April 4, 2016

Mr. Phillip Goetze
New Mexico Oil Conservation Division
Engineering Bureau
1220 South St Francis Drive
Santa Fe, New Mexico 87505

RE: Administrative Order SWD-1378-B
Geronimo 28 State SWD No. 2
API: 30-015-40876
Unit I, Section 28, T17S, R28E
SWD; Wolfcamp – Cisco (96136)
Eddy County, New Mexico

Dear Mr. Goetze:

Please find attached a copy of the subject Order issued by the OCD on June 17, 2013. Though this Order does not restrict our source water, Apache would like to notify the OCD of our intention to dispose water from not only the Glorieta/Yeso (Washington 33 State 6 – 30.015.30138), but also water from the San Andres, Queen, Grayburg (Washington 33 State 15 – 30.015.22822), Bone Spring (Palmillo 14 State 1 – 30.015.39027), and Abo (Empire Abo Unit PH-2 #K018B). Water Analysis are included for the additional formations to satisfy any compatibility concerns.

This SWD well is used only for Apache non-commercial produced water. Scaling issues are not anticipated to be a problem and Apache will continue to monitor injection pressure to ensure compliance.

If you need additional information or have any questions, you may contact Mr. Dean Gaines at 432-818-1803 or email Dean.Gaines@apachecorp.com

Kind Regards,

Isabel Hudson

Isabel Hudson
Regulatory Analyst

BAKER HUGHES

Permian Basin Area Laboratory
2101 Market Street,
Midland, Texas 79703

Upstream Chemicals

REPORT DATE: 10/15/2015

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	APACHE CORPORATION	**ACCOUNT REP:**	BOBBY D VAUGHN
DISTRICT:	NEW MEXICO	**SAMPLE ID:**	201501038231
AREA/LEASE:	WASHINGTON 33 STATE	**SAMPLE DATE:**	9/29/2015
SAMPLE POINT NAME	WASHINGTON 33 STATE #15	**ANALYSIS DATE:**	10/14/2015
SITE TYPE:	WELL SITES	**ANALYST:**	FRANCISCO RAMIREZ
SAMPLE POINT DESCRIPTION:	WELL HEAD		

APACHE CORPORATION, WASHINGTON 33 STATE, WASHINGTON 33 STATE #15

FIELD DATA

Initial Temperature (°F):	250
Final Temperature (°F):	80
Initial Pressure (psi):	100
Final Pressure (psi):	15
pH:	
pH at time of sampling:	5.9

ALKALINITY BY TITRATION:	mg/L	meq/L
Bicarbonate (HCO_3^-):	622.2	10.2
Carbonate (CO_3^{2-}):	ND	
Hydroxide (OH^-):	ND	

aqueous CO_2 (ppm):	310.0
aqueous H_2S (ppm):	204.0
aqueous O2 (ppb):	ND
Calculated TDS (mg/L):	108293
Density/Specific Gravity (g/cm³):	1.0684
Measured Specific Gravity	1.0762
Conductivity (mmhos):	ND
Resistivity:	ND
MCF/D:	No Data
BOPD:	No Data
BWPD:	No Data

ANALYSIS OF SAMPLE

ANIONS:	mg/L	meq/L
Chloride (Cl^-):	63252.9	1784.3
Sulfate (SO_4^{2-}):	4327.4	90.1
Borate (H_3BO_3):	34.2	0.6
Fluoride (F^-):	ND	
Bromide (Br^-):	ND	
Nitrite (NO_2^-):	ND	
Nitrate (NO_3^-):	ND	
Phosphate (PO_4^{3-}):	ND	
Silica (SiO_2):	ND	

ORGANIC ACIDS:	mg/L	meq/L
Formic Acid:	ND	
Acetic Acid:	ND	
Propionic Acid:	ND	
Butyric Acid:	ND	
Valeric Acid:	ND	

CATIONS:	mg/L	meq/L
Sodium (Na^+):	37234.8	1620.3
Potassium (K^+):	323.1	8.3
Magnesium (Mg^{2+}):	372.9	30.7
Calcium (Ca^{2+}):	2087.4	104.2
Strontium (Sr^{2+}):	37.1	0.8
Barium (Ba^{2+}):	0.0	0.0
Iron (Fe^{2+}):	1.6	0.1
Manganese (Mn^{2+}):	0.0	0.0
Lead (Pb^{2+}):	ND	
Zinc (Zn^{2+}):	0.0	0.0
Aluminum (Al^{3+}):	ND	
Chromium (Cr^{3+}):	ND	
Cobalt (Co^{2+}):	ND	
Copper (Cu^{2+}):	ND	
Molybdenum (Mo^{2+}):	ND	
Nickel (Ni^{2+}):	ND	
Tin (Sn^{2+}):	ND	
Titanium (Ti^{2+}):	ND	
Vanadium (V^{2+}):	ND	
Zirconium (Zr^{2+}):	ND	
Total Hardness:	6797	N/A

Anion/Cation Ratio: 1.07

ND = Not Determined

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	15 psi		0.000	0.06	11.551	0.00	0.000	-0.19	0.000
99°F	24 psi		0.000	0.09	16.226	0.01	34.618	-0.10	0.000
118°F	34 psi		0.000	0.14	25.084	0.02	63.480	-0.01	0.000
137°F	43 psi		0.000	0.20	34.479	0.03	92.338	0.09	219.442
156°F	53 psi		0.000	0.27	43.607	0.04	123.287	0.19	451.577
174°F	62 psi		0.000	0.33	52.464	0.05	156.503	0.30	665.510
193°F	72 psi		0.000	0.41	61.977	0.06	191.051	0.41	860.003
212°F	81 psi		0.000	0.49	70.993	0.07	225.292	0.52	1034.471
231°F	91 psi		0.000	0.57	79.675	0.08	257.105	0.63	1188.991
250°F	100 psi		0.000	0.66	88.101	0.09	284.023	0.75	1324.205

Conditions		Celestite ($SrSO_4$)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	15 psi	-0.05	0.000	-1.45	0.000	1.29	0.828	-1.40	0.000
99°F	24 psi	-0.04	0.000	-1.46	0.000	1.19	0.817	-1.32	0.000
118°F	34 psi	-0.03	0.000	-1.47	0.000	1.16	0.813	-1.23	0.000
137°F	43 psi	-0.02	0.000	-1.48	0.000	1.16	0.813	-1.15	0.000
156°F	53 psi	-0.01	0.000	-1.48	0.000	1.17	0.814	-1.07	0.000
174°F	62 psi	0.00	0.280	-1.49	0.000	1.19	0.817	-1.00	0.000
193°F	72 psi	0.03	1.574	-1.49	0.000	1.23	0.822	-0.94	0.000
212°F	81 psi	0.05	3.069	-1.49	0.000	1.28	0.828	-0.88	0.000
231°F	91 psi	0.08	4.707	-1.48	0.000	1.33	0.833	-0.83	0.000
250°F	100 psi	0.12	6.417	-1.48	0.000	1.39	0.838	-0.79	0.000

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered

Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.

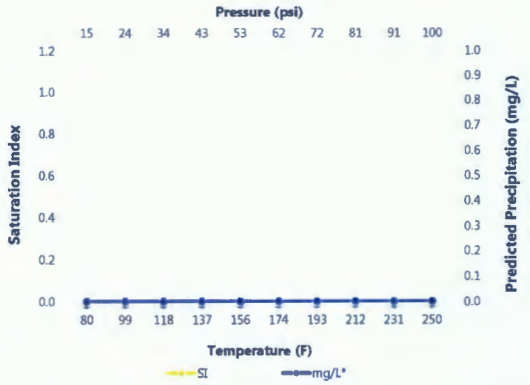
Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

ScaleSoftPitzer™ SSP2010

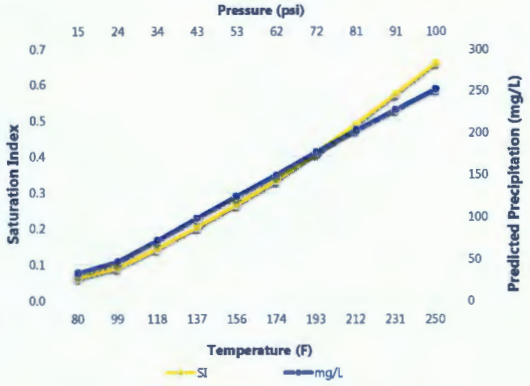
Comments: SA-Q-GR 30-015-22822

SAMPLE ID: 42276 APACHE CORPORATION, WASHINGTON 33 STATE, WASHINGTON 33 STATE #15

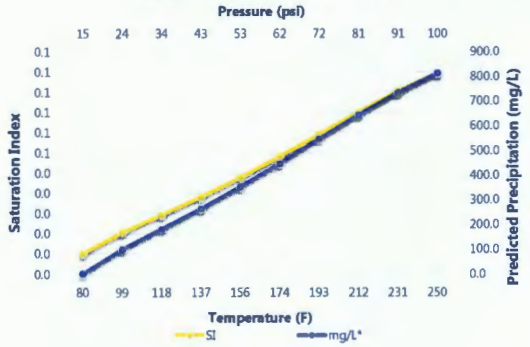
Barite (BaSO4)



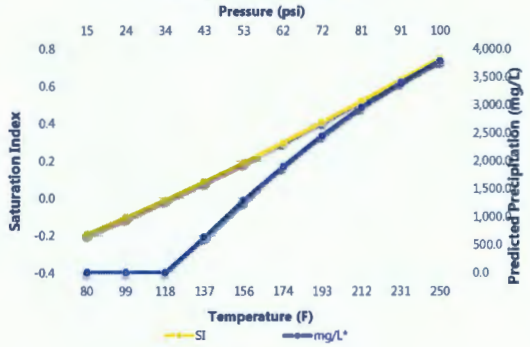
Calcite (CaCO3)



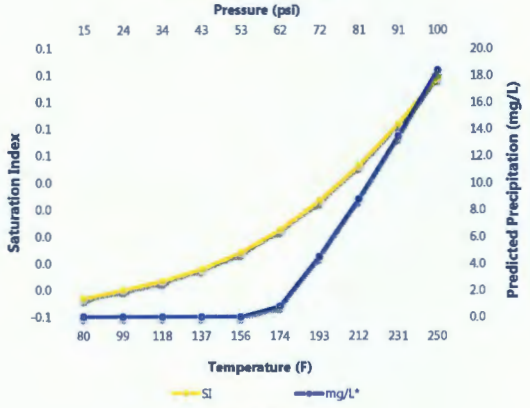
Gypsum (CaSO4·2H2O)



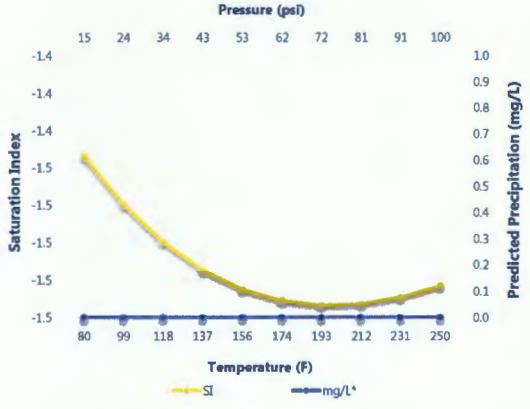
Anhydrite (CaSO4)



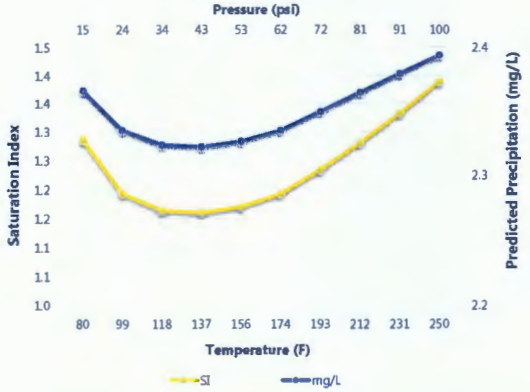
Celestite (SrSO4)



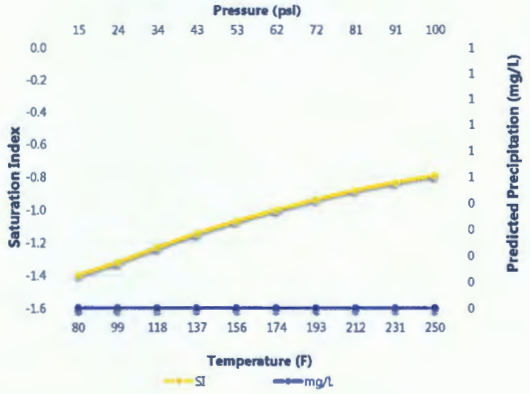
Halite (NaCl)



Iron Sulfide (FeS)



Iron Carbonate (FeCO3)



SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

BAKER HUGHES

Permian Basin Area Laboratory
2101 Market Street,
Midland, Texas 79703

Upstream Chemicals

REPORT DATE: 2/10/2016

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	APACHE CORPORATION	**ACCOUNT REP:**	REGGIE E GUY
DISTRICT:	NEW MEXICO	**SAMPLE ID:**	201601005143
AREA/LEASE:	PALMILLO	**SAMPLE DATE:**	1/26/2016
SAMPLE POINT NAME	PALMILLO 14 STATE #1	**ANALYSIS DATE:**	2/10/2016
SITE TYPE:	WELL SITES	**ANALYST:**	HECTOR MARTINEZ
SAMPLE POINT DESCRIPTION:	WELL HEAD		

APACHE CORPORATION, PALMILLO, PALMILLO 14 STATE #1H

FIELD DATA

Initial Temperature (°F):	250
Final Temperature (°F):	80
Initial Pressure (psi):	100
Final Pressure (psi):	15
pH:	
pH at time of sampling:	6.5

ALKALINITY BY TITRATION:	**mg/L**	**meq/L**
Bicarbonate (HCO_3^-):	573.4	9.4
Carbonate (CO_3^{2-}):	ND	
Hydroxide (OH^-):	ND	

aqueous CO_2 (ppm):	460.0
aqueous H_2S (ppm):	17.0
aqueous O2 (ppb):	ND
Calculated TDS (mg/L):	229451
Density/Specific Gravity (g/cm³):	1.1426
Measured Specific Gravity	1.1615
Conductivity (mmhos):	ND
Resistivity:	ND
MCF/D:	No Data
BOPD:	No Data
BWPD:	No Data

ANALYSIS OF SAMPLE

ANIONS:	**mg/L**	**meq/L**
Chloride (Cl^-):	147286.0	4154.8
Sulfate (SO_4^{2-}):	666.8	13.9
Borate (H_3BO_3):	74.9	1.2
Fluoride (F^-):	ND	
Bromide (Br^-):	ND	
Nitrite (NO_2^-):	ND	
Nitrate (NO_3^-):	ND	
Phosphate (PO_4^{3-}):	ND	
Silica (SiO_2):	ND	

ORGANIC ACIDS:	**mg/L**	**meq/L**
Formic Acid:	ND	
Acetic Acid:	ND	
Propionic Acid:	ND	
Butyric Acid:	ND	
Valeric Acid:	ND	

CATIONS:	**mg/L**	**meq/L**
Sodium (Na^+):	62950.7	2739.4
Potassium (K^+):	1788.0	45.7
Magnesium (Mg^{2+}):	1847.5	152.1
Calcium (Ca^{2+}):	13635.6	680.4
Strontium (Sr^{2+}):	563.6	12.9
Barium (Ba^{2+}):	1.1	0.0
Iron (Fe^{2+}):	60.8	2.2
Manganese (Mn^{2+}):	2.1	0.1
Lead (Pb^{2+}):	ND	
Zinc (Zn^{2+}):	0.0	0.0
Aluminum (Al^{3+}):	ND	
Chromium (Cr^{3+}):	ND	
Cobalt (Co^{2+}):	ND	
Copper (Cu^{2+}):	ND	
Molybdenum (Mo^{2+}):	ND	
Nickel (Ni^{2+}):	ND	
Tin (Sn^{2+}):	ND	
Titanium (Ti^{2+}):	ND	
Vanadium (V^{2+}):	ND	
Zirconium (Zr^{2+}):	ND	
Total Hardness:	42344	N/A

Anion/Cation Ratio: 1.15

ND = Not Determined

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		**Barite ($BaSO_4$)**		**Calcite ($CaCO_3$)**		**Gypsum ($CaSO_4 \cdot 2H_2O$)**		**Anhydrite ($CaSO_4$)**	
Temp	**Press.**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**
80°F	15 psi	0.39	0.386	2.15	148.405	0.00	0.000	-0.10	0.000
99°F	24 psi	0.26	0.298	2.19	149.036	0.01	7.504	-0.01	0.000
118°F	34 psi	0.15	0.186	2.24	149.971	0.01	6.894	0.07	49.461
137°F	43 psi	0.03	0.049	2.30	150.888	0.00	3.107	0.16	98.449
156°F	53 psi	-0.07	0.000	2.36	151.721	0.00	0.000	0.24	140.100
174°F	62 psi	-0.17	0.000	2.42	152.466	-0.01	0.000	0.33	175.255
193°F	72 psi	-0.26	0.000	2.47	153.136	-0.02	0.000	0.42	204.511
212°F	81 psi	-0.34	0.000	2.53	153.831	-0.02	0.000	0.52	228.477
231°F	91 psi	-0.42	0.000	2.59	154.506	-0.03	0.000	0.61	247.805
250°F	100 psi	-0.50	0.000	2.64	155.132	-0.05	0.000	0.70	263.169

Conditions		**Celestite ($SrSO_4$)**		**Halite (NaCl)**		**Iron Sulfide (FeS)**		**Iron Carbonate ($FeCO_3$)**	
Temp	**Press.**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**
80°F	15 psi	0.42	164.580	-0.60	0.000	3.20	28.111	1.40	41.108
99°F	24 psi	0.43	166.355	-0.61	0.000	3.09	28.070	1.50	41.689
118°F	34 psi	0.43	166.624	-0.62	0.000	3.04	28.050	1.60	42.207
137°F	43 psi	0.43	166.377	-0.63	0.000	3.00	28.038	1.70	42.586
156°F	53 psi	0.43	166.281	-0.64	0.000	2.98	28.032	1.78	42.851
174°F	62 psi	0.43	166.753	-0.65	0.000	2.96	28.028	1.84	43.032
193°F	72 psi	0.43	167.990	-0.66	0.000	2.95	28.027	1.89	43.153
212°F	81 psi	0.44	170.003	-0.67	0.000	2.95	28.033	1.93	43.248
231°F	91 psi	0.45	172.647	-0.68	0.000	2.96	28.041	1.96	43.308
250°F	100 psi	0.46	175.655	-0.69	0.000	2.97	28.050	1.97	43.336

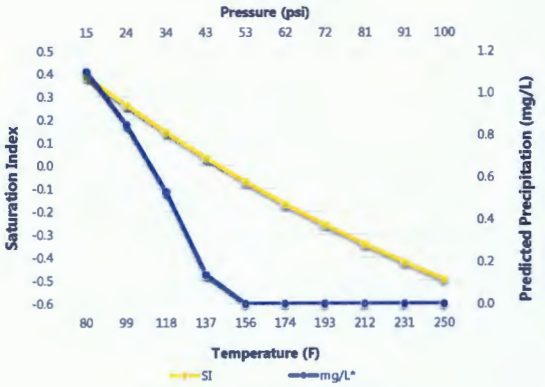
Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered
Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.
Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

ScaleSoftPitzer™
SSP2010

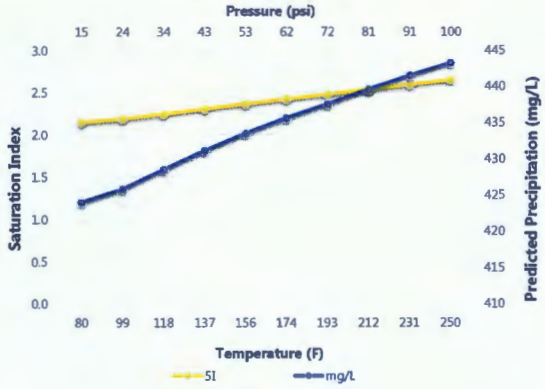
Comments: Bone Spring 30-015-39027

SAMPLE ID: 42395 APACHE CORPORATION, PALMILLO, PALMILLO 14 STATE #1

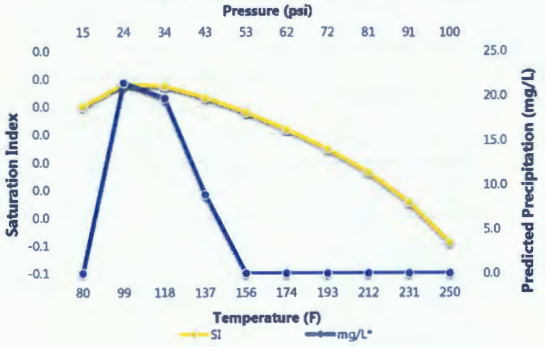
Barite (BaSO4)



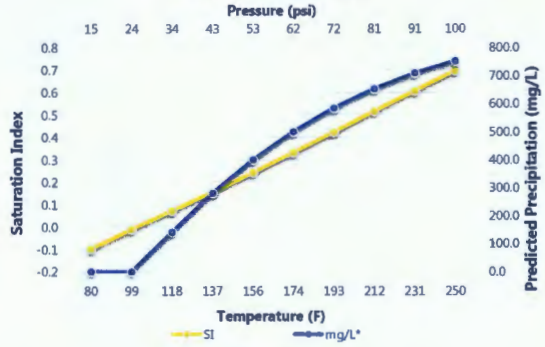
Calcite (CaCO3)



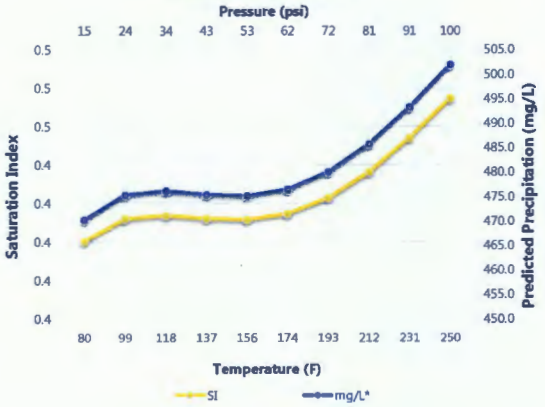
Gypsum (CaSO4·2H2O)



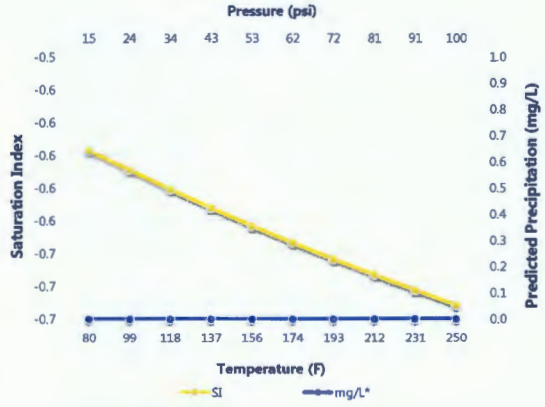
Anhydrite (CaSO4)



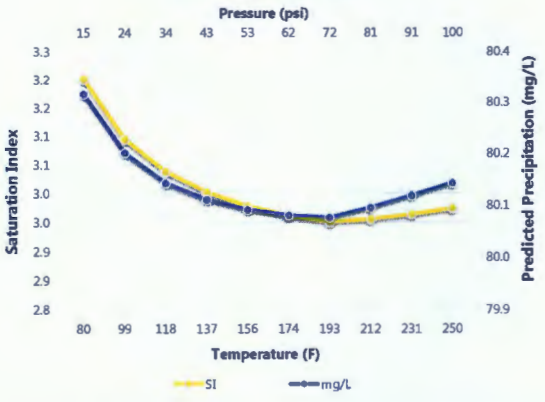
Celestite (SrSO4)



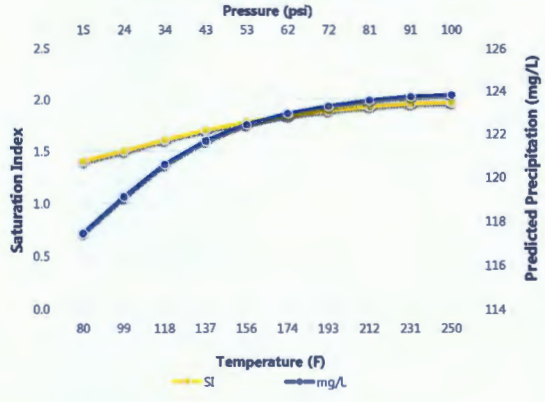
Halite (NaCl)



Iron Sulfide (FeS)



Iron Carbonate (FeCO3)



SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

BAKER HUGHES

Permian Basin Area Laboratory
2101 Market Street,
Midland, Texas 79703

Upstream Chemicals

REPORT DATE: 10/16/2015

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	APACHE CORPORATION	**ACCOUNT REP:**	BOBBY D VAUGHN
DISTRICT:	NEW MEXICO	**SAMPLE ID:**	201501038219
AREA/LEASE:	WASHINGTON 33 STATE	**SAMPLE DATE:**	9/28/2015
SAMPLE POINT NAME	WASHINGTON 33 STATE #06	**ANALYSIS DATE:**	10/14/2015
SITE TYPE:	WELL SITES	**ANALYST:**	FRANCISCO RAMIREZ
SAMPLE POINT DESCRIPTION:	WELL HEAD		

APACHE CORPORATION, WASHINGTON 33 STATE, WASHINGTON 33 STATE #06

FIELD DATA		ANALYSIS OF SAMPLE					
		ANIONS:	mg/L	meq/L	CATIONS:	mg/L	meq/L
Initial Temperature (°F):	250	Chloride (Cl^-):	111924.3	3157.2	Sodium (Na^+):	64433.8	2803.9
Final Temperature (°F):	80	Sulfate (SO_4^{2-}):	4853.7	101.1	Potassium (K^+):	370.6	9.5
Initial Pressure (psi):	100	Borate (H_3BO_3):	48.1	0.8	Magnesium (Mg^{2+}):	522.2	43.0
Final Pressure (psi):	15	Fluoride (F^-):	ND		Calcium (Ca^{2+}):	2298.1	114.7
		Bromide (Br^-):	ND		Strontium (Sr^{2+}):	45.7	1.0
pH:		Nitrite (NO_2^-):	ND		Barium (Ba^{2+}):	0.0	0.0
pH at time of sampling:	6.3	Nitrate (NO_3^-):	ND		Iron (Fe^{2+}):	2.8	0.1
		Phosphate (PO_4^{3-}):	ND		Manganese (Mn^{2+}):	0.0	0.0
		Silica (SiO_2):	ND		Lead (Pb^{2+}):	ND	
					Zinc (Zn^{2+}):	0.0	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L					
Bicarbonate (HCO_3^-):	768.6	12.6			Aluminum (Al^{3+}):	ND	
Carbonate (CO_3^{2-}):	ND				Chromium (Cr^{3+}):	ND	
Hydroxide (OH^-):	ND				Cobalt (Co^{2+}):	ND	
			ORGANIC ACIDS:	mg/L	meq/L	Copper (Cu^{2+}):	ND	
aqueous CO_2 (ppm):	290.0		Formic Acid:	ND		Molybdenum (Mo^{2+}):	ND	
aqueous H_2S (ppm):	119.0		Acetic Acid:	ND		Nickel (Nl^{2+}):	ND	
aqueous O2 (ppb):	ND		Propionic Acid:	ND		Tin (Sn^{2+}):	ND	
			Butyric Acid:	ND		Titanium (Tl^{2+}):	ND	
Calculated TDS (mg/L):	185268		Valeric Acid:	ND		Vanadium (V^{2+}):	ND	
Density/Specific Gravity (g/cm³):	1.1135					Zirconium (Zr^{2+}):	ND	
Measured Specific Gravity	1.1275							
Conductivity (mmhos):	ND					Total Hardness:	7949	N/A
Resistivity:	ND							
MCF/D:	No Data							
BOPD:	No Data							
BWPD:	No Data		Anion/Cation Ratio:		1.10	ND = Not Determined		

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	15 psi		0.000	0.88	130.761	0.07	258.036	-0.07	0.000
99°F	24 psi		0.000	0.91	132.769	0.08	283.963	0.02	57.661
118°F	34 psi		0.000	0.96	136.218	0.08	282.992	0.10	288.953
137°F	43 psi		0.000	1.01	139.682	0.08	270.081	0.19	501.302
156°F	53 psi		0.000	1.06	142.951	0.07	252.044	0.28	698.780
174°F	62 psi		0.000	1.11	146.080	0.06	231.829	0.37	882.272
193°F	72 psi		0.000	1.17	149.167	0.06	210.090	0.46	1051.491
212°F	81 psi		0.000	1.24	152.789	0.05	185.890	0.55	1205.879
231°F	91 psi		0.000	1.31	156.439	0.04	157.066	0.65	1345.011
250°F	100 psi		0.000	1.38	160.138	0.03	120.406	0.74	1468.754

Conditions		Celestite ($SrSO_4$)		Halite ($NaCl$)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	15 psi	0.11	7.583	-0.84	0.000	2.22	1.540	-0.42	0.000
99°F	24 psi	0.12	7.786	-0.85	0.000	2.11	1.537	-0.34	0.000
118°F	34 psi	0.11	7.693	-0.85	0.000	2.05	1.535	-0.26	0.000
137°F	43 psi	0.11	7.499	-0.86	0.000	2.01	1.534	-0.18	0.000
156°F	53 psi	0.11	7.344	-0.87	0.000	1.99	1.533	-0.11	0.000
174°F	62 psi	0.11	7.329	-0.87	0.000	1.98	1.533	-0.06	0.000
193°F	72 psi	0.11	7.510	-0.88	0.000	1.98	1.533	-0.01	0.000
212°F	81 psi	0.12	7.904	-0.88	0.000	2.00	1.534	0.03	0.138
231°F	91 psi	0.13	8.494	-0.89	0.000	2.02	1.534	0.06	0.275
250°F	100 psi	0.14	9.237	-0.89	0.000	2.05	1.535	0.09	0.367

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered

Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.

Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

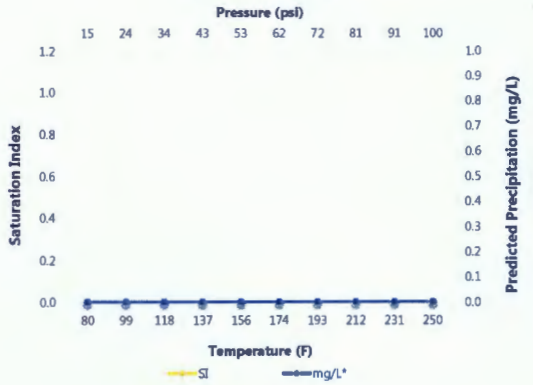
ScaleSoftPitzer™
SSP2010

Comments:

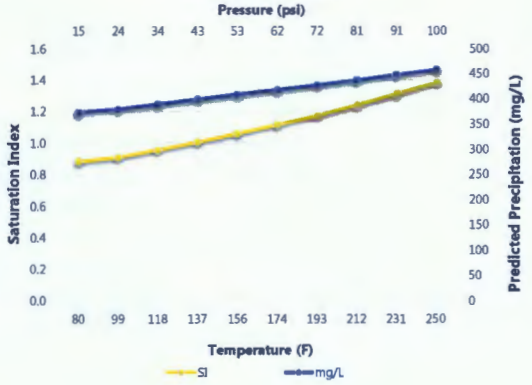
Glorieta-Yeso RA 30-015-~~22822~~ 30138

SAMPLE ID: 42275 APACHE CORPORATION, WASHINGTON 33 STATE, WASHINGTON 33 STATE #06

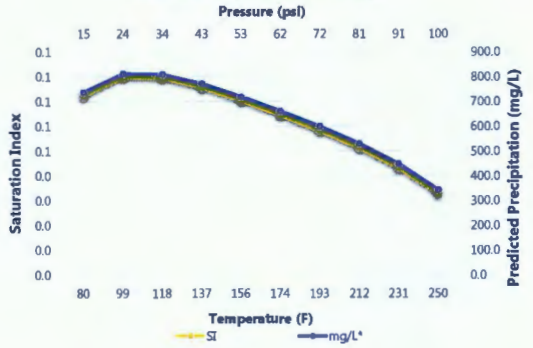
Barite (BaSO4)



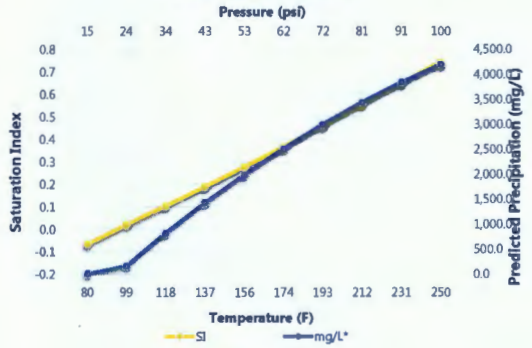
Calcite (CaCO3)



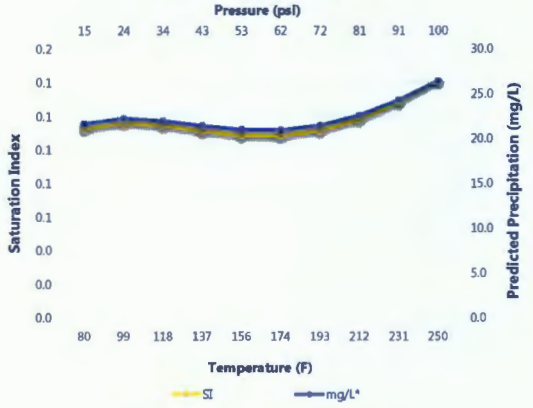
Gypsum (CaSO4·2H2O)



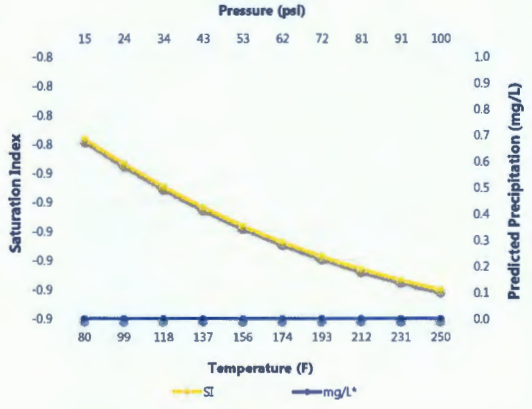
Anhydrite (CaSO4)



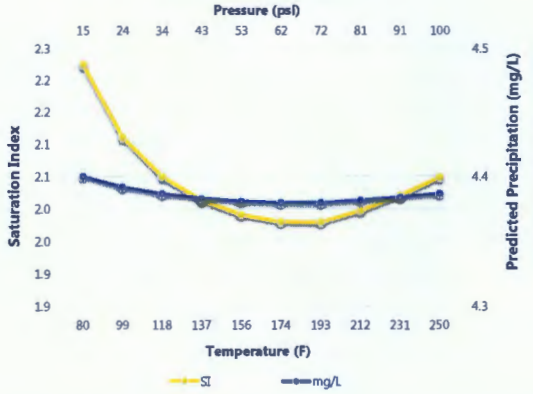
Celestite (SrSO4)



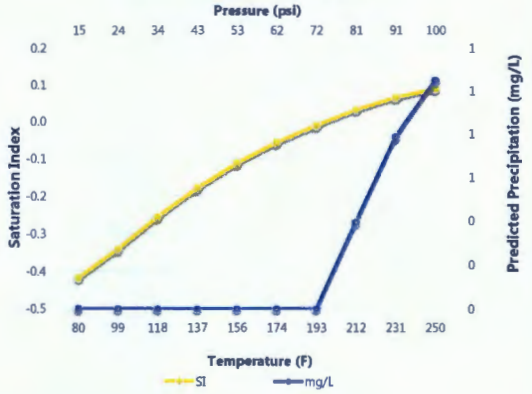
Halite (NaCl)



Iron Sulfide (FeS)



Iron Carbonate (FeCO3)



SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

BAKER HUGHES

Permian Basin Area Laboratory
2101 Market Street,
Midland, Texas 79703

Upstream Chemicals

REPORT DATE: 7/16/2015

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	APACHE CORPORATION	**ACCOUNT REP:**	BOBBY D VAUGHN
DISTRICT:	NEW MEXICO	**SAMPLE ID:**	201501025709
AREA/LEASE:	EMPIRE ABO UNIT	**SAMPLE DATE:**	7/8/2015
SAMPLE POINT NAME	EMPIRE ABO UNIT PH-2 #K018B	**ANALYSIS DATE:**	7/16/2015
SITE TYPE:	WELL SITES	**ANALYST:**	SAMUEL NEWMAN
SAMPLE POINT DESCRIPTION:	WELL HEAD		

APACHE CORPORATION, EMPIRE ABO UNIT, EMPIRE ABO UNIT PH-2 #K018B

FIELD DATA		ANALYSIS OF SAMPLE					
		ANIONS:	mg/L	meq/L	CATIONS:	mg/L	meq/L
Initial Temperature (°F):	100	Chloride (Cl^-):	33497.3	944.9	Sodium (Na^+):	20422.3	888.7
Final Temperature (°F):	80	Sulfate (SO_4^{2-}):	3702.8	77.1	Potassium (K^+):	194.8	5.0
Initial Pressure (psi):	25	Borate (H_3BO_3):	32.7	0.5	Magnesium (Mg^{2+}):	249.6	20.5
Final Pressure (psi):	40	Fluoride (F^-):	ND		Calcium (Ca^{2+}):	1491.1	74.4
		Bromide (Br^-):	ND		Strontium (Sr^{2+}):	35.5	0.8
pH:		Nitrite (NO_2^-):	ND		Barium (Ba^{2+}):	0.6	0.0
pH at time of sampling:	6.7	Nitrate (NO_3^-):	ND		Iron (Fe^{2+}):	1.8	0.1
		Phosphate (PO_4^{3-}):	ND		Manganese (Mn^{2+}):	0.0	0.0
		Silica (SiO_2):	ND		Lead (Pb^{2+}):	ND	
					Zinc (Zn^{2+}):	0.0	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L					
Bicarbonate (HCO_3^-):	1220.0	20.0			Aluminum (Al^{3+}):	ND	
Carbonate (CO_3^{2-}):	ND				Chromium (Cr^{3+}):	ND	
Hydroxide (OH^-):	ND				Cobalt (Co^{2+}):	ND	
			ORGANIC ACIDS:	mg/L	meq/L	Copper (Cu^{2+}):	ND	
aqueous CO_2 (ppm):	170.0		Formic Acid:	ND		Molybdenum (Mo^{2+}):	ND	
aqueous H_2S (ppm):	680.0		Acetic Acid:	ND		Nickel (Ni^{2+}):	ND	
aqueous O2 (ppb):	ND		Propionic Acid:	ND		Tin (Sn^{2+}):	ND	
			Butyric Acid:	ND		Titanium (Ti^{2+}):	ND	
Calculated TDS (mg/L):	60849		Valeric Acid:	ND		Vanadium (V^{2+}):	ND	
Density/Specific Gravity (g/cm³):	1.0383					Zirconium (Zr^{2+}):	ND	
Measured Specific Gravity	1.0425							
Conductivity (mmhos):	ND					Total Hardness:	4797	N/A
Resistivity:	ND							
MCF/D:	No Data							
BOPD:	No Data							
BWPD:	No Data		Anion/Cation Ratio:		1.05	ND = Not Determined		

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	40 psi	1.17	0.327	0.52	131.703	-0.05	0.000	-0.27	0.000
82°F	38 psi	1.15	0.326	0.52	131.881	-0.05	0.000	-0.26	0.000
84°F	37 psi	1.14	0.325	0.52	132.095	-0.05	0.000	-0.25	0.000
87°F	35 psi	1.12	0.324	0.53	132.352	-0.05	0.000	-0.24	0.000
89°F	33 psi	1.10	0.323	0.53	132.658	-0.05	0.000	-0.23	0.000
91°F	32 psi	1.08	0.322	0.53	133.020	-0.04	0.000	-0.22	0.000
93°F	30 psi	1.07	0.321	0.54	133.448	-0.04	0.000	-0.21	0.000
96°F	28 psi	1.05	0.320	0.54	133.953	-0.04	0.000	-0.20	0.000
98°F	27 psi	1.04	0.319	0.55	134.548	-0.04	0.000	-0.19	0.000
100°F	25 psi	1.02	0.318	0.55	135.249	-0.04	0.000	-0.18	0.000

Conditions		Celestite ($SrSO_4$)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
80°F	40 psi	0.01	0.693	-2.02	0.000	2.87	0.964	-0.71	0.000
82°F	38 psi	0.01	0.726	-2.02	0.000	2.86	0.964	-0.71	0.000
84°F	37 psi	0.01	0.762	-2.02	0.000	2.85	0.964	-0.70	0.000
87°F	35 psi	0.01	0.802	-2.02	0.000	2.84	0.964	-0.69	0.000
89°F	33 psi	0.01	0.844	-2.03	0.000	2.83	0.964	-0.68	0.000
91°F	32 psi	0.02	0.890	-2.03	0.000	2.82	0.964	-0.67	0.000
93°F	30 psi	0.02	0.940	-2.03	0.000	2.81	0.964	-0.66	0.000
96°F	28 psi	0.02	0.993	-2.03	0.000	2.81	0.964	-0.65	0.000
98°F	27 psi	0.02	1.050	-2.03	0.000	2.80	0.964	-0.63	0.000
100°F	25 psi	0.02	1.111	-2.04	0.000	2.80	0.964	-0.62	0.000

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered
Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.
Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

ScaleSoftPitzer™
SSP2010

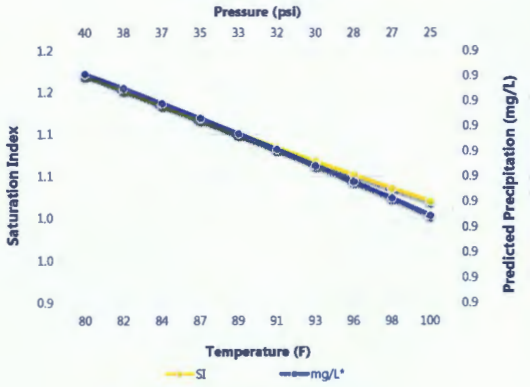
Comments:

Abo

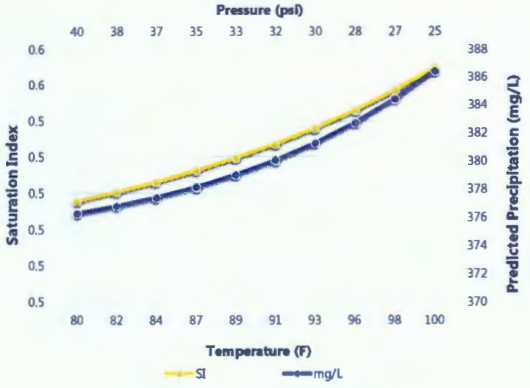
30-015-00707

SAMPLE ID: 42193 APACHE CORPORATION, EMPIRE ABO UNIT, EMPIRE ABO UNIT PH-2 #K018B

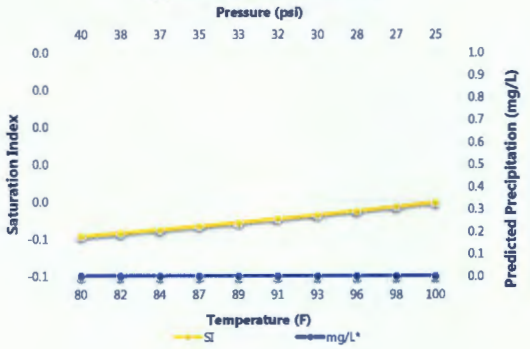
Barite (BaSO4)



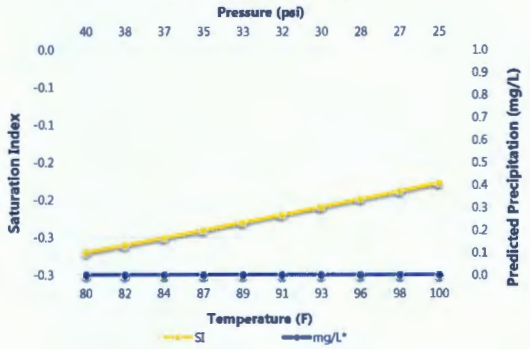
Calcite (CaCO3)



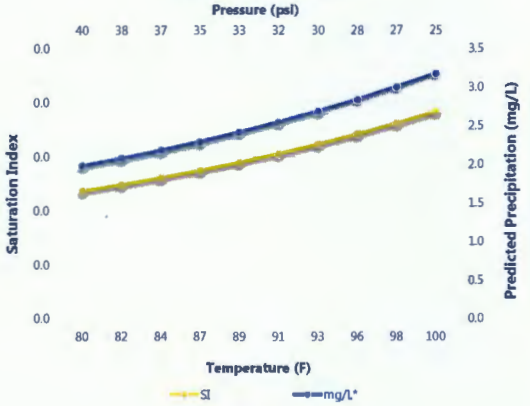
Gypsum (CaSO4·2H2O)



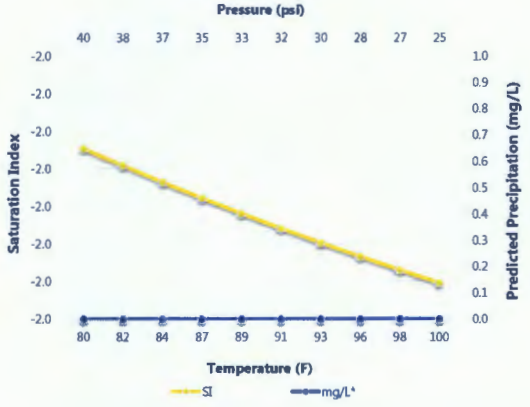
Anhydrite (CaSO4)



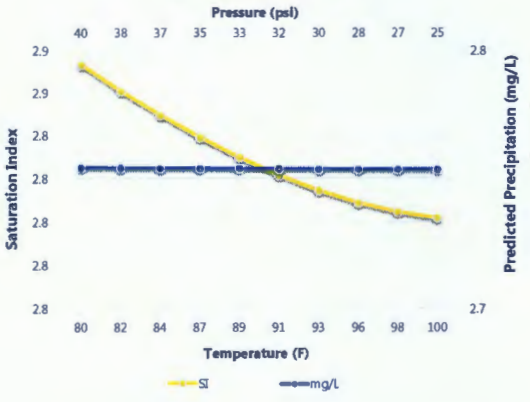
Celestite (SrSO4)



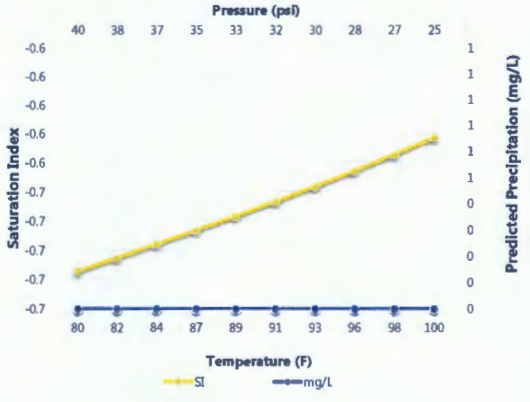
Halite (NaCl)



Iron Sulfide (FeS)



Iron Carbonate (FeCO3)



SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Goetze, Phillip, EMNRD

From: Goetze, Phillip, EMNRD
Sent: Wednesday, April 20, 2016 8:34 AM
To: Gaines, Dean (Dean.Gaines@apachecorp.com)
Cc: Jones, William V, EMNRD; Inge, Richard, EMNRD; 'Fernandez, Edward' (efernand@blm.gov) (efernand@blm.gov)
Subject: Corrected Sources - SWD-1503 and SWD-1378-B - Additional Disposal Sources

RE: AAO Federal SWD No. 1 (30-015-42549; SWD-1503) and Geronimo 28 State SWD No. 2 (30-015-40876; SWD-1378-B)

Mr. Gaines:

On behalf of Apache, you have submitted water analysis for additional sources for disposal in the two referenced SWD wells. These sources were not included in the original application for the wells and are from producing wells operated by Apache. The wells with the proposed new sources include the following (corrected):

Geronimo 28 State SWD No. 2
C-108 application sources: Glorieta and Yeso formations
Requested additional sources: San Andres – Queen – Grayburg formations, Abo formation, and Bone Spring formation

AAO Federal SWD No. 1
C-108 application sources: Glorieta and Yeso formations
Requested additional sources: San Andres – Queen – Grayburg formations

Division has reviewed the water analysis for each source and has no objections to the injection of the new sources into the respective well. Copies of the water analysis and Apache's correspondence will be placed in each of the respective administrative order file and well file. Please contact with any additional questions regarding this matter. PRG

Phillip R. Goetze, PG
Engineering and Geological Services Bureau
Oil Conservation Division
New Mexico Energy, Minerals and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, NM 87505
Direct: 505.476.3466
e-mail: phillip.goetze@state.nm.us