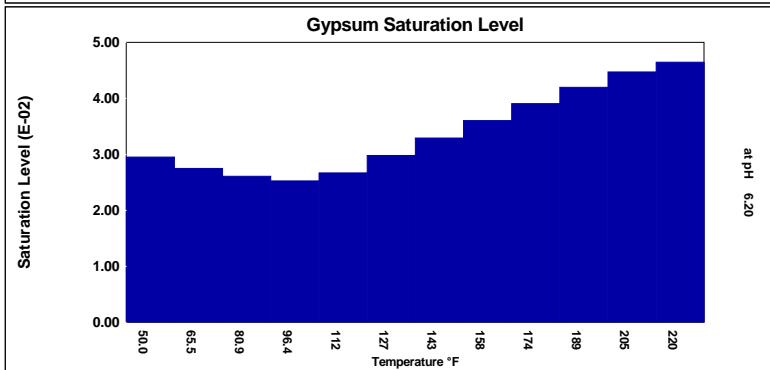
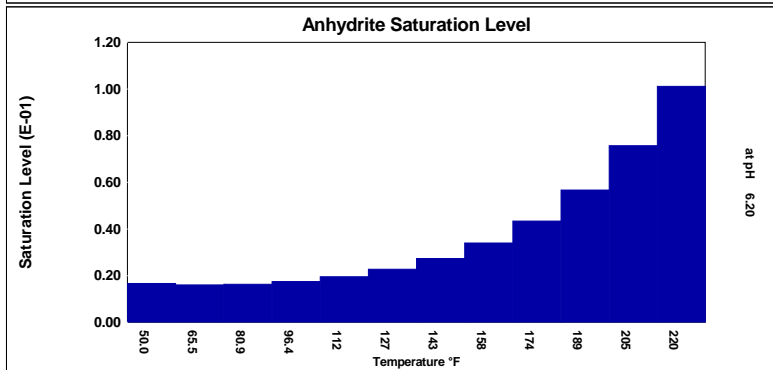
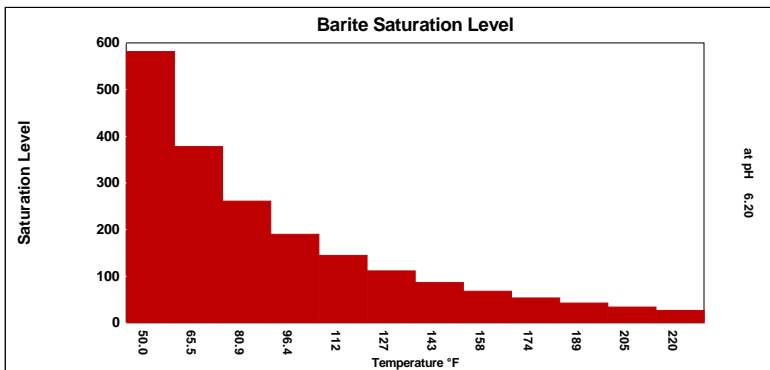
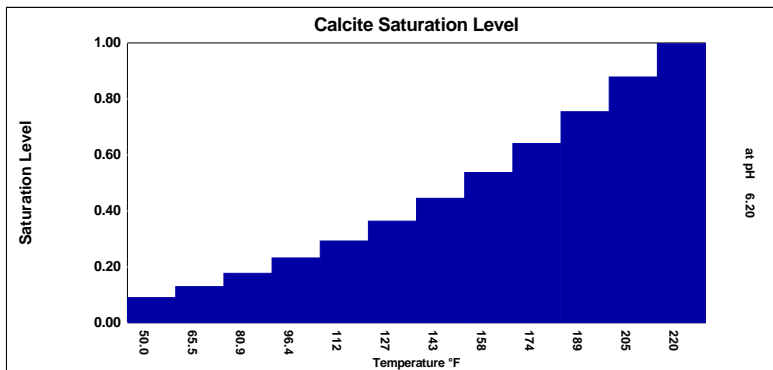
Temperature(°F)	190.00
T.D.S.	14323
Resistivity:	50.29
Sample pH	6.20
Conductivity:	19886

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0902	-0.332	0.0166	-923.97	0.0295	-739.74	581.31	22.38	0.126	-60.04	10.40	0.0345	0.00	-0.0972	0.116	0.125
65.45	0.00	0.129	-0.278	0.0160	-934.90	0.0275	-765.09	377.69	22.36	0.118	-63.22	16.78	0.0450	0.00	-0.100	0.298	0.125
80.91	0.00	0.177	-0.232	0.0163	-915.39	0.0261	-781.32	260.66	22.33	0.117	-63.32	25.64	0.0556	0.00	-0.103	0.283	0.125
96.36	0.00	0.232	-0.194	0.0175	-870.49	0.0252	-789.18	189.87	22.29	0.120	-61.76	37.28	0.0659	0.00	-0.107	0.371	0.125
111.82	0.00	0.293	-0.161	0.0195	-806.23	0.0267	-755.24	144.37	22.24	0.124	-59.57	51.93	0.0757	0.00	-0.111	0.391	0.125
127.27	0.00	0.363	-0.132	0.0227	-728.90	0.0298	-698.35	111.17	22.18	0.128	-57.70	70.74	0.0861	0.00	-0.115	0.335	0.125
142.73	0.00	0.445	-0.106	0.0274	-644.24	0.0329	-649.63	86.33	22.11	0.131	-56.20	94.48	0.0973	0.00	-0.120	0.275	0.125
158.18	0.00	0.537	-0.0820	0.0340	-557.18	0.0360	-607.84	67.56	22.02	0.134	-55.03	123.90	0.109	0.00	-0.126	0.263	0.125
173.64	0.00	0.640	-0.0596	0.0433	-471.65	0.0390	-571.97	53.24	21.90	0.136	-54.16	159.47	0.122	0.00	-0.132	0.252	0.125
189.09	0.00	0.754	-0.0384	0.0567	-390.54	0.0419	-541.25	42.22	21.77	0.137	-53.58	201.70	0.136	0.00	-0.140	0.118	0.125
204.55	0.00	0.878	-0.0181	0.0756	-315.83	0.0447	-515.03	33.68	21.60	0.137	-53.27	250.69	0.150	0.00	-0.148	0.0934	0.125
220.00	0.171	0.997	>-0.001	0.101	-253.03	0.0464	-500.37	26.49	21.37	0.134	-54.15	303.46	0.167	0.00	-0.161	0.125	0.146
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 33-18D E-33
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67221

CATIONS

Calcium (as Ca)	228.60
Magnesium (as Mg)	42.82
Barium (as Ba)	37.64
Strontium (as Sr)	22.56
Sodium (as Na)	4818
Potassium (as K)	114.70
Lithium (as Li)	10.79
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	64.66
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	8100
Sulfate (as SO ₄)	0.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	325.00
Bicarbonate (as HCO ₃)	366.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	11.93

PARAMETERS

Calculated T.D.S.	13896
Molar Conductivity	19578
Resistivity	51.08
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0833
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.30

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 33-18D E-33
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67221

SATURATION LEVEL

Calcite (CaCO ₃)	0.699
Aragonite (CaCO ₃)	0.569
Witherite (BaCO ₃)	0.0254
Strontianite (SrCO ₃)	0.161
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.257
Anhydrite (CaSO ₄)	0.00
Gypsum (CaSO ₄ *2H ₂ O)	0.00
Barite (BaSO ₄)	0.00
Celestite (SrSO ₄)	0.00
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	589.65
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	646.60
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	0.00
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0478
Aragonite (CaCO ₃)	-0.0841
Witherite (BaCO ₃)	-6.24
Strontianite (SrCO ₃)	-0.793
Calcium oxalate (CaC ₂ O ₄)	-0.207
Magnesite (MgCO ₃)	-0.268
Anhydrite (CaSO ₄)	-423.75
Gypsum (CaSO ₄ *2H ₂ O)	-580.65
Barite (BaSO ₄)	-2.31
Celestite (SrSO ₄)	-88.94
Fluorite (CaF ₂)	-18.94
Calcium phosphate	>-0.001
Hydroxyapatite	-466.94
Silica (SiO ₂)	-151.68
Brucite (Mg(OH) ₂)	0.0188
Magnesium silicate	-163.31
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.128
Halite (NaCl)	-204644
Thenardite (Na ₂ SO ₄)	-54348
Iron sulfide (FeS)	-0.0344

SIMPLE INDICES

Langelier	-0.0958
Ryznar	6.49
Puckorius	4.63
Larson-Skold Index	38.16
Stiff Davis Index	0.675
Oddo-Tomson	0.0220

BOUND IONS

Calcium	228.60	221.81
Barium	37.64	37.64
Carbonate	3.84	0.191
Phosphate	0.00	0.00
Sulfate	0.00	0.00

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

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 33-18D E-33
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67221
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	228.60
Magnesium(as Mg)	42.82
Barium(as Ba)	37.64
Strontium(as Sr)	22.56
Sodium(as Na)	4818
Potassium(as K)	114.70
Lithium(as Li)	10.79
Iron(as Fe)	64.66
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	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)	8100
Sulfate(as SO ₄)	0.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	325.00
Bicarbonate(as HCO ₃)	366.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	11.93

PARAMETERS

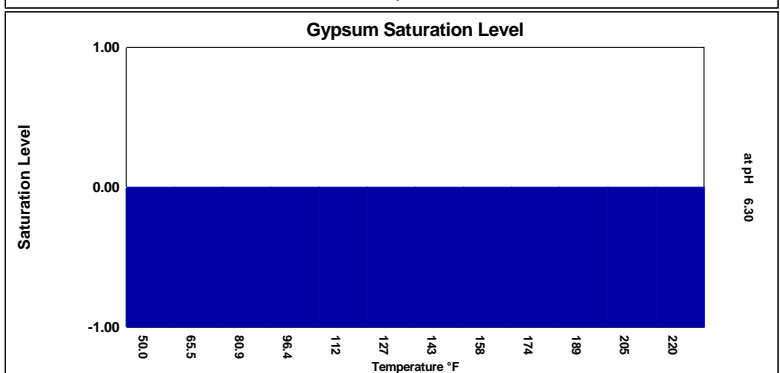
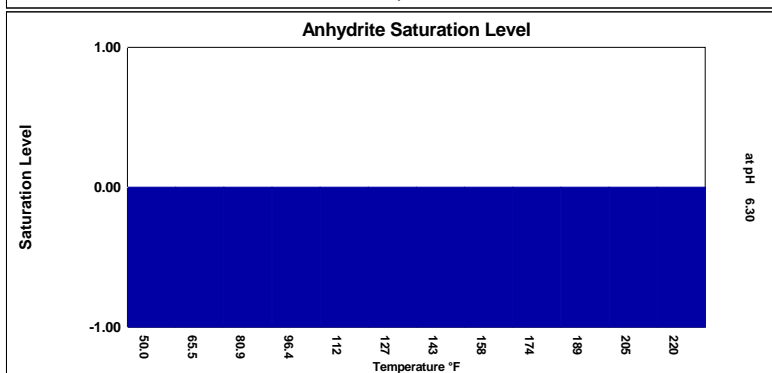
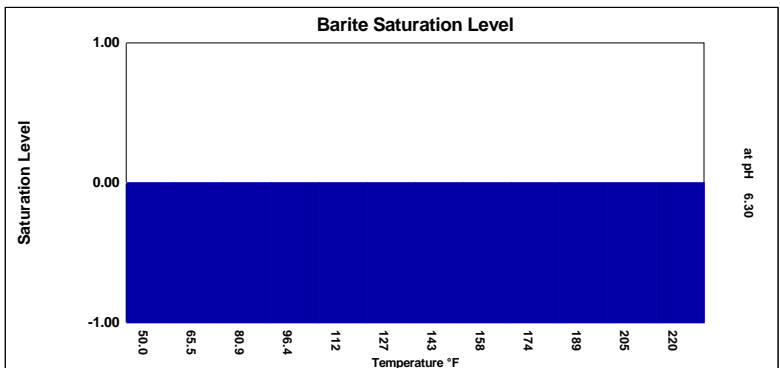
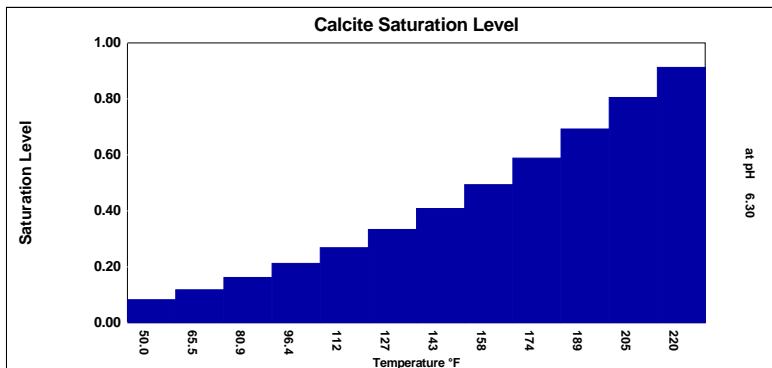
Temperature(°F)	190.00
T.D.S.	13896
Resistivity:	51.08
Sample pH	6.30
Conductivity:	19578

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0824	-0.344	0.00	-961.67	0.00	-785.40	0.00	-0.208	0.00	-100.12	33.23	0.0347	0.00	-0.0232	0.0937	0.0833
65.45	0.00	0.118	-0.288	0.00	-971.64	0.00	-809.47	0.00	-0.314	0.00	-102.95	53.58	0.0440	0.00	-0.0239	0.221	0.0833
80.91	0.00	0.162	-0.242	0.00	-951.51	0.00	-824.60	0.00	-0.445	0.00	-102.52	81.84	0.0536	0.00	-0.0247	0.188	0.0833
96.36	0.00	0.212	-0.203	0.00	-906.26	0.00	-831.50	0.00	-0.597	0.00	-100.36	118.94	0.0630	0.00	-0.0257	0.247	0.0833
111.82	0.00	0.269	-0.170	0.00	-841.91	0.00	-797.13	0.00	-0.768	0.00	-97.55	165.63	0.0720	0.00	-0.0267	0.260	0.0833
127.27	0.00	0.333	-0.141	0.00	-764.68	0.00	-740.12	0.00	-0.973	0.00	-95.09	225.33	0.0816	0.00	-0.0278	0.220	0.0833
142.73	0.00	0.408	-0.115	0.00	-680.30	0.00	-691.26	0.00	-1.22	0.00	-93.03	300.71	0.0919	0.00	-0.0291	0.179	0.0833
158.18	0.00	0.493	-0.0916	0.00	-593.67	0.00	-649.31	0.00	-1.52	0.00	-91.35	393.57	0.103	0.00	-0.0306	0.175	0.0833
173.64	0.00	0.588	-0.0696	0.00	-508.72	0.00	-613.28	0.00	-1.87	0.00	-90.01	505.83	0.115	0.00	-0.0323	0.171	0.0833
189.09	0.00	0.692	-0.0490	0.00	-428.35	0.00	-582.40	0.00	-2.29	0.00	-89.00	638.12	0.128	0.00	-0.0343	0.0824	0.0833
204.55	0.00	0.805	-0.0296	0.00	-354.52	0.00	-556.01	0.00	-2.78	0.00	-88.30	790.12	0.141	0.00	-0.0366	0.0667	0.0833
220.00	0.171	0.912	-0.0130	0.00	-292.88	0.00	-541.29	0.00	-3.42	0.00	-89.02	952.42	0.157	0.00	-0.0401	0.0900	0.0975
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

CHEVRON 33-9D O-33 PAD
SEPARATOR

Report Date: 12-31-2013 Sampled: 11-26-2013
Sample #: 2580 at 0000

Sample ID: 59101

CATIONS

Calcium (as Ca)	214.80
Magnesium (as Mg)	45.35
Barium (as Ba)	41.96
Strontium (as Sr)	22.27
Sodium (as Na)	6248
Potassium (as K)	128.10
Lithium (as Li)	4.21
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	340.30
Manganese (as Mn)	1.98
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	10500
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	350.00
Bicarbonate (as HCO ₃)	610.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

Calculated T.D.S.	18209
Molar Conductivity	24732
Resistivity	40.43
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.121
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.40

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM
ROB SIMEONECHEVRON 33-9D O-33 PAD
SEPARATOR

Report Date: 12-31-2013 Sampled: 11-26-2013
Sample #: 2580 at 0000

Sample ID: 59101

SATURATION LEVEL

Calcite (CaCO ₃)	1.21
Aragonite (CaCO ₃)	0.981
Witherite (BaCO ₃)	0.0515
Strontianite (SrCO ₃)	0.291
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.506
Anhydrite (CaSO ₄)	0.00604
Gypsum (CaSO ₄ *2H ₂ O)	0.00439
Barite (BaSO ₄)	5.27
Celestite (SrSO ₄)	0.0166
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	4253
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	6262
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.0420
Aragonite (CaCO ₃)	-0.00476
Witherite (BaCO ₃)	-6.68
Strontianite (SrCO ₃)	-0.816
Calcium oxalate (CaC ₂ O ₄)	-0.266
Magnesite (MgCO ₃)	-0.201
Anhydrite (CaSO ₄)	-478.39
Gypsum (CaSO ₄ *2H ₂ O)	-655.24
Barite (BaSO ₄)	10.18
Celestite (SrSO ₄)	-93.70
Fluorite (CaF ₂)	-20.96
Calcium phosphate	>-0.001
Hydroxyapatite	-500.15
Silica (SiO ₂)	-150.60
Brucite (Mg(OH) ₂)	0.0244
Magnesium silicate	-168.85
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.286
Halite (NaCl)	-208479
Thenardite (Na ₂ SO ₄)	-57556
Iron sulfide (FeS)	-0.00646

SIMPLE INDICES

Langelier	0.156
Ryznar	6.09
Puckorius	4.00
Larson-Skold Index	29.61
Stiff Davis Index	0.905
Oddo-Tomson	0.207

BOUND IONS

Calcium	214.80
Barium	41.96
Carbonate	9.97
Phosphate	0.00
Sulfate	25.00

TOTAL**FREE**

204.56
41.96
0.425
0.00
17.72

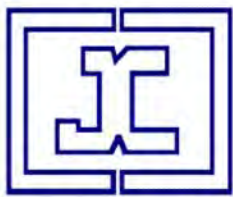
OPERATING CONDITIONS

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 33-9D O-33 PAD
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 59101
Report Date: 12-31-2013
Sample Date: 11-26-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	214.80
Magnesium(as Mg)	45.35
Barium(as Ba)	41.96
Strontium(as Sr)	22.27
Sodium(as Na)	6248
Potassium(as K)	128.10
Lithium(as Li)	4.21
Iron(as Fe)	340.30
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	1.98
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	10500
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	350.00
Bicarbonate(as HCO ₃)	610.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	0.291

PARAMETERS

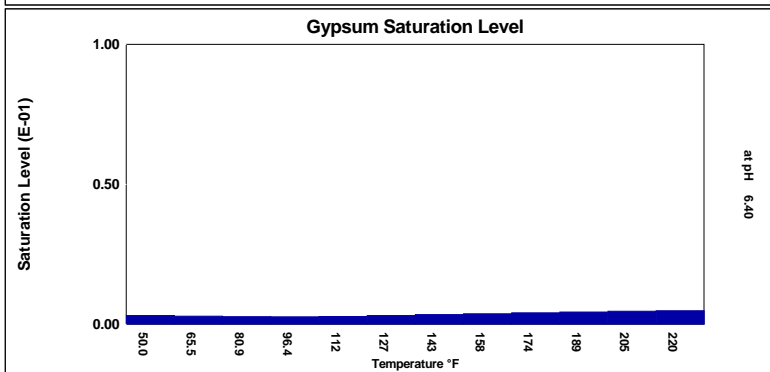
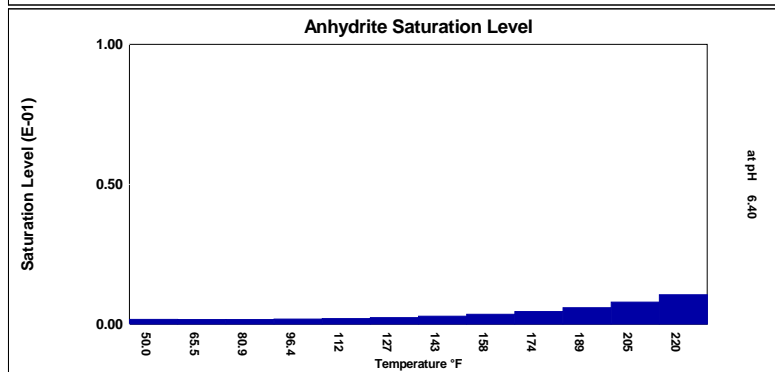
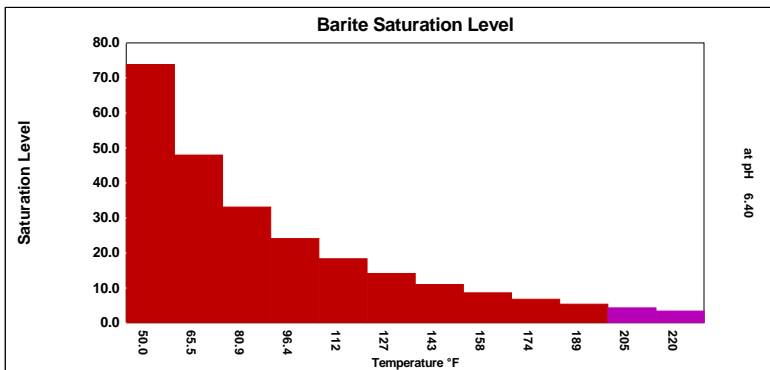
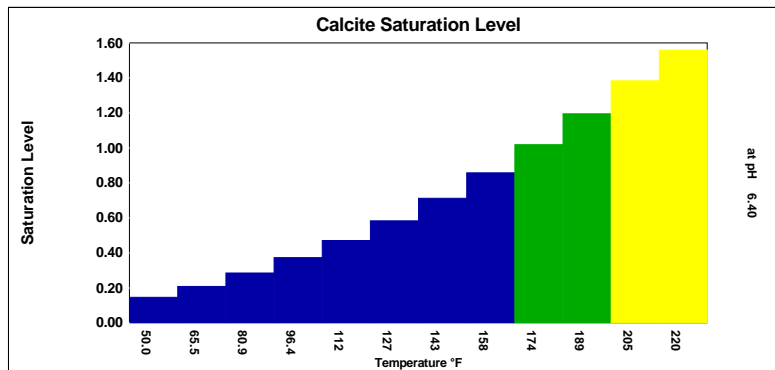
Temperature(°F)	190.00
T.D.S.	18209
Resistivity:	40.43

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.146	-0.400	0.00175	-1058	0.00309	-869.29	73.79	16.24	0.0153	-104.10	327.02	0.0789	0.00	-0.00425	0.101	0.121
65.45	0.00	0.208	-0.325	0.00168	-1070	0.00288	-896.80	47.92	15.71	0.0143	-107.43	527.29	0.0992	0.00	-0.00439	0.216	0.121
80.91	0.00	0.285	-0.261	0.00171	-1049	0.00273	-914.61	33.06	15.15	0.0142	-107.17	804.78	0.120	0.00	-0.00455	0.202	0.121
96.36	0.00	0.373	-0.205	0.00183	-1001	0.00264	-923.48	24.07	14.56	0.0145	-105.00	1168	0.141	0.00	-0.00473	0.264	0.121
111.82	0.00	0.470	-0.156	0.00205	-932.32	0.00279	-887.12	18.30	13.97	0.0151	-102.11	1625	0.161	0.00	-0.00493	0.277	0.121
127.27	0.00	0.582	-0.113	0.00239	-849.12	0.00312	-825.83	14.08	13.33	0.0155	-99.61	2208	0.182	0.00	-0.00515	0.234	0.121
142.73	0.00	0.712	-0.0717	0.00287	-757.85	0.00344	-773.39	10.93	12.65	0.0159	-97.56	2941	0.205	0.00	-0.00541	0.189	0.121
158.18	0.00	0.857	-0.0331	0.00357	-663.82	0.00376	-728.44	8.55	11.91	0.0162	-95.92	3839	0.230	0.00	-0.00570	0.190	0.121
173.64	0.00	1.02	0.00395	0.00455	-571.28	0.00408	-689.93	6.74	11.10	0.0164	-94.65	4919	0.256	0.00	-0.00604	0.191	0.121
189.09	0.00	1.19	0.0399	0.00594	-483.37	0.00438	-657.02	5.34	10.23	0.0166	-93.75	6182	0.284	0.00	-0.00644	0.0941	0.121
204.55	0.00	1.38	0.0750	0.00792	-402.25	0.00466	-629.02	4.26	9.29	0.0166	-93.18	7624	0.314	0.00	-0.00690	0.0776	0.121
220.00	0.171	1.56	0.108	0.0106	-334.45	0.00483	-614.37	3.35	8.21	0.0162	-94.25	9118	0.348	0.00	-0.00762	0.105	0.141
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 33B-13R J-13 PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67299

CATIONS

Calcium (as Ca)	255.10
Magnesium (as Mg)	51.51
Barium (as Ba)	13.80
Strontium (as Sr)	18.68
Sodium (as Na)	2391
Potassium (as K)	119.00
Lithium (as Li)	8.78
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	356.60
Manganese (as Mn)	2.59
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	4600
Sulfate (as SO ₄)	75.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	550.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	1.08

PARAMETERS

Calculated T.D.S.	8436
Molar Conductivity	11694
Resistivity	85.51
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0865
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.50

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 33B-13R J-13 PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67299

SATURATION LEVEL

Calcite (CaCO ₃)	1.96
Aragonite (CaCO ₃)	1.59
Witherite (BaCO ₃)	0.0250
Strontianite (SrCO ₃)	0.356
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.749
Anhydrite (CaSO ₄)	0.0331
Gypsum (CaSO ₄ *2H ₂ O)	0.0244
Barite (BaSO ₄)	8.65
Celestite (SrSO ₄)	0.0686
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	9791
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	9105
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.104
Aragonite (CaCO ₃)	0.0788
Witherite (BaCO ₃)	-7.56
Strontianite (SrCO ₃)	-0.525
Calcium oxalate (CaC ₂ O ₄)	-0.141
Magnesite (MgCO ₃)	-0.0596
Anhydrite (CaSO ₄)	-322.26
Gypsum (CaSO ₄ *2H ₂ O)	-447.91
Barite (BaSO ₄)	7.04
Celestite (SrSO ₄)	-58.37
Fluorite (CaF ₂)	-16.23
Calcium phosphate	>-0.001
Hydroxyapatite	-413.81
Silica (SiO ₂)	-152.93
Brucite (Mg(OH) ₂)	0.0283
Magnesium silicate	-153.72
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.245
Halite (NaCl)	-197557
Thenardite (Na ₂ SO ₄)	-49280
Iron sulfide (FeS)	-0.00283

SIMPLE INDICES

Langelier	0.358
Ryznar	5.78
Puckorius	3.93
Larson-Skold Index	16.38
Stiff Davis Index	1.13
Oddo-Tomson	0.564

BOUND IONS

Calcium	255.10	239.64
Barium	13.80	13.80
Carbonate	5.11	0.365
Phosphate	0.00	0.00
Sulfate	75.00	49.69

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

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 33B-13R J-13 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67299
Report Date: 04-21-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	255.10
Magnesium(as Mg)	51.51
Barium(as Ba)	13.80
Strontium(as Sr)	18.68
Sodium(as Na)	2391
Potassium(as K)	119.00
Lithium(as Li)	8.78
Iron(as Fe)	356.60
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	2.59
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	4600
Sulfate(as SO ₄)	75.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	550.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	1.08

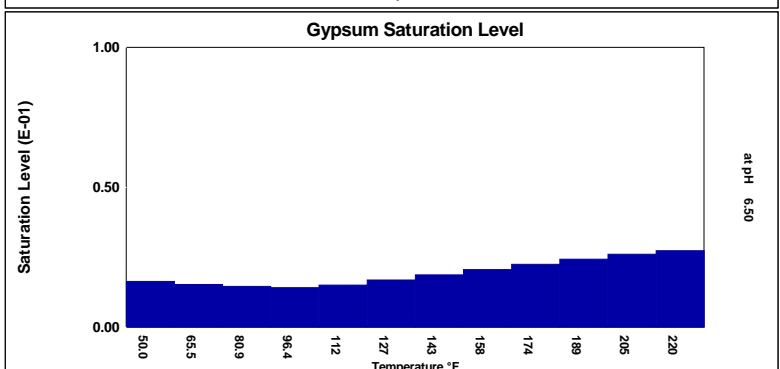
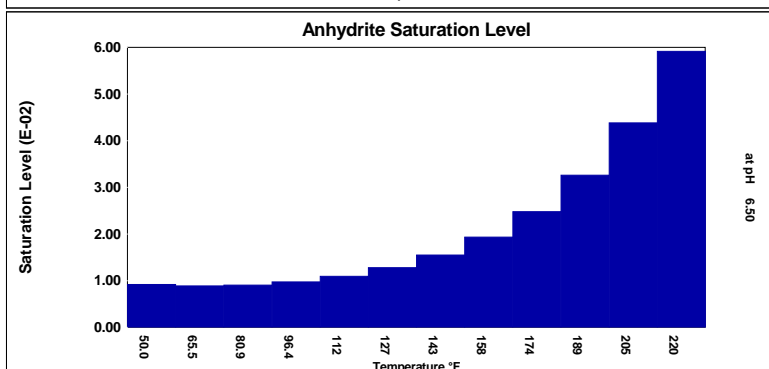
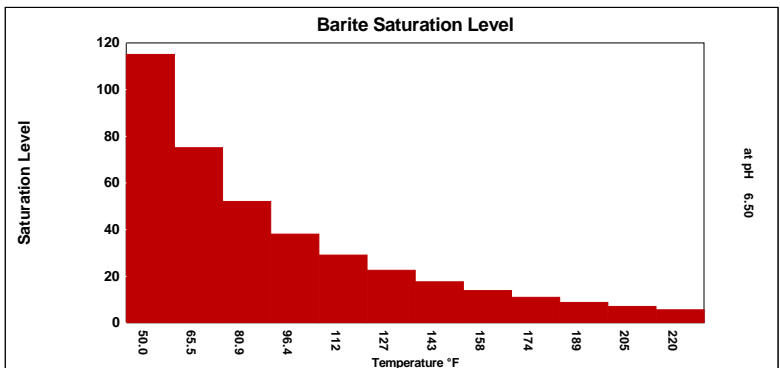
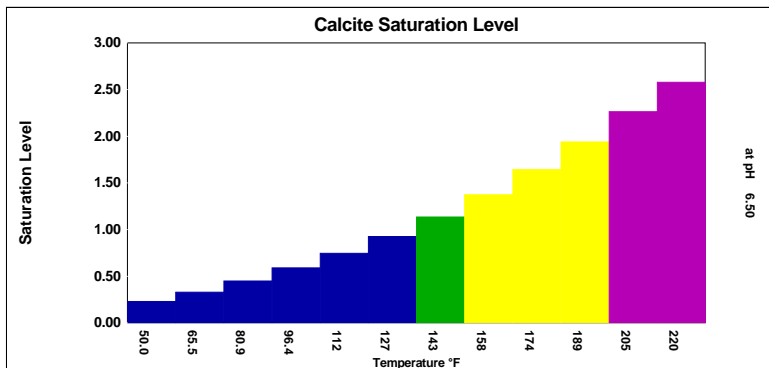
PARAMETERS

Temperature(°F)	190.00
T.D.S.	8436
Resistivity:	85.51
Sample pH	6.50
Conductivity:	11694

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.229	-0.203	0.00917	-792.93	0.0164	-632.45	115.05	8.09	0.0604	-67.52	464.56	0.0695	0.00	-0.00197	0.0839	0.0865
65.45	0.00	0.328	-0.154	0.00886	-800.57	0.0153	-652.50	75.02	8.04	0.0566	-70.03	749.88	0.0870	0.00	-0.00202	0.157	0.0865
80.91	0.00	0.449	-0.112	0.00905	-782.00	0.0146	-664.62	51.98	7.98	0.0564	-69.75	1147	0.105	0.00	-0.00208	0.134	0.0865
96.36	0.00	0.588	-0.0743	0.00973	-741.67	0.0142	-669.44	38.04	7.91	0.0580	-67.98	1669	0.123	0.00	-0.00215	0.176	0.0865
111.82	0.00	0.744	-0.0415	0.0109	-684.91	0.0150	-638.75	29.06	7.83	0.0604	-65.66	2326	0.140	0.00	-0.00223	0.184	0.0865
127.27	0.00	0.925	-0.0110	0.0128	-617.25	0.0169	-588.77	22.49	7.73	0.0627	-63.62	3170	0.158	0.00	-0.00232	0.155	0.0865
142.73	0.00	1.13	0.0181	0.0155	-543.70	0.0187	-545.83	17.57	7.61	0.0646	-61.90	4232	0.177	0.00	-0.00241	0.125	0.0865
158.18	0.00	1.37	0.0464	0.0193	-468.55	0.0206	-508.85	13.83	7.46	0.0663	-60.48	5546	0.198	0.00	-0.00253	0.130	0.0865
173.64	0.00	1.64	0.0743	0.0248	-395.20	0.0225	-476.95	10.97	7.27	0.0676	-59.33	7129	0.220	0.00	-0.00266	0.135	0.0865
189.09	0.00	1.94	0.102	0.0326	-326.16	0.0243	-449.42	8.76	7.05	0.0685	-58.41	8987	0.244	0.00	-0.00282	0.0681	0.0865
204.55	0.00	2.26	0.130	0.0438	-263.10	0.0261	-425.67	7.04	6.79	0.0692	-57.73	11106	0.269	0.00	-0.00301	0.0570	0.0865
220.00	0.171	2.58	0.158	0.0591	-210.23	0.0274	-410.83	5.61	6.45	0.0685	-58.01	13362	0.298	0.00	-0.00329	0.0777	0.101
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 33D-30 F-30
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67231

CATIONS

Calcium (as Ca)	280.90
Magnesium (as Mg)	52.00
Barium (as Ba)	36.62
Strontium (as Sr)	25.34
Sodium (as Na)	4080
Potassium (as K)	182.70
Lithium (as Li)	9.74
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	409.80
Manganese (as Mn)	2.05
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	7400
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	350.00
Bicarbonate (as HCO ₃)	610.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	8.91

PARAMETERS

Calculated T.D.S.	13232
Molar Conductivity	17937
Resistivity	55.75
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.139
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.30

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 33D-30 F-30
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67231

SATURATION LEVEL

Calcite (CaCO ₃)	1.42
Aragonite (CaCO ₃)	1.16
Witherite (BaCO ₃)	0.0421
Strontianite (SrCO ₃)	0.308
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.515
Anhydrite (CaSO ₄)	0.00925
Gypsum (CaSO ₄ *2H ₂ O)	0.00677
Barite (BaSO ₄)	5.59
Celestite (SrSO ₄)	0.0228
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	3792
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	6933
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.0544
Aragonite (CaCO ₃)	0.0249
Witherite (BaCO ₃)	-6.11
Strontianite (SrCO ₃)	-0.577
Calcium oxalate (CaC ₂ O ₄)	-0.168
Magnesite (MgCO ₃)	-0.145
Anhydrite (CaSO ₄)	-392.86
Gypsum (CaSO ₄ *2H ₂ O)	-543.10
Barite (BaSO ₄)	9.67
Celestite (SrSO ₄)	-80.76
Fluorite (CaF ₂)	-17.35
Calcium phosphate	>-0.001
Hydroxyapatite	-462.87
Silica (SiO ₂)	-151.83
Brucite (Mg(OH) ₂)	0.0187
Magnesium silicate	-162.51
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.213
Halite (NaCl)	-204434
Thenardite (Na ₂ SO ₄)	-53859
Iron sulfide (FeS)	-0.00532

SIMPLE INDICES

Langelier	0.222
Ryznar	5.86
Puckorius	3.67
Larson-Skold Index	20.97
Stiff Davis Index	0.993
Oddo-Tomson	0.347

BOUND IONS

Calcium	280.90
Barium	36.62
Carbonate	5.73
Phosphate	0.00
Sulfate	25.00

TOTAL**FREE**

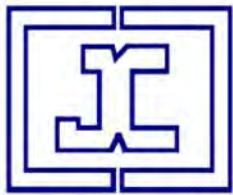
266.16
36.62
0.317
0.00
16.88

OPERATING CONDITIONS

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 33D-30 F-30
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67231
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	280.90
Magnesium(as Mg)	52.00
Barium(as Ba)	36.62
Strontium(as Sr)	25.34
Sodium(as Na)	4080
Potassium(as K)	182.70
Lithium(as Li)	9.74
Iron(as Fe)	409.80
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	2.05
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	7400
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	350.00
Bicarbonate(as HCO ₃)	610.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	8.91

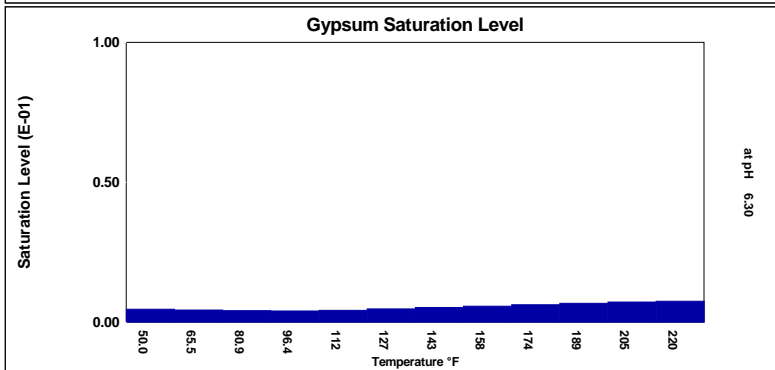
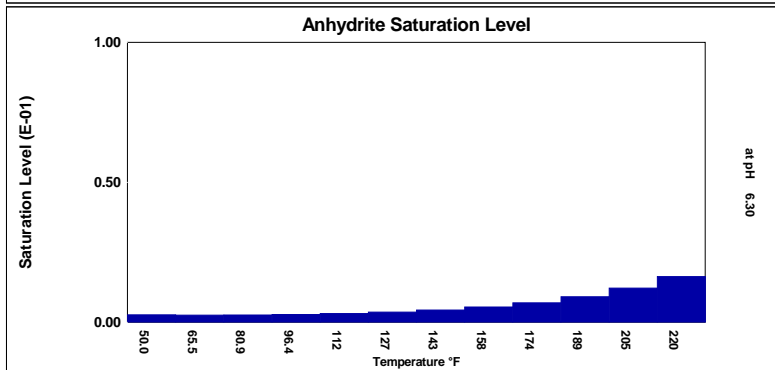
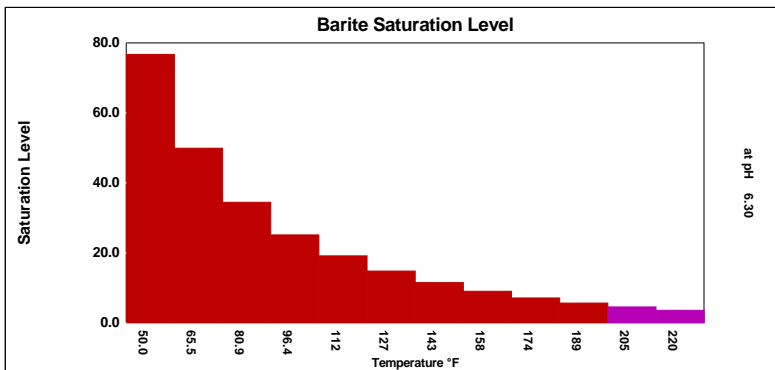
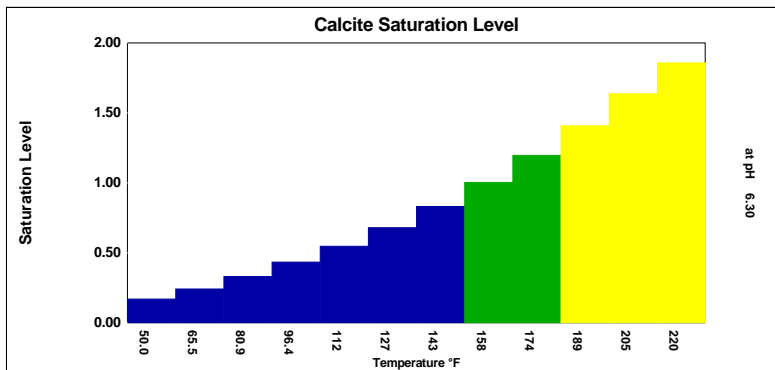
PARAMETERS

Temperature(°F)	190.00
T.D.S.	13232
Resistivity:	55.75
Sample pH	6.30
Conductivity:	17937

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.169	-0.252	0.00263	-921.23	0.00468	-743.24	76.69	15.46	0.0207	-91.26	356.23	0.0594	0.00	-0.00360	0.114	0.139
65.45	0.00	0.242	-0.201	0.00254	-931.35	0.00436	-767.28	49.88	14.93	0.0193	-94.15	574.15	0.0744	0.00	-0.00371	0.268	0.139
80.91	0.00	0.331	-0.157	0.00258	-911.67	0.00414	-782.42	34.46	14.36	0.0192	-93.80	876.67	0.0900	0.00	-0.00384	0.261	0.139
96.36	0.00	0.433	-0.119	0.00277	-867.14	0.00401	-789.37	25.14	13.79	0.0197	-91.73	1274	0.105	0.00	-0.00398	0.342	0.139
111.82	0.00	0.547	-0.0858	0.00310	-803.74	0.00425	-755.63	19.15	13.22	0.0205	-89.02	1774	0.120	0.00	-0.00413	0.360	0.139
127.27	0.00	0.679	-0.0554	0.00362	-727.66	0.00475	-699.62	14.77	12.61	0.0212	-86.65	2413	0.136	0.00	-0.00431	0.305	0.139
142.73	0.00	0.831	-0.0268	0.00436	-644.61	0.00526	-651.64	11.50	11.96	0.0217	-84.68	3221	0.153	0.00	-0.00451	0.248	0.139
158.18	0.00	1.00	< 0.001	0.00543	-559.44	0.00577	-610.46	9.02	11.26	0.0222	-83.06	4216	0.171	0.00	-0.00473	0.243	0.139
173.64	0.00	1.20	0.0269	0.00694	-476.06	0.00626	-575.11	7.12	10.52	0.0225	-81.78	5421	0.191	0.00	-0.00499	0.237	0.139
189.09	0.00	1.41	0.0529	0.00909	-397.34	0.00674	-544.80	5.66	9.72	0.0228	-80.82	6842	0.212	0.00	-0.00530	0.114	0.139
204.55	0.00	1.64	0.0785	0.0122	-325.26	0.00721	-518.87	4.53	8.87	0.0229	-80.14	8477	0.234	0.00	-0.00565	0.0924	0.139
220.00	0.171	1.86	0.103	0.0163	-265.21	0.00751	-504.19	3.58	7.91	0.0225	-80.82	10231	0.260	0.00	-0.00619	0.125	0.162
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 34B-13 O-13 PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67297

CATIONS

Calcium (as Ca)	350.00
Magnesium (as Mg)	50.87
Barium (as Ba)	7.72
Strontium (as Sr)	22.35
Sodium (as Na)	4275
Potassium (as K)	158.80
Lithium (as Li)	9.12
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	27.20
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	7500
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	175.00
Bicarbonate (as HCO ₃)	244.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	1.85

PARAMETERS

Calculated T.D.S.	12691
Molar Conductivity	18115
Resistivity	55.20
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0557
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.30

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 34B-13 O-13 PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67297

SATURATION LEVEL

Calcite (CaCO ₃)	0.733
Aragonite (CaCO ₃)	0.596
Witherite (BaCO ₃)	0.00358
Strontianite (SrCO ₃)	0.109
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.207
Anhydrite (CaSO ₄)	0.0124
Gypsum (CaSO ₄ *2H ₂ O)	0.00908
Barite (BaSO ₄)	1.24
Celestite (SrSO ₄)	0.0210
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	255.55
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	185.04
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0264
Aragonite (CaCO ₃)	-0.0489
Witherite (BaCO ₃)	-10.55
Strontianite (SrCO ₃)	-0.811
Calcium oxalate (CaC ₂ O ₄)	-0.128
Magnesite (MgCO ₃)	-0.232
Anhydrite (CaSO ₄)	-356.05
Gypsum (CaSO ₄ *2H ₂ O)	-498.02
Barite (BaSO ₄)	0.687
Celestite (SrSO ₄)	-80.44
Fluorite (CaF ₂)	-15.38
Calcium phosphate	>-0.001
Hydroxyapatite	-458.63
Silica (SiO ₂)	-151.76
Brucite (Mg(OH) ₂)	0.0186
Magnesium silicate	-161.75
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.0832
Halite (NaCl)	-203526
Thenardite (Na ₂ SO ₄)	-53546
Iron sulfide (FeS)	-0.0766

SIMPLE INDICES

Langelier	-0.0741
Ryznar	6.45
Puckorius	4.84
Larson-Skold Index	53.03
Stiff Davis Index	0.698
Oddo-Tomson	0.0579

BOUND IONS

Calcium	350.00
Barium	7.72
Carbonate	2.50
Phosphate	0.00
Sulfate	25.00

TOTAL**FREE**

341.61
7.72
0.124
0.00
17.20

OPERATING CONDITIONS

Temperature (°F)	190.00
Time(secs)	0.00

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

DownHole SAT™ Water Analysis Report

SYSTEM IDENTIFICATION

BERRY PETROLEUM
CHEVRON 34B-13 O-13 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67297
Report Date: 04-21-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	350.00
Magnesium(as Mg)	50.87
Barium(as Ba)	7.72
Strontium(as Sr)	22.35
Sodium(as Na)	4275
Potassium(as K)	158.80
Lithium(as Li)	9.12
Iron(as Fe)	27.20
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	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)	7500
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	175.00
Bicarbonate(as HCO ₃)	244.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	1.85

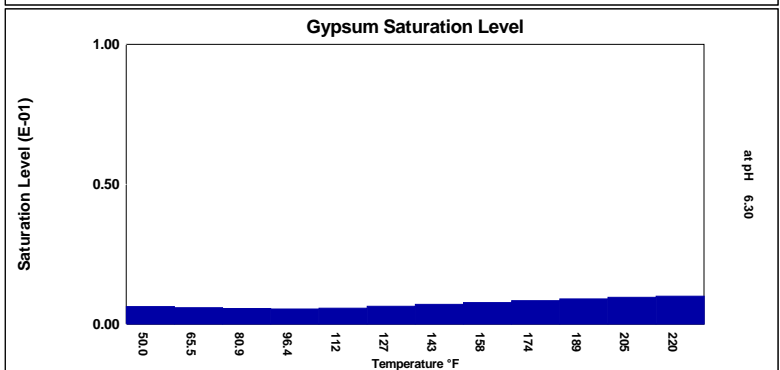
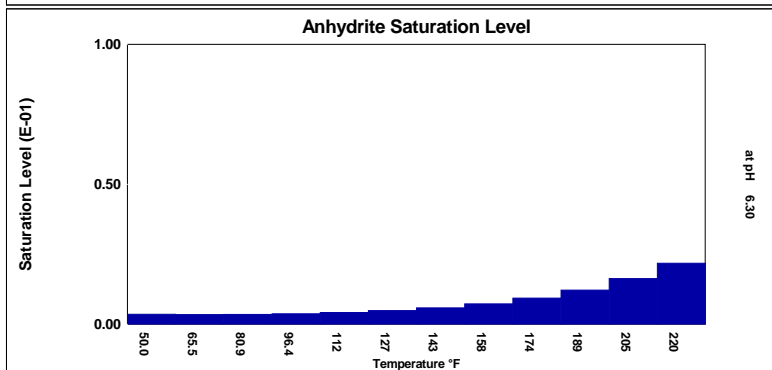
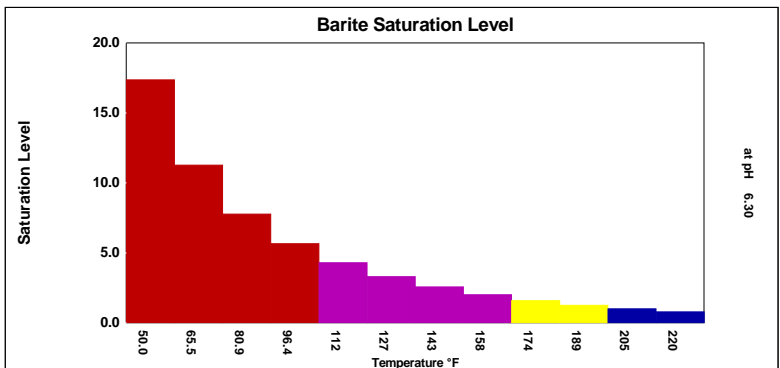
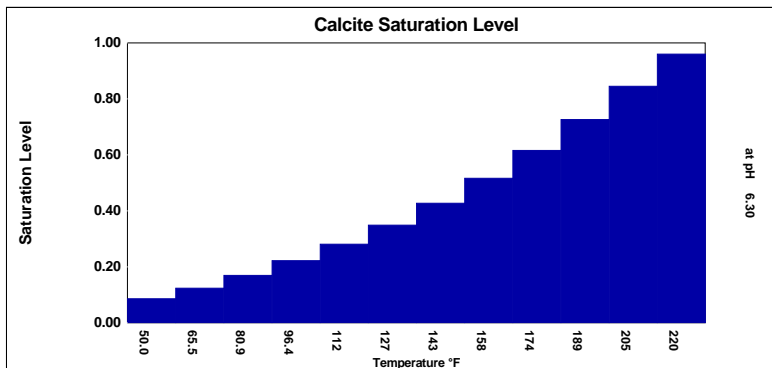
PARAMETERS

Temperature(°F)	190.00
T.D.S.	12691
Resistivity:	55.20
Sample pH	6.30
Conductivity:	18115

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0862	-0.215	0.00357	-873.36	0.00633	-694.93	17.36	4.22	0.0196	-90.71	9.52	0.0210	0.00	-0.0524	0.0804	0.0557
65.45	0.00	0.124	-0.180	0.00344	-882.89	0.00590	-718.02	11.26	4.04	0.0182	-93.57	15.34	0.0274	0.00	-0.0539	0.189	0.0557
80.91	0.00	0.169	-0.150	0.00350	-863.22	0.00561	-732.48	7.76	3.81	0.0181	-93.24	23.40	0.0339	0.00	-0.0557	0.146	0.0557
96.36	0.00	0.222	-0.126	0.00375	-819.23	0.00543	-738.99	5.65	3.54	0.0185	-91.21	33.99	0.0403	0.00	-0.0577	0.191	0.0557
111.82	0.00	0.281	-0.105	0.00420	-756.83	0.00574	-705.78	4.29	3.23	0.0192	-88.54	47.33	0.0462	0.00	-0.0599	0.200	0.0557
127.27	0.00	0.349	-0.0862	0.00488	-682.12	0.00641	-650.89	3.30	2.87	0.0198	-86.21	64.38	0.0526	0.00	-0.0624	0.170	0.0557
142.73	0.00	0.427	-0.0696	0.00588	-600.76	0.00709	-603.93	2.56	2.45	0.0202	-84.27	85.93	0.0594	0.00	-0.0652	0.138	0.0557
158.18	0.00	0.516	-0.0544	0.00731	-517.59	0.00776	-563.69	2.00	1.95	0.0206	-82.69	112.49	0.0666	0.00	-0.0684	0.135	0.0557
173.64	0.00	0.616	-0.0404	0.00932	-436.49	0.00841	-529.18	1.58	1.38	0.0209	-81.43	144.65	0.0744	0.00	-0.0720	0.132	0.0557
189.09	0.00	0.726	-0.0271	0.0122	-360.34	0.00904	-499.63	1.25	0.728	0.0210	-80.49	182.62	0.0827	0.00	-0.0763	0.0636	0.0557
204.55	0.00	0.845	-0.0146	0.0163	-291.12	0.00964	-474.42	0.999	-0.00492	0.0211	-79.84	226.34	0.0915	0.00	-0.0812	0.0515	0.0557
220.00	0.171	0.960	-0.00368	0.0218	-233.98	0.0100	-460.11	0.787	-0.895	0.0207	-80.51	273.34	0.102	0.00	-0.0888	0.0695	0.0652
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 36-42D O-36A PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67309

CATIONS

Calcium (as Ca)	109.70
Magnesium (as Mg)	42.71
Barium (as Ba)	1.44
Strontium (as Sr)	8.68
Sodium (as Na)	47.56
Potassium (as K)	86.26
Lithium (as Li)	7.98
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	177.10
Manganese (as Mn)	2.14
Zinc (as Zn)	3.42
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	600.00
Sulfate (as SO ₄)	100.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	366.00
Bicarbonate (as HCO ₃)	125.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

Calculated T.D.S.	1330
Molar Conductivity	1862
Resistivity	537.11
Sp.Gr.(g/mL)	1.00
Pressure(atm)	1.00
pCO ₂ (atm)	0.0202
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.60

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 36-42D O-36A PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67309

SATURATION LEVEL

Calcite (CaCO ₃)	0.537
Aragonite (CaCO ₃)	0.438
Witherite (BaCO ₃)	0.00177
Strontianite (SrCO ₃)	0.111
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.364
Anhydrite (CaSO ₄)	0.0503
Gypsum (CaSO ₄ *2H ₂ O)	0.0373
Barite (BaSO ₄)	3.38
Celestite (SrSO ₄)	0.118
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	12888
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	2749
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0414
Aragonite (CaCO ₃)	-0.0618
Witherite (BaCO ₃)	-5.83
Strontianite (SrCO ₃)	-0.513
Calcium oxalate (CaC ₂ O ₄)	-0.116
Magnesite (MgCO ₃)	-0.0707
Anhydrite (CaSO ₄)	-195.48
Gypsum (CaSO ₄ *2H ₂ O)	-269.31
Barite (BaSO ₄)	0.597
Celestite (SrSO ₄)	-26.24
Fluorite (CaF ₂)	-15.42
Calcium phosphate	>-0.001
Hydroxyapatite	-275.03
Silica (SiO ₂)	-154.30
Brucite (Mg(OH) ₂)	0.0301
Magnesium silicate	-125.29
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.0557
Halite (NaCl)	-171750
Thenardite (Na ₂ SO ₄)	-36558
Iron sulfide (FeS)	-0.00148

SIMPLE INDICES

Langelier	-0.219
Ryznar	7.04
Puckorius	6.15
Larson-Skold Index	9.25
Stiff Davis Index	0.377
Oddo-Tomson	0.137

BOUND IONS

Calcium	109.70	101.99
Barium	1.44	1.44
Carbonate	0.592	0.0829
Phosphate	0.00	0.00
Sulfate	100.00	59.99

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

Temperature (°F)	190.00
Time(secs)	0.00

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

DownHole SAT™ Water Analysis Report

SYSTEM IDENTIFICATION

BERRY PETROLEUM
CHEVRON 36-42D O-36A PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67309
Report Date: 04-21-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	109.70
Magnesium(as Mg)	42.71
Barium(as Ba)	1.44
Strontium(as Sr)	8.68
Sodium(as Na)	47.56
Potassium(as K)	86.26
Lithium(as Li)	7.98
Iron(as Fe)	177.10
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	2.14
Zinc(as Zn)	3.42
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	600.00
Sulfate(as SO ₄)	100.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	366.00
Bicarbonate(as HCO ₃)	125.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	0.291

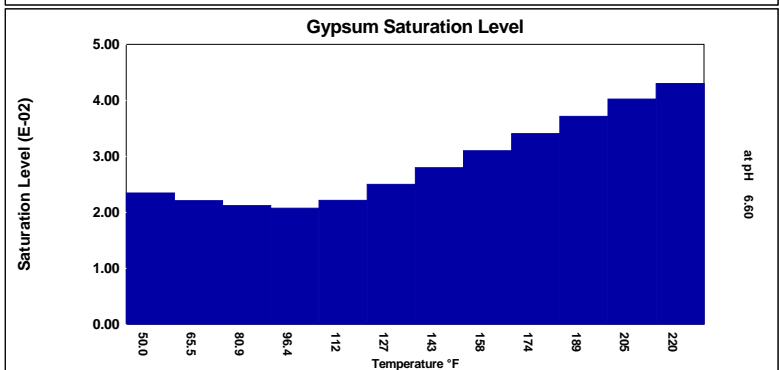
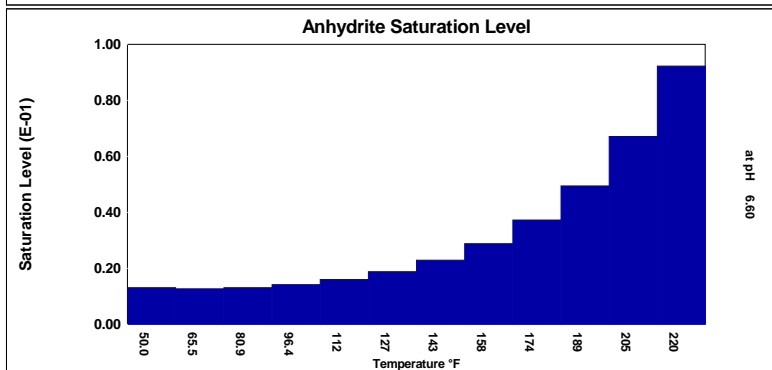
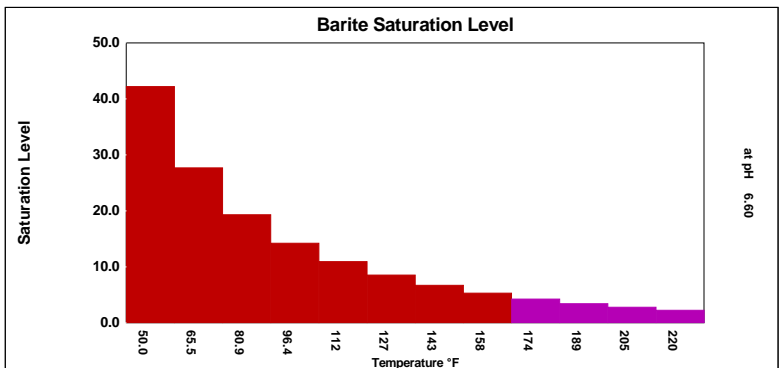
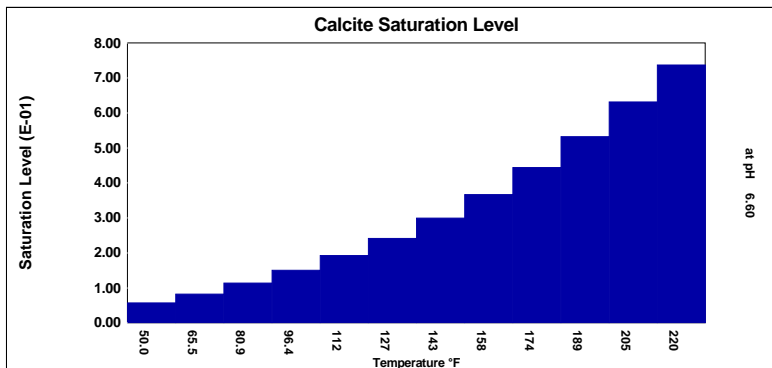
PARAMETERS

Temperature(°F)	190.00
T.D.S.	1330
Resistivity:	537.11

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0568	-0.237	0.0130	-511.75	0.0235	-409.90	42.18	0.833	0.0974	-32.84	130.97	0.0164	0.00	-0.00117	0.0483	0.0202
65.45	0.00	0.0823	-0.198	0.0127	-513.21	0.0221	-419.72	27.68	0.822	0.0919	-34.17	213.05	0.0205	0.00	-0.00119	0.0904	0.0202
80.91	0.00	0.114	-0.167	0.0130	-498.08	0.0212	-424.26	19.30	0.809	0.0921	-33.87	328.15	0.0247	0.00	-0.00121	0.0529	0.0202
96.36	0.00	0.150	-0.141	0.0141	-469.44	0.0207	-424.02	14.22	0.792	0.0953	-32.71	481.10	0.0288	0.00	-0.00123	0.0693	0.0202
111.82	0.00	0.192	-0.119	0.0160	-430.85	0.0221	-401.76	10.93	0.774	0.1000	-31.24	676.23	0.0326	0.00	-0.00126	0.0726	0.0202
127.27	0.00	0.241	-0.0995	0.0188	-385.86	0.0250	-367.79	8.52	0.752	0.104	-29.93	929.09	0.0366	0.00	-0.00129	0.0609	0.0202
142.73	0.00	0.299	-0.0828	0.0229	-337.69	0.0280	-338.32	6.70	0.724	0.108	-28.80	1251	0.0409	0.00	-0.00132	0.0494	0.0202
158.18	0.00	0.366	-0.0679	0.0288	-289.03	0.0310	-312.65	5.31	0.690	0.112	-27.83	1652	0.0455	0.00	-0.00136	0.0514	0.0202
173.64	0.00	0.444	-0.0544	0.0372	-241.96	0.0340	-290.17	4.24	0.650	0.115	-27.00	2139	0.0503	0.00	-0.00141	0.0532	0.0202
189.09	0.00	0.532	-0.0421	0.0494	-197.96	0.0371	-270.41	3.42	0.601	0.117	-26.28	2713	0.0554	0.00	-0.00147	0.0268	0.0202
204.55	0.00	0.631	-0.0307	0.0670	-157.97	0.0402	-252.95	2.77	0.542	0.120	-25.66	3366	0.0608	0.00	-0.00155	0.0225	0.0202
220.00	0.171	0.737	-0.0206	0.0922	-123.61	0.0430	-239.37	2.25	0.470	0.121	-25.33	4063	0.0668	0.00	-0.00168	0.0306	0.0237
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 6-25D F-06 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67211

CATIONS

Calcium (as Ca)	257.80
Magnesium (as Mg)	50.48
Barium (as Ba)	45.80
Strontium (as Sr)	23.90
Sodium (as Na)	4634
Potassium (as K)	143.70
Lithium (as Li)	9.49
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	17.68
Manganese (as Mn)	0.0120
Zinc (as Zn)	1.37
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	7800
Sulfate (as SO ₄)	150.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	175.00
Bicarbonate (as HCO ₃)	244.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	6.09

PARAMETERS

Calculated T.D.S.	13415
Molar Conductivity	18969
Resistivity	52.72
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0490
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.40

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 6-25D F-06 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67211

SATURATION LEVEL

Calcite (CaCO ₃)	0.659
Aragonite (CaCO ₃)	0.536
Witherite (BaCO ₃)	0.0263
Strontianite (SrCO ₃)	0.145
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.245
Anhydrite (CaSO ₄)	0.0544
Gypsum (CaSO ₄ *2H ₂ O)	0.0398
Barite (BaSO ₄)	44.35
Celestite (SrSO ₄)	0.136
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	254.55
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	147.13
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0478
Aragonite (CaCO ₃)	-0.0797
Witherite (BaCO ₃)	-5.41
Strontianite (SrCO ₃)	-0.753
Calcium oxalate (CaC ₂ O ₄)	-0.182
Magnesite (MgCO ₃)	-0.237
Anhydrite (CaSO ₄)	-374.22
Gypsum (CaSO ₄ *2H ₂ O)	-523.69
Barite (BaSO ₄)	26.26
Celestite (SrSO ₄)	-54.97
Fluorite (CaF ₂)	-17.93
Calcium phosphate	>-0.001
Hydroxyapatite	-463.14
Silica (SiO ₂)	-151.53
Brucite (Mg(OH) ₂)	0.0236
Magnesium silicate	-162.50
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.106
Halite (NaCl)	-203961
Thenardite (Na ₂ SO ₄)	-53985
Iron sulfide (FeS)	-0.0961

SIMPLE INDICES

Langelier	-0.113
Ryznar	6.63
Puckorius	5.12
Larson-Skold Index	55.66
Stiff Davis Index	0.658
Oddo-Tomson	0.0102

BOUND IONS

Calcium	257.80
Barium	45.80
Carbonate	3.16
Phosphate	0.00
Sulfate	150.00

TOTAL**FREE**

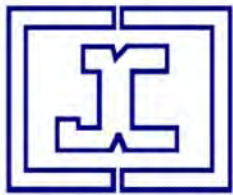
246.93
45.80
0.159
0.00
107.39

OPERATING CONDITIONS

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 6-25D F-06 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67211
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	257.80
Magnesium(as Mg)	50.48
Barium(as Ba)	45.80
Strontium(as Sr)	23.90
Sodium(as Na)	4634
Potassium(as K)	143.70
Lithium(as Li)	9.49
Iron(as Fe)	17.68
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0120
Zinc(as Zn)	1.37
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	7800
Sulfate(as SO ₄)	150.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	175.00
Bicarbonate(as HCO ₃)	244.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	6.09

PARAMETERS

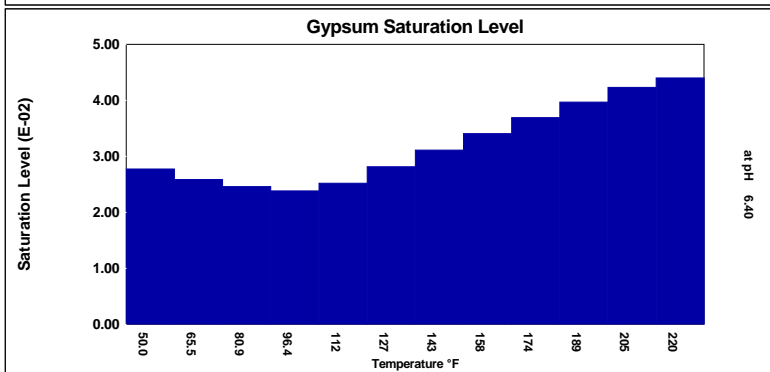
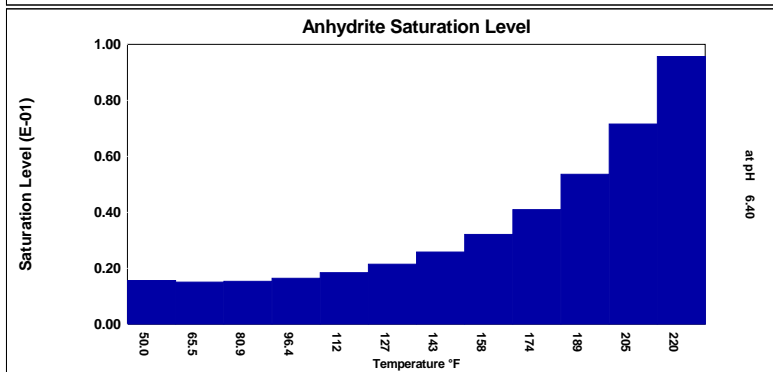
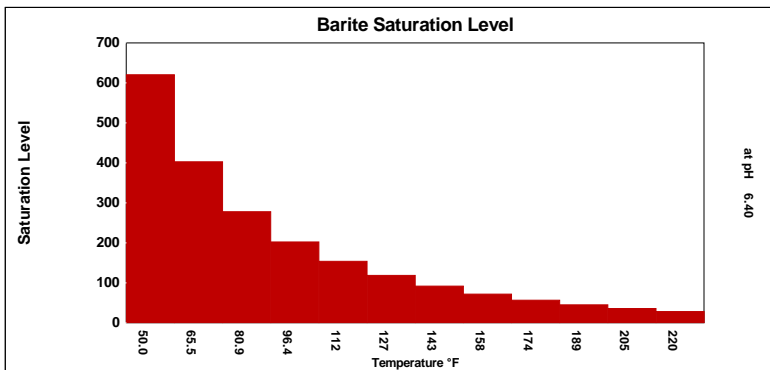
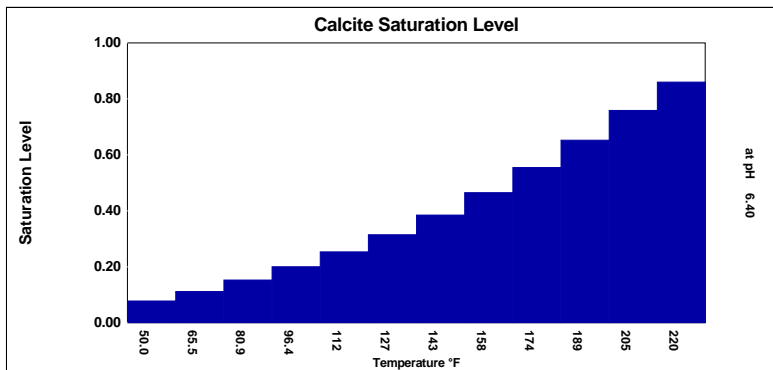
Temperature(°F)	190.00
T.D.S.	13415
Resistivity:	52.72
Sample pH	6.40
Conductivity:	18969

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0778	-0.306	0.0156	-904.98	0.0277	-722.96	620.02	27.06	0.126	-61.81	7.59	0.0259	0.00	-0.0660	0.0720	0.0490
65.45	0.00	0.112	-0.257	0.0151	-915.28	0.0258	-747.41	402.70	27.03	0.118	-64.96	12.24	0.0344	0.00	-0.0680	0.153	0.0490
80.91	0.00	0.153	-0.217	0.0154	-895.69	0.0246	-762.94	277.82	26.99	0.117	-65.02	18.69	0.0429	0.00	-0.0702	0.113	0.0490
96.36	0.00	0.200	-0.183	0.0164	-851.17	0.0238	-770.29	202.32	26.94	0.119	-63.42	27.16	0.0510	0.00	-0.0726	0.148	0.0490
111.82	0.00	0.253	-0.154	0.0184	-787.70	0.0252	-736.64	153.79	26.88	0.124	-61.19	37.83	0.0588	0.00	-0.0754	0.156	0.0490
127.27	0.00	0.314	-0.128	0.0214	-711.41	0.0281	-680.50	118.41	26.80	0.128	-59.28	51.46	0.0669	0.00	-0.0785	0.131	0.0490
142.73	0.00	0.385	-0.106	0.0258	-628.01	0.0311	-632.41	91.93	26.71	0.131	-57.73	68.66	0.0756	0.00	-0.0819	0.106	0.0490
158.18	0.00	0.465	-0.0853	0.0321	-542.35	0.0340	-591.14	71.94	26.59	0.134	-56.52	89.80	0.0849	0.00	-0.0859	0.107	0.0490
173.64	0.00	0.554	-0.0664	0.0409	-458.31	0.0369	-555.73	56.68	26.45	0.135	-55.62	115.31	0.0948	0.00	-0.0905	0.107	0.0490
189.09	0.00	0.652	-0.0488	0.0535	-378.75	0.0397	-525.37	44.94	26.27	0.136	-55.00	145.23	0.105	0.00	-0.0958	0.0528	0.0490
204.55	0.00	0.758	-0.0322	0.0715	-305.63	0.0423	-499.45	35.84	26.06	0.137	-54.65	179.45	0.116	0.00	-0.102	0.0436	0.0490
220.00	0.171	0.859	-0.0183	0.0957	-244.31	0.0440	-484.79	28.21	25.77	0.134	-55.48	215.60	0.129	0.00	-0.111	0.0591	0.0574
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 6-8D O-06 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67209

CATIONS

Calcium (as Ca)	247.70
Magnesium (as Mg)	48.71
Barium (as Ba)	27.85
Strontium (as Sr)	19.50
Sodium (as Na)	3918
Potassium (as K)	130.50
Lithium (as Li)	8.78
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	50.23
Manganese (as Mn)	0.278
Zinc (as Zn)	2.58
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	6700
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	400.00
Bicarbonate (as HCO ₃)	366.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	4.90

PARAMETERS

Calculated T.D.S.	11630
Molar Conductivity	16539
Resistivity	60.46
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.113
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.00

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

CHEVRON 6-8D O-06 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67209

SATURATION LEVEL

Calcite (CaCO ₃)	0.409
Aragonite (CaCO ₃)	0.333
Witherite (BaCO ₃)	0.0104
Strontianite (SrCO ₃)	0.0767
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.156
Anhydrite (CaSO ₄)	0.00964
Gypsum (CaSO ₄ *2H ₂ O)	0.00707
Barite (BaSO ₄)	4.99
Celestite (SrSO ₄)	0.0206
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	125.39
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	275.51
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0777
Aragonite (CaCO ₃)	-0.108
Witherite (BaCO ₃)	-6.78
Strontianite (SrCO ₃)	-0.881
Calcium oxalate (CaC ₂ O ₄)	-0.171
Magnesite (MgCO ₃)	-0.244
Anhydrite (CaSO ₄)	-379.70
Gypsum (CaSO ₄ *2H ₂ O)	-523.40
Barite (BaSO ₄)	8.68
Celestite (SrSO ₄)	-77.51
Fluorite (CaF ₂)	-17.53
Calcium phosphate	>-0.001
Hydroxyapatite	-446.29
Silica (SiO ₂)	-152.13
Brucite (Mg(OH) ₂)	0.00923
Magnesium silicate	-159.64
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.0621
Halite (NaCl)	-201931
Thenardite (Na ₂ SO ₄)	-52359
Iron sulfide (FeS)	-0.0763

SIMPLE INDICES

Langelier	-0.331
Ryznar	6.66
Puckorius	4.50
Larson-Skold Index	31.77
Stiff Davis Index	0.443
Oddo-Tomson	-0.177

BOUND IONS

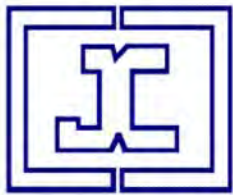
Calcium	247.70	239.06
Barium	27.85	27.85
Carbonate	1.67	0.0926
Phosphate	0.00	0.00
Sulfate	25.00	17.76

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

Temperature (°F)	190.00
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

BERRY PETROLEUM
CHEVRON 6-8D O-06 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67209
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	247.70
Magnesium(as Mg)	48.71
Barium(as Ba)	27.85
Strontium(as Sr)	19.50
Sodium(as Na)	3918
Potassium(as K)	130.50
Lithium(as Li)	8.78
Iron(as Fe)	50.23
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.278
Zinc(as Zn)	2.58
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	6700
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	400.00
Bicarbonate(as HCO ₃)	366.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	4.90

PARAMETERS

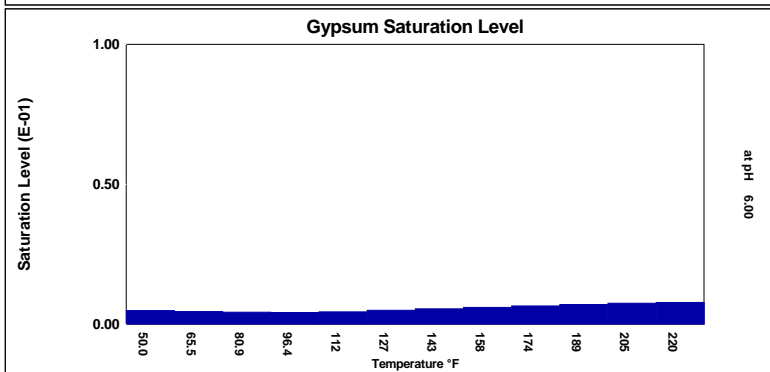
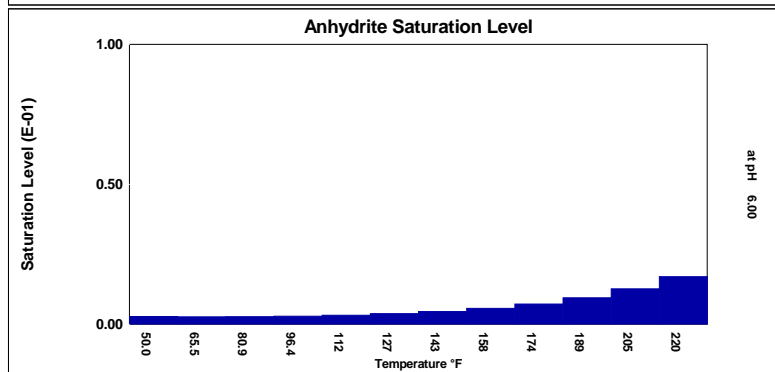
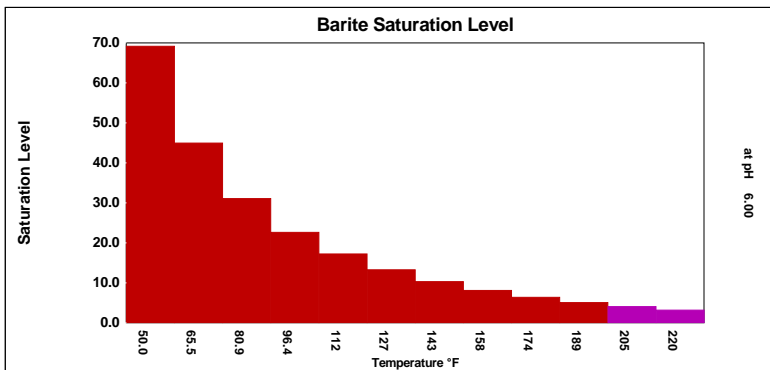
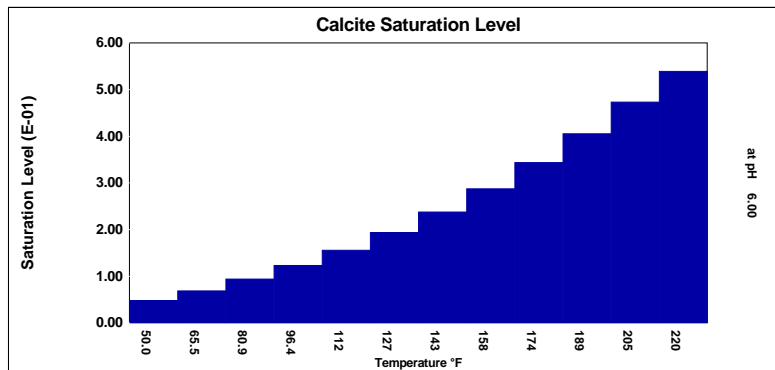
Temperature(°F)	190.00
T.D.S.	11630
Resistivity:	60.46

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0477	-0.299	0.00275	-890.71	0.00489	-720.28	69.13	14.86	0.0188	-87.82	13.88	0.0161	0.00	-0.0529	0.127	0.113
65.45	0.00	0.0684	-0.256	0.00265	-899.68	0.00456	-742.65	44.95	14.28	0.0176	-90.54	22.38	0.0208	0.00	-0.0545	0.371	0.113
80.91	0.00	0.0938	-0.220	0.00270	-880.12	0.00434	-756.50	31.04	13.67	0.0175	-90.18	34.23	0.0256	0.00	-0.0562	0.345	0.113
96.36	0.00	0.123	-0.189	0.00290	-836.79	0.00420	-762.51	22.63	13.05	0.0179	-88.18	49.77	0.0302	0.00	-0.0582	0.452	0.113
111.82	0.00	0.156	-0.164	0.00325	-775.44	0.00445	-729.58	17.22	12.44	0.0186	-85.56	69.38	0.0346	0.00	-0.0603	0.481	0.113
127.27	0.00	0.193	-0.143	0.00378	-702.01	0.00498	-675.37	13.27	11.79	0.0192	-83.27	94.55	0.0392	0.00	-0.0628	0.421	0.113
142.73	0.00	0.237	-0.124	0.00456	-621.96	0.00551	-628.87	10.32	11.09	0.0197	-81.35	126.48	0.0443	0.00	-0.0655	0.355	0.113
158.18	0.00	0.287	-0.107	0.00567	-539.96	0.00603	-588.91	8.08	10.35	0.0201	-79.78	166.06	0.0497	0.00	-0.0686	0.330	0.113
173.64	0.00	0.343	-0.0921	0.00725	-459.71	0.00655	-554.55	6.37	9.57	0.0204	-78.52	214.34	0.0555	0.00	-0.0721	0.306	0.113
189.09	0.00	0.405	-0.0785	0.00948	-383.98	0.00704	-525.02	5.06	8.73	0.0206	-77.56	271.81	0.0617	0.00	-0.0760	0.134	0.113
204.55	0.00	0.473	-0.0659	0.0127	-314.64	0.00751	-499.73	4.04	7.84	0.0206	-76.89	339.26	0.0683	0.00	-0.0806	0.101	0.113
220.00	0.171	0.539	-0.0563	0.0170	-256.72	0.00782	-485.01	3.19	6.84	0.0202	-77.46	413.33	0.0761	0.00	-0.0875	0.135	0.132
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

E-13 CHEVRON 13-213
SEPARATOR

Report Date: 06-07-2013 Sampled: 04-15-2013
Sample #: 2580 at 0000

Sample ID: 38936

CATIONS

Calcium (as Ca)	190.00
Magnesium (as Mg)	16.75
Barium (as Ba)	6.70
Strontium (as Sr)	8.95
Sodium (as Na)	1026
Potassium (as K)	87.57
Lithium (as Li)	3.02
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.346
Iron (as Fe)	79.88
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	1800
Sulfate (as SO ₄)	175.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	150.00
Bicarbonate (as HCO ₃)	427.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	1.99

PARAMETERS

Calculated T.D.S.	3866
Molar Conductivity	5445
Resistivity	183.64
Density(g/mL)	1.00
Pressure(atm)	1.00
pCO ₂ (atm)	0.0486
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.80

JACAM LABORATORIES

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

DownHole SAT™ Water Analysis Report

SYSTEM IDENTIFICATION

BERRY PETROLEUM
E-13 CHEVRON 13-213
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 38936
Report Date: 06-07-2013
Sample Date: 04-15-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	190.00
Magnesium(as Mg)	16.75
Barium(as Ba)	6.70
Strontium(as Sr)	8.95
Sodium(as Na)	1026
Potassium(as K)	87.57
Lithium(as Li)	3.02
Iron(as Fe)	79.88
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.346
Manganese(as Mn)	0.0120
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	1800
Sulfate(as SO ₄)	175.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	150.00
Bicarbonate(as HCO ₃)	427.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	1.99

PARAMETERS

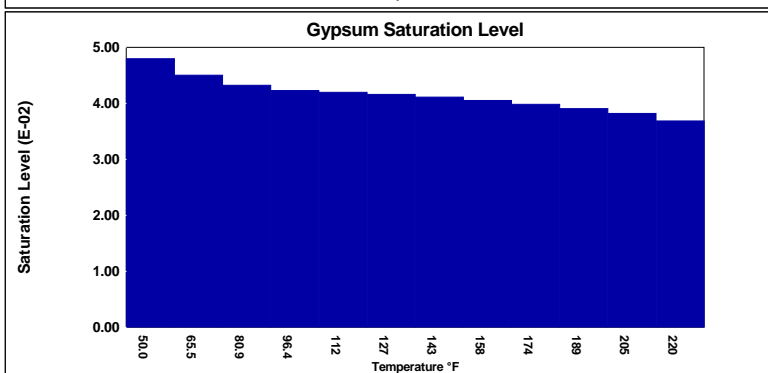
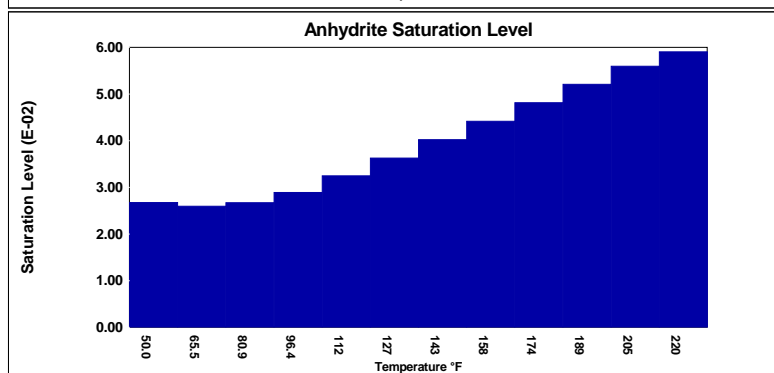
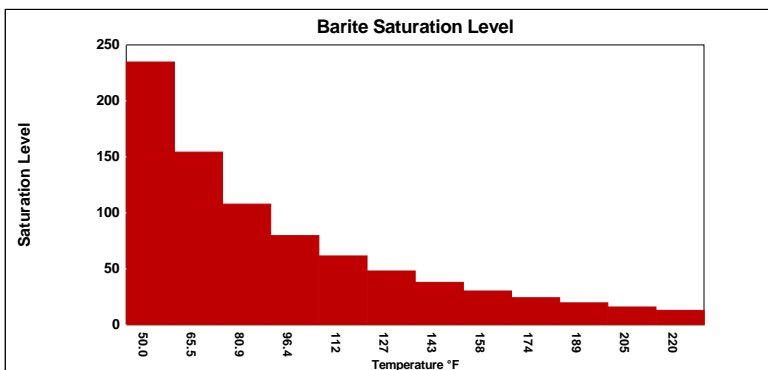
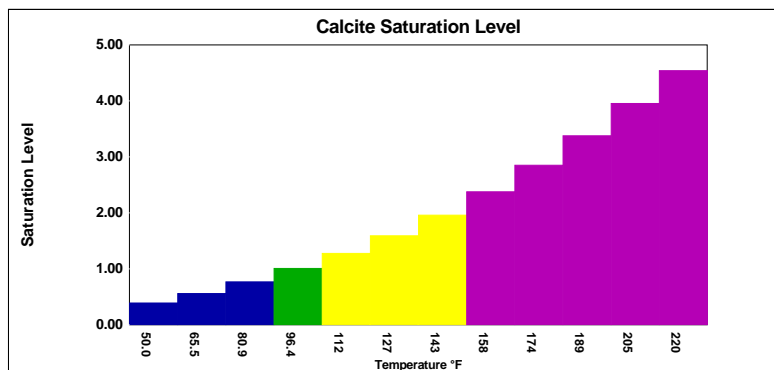
Temperature(°F)	190.00
T.D.S.	3866
Resistivity:	183.64

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.389	-0.141	0.0267	-603.92	0.0480	-472.57	234.62	3.95	0.121	-33.51	239.04	0.104	0.00	-0.00269	0.0674	0.0486
65.45	0.00	0.559	-0.0886	0.0259	-608.25	0.0450	-487.11	154.27	3.94	0.114	-35.13	387.15	0.130	0.00	-0.00275	0.126	0.0486
80.91	0.00	0.766	-0.0413	0.0267	-591.81	0.0432	-495.15	107.85	3.93	0.115	-34.87	593.95	0.156	0.00	-0.00282	0.0928	0.0486
96.36	0.00	1.01	0.00104	0.0289	-558.30	0.0423	-497.27	79.65	3.92	0.119	-33.62	867.15	0.182	0.00	-0.00289	0.122	0.0486
111.82	0.00	1.28	0.0386	0.0324	-514.64	0.0420	-495.08	61.47	3.90	0.125	-31.99	1212	0.207	0.00	-0.00297	0.127	0.0486
127.27	0.00	1.59	0.0747	0.0363	-475.48	0.0416	-493.45	48.08	3.88	0.131	-30.54	1655	0.233	0.00	-0.00307	0.107	0.0486
142.73	0.00	1.96	0.110	0.0402	-441.55	0.0411	-492.90	37.96	3.86	0.137	-29.30	2214	0.260	0.00	-0.00318	0.0866	0.0486
158.18	0.00	2.38	0.145	0.0441	-412.06	0.0405	-493.40	30.23	3.83	0.142	-28.25	2898	0.290	0.00	-0.00332	0.0902	0.0486
173.64	0.00	2.85	0.180	0.0481	-386.37	0.0398	-494.91	24.27	3.80	0.146	-27.35	3711	0.322	0.00	-0.00349	0.0934	0.0486
189.09	0.00	3.38	0.216	0.0521	-363.95	0.0390	-497.41	19.62	3.76	0.150	-26.60	4643	0.355	0.00	-0.00371	0.0471	0.0486
204.55	0.00	3.95	0.252	0.0560	-344.38	0.0382	-500.92	15.98	3.71	0.154	-25.98	5666	0.390	0.00	-0.00399	0.0394	0.0486
220.00	0.171	4.54	0.289	0.0590	-330.91	0.0368	-510.68	12.92	3.65	0.154	-25.82	6707	0.429	0.00	-0.00440	0.0537	0.0569
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

E-18 CHEVRON 18-21D
SEPARATOR

Report Date: 06-07-2013 Sampled: 04-15-2013
Sample #: 2580 at 0000

Sample ID: 38937

CATIONS

Calcium (as Ca)	279.80
Magnesium (as Mg)	25.99
Barium (as Ba)	20.60
Strontium (as Sr)	17.57
Sodium (as Na)	4521
Potassium (as K)	85.53
Lithium (as Li)	3.83
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	142.00
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	7500
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	350.00
Bicarbonate (as HCO ₃)	671.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	2.85

PARAMETERS

Calculated T.D.S.	13326
Molar Conductivity	18468
Resistivity	54.15
Density(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0720
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.80

JACAM LABORATORIES

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



DEPOSITION POTENTIAL INDICATORS

E-18 CHEVRON 18-21D SEPARATOR

Report Date:	06-07-2013	Sampled:	04-15-2013
Sample #:	2580		at 0000
Sample ID:	38937		

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	4.80	Calcite (CaCO ₃)	0.495
Aragonite (CaCO ₃)	3.91	Aragonite (CaCO ₃)	0.465
Witherite (BaCO ₃)	0.0812	Witherite (BaCO ₃)	-7.55
Strontianite (SrCO ₃)	0.732	Strontianite (SrCO ₃)	-0.302
Calcium oxalate (CaC ₂ O ₄)	0.00	Calcium oxalate (CaC ₂ O ₄)	-0.170
Magnesite (MgCO ₃)	0.875	Magnesite (MgCO ₃)	-0.0737
Anhydrite (CaSO ₄)	0.00498	Anhydrite (CaSO ₄)	-603.42
Gypsum (CaSO ₄ *2H ₂ O)	0.00367	Gypsum (CaSO ₄ *2H ₂ O)	-820.32
Barite (BaSO ₄)	3.42	Barite (BaSO ₄)	6.21
Celestite (SrSO ₄)	0.0172	Celestite (SrSO ₄)	-82.67
Fluorite (CaF ₂)	0.00	Fluorite (CaF ₂)	-17.41
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-461.42
Silica (SiO ₂)	0.00	Silica (SiO ₂)	-151.74
Brucite (Mg(OH) ₂)	< 0.001	Brucite (Mg(OH) ₂)	0.0591
Magnesium silicate	0.00	Magnesium silicate	-162.28
Iron hydroxide (Fe(OH) ₃)	12707	Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	0.00	Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	7928	Siderite (FeCO ₃)	0.724
Halite (NaCl)	< 0.001	Halite (NaCl)	-203950
Thenardite (Na ₂ SO ₄)	< 0.001	Thenardite (Na ₂ SO ₄)	-53747
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.00500

BOUND IONS

Langelier	0.764	Calcium	279.80	262.39
Ryznar	5.27	Barium	20.60	20.60
Puckorius	3.51	Carbonate	19.63	1.08
Larson-Skold Index	18.94	Phosphate	0.00	0.00
Stiff Davis Index	1.54	Sulfate	25.00	18.16
Oddo-Tomson	0.891			

Temperature (°F)	190.00
Time(secs)	0.00

JACAM LABORATORIES
205 S. Broadway • P.O. Box 96 • Sterling, KS 67579-0096

DownHole SAT™ Water Analysis Report

SYSTEM IDENTIFICATION

BERRY PETROLEUM
E-18 CHEVRON 18-21D
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 38937
Report Date: 06-07-2013
Sample Date: 04-15-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	279.80
Magnesium(as Mg)	25.99
Barium(as Ba)	20.60
Strontium(as Sr)	17.57
Sodium(as Na)	4521
Potassium(as K)	85.53
Lithium(as Li)	3.83
Iron(as Fe)	142.00
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	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)	7500
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	350.00
Bicarbonate(as HCO ₃)	671.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	2.85

PARAMETERS

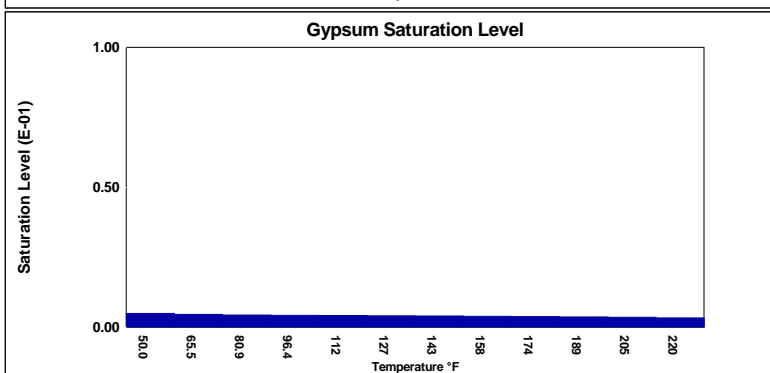
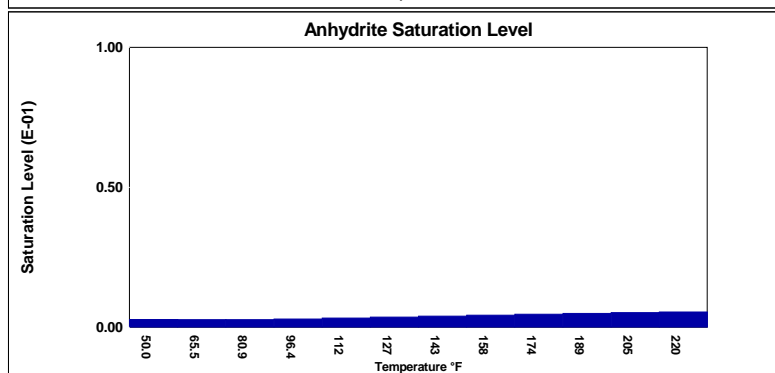
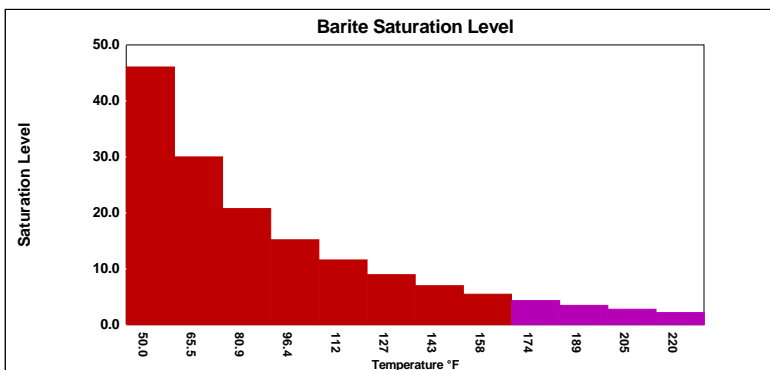
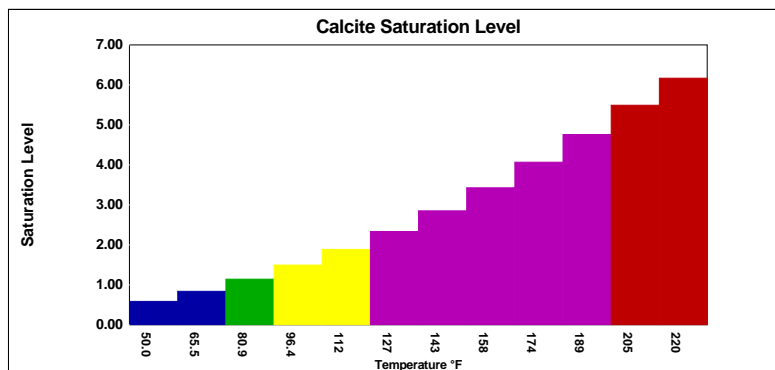
Temperature(°F)	190.00
T.D.S.	13326
Resistivity:	54.15
Sample pH	6.80
Conductivity:	18468

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.585	-0.126	0.00279	-918.26	0.00495	-741.00	46.05	11.41	0.0153	-93.28	429.03	0.205	0.00	-0.00327	0.0783	0.0720
65.45	0.00	0.837	-0.0435	0.00269	-928.38	0.00462	-765.03	30.00	11.03	0.0143	-96.14	691.10	0.258	0.00	-0.00337	0.147	0.0720
80.91	0.00	1.14	0.0336	0.00274	-908.81	0.00439	-780.18	20.76	10.59	0.0143	-95.78	1055	0.311	0.00	-0.00348	0.119	0.0720
96.36	0.00	1.49	0.104	0.00294	-864.45	0.00426	-787.15	15.17	10.11	0.0146	-93.71	1530	0.364	0.00	-0.00361	0.156	0.0720
111.82	0.00	1.88	0.168	0.00327	-805.11	0.00419	-788.19	11.58	9.62	0.0152	-91.00	2127	0.415	0.00	-0.00376	0.164	0.0720
127.27	0.00	2.33	0.231	0.00362	-752.09	0.00411	-790.45	8.95	9.07	0.0158	-88.62	2884	0.468	0.00	-0.00393	0.137	0.0720
142.73	0.00	2.85	0.295	0.00397	-706.56	0.00402	-794.72	6.98	8.45	0.0163	-86.64	3828	0.526	0.00	-0.00412	0.111	0.0720
158.18	0.00	3.43	0.359	0.00431	-667.44	0.00391	-801.01	5.48	7.78	0.0166	-85.01	4972	0.587	0.00	-0.00435	0.116	0.0720
173.64	0.00	4.07	0.425	0.00464	-633.83	0.00380	-809.32	4.34	7.05	0.0169	-83.72	6315	0.652	0.00	-0.00463	0.120	0.0720
189.09	0.00	4.76	0.491	0.00496	-605.03	0.00368	-819.71	3.46	6.26	0.0172	-82.73	7833	0.720	0.00	-0.00497	0.0605	0.0720
204.55	0.00	5.49	0.558	0.00526	-580.48	0.00355	-832.25	2.78	5.40	0.0173	-82.03	9479	0.791	0.00	-0.00540	0.0507	0.0720
220.00	0.171	6.17	0.630	0.00543	-567.67	0.00335	-858.65	2.20	4.39	0.0170	-82.68	11080	0.870	0.00	-0.00605	0.0691	0.0843
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

EL-12 CHEVRON 12-213
SEPARATOR

Report Date: 10-19-2011 Sampled: 10-04-2011
Sample #: 9669 at 0000

CATIONS

Calcium (as Ca)	138.70
Magnesium (as Mg)	29.63
Barium (as Ba)	13.77
Strontium (as Sr)	14.71
Sodium (as Na)	4335
Potassium (as K)	135.70
Lithium (as Li)	8.17
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.266
Iron (as Fe)	88.19
Manganese (as Mn)	0.936
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	6700
Sulfate (as SO ₄)	0.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	360.00
Bicarbonate (as HCO ₃)	817.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	0.00
Phosphate (as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

pH	6.90
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	12979
Molar Conductivity	18680
Field Fe	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
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JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM
ROB SIMEONEEL-12 CHEVRON 12-213
SEPARATORReport Date: 10-19-2011 Sampled: 10-04-2011
Sample #: 9669 at 0000**SATURATION LEVEL**

Calcite (CaCO ₃)	2.06
Aragonite (CaCO ₃)	1.72
Witherite (BaCO ₃)	0.0748
Strontianite (SrCO ₃)	0.421
Magnesite (MgCO ₃)	0.525
Anhydrite (CaSO ₄)	0.00
Gypsum (CaSO ₄ *2H ₂ O)	0.00
Barite (BaSO ₄)	0.00
Celestite (SrSO ₄)	0.00
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	4077
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	3497
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	0.00
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.417
Aragonite (CaCO ₃)	0.339
Witherite (BaCO ₃)	-8.20
Strontianite (SrCO ₃)	-1.28
Magnesite (MgCO ₃)	-0.596
Anhydrite (CaSO ₄)	-819.30
Gypsum (CaSO ₄ *2H ₂ O)	-789.52
Barite (BaSO ₄)	-2.86
Celestite (SrSO ₄)	-139.88
Fluorite (CaF ₂)	-19.65
Calcium phosphate	>-0.001
Hydroxyapatite	-328.22
Silica (SiO ₂)	-72.01
Brucite (Mg(OH) ₂)	-2.01
Magnesium silicate	-116.78
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.943
Halite (NaCl)	-182366
Thenardite (Na ₂ SO ₄)	-51543
Iron sulfide (FeS)	-0.00455

SIMPLE INDICES

Langelier	0.440
Ryznar	6.02
Puckorius	4.02
Larson-Skold Index	9.91
Stiff Davis Index	0.471
Oddo-Tomson	0.250

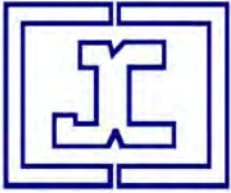
BOUND IONS

Calcium	138.70
Barium	13.77
Carbonate	6.91
Phosphate	0.00
Sulfate	0.00

TOTAL**FREE****OPERATING CONDITIONS**Temperature (°F) 120.00
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

BERRY PETROLEUM
EL-12 CHEVRON 12-213
ROB SIMEONE
SEPARATOR

Sample ID#: 9669
ID: *2580
Report Date: 10-19-2011
Sample Date: 10-04-2011
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	138.70
Magnesium(as Mg)	29.63
Barium(as Ba)	13.77
Strontium(as Sr)	14.71
Sodium(as Na)	4335
Potassium(as K)	135.70
Lithium(as Li)	8.17
Iron(as Fe)	88.19
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.266
Manganese(as Mn)	0.936
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	6700
Sulfate(as SO ₄)	0.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	360.00
Bicarbonate(as HCO ₃)	817.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	0.291

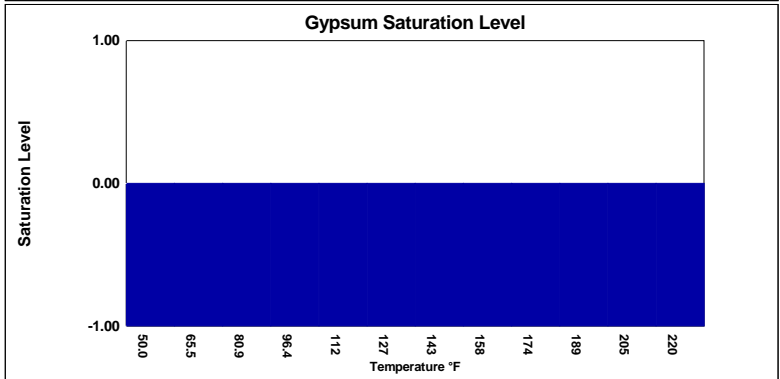
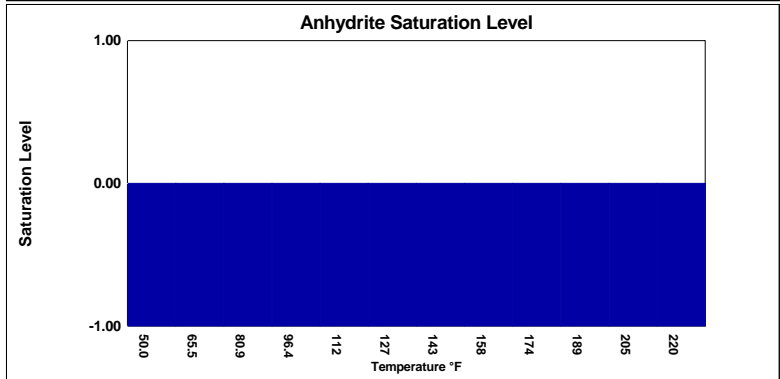
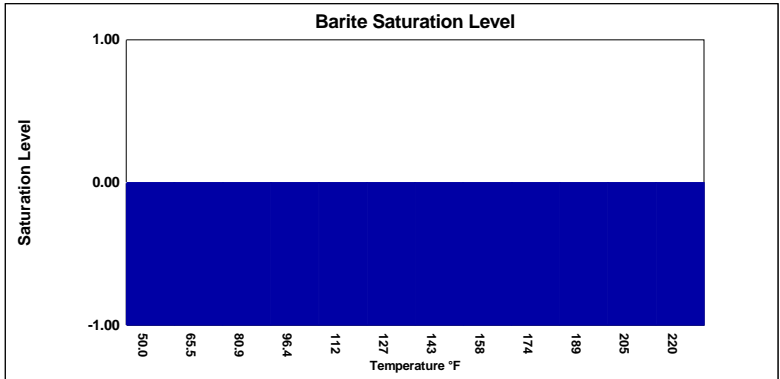
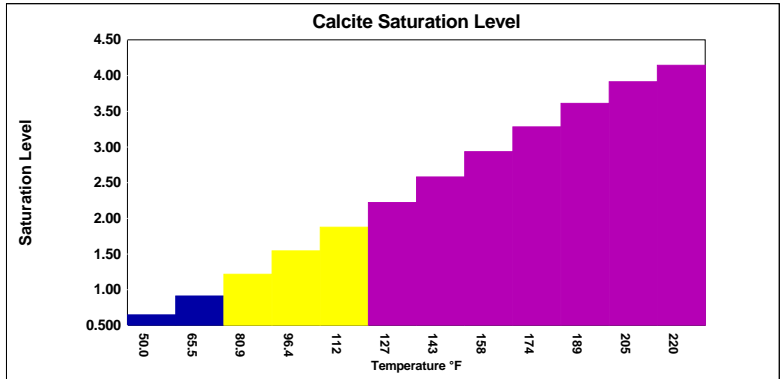
PARAMETERS

Temperature(°F)	120.00
Sample pH	6.90

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.647	-0.210	0.00	-969.01	0.00	-803.15	0.00	-0.816	0.00	-146.05	609.72	0.447	0.00	-0.00388	0.135	0.300
65.45	0.00	0.911	-0.0468	0.00	-979.05	0.00	-827.10	0.00	-1.12	0.00	-143.99	981.79	0.560	0.00	-0.00400	0.252	0.300
80.91	0.00	1.22	0.103	0.00	-960.33	0.00	-842.67	0.00	-1.50	0.00	-142.35	1495	0.675	0.00	-0.00413	0.297	0.300
96.36	0.00	1.54	0.238	0.00	-917.67	0.00	-850.56	0.00	-1.97	0.00	-141.10	2159	0.785	0.00	-0.00428	0.389	0.300
111.82	0.00	1.87	0.356	0.00	-856.86	0.00	-818.87	0.00	-2.53	0.00	-140.21	2980	0.887	0.00	-0.00445	0.408	0.300
127.27	0.00	2.22	0.470	0.00	-783.79	0.00	-765.51	0.00	-3.19	0.00	-139.67	4009	0.993	0.00	-0.00464	0.343	0.300
142.73	0.00	2.58	0.582	0.00	-703.95	0.00	-720.13	0.00	-3.96	0.00	-139.45	5268	1.10	0.00	-0.00487	0.278	0.300
158.18	0.00	2.93	0.691	0.00	-621.94	0.00	-681.47	0.00	-4.84	0.00	-139.55	6759	1.22	0.00	-0.00514	0.289	0.300
173.64	0.00	3.28	0.800	0.00	-541.47	0.00	-648.54	0.00	-5.85	0.00	-139.97	8468	1.34	0.00	-0.00548	0.299	0.300
189.09	0.00	3.61	0.906	0.00	-465.19	0.00	-620.51	0.00	-6.98	0.00	-140.71	10343	1.46	0.00	-0.00589	0.151	0.300
204.55	0.00	3.91	1.01	0.00	-394.85	0.00	-596.71	0.00	-8.25	0.00	-141.78	12298	1.58	0.00	-0.00643	0.126	0.300
220.00	0.171	4.14	1.12	0.00	-335.55	0.00	-583.56	0.00	-9.82	0.00	-144.90	14097	1.72	0.00	-0.00725	0.172	0.351
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

F-1 BERRY 1-18D
SEPARATOR

Report Date: 10-11-2012 Sampled: 09-04-2012
Sample #: 24447 at 0000

Sample ID: 2580

CATIONS

Calcium (as Ca)	338.60
Magnesium (as Mg)	20.51
Barium (as Ba)	31.08
Strontium (as Sr)	24.40
Sodium (as Na)	6232
Potassium (as K)	128.70
Lithium (as Li)	8.12
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	55.72
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	10500
Sulfate (as SO ₄)	0.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	732.00
Bicarbonate (as HCO ₃)	225.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	5.43

PARAMETERS

Calculated T.D.S.	17555
Molar Conductivity	24594
Resistivity	40.66
Density(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0198
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.90

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**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM
ROB SIMEONEF-1 BERRY 1-18D
SEPARATOR

Report Date: 10-11-2012 Sampled: 09-04-2012
Sample #: 24447 at 0000

Sample ID: 2580

SATURATION LEVEL

Calcite (CaCO ₃)	2.22
Aragonite (CaCO ₃)	1.80
Witherite (BaCO ₃)	0.0433
Strontianite (SrCO ₃)	0.361
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.268
Anhydrite (CaSO ₄)	0.00
Gypsum (CaSO ₄ *2H ₂ O)	0.00
Barite (BaSO ₄)	0.00
Celestite (SrSO ₄)	0.00
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	6780
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	1113
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	0.00
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.150
Aragonite (CaCO ₃)	0.122
Witherite (BaCO ₃)	-7.77
Strontianite (SrCO ₃)	-0.665
Calcium oxalate (CaC ₂ O ₄)	-0.161
Magnesite (MgCO ₃)	-0.611
Anhydrite (CaSO ₄)	-652.65
Gypsum (CaSO ₄ *2H ₂ O)	-892.22
Barite (BaSO ₄)	-3.19
Celestite (SrSO ₄)	-97.88
Fluorite (CaF ₂)	-16.86
Calcium phosphate	>-0.001
Hydroxyapatite	-496.04
Silica (SiO ₂)	-150.44
Brucite (Mg(OH) ₂)	0.0769
Magnesium silicate	-168.05
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.317
Halite (NaCl)	-207636
Thenardite (Na ₂ SO ₄)	-57230
Iron sulfide (FeS)	-0.0127

SIMPLE INDICES

Langelier	0.426
Ryznar	6.05
Puckorius	5.07
Larson-Skold Index	77.72
Stiff Davis Index	1.18
Oddo-Tomson	0.485

BOUND IONS

Calcium	338.60	332.25
Barium	31.08	31.08
Carbonate	10.55	0.472
Phosphate	0.00	0.00
Sulfate	0.00	0.00

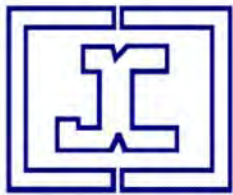
TOTAL**FREE****OPERATING CONDITIONS**

Temperature (°F)	190.00
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

BERRY PETROLEUM
F-1 BERRY 1-18D
ROB SIMEONE
SEPARATOR

Sample ID#: 24447
ID: 2580
Report Date: 10-11-2012
Sample Date: 09-04-2012
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	338.60
Magnesium(as Mg)	20.51
Barium(as Ba)	31.08
Strontium(as Sr)	24.40
Sodium(as Na)	6232
Potassium(as K)	128.70
Lithium(as Li)	8.12
Iron(as Fe)	55.72
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	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)	10500
Sulfate(as SO ₄)	0.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	732.00
Bicarbonate(as HCO ₃)	225.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	5.43

PARAMETERS

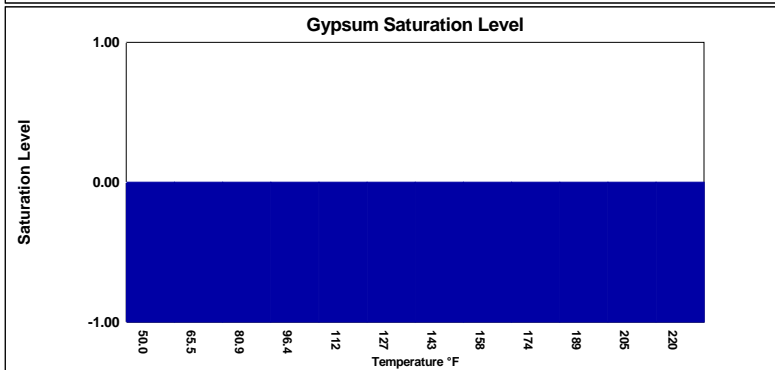
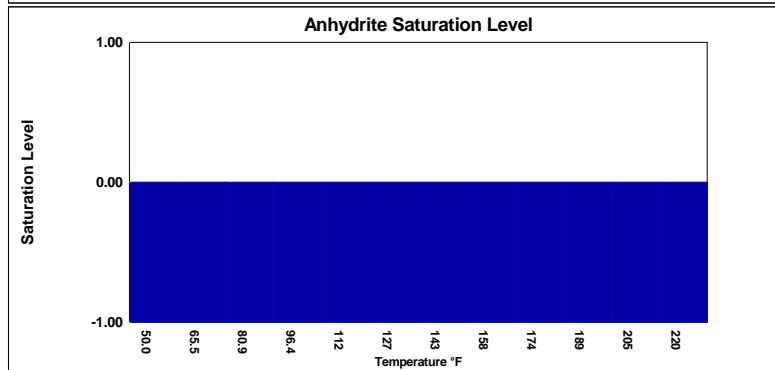
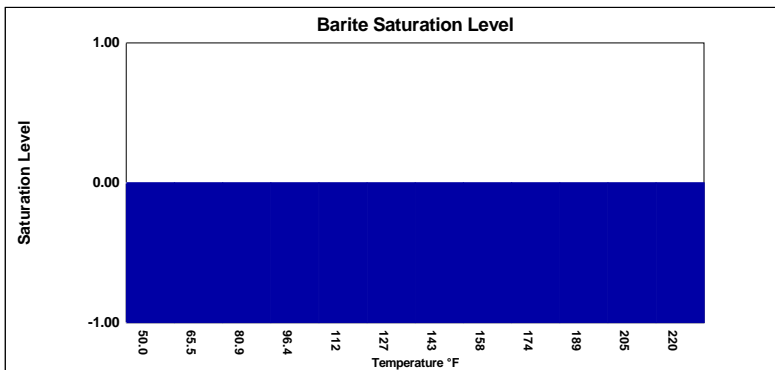
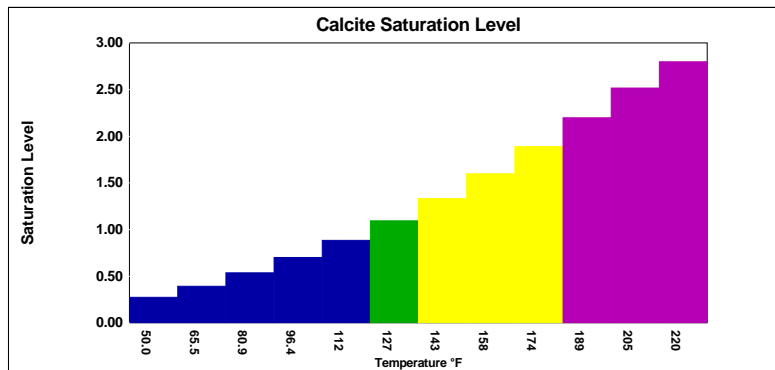
Temperature(°F)	190.00
T.D.S.	17555
Resistivity:	40.66

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.273	-0.209	0.00	-987.07	0.00	-796.23	0.00	-0.297	0.00	-108.97	62.81	0.0896	0.00	-0.00803	0.0479	0.0198
65.45	0.00	0.392	-0.153	0.00	-998.62	0.00	-822.64	0.00	-0.448	0.00	-112.14	101.03	0.113	0.00	-0.00829	0.0897	0.0198
80.91	0.00	0.536	-0.103	0.00	-978.09	0.00	-839.67	0.00	-0.633	0.00	-111.79	153.83	0.137	0.00	-0.00859	0.0522	0.0198
96.36	0.00	0.701	-0.0594	0.00	-930.73	0.00	-848.03	0.00	-0.848	0.00	-109.55	222.63	0.160	0.00	-0.00893	0.0684	0.0198
111.82	0.00	0.884	-0.0209	0.00	-867.12	0.00	-850.13	0.00	-1.09	0.00	-106.60	308.51	0.183	0.00	-0.00933	0.0717	0.0198
127.27	0.00	1.09	0.0152	0.00	-810.40	0.00	-853.68	0.00	-1.37	0.00	-104.04	416.77	0.206	0.00	-0.00978	0.0601	0.0198
142.73	0.00	1.33	0.0499	0.00	-761.82	0.00	-859.56	0.00	-1.71	0.00	-101.93	550.76	0.232	0.00	-0.0103	0.0487	0.0198
158.18	0.00	1.60	0.0835	0.00	-720.24	0.00	-867.81	0.00	-2.12	0.00	-100.23	710.77	0.258	0.00	-0.0109	0.0508	0.0198
173.64	0.00	1.89	0.117	0.00	-684.68	0.00	-878.43	0.00	-2.60	0.00	-98.91	896.74	0.287	0.00	-0.0117	0.0525	0.0198
189.09	0.00	2.20	0.148	0.00	-654.37	0.00	-891.48	0.00	-3.16	0.00	-97.94	1101	0.315	0.00	-0.0126	0.0265	0.0198
204.55	0.00	2.52	0.179	0.00	-628.75	0.00	-907.16	0.00	-3.81	0.00	-97.32	1315	0.344	0.00	-0.0138	0.0222	0.0198
220.00	0.171	2.80	0.209	0.00	-616.76	0.00	-939.35	0.00	-4.65	0.00	-98.34	1510	0.376	0.00	-0.0157	0.0302	0.0232
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

GG I-02 LATHAM 2-14
SEPARATOR

Report Date: 06-07-2013 Sampled: 04-15-2013
Sample #: 2580 at 0000

Sample ID: 38958

CATIONS

Calcium (as Ca)	195.70
Magnesium (as Mg)	15.17
Barium (as Ba)	20.76
Strontium (as Sr)	11.88
Sodium (as Na)	2916
Potassium (as K)	65.92
Lithium (as Li)	4.56
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	48.10
Manganese (as Mn)	0.0120
Zinc (as Zn)	1.26
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	4700
Sulfate (as SO ₄)	125.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	225.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	3.19

PARAMETERS

Calculated T.D.S.	8658
Molar Conductivity	12375
Resistivity	80.81
Density(g/mL)	1.00
Pressure(atm)	1.00
pCO ₂ (atm)	0.0872
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.50

JACAM LABORATORIES

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



DEPOSITION POTENTIAL INDICATORS

GG I-02 LATHAM 2-14
SEPARATOR

Report Date:	06-07-2013	Sampled:	04-15-2013
Sample #:	2580		at 0000
Sample ID:	38958		

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	1.51	Calcite (CaCO ₃)	0.0718
Aragonite (CaCO ₃)	1.23	Aragonite (CaCO ₃)	0.0397
Witherite (BaCO ₃)	0.0385	Witherite (BaCO ₃)	-6.35
Strontianite (SrCO ₃)	0.232	Strontianite (SrCO ₃)	-0.888
Calcium oxalate (CaC ₂ O ₄)	0.00	Calcium oxalate (CaC ₂ O ₄)	-0.183
Magnesite (MgCO ₃)	0.218	Magnesite (MgCO ₃)	-0.612
Anhydrite (CaSO ₄)	0.0248	Anhydrite (CaSO ₄)	-514.44
Gypsum (CaSO ₄ *2H ₂ O)	0.0184	Gypsum (CaSO ₄ *2H ₂ O)	-698.68
Barite (BaSO ₄)	25.59	Barite (BaSO ₄)	11.73
Celestite (SrSO ₄)	0.0858	Celestite (SrSO ₄)	-48.70
Fluorite (CaF ₂)	0.00	Fluorite (CaF ₂)	-18.11
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-410.65
Silica (SiO ₂)	0.00	Silica (SiO ₂)	-152.66
Brucite (Mg(OH) ₂)	< 0.001	Brucite (Mg(OH) ₂)	0.0281
Magnesium silicate	0.00	Magnesium silicate	-153.09
Iron hydroxide (Fe(OH) ₃)	1323	Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	0.00	Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	1244	Siderite (FeCO ₃)	0.246
Halite (NaCl)	< 0.001	Halite (NaCl)	-196576
Thenardite (Na ₂ SO ₄)	< 0.001	Thenardite (Na ₂ SO ₄)	-49001
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.0207

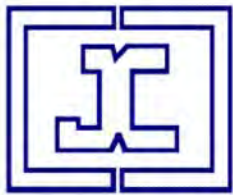
FREE

Langelier	0.248	Calcium	195.70	181.29
Ryznar	6.00	Barium	20.76	20.76
Puckorius	4.15	Carbonate	5.23	0.366
Larson-Skold Index	16.84	Phosphate	0.00	0.00
Stiff Davis Index	1.01	Sulfate	125.00	95.74
Oddo-Tomson	0.458			

Temperature (°F)	190.00
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

BERRY PETROLEUM
GG I-02 LATHAM 2-14
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 38958
Report Date: 06-07-2013
Sample Date: 04-15-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	195.70
Magnesium(as Mg)	15.17
Barium(as Ba)	20.76
Strontium(as Sr)	11.88
Sodium(as Na)	2916
Potassium(as K)	65.92
Lithium(as Li)	4.56
Iron(as Fe)	48.10
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0120
Zinc(as Zn)	1.26
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	4700
Sulfate(as SO ₄)	125.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	225.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	3.19

PARAMETERS

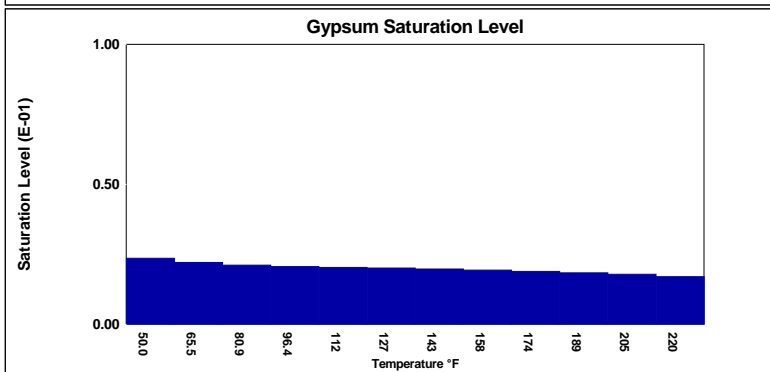
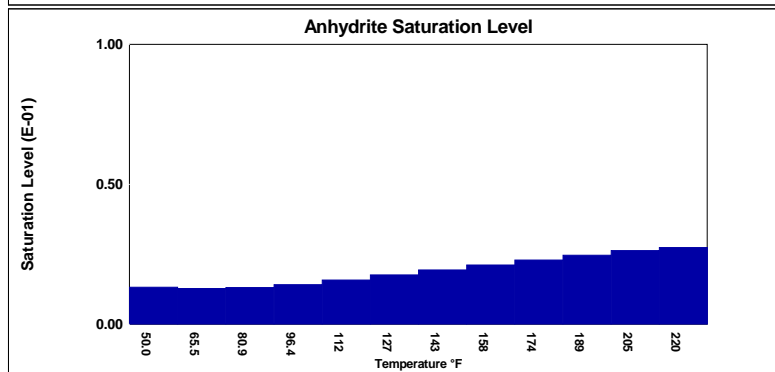
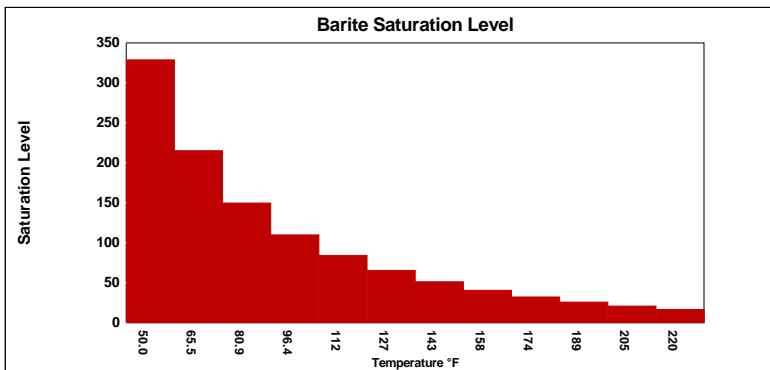
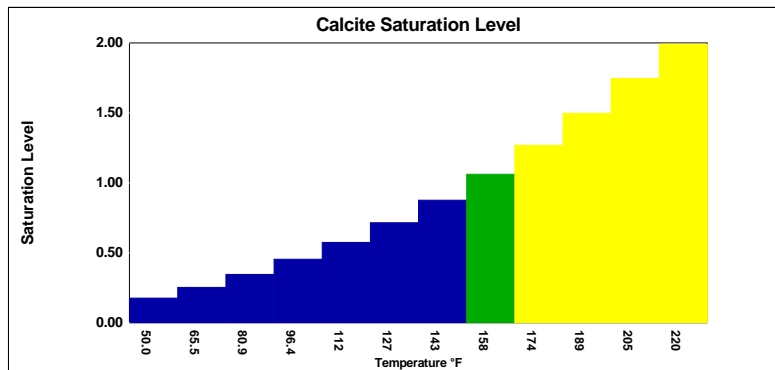
Temperature(°F)	190.00
T.D.S.	8658
Resistivity:	80.81

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.176	-0.280	0.0132	-801.98	0.0236	-643.39	328.70	12.25	0.0729	-57.08	63.07	0.0684	0.00	-0.0144	0.0842	0.0872
65.45	0.00	0.253	-0.222	0.0128	-809.54	0.0221	-663.43	215.13	12.23	0.0686	-59.50	101.91	0.0862	0.00	-0.0148	0.158	0.0872
80.91	0.00	0.346	-0.171	0.0131	-791.00	0.0211	-675.53	149.63	12.20	0.0686	-59.27	156.03	0.105	0.00	-0.0153	0.135	0.0872
96.36	0.00	0.454	-0.128	0.0141	-750.79	0.0206	-680.35	109.91	12.16	0.0708	-57.63	227.20	0.122	0.00	-0.0157	0.177	0.0872
111.82	0.00	0.574	-0.0894	0.0158	-697.53	0.0203	-679.89	84.31	12.12	0.0741	-55.46	316.95	0.139	0.00	-0.0163	0.185	0.0872
127.27	0.00	0.715	-0.0544	0.0176	-649.84	0.0201	-680.35	65.53	12.07	0.0772	-53.56	432.29	0.158	0.00	-0.0169	0.155	0.0872
142.73	0.00	0.876	-0.0216	0.0194	-608.70	0.0197	-682.42	51.38	12.01	0.0799	-51.96	577.66	0.177	0.00	-0.0176	0.126	0.0872
158.18	0.00	1.06	0.00982	0.0212	-573.16	0.0193	-686.10	40.61	11.94	0.0822	-50.64	757.45	0.198	0.00	-0.0185	0.131	0.0872
173.64	0.00	1.27	0.0403	0.0230	-542.45	0.0189	-691.37	32.34	11.85	0.0842	-49.58	974.11	0.221	0.00	-0.0194	0.136	0.0872
189.09	0.00	1.50	0.0701	0.0247	-515.93	0.0184	-698.28	25.92	11.74	0.0857	-48.74	1228	0.244	0.00	-0.0206	0.0684	0.0872
204.55	0.00	1.75	0.0994	0.0263	-493.09	0.0179	-706.86	20.90	11.61	0.0868	-48.12	1517	0.270	0.00	-0.0220	0.0573	0.0872
220.00	0.171	1.99	0.128	0.0274	-479.64	0.0170	-726.06	16.66	11.43	0.0860	-48.41	1825	0.298	0.00	-0.0240	0.0781	0.102
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

H-7A PAD CHEVRON-6-44D
WELLHEAD

Report Date: 03-28-2013 Sampled: 02-22-2013
Sample #: -31144 at 0000

Sample ID: 2580

CATIONS

Calcium (as Ca)	237.00
Magnesium (as Mg)	47.19
Barium (as Ba)	8.35
Strontium (as Sr)	20.78
Sodium (as Na)	5050
Potassium (as K)	154.10
Lithium (as Li)	10.28
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.507
Iron (as Fe)	380.40
Manganese (as Mn)	6.01
Zinc (as Zn)	0.531
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	8700
Sulfate (as SO ₄)	75.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	120.00
Bicarbonate (as HCO ₃)	610.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	15.67

PARAMETERS

Calculated T.D.S.	15395
Molar Conductivity	21592
Resistivity	46.31
Density(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0445
pH ₂ S(atm)	0.00
Temperature (°F)	120.00
pH	7.00

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM
ROB SIMEONEH-7A PAD CHEVRON-6-44D
WELLHEADReport Date: 03-28-2013 Sampled: 02-22-2013
Sample #: -31144 at 0000

Sample ID: 2580**SATURATION LEVEL**

Calcite (CaCO ₃)	2.43
Aragonite (CaCO ₃)	2.05
Witherite (BaCO ₃)	0.0267
Strontianite (SrCO ₃)	0.612
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.574
Anhydrite (CaSO ₄)	0.00770
Gypsum (CaSO ₄ *2H ₂ O)	0.00921
Barite (BaSO ₄)	10.61
Celestite (SrSO ₄)	0.0477
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	25907
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	8965
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.333
Aragonite (CaCO ₃)	0.291
Witherite (BaCO ₃)	-10.67
Strontianite (SrCO ₃)	-0.479
Calcium oxalate (CaC ₂ O ₄)	-0.178
Magnesite (MgCO ₃)	-0.350
Anhydrite (CaSO ₄)	-832.15
Gypsum (CaSO ₄ *2H ₂ O)	-848.72
Barite (BaSO ₄)	4.43
Celestite (SrSO ₄)	-82.77
Fluorite (CaF ₂)	-15.79
Calcium phosphate	>-0.001
Hydroxyapatite	-347.61
Silica (SiO ₂)	-71.55
Brucite (Mg(OH) ₂)	0.0136
Magnesium silicate	-119.84
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.657
Halite (NaCl)	-184666
Thenardite (Na ₂ SO ₄)	-54193
Iron sulfide (FeS)	-0.00102

SIMPLE INDICES

Langelier	0.454
Ryznar	6.09
Puckorius	4.61
Larson-Skold Index	24.84
Stiff Davis Index	0.442
Oddo-Tomson	0.205

BOUND IONS

Calcium	237.00	224.88
Barium	8.35	8.35
Carbonate	6.13	0.976
Phosphate	0.00	0.00
Sulfate	75.00	55.29

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

Temperature (°F)	120.00
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

BERRY PETROLEUM
H-7A PAD CHEVRON-6-44D
ROB SIMEONE
WELLHEAD

Sample ID#: -31144
ID: 2580
Report Date: 03-28-2013
Sample Date: 02-22-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	237.00
Magnesium(as Mg)	47.19
Barium(as Ba)	8.35
Strontium(as Sr)	20.78
Sodium(as Na)	5050
Potassium(as K)	154.10
Lithium(as Li)	10.28
Iron(as Fe)	380.40
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.507
Manganese(as Mn)	6.01
Zinc(as Zn)	0.531
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	8700
Sulfate(as SO ₄)	75.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	120.00
Bicarbonate(as HCO ₃)	610.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	15.67

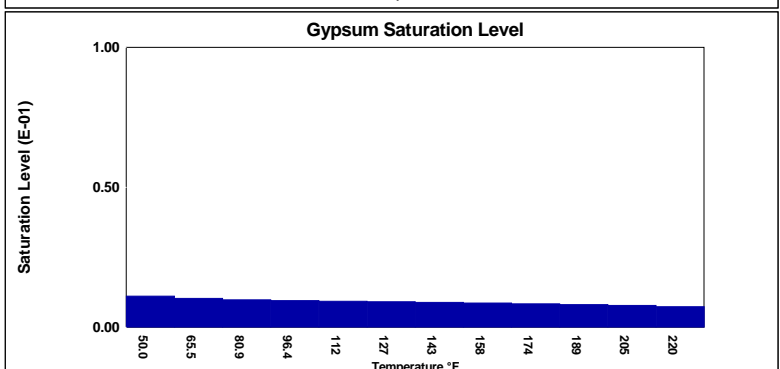
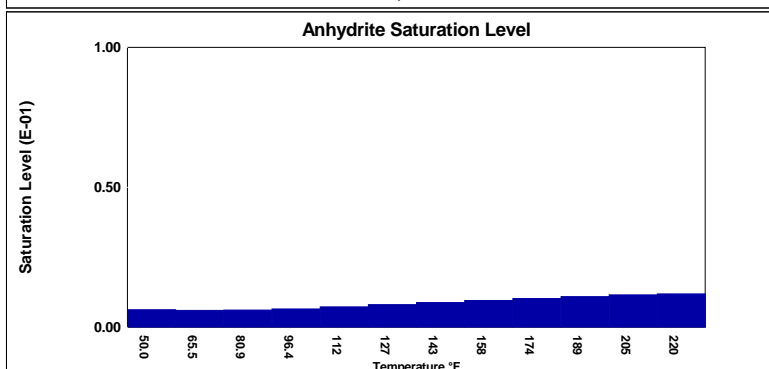
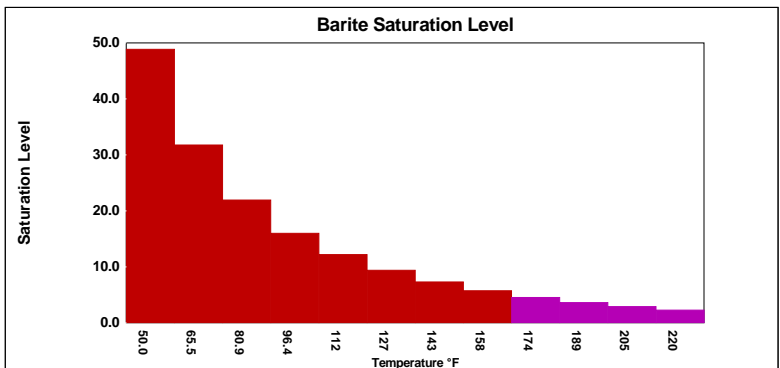
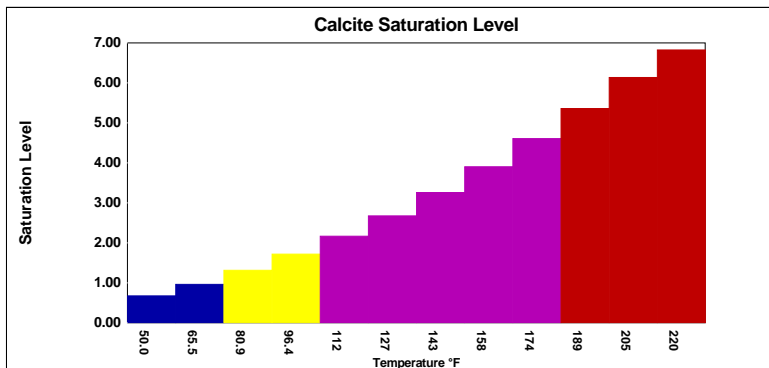
PARAMETERS

Temperature(°F)	120.00
T.D.S.	15395
Conductivity:	21592
Resistivity:	46.31

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.673	-0.128	0.00626	-979.11	0.0111	-795.01	48.84	4.84	0.0474	-85.58	1543	0.305	0.00	>-0.001	0.0652	0.0445
65.45	0.00	0.964	-0.0125	0.00602	-990.33	0.0103	-820.89	31.76	4.78	0.0443	-88.80	2488	0.382	0.00	>-0.001	0.122	0.0445
80.91	0.00	1.32	0.0957	0.00613	-970.36	0.00980	-837.48	21.94	4.70	0.0440	-88.64	3794	0.462	0.00	>-0.001	0.0877	0.0445
96.36	0.00	1.72	0.195	0.00657	-924.34	0.00949	-845.52	16.00	4.61	0.0451	-86.68	5498	0.541	0.00	>-0.001	0.115	0.0445
111.82	0.00	2.16	0.286	0.00730	-862.49	0.00931	-847.36	12.18	4.50	0.0469	-84.04	7621	0.616	0.00	>-0.001	0.120	0.0445
127.27	0.00	2.68	0.375	0.00806	-807.25	0.00912	-850.52	9.40	4.37	0.0485	-81.75	10300	0.695	0.00	-0.00104	0.101	0.0445
142.73	0.00	3.26	0.466	0.00881	-759.85	0.00889	-855.86	7.31	4.20	0.0498	-79.87	13600	0.779	0.00	-0.00110	0.0819	0.0445
158.18	0.00	3.90	0.557	0.00955	-719.14	0.00864	-863.36	5.73	4.00	0.0508	-78.35	17533	0.868	0.00	-0.00117	0.0853	0.0445
173.64	0.00	4.61	0.649	0.0103	-684.19	0.00837	-873.01	4.53	3.76	0.0517	-77.17	22034	0.961	0.00	-0.00125	0.0883	0.0445
189.09	0.00	5.36	0.741	0.0109	-654.26	0.00809	-884.85	3.61	3.46	0.0522	-76.29	26936	1.06	0.00	-0.00136	0.0445	0.0445
204.55	0.00	6.13	0.832	0.0116	-628.73	0.00779	-898.93	2.89	3.10	0.0525	-75.71	31971	1.15	0.00	-0.00149	0.0373	0.0445
220.00	0.171	6.82	0.926	0.0119	-615.86	0.00735	-928.05	2.28	2.64	0.0516	-76.50	36412	1.26	0.00	-0.00170	0.0508	0.0521
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

I-19 CHEVRON 19-1D
SEPARATOR

Report Date: 11-18-2013 Sampled: 10-29-2013
Sample #: 2580 at 0000

Sample ID: 56531

CATIONS

Calcium (as Ca)	269.50
Magnesium (as Mg)	52.54
Barium (as Ba)	23.72
Strontium (as Sr)	11.27
Sodium (as Na)	40.28
Potassium (as K)	95.74
Lithium (as Li)	6.40
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.716
Iron (as Fe)	370.40
Manganese (as Mn)	2.57
Zinc (as Zn)	0.911
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	1000
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	450.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	21.02

PARAMETERS

Calculated T.D.S.	2546
Molar Conductivity	2924
Resistivity	342.04
Sp.Gr.(g/mL)	1.00
Pressure(atm)	1.00
pCO ₂ (atm)	0.0463
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.90

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM
ROB SIMEONEI-19 CHEVRON 19-1D
SEPARATOR

Report Date: 11-18-2013 Sampled: 10-29-2013
Sample #: 2580 at 0000

Sample ID: 56531

SATURATION LEVEL

Calcite (CaCO ₃)	7.89
Aragonite (CaCO ₃)	6.42
Witherite (BaCO ₃)	0.175
Strontianite (SrCO ₃)	0.864
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	2.88
Anhydrite (CaSO ₄)	0.0195
Gypsum (CaSO ₄ *2H ₂ O)	0.0144
Barite (BaSO ₄)	8.80
Celestite (SrSO ₄)	0.0242
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	89262
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	34408
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.353
Aragonite (CaCO ₃)	0.341
Witherite (BaCO ₃)	-2.88
Strontianite (SrCO ₃)	-0.0850
Calcium oxalate (CaC ₂ O ₄)	-0.0667
Magnesite (MgCO ₃)	0.222
Anhydrite (CaSO ₄)	-196.87
Gypsum (CaSO ₄ *2H ₂ O)	-276.06
Barite (BaSO ₄)	8.23
Celestite (SrSO ₄)	-46.50
Fluorite (CaF ₂)	-12.05
Calcium phosphate	>-0.001
Hydroxyapatite	-312.25
Silica (SiO ₂)	-153.99
Brucite (Mg(OH) ₂)	0.0632
Magnesium silicate	-133.42
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.468
Halite (NaCl)	-179659
Thenardite (Na ₂ SO ₄)	-39916
Iron sulfide (FeS)	>-0.001

SIMPLE INDICES

Langelier	0.974
Ryznar	4.95
Puckorius	3.49
Larson-Skold Index	3.56
Stiff Davis Index	1.64
Oddo-Tomson	1.30

BOUND IONS

Calcium	269.50	247.25
Barium	23.72	23.72
Carbonate	7.50	0.696
Phosphate	0.00	0.00
Sulfate	25.00	13.40

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

Temperature (°F)	190.00
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

BERRY PETROLEUM
I-19 CHEVRON 19-1D
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 56531
Report Date: 11-18-2013
Sample Date: 10-29-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	269.50
Magnesium(as Mg)	52.54
Barium(as Ba)	23.72
Strontium(as Sr)	11.27
Sodium(as Na)	40.28
Potassium(as K)	95.74
Lithium(as Li)	6.40
Iron(as Fe)	370.40
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.716
Manganese(as Mn)	2.57
Zinc(as Zn)	0.911
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	1000
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	450.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	21.02

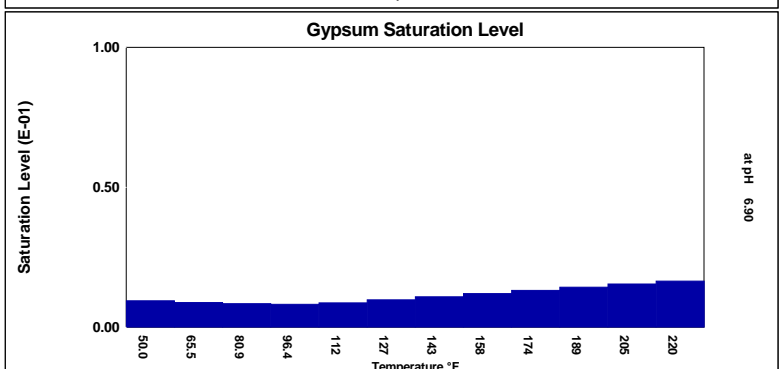
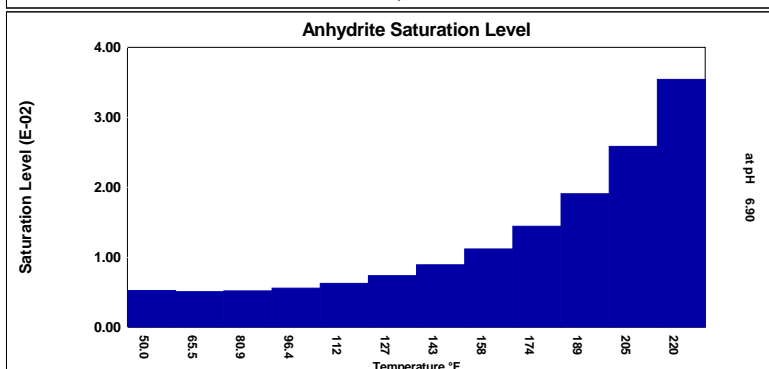
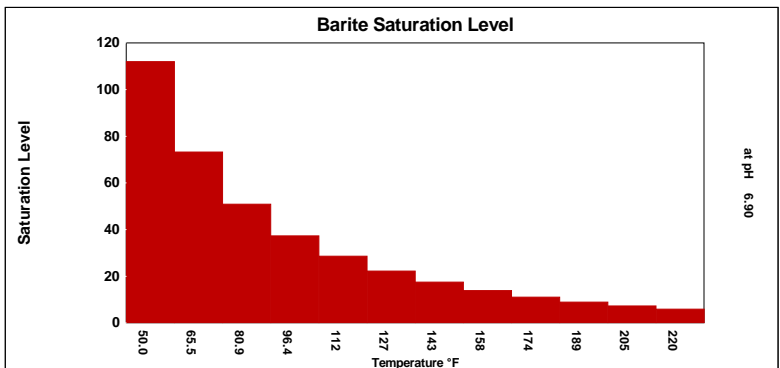
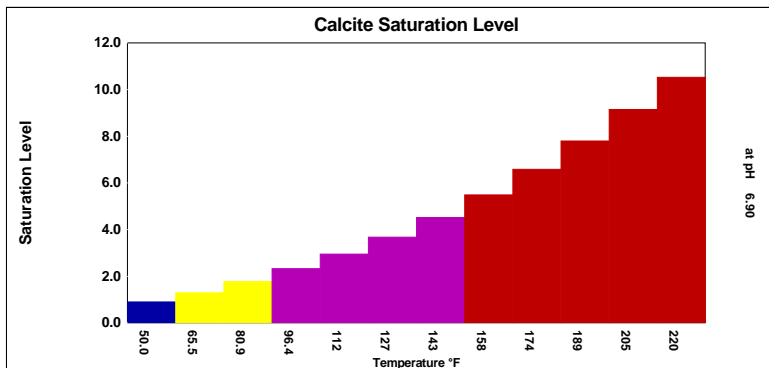
PARAMETERS

Temperature(°F)	190.00
T.D.S.	2546
Resistivity:	342.04
Sample pH	6.90
Conductivity:	2924

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.898	-0.0138	0.00526	-543.33	0.00945	-424.15	111.97	12.59	0.0204	-56.56	1801	0.141	0.00	>-0.001	0.0662	0.0463
65.45	0.00	1.29	0.0338	0.00508	-546.44	0.00883	-436.37	73.17	12.13	0.0192	-58.03	2911	0.175	0.00	>-0.001	0.124	0.0463
80.91	0.00	1.77	0.0788	0.00519	-530.66	0.00842	-442.72	50.82	11.66	0.0192	-57.48	4461	0.210	0.00	>-0.001	0.0899	0.0463
96.36	0.00	2.32	0.120	0.00558	-499.41	0.00819	-443.68	37.28	11.20	0.0198	-55.86	6502	0.244	0.00	>-0.001	0.118	0.0463
111.82	0.00	2.95	0.158	0.00629	-456.75	0.00871	-419.75	28.57	10.74	0.0207	-53.84	9074	0.276	0.00	>-0.001	0.123	0.0463
127.27	0.00	3.67	0.195	0.00736	-406.84	0.00979	-382.64	22.20	10.28	0.0215	-52.01	12362	0.310	0.00	>-0.001	0.104	0.0463
142.73	0.00	4.52	0.233	0.00894	-353.40	0.0109	-350.67	17.42	9.79	0.0223	-50.41	16476	0.346	0.00	>-0.001	0.0839	0.0463
158.18	0.00	5.48	0.271	0.0112	-299.60	0.0120	-323.00	13.80	9.30	0.0230	-49.00	21473	0.384	0.00	>-0.001	0.0874	0.0463
173.64	0.00	6.58	0.311	0.0144	-247.89	0.0132	-298.96	11.02	8.79	0.0236	-47.76	27336	0.424	0.00	>-0.001	0.0905	0.0463
189.09	0.00	7.80	0.351	0.0191	-200.09	0.0143	-277.95	8.88	8.27	0.0242	-46.67	33933	0.467	0.00	>-0.001	0.0456	0.0463
204.55	0.00	9.14	0.393	0.0258	-157.35	0.0155	-259.49	7.22	7.73	0.0247	-45.69	40987	0.510	0.00	>-0.001	0.0382	0.0463
220.00	0.171	10.52	0.437	0.0354	-121.79	0.0165	-245.81	5.86	7.19	0.0249	-45.20	47871	0.559	0.00	>-0.001	0.0520	0.0542
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

J-20 CHEVRON 20-31D
SEPARATOR

Report Date: 11-18-2013 Sampled: 10-29-2013
Sample #: 2580 at 0000

Sample ID: 56536

CATIONS

Calcium (as Ca)	313.90
Magnesium (as Mg)	58.59
Barium (as Ba)	41.17
Strontium (as Sr)	20.77
Sodium (as Na)	4683
Potassium (as K)	123.00
Lithium (as Li)	8.06
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.242
Iron (as Fe)	43.40
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.412
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	8000
Sulfate (as SO ₄)	150.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	190.00
Bicarbonate (as HCO ₃)	244.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	16.22

PARAMETERS

Calculated T.D.S.	13790
Molar Conductivity	19301
Resistivity	51.81
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0622
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.20

JACAM LABORATORIES

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



DEPOSITION POTENTIAL INDICATORS

J-20 CHEVRON 20-31D
SEPARATOR

Report Date:	11-18-2013	Sampled:	10-29-2013
Sample #:	2580		at 0000
Sample ID:	56536		

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.498	Calcite (CaCO ₃)	-0.0587
Aragonite (CaCO ₃)	0.406	Aragonite (CaCO ₃)	-0.0854
Witherite (BaCO ₃)	0.0146	Witherite (BaCO ₃)	-5.99
Strontianite (SrCO ₃)	0.0780	Strontianite (SrCO ₃)	-0.939
Calcium oxalate (CaC ₂ O ₄)	0.00	Calcium oxalate (CaC ₂ O ₄)	-0.152
Magnesite (MgCO ₃)	0.177	Magnesite (MgCO ₃)	-0.227
Anhydrite (CaSO ₄)	0.0631	Anhydrite (CaSO ₄)	-356.66
Gypsum (CaSO ₄ *2H ₂ O)	0.0462	Gypsum (CaSO ₄ *2H ₂ O)	-503.83
Barite (BaSO ₄)	37.77	Barite (BaSO ₄)	23.50
Celestite (SrSO ₄)	0.112	Celestite (SrSO ₄)	-58.30
Fluorite (CaF ₂)	0.00	Fluorite (CaF ₂)	-16.57
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-466.92
Silica (SiO ₂)	0.00	Silica (SiO ₂)	-151.43
Brucite (Mg(OH) ₂)	< 0.001	Brucite (Mg(OH) ₂)	0.0149
Magnesium silicate	0.00	Magnesium silicate	-163.13
Iron hydroxide (Fe(OH) ₃)	247.27	Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	0.00	Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	225.79	Siderite (FeCO ₃)	0.0672
Halite (NaCl)	< 0.001	Halite (NaCl)	-204478
Thenardite (Na ₂ SO ₄)	< 0.001	Thenardite (Na ₂ SO ₄)	-54357
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.0647

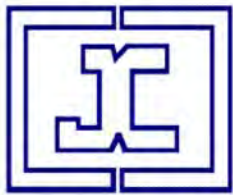
BOUND IONS

Langelier	-0.234	Calcium	313.90	301.24
Ryznar	6.67	Barium	41.17	41.17
Puckorius	4.96	Carbonate	2.07	0.100
Larson-Skold Index	57.47	Phosphate	0.00	0.00
Stiff Davis Index	0.536	Sulfate	150.00	104.33
Oddo-Tomson	-0.118			

Temperature (°F)	190.00
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

BERRY PETROLEUM
J-20 CHEVRON 20-31D
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 56536
Report Date: 11-18-2013
Sample Date: 10-29-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	313.90
Magnesium(as Mg)	58.59
Barium(as Ba)	41.17
Strontium(as Sr)	20.77
Sodium(as Na)	4683
Potassium(as K)	123.00
Lithium(as Li)	8.06
Iron(as Fe)	43.40
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.242
Manganese(as Mn)	0.0120
Zinc(as Zn)	0.412
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	8000
Sulfate(as SO ₄)	150.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	190.00
Bicarbonate(as HCO ₃)	244.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	16.22

PARAMETERS

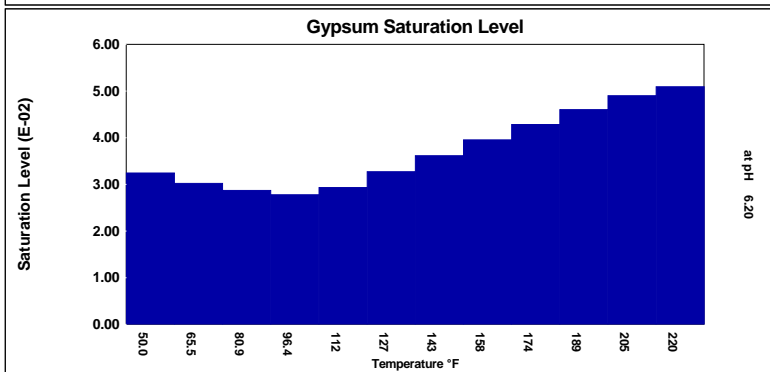
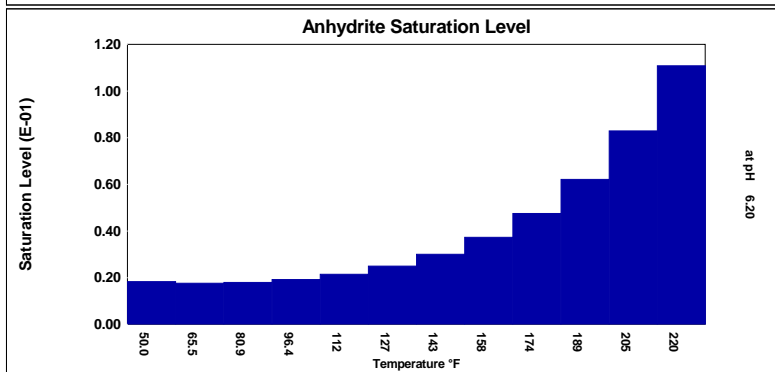
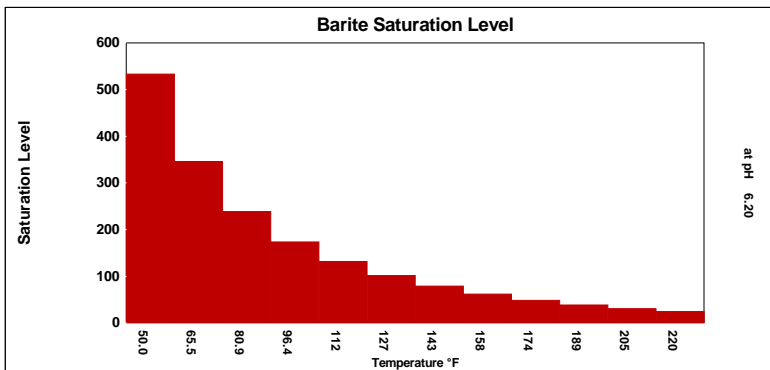
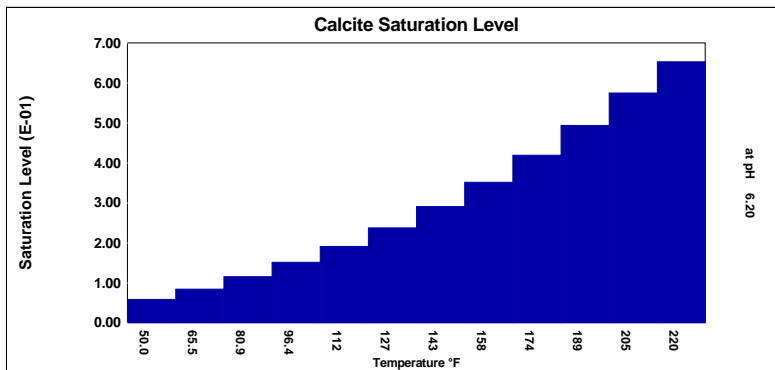
Temperature(°F)	190.00
T.D.S.	13790
Resistivity:	51.81
Sample pH	6.20
Conductivity:	19301

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0588	-0.261	0.0183	-887.75	0.0324	-702.11	533.05	24.32	0.105	-65.06	11.54	0.0172	0.00	-0.0442	0.0893	0.0622
65.45	0.00	0.0843	-0.222	0.0176	-898.29	0.0302	-726.83	345.86	24.29	0.0978	-68.27	18.61	0.0224	0.00	-0.0456	0.229	0.0622
80.91	0.00	0.115	-0.189	0.0179	-878.77	0.0287	-742.61	238.33	24.24	0.0968	-68.35	28.43	0.0276	0.00	-0.0471	0.182	0.0622
96.36	0.00	0.151	-0.162	0.0192	-834.15	0.0277	-750.17	173.36	24.19	0.0990	-66.75	41.29	0.0326	0.00	-0.0488	0.238	0.0622
111.82	0.00	0.191	-0.139	0.0214	-770.48	0.0293	-716.55	131.64	24.13	0.103	-64.51	57.49	0.0374	0.00	-0.0506	0.251	0.0622
127.27	0.00	0.237	-0.119	0.0249	-693.96	0.0327	-660.36	101.23	24.06	0.106	-62.60	78.28	0.0425	0.00	-0.0528	0.215	0.0622
142.73	0.00	0.291	-0.102	0.0300	-610.35	0.0361	-612.28	78.52	23.96	0.108	-61.05	104.50	0.0480	0.00	-0.0552	0.176	0.0622
158.18	0.00	0.351	-0.0865	0.0372	-524.56	0.0395	-571.09	61.37	23.84	0.110	-59.85	136.98	0.0538	0.00	-0.0579	0.169	0.0622
173.64	0.00	0.419	-0.0724	0.0475	-440.53	0.0428	-535.77	48.31	23.69	0.112	-58.95	176.23	0.0601	0.00	-0.0610	0.162	0.0622
189.09	0.00	0.494	-0.0595	0.0621	-361.20	0.0460	-505.54	38.28	23.51	0.112	-58.34	222.79	0.0668	0.00	-0.0645	0.0756	0.0622
204.55	0.00	0.575	-0.0474	0.0829	-288.54	0.0490	-479.77	30.50	23.29	0.112	-58.00	276.80	0.0740	0.00	-0.0687	0.0599	0.0622
220.00	0.171	0.653	-0.0379	0.111	-227.91	0.0509	-465.31	24.00	23.00	0.110	-58.86	335.01	0.0823	0.00	-0.0750	0.0805	0.0729
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

K-17 CHEVRON 18-1D
SEPARATOR

Report Date: 05-15-2013 Sampled: 04-15-2013
Sample #: 2580 at 0000

Sample ID: 37516

CATIONS

Calcium (as Ca)	7.82
Magnesium (as Mg)	31.63
Barium (as Ba)	0.204
Strontium (as Sr)	6.42
Sodium (as Na)	388.29
Potassium (as K)	63.26
Lithium (as Li)	4.70
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.573
Iron (as Fe)	94.31
Manganese (as Mn)	0.901
Zinc (as Zn)	0.892
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	700.00
Sulfate (as SO ₄)	0.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	150.00
Bicarbonate (as HCO ₃)	366.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	12.77

PARAMETERS

Calculated T.D.S.	1788
Molar Conductivity	2462
Resistivity	406.14
Density(g/mL)	1.00
Pressure(atm)	1.00
pCO ₂ (atm)	0.0692
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.50

JACAM LABORATORIES

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



DEPOSITION POTENTIAL INDICATORS

Report Date:	05-15-2013	Sampled:	04-15-2013
Sample #:	2580		at 0000
Sample ID:	37516		

Calcite (CaCO_3)	0.0906	Calcite (CaCO_3)	-0.984
Aragonite (CaCO_3)	0.0737	Aragonite (CaCO_3)	-1.20
Witherite (BaCO_3)	< 0.001	Witherite (BaCO_3)	-6.12
Strontianite (SrCO_3)	0.192	Strontianite (SrCO_3)	-0.594
Calcium oxalate (CaC_2O_4)	0.00	Calcium oxalate (CaC_2O_4)	-1.41
Magnesite (MgCO_3)	0.682	Magnesite (MgCO_3)	-0.0449
Anhydrite (CaSO_4)	0.00	Anhydrite (CaSO_4)	-374.96
Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)	0.00	Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)	-491.99
Barite (BaSO_4)	0.00	Barite (BaSO_4)	-3.56
Celestite (SrSO_4)	0.00	Celestite (SrSO_4)	-44.56
Fluorite (CaF_2)	0.00	Fluorite (CaF_2)	-25.77
Calcium phosphate	0.00	Calcium phosphate	-0.00134
Hydroxyapatite	0.00	Hydroxyapatite	-276.83
Silica (SiO_2)	0.00	Silica (SiO_2)	-154.31
Brucite ($\text{Mg}(\text{OH})_2$)	< 0.001	Brucite ($\text{Mg}(\text{OH})_2$)	0.0240
Magnesium silicate	0.00	Magnesium silicate	-125.77
Iron hydroxide ($\text{Fe}(\text{OH})_3$)	4464	Iron hydroxide ($\text{Fe}(\text{OH})_3$)	< 0.001
Strengite ($\text{FePO}_4 \cdot 2\text{H}_2\text{O}$)	0.00	Strengite ($\text{FePO}_4 \cdot 2\text{H}_2\text{O}$)	> -0.001
Siderite (FeCO_3)	3573	Siderite (FeCO_3)	0.133
Halite (NaCl)	< 0.001	Halite (NaCl)	-172050
Thenardite (Na_2SO_4)	0.00	Thenardite (Na_2SO_4)	-36682
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.00342

Langelier	-1.01	Calcium	7.82	7.33
Ryznar	8.52	Barium	0.204	0.204
Puckorius	6.86	Carbonate	0.834	0.198
Larson-Skold Index	3.31	Phosphate	0.00	0.00
Stiff Davis Index	-0.407	Sulfate	0.00	0.00
Oddo-Tomson	-0.651			

Temperature (°F)	190.00
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

BERRY PETROLEUM
K-17 CHEVRON 18-1D
ROB SIMEONE
SEPARATOR

Sample ID#: 2580
ID: 37516
Report Date: 05-15-2013
Sample Date: 04-15-2013
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	7.82
Magnesium(as Mg)	31.63
Barium(as Ba)	0.204
Strontium(as Sr)	6.42
Sodium(as Na)	388.29
Potassium(as K)	63.26
Lithium(as Li)	4.70
Iron(as Fe)	94.31
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.573
Manganese(as Mn)	0.901
Zinc(as Zn)	0.892
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	700.00
Sulfate(as SO ₄)	0.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	150.00
Bicarbonate(as HCO ₃)	366.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	12.77

PARAMETERS

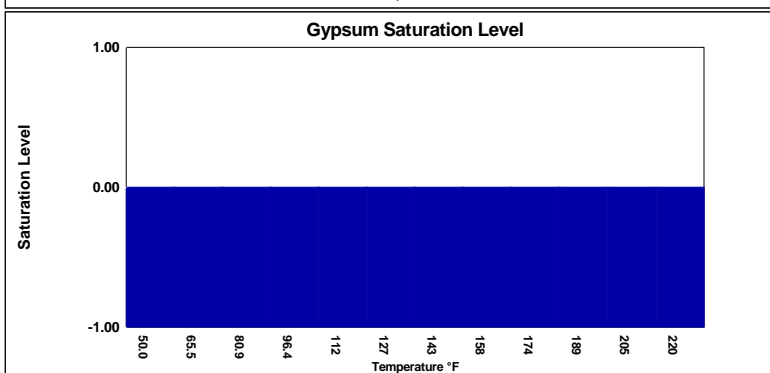
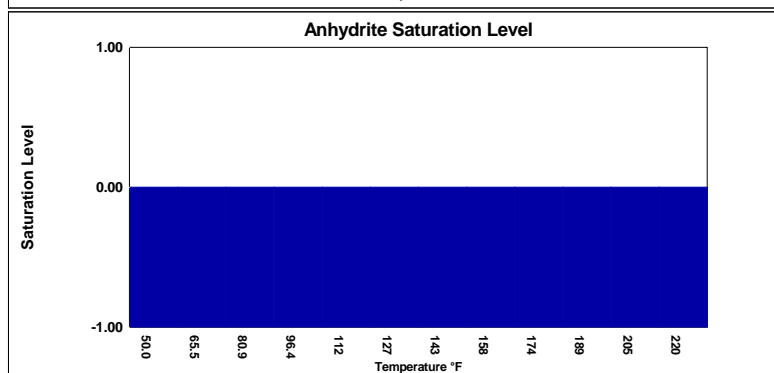
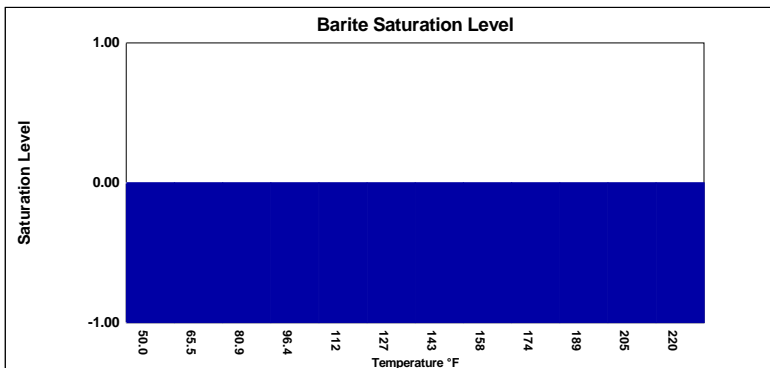
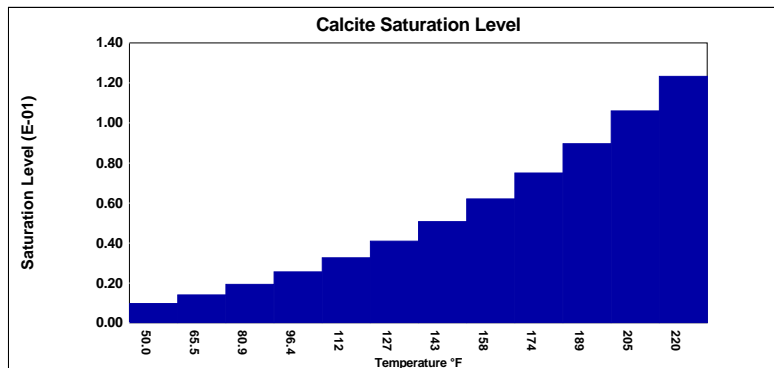
Temperature(°F)	190.00
T.D.S.	1788
Resistivity:	406.14
Sample pH	6.50
Conductivity:	2462

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.00964	-2.48	0.00	-586.51	0.00	-493.91	0.00	-1.07	0.00	-54.60	168.48	0.0384	0.00	-0.00268	0.0771	0.0692
65.45	0.00	0.0139	-2.20	0.00	-587.71	0.00	-503.38	0.00	-1.32	0.00	-55.70	274.46	0.0482	0.00	-0.00273	0.144	0.0692
80.91	0.00	0.0193	-1.96	0.00	-572.27	0.00	-507.58	0.00	-1.58	0.00	-55.05	423.32	0.0582	0.00	-0.00278	0.116	0.0692
96.36	0.00	0.0255	-1.76	0.00	-543.25	0.00	-507.01	0.00	-1.83	0.00	-53.48	621.15	0.0679	0.00	-0.00283	0.152	0.0692
111.82	0.00	0.0325	-1.58	0.00	-506.27	0.00	-502.98	0.00	-2.07	0.00	-51.56	873.44	0.0770	0.00	-0.00290	0.160	0.0692
127.27	0.00	0.0409	-1.43	0.00	-472.96	0.00	-499.33	0.00	-2.33	0.00	-49.82	1200	0.0866	0.00	-0.00297	0.134	0.0692
142.73	0.00	0.0506	-1.29	0.00	-443.90	0.00	-496.49	0.00	-2.60	0.00	-48.28	1617	0.0970	0.00	-0.00305	0.109	0.0692
158.18	0.00	0.0620	-1.18	0.00	-418.45	0.00	-494.42	0.00	-2.89	0.00	-46.92	2138	0.108	0.00	-0.00315	0.113	0.0692
173.64	0.00	0.0749	-1.08	0.00	-396.08	0.00	-493.07	0.00	-3.20	0.00	-45.71	2771	0.120	0.00	-0.00327	0.117	0.0692
189.09	0.00	0.0896	-0.990	0.00	-376.38	0.00	-492.45	0.00	-3.54	0.00	-44.66	3522	0.132	0.00	-0.00342	0.0590	0.0692
204.55	0.00	0.106	-0.912	0.00	-358.99	0.00	-492.52	0.00	-3.89	0.00	-43.73	4384	0.146	0.00	-0.00360	0.0494	0.0692
220.00	0.171	0.123	-0.852	0.00	-345.84	0.00	-496.45	0.00	-4.30	0.00	-43.22	5314	0.160	0.00	-0.00388	0.0674	0.0811
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE

L-4 CHEVRON 5-1D SEPARATOR

Report Date: 03-22-2012 Sampled: 03-12-2012
Sample #: 15444 at 0000

CATIONS

Calcium (as Ca)	456.90
Magnesium (as Mg)	41.23
Barium (as Ba)	28.87
Strontium (as Sr)	33.35
Sodium (as Na)	3835
Potassium (as K)	101.40
Lithium (as Li)	6.37
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.396
Iron (as Fe)	139.70
Manganese (as Mn)	2.11
Zinc (as Zn)	0.0880
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	6800
Sulfate (as SO ₄)	10.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	425.00
Bicarbonate (as HCO ₃)	732.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

pH	7.00
Temperature (°F)	190.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	12236
Molar Conductivity	17161
Dissolved O ₂	0.00

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM
ROB SIMEONE

L-4 CHEVRON 5-1D SEPARATOR

Report Date: 03-22-2012 Sampled: 03-12-2012
Sample #: 15444 at 0000**SATURATION LEVEL**

Calcite (CaCO ₃)	13.30
Aragonite (CaCO ₃)	10.83
Witherite (BaCO ₃)	0.196
Strontianite (SrCO ₃)	2.39
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	2.37
Anhydrite (CaSO ₄)	0.00621
Gypsum (CaSO ₄ *2H ₂ O)	0.00456
Barite (BaSO ₄)	1.87
Celestite (SrSO ₄)	0.0127
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	31367
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	12934
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.948
Aragonite (CaCO ₃)	0.930
Witherite (BaCO ₃)	-5.47
Strontianite (SrCO ₃)	0.850
Calcium oxalate (CaC ₂ O ₄)	-0.100
Magnesite (MgCO ₃)	0.495
Anhydrite (CaSO ₄)	-322.45
Gypsum (CaSO ₄ *2H ₂ O)	-455.16
Barite (BaSO ₄)	2.19
Celestite (SrSO ₄)	-78.87
Fluorite (CaF ₂)	-13.75
Calcium phosphate	>-0.001
Hydroxyapatite	-453.62
Silica (SiO ₂)	-151.99
Brucite (Mg(OH) ₂)	0.0930
Magnesium silicate	-160.87
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	1.19
Halite (NaCl)	-203128
Thenardite (Na ₂ SO ₄)	-52988
Iron sulfide (FeS)	-0.00314

SIMPLE INDICES

Langelier	1.23
Ryznar	4.55
Puckorius	2.92
Larson-Skold Index	15.50
Stiff Davis Index	2.00
Oddo-Tomson	1.37

BOUND IONS

Calcium	456.90
Barium	28.87
Carbonate	33.07
Phosphate	0.00
Sulfate	10.00

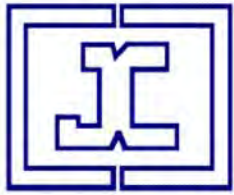
TOTAL**FREE**

425.24
28.87
1.76
0.00
6.72

OPERATING CONDITIONSTemperature (°F) 190.00
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

BERRY PETROLEUM
L-4 CHEVRON 5-1D SEPARATOR
ROB SIMEONE

Sample ID#: 15444
ID: 2580
Report Date: 03-22-2012
Sample Date: 03-12-2012
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	456.90
Magnesium(as Mg)	41.23
Barium(as Ba)	28.87
Strontium(as Sr)	33.35
Sodium(as Na)	3835
Potassium(as K)	101.40
Lithium(as Li)	6.37
Iron(as Fe)	139.70
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.396
Manganese(as Mn)	2.11
Zinc(as Zn)	0.0880
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	6800
Sulfate(as SO ₄)	10.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	425.00
Bicarbonate(as HCO ₃)	732.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	0.291

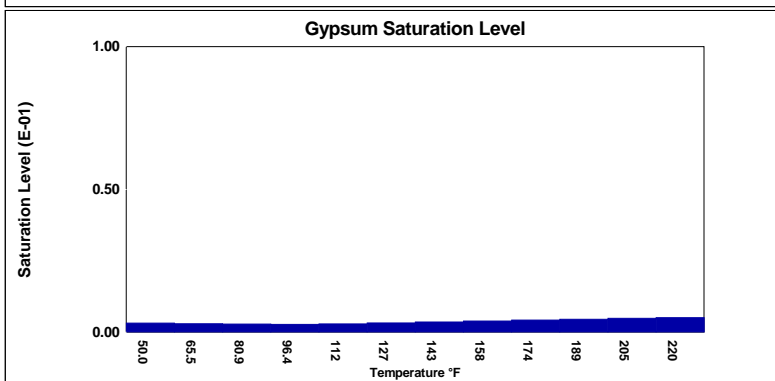
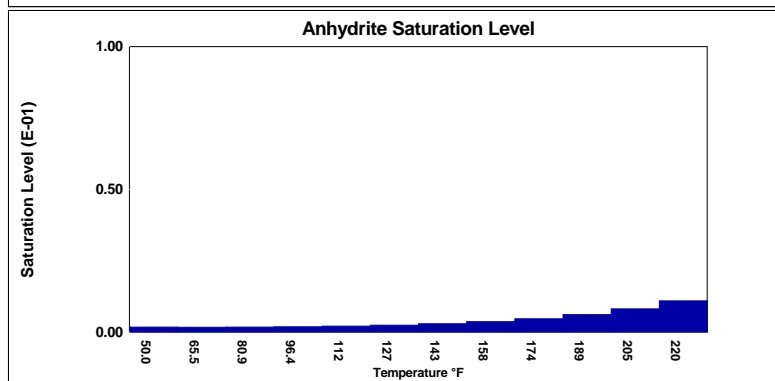
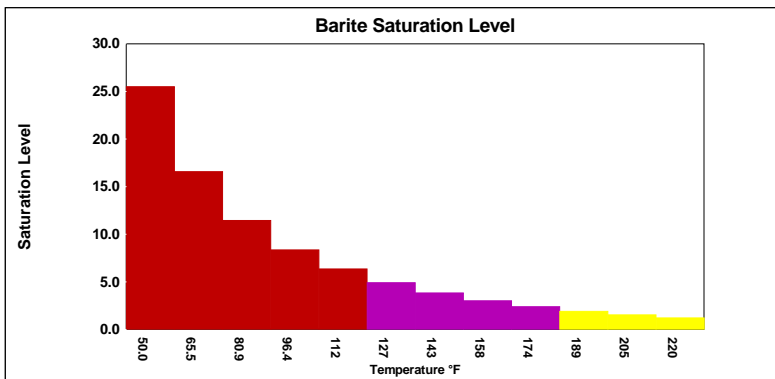
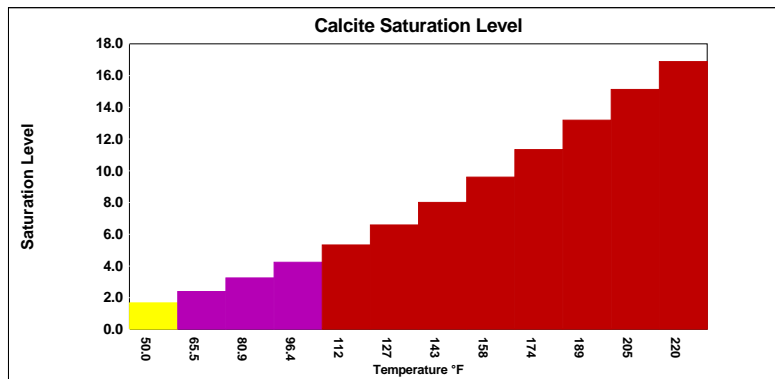
PARAMETERS

Temperature(°F)	190.00
Sample pH	7.00

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	1.67	0.120	0.00179	-820.04	0.00318	-642.15	25.48	6.08	0.0115	-89.88	739.27	0.347	0.00	-0.00201	0.00	0.00
65.45	0.00	2.38	0.218	0.00172	-829.96	0.00295	-665.16	16.56	5.79	0.0107	-92.59	1188	0.434	0.00	-0.00207	0.00	0.00
80.91	0.00	3.24	0.313	0.00175	-811.19	0.00280	-679.66	11.43	5.46	0.0106	-92.17	1809	0.523	0.00	-0.00214	0.00	0.00
96.36	0.00	4.23	0.403	0.00187	-768.54	0.00271	-686.30	8.34	5.11	0.0109	-90.07	2618	0.610	0.00	-0.00222	0.00	0.00
111.82	0.00	5.32	0.486	0.00209	-707.91	0.00287	-654.33	6.35	4.75	0.0113	-87.35	3627	0.693	0.00	-0.00231	0.00	0.00
127.27	0.00	6.58	0.572	0.00244	-635.45	0.00320	-601.45	4.90	4.35	0.0117	-84.97	4898	0.781	0.00	-0.00242	0.00	0.00
142.73	0.00	8.00	0.660	0.00294	-556.75	0.00354	-556.35	3.82	3.90	0.0120	-82.96	6465	0.874	0.00	-0.00254	0.00	0.00
158.18	0.00	9.59	0.752	0.00365	-476.63	0.00388	-517.81	3.00	3.40	0.0123	-81.30	8331	0.972	0.00	-0.00270	0.00	0.00
173.64	0.00	11.33	0.846	0.00467	-398.93	0.00421	-484.85	2.37	2.84	0.0125	-79.96	10467	1.07	0.00	-0.00289	0.00	0.00
189.09	0.00	13.19	0.942	0.00611	-326.50	0.00454	-456.68	1.89	2.23	0.0127	-78.92	12794	1.18	0.00	-0.00313	0.00	0.00
204.55	0.00	15.12	1.04	0.00817	-261.26	0.00484	-432.67	1.52	1.55	0.0128	-78.16	15180	1.29	0.00	-0.00344	0.00	0.00
220.00	0.171	16.88	1.14	0.0110	-207.94	0.00506	-418.91	1.20	0.734	0.0126	-78.70	17318	1.41	0.00	-0.00392	0.00	0.00
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 2-17D GG I-02 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67186

CATIONS

Calcium (as Ca)	231.00
Magnesium (as Mg)	44.15
Barium (as Ba)	32.28
Strontium (as Sr)	18.79
Sodium (as Na)	4675
Potassium (as K)	125.30
Lithium (as Li)	9.85
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	21.91
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	7800
Sulfate (as SO ₄)	175.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	175.00
Bicarbonate (as HCO ₃)	183.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	7.07

PARAMETERS

Calculated T.D.S.	13347
Molar Conductivity	18953
Resistivity	52.76
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0320
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.50

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 2-17D GG I-02 PAD
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000
Sample ID: 67186

SATURATION LEVEL

Calcite (CaCO ₃)	0.558
Aragonite (CaCO ₃)	0.454
Witherite (BaCO ₃)	0.0175
Strontianite (SrCO ₃)	0.108
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.202
Anhydrite (CaSO ₄)	0.0581
Gypsum (CaSO ₄ *2H ₂ O)	0.0425
Barite (BaSO ₄)	37.25
Celestite (SrSO ₄)	0.128
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	496.89
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	170.95
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0688
Aragonite (CaCO ₃)	-0.104
Witherite (BaCO ₃)	-6.74
Strontianite (SrCO ₃)	-0.965
Calcium oxalate (CaC ₂ O ₄)	-0.202
Magnesite (MgCO ₃)	-0.288
Anhydrite (CaSO ₄)	-379.65
Gypsum (CaSO ₄ *2H ₂ O)	-530.33
Barite (BaSO ₄)	18.50
Celestite (SrSO ₄)	-52.65
Fluorite (CaF ₂)	-18.78
Calcium phosphate	>-0.001
Hydroxyapatite	-462.81
Silica (SiO ₂)	-151.69
Brucite (Mg(OH) ₂)	0.0297
Magnesium silicate	-162.54
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.1000
Halite (NaCl)	-204026
Thenardite (Na ₂ SO ₄)	-53984
Iron sulfide (FeS)	-0.0630

SIMPLE INDICES

Langelier	-0.187
Ryznar	6.87
Puckorius	5.65
Larson-Skold Index	74.26
Stiff Davis Index	0.586
Oddo-Tomson	-0.0612

BOUND IONS

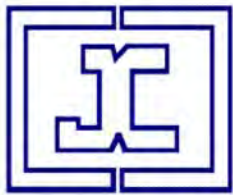
	TOTAL	FREE
Calcium	231.00	221.36
Barium	32.28	32.28
Carbonate	2.95	0.150
Phosphate	0.00	0.00
Sulfate	175.00	127.54

OPERATING CONDITIONS

Temperature (°F)	190.00
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

BERRY PETROLEUM
LATHAM 2-17D GG I-02 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67186
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	231.00
Magnesium(as Mg)	44.15
Barium(as Ba)	32.28
Strontium(as Sr)	18.79
Sodium(as Na)	4675
Potassium(as K)	125.30
Lithium(as Li)	9.85
Iron(as Fe)	21.91
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	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)	7800
Sulfate(as SO ₄)	175.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	175.00
Bicarbonate(as HCO ₃)	183.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	7.07

PARAMETERS

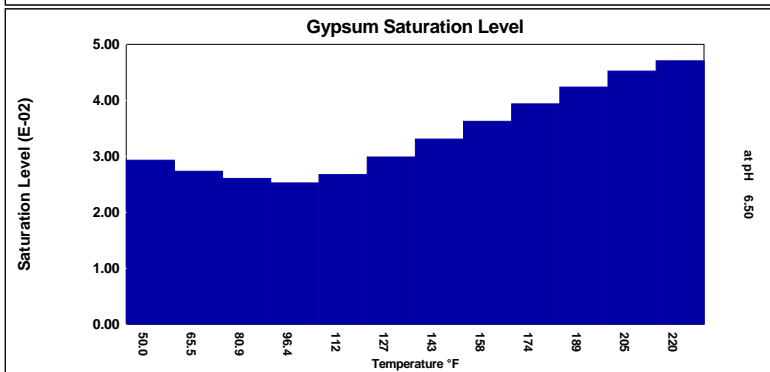
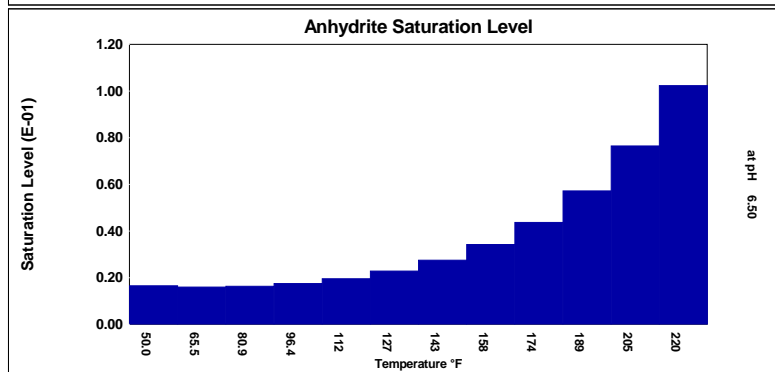
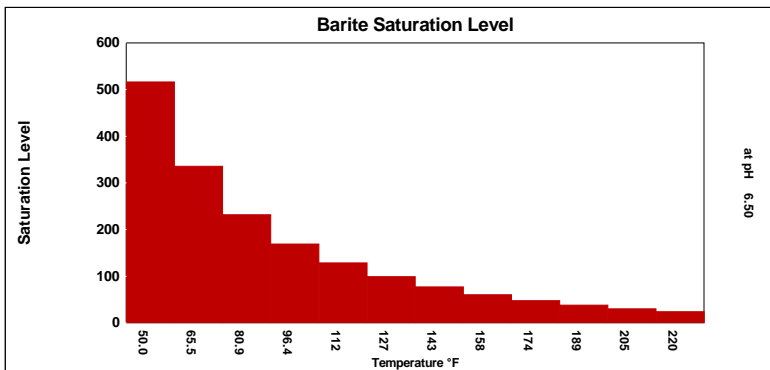
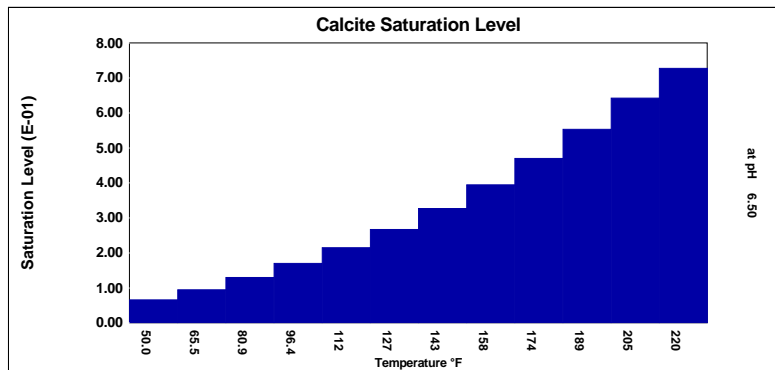
Temperature(°F)	190.00
T.D.S.	13347
Resistivity:	52.76

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.0658	-0.345	0.0165	-911.89	0.0293	-730.30	516.04	19.07	0.117	-59.22	8.86	0.0250	0.00	-0.0428	0.0575	0.0320
65.45	0.00	0.0945	-0.292	0.0159	-922.16	0.0273	-754.77	335.47	19.05	0.109	-62.31	14.30	0.0329	0.00	-0.0441	0.108	0.0320
80.91	0.00	0.129	-0.248	0.0163	-902.52	0.0260	-770.31	231.66	19.02	0.109	-62.38	21.84	0.0408	0.00	-0.0455	0.0710	0.0320
96.36	0.00	0.170	-0.211	0.0174	-857.94	0.0252	-777.66	168.87	18.98	0.111	-60.83	31.73	0.0484	0.00	-0.0471	0.0930	0.0320
111.82	0.00	0.215	-0.180	0.0195	-794.39	0.0267	-743.95	128.49	18.94	0.115	-58.67	44.20	0.0557	0.00	-0.0490	0.0975	0.0320
127.27	0.00	0.267	-0.153	0.0228	-718.00	0.0299	-687.68	99.02	18.88	0.119	-56.82	60.14	0.0634	0.00	-0.0510	0.0818	0.0320
142.73	0.00	0.326	-0.129	0.0275	-634.43	0.0331	-639.46	76.97	18.82	0.122	-55.32	80.16	0.0715	0.00	-0.0533	0.0663	0.0320
158.18	0.00	0.394	-0.107	0.0342	-548.54	0.0362	-598.07	60.28	18.73	0.125	-54.16	104.80	0.0803	0.00	-0.0560	0.0690	0.0320
173.64	0.00	0.470	-0.0879	0.0437	-464.18	0.0394	-562.52	47.55	18.63	0.127	-53.28	134.29	0.0896	0.00	-0.0591	0.0714	0.0320
189.09	0.00	0.553	-0.0698	0.0572	-384.22	0.0424	-532.04	37.74	18.50	0.128	-52.68	168.75	0.0994	0.00	-0.0628	0.0360	0.0320
204.55	0.00	0.642	-0.0530	0.0764	-310.58	0.0452	-506.00	30.13	18.35	0.128	-52.34	207.83	0.110	0.00	-0.0671	0.0302	0.0320
220.00	0.171	0.727	-0.0396	0.102	-248.63	0.0470	-491.23	23.73	18.14	0.125	-53.15	248.55	0.122	0.00	-0.0737	0.0411	0.0375
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 29-18D O-29 PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67319

CATIONS

Calcium (as Ca)	226.10
Magnesium (as Mg)	52.67
Barium (as Ba)	35.14
Strontium (as Sr)	28.16
Sodium (as Na)	4969
Potassium (as K)	154.90
Lithium (as Li)	11.46
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	53.63
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	8300
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	225.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	6.36

PARAMETERS

Calculated T.D.S.	14420
Molar Conductivity	20147
Resistivity	49.64
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.111
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.30

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 29-18D O-29 PAD
SEPARATOR

Report Date: 04-21-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67319

SATURATION LEVEL

Calcite (CaCO ₃)	0.897
Aragonite (CaCO ₃)	0.731
Witherite (BaCO ₃)	0.0311
Strontianite (SrCO ₃)	0.264
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.410
Anhydrite (CaSO ₄)	0.00763
Gypsum (CaSO ₄ *2H ₂ O)	0.00558
Barite (BaSO ₄)	5.41
Celestite (SrSO ₄)	0.0256
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	480.50
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	703.28
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	-0.0170
Aragonite (CaCO ₃)	-0.0549
Witherite (BaCO ₃)	-6.58
Strontianite (SrCO ₃)	-0.584
Calcium oxalate (CaC ₂ O ₄)	-0.216
Magnesite (MgCO ₃)	-0.180
Anhydrite (CaSO ₄)	-426.66
Gypsum (CaSO ₄ *2H ₂ O)	-585.60
Barite (BaSO ₄)	9.85
Celestite (SrSO ₄)	-81.89
Fluorite (CaF ₂)	-19.28
Calcium phosphate	>-0.001
Hydroxyapatite	-470.80
Silica (SiO ₂)	-151.52
Brucite (Mg(OH) ₂)	0.0189
Magnesium silicate	-163.95
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.172
Halite (NaCl)	-205101
Thenardite (Na ₂ SO ₄)	-54675
Iron sulfide (FeS)	-0.0425

SIMPLE INDICES

Langelier	0.0195
Ryznar	6.26
Puckorius	4.22
Larson-Skold Index	29.38
Stiff Davis Index	0.788
Oddo-Tomson	0.130

BOUND IONS

Calcium	226.10	216.56
Barium	35.14	35.14
Carbonate	5.24	0.257
Phosphate	0.00	0.00
Sulfate	25.00	17.92

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

Temperature (°F)	190.00
Time(secs)	0.00

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

DownHole SAT™ Water Analysis Report

SYSTEM IDENTIFICATION

BERRY PETROLEUM
LATHAM 29-18D O-29 PAD
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67319
Report Date: 04-21-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	226.10
Magnesium(as Mg)	52.67
Barium(as Ba)	35.14
Strontium(as Sr)	28.16
Sodium(as Na)	4969
Potassium(as K)	154.90
Lithium(as Li)	11.46
Iron(as Fe)	53.63
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	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)	8300
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	225.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	6.36

PARAMETERS

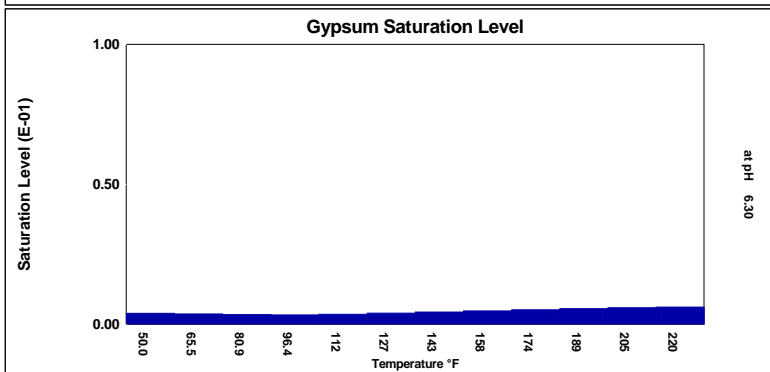
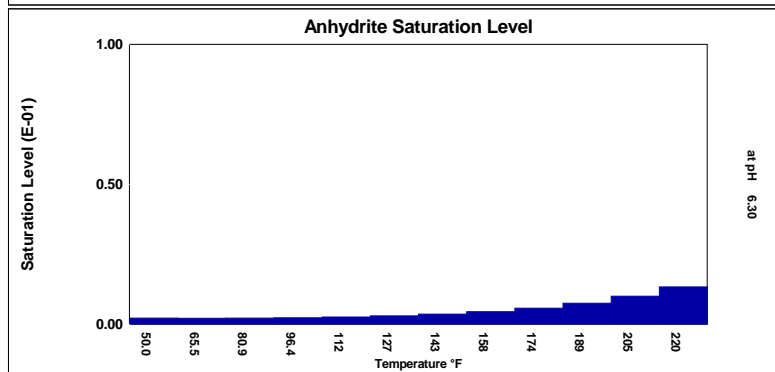
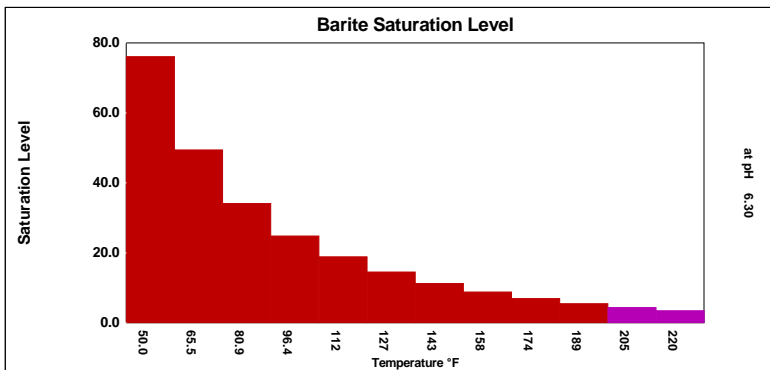
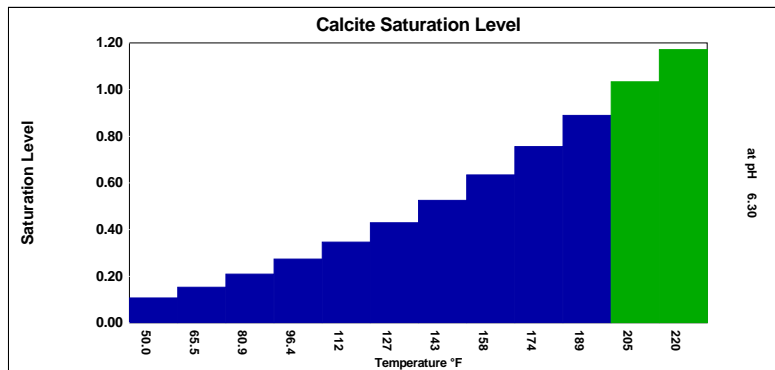
Temperature(°F)	190.00
T.D.S.	14420
Resistivity:	49.64
Sample pH	6.30
Conductivity:	20147

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.106	-0.347	0.00222	-969.07	0.00393	-790.59	76.06	16.43	0.0238	-92.16	36.14	0.0467	0.00	-0.0287	0.105	0.111
65.45	0.00	0.153	-0.288	0.00213	-979.46	0.00366	-815.27	49.39	15.80	0.0222	-95.15	58.28	0.0592	0.00	-0.0296	0.246	0.111
80.91	0.00	0.209	-0.238	0.00217	-959.40	0.00347	-830.89	34.07	15.14	0.0220	-94.84	89.03	0.0720	0.00	-0.0306	0.226	0.111
96.36	0.00	0.274	-0.195	0.00232	-913.92	0.00336	-838.17	24.80	14.48	0.0225	-92.77	129.38	0.0846	0.00	-0.0317	0.296	0.111
111.82	0.00	0.346	-0.159	0.00260	-849.09	0.00355	-803.64	18.84	13.82	0.0233	-90.05	180.17	0.0967	0.00	-0.0330	0.312	0.111
127.27	0.00	0.429	-0.126	0.00302	-771.19	0.00396	-746.19	14.49	13.13	0.0241	-87.67	245.10	0.110	0.00	-0.0344	0.264	0.111
142.73	0.00	0.525	-0.0966	0.00364	-686.01	0.00437	-696.95	11.24	12.39	0.0246	-85.71	327.08	0.123	0.00	-0.0360	0.215	0.111
158.18	0.00	0.634	-0.0691	0.00451	-598.50	0.00478	-654.69	8.79	11.61	0.0251	-84.12	428.08	0.138	0.00	-0.0378	0.210	0.111
173.64	0.00	0.756	-0.0432	0.00575	-512.62	0.00518	-618.42	6.92	10.78	0.0254	-82.87	550.19	0.154	0.00	-0.0399	0.206	0.111
189.09	0.00	0.889	-0.0185	0.00750	-431.29	0.00556	-587.33	5.48	9.90	0.0255	-81.94	694.09	0.171	0.00	-0.0424	0.0990	0.111
204.55	0.00	1.03	0.00525	0.0100	-356.49	0.00591	-560.78	4.37	8.96	0.0256	-81.33	859.49	0.189	0.00	-0.0452	0.0801	0.111
220.00	0.171	1.17	0.0265	0.0134	-293.94	0.00613	-546.06	3.43	7.89	0.0250	-82.13	1036	0.210	0.00	-0.0496	0.108	0.130
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 32-1D O-32
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67216

CATIONS

Calcium (as Ca)	235.20
Magnesium (as Mg)	46.07
Barium (as Ba)	31.47
Strontium (as Sr)	20.09
Sodium (as Na)	3939
Potassium (as K)	154.30
Lithium (as Li)	10.19
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	76.45
Manganese (as Mn)	0.228
Zinc (as Zn)	0.424
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	6700
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	395.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	8.30

PARAMETERS

Calculated T.D.S.	11826
Molar Conductivity	16631
Resistivity	60.13
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.112
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.30

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 32-1D O-32
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67216

SATURATION LEVEL

Calcite (CaCO ₃)	1.01
Aragonite (CaCO ₃)	0.825
Witherite (BaCO ₃)	0.0309
Strontianite (SrCO ₃)	0.208
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.385
Anhydrite (CaSO ₄)	0.00904
Gypsum (CaSO ₄ *2H ₂ O)	0.00663
Barite (BaSO ₄)	5.63
Celestite (SrSO ₄)	0.0211
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	749.72
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	1096
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.00188
Aragonite (CaCO ₃)	-0.0303
Witherite (BaCO ₃)	-6.25
Strontianite (SrCO ₃)	-0.741
Calcium oxalate (CaC ₂ O ₄)	-0.183
Magnesite (MgCO ₃)	-0.191
Anhydrite (CaSO ₄)	-387.83
Gypsum (CaSO ₄ *2H ₂ O)	-533.33
Barite (BaSO ₄)	9.59
Celestite (SrSO ₄)	-77.61
Fluorite (CaF ₂)	-18.06
Calcium phosphate	>-0.001
Hydroxyapatite	-447.55
Silica (SiO ₂)	-152.24
Brucite (Mg(OH) ₂)	0.0185
Magnesium silicate	-159.93
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.165
Halite (NaCl)	-202247
Thenardite (Na ₂ SO ₄)	-52447
Iron sulfide (FeS)	-0.0257

SIMPLE INDICES

Langelier	0.0695
Ryznar	6.16
Puckorius	4.12
Larson-Skold Index	23.75
Stiff Davis Index	0.843
Oddo-Tomson	0.222

BOUND IONS

Calcium	235.20	224.51
Barium	31.47	31.47
Carbonate	4.39	0.246
Phosphate	0.00	0.00
Sulfate	25.00	17.86

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

Temperature (°F)	190.00
Time(secs)	0.00

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

DownHole SAT™ Water Analysis Report

SYSTEM IDENTIFICATION

BERRY PETROLEUM
LATHAM 32-1D O-32
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67216
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	235.20
Magnesium(as Mg)	46.07
Barium(as Ba)	31.47
Strontium(as Sr)	20.09
Sodium(as Na)	3939
Potassium(as K)	154.30
Lithium(as Li)	10.19
Iron(as Fe)	76.45
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.228
Zinc(as Zn)	0.424
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	6700
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	395.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	8.30

PARAMETERS

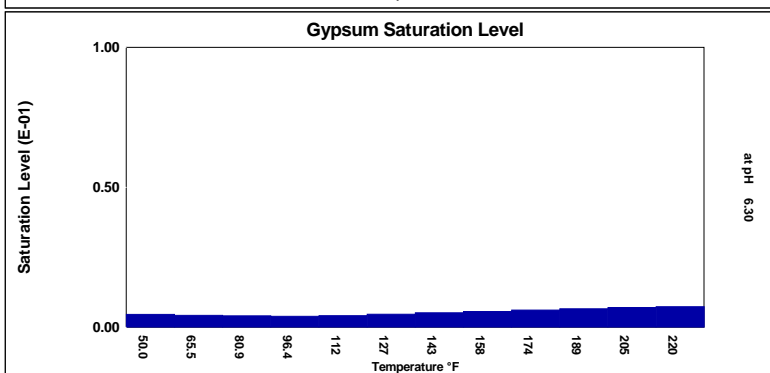
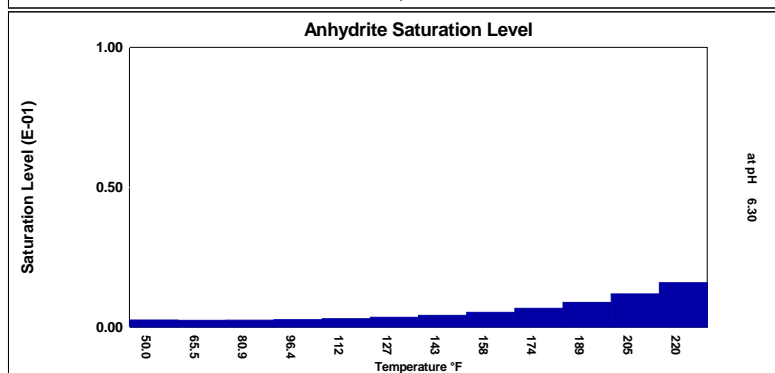
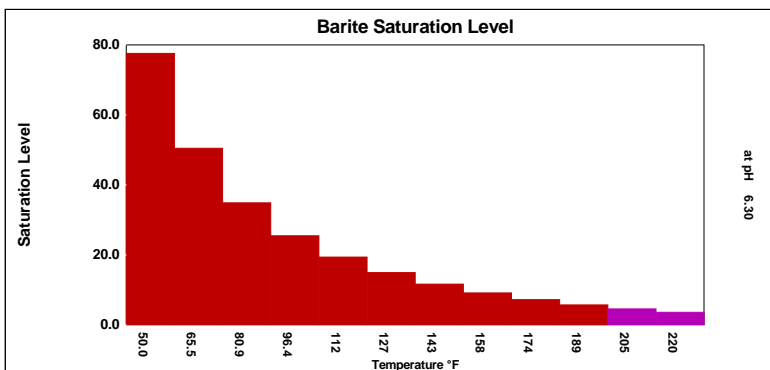
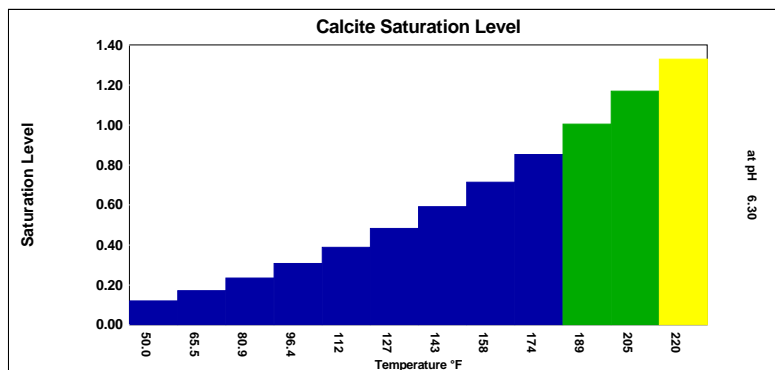
Temperature(°F)	190.00
T.D.S.	11826
Resistivity:	60.13
Sample pH	6.30
Conductivity:	16631

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.119	-0.295	0.00258	-901.02	0.00458	-730.66	77.54	15.88	0.0192	-87.97	55.90	0.0455	0.00	-0.0176	0.105	0.112
65.45	0.00	0.171	-0.243	0.00248	-910.16	0.00427	-753.28	50.45	15.25	0.0180	-90.69	90.18	0.0574	0.00	-0.0182	0.247	0.112
80.91	0.00	0.234	-0.198	0.00253	-890.61	0.00406	-767.31	34.86	14.61	0.0179	-90.33	137.88	0.0696	0.00	-0.0187	0.227	0.112
96.36	0.00	0.307	-0.160	0.00272	-847.17	0.00394	-773.43	25.43	13.97	0.0183	-88.32	200.40	0.0816	0.00	-0.0194	0.298	0.112
111.82	0.00	0.388	-0.127	0.00304	-785.61	0.00417	-740.41	19.36	13.35	0.0191	-85.69	279.29	0.0931	0.00	-0.0201	0.313	0.112
127.27	0.00	0.482	-0.0980	0.00355	-711.89	0.00466	-685.97	14.93	12.69	0.0197	-83.39	380.26	0.105	0.00	-0.0210	0.265	0.112
142.73	0.00	0.591	-0.0711	0.00428	-631.49	0.00516	-639.28	11.61	11.99	0.0202	-81.47	507.93	0.119	0.00	-0.0219	0.216	0.112
158.18	0.00	0.714	-0.0461	0.00532	-549.08	0.00565	-599.15	9.10	11.25	0.0206	-79.89	665.46	0.133	0.00	-0.0230	0.211	0.112
173.64	0.00	0.852	-0.0223	0.00680	-468.39	0.00614	-564.64	7.18	10.47	0.0209	-78.63	856.29	0.148	0.00	-0.0242	0.206	0.112
189.09	0.00	1.00	< 0.001	0.00889	-392.17	0.00660	-534.99	5.71	9.64	0.0211	-77.66	1082	0.164	0.00	-0.0257	0.0994	0.112
204.55	0.00	1.17	0.0226	0.0119	-322.28	0.00705	-509.59	4.56	8.76	0.0212	-76.98	1341	0.181	0.00	-0.0273	0.0804	0.112
220.00	0.171	1.33	0.0431	0.0159	-263.82	0.00734	-494.83	3.60	7.77	0.0208	-77.56	1621	0.202	0.00	-0.0299	0.109	0.131
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 32-24D CD-32
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67229

CATIONS

Calcium (as Ca)	206.00
Magnesium (as Mg)	41.66
Barium (as Ba)	37.33
Strontium (as Sr)	21.23
Sodium (as Na)	3963
Potassium (as K)	119.40
Lithium (as Li)	11.00
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	42.48
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.341
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	6600
Sulfate (as SO ₄)	25.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	310.00
Bicarbonate (as HCO ₃)	488.00
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	13.87

PARAMETERS

Calculated T.D.S.	11677
Molar Conductivity	16485
Resistivity	60.66
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0987
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	6.40

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**

BERRY PETROLEUM
ROB SIMEONE
GARFIELD CO

LATHAM 32-24D CD-32
SEPARATOR

Report Date: 04-18-2014 Sampled: 03-18-2014
Sample #: 2580 at 0000

Sample ID: 67229

SATURATION LEVEL

Calcite (CaCO ₃)	1.13
Aragonite (CaCO ₃)	0.919
Witherite (BaCO ₃)	0.0467
Strontianite (SrCO ₃)	0.281
Calcium oxalate (CaC ₂ O ₄)	0.00
Magnesite (MgCO ₃)	0.443
Anhydrite (CaSO ₄)	0.00822
Gypsum (CaSO ₄ *2H ₂ O)	0.00603
Barite (BaSO ₄)	6.95
Celestite (SrSO ₄)	0.0233
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	663.21
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	771.66
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.0204
Aragonite (CaCO ₃)	-0.0159
Witherite (BaCO ₃)	-5.49
Strontianite (SrCO ₃)	-0.632
Calcium oxalate (CaC ₂ O ₄)	-0.206
Magnesite (MgCO ₃)	-0.189
Anhydrite (CaSO ₄)	-396.65
Gypsum (CaSO ₄ *2H ₂ O)	-543.12
Barite (BaSO ₄)	11.03
Celestite (SrSO ₄)	-76.30
Fluorite (CaF ₂)	-18.98
Calcium phosphate	>-0.001
Hydroxyapatite	-444.85
Silica (SiO ₂)	-152.13
Brucite (Mg(OH) ₂)	0.0232
Magnesium silicate	-159.39
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.207
Halite (NaCl)	-201690
Thenardite (Na ₂ SO ₄)	-52194
Iron sulfide (FeS)	-0.0362

SIMPLE INDICES

Langelier	0.116
Ryznar	6.17
Puckorius	4.22
Larson-Skold Index	23.33
Stiff Davis Index	0.890
Oddo-Tomson	0.273

BOUND IONS

Calcium	206.00
Barium	37.33
Carbonate	5.45
Phosphate	0.00
Sulfate	25.00

TOTAL**FREE**

196.43
37.33
0.308
0.00
18.28

OPERATING CONDITIONS

Temperature (°F)	190.00
Time(secs)	0.00

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

DownHole SAT™ Water Analysis Report

SYSTEM IDENTIFICATION

BERRY PETROLEUM
LATHAM 32-24D CD-32
ROB SIMEONE
SEPARATOR
GARFIELD CO

Sample ID#: 2580
ID: 67229
Report Date: 04-18-2014
Sample Date: 03-18-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	206.00
Magnesium(as Mg)	41.66
Barium(as Ba)	37.33
Strontium(as Sr)	21.23
Sodium(as Na)	3963
Potassium(as K)	119.40
Lithium(as Li)	11.00
Iron(as Fe)	42.48
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0120
Zinc(as Zn)	0.341
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	6600
Sulfate(as SO ₄)	25.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	310.00
Bicarbonate(as HCO ₃)	488.00
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	13.87

PARAMETERS

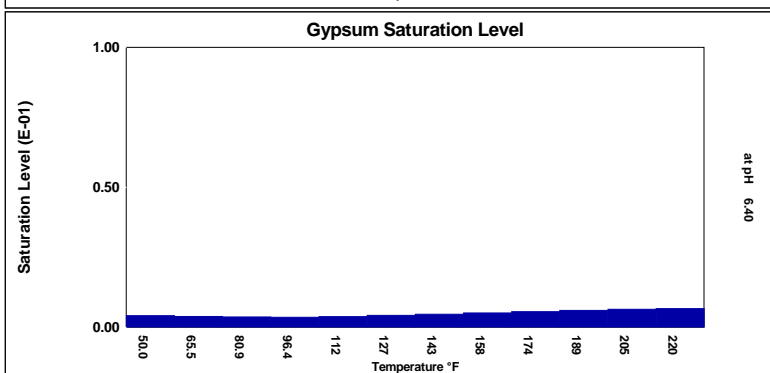
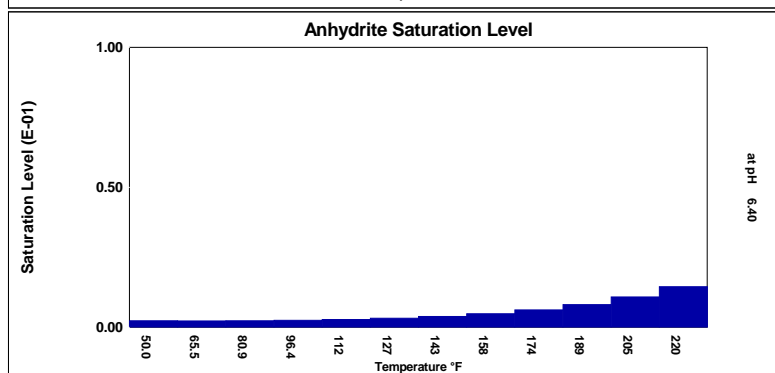
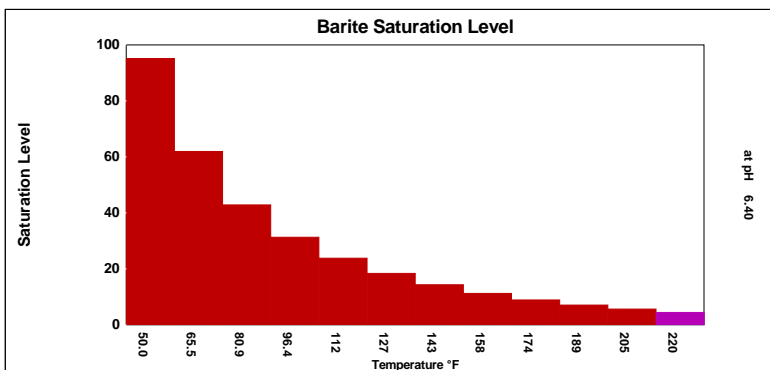
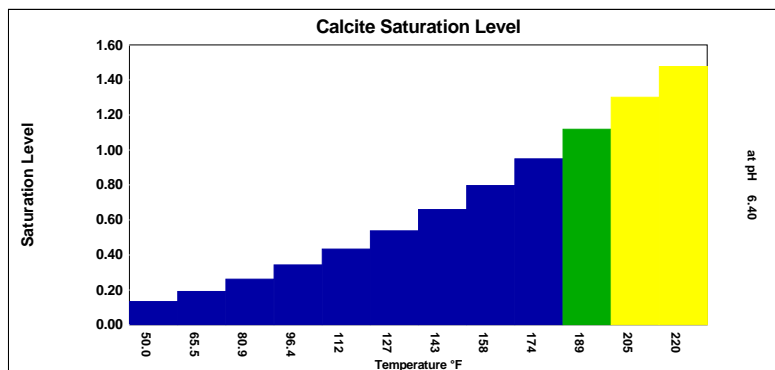
Temperature(°F)	190.00
T.D.S.	11677
Resistivity:	60.66
Sample pH	6.40
Conductivity:	16485

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.133	-0.327	0.00233	-908.67	0.00414	-740.58	95.13	16.92	0.0210	-86.65	39.55	0.0567	0.00	-0.0248	0.0939	0.0987
65.45	0.00	0.191	-0.267	0.00225	-917.64	0.00386	-763.00	61.94	16.36	0.0197	-89.35	63.84	0.0718	0.00	-0.0255	0.200	0.0987
80.91	0.00	0.261	-0.215	0.00229	-898.09	0.00368	-776.88	42.83	15.78	0.0196	-88.98	97.62	0.0873	0.00	-0.0263	0.177	0.0987
96.36	0.00	0.342	-0.171	0.00246	-854.77	0.00357	-782.88	31.27	15.19	0.0201	-86.98	141.88	0.102	0.00	-0.0273	0.232	0.0987
111.82	0.00	0.433	-0.133	0.00276	-793.44	0.00378	-749.91	23.83	14.60	0.0209	-84.36	197.72	0.117	0.00	-0.0283	0.244	0.0987
127.27	0.00	0.538	-0.0986	0.00322	-719.99	0.00423	-695.61	18.39	13.98	0.0216	-82.07	269.11	0.132	0.00	-0.0295	0.205	0.0987
142.73	0.00	0.659	-0.0668	0.00388	-639.86	0.00469	-649.01	14.31	13.32	0.0222	-80.15	359.27	0.149	0.00	-0.0308	0.166	0.0987
158.18	0.00	0.796	-0.0370	0.00483	-557.70	0.00514	-608.95	11.22	12.62	0.0227	-78.58	470.47	0.167	0.00	-0.0323	0.167	0.0987
173.64	0.00	0.949	-0.00864	0.00618	-477.18	0.00558	-574.47	8.87	11.87	0.0230	-77.32	604.19	0.186	0.00	-0.0341	0.167	0.0987
189.09	0.00	1.12	0.0188	0.00809	-401.04	0.00601	-544.84	7.05	11.08	0.0232	-76.36	761.53	0.206	0.00	-0.0361	0.0827	0.0987
204.55	0.00	1.30	0.0454	0.0108	-331.10	0.00641	-519.45	5.63	10.23	0.0233	-75.68	941.64	0.227	0.00	-0.0386	0.0682	0.0987
220.00	0.171	1.48	0.0703	0.0145	-272.43	0.00667	-504.65	4.45	9.29	0.0229	-76.24	1133	0.252	0.00	-0.0423	0.0924	0.116
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY
TIM HEATON

M-4 CHEVRON 5-433D
SEPARATOR

Report Date: 07-13-2011 Sampled: 06-27-2011
Sample #: 7138 at 0000

CATIONS

Calcium (as Ca)	233.00
Magnesium (as Mg)	15.31
Barium (as Ba)	18.56
Strontium (as Sr)	15.23
Sodium (as Na)	4379
Potassium (as K)	38.29
Lithium (as Li)	1.24
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.289
Iron (as Fe)	35.99
Manganese (as Mn)	0.858
Zinc (as Zn)	0.644
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	6700
Sulfate (as SO ₄)	45.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	854.00
Bicarbonate (as HCO ₃)	275.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	0.00
Phosphate (as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

pH	6.40
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	1.00
Calculated T.D.S.	13435
Molar Conductivity	18567
Field Fe	0.00

CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
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JACAM LABORATORIES

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

**JACAM LABORATORIES****DownHole R_x****DEPOSITION POTENTIAL INDICATORS**BERRY
TIM HEATONM-4 CHEVRON 5-433D
SEPARATORReport Date: 07-13-2011 Sampled: 06-27-2011
Sample #: 7138 at 0000**SATURATION LEVEL**

Calcite (CaCO ₃)	1.04
Aragonite (CaCO ₃)	0.867
Witherite (BaCO ₃)	0.0301
Strontianite (SrCO ₃)	0.130
Magnesite (MgCO ₃)	0.0812
Anhydrite (CaSO ₄)	0.00525
Gypsum (CaSO ₄ *2H ₂ O)	0.00707
Barite (BaSO ₄)	10.68
Celestite (SrSO ₄)	0.0127
Fluorite (CaF ₂)	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO ₂)	0.00
Brucite (Mg(OH) ₂)	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) ₃)	166.70
Strengite (FePO ₄ *2H ₂ O)	0.00
Siderite (FeCO ₃)	426.82
Halite (NaCl)	< 0.001
Thenardite (Na ₂ SO ₄)	< 0.001
Iron sulfide (FeS)	0.00

MOMENTARY EXCESS (Lbs/1000 Barrels)

Calcite (CaCO ₃)	0.00860
Aragonite (CaCO ₃)	-0.0372
Witherite (BaCO ₃)	-8.06
Strontianite (SrCO ₃)	-1.91
Magnesite (MgCO ₃)	-2.03
Anhydrite (CaSO ₄)	-767.44
Gypsum (CaSO ₄ *2H ₂ O)	-731.52
Barite (BaSO ₄)	9.50
Celestite (SrSO ₄)	-127.73
Fluorite (CaF ₂)	-15.96
Calcium phosphate	>-0.001
Hydroxyapatite	-328.15
Silica (SiO ₂)	-71.88
Brucite (Mg(OH) ₂)	-2.63
Magnesium silicate	-116.69
Iron hydroxide (Fe(OH) ₃)	< 0.001
Strengite (FePO ₄ *2H ₂ O)	>-0.001
Siderite (FeCO ₃)	0.281
Halite (NaCl)	-182163
Thenardite (Na ₂ SO ₄)	-51580
Iron sulfide (FeS)	-0.0350

SIMPLE INDICES

Langelier	0.146
Ryznar	6.11
Puckorius	3.64
Larson-Skold Index	10.47
Stiff Davis Index	0.175
Oddo-Tomson	-0.0465

BOUND IONS

Calcium	233.00
Barium	18.56
Carbonate	2.20
Phosphate	0.00
Sulfate	45.00

TOTAL**FREE**

193.85
18.56
0.418
0.00
36.25

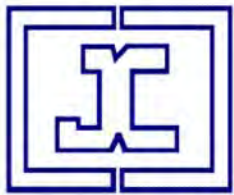
OPERATING CONDITIONS

Temperature (°F)	120.00
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

BERRY
M-4 CHEVRON 5-433D
TIM HEATON
SEPARATOR

Sample ID#: 7138
ID: *2580
Report Date: 07-13-2011
Sample Date: 06-27-2011
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	233.00
Magnesium(as Mg)	15.31
Barium(as Ba)	18.56
Strontium(as Sr)	15.23
Sodium(as Na)	4379
Potassium(as K)	38.29
Lithium(as Li)	1.24
Iron(as Fe)	35.99
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.289
Manganese(as Mn)	0.858
Zinc(as Zn)	0.644
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	6700
Sulfate(as SO ₄)	45.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	854.00
Bicarbonate(as HCO ₃)	275.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	0.291

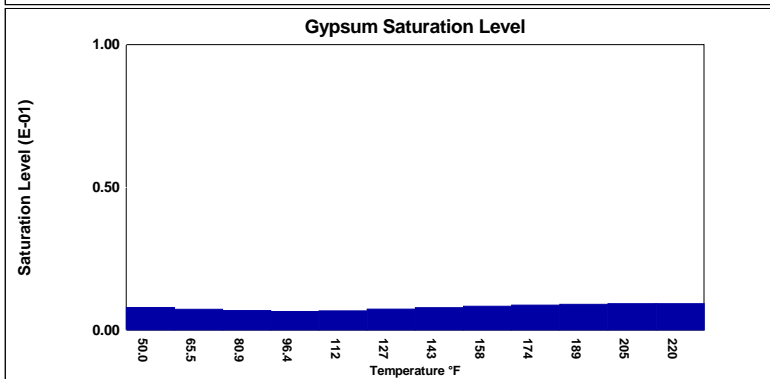
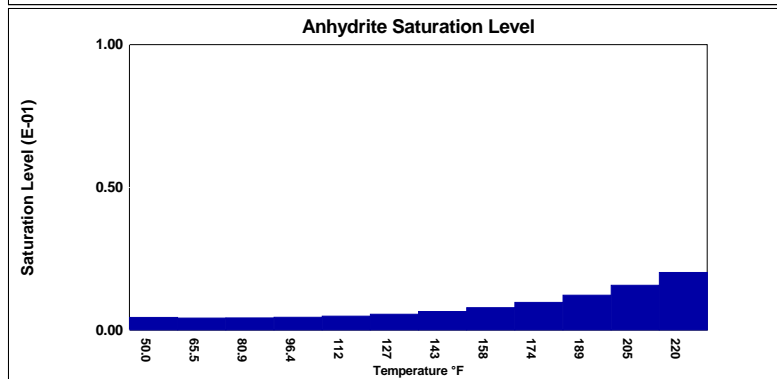
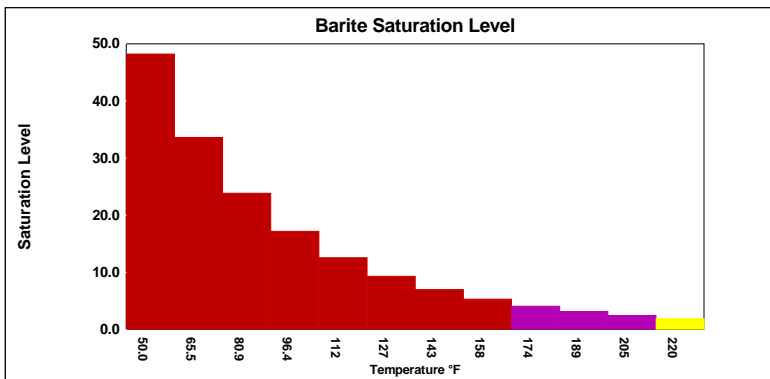
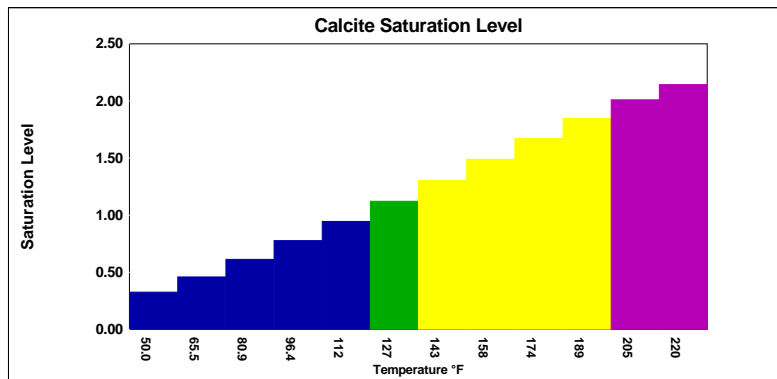
PARAMETERS

Temperature(°F)	120.00
Sample pH	6.40

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.325	-0.241	0.00446	-911.97	0.00793	-740.00	48.19	10.65	0.0123	-133.41	74.41	0.133	0.00	-0.0301	0.199	0.713
65.45	0.00	0.459	-0.171	0.00426	-922.83	0.00731	-764.72	33.60	10.50	0.0125	-131.48	119.94	0.167	0.00	-0.0310	0.423	0.713
80.91	0.00	0.613	-0.110	0.00428	-905.08	0.00686	-781.21	23.83	10.30	0.0126	-129.96	182.34	0.201	0.00	-0.0319	0.629	0.713
96.36	0.00	0.777	-0.0581	0.00450	-863.61	0.00652	-790.22	17.17	10.05	0.0127	-128.82	263.19	0.234	0.00	-0.0330	0.824	0.713
111.82	0.00	0.944	-0.0135	0.00493	-804.20	0.00674	-759.99	12.55	9.71	0.0127	-128.02	363.43	0.264	0.00	-0.0343	0.864	0.713
127.27	0.00	1.12	0.0275	0.00559	-732.73	0.00734	-708.35	9.29	9.29	0.0127	-127.56	489.74	0.296	0.00	-0.0357	0.728	0.713
142.73	0.00	1.30	0.0660	0.00654	-654.63	0.00788	-664.77	6.96	8.77	0.0127	-127.41	645.88	0.329	0.00	-0.0372	0.589	0.713
158.18	0.00	1.49	0.103	0.00787	-574.54	0.00836	-627.99	5.28	8.14	0.0126	-127.57	835.16	0.363	0.00	-0.0390	0.592	0.713
173.64	0.00	1.67	0.138	0.00970	-496.07	0.00875	-596.99	4.04	7.38	0.0125	-128.03	1059	0.398	0.00	-0.0410	0.594	0.713
189.09	0.00	1.84	0.172	0.0122	-421.85	0.00906	-570.91	3.12	6.49	0.0123	-128.81	1317	0.435	0.00	-0.0435	0.293	0.713
204.55	0.00	2.01	0.205	0.0157	-353.61	0.00929	-549.07	2.43	5.46	0.0121	-129.92	1606	0.474	0.00	-0.0463	0.242	0.713
220.00	0.171	2.14	0.238	0.0202	-296.28	0.00929	-537.76	1.87	4.15	0.0116	-133.04	1909	0.518	0.00	-0.0507	0.328	0.835
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

BERRY PETROLEUM
TIM HEATON

O-36B CHEVRON 36-1D
POST

Report Date: 12-29-2010
Sample #: 64

Sampled: 12-21-2010
at 0000

CATIONS

Calcium (as Ca)	226.00
Magnesium (as Mg)	16.32
Barium (as Ba)	19.62
Strontium (as Sr)	14.41
Sodium (as Na)	6731
Potassium (as K)	48.83
Lithium (as Mg)	1.91
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	2.29
Iron (as Fe)	166.80
Boron (as B)	0.291
Manganese (as Mn)	1.43
Zinc (as Zn)	2.56
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	10561
Sulfate (as SO ₄)	5.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	500.00
Bicarbonate (as HCO ₃)	876.00
Carbonate (as CO ₃)	0.00
Silica (as Si)	7.02
H ₂ S (as H ₂ S)	0.00
Phosphate (as PO ₄)	0.00
Nitrate (as NO ₃)	0.00
Fluoride (as F)	0.00

PARAMETERS

pH	6.70
Temperature (°F)	120.00
Density(g/mL)	1.01
Pressure(atm)	14.70
Calculated T.D.S.	19183
Molar Conductivity	26489

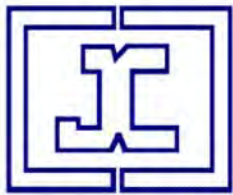
CORROSION RATE PREDICTION

CO ₂ - H ₂ S Rate(mpy)	0.00
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JACAM LABORATORIES

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

DownHole SAT™ Water Analysis Report



JACAM LABORATORIES

SYSTEM IDENTIFICATION

BERRY PETROLEUM
O-36B CHEVRON 36-1D
TIM HEATON
POST

Sample ID#: 64
ID: 2580
Report Date: 12-29-2010
Sample Date: 12-21-2010
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	226.00
Magnesium(as Mg)	16.32
Barium(as Ba)	19.62
Strontium(as Sr)	14.41
Sodium(as Na)	6731
Potassium(as K)	48.83
Lithium(as Li)	1.91
Iron(as Fe)	166.80
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	2.29
Boron(as B)	0.291
Manganese(as Mn)	1.43
Zinc(as Zn)	2.56
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	10561
Sulfate(as SO ₄)	5.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	500.00
Bicarbonate(as HCO ₃)	876.00
Carbonate(as CO ₃)	0.00
Silica(as Si)	7.02
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00

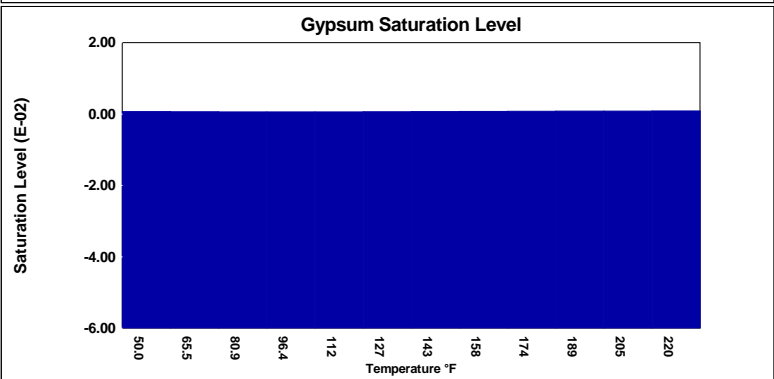
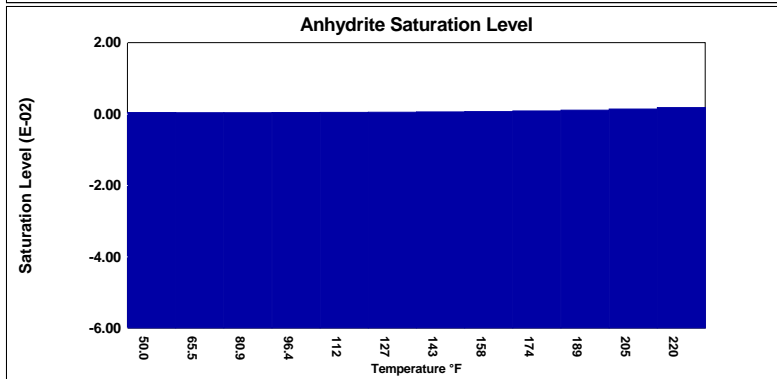
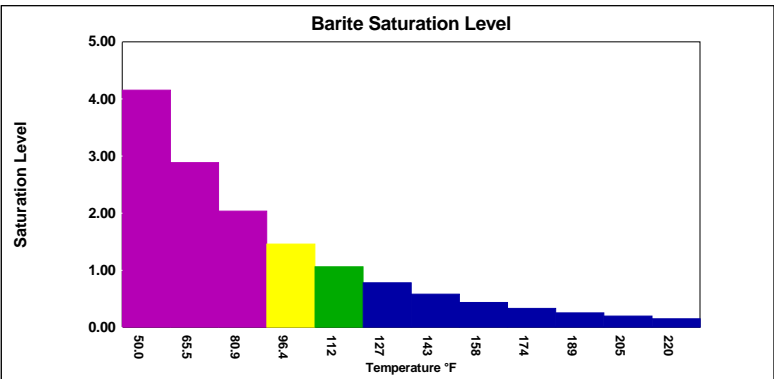
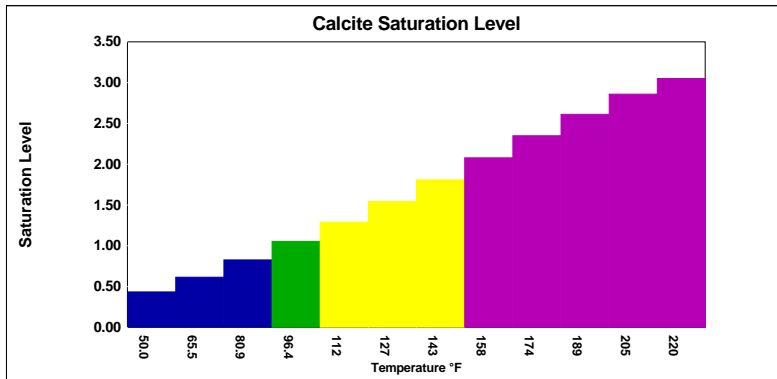
PARAMETERS

Temperature(°F)	120.00
Sample pH	6.70

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	0.435	-0.254	< 0.001	-1057	< 0.001	-869.39	4.15	2.43	< 0.001	-168.13	458.54	0.226	0.00	-0.00429	0.0395	0.00900
65.45	0.00	0.615	-0.153	< 0.001	-1070	< 0.001	-897.86	2.88	2.00	< 0.001	-166.03	736.87	0.284	0.00	-0.00444	0.0739	0.00900
80.91	0.00	0.826	-0.0622	< 0.001	-1051	< 0.001	-917.10	2.04	1.49	< 0.001	-164.44	1119	0.342	0.00	-0.00459	0.0350	0.00900
96.36	0.00	1.05	0.0178	< 0.001	-1004	< 0.001	-927.88	1.46	0.871	< 0.001	-163.32	1612	0.398	0.00	-0.00478	0.840	0.00900
111.82	0.00	1.29	0.0871	< 0.001	-937.67	< 0.001	-893.85	1.06	0.148	< 0.001	-162.65	2218	0.449	0.00	-0.00498	0.166	0.00900
127.27	0.00	1.54	0.152	< 0.001	-856.89	< 0.001	-835.22	0.780	-0.692	< 0.001	-162.41	2977	0.503	0.00	-0.00521	0.0745	0.00900
142.73	0.00	1.81	0.215	< 0.001	-768.26	< 0.001	-785.65	0.581	-1.66	< 0.001	-162.57	3906	0.559	0.00	-0.00548	0.0405	0.00900
158.18	0.00	2.08	0.276	< 0.001	-676.99	< 0.001	-743.76	0.437	-2.76	< 0.001	-163.13	5012	0.617	0.00	-0.00579	0.0316	0.00900
173.64	0.00	2.35	0.335	< 0.001	-587.24	< 0.001	-708.41	0.332	-4.00	< 0.001	-164.10	6288	0.676	0.00	-0.00616	0.0261	0.00900
189.09	0.00	2.61	0.392	0.00107	-502.04	< 0.001	-678.69	0.254	-5.40	< 0.001	-165.48	7710	0.737	0.00	-0.00660	0.0118	0.00900
204.55	0.00	2.86	0.447	0.00139	-423.41	< 0.001	-653.85	0.197	-6.97	< 0.001	-167.28	9242	0.797	0.00	-0.00713	0.00992	0.00900
220.00	0.171	3.05	0.503	0.00180	-357.66	< 0.001	-642.09	0.150	-8.91	< 0.001	-171.74	10698	0.867	0.00	-0.00798	0.0135	0.0105
		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}/{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.
Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.





JACAM LABORATORIES

DownHole R_x

WATER CHEMISTRY

LINN OPERATING
ROB SIMEONE
GARFIELD CO

CHEVRON 18-434D D-20 PAD
FLOW BACK LINE

Report Date: 07-02-2014 Sampled: 06-09-2014
Sample #: 3076 at 0000

Sample ID: 74706

CATIONS

Calcium (as Ca)	239.00
Magnesium (as Mg)	52.55
Barium (as Ba)	7.25
Strontium (as Sr)	18.67
Sodium (as Na)	4689
Potassium (as K)	155.70
Lithium (as Li)	11.73
Ammonia (as NH ₃)	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	29.42
Manganese (as Mn)	1.97
Zinc (as Zn)	0.0820
Lead (as Pb)	0.00

ANIONS

Chloride (as Cl)	7500
Sulfate (as SO ₄)	0.00
Bromine (as Br)	0.00
Dissolved CO ₂ (as CO ₂)	150.00
Bicarbonate (as HCO ₃)	1098
Carbonate (as CO ₃)	0.00
Oxalic acid (as C ₂ O ₄)	0.00
Silica (as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO ₃)	0.00
Boron (as B)	0.291

PARAMETERS

Calculated T.D.S.	13810
Molar Conductivity	18877
Resistivity	52.97
Sp.Gr.(g/mL)	1.01
Pressure(atm)	1.00
pCO ₂ (atm)	0.0664
pH ₂ S(atm)	0.00
Temperature (°F)	190.00
pH	7.10

COMMENTS

GARFIELD CO

JACAM LABORATORIES

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



DEPOSITION POTENTIAL INDICATORS

Report Date:	07-02-2014	Sampled:	06-09-2014
Sample #:	3076		at 0000
Sample ID:	74706		

Calcite (CaCO_3)	12.31	Calcite (CaCO_3)	1.82
Aragonite (CaCO_3)	10.02	Aragonite (CaCO_3)	1.78
Witherite (BaCO_3)	0.0894	Witherite (BaCO_3)	-8.82
Strontianite (SrCO_3)	2.44	Strontianite (SrCO_3)	1.53
Calcium oxalate (CaC_2O_4)	0.00	Calcium oxalate (CaC_2O_4)	-0.209
Magnesite (MgCO_3)	5.42	Magnesite (MgCO_3)	1.35
Anhydrite (CaSO_4)	0.00	Anhydrite (CaSO_4)	-421.18
Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)	0.00	Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)	-576.58
Barite (BaSO_4)	0.00	Barite (BaSO_4)	-5.61
Celestite (SrSO_4)	0.00	Celestite (SrSO_4)	-89.08
Fluorite (CaF_2)	0.00	Fluorite (CaF_2)	-19.04
Calcium phosphate	0.00	Calcium phosphate	>-0.001
Hydroxyapatite	0.00	Hydroxyapatite	-463.14
Silica (SiO_2)	0.00	Silica (SiO_2)	-151.75
Brucite ($\text{Mg}(\text{OH})_2$)	0.00126	Brucite ($\text{Mg}(\text{OH})_2$)	0.118
Magnesium silicate	0.00	Magnesium silicate	-162.65
Iron hydroxide ($\text{Fe}(\text{OH})_3$)	9886	Iron hydroxide ($\text{Fe}(\text{OH})_3$)	< 0.001
Strengite ($\text{FePO}_4 \cdot 2\text{H}_2\text{O}$)	0.00	Strengite ($\text{FePO}_4 \cdot 2\text{H}_2\text{O}$)	>-0.001
Siderite (FeCO_3)	4885	Siderite (FeCO_3)	2.29
Halite (NaCl)	< 0.001	Halite (NaCl)	-204248
Thenardite (Na_2SO_4)	0.00	Thenardite (Na_2SO_4)	-53806
Iron sulfide (FeS)	0.00	Iron sulfide (FeS)	-0.0128

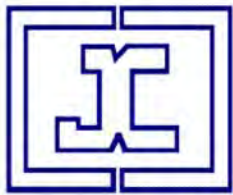
Langelier	1.21
Ryznar	4.69
Puckorius	2.89
Larson-Skold Index	11.22
Stiff Davis Index	1.98
Oddo-Tomson	1.33

Calcium	239.00	214.79
Barium	7.25	7.25
Carbonate	66.79	3.41
Phosphate	0.00	0.00
Sulfate	0.00	0.00

Temperature (°F)	190.00
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
CHEVRON 18-434D D-20 PAD
ROB SIMEONE
FLOW BACK LINE
GARFIELD CO

Sample ID#: 3076
ID: 74706
Report Date: 07-02-2014
Sample Date: 06-09-2014
at 0000

WATER CHEMISTRY

CATIONS

Calcium(as Ca)	239.00
Magnesium(as Mg)	52.55
Barium(as Ba)	7.25
Strontium(as Sr)	18.67
Sodium(as Na)	4689
Potassium(as K)	155.70
Lithium(as Li)	11.73
Iron(as Fe)	29.42
Field Iron(as Fe)	0.00
Ammonia(as NH ₃)	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	1.97
Zinc(as Zn)	0.0820
Lead(as Pb)	0.00

ANIONS

Chloride(as Cl)	7500
Sulfate(as SO ₄)	0.00
Bromine(as Br)	0.00
Dissolved CO ₂ (as CO ₂)	150.00
Bicarbonate(as HCO ₃)	1098
Carbonate(as CO ₃)	0.00
Silica(as SiO ₂)	0.00
Phosphate(as PO ₄)	0.00
H ₂ S (as H ₂ S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO ₃)	0.00
Boron(as B)	0.291

PARAMETERS

Temperature(°F)	190.00
T.D.S.	13810
Resistivity:	52.97
Sample pH	7.10
Conductivity:	18877

SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO ₃		Anhydrite CaSO ₄		Gypsum CaSO ₄ *2H ₂ O		Barite BaSO ₄		Celestite SrSO ₄		Siderite FeCO ₃		Mackawenite FeS		CO ₂ (mpy)	pCO ₂ (atm)
50.00	0.00	1.59	0.214	0.00	-951.20	0.00	-776.01	0.00	-0.887	0.00	-100.42	285.69	0.668	0.00	-0.00800	0.0759	0.0664
65.45	0.00	2.26	0.404	0.00	-961.66	0.00	-800.55	0.00	-1.25	0.00	-103.20	460.37	0.838	0.00	-0.00825	0.142	0.0664
80.91	0.00	3.08	0.590	0.00	-942.15	0.00	-816.07	0.00	-1.67	0.00	-102.76	701.85	1.01	0.00	-0.00853	0.113	0.0664
96.36	0.00	4.01	0.767	0.00	-897.63	0.00	-823.29	0.00	-2.10	0.00	-100.60	1016	1.18	0.00	-0.00885	0.148	0.0664
111.82	0.00	5.04	0.931	0.00	-834.11	0.00	-789.53	0.00	-2.54	0.00	-97.79	1408	1.35	0.00	-0.00923	0.156	0.0664
127.27	0.00	6.21	1.10	0.00	-757.89	0.00	-733.42	0.00	-3.03	0.00	-95.33	1898	1.52	0.00	-0.00968	0.131	0.0664
142.73	0.00	7.54	1.27	0.00	-674.51	0.00	-685.29	0.00	-3.57	0.00	-93.26	2502	1.70	0.00	-0.0102	0.106	0.0664
158.18	0.00	9.00	1.45	0.00	-588.94	0.00	-644.02	0.00	-4.17	0.00	-91.56	3209	1.89	0.00	-0.0109	0.110	0.0664
173.64	0.00	10.57	1.63	0.00	-505.04	0.00	-608.60	0.00	-4.83	0.00	-90.19	4001	2.08	0.00	-0.0117	0.114	0.0664
189.09	0.00	12.21	1.81	0.00	-425.67	0.00	-578.23	0.00	-5.56	0.00	-89.13	4836	2.28	0.00	-0.0128	0.0575	0.0664
204.55	0.00	13.88	1.98	0.00	-352.76	0.00	-552.28	0.00	-6.36	0.00	-88.37	5654	2.47	0.00	-0.0141	0.0482	0.0664
220.00	0.171	15.31	2.16	0.00	-291.75	0.00	-537.62	0.00	-7.34	0.00	-89.00	6318	2.68	0.00	-0.0163	0.0656	0.0778
		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}{CO₃}/K_{sp}. pCO₂ (atm) is the partial pressure of CO₂ in the gas phase.

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

