



Oilfield Labs of America
 3302 Pilot Ave.
 Midland, Texas 79706
 432-789-1860

Report Date: 2/6/2019

Complete Water Analysis

| | | | |
|---------------|----------------------------|----------------|-------------|
| Customer: | True Clear Water Solutions | Account Rep: | John Ayres |
| Operator: | Crown Quest | Sample ID: | 01190131411 |
| Lease: | Raw | Sample Date: | 1/31/2019 |
| Sample Point: | 200 | Received Date: | 1/31/2019 |
| Region: | Permian | Log Out Date: | 2/6/2019 |

True Clear Water Solutions, Crown Quest, Raw,200

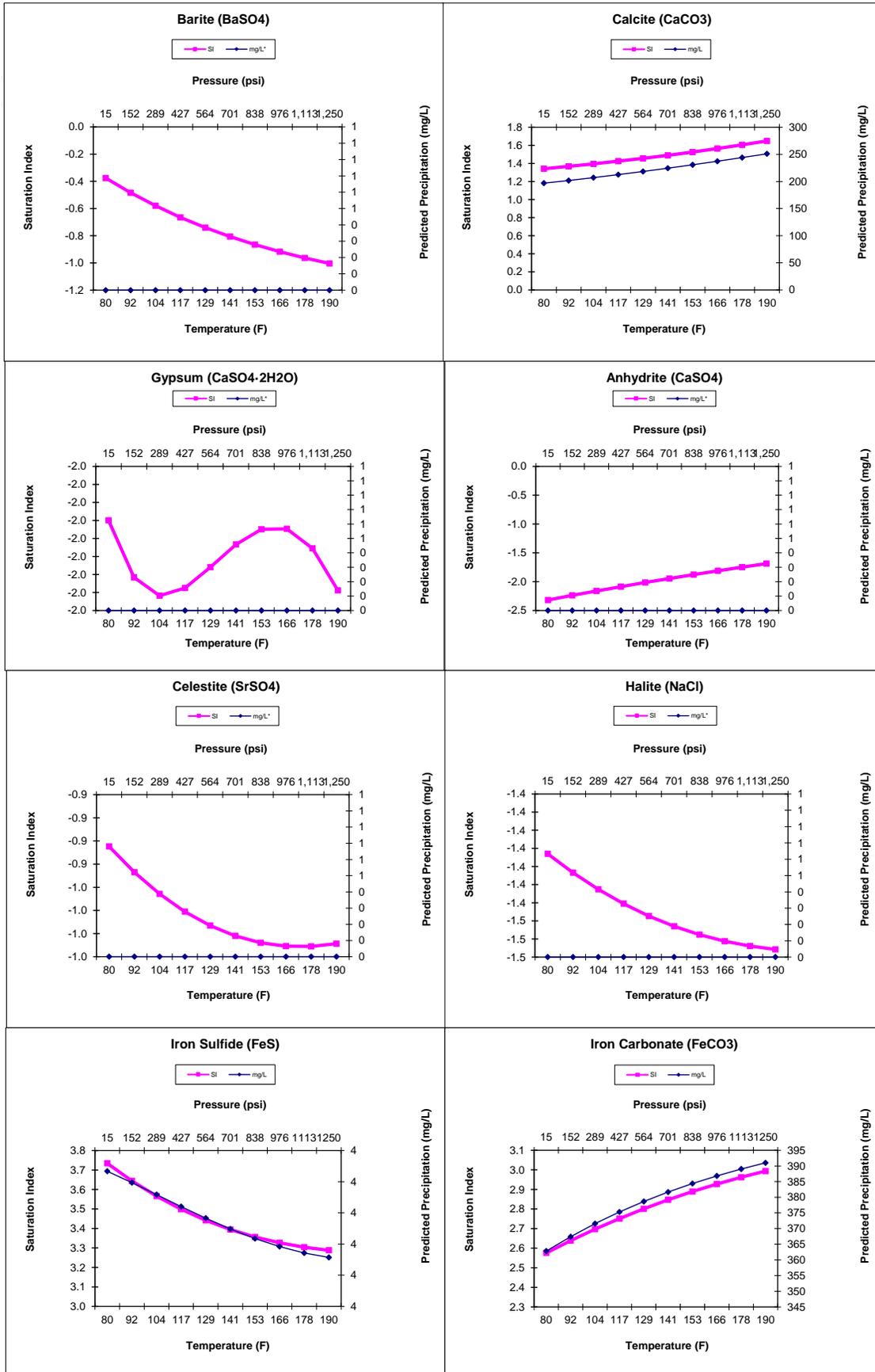
| Field Data | | Analysis of Sample | | | | | | | | | | | |
|---|--------|---|-------|--------|--------------------------------|-------------------|--------|----------|--|------|--|-------|--|
| | | Anions: | | mg/L | | meq/L | | Cations: | | mg/L | | meq/L | |
| Initial Temperature (°F): | 190 | Chloride (Cl ⁻): | 73300 | 2067.7 | Sodium (Na ⁺): | 33430 | 1454.8 | | | | | | |
| Final Temperature (°F): | 80 | Sulfate (SO ₄ ²⁻): | 30.0 | 0.6 | Potassium (K ⁺): | 400 | 10.2 | | | | | | |
| Initial Pressure (psi): | 1250 | Bicarbonate (HCO ₃ ⁻): | 449 | 7.4 | Magnesium (Mg ²⁺): | 502 | 41.3 | | | | | | |
| Final Pressure (psi): | 15 | Carbonate (CO ₃ ²⁻): | ND | | Calcium (Ca ²⁺): | 2891 | 144.3 | | | | | | |
| Dissolved Gases | | Hydroxide (OH ⁻): | ND | | Strontium (Sr ²⁺): | 620 | 14.1 | | | | | | |
| Dissolved CO ₂ (ppm): | 243 | Phosphate (PO ₄ ³⁻): | 15.6 | 0.5 | Barium (Ba ²⁺): | 3.7 | 0.1 | | | | | | |
| Dissolved H ₂ S (ppm): | 1.5 | Borate (H ₃ BO ₃): | 232 | 3.7 | Iron (Fe, Total): | 1083 | 38.8 | | | | | | |
| Sample Parameters | | Silica (SiO ₂): | 39.7 | 0.7 | Manganese (Mn ²⁺): | 1.8 | 0.1 | | | | | | |
| pH: | 7.0 | | | | Lead (Pb ²⁺): | 0.1 | 0.0 | | | | | | |
| Calculated TDS (mg/L): | 113159 | | | | Zinc (Zn ²⁺): | 2.7 | 0.1 | | | | | | |
| Calculated Density (g/cm ³): | 1.0702 | | | | Lithium (Li ⁺): | 18.2 | 2.6 | | | | | | |
| Total Hardness (mg/L CaCO ₃): | 9999 | | | | Aluminum (Al ³⁺): | 2.8 | 0.3 | | | | | | |
| Total Alkalinity (mg/L CaCO ₃): | 368 | | | | | | | | | | | | |
| | | Anion EPM Total: | 2081 | | Cation EPM Total: | 1707 | | | | | | | |
| N/A - Not Analyzed | | % RPD of Cations/Anions: | | 19.7% | | ND = Not Detected | | | | | | | |

| Conditions | | Barite (BaSO ₄) | | Calcite (CaCO ₃) | | Gypsum (CaSO ₄ ·2H ₂ O) | | Anhydrite (CaSO ₄) | |
|------------|----------|-----------------------------|-----------|------------------------------|-----------|---|-----------|--------------------------------|-----------|
| Temp | Press. | Index | Amt (ptb) | Index | Amt (ptb) | Index | Amt (ptb) | Index | Amt (ptb) |
| 80°F | 15 psi | -0.38 | 0.000 | 1.34 | 68.930 | -2.01 | 0.000 | -2.32 | 0.000 |
| 92°F | 152 psi | -0.48 | 0.000 | 1.37 | 70.659 | -2.02 | 0.000 | -2.24 | 0.000 |
| 104°F | 289 psi | -0.58 | 0.000 | 1.40 | 72.498 | -2.02 | 0.000 | -2.16 | 0.000 |
| 117°F | 427 psi | -0.66 | 0.000 | 1.42 | 74.422 | -2.02 | 0.000 | -2.09 | 0.000 |
| 129°F | 564 psi | -0.74 | 0.000 | 1.46 | 76.445 | -2.02 | 0.000 | -2.01 | 0.000 |
| 141°F | 701 psi | -0.81 | 0.000 | 1.49 | 78.568 | -2.01 | 0.000 | -1.95 | 0.000 |
| 153°F | 838 psi | -0.87 | 0.000 | 1.53 | 80.787 | -2.01 | 0.000 | -1.88 | 0.000 |
| 166°F | 976 psi | -0.92 | 0.000 | 1.56 | 83.088 | -2.01 | 0.000 | -1.81 | 0.000 |
| 178°F | 1113 psi | -0.96 | 0.000 | 1.61 | 85.455 | -2.02 | 0.000 | -1.75 | 0.000 |
| 190°F | 1250 psi | -1.00 | 0.000 | 1.65 | 87.869 | -2.02 | 0.000 | -1.69 | 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 | 15 psi | -0.92 | 0.000 | -1.41 | 0.000 | 3.73 | 1.397 | 2.58 | 126.991 |
| 92°F | 152 psi | -0.95 | 0.000 | -1.42 | 0.000 | 3.64 | 1.396 | 2.64 | 128.591 |
| 104°F | 289 psi | -0.97 | 0.000 | -1.43 | 0.000 | 3.57 | 1.396 | 2.70 | 130.055 |
| 117°F | 427 psi | -0.98 | 0.000 | -1.44 | 0.000 | 3.50 | 1.396 | 2.75 | 131.361 |
| 129°F | 564 psi | -0.99 | 0.000 | -1.45 | 0.000 | 3.44 | 1.396 | 2.80 | 132.529 |
| 141°F | 701 psi | -1.00 | 0.000 | -1.45 | 0.000 | 3.39 | 1.396 | 2.85 | 133.579 |
| 153°F | 838 psi | -1.01 | 0.000 | -1.46 | 0.000 | 3.36 | 1.396 | 2.89 | 134.524 |
| 166°F | 976 psi | -1.01 | 0.000 | -1.46 | 0.000 | 3.33 | 1.396 | 2.93 | 135.378 |
| 178°F | 1113 psi | -1.01 | 0.000 | -1.46 | 0.000 | 3.30 | 1.396 | 2.96 | 136.150 |
| 190°F | 1250 psi | -1.01 | 0.000 | -1.47 | 0.000 | 3.29 | 1.396 | 2.99 | 136.848 |

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; %CO₂ is not included in the calculations.

Comments: _____





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 Midland, Texas 79706
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Report Date: 2/6/2019

Complete Water Analysis

| | | | |
|---------------|----------------------------|----------------|-------------|
| Customer: | True Clear Water Solutions | Account Rep: | John Ayres |
| Operator: | Crown Quest | Sample ID: | 01190131412 |
| Lease: | Treated | Sample Date: | 1/31/2019 |
| Sample Point: | 180 | Received Date: | 1/31/2019 |
| Region: | Permian | Log Out Date: | 2/6/2019 |

True Clear Water Solutions, Crown Quest, Treated,180

| Field Data | | Analysis of Sample | | | | | |
|---|--------|---|-------|----------|--------------------------------|-------------------|--------|
| | | Anions: | | Cations: | | | |
| | | mg/L | meq/L | mg/L | meq/L | | |
| Initial Temperature (°F): | 190 | Chloride (Cl ⁻): | 72000 | 2031.0 | Sodium (Na ⁺): | 38791 | 1688.1 |
| Final Temperature (°F): | 80 | Sulfate (SO ₄ ²⁻): | 170 | 3.5 | Potassium (K ⁺): | 439 | 11.2 |
| Initial Pressure (psi): | 1250 | Bicarbonate (HCO ₃ ⁻): | 270 | 4.4 | Magnesium (Mg ²⁺): | 505 | 41.6 |
| Final Pressure (psi): | 15 | Carbonate (CO ₃ ²⁻): | ND | | Calcium (Ca ²⁺): | 2891 | 144.3 |
| Dissolved Gases | | Hydroxide (OH ⁻): | ND | | Strontium (Sr ²⁺): | 706 | 16.1 |
| Dissolved CO ₂ (ppm): | 217 | Phosphate (PO ₄ ³⁻): | 4.1 | 0.1 | Barium (Ba ²⁺): | 3.5 | 0.1 |
| Dissolved H ₂ S (ppm): | 1.3 | Borate (H ₃ BO ₃): | 232 | 3.8 | Iron (Fe, Total): | 21.0 | 0.8 |
| Sample Parameters | | Silica (SiO ₂): | 16.0 | 0.3 | Manganese (Mn ²⁺): | 1.2 | 0.0 |
| pH: | 7.1 | | | | Lead (Pb ²⁺): | ND | |
| Calculated TDS (mg/L): | 116069 | | | | Zinc (Zn ²⁺): | ND | |
| Calculated Density (g/cm ³): | 1.0731 | | | | Lithium (Li ⁺): | 21.8 | 3.1 |
| Total Hardness (mg/L CaCO ₃): | 10110 | | | | Aluminum (Al ³⁺): | 0.1 | 0.0 |
| Total Alkalinity (mg/L CaCO ₃): | 222 | | | | | | |
| | | Anion EPM Total: | 2043 | | Cation EPM Total: | 1905 | |
| N/A - Not Analyzed | | % RPD of Cations/Anions: | | 7.0% | | ND = Not Detected | |

| Conditions | | Barite (BaSO ₄) | | Calcite (CaCO ₃) | | Gypsum (CaSO ₄ ·2H ₂ O) | | Anhydrite (CaSO ₄) | |
|------------|----------|-----------------------------|-----------|------------------------------|-----------|---|-----------|--------------------------------|-----------|
| Temp | Press. | Index | Amt (ptb) | Index | Amt (ptb) | Index | Amt (ptb) | Index | Amt (ptb) |
| 80°F | 15 psi | 0.31 | 1.076 | 1.07 | 31.224 | -1.29 | 0.000 | -1.59 | 0.000 |
| 92°F | 152 psi | 0.21 | 0.791 | 1.10 | 32.365 | -1.30 | 0.000 | -1.51 | 0.000 |
| 104°F | 289 psi | 0.11 | 0.473 | 1.12 | 33.551 | -1.30 | 0.000 | -1.43 | 0.000 |
| 117°F | 427 psi | 0.03 | 0.129 | 1.15 | 34.795 | -1.29 | 0.000 | -1.36 | 0.000 |
| 129°F | 564 psi | -0.05 | 0.000 | 1.18 | 36.110 | -1.29 | 0.000 | -1.29 | 0.000 |
| 141°F | 701 psi | -0.11 | 0.000 | 1.21 | 37.503 | -1.29 | 0.000 | -1.22 | 0.000 |
| 153°F | 838 psi | -0.17 | 0.000 | 1.24 | 38.974 | -1.29 | 0.000 | -1.15 | 0.000 |
| 166°F | 976 psi | -0.22 | 0.000 | 1.28 | 40.520 | -1.29 | 0.000 | -1.08 | 0.000 |
| 178°F | 1113 psi | -0.27 | 0.000 | 1.31 | 42.134 | -1.29 | 0.000 | -1.02 | 0.000 |
| 190°F | 1250 psi | -0.31 | 0.000 | 1.35 | 43.805 | -1.29 | 0.000 | -0.96 | 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 | 15 psi | -0.15 | 0.000 | -1.35 | 0.000 | 1.96 | 1.165 | 0.58 | 8.029 |
| 92°F | 152 psi | -0.17 | 0.000 | -1.36 | 0.000 | 1.86 | 1.162 | 0.64 | 8.727 |
| 104°F | 289 psi | -0.19 | 0.000 | -1.37 | 0.000 | 1.78 | 1.157 | 0.70 | 9.340 |
| 117°F | 427 psi | -0.20 | 0.000 | -1.38 | 0.000 | 1.71 | 1.153 | 0.75 | 9.878 |
| 129°F | 564 psi | -0.22 | 0.000 | -1.38 | 0.000 | 1.65 | 1.149 | 0.80 | 10.348 |
| 141°F | 701 psi | -0.22 | 0.000 | -1.39 | 0.000 | 1.60 | 1.145 | 0.84 | 10.760 |
| 153°F | 838 psi | -0.23 | 0.000 | -1.39 | 0.000 | 1.55 | 1.142 | 0.88 | 11.120 |
| 166°F | 976 psi | -0.23 | 0.000 | -1.40 | 0.000 | 1.52 | 1.138 | 0.92 | 11.434 |
| 178°F | 1113 psi | -0.23 | 0.000 | -1.40 | 0.000 | 1.49 | 1.136 | 0.95 | 11.708 |
| 190°F | 1250 psi | -0.23 | 0.000 | -1.40 | 0.000 | 1.47 | 1.134 | 0.97 | 11.945 |

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; %CO₂ is not included in the calculations.

Comments: _____

