

Central Area Laboratory  
12701 N. Santa Fe Ave, Suite 151  
Oklahoma City, Oklahoma 73114

REPORT DATE: 6/25/2018

## COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER: FOUNDATION ENERGY  
DISTRICT: KANSAS  
AREA/LEASE: DEVLIN  
SAMPLE POINT NAME: DEVLIN SWD  
SITE TYPE: WELL SITES  
SAMPLE POINT DESCRIPTION: WELL HEADACCOUNT REP: NEIL J HUTTON  
SAMPLE ID: 201810007279  
SAMPLE DATE: 6/6/2018  
ANALYSIS DATE: 6/22/2018  
ANALYST: BS

## FOUNDATION ENERGY, DEVLIN, DEVLIN SWD

FIELD DATA			ANALYSIS OF SAMPLE							
			ANIONS:		mg/L	meq/L	CATIONS:		mg/L	meq/L
Initial Temperature (°F):	300		Chloride (Cl <sup>-</sup> ):		9460.0	266.9	Sodium (Na <sup>+</sup> ):		7014.3	305.2
Final Temperature (°F):	81		Sulfate (SO <sub>4</sub> <sup>2-</sup> ):		9.1	0.2	Potassium (K <sup>+</sup> ):		31.2	0.8
Initial Pressure (psi):	150		Borate (H <sub>3</sub> BO <sub>3</sub> ):		85.0	1.4	Magnesium (Mg <sup>2+</sup> ):		40.0	3.3
Final Pressure (psi):	15		Fluoride (F <sup>-</sup> ):		ND		Calcium (Ca <sup>2+</sup> ):		50.5	2.5
			Bromide (Br <sup>-</sup> ):		ND		Strontium (Sr <sup>2+</sup> ):		14.0	0.3
pH:			Nitrite (NO <sub>2</sub> <sup>-</sup> ):		ND		Barium (Ba <sup>2+</sup> ):		17.8	0.3
pH at time of sampling:	7.6		Nitrate (NO <sub>3</sub> <sup>-</sup> ):		ND		Iron (Fe <sup>2+</sup> ):		8.5	0.3
SI Residual:	mg/L		Phosphate (PO <sub>4</sub> <sup>3-</sup> ):		24.7	0.8	Manganese (Mn <sup>2+</sup> ):		0.1	0.0
Compound:	SCW-2600		Silica (SiO <sub>2</sub> ):		ND		Lead (Pb <sup>2+</sup> ):		ND	
Residual (ppm):	120.9						Zinc (Zn <sup>2+</sup> ):		0.0	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L								
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> ):	1964.2	32.2					Aluminum (Al <sup>3+</sup> ):		ND	
Carbonate (CO <sub>3</sub> <sup>2-</sup> ):	ND						Chromium (Cr <sup>3+</sup> ):		ND	
Hydroxide (OH <sup>-</sup> ):	ND						Cobalt (Co <sup>2+</sup> ):		ND	
			ORGANIC ACIDS:		mg/L	meq/L	Copper (Cu <sup>2+</sup> ):		ND	
aqueous CO <sub>2</sub> (ppm):	29.7		Formic Acid:		ND		Molybdenum (Mo <sup>2+</sup> ):		ND	
aqueous H <sub>2</sub> S (ppm):	0.5		Acetic Acid:		ND		Nickel (Ni <sup>2+</sup> ):		ND	
aqueous O <sub>2</sub> (ppb):	ND		Propionic Acid:		ND		Tin (Sn <sup>2+</sup> ):		ND	
			Butyric Acid:		ND		Titanium (Ti <sup>2+</sup> ):		ND	
Calculated TDS (mg/L):	18610		Valeric Acid:		ND		Vanadium (V <sup>2+</sup> ):		ND	
Density/Specific Gravity (g/cm <sup>3</sup> ):	1.0103						Zirconium (Zr <sup>2+</sup> ):		ND	
Measured Specific Gravity	ND						Lithium (Li):		ND	
Conductivity (mmhos):	ND									
Resistivity:	ND						Total Hardness:		320	N/A
MCF/D:	No Data									
BOPD:	No Data									
BWPD:	No Data		Anion/Cation Ratio:			0.96	ND = Not Determined			

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

Conditions		Barite (BaSO <sub>4</sub> )		Calcite (CaCO <sub>3</sub> )		Gypsum (CaSO <sub>4</sub> ·2H <sub>2</sub> O)		Anhydrite (CaSO <sub>4</sub> )	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
81°F	15 psi	0.60	4.415	0.71	32.395	-3.60	0.000	-3.84	0.000
105°F	30 psi	0.41	3.322	0.79	34.094	-3.60	0.000	-3.74	0.000
130°F	45 psi	0.26	2.277	0.91	36.536	-3.59	0.000	-3.61	0.000
154°F	60 psi	0.14	1.352	1.06	38.647	-3.57	0.000	-3.47	0.000
178°F	75 psi	0.06	0.598	1.22	40.343	-3.54	0.000	-3.31	0.000
203°F	90 psi	0.00	0.038	1.40	41.610	-3.49	0.000	-3.14	0.000
227°F	105 psi	-0.03	0.000	1.58	42.479	-3.45	0.000	-2.97	0.000
251°F	120 psi	-0.05	0.000	1.76	43.066	-3.40	0.000	-2.78	0.000
276°F	135 psi	-0.05	0.000	1.95	43.457	-3.35	0.000	-2.59	0.000
300°F	150 psi	-0.04	0.000	2.14	43.712	-3.30	0.000	-2.40	0.000

Conditions		Celestite (SrSO <sub>4</sub> )		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate (FeCO <sub>3</sub> )	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
81°F	15 psi	-2.51	0.000	-2.97	0.000	1.94	0.550	1.81	6.082
105°F	30 psi	-2.51	0.000	-3.00	0.000	1.81	0.548	1.96	6.112
130°F	45 psi	-2.49	0.000	-3.01	0.000	1.78	0.547	2.15	6.137
154°F	60 psi	-2.45	0.000	-3.02	0.000	1.80	0.548	2.33	6.153
178°F	75 psi	-2.39	0.000	-3.02	0.000	1.85	0.549	2.52	6.164
203°F	90 psi	-2.32	0.000	-3.01	0.000	1.94	0.551	2.69	6.171
227°F	105 psi	-2.23	0.000	-3.00	0.000	2.05	0.552	2.85	6.175
251°F	120 psi	-2.13	0.000	-2.98	0.000	2.17	0.554	3.00	6.177
276°F	135 psi	-2.02	0.000	-2.96	0.000	2.30	0.555	3.14	6.179
300°F	150 psi	-1.90	0.000	-2.93	0.000	2.45	0.556	3.26	6.180

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<sub>2</sub> is not included in the calculations.

Comments:

