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Groundwater Quality Evaluation: SWN Dawson Creek, Gnat Hill, and Trout Creek Wells

Routt County, Colorado

Prepared for:

SWN Production Company, LLC
10000 Energy Drive
Spring, Texas 77389

Prepared by:

Western Water & Land, Inc.
743 Horizon Ct. Suite 330
Grand Junction, CO 81506

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Western Water & Land, Inc.

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ACRONYMS

BTEX	Benzene, Toluene, Ethylbenzene, Xylenes (total)
CAB	Cation-Anion Balance
COGCC	Colorado Oil and Gas Conservation Commission
DRO	diesel range organics
EDD	Electronic Data Deliverables
EPA	U.S. Environmental Protection Agency
GRO	gasoline range organics
MDL	method detection limit
mg/L	milligrams per liter
OGED	oil and gas exploration and development
QC	quality control
RPD	relative percent difference
SUP	Special Use Permit
SWN	SWN Production Company, LLC
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
USGS	United States Geological Survey
WWL	Western Water & Land, Inc.

EXECUTIVE SUMMARY

SWN Production Company, LLC (SWN), an oil and gas production company, is permittee of Special Use Permits (SUPs) with Routt County, Colorado. The SUPs requires SWN to monitor groundwater quality at constructed monitoring wells or existing domestic wells or springs (collectively referred to as water sources) near a proposed oil and gas well location before and after completing the oil and gas well. Per the SUPs, groundwater baseline monitoring (before oil and gas well drilling commences) and post-baseline groundwater quality data were collected monthly until the oil and gas well was completed and quarterly thereafter for a period of at least one year. After this sampling period, the data are to be examined for detections in post-baseline constituents that were not detected during the baseline period and for constituent concentrations that exceed 25% of the baseline concentration (or fluctuation). SWN and the County are to assess and interpret these exceedances and decide on monitoring requirements going forward.

Routt County agreed to SWN retaining Western Water & Land, Inc. (WWL) to evaluate the collected water quality data and ascertain whether contamination has occurred as a result of SWN's oil and gas operations. WWL conducted a thorough evaluation of water quality data collected through June 2016 from 10 water sources associated with 3 oil and gas wells. One domestic water well and one monitoring well were associated with the Dawson Creek #1-25 oil and gas well; two monitoring wells were associated with the Gnat Hill #1-29 oil and gas well; and 5 domestic water wells and one spring water source were associated with the Trout Creek #1-30 oil and gas well. In addition, WWL examined produced water chemistry from the Dawson Creek #1-25 Well and the Gnat Hill #1-29 Well.

Twenty-seven inorganic constituents (including TDS and cation-anion balance), 5 dissolved gases, and 8 hydrocarbon parameters (2 TPH aggregate parameters and 6 extractable organic compounds – BTEX) were evaluated for the assessment. The water sources had between 1 and 6 baseline samples and between 7 and 18 post-baseline samples. Summary statistics, Mann-Kendall trend tests, and t-tests were used to enhance the evaluation.

Oil and gas exploration and development (OGED) production fluids (produced water) that can potentially contaminate water resources consist of saline or brine solutions that are associated with production of the hydrocarbons (oil and gas). Common constituents are the dissolved common ions of bicarbonate (total alkalinity), calcium, chloride, magnesium, potassium, sodium, and sulfate. The aggregate parameter of TDS for produced water is commonly very high, ranging from 10,000 to over 50,000 mg/L. These key "contaminants of concern" were the focus of this water quality evaluation. Secondary constituents such as

barite, boron, bromide, nitrate/nitrite, and silica, boron, iron and other metals were also examined. The combined occurrence of dissolved natural gases and hydrocarbons (TPH-DRO, TPH-GRO, and BTEX) is a strong indicator of OGED contamination.

In the analysis of the groundwater datasets, WWL found that some inorganic dissolved constituents from each water source exhibited detections in post-baseline constituents that were not detected during the baseline period, and that some constituents exceeded the 25% criterion. These constituents varied from sampling event to sampling event and from well to well. It was found in many cases that 1) new detections and the 25% exceedances were at or near the method detection limit (MDL) or of low concentrations, 2) detections and exceedances usually occurred sporadically with no pattern that would indicate apparent OGED contamination, and 3) some elevated concentrations randomly occur at or greater than 1.25 times the baseline maximum (fluctuation). These latter types of detections and exceedances may occur as outliers as a result of external influences. The cause of these types of detections or exceedances is not known but may be related to natural groundwater heterogeneity, well development processes during sampling, contamination in the field or lab, procedural differences, or other natural causes.

In virtually all of the water source chemistry data examined, there was no indication of contamination characteristic of OGED production fluids. Often, a few constituents of the contaminants of concern exhibited new detections or exceedances greater than 25% of the baseline maximum, but results were typically infrequent or spotty in occurrence. Our interpretations, based on the data provided, did not find convincing evidence to believe that OGED contamination has occurred at the water sources subject to this study as a result of SWN operations. One water source exhibited water chemistry signature similar to oil and gas produced water but this chemistry was also present within baseline samples. Another water source exhibited an abundance of post-baseline samples that exceeded 25% of the baseline maximum. The single baseline sample and shallow nature of the well may contribute to the number of 25% exceedances; the water chemistry was not indicative of an OGED contamination event.

On the basis of the data provided, there is no evidence indicating that OGED contamination has occurred at the water source locations during the post-baseline period as a result of SWN OGED operations. As a result, it is reasonable to consider a reduction in monitoring frequency at the established water sources with respect to the SUPs. Because the Trout Creek #1-30 Well has been plugged and abandoned, some water sources for that well could be considered for removal from the monitoring program consistent with Colorado Oil and Gas Conservation Commission (COGCC) Rule 609 regulations. In addition,

constituents that have consistently not been detected could be considered for removal from the analytical suite.

1.0 INTRODUCTION

SWN Production Company, LLC (SWN) retained Western Water & Land, Inc. (WWL) to conduct a water quality assessment of groundwater samples collected from water sources associated with three producing oil and gas wells located in Routt County, Colorado. SWN is required to monitor groundwater in the vicinity of these wells under Special Use Permits (SUPs) required by Routt County (Figures 1-3).

The goal of this report is to conclude with reasonable certainty as to whether contamination of groundwater has occurred at dedicated water sources (water sources collectively represent constructed monitoring wells, private water wells, and springs) as a result of oil and gas exploration and development (OGED) activities at the three SWN well pads. It is SWN's goal to be released from groundwater monitoring requirements of the SUPs and to re-align water sampling requirements with Colorado Oil and Gas Conservation Commission (COGCC) Rule 609 regulations.

This report presents background information, the scope of work, technical approach, findings and interpretations, and a conclusions section. Because the SUPs suggest some discussion may be associated with this evaluation, introductory sections have been provided on the mechanisms and characteristics of OGED contamination of groundwater. This information helps less-technical readers to better understand contaminant hydrology. Furthermore, a data analysis section has been prepared to help readers follow the technical approach of the evaluation. The following sections are presented in the remainder of the report.

2.0 Background
3.0 Mechanisms of OGED Contamination
4.0 Characteristics of OGED Contamination
5.0 Data Analysis
6.0 Findings and Interpretation of Results
7.0 Conclusions

The large amount of data that required evaluation was reduced where possible and graphically presented where useful. Ultimately, a methodical and repetitive approach was used to describe the basic findings and present interpretations. Constituent concentrations were examined individually for each dataset. The overall chemical signature was considered when evaluating the potential for OGED contamination using several interpretive criteria.

The technical deductions indicated in this report are based on the data provided. WWL's interpretations did not find reason to believe that OGED contamination has occurred at the water sources subject to this

study as a result of SWN operations. WWL does not recommend an increase in well sampling frequency under the existing SUPs at this time.

2.0 BACKGROUND

2.1 SUP Requirements

The County SUPs require key conditions be adhered to by SWN. These key conditions regarding water source sampling are summarized as follows.

1. Existing water sources within one-half mile of the proposed oil and gas well are to be incorporated into the water quality monitoring program with specific exceptions for each SUP. At the Gnat Hill #1-29 Well site, two dedicated monitoring wells are to be constructed to monitor groundwater quality during baseline and post-baseline (initiated upon commencement of drilling) within 300 feet downgradient of the proposed oil and gas well pad (well pad). One well will be constructed in the shallow unconfined aquifer, and the other well will be constructed within a deeper, fractured zone or sand lens that is clearly separated from the shallow water table aquifer.

2. The water sources will be sampled during a baseline period that occurs before drilling of the oil and gas well. Sampling will continue monthly until conclusion of well completion activities.

3. Post-baseline or post-drill sampling at the water sources will continue quarterly for one year after the baseline period ceases.

4. If a previously undetected constituent is detected or if the fluctuation of inorganics varies from the baseline sample (or baseline fluctuation if more than one baseline sample is obtained) by more than 25%, SWN and Routt County will confer in good faith and discuss the issue and collaborate, with each party's hydrologic expert if necessary, to determine an appropriate feasible sampling frequency and term going forward.

   If no such "trigger point" arises after one year, the sampling frequency may be reduced to an annual basis.

5. Water sampling may terminate, at the option of SWN, after well plugging and abandonment of the oil and gas well, or 20 years after well development, whichever is longer.

2.2 Scope of Work

SWN provided the following scope of work to be conducted by WWL for this project.

Task 1 – Review and Evaluation of Existing Data

The contractor will review and evaluate data where detections of previously undetected constituents have occurred or where fluctuations of greater than (>) 25% from baseline have occurred from water sources associated with three SWN production wells. SWN will provide Electronic Data Deliverables (EDDs), Sampling and Analysis Plans (Shell and SWN), available Data Review Sheets, available field data sheets,

well construction information (where known), and charts and spreadsheets that compare baseline and post-completion data.

Task 2 – Memo Report
The contractor will provide a memo report summarizing findings and conclusions regarding whether observed detections / fluctuations are attributable to impacts from oil and gas activities.

As indicated in the Scope of Work described above, the evaluation of existing data focuses on analytical data for post-baseline period that are >25% of the baseline period concentrations. This is an appropriate approach to identifying data to be evaluated because analytical results in the post-baseline period that are less than (<) 25% are not relevant to an investigation of potential contamination of groundwater from OGED operations.

WWL conducted a thorough analysis of the analytical data to assess the potential for OGED contamination using the maximum concentration of each constituent for the baseline period for the >25% calculation. In addition, mean baseline concentrations were used to assess a >25% criterion. This was done to provide additional information for data interpretation. The use of mean concentrations is valid given that most analytical chemistry data are normally distributed about a mean. WWL used the qualification of equal to or >25% of the baseline mean to simplify calculations. This added a small degree of conservatism to the water quality assessment. Although the two 25% criteria were key in identifying data to be evaluated per the SUPs, all results were evaluated in the baseline and post-baseline periods for overall magnitude and potential trends.

2.3 Oil and Gas Well Drilling Information

All three oil and gas wells, Dawson Creek #1-25, Gnat Hill #1-29, and Trout Creek #1-30, were drilled by SWPEI (Shell). It is SWN's understanding that the wells were drilled using closed loop methods – no reserve pits were used. The wells were acquired by SWN Production Company LLC on May 1, 2014. The Routt County SUPs were transferred to SWN at that time. Currently, both the Dawson Creek #1-25, and Gnat Hill #1-29 Wells are producing oil from the Niobrara unit of the Mancos Shale. Produced natural gas is flared because no gas transmission pipeline exists in the area. Produced water at the gas well sites is temporarily stored in separator tanks on each pad and then transferred to wastewater trucks that transport the water to an injection well facility. The Trout Creek #1-30 Well was plugged and abandoned by SWN on August 20, 2015. There are no records of spills or releases at any of the three oil and gas well sites on the COGCC database.

3.0 MECHANISIMS OF OGED CONTAMINATION

Contamination of water resources from OGED operations has been documented and studied throughout the United States. The U.S. Geological Survey has conducted a significant amount research on this topic (e.g., USGS, 2014: http://toxics.usgs.gov/sites/produced_water), and many other accounts have been documented by regulatory agencies. Historically, contamination of shallow aquifers may occur by surface infiltration from leaking pits, tanks, pipelines, spills during drilling or transport vehicles accidents, or from subsurface releases such as leakage from a failed well. Migration from a failed well may be related to well casing or cementing defect or failure in production or injection wells. Subsurface leakage of produced hydrocarbons and produced water is a main concern at OGED sites as such releases can go undetected and potentially result in groundwater contamination. Casing failure, either as a result of defects or corrosion, is not well documented and is considered to occur rarely, whereas, failure of casing cementing jobs has been known to occur on occasion and result in damage to the environment (e.g. Divide Creek, Colorado in 2004). Existing regulations and diligent drilling practices have helped to minimize the occurrence of subsurface excursions.

4.0 CHARACTERISTICS OF OGED CONTAMINATION

4.1 OGED Contaminants

The study of groundwater contaminated by produced water has been reported by numerous authors. Thamke and Smith (2014) reported that shallow groundwater contaminated by brine from the East Poplar oil field in northeastern Montana was characterized by the relative amount of sodium and chloride in the groundwater. Storage tank facilities, oil wells, brine injection wells, pipelines, and pits were identified as likely sources of the contamination. Herkelrath and others (2007) studied a plume of saline groundwater that resulted from leakage at a tank battery at the Osage-Skiatook Petroleum Environmental Research Project site in Oklahoma. Whittemore (2007) reported on the contamination of different parts of the High Plains aquifer in Kansas by oil brine that infiltrated from surface storage areas. Whittemore used chloride and bromide end-member mixing plots to differentiate and quantify contaminant sources.

Contamination associated with OGED activities is primarily due to the excursion of well drilling and production fluids including the less hazardous substances of cement and bentonite muds, surfactants, and the more hazardous substances such as produced hydrocarbons and produced water. Produced water is formation water that is recovered during extraction of the oil and gas. Produced water is typically very saline water or brine (> 35,000 milligrams per liter [mg/L] total dissolved solids). This is because deeper groundwater (often considered nontributary with regard to its connection to a natural stream) is not

readily replenished through recharge processes more common to shallow aquifers. Deep formations may contain connate water – water that was present during sedimentation and lithification. Waters with this prolonged residence time become heavily mineralized through dissolution of minerals present in the formations.

SWN provided chemical analysis of produced water from both the Dawson Creek #1-25 and Gnat Hill #1-29 Wells. These data are shown in Figure 4. In addition, the USGS has published produced water chemistry for other oil and gas wells completed in the Niobrara unit (unit of Mancos Shale). TDS concentrations range from 9,810 to 36,226 mg/L in the USGS-cited wells and were 40,613 and 139,153 mg/L in the produced water from the Dawson Creek #1-25 and Gnat Hill #1-29 Wells, respectively. Chloride and sodium make up large proportions of the dissolved solutes in these waters. In the USGS-cited wells, chloride ranges from 5,300 to 23,000 mg/L and sodium ranges from 3,757 to 13,450 mg/L. In the Dawson Creek #1-25 and Gnat Hill #1-29 Wells, the reported chloride concentrations were 23,388 and 138,663 mg/L, respectively, and the reported sodium concentrations were 13,675 and 90,600 mg/L, respectively. Figure 4 shows the common constituent concentrations for produced water samples collected from the Dawson Creek #1-25 and Gnat Hill #1-29 Wells.

Depending on the geologic material and other hydrogeologic conditions, natural groundwater in relatively shallow aquifers is comparatively of good quality, commonly having a TDS concentration of a few hundred mg/L, and often less than EPA's secondary drinking water standard of 500 mg/L. Contamination of shallow natural groundwater by OGED production fluids is characterized by the presence of elevated concentrations of chloride, sodium, and other common ions. Elevated concentrations of trace metals are also possible. On occasion, certain produced waters are deficient of certain elements or compounds, such as sulfate and nitrate. Trace metals may not typically be a contaminant of concern associated with oil and gas produced waters, but can serve as environmental tracers in contaminant investigations.

It is important to note that all groundwater will exhibit a unique geochemical signature that is a result of its meteorological and hydrogeologic setting.

4.2 Groundwater Contamination Behavior

As previously mentioned, the release of OGED production fluids to groundwater is implied and usually confirmed when the constituents common to the water source are observed to be significantly greater than normal, or new constituents not common to the water source are present. In cases of water contamination by OGED activities, for water sources being monitored over time, this contamination is usually identified

by the gradual or abrupt increase in constituent concentrations common to the oil and gas production fluids. It is almost always the case that contamination is indicated as a result of multiple constituents, not a single one. For example, highly saline OGED production fluids released to groundwater system commonly show elevated concentrations of the common ions of chloride, calcium, magnesium, sodium, and potassium; the overall TDS also increases. Less common ions and trace ions can also increase. The occurrence of hydrocarbon compounds, including dissolved gases, are obviously important indicators of contamination from OGED activity, but hydrocarbon compounds may not always be present in the same space and time as inorganic contaminants because their chemical properties impact retardation and degradation processes differently.

The spatial and temporal distribution of elevated constituent concentrations can define the "plume" or nature and extent of contamination in a groundwater system. In most heterogeneous aquifers that are not dominated by fracture flow, a contaminant released to the aquifer will disperse in time and space forming a contaminant plume. This is called hydrodynamic dispersion and is caused by molecular diffusion and mechanical dispersion which is related to heterogeneity in the aquifer materials. For a pulse release (a release where the source occurs for a fixed amount of time), at a given observation point (monitoring well) located downgradient of the release point, a dissolved contaminant migrating with the natural groundwater may show a gradual increase in contaminants at first (breakthrough) and culminate at a peak concentration and then decrease in the tail of the plume. In the case of a constant contaminant source, contaminant concentrations may rise and remain at a "steady state" concentration, depending on a number of physiochemical conditions.

Fracture-dominated systems may alter the concentration-time profile at a given monitoring point, possibly compressing the profile or resulting in little to no detection of a contaminant plume.

The chemical reactions of dissolution and precipitation that occur in natural waters are dependent on several key parameters including pH, temperature, oxidation-reduction potential, ionic strength, compound solubility, and overall thermodynamics. With this in mind, it is important to realize that while a new source of dissolved solutes may mix with natural waters of "ambient" concentration, the mixed concentration may not always reflect an overall increase in the dissolved analyte of interest. Precipitation, adsorption, or cation exchange reactions may occur that actually decrease a solute's dissolved concentration in water. The analysis conducted by WWL did not consider these physical interactions and chemical reactions. The resultant concentrations of solutes in the mixing of two or more surface water sources are dependent on the volumes of each water type and the concentrations of solutes in each source.

This is also true for groundwater systems, but is complicated by reactions and interactions with the surrounding geologic media.

4.3 Variability in Natural Water Chemistry

The chemistry of natural water has been studied extensively (e.g., Hem, 1984; Drever, 1982; Stumm, Werner and Morgan, 1970). The concentrations of dissolved constituents in groundwater are controlled by a number of physical and chemical conditions. Groundwater chemistry is controlled predominately by the mineralogic composition of geologic formations that make up the aquifer of interest. Some groundwater chemistry may be the result of deep upwelling of brines or circulating geothermal waters that manifest on the surface as springs.

It is also important to realize that groundwater systems are dynamic and that the chemical concentrations of dissolved constituents are dependent on many variables. Because well sampling for the water sources in the evaluation occurs on a quarterly basis (every 3 months), it is unlikely that stable or constant conditions exist from sample to sample. For example, seasonal effects of groundwater recharge rates can have a significant impact on water chemistry. Recharge and other natural phenomenon contribute to natural variability in groundwater chemistry, both spatially and temporally.

Variation in the chemical signature of natural groundwater systems is normal due to the heterogeneity of the geologic media and the multitude of sinuous pathways to a specific measuring point. The variation of concentrations of specific ions or chemical parameters is also affected by changes to the physical system such as the dissolution of a finite volume of specific mineral sources, seasonal and climatic fluctuations impacts on recharge, and shifts in groundwater flow paths due to dissolution and precipitation of mineral phases, or well development.

Physiochemical fluctuations are also responsible for natural inconsistencies in groundwater chemistry. These include changes in pH that may be due to the natural progression of plant community development, e.g. from deciduous to conifer forests; or a change in the oxidation-reduction conditions as groundwater migrates from deeper, oxygen-deficient portions of the aquifer to shallow oxygen-rich zones. Spatially, groundwater will commonly change in composition along its flow path, most often becoming more saline in the downgradient direction because of the extended residence time (time exposed to mineral assemblages). In shallow colluvial aquifers, the most common influence to chemistry fluctuations is due to seasonal effects of recharge where constituent concentrations are elevated in times of low recharge or drought and reduced by dilution in wet periods during snow melt or high precipitation periods. Shallow

aquifers are also influenced by plant root uptake and decomposition, interaction with streams, and the infiltration of stormwater runoff and atmospheric fallout of various elements and compounds.

Groundwater composition is measured by chemical analysis and we rely on laboratory analysis to enable us to distinguish different groundwater types. Inherent laboratory variability or error is a significant factor in evaluating potential different chemical signatures. This variability may be due to noise in a given analytical instrument, analyst procedures, laboratory contamination, or inconsistent use of the same instrument.

It is important to recognize the analytical error in the measurement of a dissolved solute or constituent. Under "constant" conditions, multiple measurements of the concentration of an analyte will have varied results due to noise in the methods and procedures used to collect and analyze the samples. After many measurements, it is generally expected that the results will be normally distributed about a mean. The more measurements taken, the better the defined mean, standard deviation, and overall distribution of results. The variability in results reflects the analytical precision of a given method. A baseline that consists of only one sample carries more uncertainty as to its representativeness of "average" baseline conditions compared to a baseline of many samples. Therefore, assigning an arbitrary exceedance criterion of 25% may have a different impact for wells that have one baseline sample compared to wells that have five or more baseline samples.

Variability in laboratory results is evident in the datasets provided by SWN. The variability is also evident in field and lab duplicate results. Laboratories establish a relative percent difference (RPD) criterion of 20%, which is calculated on duplicate samples. Generally, an RPD of less than 20% means the samples are not considered statistically different. Often, the actual calculated RPDs for metals for a given original and duplicate sample are in the 1 to 5% range. However, a calculated RPD of 19% for a metal species would still be considered acceptable, and the two samples would be considered statistically the same. The range in variability in laboratory results is important to consider when evaluating sample results for samples collected from the same water source at the same time or even over time. The "more than 25%" change, as stated in the SUPs, in the concentration of an inorganic constituent in samples collected at a specific water source is a reasonable criterion for evaluation of potential contaminant influences, but it should be realized that variation in metal composition of as much as 20% is considered an acceptable difference in laboratory analysis procedures.

Variability is also demonstrated in the change in laboratories from ACZ Laboratory to ALS Laboratory in the June 2016 sampling event. Field replicate samples were sent to an alternate lab, Accutest Laboratory. The MDLs differed in all three labs used in the analytical program and, in some labs, MDLs change frequently depending on instrument performance. The significance of variability in the different results between labs, either in duplicate samples or in comparing trends in the ACZ Laboratory analyses to results obtained by ALS Laboratory, was evident in WWL's evaluation of analytical results.

In light of the above discussion, the analytical data from a single baseline sample gives no indication of the natural range (or error) of solute concentrations at a given water source over time. There is no indication of the sample distribution or representativeness. Small sample size reduces the statistical power – the probability that a null hypothesis is shown false when the alternate hypothesis is true.

That is, if we hypothesize that the mean concentration of say sodium of one baseline sample is equal to the mean concentration of sodium in 10 post-baseline samples and, in fact, the means are not equal, what is the probability that our (null) hypothesis is shown to be false? The more we now about the mean (or maximum or minimum) sodium concentration under baseline conditions, the better the probability we have in evaluating hypotheses. While statistical tests can be performed on small sample sizes, even one sample, the confidence in these test outcomes will be low compared to tests with larger sample sizes. Therefore, to compare the 25% exceedance criteria from one baseline sample to many post-baseline samples may not give meaning to the results – these comparisons should be weighed very cautiously. The recourse is, when possible, to collect multiple baseline samples as part of a well thought out monitoring program. These programs can be augmented with real time monitoring methods if necessary.

5.0 DATA ANALYSIS

The main goal of the analysis of water quality data was to determine if inorganic constituents in a given water source exhibit significant concentration trends between the baseline period and post-baseline period. In accordance with the County SUPs:

> *If a previously undetected constituent is detected or if the fluctuation of inorganics varies from the baseline sample (or baseline fluctuation if more than one baseline sample is obtained) by more than twenty-five percent (25%), Permittee and Routt County shall meet within 30 days to discuss the issue and determine an appropriate sampling frequency going forward.*

The technical approach of the water chemistry evaluation conducted for the scope of work consisted of an initial task of data compilation and reduction followed by identification of the analytes of concern and data analysis. Each of these tasks is summarized below; findings and interpretation of results are discussed in Section 6.0.

5.1 Data Compilation and Reduction

WWL analyzed all data received from SWN (data through June 2016) and reviewed the water Sampling and Analysis Plans (SAPs). Except for recognition of existing laboratory data qualifiers, WWL did not conduct an advanced level evaluation of data quality control or quality assurance validation, e.g. Tier I or greater. For example, WWL did not examine lab QC data for suitable data qualifications based on recovery limits, holding times, or conduct a data completeness evaluation which would have evaluated analyses requested versus analyses received. Analytical results that appeared suspect are noted in the text.

WWL's analysis focused on the identification of inorganic constituents that exhibited: 1) a detection in post-baseline period after having been undetected in the baseline period; and 2) a fluctuation in the concentration from the baseline sample (or baseline fluctuation if more than one baseline sample is obtained) by more than 25%. To be clear, the focus on the 25% criterion is limited to concentrations greater than 25% of the baseline maximum concentration; results less than 25% of the baseline minimum were not addressed in the narrative.

In addition, to facilitate ease of evaluations of concentrations over time, the arithmetic average (mean) of the constituent baseline results was also compared to a 25% exceedance threshold. In the data tables, these categories were designated by colored highlights. This allowed for a rapid assessment of how a particular constituent's concentration was varying with time. One-half of the MDL was used when the constituent was not detected. Baseline data were established consistent with the COGCC policy which designates baseline as samples collected prior to the start of drilling (including setting conductor casing).

Well completion information was compiled and shown in Appendix A, Table A-0. All water quality data were compiled and organized according to water source and sampling date. Appendix A, Tables A-1 through A-12 show the compiled data; Tables A-11 and A-12 show statistical summary data.

Tables A-1 through A-10 summarize the water quality data reported for each water source. The data were color-coded based on the following characteristics:

- Red highlight: Result value more than 1.25 times the baseline maximum concentration
- Blue highlight: Result value greater than 1.25 times the baseline average concentration
- Green highlight: Result value less than 0.75 times the baseline average concentration
- Orange highlight: Result value detected during post-baseline but not detected during baseline
- Purple highlight: Cation-anion balance (CAB) is greater than 5%

Constituents that showed an apparent 25% exceedance of baseline maximum concentration but also showed an increase in the MDL (e.g. due to sample dilution) were not considered a concern in the evaluation. Statistical tests were used as supportive tools, not deterministic benchmarks.

As previously discussed, different analytical laboratories were used during the monitoring program. This resulted in different MDLs, which may have influenced statistical calculations as well as comparisons in accordance with the SUP water quality criteria. For example, arsenic may have been reported at less than 0.0005 mg/l (the MDL for that analysis) during the baseline period but later reported by another lab at a concentration of 0.0002 mg/L during the post-baseline period when the MDL for that analysis was lower.

Also, it was found that the analytical results for the last one or two sampling events in the datasets that were analyzed by ALS Laboratories (a.k.a. ALS Environmental and ALS Global) were not always consistent with the previous results that were analyzed by ACZ Laboratory. This led to some quality control questions that need to be addressed.

5.2 Analytes of Concern

As previously discussed, the study of groundwater contamination related to OGED production fluids commonly involves inorganic elements and compounds found in produced water. An evaluation of produced water sampled at the Dawson Creek #1-25 and Gnat Hill # 1-29 Wells showed elevated concentrations of the common ions bicarbonate (total alkalinity), calcium, chloride, magnesium, potassium, sodium, and sulfate, and TDS. These key “contaminants of concern” were the focus of this water quality evaluation. Secondary constituents such as barite, boron, bromide, nitrate/nitrite, and silica, boron, iron and other metals were also evaluated but were not viewed as key indicators of produced water contamination in the absence of elevated concentrations of the common ions.

An evaluation was conducted for all analytes reported in a given dataset. The analysis examined all inorganic constituents that exceeded the 25% criterion as well as dissolved gases and hydrocarbon constituents. Proportionally, trace metals are typically of less concern in OGED production fluids, but their actual concentrations can easily exceed concentrations found in shallow domestic aquifers and State groundwater standards. Therefore, trace metals were examined for exceedance of the 25% criterion. Hydrocarbons were evaluated to support assessment of potential contamination from OGED operations. The parameters and constituents that were typically not evaluated include carbonate alkalinity (total alkalinity and bicarbonate alkalinity were treated as the same), hardness, hydroxide, sum of anions, sum of cations, sodium adsorption ratio, silicon, and silicon as SiO_2. These parameters and constituents were not considered pertinent to the evaluation.

5.3 Data Analysis

Data analysis consisted of further assessing the data reflecting exceedances of the 25% criterion and performing statistical tests on complete datasets for each water source. Each constituent was analyzed individually by observing the number, magnitude, and frequency or distribution of the 25% exceedance results. The co-occurrences of other constituents exhibiting 25% exceedances were also evaluated.

The results of some statistical tests can aid or support a general conclusion related to water chemistry characteristics. Statistical tests were used to evaluate potential trends in a given constituent's results and the probability of baseline results being statistically different than the post-baseline results. WWL prepared summary statistics for each constituent for both the baseline period and post-baseline period. The summary statistics allow for a rapid assessment of data range, mean, and standard deviation for each chemical constituent. For statistical calculations, one-half the method detection limit was used for results reported as less than detection. Baseline averages were calculated as the arithmetic average.

5.3.1 Mann-Kendall Trend Analysis

The Mann-Kendall trend test was conducted for all constituents for each water source associated with the three production well datasets. The Mann-Kendall test is commonly used to evaluate trends in data values. The trend test evaluated all data from the initial baseline sample to the final post-baseline sample.

5.3.2 T-test Analysis

The Student t-test (equal variance) and Welch-Satterthwaite t-test (unequal variance) were conducted for the Dawson Creek and Gnat Hill datasets. The t-test was used to evaluate the statistical significant

difference in the two sample means of the baseline sample and post-baseline sample. Because the baseline sample populations are relatively small (5-6 samples), the results of the t-test may be of a low statistical power and therefore less reliable. The t-test was not conducted for the Trout Creek datasets because there was only one to three baseline samples for the datasets. Both one-tailed and two-tailed tests were evaluated at a 95% confidence interval. The one-tailed test was formulated to address the null hypothesis: Sample 1 (post-baseline sample) mean is less than or equal to the Sample 2 (baseline) mean, with the alternative hypothesis: Sample 1 mean is greater than the Sample 2 mean. The two-tailed null hypothesis was formulated as: Sample 1 (post-baseline sample) mean is equal to the Sample 2 (baseline) mean, with the alternative hypothesis as: Sample 1 mean is greater than or less than the Sample 2 mean. If the null hypothesis is rejected, it is assumed that the alternate hypothesis is accepted. The EPA program PRO UCL™ was used to perform the t-test calculations.

5.3.3 Assimilation of Findings

Assimilation of findings involved the compilation of individual observations, summary statistics, and the statistical test data. This was done through an examination of the concentrations of each constituent in the raw data tables, the relative magnitude and distribution of results, the occurrence of detections in post-baseline that were not detected in baseline data, the 25% exceedance designation, the results of statistical tests, and the overall water composition.

5.3.4 Interpretation Criteria

WWL's knowledge of natural water chemistry, combined with the use of statistical tools to interpret the potential for groundwater contamination resulting from OGED operations, was used to complete the data interpretation effort.

The primary goal was to evaluate whether or not natural groundwater chemistry has been altered by a release of production fluids or gases from OGED operations. When examining concentrations of a particular constituent over time from a specific well, one or more results may be elevated compared to the maximum of the baseline range of concentrations, or the mean baseline concentration. Statistical tests can help identify if such results are part of normal error or statistically significant. Statistical significance would support the hypothesis that the results are not from normal error and are the result of some other influence on the system. In this study, numerous sample constituents exhibited elevated results compared to the baseline maximum and mean. Some constituent concentrations also exhibited depressed results compared to the maximum or mean baseline concentration. While statistics may indicate that these results are significant and that the system has changed, it does not necessarily mean that the result suggests

OGED contamination. It could mean that the typical flow paths contributing water to the well have changed (e.g., the well became more developed over time), or that seasonal recharge or sampling and analysis procedures have changed. It is important to keep this in mind when examining the data interpretations presented in this report.

The following basic criteria were used to assess whether groundwater contamination from OGED operations is a plausible explanation to the observed water quality.

1. Does the existing baseline water quality exhibit significantly different characteristics than the post-baseline water quality?
2. Are the sample means between the baseline data and post-baseline data statistically the same? If not, is the post-baseline sample mean greater than the baseline sample mean?
3. Does one or more of the contaminants of concern or constituent concentrations suddenly or gradually increase over time during the post-baseline sampling period?
4. Is an observed increase in one constituent associated in time with increases in other constituents?
5. Is there a statistical increasing trend in specific constituents over time?
6. Are concentrations of constituents during post-baseline within the range of concentrations reported during baseline?
7. Are detections of hydrocarbon constituents associated with increases in inorganic constituents?
8. Have there been any reports of releases at the OGED facility?
9. Are there any other sources that could be attributed to the observed water quality change besides OGED operations?

The prevailing criteria in assessing contamination of groundwater by OGED activities is the presence of multiple constituents or contaminants of concern at elevated concentrations, namely, TDS and the inorganics of sodium, chloride, calcium, magnesium, potassium, alkalinity, and sulfate. The presence of dissolved gases and hydrocarbons can also be definitive, but may not coincide with the occurrence of inorganic constituents. Because certain reactions and interactions such as ion exchange and adsorption can reduce dissolved concentrations of certain ions, increases in concentrations can be subtle.

6.0 FINDINGS AND INTERPRETATION OF RESULTS

This section of the report summarizes the key findings and interpretation of the findings for each dataset. Each water source dataset is discussed separately.

6.1 Dawson Creek Dataset

One monitoring well and one private water well are monitored for the Dawson Creek study area (Figure 1). In addition to these two water sources, there is an additional monitoring well associated with this production well that has never been sampled due to insufficient water. The analytical data are shown in Appendix A, Tables A-1 and A-2. Piper plots are shown in Appendix B, Figures B-1 and B-2 and common ion graphs of concentration vs. time are shown in Appendix C, Figures C-1 through C-4.

6.1.1 Fralick-01 Well

The Fralick-01 Well is located approximately 3,800 feet south east of the Dawson Creek #1-25 Well. The well is completed at a depth of 700 feet within sandstone units, possibly of the Mesa Verde Group or a sandstone bed within the Lewis Shale; the depth to water is approximately 10 feet. The Fralick-01 Well had 5 baseline sample events, and 17 post-baseline sample events including one duplicate, collected on March 14, 2016. The data are shown in Appendix A, Table A-1. Examination of the Fralick-01 Well data resulted in the following key findings.

- Field notes described the Fralick-01 Well as being "inactive", "stagnant" and "does not recharge", and that little water is available for sampling. Water was sampled using a peristaltic pump or a bailer. Field notes indicated that the well was not purged prior to sampling due to the lack of recharge.
- Water type is sodium-calcium sulfate.
- CAB exceeded 5% for 10 post-baseline samples.
- Based on programmed formula, 5 constituents showed 18 detections in the post-baseline period that were not detected during the baseline period. These included fluoride (1), arsenic (10), cadmium (5), iron (1), and chromium (1).
- The baseline maximum concentration was exceeded by 25% or greater by 5 inorganic constituents a total of 10 times. These constituents included chloride (2), barium (3), cadmium (1), copper (2), and lead (2).
- Exceedance of the 25% baseline average criterion by inorganic constituents occurred 24 times by 9 constituents. These included chloride (2), arsenic (3), barium (3), cadmium (1), copper (3), iron (4), lead (4), manganese (1), and silver (3) greater than the 25% criterion.
- The Mann-Kendall trend analysis showed that 1 of the above 9 constituents exhibited an increasing trend. This constituent was lead. Alkalinity (as bicarbonate), which did not show a 25% exceedance, also exhibited an increasing trend.
- Chloride exhibited a notable increase in concentration for two consecutive sampling events (March 6, 2013 and April 3, 2013). Concentrations before and after these sample events were near the baseline average and showed a general overall decreasing trend after these events.

- The one-tailed t-test showed that the null hypothesis was not rejected for any of the inorganic constituents. Therefore, the null hypothesis was accepted that the post-baseline sample mean is less than or equal to the baseline sample mean.

- The two-tailed t-test results showed that the null hypothesis was rejected for boron, cadmium, calcium, chromium, fluoride, magnesium, nitrate/nitrite, phosphorus, potassium, selenium, silver, sodium, strontium, and TDS, and conclude that the post-baseline sample mean is not equal to the baseline sample mean. The null hypothesis was not rejected for all other inorganic constituents.

- No dissolved gases were detected in baseline or post-baseline samples.

- The organic constituent TPH-DRO showed one detection in post-baseline that equaled baseline concentration (0.3 mg/L compared to a detection limit of 0.1 mg/L).

Interpretation

The original Fralick-01 Well log indicates the well is 700 feet deep, but SWN field notes show the well depth at 12 feet and static water level at 8.85 feet (March 2016). Information on the well screen depth and the screened geologic material was not located. Well purging is not completed as the well is slow to recharge. According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Lewis Shale Formation. The well is probably screened in fine-grained sedimentary rock of the Lewis Shale which reflects its water chemistry. According to sampling field notes, the Fralick-01 Well is not used or pumped on a regular basis.

Groundwater of the Fralick-01 Well is a sodium-calcium sulfate type. A piper plot of the Fralick-01 water (baseline and post-baseline) is shown in Appendix B, Figure B-1. A single analysis of produced water from Dawson Creek #1-25 Well is also included in the plot. The figure generally indicates that the later samples may tend toward a more bicarbonate mineralized water, but generally, the cations remain proportionally stable. The proportions of cations and anions are distinct from those of produced water. Particularly, the Fralick-01 water has greater proportions of calcium and magnesium and sulfate and comparatively low chloride levels compared to the produced water. Plots of common ion concentrations versus time are shown in Appendix C, Figures C-1 and C-2.

An interpretation of the analytical data for the Fralick-01 Well is summarized as follows:

- Water type is sodium-calcium sulfate type.

- The frequent exceedance of the CAB by 5% in 10 of the 17 post-baseline samples is a general concern for overall data quality. This may be related to how the lab calculated the CAB.

- Nine inorganic constituents exhibited post-baseline concentrations that exceeded 25% of the baseline average concentrations for a total of 24 exceedances over the post-baseline sampling period. The constituents included chloride (2), arsenic (3), barium (3), cadmium (1), copper (3), iron (4), lead (4), manganese (1), and silver (3).

- The baseline maximum concentration was exceeded by 25% or greater by 5 inorganic constituents a total of 10 times. These constituents included chloride (2), barium (3), cadmium (1), copper (2), and lead (2). These constituents are discussed below.

    - The occurrence of two consecutive samples showing elevated chloride concentrations in the early part of the post-baseline period are likely valid results caused by a temporary change in hydrochemical conditions at the well, sampling or analysis procedures, or laboratory contamination. Elevated concentrations were 88.9 and 80.7 mg/L compared to a mean of 52.2 mg/L. The temporary elevated results are not interpreted to be contamination as a result of OGED activity as no other common produced water constituents showed similar fluctuations in concentrations.

    - Barium was detected all but once in the post-baseline period. Three detections qualified as at or greater than the 25% exceedance level; none of these exceeded 0.1 mg/L. Two of the exceedances occurred in consecutive sample dates (quarters). However, the relatively low concentration and infrequent number of exceedances is not interpreted as contamination from OGED operations.

    - The metals cadmium and lead had 1 and 2 25% baseline maximum exceedances, respectively. The exceedance concentration for cadmium was just above the MDL. Lead was mostly detected in low levels throughout baseline and post-baseline. The 2 lead exceedances were above the MDL of 0.0005 mg/L; the maximum of 0.0073 mg/L was about twice the average (0.0038 mg/L). Even though lead showed a Mann-Kendall trend result of probably increasing, the infrequent and sporadic distribution of the exceedances do not indicate contamination as a result of OGED operations.

    - Copper was mostly detected in baseline and post-baseline samples with 1 sample exceeding the 25% baseline maximum criterion. The highest concentration of 1.54 mg/L occurred on December 18, 2014 and followed the next quarter with a concentration of 0.48 mg/L, compared to a mean of approximately 0.2 mg/L in baseline and post-baseline samples. One sample was associated with an iron exceedance, but no other typical produced water constituents were elevated. Statistical tests indicate no trend and that the sample means are equal. There is no indication that these elevated values are related to OGED operations.

- Arsenic was not detected in the baseline period and was not detected in 7 of 17 samples in the post-baseline period. Detections during post-baseline were either at the detection limit (0.0005 mg/L) or slightly above the detection limit (0.0007 to 0.0008 mg/L). These low detection concentrations are not interpreted to be caused by OGED operations.

- The metals iron, manganese, and silver had 1 to 4 exceedances of the 25% baseline average concentration. These exceedances were associated with the calculation of the 25% criterion using one-half the detection limit (e.g., 3 of the 4 exceedances for iron were assigned to values below the detection limit because of an increase in detection limit); or were associated with isolated and

infrequent low detections of these metals. These detections are not interpreted as OGED contamination.

- The one-tailed t-test showed that the null hypothesis was not rejected for the inorganic constituents, indicating that the post-baseline mean was less than or equal to the baseline mean.

- The two-tailed t-test results showed that the null hypothesis was rejected for boron, cadmium, calcium, chromium, fluoride, magnesium, nitrate/nitrite, phosphorus, potassium, selenium, silver, sodium, strontium, and TDS, and conclude that the post-baseline sample population mean is not equal to the baseline sample mean.

- The 25% exceedances were dispersed over time, and did not indicate a temporal pattern indicative of a well release. Most of the 25% exceedances were associated with low detected concentrations near the MDL.

- The organic constituents TPH-DRO and TPH-GRO were mostly undetected in the post-baseline period and the few detections did not exceed levels in the baseline period. The overall lack of these organic constituents indicates that OGED contamination has not occurred at the well.

There were no indications of groundwater contamination by common produced water constituents of TDS, total alkalinity, boron, calcium, chloride, iron, nitrate, sodium, and potassium. The sporadic occurrence of elevated concentrations of some metals at or greater than the 25% criterion is not indicative of OGED contamination and is interpreted as normal variability in natural water and analytical drift.

6.1.2 State-01B Well

The State-01B Well is located approximately 300 feet southeast of the Dawson Creek #1-25 Well. The State-01B Well log shows the well is 135 feet deep and screened within a sandstone unit overlain by "shale or claystone"; depth to water is approximately 128 feet. Lewis Shale is the mapped bedrock formation underlying the well sites (Tweto, 1972). The State-01B Well has 5 baseline sample events, and 18 post-baseline sample events, including 1 duplicate and 1 replicate sample collected during the post-baseline period on December 17, 2014. Examination of the State-01B Well data resulted in the following key findings. The data are shown in Appendix A, Table A-2.

- Water type is sodium chloride.

- The CAB exceeded 5% for 1 of the 18 post-baseline samples.

- Based on programmed formula, 3 constituents showed 3 detections in the post-baseline period that were not detected in the baseline period. These included cadmium (1), copper (1), and mercury (1).

- The baseline maximum concentration was exceeded by 25% or greater by 8 inorganic constituents a total of 29 times. These constituents included alkalinity (7), arsenic (3), barium (2), boron (1), cadmium (2), iron (8), selenium (1), and silica (5).

- Exceedance of the 25% baseline average criterion by inorganic constituents occurred 77 times by 14 constituents. These included alkalinity (14), bromide (2), chloride (1), nitrate/nitrite (1), arsenic (7), barium (6), boron (3), cadmium (2), iron (12), manganese (9), mercury (2), selenium (1), silica (16), and silver (1).

- The Mann-Kendall trend analysis showed that 5 of the 9 inorganic constituents that exceeded the maximum baseline concentrations by 25% or greater exhibited increasing trends. These include alkalinity, barium, boron, iron, and silica.

- The one-tailed t-test showed that the null hypothesis was rejected for the constituents alkalinity, barium, boron, bromide, chloride, and silica. The alternative hypothesis was accepted that the post-baseline sample mean is greater than the baseline sample mean.

- The two-tailed t-test results showed that the null hypothesis was rejected for alkalinity, boron, bromide, chloride, magnesium, silica, and sulfate and conclude that the post-baseline sample population mean is not equal to the baseline sample mean.

- Ethane was detected in all baseline and post-baseline samples. Methane was detected in all samples, ranging from 9.6 to 23.6 mg/L during the baseline period and 5.83 to 44.7 mg/L post-baseline. No other dissolved gases were detected for baseline and post-baseline samples. The results have been qualified with an "O", indicating "Analyte concentration is estimated due to result exceeding calibration range."

- The organics TPH-DRO and TPH-GRO were detected in baseline and post-baseline samples. The TPH-DRO concentrations ranged from 0.8 to 12.1 mg/L in the baseline period, and 0.1 to 4.5 in the post-baseline period. TPH-GRO had 4 and 13 non-detections in baseline and post-baseline periods, respectively, with the maximum concentration occurring during baseline period at 1 mg/L.

Interpretation

The State-01B Well was installed as a monitoring well to monitor groundwater quality in the vicinity of the Dawson Creek #1-25 Well Site. The State-01B Well is 135 feet in depth and static water level was measured at 128 feet during well construction. Ten feet of screen was installed in claystone (shale) and well-cemented sandstone, probably of the Lewis Shale Formation (Tweto, 1972).

Groundwater of the State-01B Well is a sodium chloride type. A piper plot of the State-01B water is shown in Figure B-2. A single analysis of produced water from the Dawson Creek #1-25 Well is also included in the plot. The figure generally indicates that over time, the samples tend toward a more chloride and sodium mineralized water. The proportions of cations, particularly sodium and potassium, and the anion chloride are approaching that of produced water, while the general lack of sulfate and

bicarbonate distinguish the State-01B groundwater. Concentration vs. time plots for the key contaminants of concern are shown in Appendix C, Figures C-3 and C-4.

An interpretation of the analytical data for the State-01B Well is summarized as follows:

- The baseline maximum concentration was exceeded by 25% by 8 inorganic constituents a total of 29 times. These constituents included alkalinity (7), arsenic (3), barium (2), boron (1), cadmium (2), iron (8), selenium (1), and silica (5).
    - Alkalinity (bicarbonate) exhibited an increasing trend in the middle of the post-baseline period, but then decreased and showed some stabilization in the last 5 samples. The t-test results indicate equal means between the baseline and post-baseline periods. This trend was not accompanied with an increasing trend in TDS or other common ions such as sodium and chloride. It is not suspected that the elevated alkalinity is related to an OGED release during the post-baseline period.
    - Arsenic had a maximum elevated concentration of 0.011 mg/L compared to a baseline average of 0.0024 mg/L and maximum of 0.005 mg/L. Arsenic had an overall decreasing trend and baseline and post-baseline averages tested as equal. The elevated concentrations are not interpreted as being related to OGED contamination.
    - Barium and boron have a combined 4 exceedances and showed increasing trends. The sample means are indicated as equal between the baseline and post-baseline datasets. The few elevated results are sporadic and do not greatly exceed the baseline mean concentrations of 0.144 and 1.932 mg/L, respectively.
    - Cadmium and selenium had a combined 3 exceedances of the 25% baseline maximum concentration. The cadmium exceedances were related to an increase in the MDL for one and a replicate sample for the other; the concentrations are near the MDL and not seen as significant. Selenium had one exceedance that was bracketed by several samples that were at least 25% less than the baseline mean. The few exceedances of cadmium and selenium are not interpreted as evidence of contamination from OGED activity.
    - Iron was only detected once during baseline sampling in the last baseline sample, then showed a moderate increasing trend ("probably increasing" based on the Mann-Kendall trend test), but also had periods of non-detections during the post-baseline period. This situation led to its high number of exceedances (8). The one-tail t-test showed the means of post-baseline mean to be equal to or less than the baseline mean; the two-tail t-test showed the means to be equal. The fluctuating elevated iron concentrations are relatively small in magnitude and not likely associated with an OGED contaminant release.
    - Silica had a mean concentration of 7.6 mg/L, and a maximum concentration of 10 mg/L in the baseline period. Most exceedance concentrations are between 10 and 12 mg/L with an average of 11.8 mg/L in the post-baseline period. The t-test results showed the post-baseline mean to be greater than the baseline mean. The maximum concentration (15.7 mg/L) occurred in the replicate sample which was analyzed by a different laboratory.
- The 25% exceedances were dispersed evenly over time, and did not indicate a temporal pattern or "breakthrough" indicative of a well release after the baseline monitoring period.

- The dissolved gases of ethane and methane were detected in all baseline and post-baseline samples. The presence of methane is notable, with baseline concentrations ranging from 9.6 to 23.6 mg/L and post-baseline concentrations from 5.8 to 44.7 mg/L. These concentrations in water wells are unusual. SWN has conducted isotopic analysis of the methane and determined it to be of biogenic origin. WWL did not examine these data.

- While chloride, bromide, barium, and boron, and silica had increasing trends (Appendix C, Figures C-3 and C-4), TDS, calcium, fluoride, magnesium, potassium, sodium, and sulfate had decreasing trends and did not have any exceedances of the 25% criterion.

The baseline and post-baseline water quality data for the State-01B Well indicates saline conditions with an average TDS concentration of 13,560 and 12,950 mg/L, respectively. The saline conditions and presence of methane were present during baseline conditions before gas well drilling took place at the Dawson Creek #1-25 Well pad.

Shale formations in general are not prolific aquifers because of low transmissivity, and often because of their marine origin, host saline groundwater where present. The thin saturated interval in the State-01B Well and likely low recharge rates may contribute to the observed high salinity. Well development, if conducted after well installation, may have been ineffective because of low recharge to the well. Well development may still be occurring during post-baseline and groundwater near the well may not have completely reached chemical "stability". This might explain some observed trends in certain parameters including TDS, chloride, and silica. Silica, in particular, showed a large number of post-baseline samples that exceeded the 25% criterion and an increasing trend. The decrease in calcium and sulfate may suggest precipitation of gypsum in the vicinity of the well. The high concentrations of sodium and chloride may be related to the geologic formation; the ratios of these elements suggest the dissolution of halite or another evaporite in this formation.

The unusual saline chemistry and the occurrence of the high concentrations of methane at the State-01B Well are unique and of interest; however, the presence of these conditions during baseline sampling complicates the assessment of contamination from OGED during drilling of the Dawson Creek #1-25 Well that is subject to the existing SUP. The presence of methane may further suggest an oil and gas influence at this location, either by natural migration or OGED activity from an earlier period of time or location. Detections of TPH-DRO as high as 12.1 and 4.5 mg/L in baseline and post-baseline periods, respectively, support this theory. However, SWN has determined through isotopic analysis that the methane is of biogenic origin. Regardless of the potential for a source of OGED influence, because of similar water quality in both the baseline and post-baseline periods, there is no evidence in the data

provided to indicate contamination from the Dawson Creek #1-25 Well pad that is subject to the Routt County SUP.

6.2 Gnat Hill Dataset

Two monitoring wells are monitored for the Gnat Hill study area (Figure 2). The analytical data are shown in Appendix A, Tables A-3 and A-4. Piper plots are shown in Appendix B, Figures B-3 and B-4 and common ion graphs of concentration vs. time are shown in Appendix C, Figures C-5 through C-8.

6.2.1 Tuttle-01A Well

The Tuttle-01A Well is located approximately 50 feet south east of the Gnat Hill #1-29 Well. The Tuttle-01A Well is completed at a depth of 29 feet within unconsolidated clay, fine and coarse-grained sand; depth to water is approximately 18 feet. The Tuttle-01A Well has 5 baseline sample events, and 16 post-baseline sample events. No duplicate samples were collected at the Tuttle-01A Well. The analytical data are shown in Appendix A, Table A-3. Examination of the Tuttle-01A Well data resulted in the following key findings.

- Water type is sodium sulfate.
- The CAB exceeded 5% for 2 of the 15 post-baseline samples.
- Based on programmed formula, 6 constituents showed detections in post-baseline period that were not detected in the baseline period. These constituents included bromide, nitrate/nitrite, chromium, iron, selenium, and methane.
- Exceedance of the 25% baseline average by inorganic constituents occurred 19 times by eight constituents. These included alkalinity (2), bromide (2), chloride (2), nitrate/nitrite (4), phosphorus (1), barium (3), iron (2), and selenium (3).
- The baseline maximum concentration was exceeded by 25% or greater by 4 inorganic constituents a total of 7 times. These constituents included bromide (1), nitrate/nitrite (3), selenium (2), and chromium (1).
- The Mann-Kendall trend analysis showed that none of inorganic constituents that exceeded the maximum baseline concentrations by 25% exhibited increasing trends. Constituents that did exhibit increasing trends were alkalinity (“probably increasing”), strontium and sulfate.
- The one-tailed t-test showed that the null hypothesis was not rejected for all inorganic constituents and the null hypothesis was accepted that the post-baseline sample mean is less than or equal to the baseline sample mean.
- The two-tailed t-test results showed that the null hypothesis was rejected for manganese and sodium and it was concluded that the post-baseline sample means are not equal to the baseline sample means. The actual calculated means for the baseline period were less and slightly greater than the post-baseline period means for manganese and sodium, respectively.

- No dissolved gases were detected for baseline and post-baseline samples.
- With the exception of DRO, no hydrocarbons were detected in the baseline and post-baseline samples. DRO was detected at concentrations near the MDL in both baseline and post-baseline samples.

Interpretation

The Tuttle-01A Well log indicates the well is 29 feet deep and screened from 55 to 25 feet below ground surface. The depth to water is approximately 18 feet. The screened geologic material was indicated to be clay and fine- to coarse-grained sandstone; the sandstone units appeared to be yielding water from 2 to 13 gallons per minute. According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Lewis Shale Formation. The well is purged prior to sampling.

Groundwater of the Tuttle-01A Well is a sodium sulfate type. A piper plot of the Tuttle-01A water is shown in Appendix B, Figure B-3. A single analysis of produced water from the Gnat Hill #1-29 Well is also included in the plot. The proportions of common cations and anions are distinctly different from that of produced water. The cations show moderately low proportions of calcium and magnesium compared to sodium and potassium, and the anions show that bicarbonate and chloride are proportionally of low concentration compared to sulfate levels. Concentration versus time plots of the key contaminants of concern are shown in Appendix C, Figures C-5 and C-6.

The sodium sulfate type water may be indicative of groundwater of the Lewis Shale. This water type was described by Brogden and others (1979) in the Mancos Shale and Lewis Shale of Southwestern Colorado. Brogden reported that the groundwater can be highly mineralized with 19 of 20 wells and springs sampled exhibiting TDS concentrations greater than 500 mg/L, ranging upwards of 7,000 mg/L. In addition, sulfate concentrations in 13 of 20 wells and springs sampled exceeded the drinking water standard of 250 mg/L (Brogden and others, 1979).

An interpretation of the analytical data for the Tuttle-01A Well is summarized as follows:

- The 6 constituents of bromide, nitrate/nitrite, chromium, iron, selenium, and methane showed detections in post-baseline period that were not detected in the baseline period. Four of these constituents also exceeded the baseline maximum concentration by 25% or more (bromide, nitrate/nitrite, selenium, and chromium). With the exception of bromide, these detections were of minimal concern because of a change in detection limit that occurred or the detections were at or just above the detection limit. In addition, the detections were sporadic over time. One selenium exceedance was associated with the change in laboratory in the last sampling event of June 28, 2016.

- The bromide maximum baseline exceedance and new detection of 36.8 mg/L for the sample collected on December 17, 2014 is suspected of being the result of field or laboratory contamination or instrument error as samples before and after that date shown no detections. No other significant constituent exceedances were observed in this sample. The same can be said of iron for the same sample date (0.78 mg/L) reported compared to results before and after that date.

- The statistical increasing trends for alkalinity, strontium and sulfate are notable, but the rate of increase appears low.

- The baseline maximum 25% exceedances were dispersed sporadically over time, and did not indicate a temporal pattern or "breakthrough" indicative of a well release after the baseline monitoring period.

- The reported TDS result of 2,780 mg/L for sample September 17, 2014 appears to be an error as the calculated TDS is 5,382 mg/L, a value similar to earlier and later reported results.

There were no indications of groundwater contamination by constituents common to produced water including TDS, boron, calcium, chloride, iron, nitrate, sodium, and potassium at the Tuttle-01A Well. The sodium trend was decreasing and the chloride trend was flat.

6.2.2 Tuttle-01B Well

The Tuttle-01B Well is located approximately 50 feet south east of the Gnat Hill #1-29 Well. The Tuttle-01B Well is 95.7 feet deep and completed in claystone (shale); depth to water is approximately 88 feet. Lewis Shale is the mapped bedrock formation underlying the well sites (Tweto 1972). The Tuttle-01B Well has 6 baseline sample events, and 17 post-baseline sample events, including one duplicate sample during the baseline period, and one replicate sample during the post-baseline period. The data are shown in Appendix A, Table A-4. Examination of the Tuttle-01B Well data resulted in the following key findings.

- Water type is sodium sulfate to sodium bicarbonate.

- The CAB exceeded 5% for 4 of the 17 post-baseline samples.

- Based on programmed formula, 6 constituents showed detections in post-baseline period that were not detected in the baseline period. These included propane (1), bromide (1), iron (2), mercury (1), chromium (1), and TPH-GRO (1). However, all of these detections were of minimal concern because of concentrations at or near the detection limit, or a change in lower detection limit occurred.

- A 25% exceedance of the baseline average by inorganic constituent occurred 40 times by 9 constituents. These included bromide (11), chloride (3), fluoride (7), nitrate/nitrite (1), phosphorus (12), arsenic (2), cadmium (1), lead (2), and selenium (1).

- The baseline maximum concentration was exceeded by 25% or more by 6 inorganic constituents a total of 9 times. These constituents included chloride (2), nitrate/nitrite (1), phosphorus (2), arsenic (1), lead (2), and selenium (1).

- Two duplicate/replicate samples were associated with Tuttle-01B; the duplicate during baseline and the replicate during post-baseline. The calculated RPDs for these sample pairs indicates that the RPDs for the baseline duplicate are relatively good with all but methane, selenium, and TPH-DRO falling outside of a 20% limit. The RPDs for the post-baseline replicate are poor with a large number of constituents falling outside of a 20% limit.

- The Mann-Kendall trend analysis showed that 1 of the 7 inorganic constituents that showed 25% exceedance of the maximum baseline concentrations exhibited an increasing trend. This constituent was phosphorus.

- The one-tailed t-test showed that the null hypothesis was rejected for phosphorus only and concluded that the post-baseline sample mean was greater than the baseline sample mean.

- The two-tailed t-test results showed that the null hypothesis was rejected for barium, phosphorus, and sodium, and concluded that the post-baseline sample mean is not equal to the baseline sample mean for these constituents.

- Methane was detected up to 10.1 mg/L in the baseline period, and up to 9 mg/L in the post-baseline period. Ethane was detected at the MDL in baseline period and 0.09 mg/L in the post-baseline period. No other dissolved gases were detected for baseline and post-baseline samples.

- Hydrocarbons were detected in the baseline and post-baseline samples. DRO was detected at concentrations near the MDL in both baseline and post-baseline samples. TPH-GRO was detected at the MDL in one post-baseline sample.

Interpretation

The Tuttle-01B Well log indicates the well is 95.7 feet deep and screened from 85.7 to 95.7 feet below ground surface. The depth to water is approximately 88 feet. The screened geologic material was indicated to be claystone (shale). According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Lewis Shale Formation. The well was purged prior to sampling, and is used for monitoring purposes only.

Groundwater of the Tuttle-01B Well is a sodium sulfate type. A piper plot of the Tuttle-01B water is shown in Appendix B, Figure B-4. A single analysis of produced water from the Gnat Hill #1-29 Well is also included in the plot. On close examination, the figure generally indicates that over time, the samples tend toward a more sulfate mineralized water. The proportions of cations, particularly sodium and potassium, are near that of produced water, while the general lack of chloride and bicarbonate compared to sulfate distinguish the Tuttle-01B water from produced water. Concentration versus time plots of the key contaminants of concern are shown in Appendix C, Figures C-7 and C-8.

Brogden and others (1979) described groundwater of the Mancos Shale and Lewis Shale in Southwestern Colorado. Brogden reported that the groundwater can be highly mineralized with 19 of 20 wells and springs sampled exhibiting TDS concentrations greater than 500 mg/L, ranging upwards of 7,000 mg/L. In addition, sulfate concentrations in 13 of 20 wells and springs sampled exceeded the drinking water standard of 250 mg/L (Brogden and others, 1979).

An interpretation of the analytical data for the Tuttle-01B Well is summarized as follows:

- The constituents that showed detections (propane, bromide, iron, mercury, chromium, and TPH-GRO) in post-baseline period that were not detected in the baseline period were of minimal concern because of concentrations at or near the detection limit, or because a change in lower detection limit occurred.

- The baseline maximum concentration was exceeded by 25% or more by 6 inorganic constituents a total of 9 times. These constituents included chloride (2), nitrate/nitrite (1), phosphorus (2), arsenic (1), lead (2), and selenium (1).

    - The 2 chloride post-baseline maximum exceedances (65.2 and 57.7 mg/L) were significantly greater than the baseline mean of 37.65 mg/L, but the statistical trend is stable. In addition, the one-tailed t-test showed the post-baseline mean to be equal to or less than the baseline mean, and the two-tailed t-test showed the baseline sample mean was equal to the post-baseline sample mean. The infrequent occurrence and relatively low chloride concentrations do not indicate an OGED contaminant release during the post-baseline period.

    - The phosphorus results indicate an increasing trend with 2 results exceeding the 25% criterion. The standard deviation of both the baseline and post-baseline samples is relatively small; the maximum concentration (0.46 mg/L) is less than double the minimum concentration (0.25 mg/L). One result was associated with a new laboratory. Phosphorus can be associated with OGED produced water, but the infrequent 25% exceedances and large amount of time separation between the results do not support contamination by OGED operations during the post-baseline period.

    - Nitrate/nitrite is mostly undetected with exception of one result on December 17, 2014 at 0.17 mg/L (the MDL is 0.02 mg/L). Similarly, selenium had one exceedance of 0.0013 mg/L compared to an MDL of 0.0002 mg/L. The arsenic and lead exceedances were associated with a higher MDL (that caused the 0.5 times MDL to be a 25% exceedance) or very low concentrations. These 25% exceedances of the maximum baseline concentration are spotty and sparse. The results do not support contamination by OGED operations during the post-baseline period.

- The actual calculated mean concentrations for barium and sodium for the baseline period are slightly greater than the post-baseline period, whereas the mean concentration for phosphorus is slightly greater for the post-baseline period (see phosphorus bullet above).

- Overall, the 25% exceedances were dispersed sporadically over time, and do not indicate a temporal pattern or "breakthrough" indicative of a well release after the baseline monitoring period.

- The frequent occurrence of methane in both the baseline and post-baseline sampling periods with no notable increase in the post-baseline period does not indicate a natural gas release has occurred as a result of recent OGED activity.

- The high RPDs observed for the post-baseline period replicate sample demonstrates how differing detection limits, and possibly analytical procedures, may affect the RPD parameter and certainty in analytical results.

- There were no indications of groundwater contamination by the common produced water constituents of TDS, total alkalinity, boron, calcium, chloride, iron, nitrate, sodium, and potassium at the Tuttle-01B Well.

6.3 Trout Creek Dataset

The Trout Creek #1-30 production well was plugged and abandoned by SWN on August 20, 2015; however, the data that was evaluated extends through June 2016. The Trout Creek datasets consist of 5 private water wells and one spring. The analytical data are shown in Appendix A, Tables A-5 through A-10. Piper plots are shown in Appendix B, Figures B-5 through B-10 and common ion graphs of concentration vs. time are shown in Appendix C, Figures C-9 through C-20.

6.3.1 Jones-01 Well

The approximate distance from the Trout Creek #1-30 Well to the Jones-01 Well is 2,300 feet. The Jones-01 Well has 1 baseline sample and 15 post-baseline sample events; no duplicate samples were collected. The data are shown in Appendix A, Table A-5. Examination of the Jones-01 Well data resulted in the following key findings.

- Water type is calcium bicarbonate-sulfate.

- The CAB exceeded 5% for 1 of the 15 post-baseline samples.

- Based on programmed formula, 5 constituents showed 21 detections in post-baseline period that were not detected in the baseline period. These included methane (5), fluoride (2), nitrate/nitrite (4), arsenic (4), and lead (6).

- The baseline maximum concentration was exceeded by 25% or more a total of 165 times by 21 inorganic constituents. These included alkalinity (9), bromide (10), chloride (12), fluoride (6), sulfate (12), nitrate/nitrite (4), phosphorus (1), TDS (12), arsenic (1), barium (10), boron (4), calcium (12), iron (7), lead (4), magnesium (10), manganese (9), potassium (7), selenium (12), silica (9), sodium (2), and strontium (12).

- The Mann-Kendall trend analysis showed that chloride, fluoride, and lead were probably increasing. These inorganic constituents also exhibited exceedances of the 25% criterion. All other constituents were stable or decreasing.

- T-tests were not performed as there was only one baseline sample.

- Methane was not detected during the baseline period and detected 5 times during post-baseline period but none exceeded 0.022 mg/L. No other dissolved gases were detected for baseline and post-baseline samples.

- No hydrocarbons were detected in the baseline and post-baseline samples.

Interpretation

The Jones-01 Well log indicates the well is 20 feet deep and screened from 10 to 20 feet below ground surface. The depth to water and screened geologic material were not noted. According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Iles Formation. The well is purged prior to sampling.

Groundwater of the Jones-01 Well is a calcium bicarbonate-sulfate type. A piper plot of the Jones-01 water is shown in Appendix B, Figure B-5. A single analysis of produced water from the Dawson Creek #1-25 Well is also included in the plot. Plots of common ion concentrations versus time are shown in Appendix C, Figures C-9 and C-10. Figure B-5 indicates the proportionally higher amounts of calcium, low proportions of chloride and sodium, and similar proportions of sulfate and bicarbonate. In addition, the two latest samples collected tend toward higher proportions of chloride, sodium, potassium, and lower proportions of sulfate; this is related to the overall decreasing trend in some common constituent concentrations beginning in June 2015 (see Appendix C, Figure C-9). The proportions of cations and anions in the produced water are distinctly different from the Jones-01 Well.

A notable fluctuation in concentrations in several constituents is evident in Figures C-9 and C-10. The figures show that concentrations are stable to increasing in early post-baseline time, show distinct oscillating concentrations in middle of the post-baseline time, and decreasing concentrations in late post-baseline time. The maximum concentrations appear to occur in early to late summer, the minimum in the winter season. The last two sampling results may be affected by a change in laboratory; there is a prevalent decrease in the 25% exceedances for these results.

As described above, there are a large number of results that meet the baseline maximum 25% exceedance criterion for the Jones-01 Well. This is demonstrated by examining Appendix A, Table A-5, where the

highlighted cells are a substantial proportion of the results shown. All of these exceedances were evaluated. However, addressing all of the constituents that show 25% exceedances will not be discussed here and only those constituents most indicative to potential contamination from OGED operations are discussed below.

An interpretation of the analytical data for the Jones-01 Well is summarized as follows:

- The 5 constituents that showed detections in post-baseline period that were not detected in the baseline period (methane, fluoride, nitrate/nitrite, arsenic, and lead) do not show elevated concentrations of concern. The trace metals arsenic and lead had detections at the detection limits. All of these detections were of minimal concern because of concentrations at or near the detection limit, or a change in lower detection limit occurred.

- The 25% exceedances of the baseline maximum are prevalent throughout the dataset from the initial post-baseline sample to the last, and are associated with many constituents, even those not typically associated with OGED production fluids.

- Constituents most common to OGED production fluids such as chloride and sodium are not proportionally dominant solutes. Chloride concentrations range from 2.5 to 21.3 mg/L with 12 25% exceedances of the baseline maximum. Sodium, on the other hand, ranged from 13 to 42 mg/L with only 2 25% exceedances of baseline maximum.

- The slight increasing trends in chloride, fluoride and lead concentrations are within normal groundwater concentrations ranges; fluoride was not detected until a laboratory change for the last two samples.

- The low detections of methane with no notable increase in the post-baseline period and no detections of TPH-DRO and TPH-GRO in both the baseline and post-baseline sampling periods do not indicate a release of hydrocarbons has occurred as a result of recent OGED activity.

The analytical data for the Jones-01 Well show that the post-baseline period exhibits a significant number of constituent results that exceed the baseline maximum concentration 25% criterion. The lack of higher concentrations of chloride and sodium and no detections of hydrocarbons do not support the occurrence of OGED contamination at the Jones-01 Well. There are some possible factors that may explain the broad existence of the 25% exceedances. The first is that only one baseline sample was obtained and its representativeness to baseline is unknown. It is possible that the baseline results represent concentrations on the low end of the baseline normal distribution. Second, the Jones-01 Well is shallow (20 feet) compared to other wells in the Trout Creek dataset; the other wells range from 100 to 340 feet in depth. The shallow depth may subject the Jones-01 Well to influences of areal recharge and evaporation which can affect water chemistry. Third, field notes indicate that sampling occurs from a hose bib on the side of the Jones residence because access to the actual wellhead is not possible. Proper sampling protocol would

require that water treatment not be allowed to influence the well water sampled. If water treatment is occurring without the samplers' knowledge, such treatment would likely affect water chemistry. This may include storage of pumped groundwater in a cistern. The fourth and final issue is owner use and maintenance of the well. Knowledge of any well owner use and maintenance may reveal potential influences to the groundwater chemistry.

It is reasonable to assume the shallow aquifer depth is related to fluctuating water composition with time. The Jones-01 Well is located on an alluvial plain near Trout Creek. The presence of an alluvial aquifer near an active stream could explain the fluctuations observed in water chemistry of the Jones-01 Well.

Additional data could be acquired to better understand the well's chemistry, but such work is not seen as the responsibility of SWN, as no indication of OGED contamination has been observed at the Jones-01 Well. The well could be accessed and an automated pressure transducer and conductance sonde be installed. Information on climatic data and water level elevations would allow the evaluation of a relationship between the occurrence of seasonal recharge (stream-aquifer interface, precipitation and snow pack) and solute concentrations in underlying groundwater.

The analytical data show a significant period of elevated concentrations of common constituents during the post-baseline period compared to the single baseline sample data. It is not known if the observed water chemistry is a result of OGED operations, but the lack of higher concentrations of chloride and sodium and hydrocarbons do not support a hypothesis of OGED contamination. However, the unusual fluctuation in post-baseline chemistry may deserve further investigation.

6.3.2 Myhre-01 Well

The approximate distance from the Trout Creek #1-30 Well to the Myhre-01 Well is 1,000 feet. The Myhre-01 Well has 1 baseline sample event, and 13 post-baseline sample events, including one duplicate sample during the post-baseline period. The data are shown in Appendix A, Table A-6. Examination of the Myhre-01 Well data resulted in the following key findings.

- Water type is sodium bicarbonate.
- The CAB exceeded 5% for 1 of the 13 post-baseline samples.
- Based on programmed formula, 7 constituents showed detections in post-baseline period that were not detected in the baseline period. These include methane (1), nitrate/nitrite (7), phosphorus (3), cadmium (1), copper (1), lead (1), and TPH-DRO (1).

- The baseline maximum concentration was exceeded by 25% or more a total of 29 times by 12 inorganic constituents. These included bromide (5), chloride (1), fluoride (2), nitrate/nitrite (6), phosphorus (3), cadmium (1), copper (1), iron (1), lead (3), manganese (3), potassium (1), and selenium (2).

- One duplicate sample was associated with Myhre-01 during post-baseline. The calculated RPD for these sample pairs indicates that the RPDs for the post-baseline duplicate are relatively good with all but nitrate/nitrite falling outside of a 20% limit.

- The Mann-Kendall trend analysis showed that potassium was the only 1 of the 12 inorganic constituents that showed exceedance of the maximum baseline concentrations by 25% or more that also exhibited an increasing trend.

- T-tests were not performed as there was only one baseline sample.

- Methane was detected once at 0.0068 mg/L in post-baseline sampling. No other dissolved gases were detected for baseline and post-baseline samples.

- No hydrocarbons, with the exception of TPH-DRO, were detected in the baseline and post-baseline samples. TPH-DRO was detected once at the MDL in the post-baseline sampling period.

Interpretation

The Myhre-01 Well log indicates the well is 225 feet deep and screened from 135 to 205 feet below ground surface. The depth to water during well completion was 125 feet. The screened geologic material was indicated to be shale and sandstone; the sandstone units appeared to be yielding water from 2 to 13 gallons per minute. According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Iles Formation. The well was purged prior to sampling.

Groundwater of the Myhre-01 Well is a sodium bicarbonate type. A piper plot of the Myhre-01 water is shown in Appendix B, Figure B-6 and a plot of common ion concentrations vs. time is shown in Appendix C, Figures C-11 and C-12. Figure B-6 generally indicates that water quality over time at the Myhre-01 Well does not greatly vary in composition, with exception of the last sample date of 6/30/16, where chloride and sulfate dramatically decrease in concentration. This decrease in concentration is associated with the lab change; it is suspected that one or more quality control issues may be related to the change in concentrations. A single analysis of produced water from the Dawson Creek #1-25 Well is also included in the plot. The Myhre-01 Well water chemistry is easily distinguished from the produced water chemistry.

Figures C-11 and C-12 indicate that the common ion concentrations over time have remained somewhat stable since sampling began. There are no indications that water chemistry fluctuates seasonally, which is

reasonable since the aquifer(s) penetrated were at depths greater than 100 feet and possibly confined by low permeability shale units.

An interpretation of the analytical data for the Myhre-01 Well is summarized as follows:

- The 5 inorganic constituents that showed detections in post-baseline period that were not detected in the baseline period include nitrate/nitrite (7), phosphorus (3), cadmium (1), copper (1), and lead (1). The detections of cadmium, copper and lead all occurred in the same sample and all other samples dates showed no detections. All of the detections for the 5 constituents were of minimal concern because of concentrations at or near the detection limit, or a change to a lower detection limit occurred, (with the exception of copper which was detected at 3.11 mg/L with a detection limit 0.01 mg/L).

- The inorganic constituents that showed exceedance by 25% of the baseline maximum occurred at the MDL or at concentrations slightly above the MDL. Chloride had one exceedance result of 5.21 mg/L compared to the baseline maximum of 3.63 mg/L. The levels of concentrations and distribution in time are not indicative of contamination related to an OGED release.

- The results of the RPD calculation showed low values mostly within quality control limits. The results add some certainty to analytical precision.

- The increasing trend of potassium, while subtle, is not accompanied with increasing trends in other common ions typically associated with OGED production fluids. Chloride shows a decreasing trend and sodium is stable.

- The higher detected concentrations for the organic constituents of methane (1) and DRO (1) during post-baseline were at a very low concentration for methane (0.0068 mg/L) and at the MDL for DRO. The MDL for DRO changed, causing exceedances below the previous detection limit. These detections of not of concern.

There were no indications of groundwater contamination by the common produced water constituents of TDS, total alkalinity, boron, calcium, chloride, iron, nitrate, sodium, and potassium at the Myhre-01 Well.

6.3.3 Myhre-02 Spring

The approximate distance from the Trout Creek #1-30 Well to the Myhre-02 Spring is 1,000 feet. The Myhre-02 Spring has 1 baseline sample event, and 7 post-baseline sample events. No duplicates or replicates were collected during the baseline or post-baseline period. No duplicate sample was associated with Myhre-02 during post-baseline. The data are shown in Appendix A, Table A-7. Examination of the Myhre-02 Spring data resulted in the following key findings.

- The sample site is a spring where spring water is collected from a conveyance pipe or a receiving livestock trough.

- Water type is calcium-sodium bicarbonate.

- The CAB exceeded 5% for 1 of the 7 post-baseline samples.
- Based on programmed formula, 2 constituents showed detections in post-baseline period that were not detected in the baseline period. These included methane (2) and manganese (2).
- Exceedance of the baseline maximum concentration by 25% or more by inorganic constituents occurred 34 times by 10 constituents. These included total alkalinity (4), chloride (1), nitrate/nitrite (6), phosphorus (6), TDS (1), barium (5), calcium (5), iron (1), potassium (3), and strontium (2) greater than the 25% criterion.
- The Mann-Kendall trend analysis showed that 5 of the 10 inorganic constituents that exceeded 25% of the baseline maximum concentration exhibited increasing trends. These constituents were alkalinity, phosphorus, TDS, calcium, and strontium.
- T-tests were not performed as there was only one baseline sample.
- Methane was detected up to 0.0248 mg/L in the post-baseline samples. No other dissolved gases were detected for baseline and post-baseline samples.
- No hydrocarbons were detected in the baseline and post-baseline samples.

Interpretation

The Myhre-02 Spring is a spring that has been developed for agricultural water supply. An underground pipe that taps into shallow groundwater conveys water from the subsurface to a livestock trough downslope of the underground source. Flow from the pipe is typically small, about 0.05 gpm. According the geologic map authored by Tweto (1972), the spring appears to be located in an area underlain by the Dakota Sandstone, Morrison Formation and Sundance Formation.

Groundwater of the Myhre-02 Spring is a calcium-sodium bicarbonate type. A piper plot of the Myhre-02 water is shown in Appendix B, Figure B-7 and a plot of common ion concentrations vs. time is shown in Appendix C, Figures C-13 and C-14. Figure B-7 generally indicates that sample chemistry has perhaps trended to higher proportions of calcium and bicarbonate over time, but proportions of chloride have remained stable. This is also indicated in Figure C-13 by the increasing trend in alkalinity. A single analysis of produced water from the Dawson Creek #1-25 Well is also included in Figure B-7. The Myhre-02 Spring water has a distinctly different water chemistry type compared to the produced water.

Figure C-13 and C-14 indicate that the common ion concentrations over time have remained somewhat stable since sampling began. There are not indications that water chemistry fluctuates seasonally.

An interpretation of the analytical data for the Myhre-02 Spring is summarized as follows:

- The 2 constituents, methane and manganese, that showed detections in post-baseline period that were not detected in the baseline period were infrequent and had concentrations just above the detection limit. These detections are of minimal concern, and do not indicate contamination associated with OGED activity.

- The concentrations of constituents that exceeded the baseline maximum concentration by 25% or more in the post-baseline period are not particularly elevated above the natural range for shallow groundwater. The more common parameters of alkalinity, nitrate/nitrite, phosphorus, calcium, barium, and potassium exhibited concentrations that were not unusual and not indicative of an OGED contamination event.

- Five of the 10 inorganic constituents that showed exceedances of the 25% baseline maximum exhibited increasing trends. Alkalinity (equal to bicarbonate), phosphorus, TDS, calcium and strontium exhibit increasing trends, the highest concentrations of which occurred in sample events at the end of the period where samples were shipped to a new laboratory. While concentrations are not particularly high, the increasing trends are noteworthy.

- The lack of elevated concentrations and stable trends in chloride and sodium do not support a hypothesis of OGED contamination at the Myhre-02 Spring location.

- Methane was not detected in 5 of 7 post-baseline samples. Two detections were at concentrations of 0.011 and 0.03 mg/L with an apparent MDL of 0.009 mg/L. The detections were bracketed in time with two samples that did not detect methane. A change in laboratory resulted in an MDL change from 0.001 to 0.0248 mg/L resulting in the post-baseline 25% exceedance criterion of 0.02455 (one-half the detection limit). These low concentrations did not occur in consecutive samples, and the lack of other detected dissolved gases or hydrocarbons does not support contamination by OGED operations.

While there are some contaminants of concern the exhibit increasing trends, concentrations are not of concern at this time. The key inorganic contaminants common to OGED production fluids are sodium and chloride. These constituents do not show concentrations of concern or increasing trends. Because sampling of Myhre-02 Spring involved sampling from the outfall pipe and the receiving trough, it is not certain how constituents in this "surface water" may be affected by surface phenomenon of evaporation and biological activity. In addition, the collection of only one baseline sample introduces uncertainty about the natural range of water composition at the Myhre-02 Spring location.

6.3.4 Saddleback-01 Well

The approximate distance from the Trout Creek #1-30 Well to Saddleback-01 Well is 2,200 feet. The Saddleback-01 Well has 1 baseline sample event and 16 post-baseline sample events, including two duplicate samples during the post-baseline period. One sample and its duplicate were analyzed for GRO and BTEX only. The data are shown in Appendix A, Table A-8. Examination of the Saddleback-01 Well data resulted in the following key findings.

- Water type is sodium bicarbonate.
- The CAB did not exceed 5% for any of the samples.
- Based on programmed formula, 5 inorganic constituents showed detections in post-baseline period that were not detected in the baseline period. These included nitrate/nitrite (2), copper (2), iron (2), manganese (1), and chromium (1).
- Exceedance of the baseline maximum concentration by 25% or more by inorganic constituents occurred 30 times by 13 constituents. These included chloride (3), fluoride (3), nitrate/nitrite (2), phosphorus (8), barium (1), chromium (1), copper (2), iron (2), lead (3), magnesium (1), manganese (1), potassium (1), and selenium (2).
- Two duplicate samples were associated with Saddleback-01 during post-baseline. The calculated RPD for the sample pairs indicates that the RPDs for the post-baseline duplicate are relatively good with all but fluoride (March 11, 2014 sample) falling within the 20% limit with a value of 21%.
- The Mann-Kendall trend analysis showed that potassium was the only constituent of the 13 inorganic constituents that exceeded 25% of the average baseline concentrations to exhibit a "probably increasing" trend.
- T-tests were not performed as there was only one baseline sample.
- Methane was detected at 0.032 mg/L in the baseline sample, and 13 times in the post-baseline with a maximum detection of 0.77 mg/L. No other dissolved gases were detected for baseline and post-baseline samples.
- No hydrocarbons were detected in the baseline and post-baseline samples. The two final samples in the dataset were analyzed at a different lab, and had a slightly higher MDL.

Interpretation

The Saddleback-01 Well log indicates the well is 220 feet deep and screened from 160 to 220 feet below ground surface. The depth to water during well completion was 140 feet. The screened geologic material was indicated to be sandstone. According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Iles Formation. The well is purged prior to sampling.

Groundwater of the Saddleback-01 Well is a sodium bicarbonate to sodium sulfate type. A piper plot of the Saddleback-01 water is shown in Appendix B, Figure B-8 and a plot of common ion concentrations vs. time is shown in Figures C-15 and C-16. Figure B-8 generally indicates that the Saddleback-01 Well water is proportionally high in sodium compared to other common cations, and proportionally high in bicarbonate and moderately high in sulfate. Chloride, calcium and magnesium levels are proportionally very low. A single analysis of produced water from the Dawson Creek #1-25 Well is also included in the

plot. The proportions of the cations sodium and potassium in the Saddleback-01 Well are similar to the produced water but the anion characteristics are not similar.

Figures C-15 and C-16 indicate that the common ion concentrations over time have remained somewhat stable since sampling began. There are not indications that water chemistry fluctuates seasonally which is reasonable since the aquifer(s) penetrated were at depths greater than 100 feet and possibly confined by low permeability shale units.

An interpretation of the analytical data for the Saddleback-01 Well is summarized as follows:

- Water type is sodium bicarbonate. The Saddleback-01 water chemistry is significantly dominated by sodium and bicarbonate; these constituents make up a large percentage of TDS.

- The 5 inorganic constituents that showed detections in post-baseline period and were not detected in the baseline period included nitrate/nitrite (2), copper (2), iron (2) manganese (1), and chromium (1). All of these detections were of no concern because concentrations were at or near the detection limit, or a change in the detection limit occurred.

- The 13 inorganic constituents that exceeded the baseline maximum concentration by 25% or more included chloride (3), fluoride (3), nitrate/nitrite (2), phosphorus (8), barium (1), copper (2), iron (2), lead (3), magnesium (1), manganese (1), potassium (1), selenium (2), and chromium (1). These exceedances are of minimal concern because the results often were slightly above the MDL, at the MDL, or not indicative of a contamination event associated with OGED operations.

- The results of the RPD calculation showed low values mostly within quality control limits. The results add some certainty to analytical precision.

- The increasing trend of alkalinity and potassium are moderate to subtle. The “probably increasing” trend for potassium may have been influenced by an analysis after changing to a new laboratory. The detection of 2.5 mg/L was the maximum concentration for potassium in the dataset. These increasing trends are not accompanied with increasing trends in other common ions typically associated with OGED production fluids. Chloride shows a decreasing trend and sodium is stable.

- Methane concentrations in the post-baseline samples exhibited 13 results exceeding the 25% criterion. While an increasing trend is apparent, the concentrations did not exceed 1 mg/L, no other dissolved gases were detected for baseline and post-baseline samples, no other hydrocarbons were detected, and no other increased trends with significant concentrations were observed in solutes typically associated with OGED production fluids.

- The absence of hydrocarbon detections in the baseline and post-baseline periods do not indicate the presence of OGED contamination.

The sporadic distribution of constituent concentrations exceeding the 25% criterion, the lack of increasing trends, and the relatively low or absent concentrations of key OGED contaminants of concern do not indicate contamination by OGED operations at the Saddleback-01 Well.

6.3.5 Walsh-01 Well

The approximate distance from the Trout Creek #1-30 Well to Walsh-01 Well is 1,700 feet. The Walsh-01 Well has 3 baseline sample events and 18 post-baseline sample events, including one duplicate sample during the baseline period and 3 duplicate samples during the post-baseline period. The data are shown in Appendix A, Table A-9. Examination of the Walsh-01 Well data resulted in the following key findings.

- Water type is sodium bicarbonate.
- The CAB did not exceed 5% for any of the samples.
- The analytical data for chloride and sulfate show inconsistent diverging fluctuations (see Figure C-16); it is suspected this data may be affected by laboratory reporting errors.
- Based on programmed formula, 6 constituents showed detections in post-baseline period that were not detected in the baseline period. These included nitrate/nitrite (1), copper (4), iron (1), lead (1), selenium (2), and chromium (1).
- Exceedance of the baseline maximum concentration by 25% or more by inorganic constituents occurred 26 times by 12 constituents. These included bromide (1), chloride (1), sulfate (7), phosphorus (2), TDS (1), arsenic (4), copper (2), iron (1), lead (1), magnesium (2), potassium (1), and selenium (3).
- Exceedance of the baseline average concentration by 25% or more by inorganic constituents occurred 50 times by 14 constituents. These included bromide (4), chloride (1), sulfate (13), nitrate/nitrite (1), phosphorus (2), total dissolved solids (1), arsenic (12), chromium (1), copper (4), iron (1), lead (3), magnesium (2), potassium (1), and selenium (4).
- Four duplicate samples were associated with Walsh-01 Well, one during baseline and three during post-baseline. The calculated RPD for these sample pairs indicates that the RPDs for the baseline duplicate fall within the 20% limit with the exception of methane. The post-baseline sample pairs show 20% exceedances for methane (April 1, 2013 and November 5, 2013), bromide (April 1, 2013 and November 5, 2013), chloride (April 1, 2013), sulfate (April 1, 2013), lead (April 1, 2013), total phosphorus (November 5, 2013), magnesium (November 5, 2013), and selenium (November 5, 2013).
- The Mann-Kendall trend analysis showed that selenium was the only inorganic constituent that exceeded the baseline average and baseline maximum concentrations by 25% or more that exhibited a “probably increasing” trend.
- T-tests were not performed due to the low number of baseline samples.

- Methane was detected up to 2.9 mg/L in the baseline period and up to 5.3 mg/L in the post-baseline period. No other dissolved gases were detected for baseline and post-baseline samples.

- No hydrocarbons were detected in the baseline and post-baseline samples.

Interpretation

The Walsh-01 Well log indicates the well is 340 feet deep and screened from 280 to 340 feet below ground surface. The depth to water during well completion was 161 feet. The screened geologic material was indicated to be coarse to silty sandstone. According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Park Formation. The well is purged prior to sampling.

Groundwater of the Walsh-01 Well is a sodium bicarbonate type. A piper plot of the Walsh-01 water is shown in Appendix B, Figure B-9. A single analysis of produced water from the Dawson Creek #1-25 Well is also included in the plot. Plots of common ion concentrations versus time are shown in Appendix C, Figures C-17 and C-18. Figure B-9 indicates the strong proportional amounts of sodium and bicarbonate and the proportional lack of chloride in the Walsh-01 Well water. The proportions of cations in the Walsh-01 Well water are similar to the produced water, but chloride is distinctively lacking.

Figures C-17 and C-18 indicate that the common ion concentrations over time have remained somewhat stable since sampling began. There are not indications that water chemistry fluctuates seasonally which is reasonable since the aquifer(s) penetrated were at depths greater than 100 feet and possibly confined by low permeability shale units.

An interpretation of the analytical data for the Walsh-01 Well is summarized as follows:

- Water type is sodium bicarbonate. The Walsh-01 water chemistry is significantly dominated by sodium and bicarbonate. These ions make up a large percentage of TDS.

- The 6 constituents (nitrate/nitrite, copper, iron, lead, selenium, and chromium) that showed detections in post-baseline period that were not detected in the baseline period are not contaminants of concern and showed detections of minimal concern because of concentrations at or near the detection limit, or a change in the MDL occurred.

- Most of the constituents with exceedances 25% above the baseline maximum concentration were associated with concentrations at or just above the MDL, and of spotty, infrequent occurrence (e.g. phosphorus with an MDL of 0.01 mg/L and exceedances of 0.04 mg/L). These include secondary contaminants of concern such as bromide and sulfate. Sulfate, for example, had 7 exceedances with a maximum post-baseline concentration of 41.9 mg/L and a mean baseline

concentration of 19.5 mg/L (post-baseline mean was 28.25 mg/L). However, the concentration fluctuated over time and did not exhibit an increasing trend. Bromide concentrations were low, exceedances were modest, spotty, and the baseline mean of 0.22 mg/L was greater than the post-baseline mean of 0.18 mg/L. It is not suspected that these exceedances are associated with an OGED-related release.

- Selenium was the only constituent that showed a "probably increasing" trend, but this trend appears to be an artifact of the MDL used by a laboratory change at the end of the post-baseline dataset.

- Methane was detected throughout the baseline and post-baseline at concentrations ranging from 0.116 to 5.3 mg/L. The mean baseline concentration was 2.37 mg/L compared to the post-baseline concentration of 1.27 mg/L. Two of the higher concentration results occur in consecutive sampling events, but are followed by low concentrations. The spotty nature of the higher concentrations and the general lack of other dissolved gases and hydrocarbons do not support OGED-related contamination.

- The results of the RPD quality control generally supported good quality control and analytical precision; however, some of the constituents that exceeded the 20% RPD limit were also those that showed exceedance of the 25% criterion. This observation, however, does not change the overall interpretation that OGED contamination is not evident in the dataset.

The overall lack of elevated concentrations of key constituents common to OGED production fluids does not support a hypothesis of contamination at the Walsh-01 Well location.

6.3.6 Werner-01 Well

The approximate distance from the Trout Creek #1-30 Well to Werner-01 Well is 1,800 feet. The Werner-01 Well has 1 baseline sample event and 14 post-baseline sample events, including one duplicate sample during the post-baseline period. The data are shown in Appendix A, Table A-10. Examination of the Werner-01 Well data resulted in the following key findings.

- Water type is sodium bicarbonate.

- The CAB did not exceed 5% for any of the samples.

- Based on programmed formula, 4 constituents showed detections in post-baseline period that were not detected in the baseline period. These included methane (3), iron (9), lead (1), and selenium (1).

- Exceedance of the baseline maximum concentration by 25% or more by inorganic constituent occurred 35 times by 10 constituents. These included carbonate alkalinity (4), bromide (4), chloride (3), fluoride (3), phosphorus (4), iron (9), lead (3), manganese (1), potassium (1), and selenium (3).

- One duplicate sample was associated with Werner-01 Well post-baseline. The calculated RPDs for the sample pairs indicates that the RPDs fall within the 20% limit with the exception of bromide (86%) and fluoride (86%) and iron (-148%).

- The Mann-Kendall trend analysis showed that none of the 10 inorganic constituents that exceeded 25% of the average baseline concentration exhibited increasing trends.

- T-tests were not performed as there was only one baseline sample.

- Methane was detected 3 times and up to 0.013 mg/L in the post-baseline period; 1 detection was at the MDL and after a change in laboratory. No other dissolved gases were detected for baseline and post-baseline samples.

- No hydrocarbons were detected in the baseline and post-baseline samples.

Interpretation

The original Werner-01 Well proposed construction form (dated 1972) indicates the well is 100 feet deep and screened from 70 to 100 feet below ground surface. The depth to water has not been measured in the field due to inaccessibility. It is unknown what the screened geologic material is at the well. According a geologic map authored by Tweto (1972), the well appears to be located in an area underlain by the Iles Formation. The well is purged prior to sampling.

Groundwater of the Werner-01 Well is a sodium bicarbonate type. A piper plot of the Werner-01 water is shown in Appendix B, Figure B-10. A single analysis of produced water from the Dawson Creek #1-25 Well is also included in the plot. Plots of common ion concentrations versus time are shown in Appendix C, Figures C-19 and C-20. Figure B-10 indicates that the common ion water quality is relatively similar over time; sodium and potassium proportionally dominate as cations; and that bicarbonate is proportionally dominant for anions. The Werner-01 Well water is readily distinguishable from the Dawson Creek #1-25 Well produced water chemistry.

Figures C-19 and C-20 indicate that the common ion concentrations over time have remained somewhat stable since sampling began. There are not indications that water chemistry fluctuates seasonally which is reasonable since the aquifer(s) penetrated were at depths greater than 100 feet and possibly confined by low permeability shale units.

An interpretation of the analytical data for the Werner-01 Well is summarized as follows:

- Water type is sodium bicarbonate with a high proportion of dissolved constituents that make up TDS being sodium, bicarbonate, and sulfate.

- The inorganic constituents (excluding carbonate alkalinity) that showed detections in post-baseline period that were not detected in the baseline period are iron (9), lead (1), and selenium (1). All of these detections were of minimal concern because of concentrations at or near the detection limit, or because a change in the MDL occurred. In addition, these detections were not associated with typical contaminants of concern (the common ions) associated with OGED production fluids.

- Exceedance of the baseline maximum concentration by 25% or more by the inorganic constituents is not indicative of OGED contamination event. The constituents are dispersed throughout the post-baseline period, generally exhibit relatively low concentrations, some just above detection limit. In the post-baseline period, fluoride, lead, manganese, and selenium had many non-detections. The common constituents of chloride, and potassium (and carbonate alkalinity), do not exhibit indications of elevated concentrations that would be related to OGED operations.

- The results of the duplicate sample RPD calculation indicate most constituents fall below the 20% limit. The constituents that exceeded the limit, bromide (86%) and fluoride (86%) and iron (-148%), were also constituents that showed exceedance of the 25% SUP criterion. However, as mentioned above, the concentration levels of these constituents are not of concern.

- The Mann-Kendall trend analysis showed that none of the 10 inorganic constituents that exceeded 25% of the baseline maximum concentrations exhibited increasing trends. However, bicarbonate alkalinity which represents most of the total alkalinity, did show an increasing trend. This single trend occurs over a range of 424 to 485 mg/L. Without increases of other constituents, the alkalinity trend is not likely indicative of OGED-related contamination.

- The overall low number of detections of methane (3) and associated low concentrations (maximum of 0.013 mg/L), in addition to no other detections of dissolved gases or hydrocarbons, do not support contamination by OGED operations.

Overall, the water chemistry represented by the baseline and post-baseline period for the Werner-01 Well does not show indications of contamination by OGED operations. This is supported by the lack of elevated concentrations of contaminants of concern, namely the common ions (chloride, sodium, calcium, magnesium, etc.) typically associated with OGED production fluids.

7.0 CONCLUSIONS

In accordance with Routt County SUPs granted to SWN, WWL conducted a thorough evaluation of water quality data from 10 water sources associated with 3 oil and gas wells. These oil and gas wells included Dawson Creek #1-25, Gnat Hill #1-29, and Trout Creek #1-30. One domestic water well and one monitoring well were associated with the Dawson Creek #1-25 Well; two monitoring wells were associated with the Gnat Hill #1-29 Well; and 5 domestic water wells and one spring water source were associated with the Trout Creek #1-30 Well. In addition, WWL examined produced water chemistry from the Dawson Creek #1-25 Well and the Gnat Hill #1-29 Well.

Twenty-seven inorganic constituents (including TDS and cation-anion balance), 5 dissolved gases, and 8 hydrocarbon parameters (2 TPH aggregate parameters and 6 extractable organic compounds – BTEX) were evaluated for the assessment. The water sources had between 1 and 6 baseline samples and between 7 and 18 post-baseline samples. Summary statistics, Mann-Kendall trend test, and t-tests were used to enhance the evaluation.

Oil and gas exploration and development (OGED) production fluids (produced water) that can potentially contaminate water resources consist of saline or brine solutions that are associated with production of the hydrocarbons (oil and gas). Common constituents are the dissolved common ions of bicarbonate (total alkalinity), calcium, chloride, magnesium, potassium, sodium, and sulfate. The aggregate parameter of TDS for produced water is commonly very high, commonly ranging from 10,000 to over 50,000 mg/L. These key "contaminants of concern" were the focus of this water quality evaluation. Secondary constituents such as barite, boron, bromide, nitrate/nitrite, and silica, boron, iron and other metals were also examined. The combined occurrence of dissolved natural gases and hydrocarbons (TPH-DRO, TPH-GRO, and BTEX) is also a strong indicator of OGED contamination.

In the analysis of the groundwater datasets, WWL found that some inorganic dissolved constituents from each water source exhibited detections in post-baseline constituents that were not detected during the baseline period, and that some constituents exceeded the 25% criterion. These constituents varied from sampling event to sampling event and from well to well. It was found in many cases that 1) new detections and the 25% exceedances were at or near the MDL or of low concentrations, 2) detections and exceedances usually occurred sporadically with no pattern that would indicate apparent OGED contamination, and 3) some elevated concentrations randomly occur at or greater than 1.25 times the baseline maximum (fluctuation). These latter types of detections and exceedances may occur as outliers as a result of external influences. The cause of these types of detections or exceedances is not known but may be related to natural groundwater heterogeneity, well development processes during sampling, contamination in the field or lab, procedural differences, or other natural causes.

In virtually all of the water source chemistry data examined, there was no indication of contamination characteristic of OGED production fluids. Often, several of the constituents of the contaminants of concern exhibited new detections or exceedances greater than 25% of the baseline maximum, but results were typically infrequent or spotty in occurrence. Our interpretations, based on the data provided, did not find convincing evidence to believe that OGED contamination has occurred at the water sources subject

to this study as a result of SWN operations. One water source exhibited water chemistry signature similar to oil and gas produced water but this chemistry was also present within baseline samples. Another water source exhibited an abundance of post-baseline samples that exceeded 25% of the baseline maximum. The single baseline sample and shallow nature of the well may contribute to the number of 25% exceedances; the water chemistry was not indicative of an OGED contamination event.

On the basis of the data provided, there is no evidence indicating that OGED contamination has occurred at the water source locations during the post-baseline period as a result of SWN OGED operations. As a result, it is reasonable to consider a reduction in monitoring frequency at the established water sources with respect to the SUPs. Because the Trout Creek #1-30 Well has been plugged and abandoned, some water sources for that well could be considered for removal from the monitoring program consistent with COGCC Rule 609 regulations. In addition, constituents that have consistently not been detected could be considered for removal from the analytical suite.

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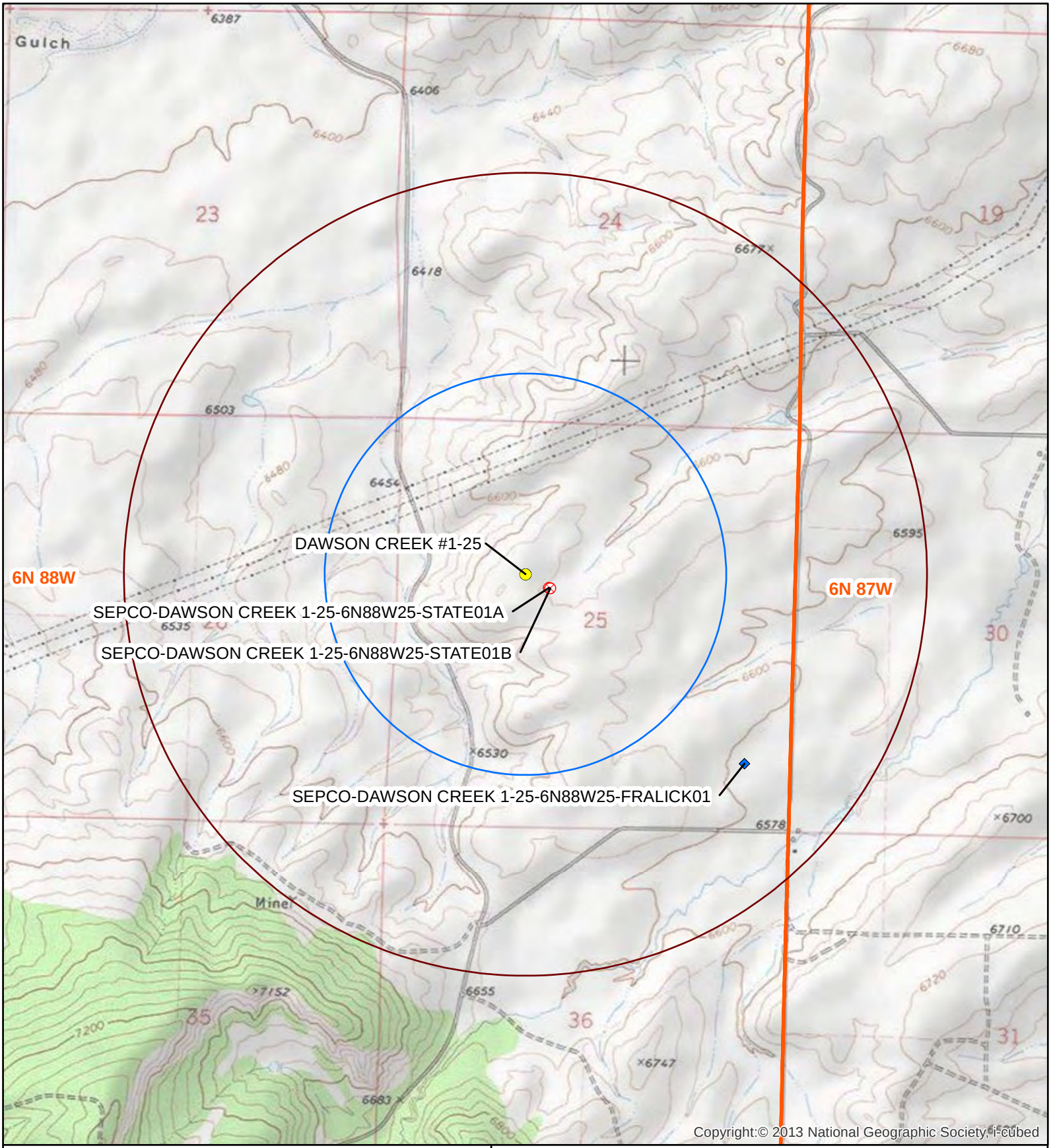


Legend

- Water Well Sample
- Dedicated Monitoring Well
- Well Pad
- Half-Mile Buffer
- One-Mile Buffer
- Township Lines

N

0 375 750 1,500 2,250 3,000 Feet

1:20,000

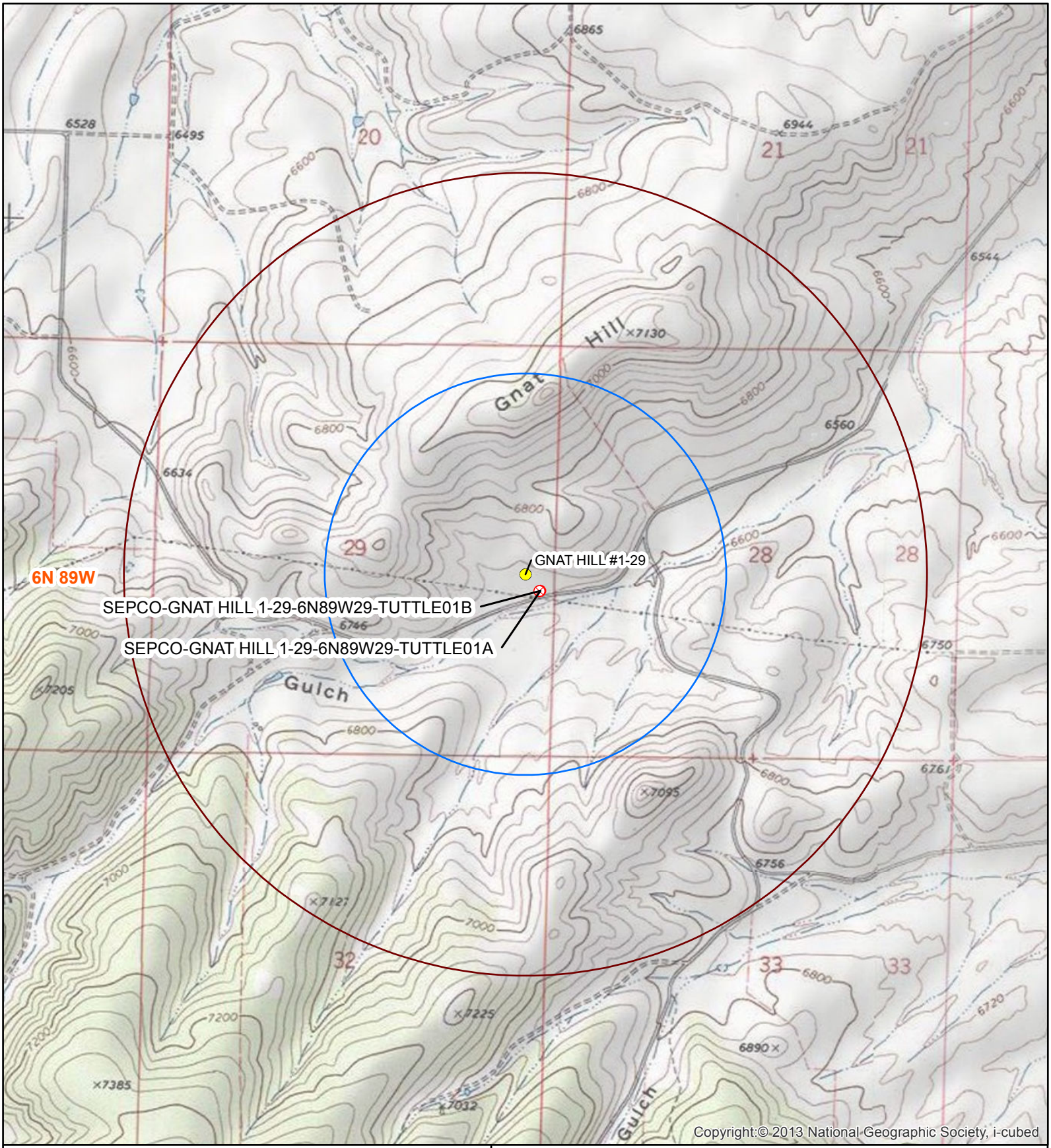
Figure 1. Dawson Creek #1-25 Well Pad and Water Source Location Map
SE 1/4, NW 1/4, S25, T6N, R88W, 6 PM

Routt County, Colorado

SWN Production Company, LLC

Basemap Source: ESRI ArcGIS Online

Western Water & Land, Inc.
Applications in Earth Science



Legend

- Dedicated Monitoring Well
- Well Pad
- Half-Mile Buffer
- One-Mile Buffer
- Township Lines

N

0 375 750 1,500 2,250 3,000 Feet

1:20,000

Figure 2. Gnat Hill #1-29 Well Pad and Water Source Location Map
NE 1/4, SE 1/4, S29, T6N, R89W, 6 PM

Routt County, Colorado

SWN Production Company, LLC

Basemap Source: ESRI ArcGIS Online

Western Water & Land, Inc.
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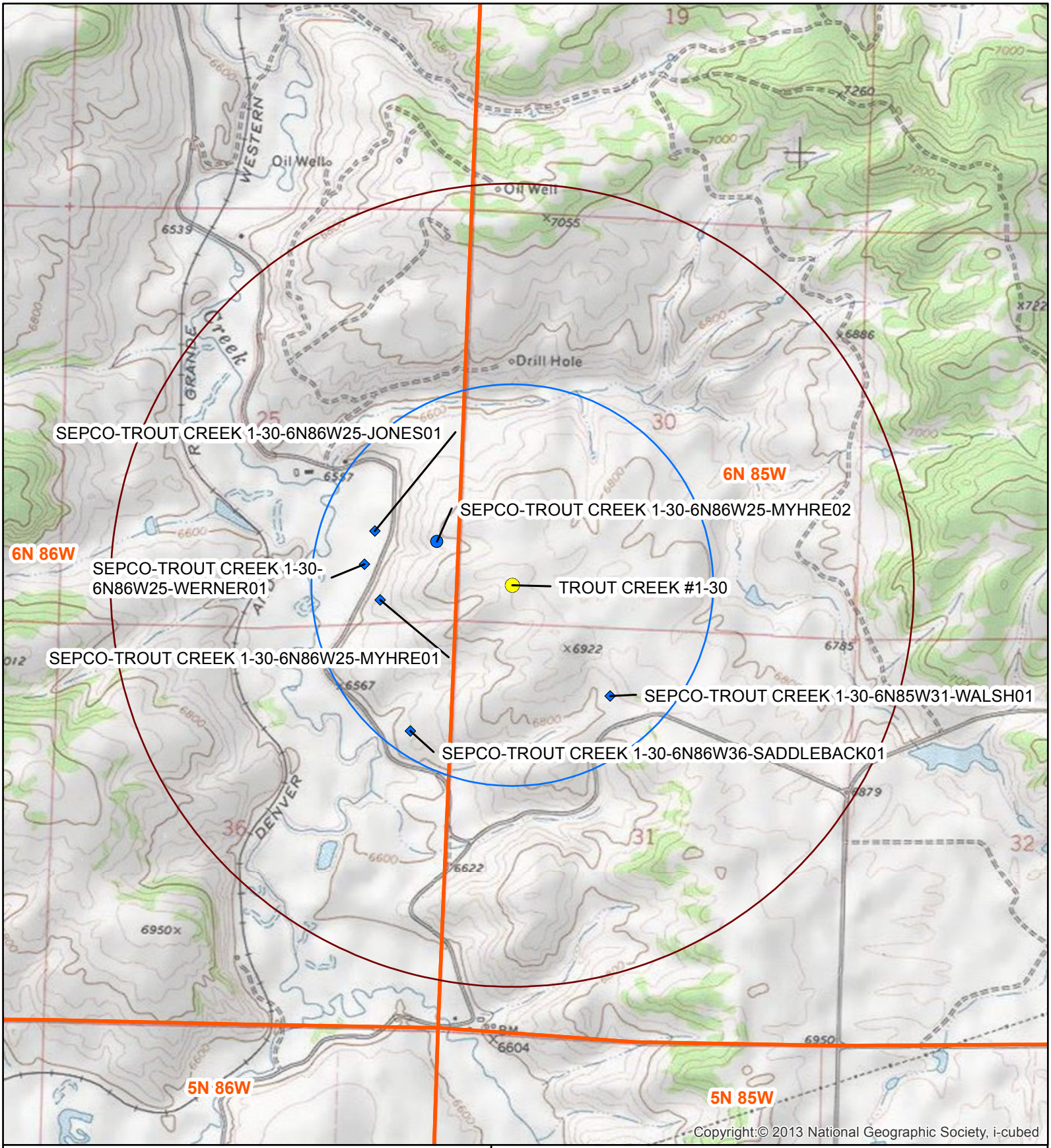

Legend

- Water Well Sample
- Spring Sample
- Well Pad
- Half-Mile Buffer
- One-Mile Buffer
- Township Lines

N

0 375 750 1,500 2,250 3,000 Feet

1:20,000

Figure 3. Trout Creek #1-30 Well Pad and Water Source Location Map
SW 1/4, SW 1/4, S30, T6N, R85W, 6 PM

Routt County, Colorado

SWN Production Company, LLC

Basemap Source: ESRI ArcGIS Online

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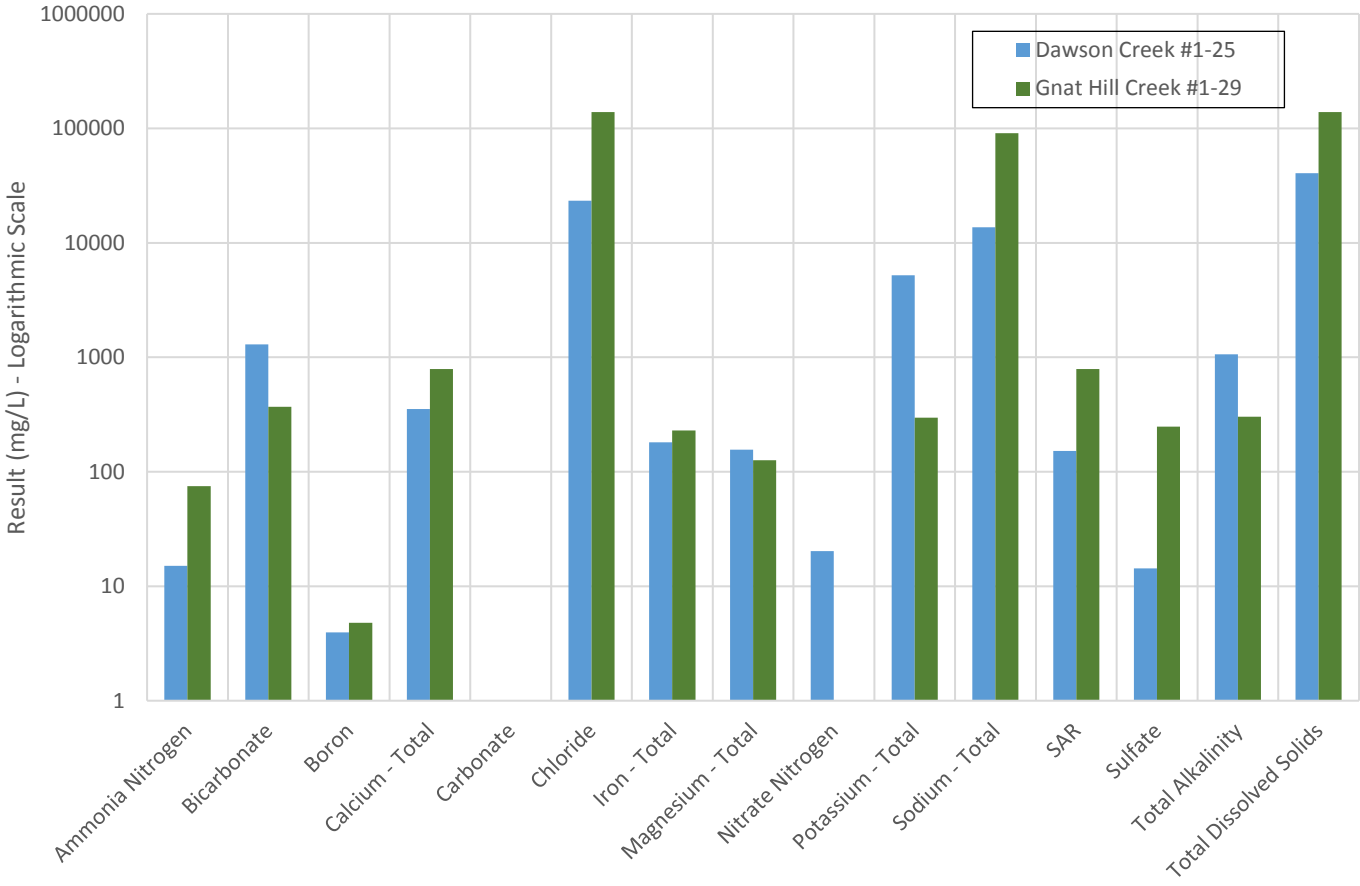
Figure 4. Produced Water Chemistry



Parameter	Method	Units	Dawson Creek #1-25 10/22/2014 Reported Result	Gnat Hill Creek #1-29 10/23/2014 Reported Result
Ammonia Nitrogen	SM 4500-NH3-G	mg/L	15.07	75.04
Bicarbonate	SM 2320-B	mg/L	1295.6	369.2
Boron	SM 4500-B B	mg/L	3.95	4.80
Calcium - Total	SM 3111-B	mg/L	353.7	791.5
Calcium - Hardness	SM 3111-B	mg/L as CaCO3	883.20	1976.40
Carbonate	SM 2320-B	mg/L	BDL	BDL
Chloride	EPA 300.0	mg/L	23387.77	138663.12
Iron - Total	SM 3111-B	mg/L	180.85	229.70
Magnesium - Total	SM 3111-B	mg/L	155.8	126.0
Nitrate Nitrogen	EPA 300.0	mg/L	20.24	BDL
pH	SM 4500-H-B	units	6.50	6.30
Potassium - Total	SM 3111-B	mg/L	5215.0	297.8
Resistivity @ 77° F	SM 2520 B	ohm.m	0.15	0.07
Sodium - Total	SM 3111-B	mg/L	13675	90600
Sodium Adsorption Ratio	SM 3111-B	units	152.40	789.30
Specific Gravity	SM 2710 F	g/ml	1.02	1.04
Sulfate	EPA 300.0	mg/L	14.35	248.36
Total Alkalinity	SM 2320-B	mg/L as CaCO3	1062.0	302.6
Total Dissolved Solids	SM 2540-C	mg/L	40613	139153

Notes: BDL = below detection limit

APPENDIX A

Summary Tables

Table A-0: Water Well Completion Information

Site	Well ID	Diameter (in)	TotalDepth (ft)	Depth to Water (ft)	Screen Interval (ft)	Pumping rate (gpm)	Screened geologic material	Geologic Formation (Surface, COGCC Map)	Sampling Method (pump, bail, etc.)	Well Purged During Sampling?	Is well used regularly?
Dawson Creek	Fralick-01	12	700 (12)	8.85	UNK	UNK	UNK	Lewis Shale (Kls)	Bailer	No	No
	State-01B	2	135	128	125 - 135	UNK	Clay, well-cemented sandstone	Lewis Shale (Kls)	Bailer	Yes	No
Gnat Hill	Tuttle-01A	2	29	18	15 - 25	UNK	Clay, fine and course-grained sand	Lewis Shale (Kls)	Bailer	Yes	No
	Tuttle-01B	2	95.7	88	85.7 - 95.7	UNK	Clay stone (shale)	Lewis Shale (Kls)	Bailer	Yes	No
Trout Creek	Jones-01	6	20	UNK	10 - 20	15	UNK	Iles FM (Ki)	Spigot at house	Yes	Yes
	Myhre-01	5	225	125	135 - 205	15	Shale, sandstone	Iles FM (Ki)	Dedicated pump	Yes	UNK
	Myhre-02	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	Dakota, Morrison, Sundance (KJds)	*NA*	*NA*	UNK
	Saddleback-01	5	220	140	160 - 220	5	Sandstone	Iles FM (Ki)	Dedicated pump	Yes	UNK
	Walsh-01	5	340	161	280 - 340	7	Course and silty sandstone	Dakota, Morrison, Sundance (KJds)	Dedicated pump	Yes	UNK
	Werner-01	UNK	100	UNK	70 - 100	15	UNK	Iles FM (Ki)	Dedicated pump	Yes	UNK

Table A-1: Fralick-01 Well Analytical Results

Sample Date		8/30/2012			9/18/2012			10/10/2012			11/7/2012			12/5/2012			1/3/2013			2/7/2013		
Lab Sample ID		L96490-01			L96801-01			L97254-01			L97738-01			L98204-01			L10041-01			L10563-01		
Duplicate or Replicate																						
Sample Purpose		Baseline			Baseline			Baseline			Baseline			Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L																					
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L																					
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		341	341		338	338		343	343		359	359		321	321		308	308		297	297
Alkalinity, Bicarbonate as CaCO3	mg/L		341	341		338	338		343	343		359	359		321	321		308	308		297	297
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L	<	1	0.5	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25
Chloride	mg/L		55.3	55.3		57	57		60.5	60.5		44.7	44.7		43.4	43.4		43.5	43.5		56.7	56.7
Fluoride	mg/L	<	2	1	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5
Sulfate	mg/L		2547.9	2547.9		2619.4	2619.4		2551.5	2551.5		2774.8	2774.8		2403.4	2403.4		2376.3	2376.3		2480	2480
Nitrate/Nitrite as N	mg/L		6.69	6.69		6	6		6.55	6.55		6.57	6.57		6.03	6.03		6.51	6.51		6.6	6.6
Phosphorus, Total	mg/L		0.13	0.13		0.16	0.16		0.16	0.16		0.12	0.12		0.05	0.05		0.03	0.03		0.04	0.04
Solids, Total Dissolved	mg/L		4290	4290		4280	4280		4260	4260		4350	4350		4330	4330		4400	4400		4310	4310
Hardness as CaCO3	mg/L		1720	1720		1700	1700		1820	1820		1810	1810		1780	1780		1800	1800		1740	1740
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		61.9	61.9		63.4	63.4		62.1	62.1		66.7	66.7		58.1	58.1		57.3	57.3		59.6	59.6
Sum of Cations	meq/L		59.4	59.4		58.8	58.8		61.6	61.6		62.4	62.4		61.8	61.8		63.5	63.5		61.3	61.3
Cation-Anion Balance	%		-2.1	-2.1		-3.8	-3.8		-0.4	-0.4		-3.3	-3.3		3.1	3.1		5.1	5.1		1.4	1.4
Sodium Adsorption Ratio	NU		5.99	5.99		5.98	5.98		5.91	5.91		6.15	6.15		6.2	6.2		6.44	6.44		6.32	6.32
Arsenic	mg/L	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005
Barium	mg/L		0.025	0.025		0.03	0.03		0.023	0.023		0.04	0.04		0.023	0.023		0.02	0.02		0.02	0.02
Boron	mg/L		0.37	0.37		0.39	0.39		0.38	0.38		0.46	0.46		0.42	0.42		0.45	0.45		0.4	0.4
Cadmium	mg/L	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025		0.0007	0.0007
Calcium	mg/L		405	405		404	404		426	426		432	432		420	420		429	429		410	410
Copper	mg/L		0.47	0.47		0.5	0.5		0.38	0.38		0.1	0.1	<	0.01	0.005	<	0.05	0.025	<	0.05	0.025
Iron	mg/L	<	0.02	0.01	<	0.1	0.05	<	0.02	0.01	<	0.1	0.05	<	0.02	0.01	<	0.1	0.05	<	0.1	0.05
Lead	mg/L		0.005	0.005		0.0073	0.0073		0.0045	0.0045		0.0018	0.0018	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025
Magnesium	mg/L		173	173		168	168		183	183		177	177		177	177		178	178		174	174
Manganese	mg/L		0.054	0.054		0.05	0.05		0.079	0.079	<	0.03	0.015	<	0.005	0.0025	<	0.03	0.015	<	0.03	0.015
Mercury	mg/L	<	0.0002	0.0001	<	0.001	0.0005	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		2.4	2.4		3	3		3.1	3.1		3	3		2.8	2.8		3	3		3	3
Selenium	mg/L		0.977	0.977		0.863	0.863		0.9165	0.9165		0.953	0.953		0.9165	0.9165		0.8765	0.8765		0.9255	0.9255
Silica	mg/L		22	22		21	21		21.8	21.8		22	22		21.1	21.1		19	19		18	18
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.05	0.025	<	0.01	0.005	<	0.05	0.025	<	0.01	0.005	<	0.05	0.025	<	0.05	0.025
Sodium	mg/L		565	565		560	560		572	572		594	594		594	594		621	621		599	599
Strontium	mg/L		3.03	3.03		3.1	3.1		3.23	3.23		3.11	3.11		3.03	3.03		3.26	3.26		3.19	3.19
Chromium	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.01	0.005	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05		0.2	0.2	<	0.3	0.3	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	0.2	0.1	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	0.2	0.1	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	0.4	0.2	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	0.2	0.1	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	0.2	0.1	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-1: Fralick-01 Well Analytical Results

Sample Date		3/6/2013			4/3/2013			8/7/2013			11/5/2013			3/11/2014			6/19/2014			9/17/2014		
Lab Sample ID		L10987-01			L11413-01			L13712-01			L15392-01			L17167-01			L18996-01			L20580-01		
Duplicate or Replicate																						
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L							<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L							<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		308	308		314	314		259	259		313	313		351	351		323	323		349	349
Alkalinity, Bicarbonate as CaCO3	mg/L		308	308		314	314		259	259		313	313		351	351		323	323		349	349
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25
Chloride	mg/L		88.9	88.9		80.7	80.7		54.2	54.2		48.3	48.3		54.2	54.2	<	25	12.5		44.7	44.7
Fluoride	mg/L	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	2.5	1.25	<	2.5	1.25
Sulfate	mg/L		2547.5	2547.5		2681.1	2681.1		1930	1930		2230	2230		2380	2380		835	835		2220	2220
Nitrate/Nitrite as N	mg/L		5.34	5.34		6.52	6.52		3.94	3.94		5.94	5.94		4.29	4.29		2.13	2.13		5.92	5.92
Phosphorus, Total	mg/L		0.03	0.03		0.03	0.03		0.02	0.02		0.03	0.03		0.03	0.03		0.03	0.03		0.03	0.03
Solids, Total Dissolved	mg/L		4310	4310		4370	4370		3390	3390		4310	4310		4030	4030		2230	2230		3750	3750
Hardness as CaCO3	mg/L		1790	1790		1800	1800		1700	1700		1710	1710		1610	1610		922	922		1540	1540
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		62.1	62.1		64.8	64.8		47.2	47.2		54	54		59	59		24	24		55	55
Sum of Cations	meq/L		63.4	63.4		63.5	63.5		59.3	59.3		59	59		56	56		33	33		55	55
Cation-Anion Balance	%		1	1		-1	-1		11.4	11.4		4.4	4.4		-2.6	-2.6		15.8	15.8		0	0
Sodium Adsorption Ratio	NU		6.49	6.49		6.44	6.44		6.12	6.12		6.08	6.08		5.84	5.84		4.7	4.7		6	6
Arsenic	mg/L		0.0002	0.0002		0.0008	0.0008		0.0005	0.0005	<	0.001	0.0005		0.0005	0.0005		0.0005	0.0005	<	0.0004	0.0002
Barium	mg/L		0.019	0.019		0.03	0.03		0.022	0.022		0.023	0.023		0.054	0.054		0.03	0.03		0.026	0.026
Boron	mg/L		0.36	0.36		0.44	0.44		0.34	0.34		0.38	0.38		0.31	0.31		0.21	0.21		0.34	0.34
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005		0.0001	0.0001	<	0.0005	0.00025	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0002	0.0001
Calcium	mg/L		417	417		424	424		403	403		400	400		376	376		220	220		367	367
Copper	mg/L	<	0.01	0.005	<	0.05	0.025		0.06	0.06		0.05	0.05		0.04	0.04		0.03	0.03		0.09	0.09
Iron	mg/L	<	0.02	0.01	<	0.1	0.05	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Lead	mg/L	<	0.0001	0.00005		0.0006	0.0006		0.0014	0.0014		0.0008	0.0008		0.0005	0.0005		0.0004	0.0004		0.0019	0.0019
Magnesium	mg/L		182	182		181	181		168	168		172	172		162	162		90.6	90.6		152	152
Manganese	mg/L	<	0.005	0.0025	<	0.03	0.015	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		2.6	2.6		3	3		2.5	2.5		2.4	2.4		2.6	2.6		2	2		2.5	2.5
Selenium	mg/L		0.8585	0.8585		0.82	0.82		0.9095	0.9095		0.939	0.939		1.01	1.01		0.802	0.802		0.7498	0.7498
Silica	mg/L		17	17		18	18		20.5	20.5		22	22		16.9	16.9		14.6	14.6		21.4	21.4
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.05	0.025	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		624	624		621	621		573	573		571	571		532	532		325	325		538	538
Strontium	mg/L		3.14	3.14		3.26	3.26		2.96	2.96		3.05	3.05		2.85	2.85		1.51	1.51		2.72	2.72
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.02	0.01
TPH-DRO (C10-C28)	mg/L		0.3	0.3	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05		0.1	0.1	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-1: Fralick-01 Well Analytical Results

Sample Date		12/18/2014			3/25/2015			6/16/2015			9/22/2015			12/16/2015			3/14/2016			3/14/2016		
Lab Sample ID		L22102-01			L23478-01			L24921-01			L26811-01			L28232-01			L29397-01			L29398-01		
Duplicate or Replicate																				Duplicate		
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	UNITS	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result
Butane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015									
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015									
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		352	352		369	369		405	405		395	395		359	359		368	368		354	354
Alkalinity, Bicarbonate as CaCO3	mg/L		352	352		369	369		405	405		395	395		359	359		368	368		354	354
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L	<	2.5	1.25	<	2.5	1.25	<	0.5	0.25	<	2.5	1.25	<	1	0.5	<	2.5	1.25	<	2.5	1.25
Chloride	mg/L		50.1	50.1		30.6	30.6		11.8	11.8		39.6	39.6		36.8	36.8		44.8	44.8		46.3	46.3
Fluoride	mg/L	<	2.5	1.25	<	2.5	1.25	<	0.5	0.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25
Sulfate	mg/L		2430	2430		1200	1200		550	550		2100	2100		1770	1770		2650	2650		2690	2690
Nitrate/Nitrite as N	mg/L		5.56	5.56		2.57	2.57		0.88	0.88		3.1	3.1		6.45	6.45		6.46	6.46		7.2	7.2
Phosphorus, Total	mg/L		0.06	0.06		0.05	0.05		0.03	0.03		0.04	0.04		0.06	0.06		0.04	0.04		0.04	0.04
Solids, Total Dissolved	mg/L		3890	3890		2770	2770		1370	1370		2720	2720		3880	3880		3680	3680		3990	3990
Hardness as CaCO3	mg/L		1520	1520		1220	1220		701	701		1220	1220		1030	1030		1460	1460		1590	1590
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		60	60		33	33		20	20		53	53		45	45		64	64		65	65
Sum of Cations	meq/L		54	54		42	42		25	25		44	44		38	38		52	52		56	56
Cation-Anion Balance	%		-5.3	-5.3		12	12		11.1	11.1		-9.3	-9.3		-8.4	-8.4		-10.3	-10.3		-7.4	-7.4
Sodium Adsorption Ratio	NU		5.9	5.9		5.1	5.1		4.1	4.1		5.5	5.5		5.5	5.5		5.8	5.8		6.1	6.1
Arsenic	mg/L	<	0.0004	0.0002		0.0005	0.0005		0.0005	0.0005	<	0.0004	0.0002		0.0005	0.0005		0.0007	0.0007		0.0007	0.0007
Barium	mg/L		0.023	0.023		0.069	0.069		0.095	0.095		0.034	0.034		0.033	0.033		0.026	0.026		0.019	0.019
Boron	mg/L		0.35	0.35		0.24	0.24		0.2	0.2		0.33	0.33		0.3	0.3		0.36	0.36		0.38	0.38
Cadmium	mg/L		0.0003	0.0003	<	0.0002	0.0001	<	0.0001	0.00005	<	0.0002	0.0001	<	0.0002	0.0001		0.0002	0.0002		0.0002	0.0002
Calcium	mg/L		365	365		288	288		167	167		295	295		246	246		349	349		383	383
Copper	mg/L		1.54	1.54		0.48	0.48		0.03	0.03		0.13	0.13		0.77	0.77		0.32	0.32		0.22	0.22
Iron	mg/L		0.08	0.08	<	0.02	0.01	<	0.02	0.01	<	0.04	0.02	<	0.04	0.02	<	0.02	0.01	<	0.02	0.01
Lead	mg/L		0.0037	0.0037		0.0137	0.0137		0.0002	0.0002		0.0055	0.0055		0.0144	0.0144		0.0046	0.0046		0.0037	0.0037
Magnesium	mg/L		147	147		121	121		69	69		118	118		101	101		142	142		153	153
Manganese	mg/L	<	0.01	0.005	<	0.005	0.0025	<	0.005	0.0025		0.02	0.02	<	0.01	0.005		0.047	0.047		0.052	0.052
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		2.6	2.6		2.7	2.7		1.9	1.9		2.6	2.6		2.4	2.4		2.4	2.4		2.2	2.2
Selenium	mg/L		0.7882	0.7882		0.6574	0.6574		0.701	0.701		0.6594	0.6594		0.6226	0.6226		0.7656	0.7656		0.8136	0.8136
Silica	mg/L		20.6	20.6		14.5	14.5		13.4	13.4		20.1	20.1		19.1	19.1		21.5	21.5		22	22
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.02	0.01	<	0.01	0.005	<	0.01	0.005	<	0.02	0.01	<	0.02	0.01	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		523	523		402	402		246	246		438	438		401	401		506	506		548	548
Strontium	mg/L		2.75	2.75		2.04	2.04		1.36	1.36		2.12	2.12		1.74	1.74		2.52	2.52		2.62	2.62
Chromium	mg/L		0.02	0.02	<	0.01	0.005	<	0.01	0.005	<	0.02	0.01	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-1: Fralick-01 Well Analytical Results

Sample Date			6/29/2016	
Lab Sample ID			1606579-1, -2	
Duplicate or Replicate				
Sample Purpose			Post-Baseline	
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**
Butane	mg/L			
Ethane	mg/L	<	0.002	0.001
Ethylene	mg/L			
Methane	mg/L	<	0.001	0.0005
Propane	mg/L	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		360	360
Alkalinity, Bicarbonate as CaCO3	mg/L		360	360
Alkalinity, Carbonate as CaCO3	mg/L	<	20	10
Bromide	mg/L	<	0.06	0.03
Chloride	mg/L		45	45
Fluoride	mg/L		0.66	0.66
Sulfate	mg/L		2900	2900
Nitrate/Nitrite as N	mg/L		7.5	7.5
Phosphorus, Total	mg/L	<	0.01	0.005
Solids, Total Dissolved	mg/L		4200	4200
Hardness as CaCO3	mg/L		1700	1700
Hydroxide as CaCO3	mg/L	<	20	10
Sum of Anions	meq/L			
Sum of Cations	meq/L			
Cation-Anion Balance	%		NA	NA
Sodium Adsorption Ratio	NU	<	0.0035	0.00175
Arsenic	mg/L	<	0.0002	0.0001
Barium	mg/L	<	0.000001	0.0000005
Boron	mg/L		0.38	0.38
Cadmium	mg/L	<	0.000088	0.000044
Calcium	mg/L		410	410
Copper	mg/L		0.06	0.06
Iron	mg/L	<	0.000016	0.000008
Lead	mg/L		0.0083	0.0083
Magnesium	mg/L		150	150
Manganese	mg/L	<	0.0000006	0.0000003
Mercury	mg/L	<	0.00006	0.00003
Potassium	mg/L		2.7	2.7
Selenium	mg/L		0.74	0.74
Silica	mg/L			
Silicon	mg/L		11	11
Silicon as SiO2	mg/L		23	23
Silver	mg/L	<	0.0000011	5.5E-07
Sodium	mg/L		600	600
Strontium	mg/L		3.2	3.2
Chromium	mg/L	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	0.17	0.085
TPH-GRO (C6-C10)	mg/L	<	0.1	0.05
Benzene	ug/L	<	0.3	0.15
Ethylbenzene	ug/L	<	0.3	0.15
m+p-Xylene	ug/L	<	0.3	0.15
o-Xylene	ug/L	<	0.3	0.15
Toluene	ug/L	<	0.3	0.15
Xylene (total)	ug/L	<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-2: State-01B Well Analytical Results

Sample Date		8/23/2012			9/18/2012			10/10/2012			11/8/2012			12/5/2012			1/3/2013			2/7/2013		
Lab Sample ID		L96381-01			L96801-02			L97253-01			L97770-01			L98206-01			L10040-01			L10564-01		
Duplicate or Replicate																						
Sample Purpose		Baseline			Baseline			Baseline			Baseline			Baseline			Post-Baseline			Post-Baseline		
Parameter	UNITS	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result
Butane	mg/L																					
Ethane	mg/L		0.12	0.12		0.12	0.12		0.13	0.13		0.11	0.11		0.19	0.19		0.18	0.18		0.08	0.08
Ethylene	mg/L																					
Methane	mg/L		18.8	18.8		12.6	12.6		23.6	23.6		9.6	9.6		19.6	19.6		16	16		10.2	10.2
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		341	341		296	296		303	303		318	318		373	373		347	347		359	359
Alkalinity, Bicarbonate as CaC	mg/L		341	341		296	296		303	303		318	318		373	373		347	347		359	359
Alkalinity, Carbonate as CaCO	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L		73.1	73.1		96.6	96.6		93.2	93.2		85.4	85.4		80.4	80.4		81	81		85.7	85.7
Chloride	mg/L		5489	5489		7062	7062		6783	6783		6423	6423		6185	6185		6123	6123		6587	6587
Fluoride	mg/L	<	10	5	<	2	1	<	10	5	<	10	5	<	10	5	<	10	5	<	10	5
Sulfate	mg/L		2440	2440		863.8	863.8		974	974		1197	1197		2159	2159		1645	1645		1671	1671
Nitrate/Nitrite as N	mg/L		18.1	18.1		0.57	0.57	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		29.5	29.5		0.57	0.57		0.13	0.13		0.1	0.1		0.08	0.08		0.03	0.03		0.08	0.08
Solids, Total Dissolved	mg/L		13700	13700		13100	13100		13000	13000		13400	13400		14600	14600		14100	14100		14200	14200
Hardness as CaCO3	mg/L		1280	1280		804	804		905	905		958	958		967	967		856	856		839	839
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		213	213		223	223		218	218		212	212		227	227		214	214		228	228
Sum of Cations	meq/L		220	220		210	210		228	228		206	206		235	235		228	228		222	222
Cation-Anion Balance	%		1.6	1.6		-3	-3		2.2	2.2		-1.4	-1.4		1.7	1.7		3.2	3.2		-1.3	-1.3
Sodium Adsorption Ratio	NU		54.3	54.3		68.2	68.2		69.5	69.5		60.3	60.3		69.2	69.2		71.8	71.8		70.7	70.7
Arsenic	mg/L		0.002	0.002	<	0.002	0.001	<	0.002	0.001		0.003	0.003		0.005	0.005		0.004	0.004		0.006	0.006
Barium	mg/L		0.2	0.2		0.16	0.16		0.11	0.11		0.15	0.15		0.1	0.1		0.17	0.17		0.16	0.16
Boron	mg/L		1.76	1.76		1.9	1.9		2	2		1.9	1.9		2.1	2.1		2.1	2.1		2	2
Cadmium	mg/L	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005
Calcium	mg/L		172	172		136	136		155	155		168	168		191	191		173	173		168	168
Copper	mg/L	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
Iron	mg/L	<	0.1	0.05	<	0.2	0.1	<	0.2	0.1	<	0.2	0.1		0.3	0.3		0.5	0.5		1	1
Lead	mg/L		0.007	0.007	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005
Magnesium	mg/L		207	207		113	113		126	126		131	131		119	119		103	103		102	102
Manganese	mg/L		0.13	0.13		0.09	0.09		0.08	0.08		0.13	0.13		0.75	0.75		0.57	0.57		0.58	0.58
Mercury	mg/L	<	0.0002	0.0001	<	0.001	0.0005	<	0.0002	0.0001	<	0.001	0.0005	<	0.0002	0.0001	<	0.0002	0.0001	<	0.001	0.0005
Potassium	mg/L		18	18		18	18		18	18		21	21		15	15		15	15		15	15
Selenium	mg/L		0.051	0.051		0.022	0.022		0.011	0.011		0.012	0.012		0.005	0.005		0.002	0.002		0.005	0.005
Silica	mg/L		7	7		7	7		7	7		7	7		10	10		10	10		9	9
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L		0.08	0.08	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
Sodium	mg/L		4410	4410		4390	4390		4750	4750		4240	4240		4890	4890		4770	4770		4650	4650
Strontium	mg/L		8.12	8.12		7.4	7.4		8.1	8.1		7.6	7.6		9.3	9.3		9	9		9	9
Chromium	mg/L		0.7	0.7	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
TPH-DRO (C10-C28)	mg/L		0.8	0.8		12.1	12.1		6.9	6.9		2	2		3.7	3.7		2.2	2.2		2.2	2.2
TPH-GRO (C6-C10)	mg/L	<	1	0.5	<	0.3	0.15	<	0.05	0.025		0.08	0.08	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	4	2	<	5	2.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	4	2	<	5	2.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	8	4	<	10	5	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	4	2	<	5	2.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	4	2	<	5	2.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-2: State-01B Well Analytical Results

Sample Date		3/6/2013			4/3/2013			8/7/2013			11/4/2013			3/11/2014			6/19/2014			9/17/2014		
Lab Sample ID		L10988-01			L11414-01			L13713-01			L15372-01			L17166-01			L18997-01			L20581-01		
Duplicate or Replicate																						
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	UNITS	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result
Butane	mg/L							<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L		0.16	0.16		0.09	0.09		0.06	0.06		0.13	0.13		0.12	0.12		0.13	0.13		0.2	0.2
Ethylene	mg/L							<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L		18.1	18.1		14.1	14.1		5.9	5.9		44.7	44.7		12	12		10.2	10.2		12.5	12.5
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		375	375		429	429		412	412		488	488		523	523		568	568		576	576
Alkalinity, Bicarbonate as CaC	mg/L		375	375		429	429		412	412		488	488		523	523		568	568		576	576
Alkalinity, Carbonate as CaCO	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L		90.6	90.6		98.9	98.9		95.4	95.4		86.4	86.4		96.5	96.5		90.9	90.9		99	99
Chloride	mg/L		6986	6986		7177	7177		7200	7200		6500	6500		6980	6980		7050	7050		7460	7460
Fluoride	mg/L	<	10	5	<	10	5	<	10	5	<	10	5	<	10	5	<	5	2.5	<	5	2.5
Sulfate	mg/L		1566	1566		1384	1384		1320	1320		1250	1250		1250	1250		1220	1220		1100	1100
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.06	0.06		0.04	0.04		0.07	0.07		0.14	0.14		0.03	0.03		0.13	0.13		0.08	0.08
Solids, Total Dissolved	mg/L		14100	14100		14000	14000		13200	13200		14300	14300		12300	12300		13400	13400		13100	13100
Hardness as CaCO3	mg/L		869	869		806	806		800	800		801	801		777	777		814	814		734	734
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		237	237		240	240		239	239		219	219		233	233		236	236		245	245
Sum of Cations	meq/L		231	231		224	224		226	226		229	229		229	229		236	236		215	215
Cation-Anion Balance	%		-1.3	-1.3		-3.4	-3.4		-2.8	-2.8		2.2	2.2		-0.9	-0.9		0	0		-6.5	-6.5
Sodium Adsorption Ratio	NU		72.1	72.1		73.1	73.1		74.1	74.1		75.1	75.1		76.6	76.6		77	77		74	74
Arsenic	mg/L		0.0071	0.0071		0.011	0.011		0.008	0.008		0.003	0.003		0.003	0.003		0.0037	0.0037		0.002	0.002
Barium	mg/L		0.15	0.15		0.17	0.17		0.16	0.16		0.12	0.12		0.12	0.12		0.1	0.1		0.11	0.11
Boron	mg/L		2	2		2.2	2.2		2.08	2.08		2.3	2.3		2.3	2.3		2.6	2.6		2.6	2.6
Cadmium	mg/L	<	0.001	0.0005	<	0.003	0.0015	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005
Calcium	mg/L		180	180		171	171		172	172		179	179		176	176		184	184		167	167
Copper	mg/L	<	0.05	0.025	<	0.1	0.05	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
Iron	mg/L		0.5	0.5	<	0.2	0.1	<	0.1	0.05		0.3	0.3	<	0.2	0.1		0.3	0.3		0.2	0.2
Lead	mg/L	<	0.001	0.0005	<	0.003	0.0015	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.0001	0.00005	<	0.001	0.0005
Magnesium	mg/L		102	102		92	92		90	90		86	86		82	82		86	86		77	77
Manganese	mg/L		0.53	0.53		0.42	0.42		0.44	0.44		0.4	0.4		0.36	0.36		0.4	0.4		0.34	0.34
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.001	0.0005
Potassium	mg/L		14	14		14	14		14	14		13	13		13	13		14	14		15	15
Selenium	mg/L		0.004	0.004		0.093	0.093		0.002	0.002		0.004	0.004	<	0.001	0.0005		0.024	0.024		0.002	0.002
Silica	mg/L		10	10		11	11		11	11		12	12		12	12		14	14		14	14
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.05	0.025	<	0.1	0.05	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
Sodium	mg/L		4830	4830		4710	4710		4760	4760		4830	4830		4850	4850		4990	4990		4550	4550
Strontium	mg/L		9.14	9.14		8.9	8.9		8.96	8.96		9.1	9.1		9.15	9.15		9.21	9.21		8.73	8.73
Chromium	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.01	0.005	<	0.1	0.05	<	0.05	0.025	<	0.05	0.025	<	0.1	0.05
TPH-DRO (C10-C28)	mg/L		1.2	1.2		0.7	0.7		0.5	0.5		2.4	2.4		0.9	0.9		0.8	0.8		0.8	0.8
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025		0.05	0.05
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-2: State-01B Well Analytical Results

Sample Date		12/17/2014			12/17/2014			12/17/2014			3/25/2015			6/17/2015			9/23/2015			12/16/2015		
Lab Sample ID		D65874-1			L22069-01			L22070-01			L23477-01			L24948-01			L26835-01			L28231-01		
Duplicate or Replicate		Replicate			Duplicate																	
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	UNITS	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result
Butane	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015			
Ethane	mg/L		0.0843	0.0843		0.17	0.17		0.18	0.18		0.13	0.13		0.14	0.14		0.18	0.18		0.22	0.22
Ethylene	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015			
Methane	mg/L		5.83	5.83		14.8	14.8		18.8	18.8		9.9	9.9		5.9	5.9		18.8	18.8		36.8	36.8
Propane	mg/L	<	0.0011	0.00055	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L					537	537		537	537		484	484		443	443		458	458		429	429
Alkalinity, Bicarbonate as CaC	mg/L		518	518		537	537		537	537		484	484		443	443		458	458		429	429
Alkalinity, Carbonate as CaCO	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L		101	101		98.6	98.6		89	89		108	108		95.3	95.3		95.5	95.5		94.3	94.3
Chloride	mg/L		6770	6770		6960	6960		6800	6800		6820	6820		7410	7410		7230	7230		7310	7310
Fluoride	mg/L	<	2.5	1.25	<	1	0.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5
Sulfate	mg/L		874	874		856	856		817	817		583	583		465	465		415	415		325	325
Nitrate/Nitrite as N	mg/L		4.7	4.7	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01		0.08	0.08		0.03	0.03	<	0.02	0.01
Phosphorus, Total	mg/L		0.2	0.2		0.11	0.11		0.12	0.12		0.05	0.05		0.04	0.04		0.12	0.12		0.06	0.06
Solids, Total Dissolved	mg/L		13500	13500		12500	12500		12100	12100		12400	12400		12500	12500		10900	10900		12600	12600
Hardness as CaCO3	mg/L					704	704		707	707		662	662		644	644		660	660		615	615
Hydroxide as CaCO3	mg/L				<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L					225	225		219	219		214	214		227	227		222	222		221	221
Sum of Cations	meq/L					213	213		216	216		211	211		207	207		216	216		206	206
Cation-Anion Balance	%		1.2	1.2		-2.7	-2.7		-0.7	-0.7		-0.7	-0.7		-4.6	-4.6		-1.4	-1.4		-3.5	-3.5
Sodium Adsorption Ratio	NU					75	75		76	76		77	77		76	76		79	79		78	78
Arsenic	mg/L	<	0.009	0.0045		0.002	0.002	<	0.002	0.001	<	0.002	0.001	<	0.002	0.001	<	0.002	0.001	<	0.002	0.001
Barium	mg/L		0.123	0.123		0.12	0.12		0.11	0.11		0.23	0.23		0.24	0.24		0.23	0.23		0.24	0.24
Boron	mg/L		3.02	3.02		2.4	2.4		2.4	2.4		2.2	2.2		2.2	2.2		2.4	2.4		2.3	2.3
Cadmium	mg/L		0.0014	0.0014	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005
Calcium	mg/L		159	159		160	160		161	161		148	148		144	144		149	149		139	139
Copper	mg/L		0.0133	0.0133	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
Iron	mg/L		0.55	0.55		1.2	1.2		1.4	1.4		0.3	0.3	<	0.2	0.1		1.1	1.1		0.6	0.6
Lead	mg/L	<	0.0041	0.00205	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005
Magnesium	mg/L		75.9	75.9		74	74		74	74		71	71		69	69		70	70		65	65
Manganese	mg/L		0.281	0.281		0.28	0.28		0.28	0.28		0.19	0.19		0.18	0.18		0.2	0.2		0.14	0.14
Mercury	mg/L		0.000025	0.000025	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		15	15		14	14		14	14		14	14		13	13		14	14		12	12
Selenium	mg/L		0.003	0.003	<	0.001	0.0005	<	0.001	0.0005		0.002	0.002		0.001	0.001		0.003	0.003		0.003	0.003
Silica	mg/L		15.7	15.7		13	13		13	13		11	11		11	11		12	12		11	11
Silicon	mg/L		7.32	7.32																		
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.0004	0.0002	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05		0.1	0.1
Sodium	mg/L		4840	4840		4510	4510		4580	4580		4480	4480		4400	4400		4600	4600		4390	4390
Strontium	mg/L		8.84	8.84		8.41	8.41		8.46	8.46		8.12	8.12		7.9	7.9		8.14	8.14		7.68	7.68
Chromium	mg/L	<	0.0014	0.0007	<	0.1	0.05	<	0.1	0.05	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05	<	0.05	0.025
TPH-DRO (C10-C28)	mg/L					0.6	0.6		1	1	<	0.1	0.05		4.5	4.5	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L				<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025		0.07	0.07		0.05	0.05
Benzene	ug/L	<	0.25	0.125	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L				<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L				<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L				<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	0.22	0.11	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-2: State-01B Well Analytical Results

Sample Date		3/22/2016			6/29/2016		
Lab Sample ID		L29552-01			1606577-1, -2		
Duplicate or Replicate							
Sample Purpose		Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L						
Ethane	mg/L		0.15	0.15		0.23	0.23
Ethylene	mg/L						
Methane	mg/L		26.7	26.7		14	14
Propane	mg/L	<	0.03	0.015	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		432	432		440	440
Alkalinity, Bicarbonate as CaC	mg/L		432	432		440	440
Alkalinity, Carbonate as CaCO	mg/L	<	2	1	<	20	10
Bromide	mg/L		95.5	95.5		110	110
Chloride	mg/L		7430	7430		8100	8100
Fluoride	mg/L	<	5	2.5	<	0.6	0.3
Sulfate	mg/L		281	281		270	270
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.003	0.0015
Phosphorus, Total	mg/L		0.03	0.03		0.35	0.35
Solids, Total Dissolved	mg/L		12900	12900		11000	11000
Hardness as CaCO3	mg/L		615	615		550	550
Hydroxide as CaCO3	mg/L	<	2	1	<	20	10
Sum of Anions	meq/L		224	224			
Sum of Cations	meq/L		206	206			
Cation-Anion Balance	%		-4.2	-4.2		NA	NA
Sodium Adsorption Ratio	NU		78	78	<	0.0049	0.00245
Arsenic	mg/L		0.0012	0.0012	<	0.0002	0.0001
Barium	mg/L		0.35	0.35		0.42	0.42
Boron	mg/L		2.4	2.4		2.4	2.4
Cadmium	mg/L	<	0.001	0.0005	<	0.000088	0.000044
Calcium	mg/L		139	139		130	130
Copper	mg/L	<	0.1	0.05	<	0.0000039	0.00000195
Iron	mg/L	<	0.2	0.1		0.15	0.15
Lead	mg/L	<	0.001	0.0005	<	0.00017	0.000085
Magnesium	mg/L		65	65		55	55
Manganese	mg/L		0.18	0.18		0.13	0.13
Mercury	mg/L	<	0.0002	0.0001	<	0.00006	0.00003
Potassium	mg/L		14	14		14	14
Selenium	mg/L		0.0024	0.0024	<	0.00066	0.00033
Silica	mg/L		11	11			
Silicon	mg/L					5.3	5.3
Silicon as SiO2	mg/L					11	11
Silver	mg/L	<	0.1	0.05	<	0.0000011	0.00000055
Sodium	mg/L		4380	4380		4200	4200
Strontium	mg/L		7.66	7.66		8.1	8.1
Chromium	mg/L	<	0.1	0.05	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.17	0.085
TPH-GRO (C6-C10)	mg/L		0.06	0.06	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	0.3	0.15
Xylene (total)	ug/L				<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-3: Tuttle-01A Well Analytical Data

Sample Date		10/10/2012			11/8/2012			12/5/2012			1/2/2013			2/5/2013			3/5/2013			4/3/2013		
Lab Sample ID		L97255-01			L97768-01			L98207-01			L10014-01			L10503-01			L10964-01			L11411-01		
Duplicate or Replicate																						
Sample Purpose		Baseline			Baseline			Baseline			Baseline			Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L																					
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L																					
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		672	672		647	647		196	196		645	645		649	649		646	646		675	675
Alkalinity, Bicarbonate as CaCO3	mg/L		672	672		647	647		184	184		645	645		649	649		646	646		675	675
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1		12	12	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25		2.14	2.14
Chloride	mg/L		79.4	79.4		70.8	70.8		65.1	65.1		66.4	66.4		72.2	72.2		75	75		86.8	86.8
Fluoride	mg/L	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	2	1
Sulfate	mg/L		3140.7	3140.7		3283.6	3283.6		3097.4	3097.4		3090.3	3090.3		2861.5	2861.5		3150.8	3150.8		3136.2	3136.2
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.44	0.44		1.01	1.01		0.36	0.36		0.07	0.07		0.14	0.14		0.15	0.15		0.06	0.06
Solids, Total Dissolved	mg/L		5280	5280		5500	5500		5490	5490		5460	5460		5480	5480		4870	4870		5520	5520
Hardness as CaCO3	mg/L		1830	1830		1920	1920		1870	1870		1870	1870		1910	1910		1830	1830		1820	1820
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		81.6	81.6		83.9	83.9		70.8	70.8		79.7	79.7		75.1	75.1		81.2	81.2		81.8	81.8
Sum of Cations	meq/L		82.7	82.7		82.5	82.5		82.5	82.5		82.7	82.7		82.4	82.4		81.2	81.2		80.6	80.6
Cation-Anion Balance	%		0.7	0.7		-0.8	-0.8		7.6	7.6		1.8	1.8		4.6	4.6		0	0		-0.7	-0.7
Sodium Adsorption Ratio	NU		10.7	10.7		10	10		10.4	10.4		10.4	10.4		10.1	10.1		10.4	10.4		10.3	10.3
Arsenic	mg/L	<	0.001	0.0005	<	0.001	0.0005	<	0.001	0.0005		0.0009	0.0009	<	0.001	0.0005	<	0.001	0.0005		0.0007	0.0007
Barium	mg/L	<	0.06	0.03		0.04	0.04		0.014	0.014		0.013	0.013	<	0.02	0.01	<	0.02	0.01		0.02	0.02
Boron	mg/L		0.7	0.7		0.93	0.93		0.9	0.9		0.92	0.92		0.96	0.96		0.9	0.9		1.02	1.02
Cadmium	mg/L	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0001	0.00005	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0001	0.00005
Calcium	mg/L		275	275		287	287		271	271		273	273		283	283		270	270		270	270
Copper	mg/L	<	0.2	0.1	<	0.05	0.025	<	0.01	0.005	<	0.01	0.005		0.11	0.11	<	0.05	0.025	<	0.05	0.025
Iron	mg/L	<	0.4	0.2	<	0.1	0.05		0.07	0.07		1.94	1.94		0.2	0.2	<	0.1	0.05		0.2	0.2
Lead	mg/L	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0001	0.00005	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0001	0.00005
Magnesium	mg/L		278	278		293	293		290	290		290	290		292	292		280	280		279	279
Manganese	mg/L		0.7	0.7		0.45	0.45		0.461	0.461		0.465	0.465		0.47	0.47		0.49	0.49		0.45	0.45
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		10	10		5	5		5.1	5.1		4.9	4.9		6	6		5	5		5	5
Selenium	mg/L	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025		0.0008	0.0008		0.0002	0.0002
Silica	mg/L		16	16		17	17		18.5	18.5		19	19		18	18		18	18		18	18
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.2	0.1	<	0.05	0.025	<	0.01	0.005	<	0.01	0.005	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Sodium	mg/L		1040	1040		997	997		1020	1020		1020	1020		1000	1000		1010	1010		1000	1000
Strontium	mg/L		3.9	3.9		3.91	3.91		3.92	3.92		3.96	3.96		4.08	4.08		3.99	3.99		4.01	4.01
Chromium	mg/L	<	0.2	0.1	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L		0.1	0.1		0.2	0.2		0.2	0.2		0.1	0.1		1	1		0.3	0.3	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-3: Tuttle-01A Well Analytical Data

Sample Date		5/8/2013			8/6/2013			11/4/2013			3/10/2014			6/18/2014			9/17/2014			12/17/2014		
Lab Sample ID		L11961-01			L13679-01			L15370-01			L17146-01			L18964-01			L20579-01			L22071-01		
Duplicate or Replicate																						
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		655	655		662	662		660	660		708	708		715	715		680	680		352	352
Alkalinity, Bicarbonate as CaCO3	mg/L		655	655		662	662		660	660		708	708		715	715		680	680		352	352
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25		36.8	36.8
Chloride	mg/L		72.2	72.2		96.2	96.2		77.9	77.9		95.4	95.4		83.4	83.4		73.4	73.4		75	75
Fluoride	mg/L	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25
Sulfate	mg/L		3192.1	3192.1		3350	3350		3160	3160		3180	3180		3400	3400		3060	3060		3090	3090
Nitrate/Nitrite as N	mg/L		0.02	0.02	<	0.02	0.01	<	0.02	0.01		0.15	0.15		0.07	0.07	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.14	0.14		0.98	0.98		0.06	0.06		0.02	0.02		0.19	0.19		0.05	0.05		0.13	0.13
Solids, Total Dissolved	mg/L		5400	5400		5500	5500		5430	5430		5320	5320		5400	5400		2780	2780		5710	5710
Hardness as CaCO3	mg/L		1810	1810		1870	1870		1890	1890		1780	1780		1700	1700		1910	1910		1850	1850
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		82.2	82.2		86.3	86.3		82	82		84	84		88	88		80	80		75	75
Sum of Cations	meq/L		80.2	80.2		83.3	83.3		83	83		79	79		74.7	74.7		82	82		80	80
Cation-Anion Balance	%		-1.2	-1.2		-1.8	-1.8		0.6	0.6		-3.1	-3.1		-8.2	-8.2		1.2	1.2		3.2	3.2
Sodium Adsorption Ratio	NU		10.3	10.3		10.6	10.6		10.3	10.3		10.3	10.3		9.8	9.8		10	10		10	10
Arsenic	mg/L	<	0.001	0.0005		0.0004	0.0004	<	0.001	0.0005	<	0.001	0.0005		0.0005	0.0005	<	0.0004	0.0002		0.0005	0.0005
Barium	mg/L		0.03	0.03		0.013	0.013		0.01	0.01		0.006	0.006		0.011	0.011		0.021	0.021		0.01	0.01
Boron	mg/L		0.92	0.92		0.87	0.87		0.89	0.89		0.83	0.83		0.81	0.81		0.9	0.9		0.88	0.88
Cadmium	mg/L	<	0.0005	0.00025	<	0.0001	0.00005	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0001	0.00005	<	0.0002	0.0001	<	0.0001	0.00005
Calcium	mg/L		267	267		274	274		278	278		269	269		254	254		285	285		274	274
Copper	mg/L	<	0.05	0.025	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Iron	mg/L		0.2	0.2		0.07	0.07		0.9	0.9		0.07	0.07		0.04	0.04		0.06	0.06		0.78	0.78
Lead	mg/L	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.0001	0.00005	<	0.0002	0.0001	<	0.0001	0.00005
Magnesium	mg/L		277	277		288	288		291	291		269	269		259	259		291	291		282	282
Manganese	mg/L		0.44	0.44		0.432	0.432		0.458	0.458		0.43	0.43		0.428	0.428		0.455	0.455		0.445	0.445
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		5	5		4.8	4.8		4.8	4.8		4.4	4.4		4.4	4.4		5.1	5.1		4.8	4.8
Selenium	mg/L	<	0.0005	0.00025		0.0003	0.0003	<	0.0005	0.00025		0.0002	0.0002		0.0001	0.0001	<	0.0002	0.0001	<	0.0001	0.00005
Silica	mg/L		18	18		18	18		18.6	18.6		16.9	16.9		16.6	16.6		19.2	19.2		18.1	18.1
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.05	0.025	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.05	0.025
Sodium	mg/L		997	997		1040	1040		1020	1020		989	989		921	921		988	988		978	978
Strontium	mg/L		4.01	4.01		4.02	4.02		4.19	4.19		3.96	3.96		3.69	3.69		4.19	4.19		4.01	4.01
Chromium	mg/L	<	0.05	0.025		0.03	0.03	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.02	0.01		0.02	0.02
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05		0.1	0.1		0.2	0.2	<	0.1	0.05		0.3	0.3
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-3: Tuttle-01A Well Analytical Data

Sample Date		3/24/2015			6/16/2015			8/11/2015			9/22/2015			12/17/2015			3/14/2016			6/28/2016		
Lab Sample ID		L23438-01			L24918-01			L25970-01			L26812-01			L28264-01			L29400-01			1606586-1, -2		
Duplicate or Replicate																						
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.03	0.015	<	0.03	0.015				<	0.03	0.015									
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01				<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.002	0.001
Ethylene	mg/L	<	0.03	0.015	<	0.03	0.015				<	0.03	0.015									
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045				<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045		0.0037	0.0037
Propane	mg/L	<	0.03	0.015	<	0.03	0.015				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		699	699		669	669					685	685		653	653		662	662		660	660
Alkalinity, Bicarbonate as CaCO3	mg/L		699	699		669	669					685	685		653	653		662	662		660	660
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1				<	2	1	<	2	1	<	2	1	<	20	10
Bromide	mg/L	<	2.5	1.25	<	2.5	1.25				<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	0.6	0.3
Chloride	mg/L		76.1	76.1		81	81					70.3	70.3		73.9	73.9		67.3	67.3		76	76
Fluoride	mg/L	<	2.5	1.25	<	2.5	1.25				<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	0.3	0.15
Sulfate	mg/L		3190	3190		3350	3350					3120	3120		3190	3190		3290	3290		3400	3400
Nitrate/Nitrite as N	mg/L	<	0.02	0.01		0.03	0.03				<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.003	0.0015
Phosphorus, Total	mg/L		0.03	0.03		0.02	0.02					0.03	0.03	<	0.02	0.01		0.04	0.04	<	0.01	0.005
Solids, Total Dissolved	mg/L		5300	5300		5400	5400					5440	5440		5640	5640		5500	5500		5800	5800
Hardness as CaCO3	mg/L		1860	1860		1790	1790					1820	1820		1880	1880		1820	1820		1800	1800
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1				<	2	1	<	2	1	<	2	1	<	20	10
Sum of Anions	meq/L		83	83		86	86					81	81		82	82		84	84			
Sum of Cations	meq/L		80	80		79	79					79	79		81	81		79	79			
Cation-Anion Balance	%		-1.8	-1.8		-4.2	-4.2					-1.3	-1.3		-0.6	-0.6		-3.1	-3.1			
Sodium Adsorption Ratio	NU		10	10		10	10					10	10		10	10		9.8	9.8	<	0.0035	0.00175
Arsenic	mg/L		0.0005	0.0005	<	0.001	0.0005				<	0.001	0.0005	<	0.001	0.0005		0.0006	0.0006	<	0.0002	0.0001
Barium	mg/L		0.008	0.008	<	0.02	0.01					0.03	0.03		0.04	0.04		0.006	0.006	<	0.000001	0.0000005
Boron	mg/L		0.83	0.83		0.88	0.88					0.87	0.87		0.89	0.89		0.83	0.83		0.91	0.91
Cadmium	mg/L	<	0.0001	0.00005	<	0.0005	0.00025				<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.000088	0.000044
Calcium	mg/L		272	272		274	274					279	279		284	284		270	270		280	280
Copper	mg/L	<	0.01	0.005	<	0.05	0.025				<	0.05	0.025	<	0.05	0.025	<	0.01	0.005	<	0.0000039	1.95E-06
Iron	mg/L		0.19	0.19	<	0.1	0.05					0.3	0.3		0.4	0.4		0.17	0.17	<	0.000016	0.000008
Lead	mg/L	<	0.0001	0.00005	<	0.0005	0.00025				<	0.0005	0.00025	<	0.0005	0.00025	<	0.0005	0.00025	<	0.00017	0.000085
Magnesium	mg/L		286	286		268	268					273	273		284	284		279	279		260	260
Manganese	mg/L		0.435	0.435		0.43	0.43					0.43	0.43		0.45	0.45		0.394	0.394		0.4	0.4
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001				<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.00006	0.00003
Potassium	mg/L		4.8	4.8		5	5					5	5		5	5		4.8	4.8		5.2	5.2
Selenium	mg/L		0.0002	0.0002	<	0.0005	0.00025					0.0005	0.0005	<	0.0005	0.00025	<	0.0005	0.00025		0.0014	0.0014
Silica	mg/L		17.9	17.9		17	17					17	17		18	18		17	17			
Silicon	mg/L																				8.4	8.4
Silicon as SiO2	mg/L																				18	18
Silver	mg/L	<	0.01	0.005	<	0.05	0.025				<	0.05	0.025	<	0.05	0.025	<	0.01	0.005	<	0.0000011	5.5E-07
Sodium	mg/L		976	976		968	968					968	968		988	988		954	954		1000	1000
Strontium	mg/L		4.03	4.03		4.02	4.02					3.97	3.97		4.05	4.05		3.81	3.81		4.5	4.5
Chromium	mg/L	<	0.01	0.005	<	0.05	0.025				<	0.05	0.025	<	0.05	0.025	<	0.01	0.005	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05				<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.17	0.085
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Xylene (total)	ug/L																			<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-4: Tuttle-01B Well Analytical Results

Sample Date		10/10/2012			11/8/2012			12/5/2012			1/2/2013			1/2/2013			2/5/2013			3/5/2013		
Lab Sample ID		L97257-01			L97769-01			L98203-01			L10013-01			L10015-01			L10504-01			L10965-01		
Duplicate or Replicate											Duplicate											
Sample Purpose		Baseline			Baseline			Baseline			Baseline			Baseline			Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L																					
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01		0.02	0.02		0.02	0.02	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L																					
Methane	mg/L		0.031	0.031		0.047	0.047		2.2	2.2		10.1	10.1		1.3	1.3		1.4	1.4		1.8	1.8
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		624	624		641	641		646	646		728	728		725	725		740	740		740	740
Alkalinity, Bicarbonate as CaCO3	mg/L		604	604		622	622		621	621		716	716		712	712		722	722		707	707
Alkalinity, Carbonate as CaCO3	mg/L		20	20		19	19		26	26		12	12		14	14		18	18		33	33
Bromide	mg/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Chloride	mg/L		40.3	40.3		35.9	35.9		38.8	38.8		35.6	35.6		36.1	36.1		39.2	39.2		38.1	38.1
Fluoride	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1		2.2	2.2		2.1	2.1
Sulfate	mg/L		1833.5	1833.5		1883.3	1883.3		1848.7	1848.7		1377.9	1377.9		1406	1406		1341.1	1341.1		1358.4	1358.4
Nitrate/Nitrite as N	mg/L	<	0.02	0.01		0.02	0.02	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.22	0.22		0.2	0.2		0.19	0.19		0.24	0.24		0.23	0.23		0.26	0.26		0.25	0.25
Solids, Total Dissolved	mg/L		3300	3300		3470	3470		3450	3450		2990	2990		2980	2980		2880	2880		2910	2910
Hardness as CaCO3	mg/L		94	94		87	87		78	78		58	58		59	59		61	61		52	52
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		52.1	52.1		53.4	53.4		52.8	52.8		44.5	44.5		45.1	45.1		44.2	44.2		44.5	44.5
Sum of Cations	meq/L		53.6	53.6		51.2	51.2		55.4	55.4		44.2	44.2		44.1	44.1		42.6	42.6		43.4	43.4
Cation-Anion Balance	%		1.4	1.4		-2.1	-2.1		2.4	2.4		-0.3	-0.3		-1.1	-1.1		-1.8	-1.8		-1.3	-1.3
Sodium Adsorption Ratio	NU		53	53		53	53		60.8	60.8		56.3	56.3		56	56		53.1	53.1		58.9	58.9
Arsenic	mg/L		0.0015	0.0015		0.0021	0.0021		0.0024	0.0024		0.0022	0.0022		0.0023	0.0023		0.0015	0.0015		0.0014	0.0014
Barium	mg/L	<	0.06	0.03		0.043	0.043		0.035	0.035		0.028	0.028		0.028	0.028		0.031	0.031		0.027	0.027
Boron	mg/L		2	2		2.07	2.07		2.19	2.19		2.14	2.14		2.18	2.18		2.17	2.17		2.19	2.19
Cadmium	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0002	0.0001	<	0.0002	0.0001
Calcium	mg/L		18	18		18	18		16.1	16.1		12.1	12.1		12.1	12.1		12.2	12.2		10.6	10.6
Copper	mg/L	<	0.2	0.1	<	0.02	0.01	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005		0.03	0.03	<	0.02	0.01
Iron	mg/L	<	0.4	0.2	<	0.04	0.02	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.04	0.02	<	0.04	0.02
Lead	mg/L		0.0002	0.0002		0.0005	0.0005	<	0.0002	0.0001	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0002	0.0001	<	0.0002	0.0001
Magnesium	mg/L		12	12		10.1	10.1		9.2	9.2		6.8	6.8		6.9	6.9		7.3	7.3		6.1	6.1
Manganese	mg/L	<	0.1	0.05		0.04	0.04		0.177	0.177		0.145	0.145		0.146	0.146		0.13	0.13		0.11	0.11
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		8	8		5	5		4	4		3.2	3.2		3.3	3.3		3.5	3.5		3	3
Selenium	mg/L		0.0004	0.0004		0.0005	0.0005		0.0003	0.0003		0.0003	0.0003	<	0.0002	0.0001	<	0.0002	0.0001		0.0002	0.0002
Silica	mg/L	<	9	4.5		6.8	6.8		8.2	8.2		7.8	7.8		7.9	7.9		7.9	7.9		8.1	8.1
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.2	0.1	<	0.02	0.01	<	0.05	0.025	<	0.01	0.005	<	0.01	0.005	<	0.02	0.01	<	0.02	0.01
Sodium	mg/L		1170	1170		1120	1120		1220	1220		976	976		973	973		938	938		960	960
Strontium	mg/L		0.6	0.6		0.66	0.66		0.65	0.65		0.51	0.51		0.52	0.52		0.51	0.51		0.47	0.47
Chromium	mg/L	<	0.2	0.1	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
TPH-DRO (C10-C28)	mg/L		1.5	1.5		0.9	0.9		0.2	0.2	<	0.1	0.05		0.6	0.6		11.4	11.4		0.9	0.9
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-4: Tuttle-01B Well Analytical Results

Sample Date		4/3/2013			5/8/2013			8/6/2013			11/4/2013			3/10/2014			6/18/2014			9/17/2014		
Lab Sample ID		L11412-01			L11962-01			L13680-01			L15371-01			L17147-01			L18965-01			L20578-01		
Duplicate or Replicate																						
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.2	0.1	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.09	0.045		0.03	0.03
Ethylene	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.1	0.05	<	0.03	0.015
Methane	mg/L		0.74	0.74		0.74	0.74		0.685	0.685		1.59	1.59		0.136	0.136		1.01	1.01		4.2	4.2
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.1	0.05	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		720	720		735	735		700	700		745	745		769	769		634	634		751	751
Alkalinity, Bicarbonate as CaCO3	mg/L		676	676		700	700		669	669		664	664		758	758		622	622		746	746
Alkalinity, Carbonate as CaCO3	mg/L		44	44		35	35		31	31		81	81		11	11		12	12		5.3	5.3
Bromide	mg/L	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25	<	2.5	1.25
Chloride	mg/L		65.2	65.2		37.4	37.4		57.7	57.7		41.1	41.1		44.4	44.4		46.1	46.1		40.4	40.4
Fluoride	mg/L	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	5	2.5	<	2.5	1.25	<	2.5	1.25
Sulfate	mg/L		1397.3	1397.3		1365.9	1365.9		1590	1590		1320	1320		1340	1340		1500	1500		1390	1390
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.41	0.41		0.29	0.29		0.27	0.27		0.31	0.31		0.3	0.3		0.31	0.31		0.28	0.28
Solids, Total Dissolved	mg/L		2900	2900		2850	2850		3020	3020		2820	2820		2820	2820		2790	2790		2830	2830
Hardness as CaCO3	mg/L		53	53		51	51		57	57		50	50		49	49		47	47		51	51
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		45.6	45.6		44.4	44.4		49	49		44	44		45	45		46	46		45	45
Sum of Cations	meq/L		43.8	43.8		43.1	43.1		44.5	44.5		43	43		42	42		40	40		43	43
Cation-Anion Balance	%		-2	-2		-1.5	-1.5		-4.8	-4.8		-1.1	-1.1		-3.4	-3.4		-7	-7		-2.3	-2.3
Sodium Adsorption Ratio	NU		58.4	58.4		58.7	58.7		57.6	57.6		58.9	58.9		58.3	58.3		56	56		58	58
Arsenic	mg/L		0.0029	0.0029		0.0014	0.0014		0.0015	0.0015		0.0016	0.0016		0.0025	0.0025		0.0015	0.0015		0.0012	0.0012
Barium	mg/L		0.029	0.029		0.032	0.032		0.026	0.026		0.022	0.022		0.024	0.024		0.02	0.02		0.022	0.022
Boron	mg/L		2.26	2.26		2.09	2.09		2.16	2.16		2.14	2.14		2.06	2.06		1.98	1.98		2.15	2.15
Cadmium	mg/L	<	0.0001	0.00005	<	0.0002	0.0001	<	0.0001	0.00005	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0001	0.00005	<	0.0002	0.0001
Calcium	mg/L		10.8	10.8		10.5	10.5		11.6	11.6		10.2	10.2		10.2	10.2		9.6	9.6		10.5	10.5
Copper	mg/L		0.03	0.03	<	0.02	0.01	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Iron	mg/L	<	0.04	0.02	<	0.04	0.02		0.02	0.02	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Lead	mg/L	<	0.0001	0.00005	<	0.0002	0.0001		0.0001	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0001	0.00005	<	0.0002	0.0001
Magnesium	mg/L		6.4	6.4		6.1	6.1		6.7	6.7		6	6		5.8	5.8		5.5	5.5		6.1	6.1
Manganese	mg/L		0.1	0.1		0.1	0.1		0.086	0.086		0.07	0.07		0.07	0.07		0.057	0.057		0.058	0.058
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		3.8	3.8		3.2	3.2		3.3	3.3		3	3		2.9	2.9		3	3		3	3
Selenium	mg/L		0.0003	0.0003	<	0.0002	0.0001		0.0002	0.0002	<	0.0002	0.0001		0.0001	0.0001	<	0.0001	0.00005		0.0002	0.0002
Silica	mg/L		7.6	7.6		7.7	7.7		7.9	7.9		7.8	7.8		7.6	7.6		7.2	7.2		7.9	7.9
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		969	969		955	955		984	984		947	947		930	930		874	874		947	947
Strontium	mg/L		0.48	0.48		0.48	0.48		0.5	0.5		0.46	0.46		0.451	0.451		0.447	0.447		0.457	0.457
Chromium	mg/L	<	0.01	0.005	<	0.02	0.01	<	0.01	0.005	<	0.02	0.01	<	0.01	0.005	<	0.01	0.005	<	0.02	0.01
TPH-DRO (C10-C28)	mg/L		0.3	0.3		0.5	0.5		0.1	0.1	<	0.1	0.05		0.3	0.3		0.2	0.2		0.2	0.2
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-4: Tuttle-01B Well Analytical Results

Sample Date		12/17/2014			12/17/2014			3/24/2015			6/16/2015			8/11/2015			9/22/2015			12/17/2015		
Lab Sample ID		L22072-01			D65873-1			L23439-01			L24919-01			L25971-01			L26813-01			L28265-01		
Duplicate or Replicate					Replicate																	
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.03	0.015				<	0.03	0.015	<	0.03	0.015				<	0.03	0.015			
Ethane	mg/L		0.04	0.04	<	0.0008	0.0004	<	0.02	0.01		0.03	0.03					0.05	0.05	<	0.02	0.01
Ethylene	mg/L	<	0.03	0.015				<	0.03	0.015	<	0.03	0.015				<	0.03	0.015			
Methane	mg/L		4.53	4.53	<	0.0004	0.0002		0.349	0.349		9	9					4.8	4.8		8.3	8.3
Propane	mg/L	<	0.03	0.015	<	0.0011	0.00055	<	0.03	0.015	<	0.03	0.015				<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		728	728					691	691		672	672					713	713		674	674
Alkalinity, Bicarbonate as CaCO3	mg/L		703	703		670	670		689	689		660	660					689	689		642	642
Alkalinity, Carbonate as CaCO3	mg/L		24.3	24.3		3.2	3.2		2.8	2.8		12.1	12.1					24.6	24.6		31.9	31.9
Bromide	mg/L	<	2.5	1.25		0.31	0.31	<	2.5	1.25	<	2.5	1.25				<	2.5	1.25	<	1	0.5
Chloride	mg/L		49.5	49.5		34.3	34.3		40.4	40.4		44.1	44.1					36.3	36.3		33.2	33.2
Fluoride	mg/L	<	2.5	1.25		1.7	1.7	<	2.5	1.25	<	2.5	1.25				<	2.5	1.25	<	2.5	1.25
Sulfate	mg/L		1450	1450		1500	1500		1580	1580		1700	1700					1530	1530		1390	1390
Nitrate/Nitrite as N	mg/L	<	0.02	0.01		0.17	0.17	<	0.02	0.01	<	0.02	0.01				<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.3	0.3		0.28	0.28		0.26	0.26		0.29	0.29					0.3	0.3		0.27	0.27
Solids, Total Dissolved	mg/L		2910	2910		3040	3040		3040	3040		2920	2920					2980	2980		3030	3030
Hardness as CaCO3	mg/L		53	53					57	57		56	56					56	56		54.9	54.9
Hydroxide as CaCO3	mg/L	<	2	1				<	2	1	<	2	1				<	2	1	<	2	1
Sum of Anions	meq/L		46	46					48	48		50	50					47	47		44	44
Sum of Cations	meq/L		42	42					43	43		43	43					44	44		43	43
Cation-Anion Balance	%		-4.5	-4.5		1.4	1.4		-5.5	-5.5		-7.5	-7.5					-3.3	-3.3		-1.1	-1.1
Sodium Adsorption Ratio	NU		56	56					56	56		56	56					57	57		57	57
Arsenic	mg/L		0.0008	0.0008	<	0.009	0.0045		0.001	0.001		0.0008	0.0008					0.0006	0.0006		0.0009	0.0009
Barium	mg/L		0.023	0.023		0.0259	0.0259		0.022	0.022		0.025	0.025					0.029	0.029		0.026	0.026
Boron	mg/L		2.06	2.06		2.5	2.5		1.95	1.95		2.02	2.02					2.02	2.02		2.02	2.02
Cadmium	mg/L	<	0.0002	0.0001	<	0.00036	0.00018	<	0.0001	0.00005	<	0.0002	0.0001				<	0.0002	0.0001	<	0.0002	0.0001
Calcium	mg/L		10.8	10.8		11.4	11.4		11.4	11.4		11.3	11.3					11.4	11.4		11.1	11.1
Copper	mg/L	<	0.02	0.01		0.0062	0.0062	<	0.01	0.005	<	0.02	0.01				<	0.02	0.01	<	0.02	0.01
Iron	mg/L	<	0.04	0.02		0.0211	0.0211	<	0.02	0.01	<	0.04	0.02				<	0.04	0.02	<	0.04	0.02
Lead	mg/L	<	0.0002	0.0001	<	0.0041	0.00205	<	0.0001	0.00005	<	0.0002	0.0001				<	0.0002	0.0001	<	0.0002	0.0001
Magnesium	mg/L		6.4	6.4		6.57	6.57		6.9	6.9		6.8	6.8					6.6	6.6		6.6	6.6
Manganese	mg/L		0.05	0.05		0.0641	0.0641		0.058	0.058		0.06	0.06					0.05	0.05		0.04	0.04
Mercury	mg/L	<	0.0002	0.0001		0.000044	0.000044	<	0.0002	0.0001	<	0.0002	0.0001				<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		3.5	3.5		3.18	3.18		3.3	3.3		3.3	3.3					3.3	3.3		3.2	3.2
Selenium	mg/L	<	0.0002	0.0001	<	0.00042	0.00021	<	0.0001	0.00005	<	0.0002	0.0001					0.0013	0.0013	<	0.0002	0.0001
Silica	mg/L		7.2	7.2		7.7	7.7		7.3	7.3		7	7					7.2	7.2		7	7
Silicon	mg/L					3.58	3.58															
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.02	0.01	<	0.0004	0.0002	<	0.01	0.005	<	0.02	0.01				<	0.02	0.01	<	0.02	0.01
Sodium	mg/L		935	935		1050	1050		952	952		952	952					974	974		959	959
Strontium	mg/L		0.49	0.49		0.491	0.491		0.509	0.509		0.5	0.5					0.5	0.5		0.5	0.5
Chromium	mg/L	<	0.02	0.01		0.0014	0.0014	<	0.01	0.005	<	0.02	0.01				<	0.02	0.01	<	0.02	0.01
TPH-DRO (C10-C28)	mg/L		0.5	0.5					0.7	0.7		0.5	0.5				<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025				<	0.05	0.025	<	0.05	0.025	<	0.05	0.025		0.05	0.05	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	0.25	0.125	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5				<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1				<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5				<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	0.22	0.11	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-4: Tuttle-01B Well Analytical Results

Sample Date		3/14/2016			6/28/2016		
Lab Sample ID		L29401-01			1606589-1, -2		
Duplicate or Replicate							
Sample Purpose		Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L						
Ethane	mg/L		0.03	0.03		0.051	0.051
Ethylene	mg/L						
Methane	mg/L		5.2	5.2		4.2	4.2
Propane	mg/L	<	0.03	0.015		0.0024	0.0024
Alkalinity, Total as CaCO3	mg/L		670	670		670	670
Alkalinity, Bicarbonate as CaCO3	mg/L		609	609		670	670
Alkalinity, Carbonate as CaCO3	mg/L		60.3	60.3	<	20	10
Bromide	mg/L	<	1	0.5	<	0.06	0.03
Chloride	mg/L		32.5	32.5		34	34
Fluoride	mg/L	<	1	0.5		1.5	1.5
Sulfate	mg/L		1540	1540		1800	1800
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.003	0.0015
Phosphorus, Total	mg/L		0.3	0.3		0.46	0.46
Solids, Total Dissolved	mg/L		3070	3070		3400	3400
Hardness as CaCO3	mg/L		51	51		59	59
Hydroxide as CaCO3	mg/L	<	2	1	<	20	10
Sum of Anions	meq/L		47	47			
Sum of Cations	meq/L		40	40			
Cation-Anion Balance	%		-8	-8			
Sodium Adsorption Ratio	NU		54	54	<	0.0035	0.00175
Arsenic	mg/L		0.0011	0.0011	<	0.0002	0.0001
Barium	mg/L		0.016	0.016	<	0.000001	0.0000005
Boron	mg/L		1.83	1.83		2.2	2.2
Cadmium	mg/L	<	0.0001	0.00005	<	0.000088	0.000044
Calcium	mg/L		10.6	10.6		12	12
Copper	mg/L	<	0.01	0.005	<	0.0000039	1.95E-06
Iron	mg/L	<	0.02	0.01	<	0.000016	0.000008
Lead	mg/L	<	0.0001	0.00005		0.0011	0.0011
Magnesium	mg/L		6	6		6.8	6.8
Manganese	mg/L		0.035	0.035		0.04	0.04
Mercury	mg/L	<	0.0002	0.0001	<	0.00006	0.00003
Potassium	mg/L		2.9	2.9		3.7	3.7
Selenium	mg/L	<	0.0002	0.0001	<	0.00066	0.00033
Silica	mg/L		6.4	6.4			
Silicon	mg/L					3.4	3.4
Silicon as SiO2	mg/L					7.3	7.3
Silver	mg/L	<	0.01	0.005	<	0.0000011	5.5E-07
Sodium	mg/L		877	877		1100	1100
Strontium	mg/L		0.463	0.463		0.61	0.61
Chromium	mg/L	<	0.01	0.005	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05		0.87	0.87
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	0.3	0.15
Xylene (total)	ug/L				<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-5: Jones-01 Well Analytical Results

Sample Date		12/4/2012			2/7/2013			4/2/2013			5/7/2013			8/8/2013			11/6/2013			3/11/2014		
Lab Sample ID		L98177-01			L10552-01			L11392-01			L11936-01			L13758-01			L15414-01			L17165-01		
Duplicate or Replicate																						
Sample Purpose		Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L										<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L										<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		134	134		163	163		160	160		160	160		331	331		207	207		214	214
Alkalinity, Bicarbonate as CaCO3	mg/L		133	133		160	160		160	160		160	160		331	331		207	207		214	214
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1		3	3	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125
Chloride	mg/L		4.24	4.24		2.55	2.55		3.51	3.51		10.22	10.22		20.7	20.7		12.1	12.1		7.53	7.53
Fluoride	mg/L	<	0.1	0.05	<	0.2	0.1	<	0.2	0.1	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25
Sulfate	mg/L		115.71	115.71		155.31	155.31		156.43	156.43		239.52	239.52		199	199		166	166		217	217
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01		0.34	0.34	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.02	0.02		0.08	0.08		0.01	0.01		0.02	0.02	<	0.01	0.005		0.01	0.01	<	0.01	0.005
Solids, Total Dissolved	mg/L		300	300		410	410		400	400		540	540		696	696		650	650		540	540
Hardness as CaCO3	mg/L		200	200		272	272		264	264		344	344		496	496		296	296		343	343
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		5.2	5.2		6.6	6.6		6.6	6.6		8.5	8.5		11.4	11.4		8	8		9.1	9.1
Sum of Cations	meq/L		5.4	5.4		6.6	6.6		6.4	6.4		8.2	8.2		12	12		7.5	7.5		8.3	8.3
Cation-Anion Balance	%		1.9	1.9		0	0		-1.5	-1.5		-1.8	-1.8		2.6	2.6		-3.2	-3.2		-4.6	-4.6
Sodium Adsorption Ratio	NU		0.93	0.93		0.66	0.66		0.66	0.66		0.67	0.67		0.83	0.83		0.89	0.89		0.74	0.74
Arsenic	mg/L	<	0.0002	0.0001		0.0002	0.0002	<	0.0002	0.0001	<	0.0002	0.0001		0.0003	0.0003	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L		0.059	0.059		0.086	0.086		0.075	0.075		0.092	0.092		0.169	0.169		0.071	0.071		0.091	0.091
Boron	mg/L		0.03	0.03		0.04	0.04		0.02	0.02		0.03	0.03		0.04	0.04		0.03	0.03		0.03	0.03
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Calcium	mg/L		42	42		64.3	64.3		61.3	61.3		80.7	80.7		124	124		63.2	63.2		81.9	81.9
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Iron	mg/L		0.15	0.15		0.12	0.12		0.09	0.09		0.09	0.09		0.27	0.27		0.04	0.04		0.15	0.15
Lead	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005		0.0001	0.0001	<	0.0001	0.00005	<	0.0001	0.00005		0.0002	0.0002
Magnesium	mg/L		23.1	23.1		27	27		26.9	26.9		34.7	34.7		45.3	45.3		33.5	33.5		33.7	33.7
Manganese	mg/L		0.297	0.297		0.463	0.463		0.398	0.398		0.258	0.258		1.54	1.54		0.336	0.336		0.417	0.417
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		1.9	1.9		1.9	1.9		1.8	1.8		1.9	1.9		3.3	3.3		2.6	2.6		2	2
Selenium	mg/L		0.0001	0.0001		0.0004	0.0004		0.0005	0.0005		0.003	0.003		0.0003	0.0003		0.0002	0.0002		0.0005	0.0005
Silica	mg/L		8.2	8.2		13.8	13.8		12.3	12.3		11.3	11.3		21.6	21.6		9.5	9.5		12.2	12.2
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		29.7	29.7		24.7	24.7		24.3	24.3		28.2	28.2		42	42		34.6	34.6		31.1	31.1
Strontium	mg/L		0.24	0.24		0.36	0.36		0.33	0.33		0.43	0.43		0.68	0.68		0.4	0.4		0.428	0.428
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected

Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-5: Jones-01 Well Analytical Results

Sample Date		6/20/2014			9/18/2014			12/18/2014			3/26/2015			6/17/2015			8/11/2015			9/23/2015		
Lab Sample ID		L19031-01			L20619-01			L22101-01			L23503-01			L24949-01			L25968-01			L26834-01		
Duplicate or Replicate																						
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015				<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01				<	0.02	0.01
Ethylene	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015				<	0.03	0.015
Methane	mg/L		0.02	0.02	<	0.009	0.0045		0.019	0.019	<	0.009	0.0045		0.019	0.019					0.022	0.022
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015				<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		346	346		291	291		231	231		218	218		251	251					198	198
Alkalinity, Bicarbonate as CaCO3	mg/L		346	346		291	291		231	231		218	218		251	251					198	198
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1				<	2	1
Bromide	mg/L	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125				<	0.25	0.125
Chloride	mg/L		21.3	21.3		14.1	14.1		13.8	13.8		10.1	10.1		13.5	13.5					11.9	11.9
Fluoride	mg/L	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125	<	0.25	0.125				<	0.25	0.125
Sulfate	mg/L		211	211		170	170		146	146		198	198		242	242					176	176
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01		0.06	0.06	<	0.02	0.01				<	0.02	0.01
Phosphorus, Total	mg/L		0.01	0.01		0.01	0.01		0.02	0.02		0.02	0.02		0.01	0.01					0.01	0.01
Solids, Total Dissolved	mg/L		660	660		570	570		464	464		526	526		640	640					494	494
Hardness as CaCO3	mg/L		476	476		398	398		307	307		356	356		417	417					336	336
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1				<	2	1
Sum of Anions	meq/L		12	12		9.8	9.8		8.1	8.1		8.8	8.8		11	11					8	8
Sum of Cations	meq/L		11	11		9.6	9.6		7.7	7.7		8.8	8.8		9.9	9.9					8.3	8.3
Cation-Anion Balance	%		-4.3	-4.3		-1	-1		-2.5	-2.5		0	0		-5.3	-5.3					1.8	1.8
Sodium Adsorption Ratio	NU		0.75	0.75		0.76	0.76		0.84	0.84		0.81	0.81		0.73	0.73					0.82	0.82
Arsenic	mg/L		0.0002	0.0002		0.0002	0.0002	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001				<	0.0002	0.0001
Barium	mg/L		0.148	0.148		0.126	0.126		0.072	0.072		0.089	0.089		0.115	0.115					0.092	0.092
Boron	mg/L		0.03	0.03		0.05	0.05		0.02	0.02		0.03	0.03		0.03	0.03					0.04	0.04
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005				<	0.0001	0.00005
Calcium	mg/L		120	120		97.9	97.9		67.2	67.2		82.8	82.8		102	102					72.4	72.4
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005				<	0.01	0.005
Iron	mg/L		0.23	0.23		0.23	0.23		0.19	0.19		0.29	0.29		0.26	0.26					0.35	0.35
Lead	mg/L	<	0.0001	0.00005	<	0.0001	0.00005		0.0003	0.0003		0.0003	0.0003		0.0001	0.0001					0.0002	0.0002
Magnesium	mg/L		42.8	42.8		37.3	37.3		33.7	33.7		36.2	36.2		39.5	39.5					37.8	37.8
Manganese	mg/L		1.24	1.24		0.938	0.938		0.532	0.532		0.352	0.352		0.441	0.441					0.386	0.386
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001				<	0.0002	0.0001
Potassium	mg/L		2.7	2.7		2.8	2.8		2.6	2.6		2.4	2.4		2.2	2.2					2.4	2.4
Selenium	mg/L		0.0002	0.0002	<	0.0001	0.00005	<	0.0001	0.00005		0.0009	0.0009		0.0003	0.0003					0.0004	0.0004
Silica	mg/L		18.5	18.5		15.3	15.3		9.6	9.6		11.8	11.8		13.4	13.4					8.5	8.5
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005				<	0.01	0.005
Sodium	mg/L		37.2	37.2		34.5	34.5		33.4	33.4		34.7	34.7		33.7	33.7					34.2	34.2
Strontium	mg/L		0.655	0.655		0.561	0.561		0.404	0.404		0.437	0.437		0.581	0.581					0.458	0.458
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005				<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05				<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected

Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-5: Jones-01 Well Analytical Results

Sample Date		3/29/2016			6/29/2016		
Lab Sample ID		1603554-1, -2			1606578-1, -2		
Duplicate or Replicate							
Sample Purpose		Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L						
Ethane	mg/L	<	0.002	0.001	<	0.002	0.001
Ethylene	mg/L						
Methane	mg/L	<	0.001	0.0005		0.0014	0.0014
Propane	mg/L	<	0.001	0.0005	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		120	120		41	41
Alkalinity, Bicarbonate as CaCO3	mg/L		120	120		41	41
Alkalinity, Carbonate as CaCO3	mg/L	<	20	10	<	20	10
Bromide	mg/L	<	0.06	0.03	<	0.06	0.03
Chloride	mg/L		20	20		11	11
Fluoride	mg/L		0.79	0.79		0.75	0.75
Sulfate	mg/L		65	65		21	21
Nitrate/Nitrite as N	mg/L		0.25	0.25		0.03	0.03
Phosphorus, Total	mg/L	<	0.01	0.005	<	0.01	0.005
Solids, Total Dissolved	mg/L		270	270		92	92
Hardness as CaCO3	mg/L		150	150		48	48
Hydroxide as CaCO3	mg/L	<	20	10	<	20	10
Sum of Anions	meq/L						
Sum of Cations	meq/L						
Cation-Anion Balance	%						
Sodium Adsorption Ratio	NU		0.84	0.84		0.83	0.83
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L	<	0.000001	0.0000005	<	0.000001	0.0000005
Boron	mg/L	<	0.0000099	4.95E-06	<	0.000012	0.000006
Cadmium	mg/L	<	0.000088	0.000044	<	0.000088	0.000044
Calcium	mg/L		38	38		12	12
Copper	mg/L	<	0.0000019	9.5E-07	<	0.0000039	1.95E-06
Iron	mg/L	<	0.000014	0.000007	<	0.000016	0.000008
Lead	mg/L	<	0.00017	0.000085	<	0.00017	0.000085
Magnesium	mg/L		14	14		4.3	4.3
Manganese	mg/L	<	8.7E-07	4.35E-07	<	0.0000006	0.0000003
Mercury	mg/L	<	0.00006	0.00003	<	0.00006	0.00003
Potassium	mg/L		2.2	2.2		1.8	1.8
Selenium	mg/L	<	0.00066	0.00033	<	0.00066	0.00033
Silica	mg/L						
Silicon	mg/L					3.3	3.3
Silicon as SiO2	mg/L					7	7
Silver	mg/L	<	0.0000019	9.5E-07	<	0.0000011	5.5E-07
Sodium	mg/L		24	24		13	13
Strontium	mg/L		0.26	0.26		0.09	0.09
Chromium	mg/L	<	0.1333338	0.1333336	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	0.17	0.085	<	0.17	0.085
TPH-GRO (C6-C10)	mg/L	<	0.1	0.05	<	0.1	0.05
Benzene	ug/L	<	0.3	0.15	<	0.3	0.15
Ethylbenzene	ug/L	<	0.3	0.15	<	0.3	0.15
m+p-Xylene	ug/L	<	0.3	0.15	<	0.3	0.15
o-Xylene	ug/L	<	0.3	0.15	<	0.3	0.15
Toluene	ug/L	<	0.3	0.15	<	0.3	0.15
Xylene (total)	ug/L	<	1	0.5	<	1	0.5

Notes:
ND = Not detected

Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-6: Myhre-01 Well Analytical Results

Sample Date		12/3/2012			4/2/2013			5/7/2013			8/7/2013			3/12/2014			6/20/2014			9/18/2014		
Lab Sample ID		L98160-01			L11391-01			L11937-01			L13711-01			L17181-01			L19029-01			L20622-01		
Duplicate or Replicate																						
Sample Purpose		Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L							<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L							<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L	<	0.009	0.0045	<	0.009		<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		392	392		417	417		419	419		391	391		424	424		428	428		426	426
Alkalinity, Bicarbonate as CaCO3	mg/L		392	392		416	416		419	419		391	391		424	424		428	428		426	426
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Bromide	mg/L		0.078	0.078	<	0.1	0.05	<	0.1	0.05	<	0.5	0.25	<	0.1	0.05	<	0.1	0.05		0.091	0.091
Chloride	mg/L		3.63	3.63		5.21	5.21		4.03	4.03		4.48	4.48		4.28	4.28		4.11	4.11		3.72	3.72
Fluoride	mg/L		0.17	0.17		0.48	0.48	<	0.2	0.1		0.14	0.14	<	0.2	0.1		0.14	0.14		0.19	0.19
Sulfate	mg/L		171.36	171.36		166.76	166.76		176.88	176.88		164	164		174	174		190	190		151	151
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01		0.02	0.02	<	0.02	0.01		0.03	0.03	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005		0.01	0.01		0.01	0.01
Solids, Total Dissolved	mg/L		650	650		650	650		660	660		672	672		650	650		650	650		640	640
Hardness as CaCO3	mg/L		315	315		306	306		288	288		317	317		292	292		316	316		295	295
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		11.6	11.6		12	12		12.2	12.2		11.4	11.4		12	12		13	13		12	12
Sum of Cations	meq/L		12	12		11.6	11.6		11	11		11.7	11.7		11	11		12	12		11	11
Cation-Anion Balance	%		1.7	1.7		-1.7	-1.7		-5.2	-5.2		1.3	1.3		-4.3	-4.3		-4	-4		-4.3	-4.3
Sodium Adsorption Ratio	NU		3.18	3.18		3.07	3.07		3.03	3.03		2.97	2.97		3.14	3.14		3.1	3.1		3.1	3.1
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L		0.017	0.017		0.019	0.019		0.016	0.016		0.018	0.018		0.019	0.019		0.021	0.021		0.017	0.017
Boron	mg/L		0.14	0.14		0.13	0.13		0.14	0.14		0.14	0.14		0.14	0.14		0.14	0.14		0.13	0.13
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Calcium	mg/L		75.4	75.4		73.3	73.3		68.8	68.8		77.2	77.2		70.8	70.8		77.5	77.5		72	72
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Iron	mg/L		0.06	0.06		0.04	0.04	<	0.02	0.01	<	0.02	0.01		0.03	0.03		0.03	0.03	<	0.02	0.01
Lead	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Magnesium	mg/L		30.7	30.7		29.9	29.9		28.3	28.3		30.2	30.2		27.9	27.9		29.7	29.7		27.9	27.9
Manganese	mg/L		0.01	0.01		0.015	0.015		0.009	0.009		0.012	0.012		0.011	0.011		0.02	0.02		0.009	0.009
Mercury	mg/L		0.0003	0.0003	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		2.9	2.9		2.8	2.8		2.7	2.7		2.9	2.9		2.8	2.8		2.9	2.9		2.9	2.9
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Silica	mg/L		15.1	15.1		14.4	14.4		14.7	14.7		14.6	14.6		13.8	13.8		14.1	14.1		13.8	13.8
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		128	128		122	122		117	117		120	120		122	122		124	124		121	121
Strontium	mg/L		1.95	1.95		1.94	1.94		1.82	1.82		2.05	2.05		1.9	1.9		2	2		1.91	1.91
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05		0.1	0.1	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-6: Myhre-01 Well Analytical Results

Sample Date		9/18/2014			12/18/2014			3/25/2015			6/18/2015			9/23/2015			3/22/2016			6/30/2016		
Lab Sample ID		L20623-01			L22100-01			L23475-01			L24987-01			L26833-01			1603432-1, -2			1607310-1, -2		
Duplicate or Replicate		Duplicate																				
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	UNITS	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result
Butane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015						
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.002	0.001	<	0.002	0.001
Ethylene	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015						
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045		0.0068	0.0068	<	0.001	0.0005
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.001	0.0005	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		429	429		441	441		421	421		421	421		435	435		410	410		410	410
Alkalinity, Bicarbonate as CaCO3	mg/L		429	429		441	441		421	421		421	421		435	435		410	410		410	410
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	20	10	<	20	10
Bromide	mg/L		0.092	0.092	<	0.25	0.125	<	0.5	0.25	<	0.25	0.125	<	0.25	0.125	<	0.06	0.03	<	0.06	0.03
Chloride	mg/L		3.7	3.7		4.06	4.06	<	5	2.5		2.93	2.93		3.46	3.46	<	0.06	0.03	<	0.06	0.03
Fluoride	mg/L		0.18	0.18	<	0.25	0.125	<	0.5	0.25	<	0.25	0.125	<	0.25	0.125		0.2	0.2	<	0.03	0.015
Sulfate	mg/L		151	151		164	164		160	160		161	161		148	148		160	160		10	10
Nitrate/Nitrite as N	mg/L		0.03	0.03	<	0.02	0.01		0.02	0.02	<	0.02	0.01		0.02	0.02		0.03	0.03		0.01	0.01
Phosphorus, Total	mg/L	<	0.01	0.005	<	0.01	0.005		0.02	0.02	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Solids, Total Dissolved	mg/L		650	650		646	646		640	640		650	650		640	640		710	710		650	650
Hardness as CaCO3	mg/L		297	297		304	304		299	299		285	285		306	306		310	310		310	310
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	20	10	<	20	10
Sum of Anions	meq/L		12	12		12	12		12	12		12	12		12	12						
Sum of Cations	meq/L		11	11		12	12		11	11		11	11		12	12						
Cation-Anion Balance	%		-4.3	-4.3		0	0		-4.3	-4.3		-4.3	-4.3		0	0						
Sodium Adsorption Ratio	NU		3.1	3.1		3	3		3	3		3.1	3.1		3.2	3.2		3	3		2.9	2.9
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L		0.017	0.017		0.019	0.019		0.017	0.017		0.019	0.019		0.018	0.018	<	0.000001	0.0000005	<	0.000001	0.0000005
Boron	mg/L		0.14	0.14		0.13	0.13		0.12	0.12		0.13	0.13		0.14	0.14		0.14	0.14		0.13	0.13
Cadmium	mg/L	<	0.0001	0.00005		0.0003	0.0003	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.000088	0.000044	<	0.000088	0.000044
Calcium	mg/L		72.7	72.7		74.3	74.3		71.9	71.9		69.5	69.5		73.9	73.9		73	73		74	74
Copper	mg/L	<	0.01	0.005		3.11	3.11	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000039	1.95E-06	<	0.0000019	9.5E-07
Iron	mg/L	<	0.02	0.01		0.15	0.15	<	0.02	0.01		0.04	0.04		0.03	0.03	<	0.000016	0.000008	<	0.000014	0.000007
Lead	mg/L	<	0.0001	0.00005		0.0003	0.0003	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.00017	0.000085	<	0.00017	0.000085
Magnesium	mg/L		28.1	28.1		28.8	28.8		29	29		27.1	27.1		29.4	29.4		30	30		30	30
Manganese	mg/L		0.009	0.009		0.013	0.013		0.01	0.01		0.012	0.012		0.01	0.01		0.01	0.01		0.01	0.01
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.00006	0.00003	<	0.00006	0.00003
Potassium	mg/L		2.9	2.9		2.9	2.9		2.8	2.8		2.9	2.9		3	3		3.2	3.2		4	4
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.00066	0.00033	<	0.00066	0.00033
Silica	mg/L		13.8	13.8		14.2	14.2		13.9	13.9		13.5	13.5		14.2	14.2						
Silicon	mg/L																				6.7	6.7
Silicon as SiO2	mg/L																				14	14
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000011	5.5E-07	<	0.0000019	9.5E-07
Sodium	mg/L		122	122		119	119		119	119		119	119		126	126		120	120		120	120
Strontium	mg/L		1.93	1.93		2.02	2.02		1.89	1.89		1.87	1.87		1.92	1.92		1.9	1.9		1.9	1.9
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000024	0.0000012	<	0.0000014	0.0000007
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.19	0.095	<	0.15	0.075
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	0.3	0.15	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Xylene (total)	ug/L																<	1	0.5	<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-7: Myhre-02 Spring Analytical Results

Sample Date		12/3/2012			5/7/2013			6/20/2014			9/18/2014			3/25/2015			6/18/2015			3/22/2016	
Lab Sample ID		L98155-01			L11938-01			L19030-01			L20621-01			L23476-01			L24988-01			1603430-1,2	
Sample Collection Point		Trough			Trough			Outfall			Outfall			Trough			Outfall			Outfall	
Sample Purpose		Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline	
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**ND**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015			
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.002	0.001
Ethylene	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015			
Methane	mg/L	<	0.009	0.0045		0.011	0.011	<	0.009	0.0045	<	0.009	0.0045		0.03	0.03	<	0.009	0.0045	<	0.001	0.0005
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		148	148		85	85		222	222		156	156		181	181		216	216		260	260
Alkalinity, Bicarbonate as CaCO3	mg/L		110	110		44	44		217	217		156	156		181	181		216	216		260	260
Alkalinity, Carbonate as CaCO3	mg/L		38	38		41	41		5	5	<	2	1	<	2	1	<	2	1	<	20	10
Bromide	mg/L		0.086	0.086		0.101	0.101	<	0.05	0.025		0.094	0.094	<	0.05	0.025	<	0.05	0.025	<	0.06	0.03
Chloride	mg/L		5.11	5.11		3.05	3.05		3.07	3.07		6.06	6.06		6.5	6.5		1.42	1.42		5.2	5.2
Fluoride	mg/L		0.15	0.15		0.12	0.12		0.13	0.13		0.16	0.16		0.13	0.13		0.11	0.11		0.16	0.16
Sulfate	mg/L		17.17	17.17		15.75	15.75		16.2	16.2		19.2	19.2		4.95	4.95		15.2	15.2		20	20
Nitrate/Nitrite as N	mg/L		0.08	0.08		0.25	0.25		0.59	0.59		0.21	0.21	<	0.02	0.01		0.35	0.35		2.2	2.2
Phosphorus, Total	mg/L		0.03	0.03		0.08	0.08		0.09	0.09		0.03	0.03		0.07	0.07		0.12	0.12		0.3166667	0.3166667
Solids, Total Dissolved	mg/L		220	220		160	160		250	250		240	240		202	202		260	260		352	352
Hardness as CaCO3	mg/L		118	118		80	80		157	157		115	115		134	134		183	183		250	250
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	20	10
Sum of Anions	meq/L		3.5	3.5		2.1	2.1		4.9	4.9		3.7	3.7		3.9	3.9		4.7	4.7			
Sum of Cations	meq/L		3.8	3.8		2.2	2.2		4.1	4.1		3.6	3.6		3.8	3.8		4.6	4.6			
Cation-Anion Balance	%		4.1	4.1		2.3	2.3		-8.9	-8.9		-1.4	-1.4		-1.3	-1.3		-1.1	-1.1			
Sodium Adsorption Ratio	NU		1.26	1.26		0.67	0.67		0.76	0.76		1.1	1.1		0.86	0.86		0.63	0.63		0.72	0.72
Arsenic	mg/L		0.0025	0.0025		0.0021	0.0021		0.0018	0.0018		0.0021	0.0021		0.0018	0.0018		0.0017	0.0017		0.0021	0.0021
Barium	mg/L		0.078	0.078		0.063	0.063		0.099	0.099		0.065	0.065		0.197	0.197		0.107	0.107		0.15	0.15
Boron	mg/L		0.04	0.04		0.04	0.04		0.04	0.04		0.04	0.04		0.03	0.03		0.04	0.04	<	0.000012	0.000006
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.000088	0.000044
Calcium	mg/L		28.4	28.4		22.9	22.9		48.7	48.7		29.1	29.1		37.3	37.3		59.7	59.7		80	80
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000039	1.95E-06
Iron	mg/L		0.09	0.09		0.1	0.1	<	0.02	0.01		0.09	0.09		0.39	0.39		0.07	0.07	<	0.000016	0.000008
Lead	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.00017	0.000085
Magnesium	mg/L		11.5	11.5		5.5	5.5		8.6	8.6		10.4	10.4		10	10		8.2	8.2		12	12
Manganese	mg/L	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025		0.006	0.006	<	0.005	0.0025	<	0.0000006	0.0000003
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.00006	0.00003
Potassium	mg/L		1.1	1.1		1.3	1.3		0.9	0.9		2.1	2.1		2.3	2.3		1.1	1.1		1.9	1.9
Selenium	mg/L		0.0008	0.0008		0.0008	0.0008		0.0007	0.0007		0.0006	0.0006		0.0002	0.0002		0.0005	0.0005	<	0.00066	0.00033
Silica	mg/L		21.2	21.2		18.2	18.2		18.4	18.4		21.7	21.7		12.8	12.8		18.7	18.7			
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000011	5.5E-07
Sodium	mg/L		31.1	31.1		13.5	13.5		21.7	21.7		26.7	26.7		22.6	22.6		19.5	19.5		26	26
Strontium	mg/L		0.3	0.3		0.2	0.2		0.328	0.328		0.457	0.457		0.314	0.314		0.371	0.371		0.47	0.47
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.19	0.095
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Xylene (total)	ug/L																			<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-7: Myhre-02 Spring Analytical Results

Sample Date		6/30/2016		
Lab Sample ID		1607309-1,2		
Sample Collection Point		Unknown		
Sample Purpose		Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**
Butane	mg/L			
Ethane	mg/L	<	0.04725	0.04675
Ethylene	mg/L			
Methane	mg/L	<	0.0248	0.02455
Propane	mg/L	<	0.0685	0.06825
Alkalinity, Total as CaCO3	mg/L		360	360
Alkalinity, Bicarbonate as CaCO3	mg/L		360	360
Alkalinity, Carbonate as CaCO3	mg/L	<	20	10
Bromide	mg/L	<	0.06	0.03
Chloride	mg/L		0.51	0.51
Fluoride	mg/L	<	0.03	0.015
Sulfate	mg/L		2.2	2.2
Nitrate/Nitrite as N	mg/L		0.35	0.35
Phosphorus, Total	mg/L		0.2	0.2
Solids, Total Dissolved	mg/L		250	250
Hardness as CaCO3	mg/L		200	200
Hydroxide as CaCO3	mg/L	<	20	10
Sum of Anions	meq/L			
Sum of Cations	meq/L			
Cation-Anion Balance	%			
Sodium Adsorption Ratio	NU		0.63	0.63
Arsenic	mg/L	<	0.0002	0.0001
Barium	mg/L		0.12	0.12
Boron	mg/L	<	0.0000099	4.95E-06
Cadmium	mg/L	<	0.000088	0.000044
Calcium	mg/L		64	64
Copper	mg/L	<	0.0000019	9.5E-07
Iron	mg/L	<	0.000014	0.000007
Lead	mg/L	<	0.00017	0.000085
Magnesium	mg/L		9	9
Manganese	mg/L	<	8.7E-07	4.35E-07
Mercury	mg/L	<	0.00006	0.00003
Potassium	mg/L		1.1	1.1
Selenium	mg/L	<	0.00066	0.00033
Silica	mg/L			
Silicon	mg/L		9.8	9.8
Silicon as SiO2	mg/L		21	21
Silver	mg/L	<	0.0000019	9.5E-07
Sodium	mg/L		20	20
Strontium	mg/L		0.35	0.35
Chromium	mg/L	<	0.0000014	0.0000007
TPH-DRO (C10-C28)	mg/L	<	3.27	3.235
TPH-GRO (C6-C10)	mg/L	<	0.1	0.05
Benzene	ug/L	<	0.3	0.15
Ethylbenzene	ug/L	<	0.3	0.15
m+p-Xylene	ug/L	<	0.3	0.15
o-Xylene	ug/L	<	0.3	0.15
Toluene	ug/L	<	0.3	0.15
Xylene (total)	ug/L	<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-8: Saddleback-01 Well Analytical Results

Sample Date		12/4/2012			2/6/2013			3/4/2013			4/1/2013			5/7/2013			8/8/2013			3/11/2014		
Lab Sample ID		L98178-01			L10534-01			L10947-01			L11362-01			L11935-01			L13757-01			L17162-01		
Duplicate or Replicate																				Yes		
Sample Purpose		Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	UNITS	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result
Butane	mg/L													<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L													<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L		0.032	0.032		0.059	0.059		0.057	0.057		0.078	0.078		0.08	0.08		0.032	0.032		0.073	0.073
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		609	609		592	592		605	605		616	616		599	599		618	618		664	664
Alkalinity, Bicarbonate as CaCO3	mg/L		545	545		539	539		561	561		561	561		547	547		567	567		603	603
Alkalinity, Carbonate as CaCO3	mg/L		64	64		53	53		44	44		55	55		53	53		51	51		62	62
Bromide	mg/L	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25
Chloride	mg/L		6.42	6.42		7.3	7.3		7.1	7.1		13	13		6	6		10.4	10.4		6.83	6.83
Fluoride	mg/L		0.84	0.84		1.2	1.2		1.2	1.2		1.3	1.3	<	1	0.5	<	1	0.5		0.81	0.81
Sulfate	mg/L		409.3	409.3		378.5	378.5		390.4	390.4		414.5	414.5		405.7	405.7		406	406		402	402
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01		0.04	0.04	<	0.02	0.01
Phosphorus, Total	mg/L		0.03	0.03		0.04	0.04		0.04	0.04		0.04	0.04		0.04	0.04		0.03	0.03		0.03	0.03
Solids, Total Dissolved	mg/L		1260	1260		1290	1290		1280	1280		1270	1270		1280	1280		1260	1260		1230	1230
Hardness as CaCO3	mg/L		14	14		16	16		13	13		14	14		13	13		14	14		14	14
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		21	21		20.1	20.1		20.6	20.6		21.5	21.5		20.7	20.7		21.2	21.2		22	22
Sum of Cations	meq/L		21	21		19.6	19.6		20.1	20.1		20.3	20.3		20.2	20.2		20.8	20.8		21	21
Cation-Anion Balance	%		0	0		-1.3	-1.3		-1.2	-1.2		-2.9	-2.9		-1.2	-1.2		-1	-1		-2.3	-2.3
Sodium Adsorption Ratio	NU		55.4	55.4		48.2	48.2		54.3	54.3		52.5	52.5		54.5	54.5		55.6	55.6		54.4	54.4
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L		0.015	0.015		0.016	0.016		0.012	0.012		0.013	0.013		0.015	0.015		0.014	0.014		0.013	0.013
Boron	mg/L		0.42	0.42		0.41	0.41		0.4	0.4		0.41	0.41		0.41	0.41		0.41	0.41		0.39	0.39
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Calcium	mg/L		3.3	3.3		3.6	3.6		3	3		3.3	3.3		3	3		3.3	3.3		3.2	3.2
Copper	mg/L	<	0.01	0.005		0.01	0.01	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Iron	mg/L	<	0.02	0.01		0.07	0.07		0.05	0.05	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Lead	mg/L		0.0001	0.0001		0.0001	0.0001	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005		0.0001	0.0001	<	0.0001	0.00005
Magnesium	mg/L		1.4	1.4		1.7	1.7		1.4	1.4		1.5	1.5		1.4	1.4		1.3	1.3		1.4	1.4
Manganese	mg/L	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		1.5	1.5		1.8	1.8		1.5	1.5		1.6	1.6		1.5	1.5		1.5	1.5		1.5	1.5
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Silica	mg/L		7.6	7.6		7.3	7.3		7.2	7.2		7.4	7.4		7.6	7.6		7.1	7.1		7.1	7.1
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		471	471		438	438		449	449		453	453		451	451		466	466		458	458
Strontium	mg/L		0.29	0.29		0.3	0.3		0.29	0.29		0.3	0.3		0.28	0.28		0.29	0.29		0.294	0.294
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-8: Saddleback-01 Well Analytical Results

Sample Date		3/11/2014			9/18/2014			12/18/2014			3/25/2015			6/18/2015			8/11/2015			8/11/2015		
Lab Sample ID		L17163-01			L20618-01			L22099-01			L23473-01			L24985-01			L25969-01			L25972-01		
Duplicate or Replicate																	Duplicate					
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015						
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01						
Ethylene	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015						
Methane	mg/L		0.083	0.083		0.056	0.056		0.116	0.116		0.282	0.282		0.151	0.151						
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015						
Alkalinity, Total as CaCO3	mg/L		642	642		634	634		646	646		664	664		652	652						
Alkalinity, Bicarbonate as CaCO3	mg/L		587	587		582	582		586	586		614	614		590	590						
Alkalinity, Carbonate as CaCO3	mg/L		54	54		51.3	51.3		60.4	60.4		50.3	50.3		61.8	61.8						
Bromide	mg/L	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25	<	0.5	0.25						
Chloride	mg/L		7.89	7.89		6.84	6.84		7.24	7.24		7.48	7.48	<	5	2.5						
Fluoride	mg/L	<	1	0.5		0.77	0.77		0.77	0.77		0.82	0.82	<	0.5	0.25						
Sulfate	mg/L		410	410		401	401		392	392		351	351		345	345						
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01		0.03	0.03						
Phosphorus, Total	mg/L		0.03	0.03		0.04	0.04		0.03	0.03		0.04	0.04		0.04	0.04						
Solids, Total Dissolved	mg/L		1270	1270		1270	1270		1280	1280		1210	1210		1200	1200						
Hardness as CaCO3	mg/L		14	14		17	17		14	14		14	14		15	15						
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1						
Sum of Anions	meq/L		22	22		21	21		21	21		21	21		20	20						
Sum of Cations	meq/L		20	20		21	21		20	20		19	19		19	19						
Cation-Anion Balance	%		-4.8	-4.8		0	0		-2.4	-2.4		-5	-5		-2.6	-2.6						
Sodium Adsorption Ratio	NU		53.9	53.9		50	50		52	52		51	51		48	48						
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001						
Barium	mg/L		0.013	0.013		0.021	0.021		0.013	0.013		0.009	0.009		0.012	0.012						
Boron	mg/L		0.39	0.39		0.4	0.4		0.39	0.39		0.37	0.37		0.39	0.39						
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005						
Calcium	mg/L		3.2	3.2		3.7	3.7		3.2	3.2		3.1	3.1		3.4	3.4						
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005		0.01	0.01						
Iron	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01						
Lead	mg/L	<	0.0001	0.00005		0.0001	0.0001		0.0002	0.0002	<	0.0001	0.00005	<	0.0001	0.00005						
Magnesium	mg/L		1.4	1.4		1.8	1.8		1.5	1.5		1.5	1.5		1.6	1.6						
Manganese	mg/L	<	0.005	0.0025		0.005	0.005	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025						
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001						
Potassium	mg/L		1.6	1.6		1.7	1.7		1.6	1.6		1.6	1.6		1.5	1.5						
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005						
Silica	mg/L		7	7		7.1	7.1		7.3	7.3		7.2	7.2		7	7						
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005						
Sodium	mg/L		454	454		461	461		444	444		430	430		427	427						
Strontium	mg/L		0.296	0.296		0.35	0.35		0.296	0.296		0.272	0.272		0.279	0.279						
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005						
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05						
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-8: Saddleback-01 Well Analytical Results

Sample Date		9/24/2015			3/29/2016			6/29/2016		
Lab Sample ID		L26863-01			1603555-1, -2			1606576-1, -2		
Duplicate or Replicate										
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.03	0.015						
Ethane	mg/L	<	0.02	0.01	<	0.002	0.001	<	0.002	0.001
Ethylene	mg/L	<	0.03	0.015						
Methane	mg/L		0.386	0.386		0.77	0.77		0.64	0.64
Propane	mg/L	<	0.03	0.015	<	0.001	0.0005	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		671	671		650	650		670	670
Alkalinity, Bicarbonate as CaCO3	mg/L		596	596		650	650		670	670
Alkalinity, Carbonate as CaCO3	mg/L		74.9	74.9	<	20	10	<	20	10
Bromide	mg/L	<	0.5	0.25	<	0.06	0.03	<	0.06	0.03
Chloride	mg/L		6.04	6.04		8.1	8.1		7.3	7.3
Fluoride	mg/L	<	0.5	0.25		0.65	0.65		0.85	0.85
Sulfate	mg/L		296	296		350	350		420	420
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.003	0.0015	<	0.003	0.0015
Phosphorus, Total	mg/L		0.03	0.03	<	0.01	0.005	<	0.15	0.075
Solids, Total Dissolved	mg/L		1160	1160		1500	1500		1300	1300
Hardness as CaCO3	mg/L		14	14		13	13		14	14
Hydroxide as CaCO3	mg/L	<	2	1	<	20	10	<	20	10
Sum of Anions	meq/L		20	20						
Sum of Cations	meq/L		19	19						
Cation-Anion Balance	%		-2.6	-2.6						
Sodium Adsorption Ratio	NU		52	52		51	51		52	52
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L		0.011	0.011	<	0.000001	0.0000005	<	0.000001	0.0000005
Boron	mg/L		0.4	0.4		0.42	0.42		0.4	0.4
Cadmium	mg/L	<	0.0001	0.00005	<	0.000088	0.000044	<	0.000088	0.000044
Calcium	mg/L		3.1	3.1		3.1	3.1		3.2	3.2
Copper	mg/L	<	0.01	0.005	<	0.0000019	9.5E-07	<	0.0000039	1.95E-06
Iron	mg/L	<	0.02	0.01	<	0.000014	0.000007	<	0.000016	0.000008
Lead	mg/L		0.0014	0.0014	<	0.00017	0.000085		0.0011	0.0011
Magnesium	mg/L		1.4	1.4		1.4	1.4		1.4	1.4
Manganese	mg/L	<	0.005	0.0025	<	8.7E-07	4.35E-07	<	0.0000006	0.0000003
Mercury	mg/L	<	0.0002	0.0001	<	0.00006	0.00003	<	0.00006	0.00003
Potassium	mg/L		1.6	1.6		2.5	2.5		1.7	1.7
Selenium	mg/L	<	0.0001	0.00005	<	0.00066	0.00033	<	0.00066	0.00033
Silica	mg/L		7	7						
Silicon	mg/L								3.5	3.5
Silicon as SiO2	mg/L								7.4	7.4
Silver	mg/L	<	0.01	0.005	<	0.0000019	9.5E-07	<	0.0000011	5.5E-07
Sodium	mg/L		433	433		430	430		440	440
Strontium	mg/L		0.263	0.263		0.27	0.27		0.32	0.32
Chromium	mg/L		0.01	0.01	<	0.0000014	0.0000007	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.17	0.085	<	0.17	0.085
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	0.3	0.15	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	0.3	0.15	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Xylene (total)	ug/L				<	1	0.5	<	1	0.5

Notes:

ND = Not detected

Calc Res = Result used for calculations (1/2 MDL for ND)

Red fill and text: Result value 25% greater than baseline max

Blue fill and text: Result value 25% greater than baseline average

Green fill and text: Result value 25% less than baseline average

Orange fill: Analyte detections post-completion (baseline ND)

Purple fill: CAB is greater than 5%

Table A-9: Walsh-01 Well Analytical Results

Sample Date		12/3/2012			1/2/2013			1/2/2013			2/6/2013			2/6/2013			3/4/2013			4/1/2013		
Lab Sample ID		L98159-01			L10019-01			L10020-01			L10535-01			L10536-01			L10951-01			L11364-01		
Duplicate or Replicate					Duplicate						Duplicate											
Sample Purpose		Baseline			Baseline			Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L																					
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L																					
Methane	mg/L		2.1	2.1		2.1	2.1		2.9	2.9		0.22	0.22		0.24	0.24		1.1	1.1		1.05	1.05
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		588	588		629	629		608	608		540	540		525	525		564	564		572	572
Alkalinity, Bicarbonate as CaCO3	mg/L		522	522		559	559		537	537		474	474		454	454		504	504		505	505
Alkalinity, Carbonate as CaCO3	mg/L		66	66		70	70		71	71		66	66		70	70		61	61		68	68
Bromide	mg/L		0.166	0.166		0.244	0.244		0.247	0.247		0.166	0.166		0.16	0.16		0.218	0.218		0.305	0.305
Chloride	mg/L		26.9	26.9		39.98	39.98		39.53	39.53		16.57	16.57		15.6	15.6		27.33	27.33		25.67	25.67
Fluoride	mg/L		6.9	6.9		6.36	6.36		6.35	6.35		8	8		8.13	8.13		7.28	7.28		7.96	7.96
Sulfate	mg/L		28.35	28.35		15.11	15.11		15.14	15.14		38.62	38.62		35.96	35.96		26.55	26.55		29.97	29.97
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.03	0.03		0.03	0.03		0.03	0.03		0.03	0.03		0.03	0.03		0.03	0.03		0.03	0.03
Solids, Total Dissolved	mg/L		740	740		790	790		790	790		710	710		700	700		740	740		710	710
Hardness as CaCO3	mg/L		8	8		8	8		8	8		7	7		7	7		7	7		8	8
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		13.5	13.5		14.4	14.4		13.9	13.9		12.5	12.5		12.1	12.1		13	13		13.2	13.2
Sum of Cations	meq/L		13.7	13.7		14.2	14.2		14	14		11.9	11.9		12.1	12.1		13.1	13.1		13	13
Cation-Anion Balance	%		0.7	0.7		-0.7	-0.7		0.4	0.4		-2.5	-2.5		0	0		0.4	0.4		-0.8	-0.8
Sodium Adsorption Ratio	NU		47.8	47.8		49.8	49.8		48.3	48.3		44.1	44.1		44.8	44.8		48.8	48.8		46.2	46.2
Arsenic	mg/L		0.0028	0.0028		0.0016	0.0016		0.0014	0.0014		0.0037	0.0037		0.0037	0.0037		0.0018	0.0018		0.0026	0.0026
Barium	mg/L		0.028	0.028		0.033	0.033		0.035	0.035		0.024	0.024		0.025	0.025		0.029	0.029		0.027	0.027
Boron	mg/L		1.31	1.31		1.31	1.31		1.31	1.31		1.25	1.25		1.25	1.25		1.25	1.25		1.25	1.25
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Calcium	mg/L		1.7	1.7		1.7	1.7		1.8	1.8		1.5	1.5		1.5	1.5		1.5	1.5		1.6	1.6
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005		0.02	0.02		0.02	0.02	<	0.01	0.005	<	0.01	0.005
Iron	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Lead	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Magnesium	mg/L		0.9	0.9		0.9	0.9		0.9	0.9		0.8	0.8		0.8	0.8		0.8	0.8		0.9	0.9
Manganese	mg/L	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025
Mercury	mg/L		0.0003	0.0003	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		1.7	1.7		1.7	1.7		1.7	1.7		1.7	1.7		1.7	1.7		1.7	1.7		1.7	1.7
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Silica	mg/L		7.3	7.3		7	7		7.1	7.1		6.8	6.8		6.9	6.9		6.8	6.8		6.8	6.8
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		306	306		319	319		314	314		266	266		270	270		294	294		291	291
Strontium	mg/L		0.09	0.09		0.1	0.1		0.1	0.1		0.08	0.08		0.08	0.08		0.09	0.09		0.09	0.09
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.09	0.045
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-9: Walsh-01 Well Analytical Results

Sample Date		4/1/2013			5/6/2013			8/8/2013			11/5/2013			11/5/2013			3/11/2014			6/19/2014		
Lab Sample ID		L11366-01			L11912-01			L13756-01			L15395-01			L15396-01			L17164-01			L18995-01		
Duplicate or Replicate		Duplicate												Duplicate								
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L				<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L		0.7	0.7		0.116	0.116		0.77	0.77		0.365	0.365		0.77	0.77		3.1	3.1		4.17	4.17
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		569	569		516	516		631	631		544	544		560	560		537	537		566	566
Alkalinity, Bicarbonate as CaCO3	mg/L		506	506		451	451		573	573		466	466		489	489		483	483		492	492
Alkalinity, Carbonate as CaCO3	mg/L		63	63		65	65		59	59		78	78		71	71		54	54		74	74
Bromide	mg/L	<	0.5	0.25		0.225	0.225		0.29	0.29		0.194	0.194		0.312	0.312		0.296	0.296		0.212	0.212
Chloride	mg/L		32.4	32.4		16.2	16.2		48.6	48.6		22.5	22.5		21.3	21.3		39	39		15.6	15.6
Fluoride	mg/L		7.7	7.7		8.15	8.15		6.9	6.9		7.63	7.63		7.27	7.27		6.54	6.54		7.6	7.6
Sulfate	mg/L		20.8	20.8		41.95	41.95		9.45	9.45		33.9	33.9		31.2	31.2		16.5	16.5		40.1	40.1
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.03	0.03		0.03	0.03		0.03	0.03		0.03	0.03		0.04	0.04		0.02	0.02		0.03	0.03
Solids, Total Dissolved	mg/L		730	730		690	690		808	808		720	720		710	710		760	760		680	680
Hardness as CaCO3	mg/L		7	7		6	6		8	8		10	10		6	6		8	8		7	7
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		13.1	13.1		12.1	12.1		14.6	14.6		13	13		13	13		13	13		13	13
Sum of Cations	meq/L		13	13		11.7	11.7		14.9	14.9		12	12		12	12		14	14		12	12
Cation-Anion Balance	%		-0.4	-0.4		-1.7	-1.7		1	1		-4	-4		-4	-4		3.7	3.7		-4	-4
Sodium Adsorption Ratio	NU		46.8	46.8		46.6	46.6		51.4	51.4		37.9	37.9		45.5	45.5		49.2	49.2		46	46
Arsenic	mg/L		0.0026	0.0026		0.004	0.004		0.0008	0.0008		0.003	0.003		0.003	0.003		0.0014	0.0014		0.003	0.003
Barium	mg/L		0.026	0.026		0.025	0.025		0.036	0.036		0.025	0.025		0.025	0.025		0.033	0.033		0.027	0.027
Boron	mg/L		1.25	1.25		1.25	1.25		1.32	1.32		1.23	1.23		1.23	1.23		1.24	1.24		1.25	1.25
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Calcium	mg/L		1.5	1.5		1.3	1.3		1.8	1.8		1.6	1.6		1.4	1.4		1.6	1.6		1.5	1.5
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005		0.01	0.01		0.01	0.01	<	0.01	0.005	<	0.01	0.005
Iron	mg/L	<	0.02	0.01		0.07	0.07	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Lead	mg/L		0.0002	0.0002	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Magnesium	mg/L		0.9	0.9		0.7	0.7		0.9	0.9		1.4	1.4		0.7	0.7		0.9	0.9		0.8	0.8
Manganese	mg/L	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		1.7	1.7		1.5	1.5		1.9	1.9		1.5	1.5		1.4	1.4		1.7	1.7		1.6	1.6
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005		0.0003	0.0003	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Silica	mg/L		6.8	6.8		7	7		7	7		6.8	6.8		6.8	6.8		6.8	6.8		6.8	6.8
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		290	290		262	262		334	334		269	269		261	261		310	310		277	277
Strontium	mg/L		0.09	0.09		0.08	0.08		0.11	0.11		0.08	0.08		0.08	0.08		0.101	0.101		0.082	0.082
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-9: Walsh-01 Well Analytical Results

Sample Date		9/18/2014			12/18/2014			3/25/2015			6/18/2015			9/23/2015			3/22/2016			6/30/2016		
Lab Sample ID		L20617-01			L22103-01			L23474-01			L24984-01			L26832-01			1603431-1, -2			1607311-1, -2		
Duplicate or Replicate																						
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.2	0.1	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015						
Ethane	mg/L	<	0.09	0.045	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.002	0.001	<	0.002	0.001
Ethylene	mg/L	<	0.1	0.05	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015						
Methane	mg/L		0.96	0.96		0.137	0.137		1.87	1.87		5.3	5.3		0.313	0.313		0.18	0.18		1.6	1.6
Propane	mg/L	<	0.1	0.05	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.001	0.0005	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		566	566		567	567		618	618		657	657		550	550		560	560		620	620
Alkalinity, Bicarbonate as CaCO3	mg/L		498	498		466	466		557	557		582	582		468	468		560	560		620	620
Alkalinity, Carbonate as CaCO3	mg/L		68.4	68.4		101	101		60.7	60.7		75	75		81.9	81.9	<	20	10	<	20	10
Bromide	mg/L	<	0.25	0.125		0.151	0.151	<	0.1	0.05		0.199	0.199	<	0.1	0.05	<	0.06	0.03	<	0.06	0.03
Chloride	mg/L		20.4	20.4		15.6	15.6		27.9	27.9		43.8	43.8		13.9	13.9	<	0.06	0.03		0.2	0.2
Fluoride	mg/L		7.04	7.04		7.68	7.68		7.03	7.03		6.02	6.02		6.48	6.48		8	8	<	0.03	0.015
Sulfate	mg/L		30	30		40.6	40.6		28	28		10.4	10.4		36.3	36.3		38	38	<	0.3	0.15
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01		0.02	0.02	<	0.003	0.0015
Phosphorus, Total	mg/L		0.02	0.02		0.03	0.03		0.03	0.03		0.04	0.04		0.02	0.02	<	0.01	0.005	<	0.01	0.005
Solids, Total Dissolved	mg/L		680	680		654	654		714	714		804	804		664	664		1000	1000		910	910
Hardness as CaCO3	mg/L		8.9	8.9		7	7		8.1	8.1		9.3	9.3		7.5	7.5		3.8	3.8		4.5	4.5
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	20	10	<	20	10
Sum of Anions	meq/L		13	13		13	13		14	14		15	15		13	13						
Sum of Cations	meq/L		12	12		12	12		13	13		14	14		12	12						
Cation-Anion Balance	%		-4	-4		-4	-4		-3.7	-3.7		-3.4	-3.4		-4	-4						
Sodium Adsorption Ratio	NU		40	40		43	43		44	44		44	44		44	44		41	41		48	48
Arsenic	mg/L		0.0026	0.0026		0.0035	0.0035		0.0019	0.0019		0.0008	0.0008		0.0037	0.0037		0.003	0.003	<	0.0002	0.0001
Barium	mg/L		0.027	0.027		0.022	0.022		0.027	0.027		0.036	0.036		0.024	0.024	<	0.000001	0.0000005	<	0.000001	0.0000005
Boron	mg/L		1.22	1.22		1.19	1.19		1.16	1.16		1.22	1.22		1.21	1.21		1.3	1.3		1.3	1.3
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.000088	0.000044	<	0.000088	0.000044
Calcium	mg/L		1.6	1.6		1.5	1.5		1.6	1.6		1.9	1.9		1.5	1.5		1.5	1.5		1.8	1.8
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000039	1.95E-06	<	0.0000019	9.5E-07
Iron	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.000016	0.000008	<	0.000014	0.000007
Lead	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.00017	0.000085	<	0.00017	0.000085
Magnesium	mg/L		1.2	1.2		0.8	0.8		1	1		1.1	1.1		0.9	0.9	<	0.000058	0.000029	<	0.000019	0.0000095
Manganese	mg/L	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.0000006	0.0000003	<	8.7E-07	4.35E-07
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.00006	0.00003	<	0.00006	0.00003
Potassium	mg/L		1.7	1.7		1.6	1.6		1.8	1.8		1.7	1.7		1.7	1.7		2	2		3.1	3.1
Selenium	mg/L	<	0.0001	0.00005		0.0001	0.0001	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.00066	0.00033	<	0.00066	0.00033
Silica	mg/L		6.6	6.6		6.6	6.6		6.7	6.7		6.7	6.7		6.8	6.8						
Silicon	mg/L																				3.4	3.4
Silicon as SiO2	mg/L																				7.2	7.2
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000011	5.5E-07	<	0.0000019	9.5E-07
Sodium	mg/L		273	273		262	262		286	286		306	306		271	271		260	260		320	320
Strontium	mg/L		0.084	0.084		0.077	0.077		0.087	0.087		0.105	0.105		0.078	0.078		0.08	0.08		0.1	0.1
Chromium	mg/L	<	0.01	0.005		0.01	0.01	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000024	0.0000012	<	0.0000014	0.0000007
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.18	0.09	<	0.14	0.07
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.1	0.05	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	0.3	0.15	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15	<	0.3	0.15
Xylene (total)	ug/L																<	1	0.5	<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-10: Werner-01 Well Analytical Results

Sample Date		12/4/2012			3/4/2013			4/2/2013			5/7/2013			8/15/2013			11/6/2013			3/12/2014		
Lab Sample ID		L98176-01			L10948-01			L11393-01			L11939-01			L13901-01			L15415-01			L17182-01		
Duplicate or Replicate																						
Sample Purpose		Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	UNITS	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result	ND	Result	Calc Result
Butane	mg/L										<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Ethylene	mg/L										<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015
Alkalinity, Total as CaCO3	mg/L		459	459		441	441		445	445		442	442		433	433		443	443		472	472
Alkalinity, Bicarbonate as CaCO3	mg/L		459	459		440	440		444	444		442	442		424	424		443	443		472	472
Alkalinity, Carbonate as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1		9	9	<	2	1	<	2	1
Bromide	mg/L		0.08	0.08	<	0.1	0.05		0.219	0.219	<	0.1	0.05	<	0.1	0.05		0.119	0.119	<	0.1	0.05
Chloride	mg/L		4.69	4.69		4.97	4.97		5.95	5.95		4.88	4.88		9.07	9.07		5.23	5.23		5.32	5.32
Fluoride	mg/L		0.14	0.14		0.21	0.21	<	0.2	0.1	<	0.2	0.1	<	0.2	0.1	<	0.2	0.1	<	0.2	0.1
Sulfate	mg/L		166.98	166.98		172.64	172.64		159.45	159.45		170.47	170.47		160	160		169	169		183	183
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01
Phosphorus, Total	mg/L		0.01	0.01	<	0.01	0.005	<	0.01	0.005		0.02	0.02		0.02	0.02		0.01	0.01		0.01	0.01
Solids, Total Dissolved	mg/L		700	700		710	710		700	700		700	700		714	714		740	740		710	710
Hardness as CaCO3	mg/L		227	227		232	232		229	229		224	224		183	183		226	226		208	208
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
Sum of Anions	meq/L		12.8	12.8		12.6	12.6		12.4	12.4		12.6	12.6		12.3	12.3		13	13		13	13
Sum of Cations	meq/L		12.9	12.9		12.7	12.7		12.8	12.8		12.1	12.1		11.7	11.7		12	12		12	12
Cation-Anion Balance	%		0.4	0.4		0.4	0.4		1.6	1.6		-2	-2		-2.5	-2.5		-4	-4		-4	-4
Sodium Adsorption Ratio	NU		5.5	5.5		5.2	5.2		5.32	5.32		5.01	5.01		5.82	5.82		5.1	5.1		5.43	5.43
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L		0.023	0.023		0.021	0.021		0.02	0.02		0.016	0.016		0.019	0.019		0.019	0.019		0.019	0.019
Boron	mg/L		0.17	0.17		0.15	0.15		0.17	0.17		0.16	0.16		0.16	0.16		0.16	0.16		0.16	0.16
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Calcium	mg/L		52	52		53.1	53.1		52.2	52.2		51.1	51.1		42.3	42.3		52.5	52.5		48.3	48.3
Copper	mg/L		0.02	0.02	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Iron	mg/L	<	0.02	0.01		0.02	0.02		0.02	0.02	<	0.02	0.01		0.08	0.08		0.03	0.03	<	0.02	0.01
Lead	mg/L	<	0.0001	0.00005		0.0003	0.0003	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005
Magnesium	mg/L		23.5	23.5		24.1	24.1		24	24		23.3	23.3		18.9	18.9		23	23		21.3	21.3
Manganese	mg/L		0.008	0.008	<	0.005	0.0025		0.008	0.008	<	0.005	0.0025	<	0.005	0.0025		0.023	0.023	<	0.005	0.0025
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Potassium	mg/L		3.2	3.2		3.2	3.2		3.2	3.2		3	3		2.7	2.7		3.1	3.1		3	3
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005		0.0001	0.0001
Silica	mg/L		13.4	13.4		13.1	13.1		13	13		13.5	13.5		12	12		13.2	13.2		12.2	12.2
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Sodium	mg/L		188	188		180	180		183	183		170	170		179	179		174	174		178	178
Strontium	mg/L		2.07	2.07		2.15	2.15		2.11	2.11		2.01	2.01		1.77	1.77		2.12	2.12		1.98	1.98
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5
Xylene (total)	ug/L																					

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-10: Werner-01 Well Analytical Results

Sample Date		6/20/2014			9/18/2014			3/26/2015			6/17/2015			6/17/2015			9/23/2015			3/29/2016		
Lab Sample ID		L19032-01			L20620-01			L23504-01			L24945-01			L24946-01			L26836-01			1603557-1,2		
Duplicate or Replicate											Duplicate											
Sample Purpose		Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline			Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**	**ND**	**Result**	**Calc Result**
Butane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015			
Ethane	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.002	0.001
Ethylene	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015			
Methane	mg/L	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045	<	0.009	0.0045		0.013	0.013		0.0085	0.0085
Propane	mg/L	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.03	0.015	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		469	469		459	459		485	485		450	450		460	460		468	468		460	460
Alkalinity, Bicarbonate as CaCO3	mg/L		447	447		459	459		485	485		450	450		460	460		468	468		460	460
Alkalinity, Carbonate as CaCO3	mg/L		22	22	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	20	10
Bromide	mg/L	<	0.1	0.05	<	0.25	0.125	<	0.1	0.05	<	0.25	0.125	<	0.1	0.05	<	0.1	0.05	<	0.06	0.03
Chloride	mg/L		6.4	6.4		4.83	4.83		5.05	5.05		3.9	3.9		4.5	4.5		4.66	4.66		5.6	5.6
Fluoride	mg/L		0.15	0.15	<	0.25	0.125		0.2	0.2	<	0.25	0.125	<	0.1	0.05	<	0.1	0.05		0.16	0.16
Sulfate	mg/L		157	157		148	148		168	168		153	153		157	157		137	137		160	160
Nitrate/Nitrite as N	mg/L	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.02	0.01	<	0.003	0.0015
Phosphorus, Total	mg/L		0.02	0.02		0.01	0.01		0.02	0.02		0.01	0.01	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005
Solids, Total Dissolved	mg/L		660	660		690	690		704	704		684	684		688	688		688	688		760	760
Hardness as CaCO3	mg/L		190	190		211	211		201	201		206	206		206	206		209	209		230	230
Hydroxide as CaCO3	mg/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	20	10
Sum of Anions	meq/L		13	13		12	12		13	13		12	12		13	13		12	12			
Sum of Cations	meq/L		12	12		12	12		12	12		12	12		12	12		12	12			
Cation-Anion Balance	%		-4	-4		0	0		-4	-4		0	0		-4	-4		0	0			
Sodium Adsorption Ratio	NU		6.1	6.1		5.3	5.3		5.6	5.6		5.3	5.3		5.3	5.3		5.4	5.4		5.2	5.2
Arsenic	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001
Barium	mg/L		0.022	0.022		0.023	0.023		0.016	0.016		0.018	0.018		0.018	0.018		0.02	0.02	<	0.000001	0.0000005
Boron	mg/L		0.16	0.16		0.16	0.16		0.15	0.15		0.15	0.15		0.15	0.15		0.16	0.16		0.17	0.17
Cadmium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.000088	0.000044
Calcium	mg/L		44.1	44.1		49.4	49.4		46.3	46.3		48.1	48.1		47.9	47.9		48.5	48.5		54	54
Copper	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000019	9.5E-07
Iron	mg/L		0.02	0.02		0.13	0.13	<	0.02	0.01		0.03	0.03		0.2	0.2		0.04	0.04	<	0.000014	0.000007
Lead	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.00017	0.000085
Magnesium	mg/L		19.3	19.3		21.4	21.4		20.8	20.8		20.9	20.9		20.9	20.9		21.4	21.4		24	24
Manganese	mg/L		0.007	0.007		0.009	0.009	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	0.005	0.0025	<	8.7E-07	4.35E-07
Mercury	mg/L	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.0002	0.0001	<	0.00006	0.00003
Potassium	mg/L		2.9	2.9		3.1	3.1		3.1	3.1		3	3		3	3		3.2	3.2		4.4	4.4
Selenium	mg/L	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.0001	0.00005	<	0.00066	0.00033
Silica	mg/L		11.8	11.8		12.4	12.4		12	12		12.3	12.3		12.3	12.3		12.6	12.6			
Silicon	mg/L																					
Silicon as SiO2	mg/L																					
Silver	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000019	9.5E-07
Sodium	mg/L		190	190		175	175		182	182		173	173		173	173		179	179		180	180
Strontium	mg/L		1.79	1.79		2.03	2.03		1.9	1.9		1.92	1.92		1.97	1.97		1.95	1.95		2.1	2.1
Chromium	mg/L	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.01	0.005	<	0.0000014	0.0000007
TPH-DRO (C10-C28)	mg/L	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.1	0.05	<	0.17	0.085
TPH-GRO (C6-C10)	mg/L	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.05	0.025	<	0.1	0.05
Benzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Ethylbenzene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
m+p-Xylene	ug/L	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	2	1	<	0.3	0.15
o-Xylene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Toluene	ug/L	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	1	0.5	<	0.3	0.15
Xylene (total)	ug/L																			<	1	0.5

Notes:

ND = Not detected

Calc Res = Result used for calculations (1/2 MDL for ND)

Red fill and text: Result value 25% greater than baseline max

Blue fill and text: Result value 25% greater than baseline average

Green fill and text: Result value 25% less than baseline average

Orange fill: Analyte detections post-completion (baseline ND)

Purple fill: CAB is greater than 5%

Table A-10: Werner-01 Well Analytical Results

Sample Date		6/29/2016		
Lab Sample ID		1606575-1,2		
Duplicate or Replicate				
Sample Purpose		Post-Baseline		
Parameter	**UNITS**	**ND**	**Result**	**Calc Result**
Butane	mg/L			
Ethane	mg/L	<	0.002	0.001
Ethylene	mg/L			
Methane	mg/L		0.009	0.009
Propane	mg/L	<	0.001	0.0005
Alkalinity, Total as CaCO3	mg/L		460	460
Alkalinity, Bicarbonate as CaCO3	mg/L		460	460
Alkalinity, Carbonate as CaCO3	mg/L	<	20	10
Bromide	mg/L	<	0.06	0.03
Chloride	mg/L		5.7	5.7
Fluoride	mg/L		0.19	0.19
Sulfate	mg/L		180	180
Nitrate/Nitrite as N	mg/L	<	0.003	0.0015
Phosphorus, Total	mg/L	<	0.01	0.005
Solids, Total Dissolved	mg/L		710	710
Hardness as CaCO3	mg/L		200	200
Hydroxide as CaCO3	mg/L	<	20	10
Sum of Anions	meq/L			
Sum of Cations	meq/L			
Cation-Anion Balance	%			
Sodium Adsorption Ratio	NU		5.9	5.9
Arsenic	mg/L	<	0.0002	0.0001
Barium	mg/L	<	0.000001	0.0000005
Boron	mg/L		0.15	0.15
Cadmium	mg/L	<	0.000088	0.000044
Calcium	mg/L		46	46
Copper	mg/L	<	0.0000039	1.95E-06
Iron	mg/L	<	0.000016	0.000008
Lead	mg/L	<	0.00017	0.000085
Magnesium	mg/L		21	21
Manganese	mg/L	<	0.0000006	0.0000003
Mercury	mg/L	<	0.00006	0.00003
Potassium	mg/L		3.3	3.3
Selenium	mg/L	<	0.00066	0.00033
Silica	mg/L			
Silicon	mg/L		5.7	5.7
Silicon as SiO2	mg/L		12	12
Silver	mg/L	<	0.0000011	5.5E-07
Sodium	mg/L		190	190
Strontium	mg/L		2	2
Chromium	mg/L	<	0.0000024	0.0000012
TPH-DRO (C10-C28)	mg/L	<	15.085	15.0425
TPH-GRO (C6-C10)	mg/L	<	0.1	0.05
Benzene	ug/L	<	0.3	0.15
Ethylbenzene	ug/L	<	0.3	0.15
m+p-Xylene	ug/L	<	0.3	0.15
o-Xylene	ug/L	<	0.3	0.15
Toluene	ug/L	<	0.3	0.15
Xylene (total)	ug/L	<	1	0.5

Notes:
ND = Not detected
Calc Res = Result used for calculations (1/2 MDL for ND)
Red fill and text: Result value 25% greater than baseline max
Blue fill and text: Result value 25% greater than baseline average
Green fill and text: Result value 25% less than baseline average
Orange fill: Analyte detections post-completion (baseline ND)
Purple fill: CAB is greater than 5%

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Dawson Creek #1-25												
Sampling Station		Fralick-01 Well												
		Summary Statistics Baseline 8/30/12 to 9/18/2012						Summary Statistics Post-drill 10/10/12 to 6/9/16						
Parameter	**UNITS**	**Count**	**ND**	**Min**	**Max**	**Avg**	**ST**	**Count**	**ND**	**Min**	**Max**	**Avg**	**ST**	**>25% Max**
Butane	mg/L	0	0	0	0	NA	NA	9	9	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	5	5	0.02	0.02	0.01	0	17	17	0.002	0.02	0.009	0.002	0
Ethylene	mg/L	0	0	0	0	NA	NA	9	9	0.03	0.03	0.015	0.000	NA
Methane	mg/L	5	5	0.009	0.009	0.0045	0	17	17	0.001	0.009	0.004	0.001	0
Propane	mg/L	5	5	0.03	0.03	0.015	0	17	17	0.001	0.03	0.014	0.004	0
Alkalinity, Total as CaCO3	mg/L	5	0	321	359	340.4	13.55729	17	0	259	405	340.235	37.357	0
Alkalinity, Bicarbonate as Ca	mg/L	5	0	321	359	340.4	13.55729	17	0	259	405	340.235	37.357	0
Alkalinity, Carbonate as CaC	mg/L	5	5	2	2	1	0	17	17	2	20	1.529	2.183	1
Bromide	mg/L	5	5	1	2.5	1.1	0.33541	17	17	0.06	2.5	1.075	0.398	0
Chloride	mg/L	5	0	43.4	60.5	52.18	7.668572	17	1	11.8	88.9	46.394	19.329	2
Fluoride	mg/L	5	5	2	5	2.2	0.67082	17	16	0.5	5	1.671	0.761	0
Sulfate	mg/L	5	0	2403.4	2774.8	2579.4	134.6549	17	0	550	2900	2115.876	671.478	0
Nitrate/Nitrite as N	mg/L	5	0	6	6.69	6.368	0.326833	17	0	0.88	7.5	5.112	1.949	0
Phosphorus, Total	mg/L	5	0	0.05	0.16	0.124	0.045056	17	1	0.01	0.06	0.035	0.013	0
Solids, Total Dissolved	mg/L	5	0	4260	4350	4302	37.01351	17	0	1370	4400	3623.529	865.354	0
Hardness as CaCO3	mg/L	5	0	1700	1820	1766	53.66563	17	0	701	1800	1473.706	336.158	0
Hydroxide as CaCO3	mg/L	5	5	2	2	1	0	17	17	2	20	1.529	2.183	1
Sum of Anions	meq/L	5	0	58.1	66.7	62.44	3.094834	16	0	20	65	51.438	14.207	NA
Sum of Cations	meq/L	5	0	58.8	62.4	60.8	1.593738	16	0	25	63.5	51.563	11.762	NA
Cation-Anion Balance	%	5	0	-3.8	3.1	-1.3	2.786575	16	0	-10.3	15.8	1.119	8.282	NA
Sodium Adsorption Ratio	NU	5	0	5.91	6.2	6.046	0.123004	17	1	0.0035	6.49	5.437	1.542	NA
Arsenic	mg/L	5	5	0.001	0.001	0.0005	0	17	7	0.0002	0.001	0.0004	0.0002	0
Barium	mg/L	5	0	0.023	0.04	0.0282	0.00719	17	1	0.000001	0.095	0.032	0.022	3
Boron	mg/L	5	0	0.37	0.46	0.404	0.036469	17	0	0.2	0.45	0.339	0.071	0
Cadmium	mg/L	5	5	0.0005	0.0005	0.00025	0	17	12	0.000088	0.0007	0.0002	0.0002	1
Calcium	mg/L	5	0	404	432	417.4	12.52198	17	0	167	429	349.941	78.688	0
Copper	mg/L	5	1	0.01	0.5	0.291	0.224678	17	4	0.01	1.54	0.229	0.395	2
Iron	mg/L	5	5	0.02	0.1	0.026	0.021909	17	16	0.000016	0.1	0.022	0.022	0
Lead	mg/L	5	1	0.0005	0.0073	0.00377	0.002774	17	3	0.0001	0.0144	0.004	0.005	2
Magnesium	mg/L	5	0	168	183	175.6	5.549775	17	0	69	182	144.741	33.790	0
Manganese	mg/L	5	2	0.005	0.079	0.0401	0.031017	17	14	0.0000006	0.052	0.011	0.016	0
Mercury	mg/L	5	5	0.0002	0.001	0.00018	0.000179	17	17	0.00006	0.0002	0.0001	0.0000	0
Potassium	mg/L	5	0	2.4	3.1	2.86	0.279285	17	0	1.9	3	2.535	0.314	0
Selenium	mg/L	5	0	0.863	0.977	0.9252	0.043233	17	0	0.6226	1.01	0.8023	0.1089	0
Silica	mg/L	5	0	21	22	21.58	0.491935	16	0	13.4	22	18.663	2.776	0
Silicon	mg/L	0	0	0	0	NA	NA	1	0	11	11	11.000	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	23	23	23.000	NA	NA
Silver	mg/L	5	5	0.01	0.05	0.013	0.010954	17	17	0.0000011	0.05	0.009	0.008	0
Sodium	mg/L	5	0	560	594	577	16.09348	17	0	246	624	509.882	110.932	0
Strontium	mg/L	5	0	3.03	3.23	3.1	0.081854	17	0	1.36	3.26	2.605	0.628	0
Chromium	mg/L	5	5	0.01	0.05	0.021	0.008944	17	16	0.0000024	0.05	0.0085295	0.0074507	0
TPH-DRO (C10-C28)	mg/L	5	3	0.1	0.3	0.13	0.115109	17	15	0.1	0.3	0.070	0.061	0
TPH-GRO (C6-C10)	mg/L	5	5	0.05	0.05	0.025	0	17	17	0.05	0.1	0.026	0.006	0
Benzene	ug/L	5	5	0.2	1	0.42	0.178885	17	17	0.3	1	0.479	0.085	0
Ethylbenzene	ug/L	5	5	0.2	1	0.42	0.178885	17	17	0.3	1	0.479	0.085	0
m+p-Xylene	ug/L	5	5	0.4	2	0.84	0.357771	17	17	0.3	2	0.950	0.206	0
o-Xylene	ug/L	5	5	0.2	1	0.42	0.178885	17	17	0.3	1	0.479	0.085	0
Toluene	ug/L	5	5	0.2	1	0.42	0.178885	17	17	0.3	1	0.479	0.085	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	1	1	1	1	0.500	NA	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Dawson Creek #1-25												
Sampling Station		State-01B Well												
		Summary Statistics Baseline 8/23/12 to 9/18/2012						Summary Statistics Post-drill 10/10/12 to 6/29/16						
Parameter	**UNITS**	**Count**	**ND**	**Min**	**Max**	**Avg**	**ST**	**Count**	**ND**	**Min**	**Max**	**Avg**	**ST**	**>25% Max**
Butane	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	5	0	0.11	0.19	0.134	0.032094	18	0	0.06	0.23	0.146	0.048	0
Ethylene	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Methane	mg/L	5	0	9.6	23.6	16.84	5.646946	18	0	5.83	44.7	16.402	10.396	2
Propane	mg/L	5	5	0.03	0.03	0.015	0	18	18	0.001	0.03	0.013	0.005	0
Alkalinity, Total as CaCO3	mg/L	5	0	296	373	326.2	31.33209	17	0	347	576	461.000	69.905	7
Alkalinity, Bicarbonate as Ca	mg/L	5	0	296	373	326.2	31.33209	18	0	347	576	464.167	69.136	8
Alkalinity, Carbonate as CaC	mg/L	5	5	2	2	1	0	18	18	2	20	1.500	2.121	1
Bromide	mg/L	5	0	73.1	96.6	85.74	9.513044	18	0	81	110	95.089	7.301	0
Chloride	mg/L	5	0	5489	7062	6388.4	604.3458	18	0	6123	8100	7049.611	438.602	0
Fluoride	mg/L	5	5	2	10	4.2	1.788854	18	18	0.6	10	3.169	1.646	0
Sulfate	mg/L	5	0	863.8	2440	1526.76	722.4154	18	0	270	1671	960.667	483.246	0
Nitrate/Nitrite as N	mg/L	5	3	0.02	18.1	3.74	8.031146	18	15	0.003	4.7	0.275	1.104	0
Phosphorus, Total	mg/L	5	0	0.08	29.5	6.076	13.09599	18	0	0.03	0.35	0.097	0.079	0
Solids, Total Dissolved	mg/L	5	0	13000	14600	13560	642.6508	18	0	10900	14300	12950.000	1020.525	0
Hardness as CaCO3	mg/L	5	0	804	1280	982.8	178.3359	17	0	550	869	732.529	96.483	0
Hydroxide as CaCO3	mg/L	5	5	2	2	1	0	17	17	2	20	1.529	2.183	1
Sum of Anions	meq/L	5	0	212	227	218.6	6.426508	16	0	214	245	227.688	9.617	NA
Sum of Cations	meq/L	5	0	206	235	219.8	12.09132	16	0	206	236	219.688	9.680	NA
Cation-Anion Balance	%	5	0	-3	2.2	0.22	2.291724	17	0	-6.5	3.2	-1.612	2.493	NA
Sodium Adsorption Ratio	NU	5	0	54.3	69.5	64.3	6.750185	17	1	0.0049	79	70.794	18.393	NA
Arsenic	mg/L	5	2	0.002	0.005	0.0024	0.001673	18	7	0.0002	0.011	0.0034	0.0030	3
Barium	mg/L	5	0	0.1	0.2	0.144	0.040373	18	0	0.1	0.42	0.185	0.088	2
Boron	mg/L	5	0	1.76	2.1	1.932	0.126965	18	0	2	3.02	2.328	0.246	1
Cadmium	mg/L	5	5	0.001	0.001	0.0005	0	18	17	0.000088	0.003	0.0006	0.0003	2
Calcium	mg/L	5	0	136	191	164.4	20.45238	18	0	130	184	161.056	16.134	0
Copper	mg/L	5	5	0.05	0.1	0.045	0.01118	18	17	0.0000039	0.1	0.042	0.015	0
Iron	mg/L	5	4	0.1	0.3	0.13	0.097468	18	5	0.1	1.4	0.475	0.426	8
Lead	mg/L	5	4	0.001	0.007	0.0018	0.002907	18	18	0.0001	0.0041	0.001	0.000	0
Magnesium	mg/L	5	0	113	207	139.2	38.51234	18	0	55	103	79.939	13.915	0
Manganese	mg/L	5	0	0.08	0.75	0.236	0.288236	18	0	0.13	0.58	0.328	0.145	0
Mercury	mg/L	5	5	0.0002	0.001	0.00026	0.000219	18	17	0.000025	0.001	0.0001	0.0001	0
Potassium	mg/L	5	0	15	21	18	2.12132	18	0	12	15	13.944	0.802	0
Selenium	mg/L	5	0	0.005	0.051	0.0202	0.018267	18	4	0.00066	0.093	0.0085	0.0218	1
Silica	mg/L	5	0	7	10	7.6	1.341641	17	0	9	15.7	11.806	1.696	5
Silicon	mg/L	0	0	0	0	NA	NA	2	0	5.3	7.32	6.310	1.428	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	11	11	11.000	NA	NA
Silver	mg/L	5	4	0.08	0.1	0.056	0.013416	18	17	0.0000011	0.1	0.044	0.022	0
Sodium	mg/L	5	0	4240	4890	4536	271.9926	18	0	4200	4990	4628.889	210.039	0
Strontium	mg/L	5	0	7.4	9.3	8.104	0.738295	18	0	7.66	9.21	8.583	0.531	0
Chromium	mg/L	5	4	0.1	0.7	0.18	0.290689	18	18	0.0000024	0.1	0.036	0.019	0
TPH-DRO (C10-C28)	mg/L	5	0	0.8	12.1	5.1	4.535967	17	5	0.1	4.5	1.064	1.175	0
TPH-GRO (C6-C10)	mg/L	5	4	0.05	1	0.156	0.199041	17	13	0.05	0.1	0.034	0.015	0
Benzene	ug/L	5	5	1	5	1.2	0.974679	18	18	0.25	1	0.460	0.117	0
Ethylbenzene	ug/L	5	5	1	5	1.2	0.974679	17	17	0.3	1	0.479	0.085	0
m+p-Xylene	ug/L	5	5	2	10	2.4	1.949359	17	17	0.3	2	0.950	0.206	0
o-Xylene	ug/L	5	5	1	5	1.2	0.974679	17	17	0.3	1	0.479	0.085	0
Toluene	ug/L	5	5	1	5	1.2	0.974679	18	18	0.22	1	0.459	0.120	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	1	1	1	1	0.500	NA	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Gnat Hill #1-29												
Sampling Station		Tuttle-01A Well												
		Summary Statistics Baseline 10/10/12 to 11/8/12						Summary Statistics Post-drill 12/5/12 to 6/28/16						
Parameter	UNITS	Count	ND	Min	Max	Avg	ST	Count	ND	Min	Max	Avg	ST	>25% Max
Butane	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	5	5	0.02	0.02	0.01	0	15	15	0.002	0.02	0.009	0.002	0
Ethylene	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Methane	mg/L	5	5	0.009	0.009	0.0045	0	15	14	0.0037	0.009	0.004	0.000	0
Propane	mg/L	5	5	0.03	0.03	0.015	0	15	15	0.001	0.03	0.014	0.004	0
Alkalinity, Total as CaCO3	mg/L	5	0	196	672	561.8	204.7796	15	0	352	715	652.067	85.515	0
Alkalinity, Bicarbonate as Ca	mg/L	5	0	184	672	559.4	210.1388	15	0	352	715	652.067	85.515	0
Alkalinity, Carbonate as CaC	mg/L	5	4	2	12	3.2	4.91935	15	15	2	20	1.600	2.324	0
Bromide	mg/L	5	5	2.5	2.5	1.25	0	15	13	0.6	36.8	3.616	9.187	1
Chloride	mg/L	5	0	65.1	79.4	70.78	5.651725	15	0	67.3	96.2	78.660	8.511	0
Fluoride	mg/L	5	5	5	5	2.5	0	15	15	0.3	5	1.577	0.731	0
Sulfate	mg/L	5	0	2861.5	3283.6	3094.7	151.8289	15	0	3060	3400	3217.273	111.956	0
Nitrate/Nitrite as N	mg/L	5	5	0.02	0.02	0.01	0	15	11	0.003	0.15	0.025	0.038	3
Phosphorus, Total	mg/L	5	0	0.07	1.01	0.404	0.371389	15	2	0.01	0.98	0.128	0.243	0
Solids, Total Dissolved	mg/L	5	0	5280	5500	5442	91.76056	15	0	2780	5800	5267.333	719.538	0
Hardness as CaCO3	mg/L	5	0	1830	1920	1880	36.05551	15	0	1700	1910	1828.667	52.081	0
Hydroxide as CaCO3	mg/L	5	5	2	2	1	0	15	15	2	20	1.600	2.324	1
Sum of Anions	meq/L	5	0	70.8	83.9	78.22	5.259943	14	0	75	88	82.607	3.151	NA
Sum of Cations	meq/L	5	0	82.4	82.7	82.56	0.134164	14	0	74.7	83.3	80.143	2.122	NA
Cation-Anion Balance	%	5	0	-0.8	7.6	2.78	3.340958	14	0	-8.2	3.2	-1.500	2.705	NA
Sodium Adsorption Ratio	NU	5	0	10	10.7	10.32	0.277489	15	1	0.0035	10.6	9.453	2.625	NA
Arsenic	mg/L	5	4	0.0009	0.001	0.00058	0.000179	15	9	0.0002	0.001	0.0005	0.0001	0
Barium	mg/L	5	2	0.013	0.06	0.0214	0.012992	15	3	0.000001	0.04	0.015	0.011	0
Boron	mg/L	5	0	0.7	0.96	0.882	0.104019	15	0	0.81	1.02	0.882	0.050	0
Cadmium	mg/L	5	5	0.0001	0.0005	0.00021	8.94E-05	15	15	0.000088	0.0005	0.0002	0.0001	0
Calcium	mg/L	5	0	271	287	277.8	6.870226	15	0	254	285	273.333	7.641	0
Copper	mg/L	5	4	0.01	0.2	0.049	0.051889	15	15	3.9E-06	0.05	0.013	0.010	0
Iron	mg/L	5	2	0.07	1.94	0.492	0.812508	15	3	0.000016	0.9	0.232	0.271	0
Lead	mg/L	5	5	0.0001	0.0005	0.00021	8.94E-05	15	15	0.0001	0.0005	0.000	0.000	0
Magnesium	mg/L	5	0	278	293	288.6	6.0663	15	0	259	291	277.733	10.180	0
Manganese	mg/L	5	0	0.45	0.7	0.5092	0.106914	15	0	0.394	0.49	0.438	0.023	0
Mercury	mg/L	5	5	0.0002	0.0002	0.0001	0	15	15	0.00006	0.0002	0.0001	0.0000	0
Potassium	mg/L	5	0	4.9	10	6.2	2.169101	15	0	4.4	5.2	4.873	0.228	0
Selenium	mg/L	5	5	0.0005	0.0005	0.00025	0	15	7	0.0001	0.0014	0.0003	0.0003	2
Silica	mg/L	5	0	16	19	17.7	1.204159	14	0	16.6	19.2	17.736	0.734	0
Silicon	mg/L	0	0	0	0	NA	NA	1	0	8.4	8.4	8.400	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	18	18	18.000	NA	NA
Silver	mg/L	5	5	0.01	0.2	0.032	0.039306	15	15	1.1E-06	0.05	0.014	0.011	0
Sodium	mg/L	5	0	997	1040	1015.4	17.48714	15	0	921	1040	986.467	28.329	0
Strontium	mg/L	5	0	3.9	4.08	3.954	0.074027	15	0	3.69	4.5	4.030	0.179	0
Chromium	mg/L	5	5	0.05	0.2	0.04	0.033541	15	13	2.4E-06	0.05	0.014	0.011	0
TPH-DRO (C10-C28)	mg/L	5	0	0.1	1	0.32	0.383406	15	11	0.1	0.3	0.099	0.091	0
TPH-GRO (C6-C10)	mg/L	5	5	0.05	0.05	0.025	0	16	16	0.05	0.1	0.027	0.006	0
Benzene	ug/L	5	5	1	1	0.5	0	16	16	0.3	1	0.478	0.087	0
Ethylbenzene	ug/L	5	5	1	1	0.5	0	16	16	0.3	1	0.478	0.087	0
m+p-Xylene	ug/L	5	5	2	2	1	0	16	16	0.3	2	0.947	0.213	0
o-Xylene	ug/L	5	5	1	1	0.5	0	16	16	0.3	1	0.478	0.087	0
Toluene	ug/L	5	5	1	1	0.5	0	16	16	0.3	1	0.478	0.087	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	1	1	1	1	0.500	NA	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Gnat Hill #1-29												
Sampling Station		Tuttle-01B Well												
		Summary Statistics Baseline 10/10/12 to 11/8/12						Summary Statistics Post-drill 12/5/12 to 6/28/16						
Parameter	UNITS	Count	ND	Min	Max	Avg	ST	Count	ND	Min	Max	Avg	ST	>25% Max
Butane	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.2	0.024	0.027	NA
Ethane	mg/L	6	4	0.02	0.02	0.013333	0.005164	16	10	0.0008	0.09	0.022	0.017	7
Ethylene	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.1	0.019	0.011	NA
Methane	mg/L	6	0	0.031	10.1	2.513	3.810831	16	1	0.0004	9	2.955	2.882	0
Propane	mg/L	6	6	0.03	0.03	0.015	0	16	15	0.0011	0.1	0.015	0.010	1
Alkalinity, Total as CaCO3	mg/L	6	0	624	740	684	52.24175	15	0	634	769	707.467	38.197	0
Alkalinity, Bicarbonate as Ca	mg/L	6	0	604	722	666.1667	55.77963	16	0	609	758	679.625	39.243	0
Alkalinity, Carbonate as CaC	mg/L	6	0	12	26	18.16667	4.91596	16	1	2.8	81	26.344	21.718	5
Bromide	mg/L	6	6	1	1	0.5	0	16	15	0.06	2.5	0.974	0.435	0
Chloride	mg/L	6	0	35.6	40.3	37.65	2.020643	16	0	32.5	65.2	42.169	9.067	2
Fluoride	mg/L	6	5	2	2.2	1.2	0.489898	16	13	1	5	1.691	0.646	0
Sulfate	mg/L	6	0	1341.1	1883.3	1615.083	264.2958	16	0	1320	1800	1484.475	135.751	0
Nitrate/Nitrite as N	mg/L	6	5	0.02	0.02	0.011667	0.004082	16	15	0.003	0.17	0.019	0.040	1
Phosphorus, Total	mg/L	6	0	0.19	0.26	0.223333	0.02582	16	0	0.25	0.46	0.305	0.054	2
Solids, Total Dissolved	mg/L	6	0	2880	3470	3178.333	259.8012	16	0	2790	3400	2958.125	149.364	0
Hardness as CaCO3	mg/L	6	0	58	94	72.83333	15.66418	15	0	47	59	53.127	3.416	0
Hydroxide as CaCO3	mg/L	6	6	2	2	1	0	15	15	2	20	1.600	2.324	1
Sum of Anions	meq/L	6	0	44.2	53.4	48.68333	4.501296	14	0	44	50	46.107	1.877	NA
Sum of Cations	meq/L	6	0	42.6	55.4	48.51667	5.541991	14	0	40	44.5	42.700	1.324	NA
Cation-Anion Balance	%	6	0	-2.1	2.4	-0.25	1.80527	15	0	-8	1.4	-3.460	2.716	NA
Sodium Adsorption Ratio	NU	6	0	53	60.8	55.36667	3.070288	15	1	0.0035	58.9	53.387	14.835	NA
Arsenic	mg/L	6	0	0.0015	0.0024	0.002	0.0004	16	2	0.0002	0.009	0.0015	0.0011	1
Barium	mg/L	6	1	0.028	0.06	0.0325	0.005753	16	1	0.000001	0.032	0.023	0.007	0
Boron	mg/L	6	0	2	2.19	2.125	0.075033	16	0	1.83	2.5	2.102	0.151	0
Cadmium	mg/L	6	6	0.0001	0.0002	8.33E-05	2.58E-05	16	16	0.000088	0.00036	0.0001	0.0000	0
Calcium	mg/L	6	0	12.1	18	14.75	2.949407	16	0	9.6	12	10.875	0.623	0
Copper	mg/L	6	5	0.01	0.2	0.025833	0.037605	16	14	3.9E-06	0.03	0.008	0.007	0
Iron	mg/L	6	6	0.02	0.4	0.045	0.076092	16	14	0.000016	0.04	0.015	0.006	0
Lead	mg/L	6	4	0.0001	0.0005	0.000167	0.000172	16	14	0.0001	0.0041	0.000	0.001	2
Magnesium	mg/L	6	0	6.8	12	8.716667	2.093243	16	0	5.5	6.9	6.336	0.405	0
Manganese	mg/L	6	1	0.04	0.177	0.114667	0.056177	16	0	0.035	0.11	0.066	0.023	0
Mercury	mg/L	6	6	0.0002	0.0002	0.0001	0	16	15	0.000044	0.0002	0.0001	0.0000	0
Potassium	mg/L	6	0	3.2	8	4.5	1.837389	16	0	2.9	3.8	3.224	0.267	0
Selenium	mg/L	6	2	0.0002	0.0005	0.000283	0.00016	16	10	0.0001	0.0013	0.0002	0.0003	1
Silica	mg/L	6	1	6.8	9	7.183333	1.399166	15	0	6.4	8.1	7.440	0.450	0
Silicon	mg/L	0	0	0	0	NA	NA	2	0	3.4	3.58	3.490	0.127	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	7.3	7.3	7.300	NA	NA
Silver	mg/L	6	6	0.01	0.2	0.025833	0.03707	16	16	1.1E-06	0.02	0.007	0.003	0
Sodium	mg/L	6	0	938	1220	1066.167	118.8115	16	0	874	1100	960.313	54.683	0
Strontium	mg/L	6	0	0.51	0.66	0.575	0.07064	16	0	0.447	0.61	0.488	0.038	0
Chromium	mg/L	6	6	0.02	0.2	0.025	0.036742	16	15	2.4E-06	0.02	0.007	0.003	0
TPH-DRO (C10-C28)	mg/L	6	1	0.1	11.4	2.441667	4.419323	15	4	0.1	0.9	0.351	0.297	0
TPH-GRO (C6-C10)	mg/L	6	6	0.05	0.05	0.025	3.8E-18	16	15	0.05	0.1	0.028	0.009	0
Benzene	ug/L	6	6	1	1	0.5	0	17	17	0.25	1	0.457	0.120	0
Ethylbenzene	ug/L	6	6	1	1	0.5	0	16	16	0.3	1	0.478	0.087	0
m+p-Xylene	ug/L	6	6	2	2	1	0	16	16	0.3	2	0.947	0.213	0
o-Xylene	ug/L	6	6	1	1	0.5	0	16	16	0.3	1	0.478	0.087	0
Toluene	ug/L	6	6	1	1	0.5	0	17	17	0.22	1	0.456	0.123	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	1	1	1	1	0.500	NA	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Trout Creek #1-30												
Sampling Station		Jones-01 Well												
		Summary Statistics Baseline 12/4/2012						Summary Statistics Post-drill 2/7/13 to 6/29/16						
Parameter	UNITS	Count	ND	Min	Max	Avg	ST	Count	ND	Min	Max	Avg	ST	>25% Max
Butane	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	1	1	0.02	0.02	0.01	NA	14	14	0.002	0.02	0.009	0.003	0
Ethylene	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Methane	mg/L	1	1	0.009	0.009	0.0045	NA	14	9	0.001	0.022	0.008	0.008	4
Propane	mg/L	1	1	0.03	0.03	0.015	NA	14	14	0.001	0.03	0.013	0.005	0
Alkalinity, Total as CaCO3	mg/L	1	0	134	134	134	NA	14	0	41	346	209.357	81.296	9
Alkalinity, Bicarbonate as Ca	mg/L	1	0	133	133	133	NA	14	0	41	346	209.143	81.431	9
Alkalinity, Carbonate as CaC	mg/L	1	1	2	2	1	NA	14	13	2	20	2.429	3.251	3
Bromide	mg/L	1	1	0.05	0.05	0.025	NA	14	14	0.06	0.25	0.101	0.040	12
Chloride	mg/L	1	0	4.24	4.24	4.24	NA	14	0	2.55	21.3	12.308	5.710	12
Fluoride	mg/L	1	1	0.1	0.1	0.05	NA	14	12	0.2	0.79	0.249	0.229	14
Sulfate	mg/L	1	0	115.71	115.71	115.71	NA	14	0	21	242	168.733	61.871	12
Nitrate/Nitrite as N	mg/L	1	1	0.02	0.02	0.01	NA	14	10	0.02	0.34	0.056	0.104	4
Phosphorus, Total	mg/L	1	0	0.02	0.02	0.02	NA	14	4	0.01	0.08	0.016	0.019	1
Solids, Total Dissolved	mg/L	1	0	300	300	300	NA	14	0	92	696	496.571	164.906	12
Hardness as CaCO3	mg/L	1	0	200	200	200	NA	14	0	48	496	321.643	118.482	12
Hydroxide as CaCO3	mg/L	1	1	2	2	1	NA	14	14	2	20	2.286	3.268	2
Sum of Anions	meq/L	1	0	5.2	5.2	5.2	NA	12	0	6.6	12	8.992	1.759	NA
Sum of Cations	meq/L	1	0	5.4	5.4	5.4	NA	12	0	6.4	12	8.692	1.683	NA
Cation-Anion Balance	%	1	0	1.9	1.9	1.9	NA	12	0	-5.3	2.6	-1.650	2.487	NA
Sodium Adsorption Ratio	NU	1	0	0.93	0.93	0.93	NA	14	0	0.66	0.89	0.774	0.075	NA
Arsenic	mg/L	1	1	0.0002	0.0002	0.0001	NA	14	10	0.0002	0.0003	0.0001	0.0001	4
Barium	mg/L	1	0	0.059	0.059	0.059	NA	14	2	0.000001	0.169	0.088	0.047	10
Boron	mg/L	1	0	0.03	0.03	0.03	NA	14	2	0.0000099	0.05	0.028	0.014	4
Cadmium	mg/L	1	1	0.0001	0.0001	0.00005	NA	14	14	0.000088	0.0001	0.000	0.000	0
Calcium	mg/L	1	0	42	42	42	NA	14	0	12	124	76.264	29.929	12
Copper	mg/L	1	1	0.01	0.01	0.005	NA	14	14	0.0000019	0.01	0.004	0.002	0
Iron	mg/L	1	0	0.15	0.15	0.15	NA	14	2	0.000014	0.35	0.165	0.112	7
Lead	mg/L	1	1	0.0001	0.0001	0.00005	NA	14	8	0.0001	0.0003	0.000	0.000	8
Magnesium	mg/L	1	0	23.1	23.1	23.1	NA	14	0	4.3	45.3	31.907	11.048	10
Manganese	mg/L	1	0	0.297	0.297	0.297	NA	14	2	0.0000006	1.54	0.522	0.435	9
Mercury	mg/L	1	1	0.0002	0.0002	0.0001	NA	14	14	0.00006	0.0002	0.000	0.000	0
Potassium	mg/L	1	0	1.9	1.9	1.9	NA	14	0	1.8	3.3	2.329	0.441	7
Selenium	mg/L	1	0	0.0001	0.0001	0.0001	NA	14	4	0.0001	0.003	0.001	0.001	12
Silica	mg/L	1	0	8.2	8.2	8.2	NA	12	0	8.5	21.6	13.150	3.808	9
Silicon	mg/L	0	0	0	0	NA	NA	1	0	3.3	3.3	3.300	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	7	7	7.000	NA	NA
Silver	mg/L	1	1	0.01	0.01	0.005	NA	14	14	0.0000011	0.01	0.004	0.002	0
Sodium	mg/L	1	0	29.7	29.7	29.7	NA	14	0	13	42	30.686	7.263	2
Strontium	mg/L	1	0	0.24	0.24	0.24	NA	14	0	0.09	0.68	0.434	0.156	12
Chromium	mg/L	1	1	0.01	0.01	0.005	NA	14	14	0.0000024	0.133334	0.014	0.034	0
TPH-DRO (C10-C28)	mg/L	1	1	0.1	0.1	0.05	NA	14	14	0.1	0.17	0.055	0.013	2
TPH-GRO (C6-C10)	mg/L	1	1	0.05	0.05	0.025	NA	15	15	0.05	0.1	0.028	0.009	2
Benzene	ug/L	1	1	1	1	0.5	NA	15	15	0.3	1	0.453	0.123	0
Ethylbenzene	ug/L	1	1	1	1	0.5	NA	15	15	0.3	1	0.453	0.123	0
m+p-Xylene	ug/L	1	1	2	2	1	NA	15	15	0.3	2	0.887	0.299	0
o-Xylene	ug/L	1	1	1	1	0.5	NA	15	15	0.3	1	0.453	0.123	0
Toluene	ug/L	1	1	1	1	0.5	NA	15	15	0.3	1	0.453	0.123	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	2	2	1	1	0.500	0.000	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Trout Creek #1-30												
Sampling Station		Myhre-01 Well												
		Summary Statistics Baseline 12/4/2012						Summary Statistics Post-drill 2/7/13 to 6/29/16						
Parameter	**UNITS**	**Count**	**ND**	**Min**	**Max**	**Avg**	**ST**	**Count**	**ND**	**Min**	**Max**	**Avg**	**ST**	**>25% Max**
Butane	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	1	1	0.02	0.02	0.01	NA	13	13	0.002	0.02	0.009	0.003	0
Ethylene	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Methane	mg/L	1	1	0.009	0.009	0.0045	NA	13	12	0.001	0.009	0.004	0.001	1
Propane	mg/L	1	1	0.03	0.03	0.015	NA	13	13	0.001	0.03	0.013	0.005	0
Alkalinity, Total as CaCO3	mg/L	1	0	392	392	392	NA	13	0	391	441	420.923	12.599	0
Alkalinity, Bicarbonate as Ca	mg/L	1	0	392	392	392	NA	13	0	391	441	420.846	12.628	0
Alkalinity, Carbonate as CaC	mg/L	1	1	2	2	1	NA	13	13	2	20	2.385	3.380	2
Bromide	mg/L	1	0	0.078	0.078	0.078	NA	13	11	0.06	0.5	0.101	0.075	5
Chloride	mg/L	1	0	3.63	3.63	3.63	NA	13	3	0.06	5.21	3.272	1.589	1
Fluoride	mg/L	1	0	0.17	0.17	0.17	NA	13	7	0.03	0.5	0.167	0.110	2
Sulfate	mg/L	1	0	171.36	171.36	171.36	NA	13	0	10	190	152.049	44.200	0
Nitrate/Nitrite as N	mg/L	1	1	0.02	0.02	0.01	NA	13	6	0.01	0.03	0.017	0.009	6
Phosphorus, Total	mg/L	1	1	0.01	0.01	0.005	NA	13	10	0.01	0.02	0.007	0.004	3
Solids, Total Dissolved	mg/L	1	0	650	650	650	NA	13	0	640	710	654.462	18.800	0
Hardness as CaCO3	mg/L	1	0	315	315	315	NA	13	0	285	317	301.923	10.218	0
Hydroxide as CaCO3	mg/L	1	1	2	2	1	NA	13	13	2	20	2.385	3.380	2
Sum of Anions	meq/L	1	0	11.6	11.6	11.6	NA	11	0	11.4	13	12.055	0.370	NA
Sum of Cations	meq/L	1	0	12	12	12	NA	11	0	11	12	11.391	0.466	NA
Cation-Anion Balance	%	1	0	1.7	1.7	1.7	NA	11	0	-5.2	1.3	-2.827	2.283	NA
Sodium Adsorption Ratio	NU	1	0	3.18	3.18	3.18	NA	13	0	2.9	3.2	3.055	0.080	NA
Arsenic	mg/L	1	1	0.0002	0.0002	0.0001	NA	13	13	0.0002	0.0002	0.0001	0.0000	0
Barium	mg/L	1	0	0.017	0.017	0.017	NA	13	2	0.000001	0.021	0.015	0.007	0
Boron	mg/L	1	0	0.14	0.14	0.14	NA	13	0	0.12	0.14	0.135	0.007	0
Cadmium	mg/L	1	1	0.0001	0.0001	0.00005	NA	13	12	0.000088	0.0003	0.0001	0.0001	1
Calcium	mg/L	1	0	75.4	75.4	75.4	NA	13	0	68.8	77.5	72.992	2.558	0
Copper	mg/L	1	1	0.01	0.01	0.005	NA	13	12	1.9E-06	3.11	0.243	0.861	1
Iron	mg/L	1	0	0.06	0.06	0.06	NA	13	7	0.000014	0.15	0.028	0.039	1
Lead	mg/L	1	1	0.0001	0.0001	0.00005	NA	13	12	0.0001	0.0003	0.000	0.000	3
Magnesium	mg/L	1	0	30.7	30.7	30.7	NA	13	0	27.1	30.2	28.946	1.010	0
Manganese	mg/L	1	0	0.01	0.01	0.01	NA	13	0	0.009	0.02	0.012	0.003	3
Mercury	mg/L	1	0	0.0003	0.0003	0.0003	NA	13	13	0.00006	0.0002	0.0001	0.0000	0
Potassium	mg/L	1	0	2.9	2.9	2.9	NA	13	0	2.7	4	2.977	0.330	1
Selenium	mg/L	1	1	0.0001	0.0001	0.00005	NA	13	13	0.0001	0.00066	0.0001	0.0001	2
Silica	mg/L	1	0	15.1	15.1	15.1	NA	11	0	13.5	14.7	14.091	0.373	0
Silicon	mg/L	0	0	0	0	NA	NA	1	0	6.7	6.7	6.700	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	14	14	14.000	NA	NA
Silver	mg/L	1	1	0.01	0.01	0.005	NA	13	13	1.1E-06	0.01	0.004	0.002	0
Sodium	mg/L	1	0	128	128	128	NA	13	0	117	126	120.846	2.375	0
Strontium	mg/L	1	0	1.95	1.95	1.95	NA	13	0	1.82	2.05	1.927	0.063	0
Chromium	mg/L	1	1	0.01	0.01	0.005	NA	13	13	1.4E-06	0.01	0.004	0.002	0
TPH-DRO (C10-C28)	mg/L	1	1	0.1	0.1	0.05	NA	13	12	0.1	0.19	0.059	0.018	3
TPH-GRO (C6-C10)	mg/L	1	1	0.05	0.05	0.025	NA	13	13	0.05	0.1	0.029	0.009	2
Benzene	ug/L	1	1	1	1	0.5	NA	13	13	0.3	1	0.446	0.131	0
Ethylbenzene	ug/L	1	1	1	1	0.5	NA	13	13	0.3	1	0.446	0.131	0
m+p-Xylene	ug/L	1	1	2	2	1	NA	13	13	0.3	2	0.869	0.319	0
o-Xylene	ug/L	1	1	1	1	0.5	NA	13	13	0.3	1	0.446	0.131	0
Toluene	ug/L	1	1	1	1	0.5	NA	13	13	0.3	1	0.446	0.131	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	2	2	1	1	0.500	0.000	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Trout Creek #1-30												
Sampling Station		Myhre-02 Spring												
		Summary Statistics Baseline 12/4/2012						Summary Statistics Post-drill 2/7/13 to 6/29/16						
Parameter	UNITS	Count	ND	Min	Max	Avg	ST	Count	ND	Min	Max	Avg	ST	>25% Max
Butane	mg/L	0	0	0	0	NA	NA	5	5	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	1	1	0.02	0.02	0.02	NA	7	7	0.002	0.04725	0.015	0.016	1
Ethylene	mg/L	0	0	0	0	NA	NA	5	5	0.03	0.03	0.015	0.000	NA
Methane	mg/L	1	1	0.009	0.009	0.009	NA	7	5	0.001	0.0248	0.008	0.009	2
Propane	mg/L	1	1	0.03	0.03	0.03	NA	7	7	0.001	0.0685	0.021	0.024	1
Alkalinity, Total as CaCO3	mg/L	1	0	148	148	148	NA	7	0	85	360	216.500	93.239	4
Alkalinity, Bicarbonate as Ca	mg/L	1	0	110	110	110	NA	7	0	44	360	208.833	105.403	6
Alkalinity, Carbonate as CaC	mg/L	1	0	38	38	38	NA	7	5	2	41	11.333	15.082	0
Bromide	mg/L	1	0	0.086	0.086	0.086	NA	7	5	0.05	0.101	0.051	0.036	0
Chloride	mg/L	1	0	5.11	5.11	5.11	NA	7	0	0.51	6.06	3.218	2.127	1
Fluoride	mg/L	1	0	0.15	0.15	0.15	NA	7	1	0.03	0.16	0.116	0.054	0
Sulfate	mg/L	1	0	17.17	17.17	17.17	NA	7	0	2.2	20	14.758	6.452	0
Nitrate/Nitrite as N	mg/L	1	0	0.08	0.08	0.08	NA	7	1	0.21	2.2	0.658	0.767	6
Phosphorus, Total	mg/L	1	0	0.03	0.03	0.03	NA	7	0	0.03	0.316667	0.139	0.103	6
Solids, Total Dissolved	mg/L	1	0	220	220	220	NA	7	0	160	352	252.000	61.123	1
Hardness as CaCO3	mg/L	1	0	118	118	118	NA	7	0	80	250	164.167	60.924	4
Hydroxide as CaCO3	mg/L	1	1	2	2	2	NA	7	7	2	20	4.000	4.648	2
Sum of Anions	meq/L	1	0	3.5	3.5	3.5	NA	5	0	2.1	4.9	3.850	1.279	NA
Sum of Cations	meq/L	1	0	3.8	3.8	3.8	NA	5	0	2.2	4.6	3.625	1.034	NA
Cation-Anion Balance	%	1	0	4.1	4.1	4.1	NA	5	0	-8.9	2.3	-2.275	4.725	NA
Sodium Adsorption Ratio	NU	1	0	1.26	1.26	1.26	NA	7	0	0.63	1.1	0.752	0.178	NA
Arsenic	mg/L	1	0	0.0025	0.0025	0.0025	NA	7	1	0.0002	0.0021	0.0017	0.0008	0
Barium	mg/L	1	0	0.078	0.078	0.078	NA	7	0	0.063	0.15	0.101	0.033	5
Boron	mg/L	1	0	0.04	0.04	0.04	NA	7	2	9.9E-06	0.04	0.027	0.021	0
Cadmium	mg/L	1	1	0.0001	0.0001	0.0001	NA	7	7	0.000088	0.0001	0.0000	0.0000	0
Calcium	mg/L	1	0	28.4	28.4	28.4	NA	7	0	22.9	80	50.733	21.725	5
Copper	mg/L	1	1	0.01	0.01	0.01	NA	7	7	1.9E-06	0.01	0.003	0.003	0
Iron	mg/L	1	0	0.09	0.09	0.09	NA	7	3	0.000014	0.1	0.045	0.047	1
Lead	mg/L	1	1	0.0001	0.0001	0.0001	NA	7	7	0.0001	0.00017	0.000	0.000	0
Magnesium	mg/L	1	0	11.5	11.5	11.5	NA	7	0	5.5	12	8.950	2.191	0
Manganese	mg/L	1	1	0.005	0.005	0.005	NA	7	6	6E-07	0.005	0.002	0.001	0
Mercury	mg/L	1	1	0.0002	0.0002	0.0002	NA	7	7	0.00006	0.0002	0.0001	0.0000	0
Potassium	mg/L	1	0	1.1	1.1	1.1	NA	7	0	0.9	2.1	1.400	0.486	3
Selenium	mg/L	1	0	0.0008	0.0008	0.0008	NA	7	2	0.0005	0.0008	0.0005	0.0002	0
Silica	mg/L	1	0	21.2	21.2	21.2	NA	5	0	18.2	21.7	19.250	1.646	0
Silicon	mg/L	0	0	0	0	NA	NA	1	0	9.8	9.8	9.800	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	21	21	21.000	NA	NA
Silver	mg/L	1	1	0.01	0.01	0.01	NA	7	7	1.1E-06	0.01	0.003	0.003	0
Sodium	mg/L	1	0	31.1	31.1	31.1	NA	7	0	13.5	26.7	21.233	4.841	0
Strontium	mg/L	1	0	0.3	0.3	0.3	NA	7	0	0.2	0.47	0.363	0.098	2
Chromium	mg/L	1	1	0.01	0.01	0.01	NA	7	7	1.4E-06	0.01	0.003	0.003	0
TPH-DRO (C10-C28)	mg/L	1	1	0.1	0.1	0.1	NA	7	7	0.1	3.27	0.588	1.297	1
TPH-GRO (C6-C10)	mg/L	1	1	0.05	0.05	0.05	NA	7	7	0.05	0.1	0.033	0.013	0
Benzene	ug/L	1	1	1	1	1	NA	7	7	0.3	1	0.383	0.181	0
Ethylbenzene	ug/L	1	1	1	1	1	NA	7	7	0.3	1	0.383	0.181	0
m+p-Xylene	ug/L	1	1	2	2	2	NA	7	7	0.3	2	0.717	0.439	0
o-Xylene	ug/L	1	1	1	1	1	NA	7	7	0.3	1	0.383	0.181	0
Toluene	ug/L	1	1	1	1	1	NA	7	7	0.3	1	0.383	0.181	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	2	2	1	1	0.500	0.000	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Trout Creek #1-30												
Sampling Station		Saddleback-01 Well												
		Summary Statistics Baseline 12/4/2012						Summary Statistics Post-drill 2/7/13 to 6/29/16						
Parameter	UNITS	Count	ND	Min	Max	Avg	ST	Count	ND	Min	Max	Avg	ST	>25% Max
Butane	mg/L	0	0	0	0	NA	NA	9	9	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	1	1	0.02	0.02	0.01	NA	14	14	0.002	0.02	0.009	0.003	0
Ethylene	mg/L	0	0	0	0	NA	NA	9	9	0.03	0.03	0.015	0.000	NA
Methane	mg/L	1	0	0.032	0.032	0.032	NA	14	0	0.032	0.77	0.205	0.235	13
Propane	mg/L	1	1	0.03	0.03	0.015	NA	14	14	0.001	0.03	0.013	0.005	0
Alkalinity, Total as CaCO3	mg/L	1	0	609	609	609	NA	14	0	592	671	637.357	27.040	0
Alkalinity, Bicarbonate as Ca	mg/L	1	0	545	545	545	NA	14	0	539	670	589.500	36.719	0
Alkalinity, Carbonate as CaC	mg/L	1	0	64	64	64	NA	14	2	20	74.9	49.336	18.193	0
Bromide	mg/L	1	1	0.5	0.5	0.25	NA	14	14	0.06	0.5	0.219	0.080	0
Chloride	mg/L	1	0	6.42	6.42	6.42	NA	14	1	5	13	7.430	2.315	3
Fluoride	mg/L	1	0	0.84	0.84	0.84	NA	14	5	0.5	1.3	0.741	0.331	3
Sulfate	mg/L	1	0	409.3	409.3	409.3	NA	14	0	296	420	383.007	35.193	0
Nitrate/Nitrite as N	mg/L	1	1	0.02	0.02	0.01	NA	14	12	0.003	0.04	0.012	0.010	2
Phosphorus, Total	mg/L	1	0	0.03	0.03	0.03	NA	14	2	0.01	0.15	0.036	0.015	8
Solids, Total Dissolved	mg/L	1	0	1260	1260	1260	NA	14	0	1160	1500	1271.429	76.847	0
Hardness as CaCO3	mg/L	1	0	14	14	14	NA	14	0	13	17	14.214	1.122	0
Hydroxide as CaCO3	mg/L	1	1	2	2	1	NA	14	14	2	20	2.286	3.268	2
Sum of Anions	meq/L	1	0	21	21	21	NA	12	0	20	22	20.925	0.693	NA
Sum of Cations	meq/L	1	0	21	21	21	NA	12	0	19	21	20.000	0.735	NA
Cation-Anion Balance	%	1	0	0	0	0	NA	12	0	-5	0	-2.275	1.492	NA
Sodium Adsorption Ratio	NU	1	0	55.4	55.4	55.4	NA	14	0	48	55.6	52.100	2.327	NA
Arsenic	mg/L	1	1	0.0002	0.0002	0.0001	NA	14	14	0.0002	0.0002	0.0001	0.0000	0
Barium	mg/L	1	0	0.015	0.015	0.015	NA	14	2	0.000001	0.021	0.012	0.006	1
Boron	mg/L	1	0	0.42	0.42	0.42	NA	14	0	0.37	0.42	0.399	0.013	0
Cadmium	mg/L	1	1	0.0001	0.0001	0.00005	NA	14	14	0.000088	0.0001	0.0000	0.0000	0
Calcium	mg/L	1	0	3.3	3.3	3.3	NA	14	0	3	3.7	3.243	0.206	0
Copper	mg/L	1	1	0.01	0.01	0.005	NA	14	12	1.9E-06	0.01	0.005	0.003	2
Iron	mg/L	1	1	0.02	0.02	0.01	NA	14	12	0.000014	0.07	0.016	0.019	2
Lead	mg/L	1	0	0.0001	0.0001	0.0001	NA	14	8	0.0001	0.0014	0.000	0.000	3
Magnesium	mg/L	1	0	1.4	1.4	1.4	NA	14	0	1.3	1.8	1.479	0.137	1
Manganese	mg/L	1	1	0.005	0.005	0.0025	NA	14	13	6E-07	0.005	0.002	0.001	1
Mercury	mg/L	1	1	0.0002	0.0002	0.0001	NA	14	14	0.00006	0.0002	0.0001	0.0000	0
Potassium	mg/L	1	0	1.5	1.5	1.5	NA	14	0	1.5	2.5	1.657	0.259	1
Selenium	mg/L	1	1	0.0001	0.0001	0.00005	NA	14	14	0.0001	0.00066	0.0001	0.0001	2
Silica	mg/L	1	0	7.6	7.6	7.6	NA	12	0	7	7.6	7.192	0.183	0
Silicon	mg/L	0	0	0	0	NA	NA	1	0	3.5	3.5	3.500	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	7.4	7.4	7.400	NA	NA
Silver	mg/L	1	1	0.01	0.01	0.005	NA	14	14	1.1E-06	0.01	0.004	0.002	0
Sodium	mg/L	1	0	471	471	471	NA	14	0	427	466	445.286	12.572	0
Strontium	mg/L	1	0	0.29	0.29	0.29	NA	14	0	0.263	0.35	0.293	0.022	0
Chromium	mg/L	1	1	0.01	0.01	0.005	NA	14	13	1.4E-06	0.01	0.005	0.002	1
TPH-DRO (C10-C28)	mg/L	1	1	0.1	0.1	0.05	NA	14	14	0.1	0.17	0.055	0.013	2
TPH-GRO (C6-C10)	mg/L	1	1	0.05	0.05	0.025	NA	16	16	0.05	0.1	0.028	0.009	2
Benzene	ug/L	1	1	1	1	0.5	NA	16	16	0.3	1	0.456	0.120	0
Ethylbenzene	ug/L	1	1	1	1	0.5	NA	16	16	0.3	1	0.456	0.120	0
m+p-Xylene	ug/L	1	1	2	2	1	NA	16	16	0.3	2	0.894	0.290	0
o-Xylene	ug/L	1	1	1	1	0.5	NA	16	16	0.3	1	0.456	0.120	0
Toluene	ug/L	1	1	1	1	0.5	NA	16	16	0.3	1	0.456	0.120	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	2	2	1	1	0.500	0.000	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Trout Creek #1-30												
Sampling Station		Walsh-01 Well												
		Summary Statistics Baseline 12/4/2012						Summary Statistics Post-drill 2/7/13 to 6/29/16						
Parameter	UNITS	Count	ND	Min	Max	Avg	ST	Count	ND	Min	Max	Avg	ST	>25% Max
Butane	mg/L	0	0	0	0	NA	NA	11	11	0.03	0.2	0.023	0.026	NA
Ethane	mg/L	3	3	0.02	0.02	0.01	0	18	18	0.002	0.09	0.011	0.009	1
Ethylene	mg/L	0	0	0	0	NA	NA	11	11	0.03	0.1	0.018	0.011	NA
Methane	mg/L	3	0	2.1	2.9	2.366667	0.46188	18	0	0.116	5.3	1.276	1.479	3
Propane	mg/L	3	3	0.03	0.03	0.015	0	18	18	0.001	0.1	0.015	0.010	1
Alkalinity, Total as CaCO3	mg/L	3	0	588	629	608.3333	20.50203	18	0	516	657	570.111	37.871	0
Alkalinity, Bicarbonate as Ca	mg/L	3	0	522	559	539.3333	18.61003	18	0	451	620	508.222	49.211	0
Alkalinity, Carbonate as CaC	mg/L	3	0	66	71	69	2.645751	18	2	20	101	63.111	21.956	1
Bromide	mg/L	3	0	0.166	0.247	0.219	0.045924	18	6	0.06	0.5	0.181	0.094	4
Chloride	mg/L	3	0	26.9	39.98	35.47	7.425247	18	1	0.06	48.6	22.367	12.987	1
Fluoride	mg/L	3	0	6.35	6.9	6.536667	0.314696	18	1	0.03	8.15	6.968	1.841	0
Sulfate	mg/L	3	0	15.11	28.35	19.53333	7.635472	18	1	0.3	41.95	28.247	12.157	13
Nitrate/Nitrite as N	mg/L	3	3	0.02	0.02	0.01	0	18	17	0.003	0.02	0.010	0.003	1
Phosphorus, Total	mg/L	3	0	0.03	0.03	0.03	0	18	2	0.01	0.04	0.027	0.010	2
Solids, Total Dissolved	mg/L	3	0	740	790	773.3333	28.86751	18	0	654	1000	743.556	88.697	1
Hardness as CaCO3	mg/L	3	0	8	8	8	0	18	0	3.8	10	7.228	1.532	0
Hydroxide as CaCO3	mg/L	3	3	2	2	1	0	18	18	2	20	2.000	2.910	2
Sum of Anions	meq/L	3	0	13.5	14.4	13.93333	0.450925	16	0	12.1	15	13.163	0.777	NA
Sum of Cations	meq/L	3	0	13.7	14.2	13.96667	0.251661	16	0	11.7	14.9	12.669	0.951	NA
Cation-Anion Balance	%	3	0	-0.7	0.7	0.133333	0.737111	16	0	-4	3.7	-1.963	2.372	NA
Sodium Adsorption Ratio	NU	3	0	47.8	49.8	48.63333	1.040833	18	0	37.9	51.4	45.072	3.340	NA
Arsenic	mg/L	3	0	0.0014	0.0028	0.001933	0.000757	18	1	0.0002	0.004	0.0025	0.0011	12
Barium	mg/L	3	0	0.028	0.035	0.032	0.003606	18	2	0.000001	0.036	0.024	0.010	0
Boron	mg/L	3	0	1.31	1.31	1.31	0	18	0	1.16	1.32	1.243	0.038	0
Cadmium	mg/L	3	3	0.0001	0.0001	0.00005	0	18	18	0.000088	0.0001	0.0000	0.0000	0
Calcium	mg/L	3	0	1.7	1.8	1.733333	0.057735	18	0	1.3	1.9	1.567	0.146	0
Copper	mg/L	3	3	0.01	0.01	0.005	0	18	14	1.9E-06	0.02	0.007	0.005	4
Iron	mg/L	3	3	0.02	0.02	0.01	0	18	17	0.000014	0.07	0.012	0.015	1
Lead	mg/L	3	3	0.0001	0.0001	0.00005	0	18	17	0.0001	0.0002	0.000	0.000	3
Magnesium	mg/L	3	0	0.9	0.9	0.9	0	18	2	0.000019	1.4	0.811	0.343	2
Manganese	mg/L	3	3	0.005	0.005	0.0025	0	18	18	6E-07	0.005	0.002	0.001	0
Mercury	mg/L	3	2	0.0002	0.0003	0.000167	0.000115	18	18	0.00006	0.0002	0.0001	0.0000	0
Potassium	mg/L	3	0	1.7	1.7	1.7	0	18	0	1.4	3.1	1.761	0.362	1
Selenium	mg/L	3	3	0.0001	0.0001	0.00005	0	18	16	0.0001	0.00066	0.0001	0.0001	4
Silica	mg/L	3	0	7	7.3	7.133333	0.152753	16	0	6.6	7	6.794	0.112	0
Silicon	mg/L	0	0	0	0	NA	NA	1	0	3.4	3.4	3.400	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	7.2	7.2	7.200	NA	NA
Silver	mg/L	3	3	0.01	0.01	0.005	0	18	18	1.1E-06	0.01	0.004	0.002	0
Sodium	mg/L	3	0	306	319	313	6.557439	18	0	260	334	283.444	22.091	0
Strontium	mg/L	3	0	0.09	0.1	0.096667	0.005774	18	0	0.077	0.11	0.087	0.010	0
Chromium	mg/L	3	3	0.01	0.01	0.005	0	18	17	1.4E-06	0.01	0.005	0.002	1
TPH-DRO (C10-C28)	mg/L	3	3	0.1	0.1	0.05	8.5E-18	18	18	0.09	0.18	0.053	0.010	2
TPH-GRO (C6-C10)	mg/L	3	3	0.05	0.05	0.025	4.25E-18	18	18	0.05	0.1	0.028	0.008	2
Benzene	ug/L	3	3	1	1	0.5	0	18	18	0.3	1	0.461	0.113	0
Ethylbenzene	ug/L	3	3	1	1	0.5	0	18	18	0.3	1	0.461	0.113	0
m+p-Xylene	ug/L	3	3	2	2	1	0	18	18	0.3	2	0.906	0.275	0
o-Xylene	ug/L	3	3	1	1	0.5	0	18	18	0.3	1	0.461	0.113	0
Toluene	ug/L	3	3	1	1	0.5	0	18	18	0.3	1	0.461	0.113	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	2	2	1	1	0.500	0.000	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-11: Summary Statistics of Water Source Analytical Results

Well Pad		Trout Creek #1-30												
Sampling Station		Werner-01 Well												
		Summary Statistics Baseline 12/4/2012						Summary Statistics Post-drill 3/4/13 to 6/29/16						
Parameter	UNITS	Count	ND	Min	Max	Avg	ST	Count	ND	Min	Max	Avg	ST	>25% Max
Butane	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Ethane	mg/L	1	1	0.02	0.02	0.01	NA	14	14	0.002	0.02	0.009	0.003	0
Ethylene	mg/L	0	0	0	0	NA	NA	10	10	0.03	0.03	0.015	0.000	NA
Methane	mg/L	1	1	0.009	0.009	0.0045	NA	14	11	0.0085	0.013	0.006	0.003	3
Propane	mg/L	1	1	0.03	0.03	0.015	NA	14	14	0.001	0.03	0.013	0.005	0
Alkalinity, Total as CaCO3	mg/L	1	0	459	459	459	NA	14	0	433	485	456.214	14.524	0
Alkalinity, Bicarbonate as Ca	mg/L	1	0	459	459	459	NA	14	0	424	485	453.857	15.541	0
Alkalinity, Carbonate as CaC	mg/L	1	1	2	2	1	NA	14	12	2	22	4.357	6.259	4
Bromide	mg/L	1	0	0.08	0.08	0.08	NA	14	12	0.06	0.25	0.075	0.053	4
Chloride	mg/L	1	0	4.69	4.69	4.69	NA	14	0	3.9	9.07	5.433	1.223	3
Fluoride	mg/L	1	0	0.14	0.14	0.14	NA	14	9	0.1	0.25	0.126	0.051	3
Sulfate	mg/L	1	0	166.98	166.98	166.98	NA	14	0	137	183	162.469	12.398	0
Nitrate/Nitrite as N	mg/L	1	1	0.02	0.02	0.01	NA	14	14	0.003	0.02	0.009	0.003	0
Phosphorus, Total	mg/L	1	0	0.01	0.01	0.01	NA	14	6	0.01	0.02	0.011	0.006	4
Solids, Total Dissolved	mg/L	1	0	700	700	700	NA	14	0	660	760	704.143	24.362	0
Hardness as CaCO3	mg/L	1	0	227	227	227	NA	14	0	183	232	211.071	15.264	0
Hydroxide as CaCO3	mg/L	1	1	2	2	1	NA	14	14	2	20	2.286	3.268	2
Sum of Anions	meq/L	1	0	12.8	12.8	12.8	NA	12	0	12	13	12.575	0.427	NA
Sum of Cations	meq/L	1	0	12.9	12.9	12.9	NA	12	0	11.7	12.8	12.108	0.315	NA
Cation-Anion Balance	%	1	0	0.4	0.4	0.4	NA	12	0	-4	1.6	-1.875	2.149	NA
Sodium Adsorption Ratio	NU	1	0	5.5	5.5	5.5	NA	14	0	5.01	6.1	5.427	0.317	NA
Arsenic	mg/L	1	1	0.0002	0.0002	0.0001	NA	14	14	0.0002	0.0002	0.0001	0.0000	0
Barium	mg/L	1	0	0.023	0.023	0.023	NA	14	2	0.000001	0.023	0.017	0.007	0
Boron	mg/L	1	0	0.17	0.17	0.17	NA	14	0	0.15	0.17	0.158	0.007	0
Cadmium	mg/L	1	1	0.0001	0.0001	0.00005	NA	14	14	0.000088	0.0001	0.0000	0.0000	0
Calcium	mg/L	1	0	52	52	52	NA	14	0	42.3	54	48.843	3.469	0
Copper	mg/L	1	0	0.02	0.02	0.02	NA	14	14	1.9E-06	0.01	0.004	0.002	0
Iron	mg/L	1	1	0.02	0.02	0.01	NA	14	5	0.000014	0.2	0.043	0.057	9
Lead	mg/L	1	1	0.0001	0.0001	0.00005	NA	14	13	0.0001	0.0003	0.000	0.000	3
Magnesium	mg/L	1	0	23.5	23.5	23.5	NA	14	0	18.9	24.1	21.736	1.689	0
Manganese	mg/L	1	0	0.008	0.008	0.008	NA	14	10	6E-07	0.023	0.005	0.006	1
Mercury	mg/L	1	1	0.0002	0.0002	0.0001	NA	14	14	0.00006	0.0002	0.0001	0.0000	0
Potassium	mg/L	1	0	3.2	3.2	3.2	NA	14	0	2.7	4.4	3.157	0.388	1
Selenium	mg/L	1	1	0.0001	0.0001	0.00005	NA	14	13	0.0001	0.00066	0.0001	0.0001	3
Silica	mg/L	1	0	13.4	13.4	13.4	NA	12	0	11.8	13.5	12.533	0.545	0
Silicon	mg/L	0	0	0	0	NA	NA	1	0	5.7	5.7	5.700	NA	NA
Silicon as SiO2	mg/L	0	0	0	0	NA	NA	1	0	12	12	12.000	NA	NA
Silver	mg/L	1	1	0.01	0.01	0.005	NA	14	14	1.1E-06	0.01	0.004	0.002	0
Sodium	mg/L	1	0	188	188	188	NA	14	0	170	190	179.000	5.974	0
Strontium	mg/L	1	0	2.07	2.07	2.07	NA	14	0	1.77	2.15	1.986	0.116	0
Chromium	mg/L	1	1	0.01	0.01	0.005	NA	14	14	1.4E-06	0.01	0.004	0.002	0
TPH-DRO (C10-C28)	mg/L	1	1	0.1	0.1	0.05	NA	14	14	0.1	15.085	1.123	4.006	2
TPH-GRO (C6-C10)	mg/L	1	1	0.05	0.05	0.025	NA	14	14	0.05	0.1	0.029	0.009	2
Benzene	ug/L	1	1	1	1	0.5	NA	14	14	0.3	1	0.450	0.127	0
Ethylbenzene	ug/L	1	1	1	1	0.5	NA	14	14	0.3	1	0.450	0.127	0
m+p-Xylene	ug/L	1	1	2	2	1	NA	14	14	0.3	2	0.879	0.309	0
o-Xylene	ug/L	1	1	1	1	0.5	NA	14	14	0.3	1	0.450	0.127	0
Toluene	ug/L	1	1	1	1	0.5	NA	14	14	0.3	1	0.450	0.127	0
Xylene (total)	ug/L	0	0	0	0	NA	NA	2	2	1	1	0.500	0.000	NA

Notes:

ND = Not Detected

ST = Standard Deviation

Table A-12: Summary of Statistical Test Results

Well Pad Sampling Station	Dawson Creek #1-25 Fralick-01 Well					
			Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean <= Sample 2 Mean H_a: Sample 1 Mean > Sample 2 Mean		Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean = Sample 2 Mean (Two Sided Alternative) H_a: Sample 1 Mean <> Sample 2 Mean	
Analyte	**Mann-Kendall / CF(%)**	**F-Test**	**T-Test (one tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**	**T-Test (two tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**
Alkalinity, Bicarbonate as CaCO3	Increasing / 98.4	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Alkalinity, Carbonate as CaCO3	NA	NA	NA	NA	NA	NA
Alkalinity, Total as CaCO3	Increasing / 99.5	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Arsenic	Decreasing / 99.8	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Barium	No Trend / 58.8	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Boron	Decreasing / 98.9	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Bromide	Stable / 78.3	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Cadmium	Decreasing / 96.5	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Calcium	Decreasing / 99.9	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Cation-Anion Balance	NA	NA	NA	Same Result	NA	Same Result
Chloride	Decreasing / 98.2	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Chromium	Decreasing / 99.6	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Copper	No Trend / 82.9	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Fluoride	Decreasing / 99.8	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Hardness as CaCO3	Decreasing / 99.9	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Hydroxide as CaCO3	NA	NA	NA	NA	NA	NA
Iron	Stable / 88.6	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Lead	Prob. Increasing / 91.1	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Magnesium	Decreasing / 99.9	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Manganese	Prob. Decreasing / 93.0	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean
Mercury	Stable / 85.6	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Nitrate/Nitrite as N	Stable / 85.6	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <> Sample 2 Mean
Phosphorus, Total	Decreasing / 95.2	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Potassium	Decreasing / 99.5	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Selenium	Decreasing / 99.9	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Silica	Stable / 88.5	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Silicon	NA	NA	NA	NA	NA	NA
Silicon as SiO2	NA	NA	NA	NA	NA	NA
Silver	Prob. Decreasing / 92.4	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean
Sodium	Decreasing / 98.2	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Sodium Adsorption Ratio	NA	NA	NA	NA	NA	NA
Solids, Total Dissolved	Decreasing / 99.6	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Strontium	Decreasing / 99.7	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Sulfate	Prob. Decreasing / 94.8	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <> Sample 2 Mean
Sum of Anions	NA	NA	NA	NA	NA	NA
Sum of Cations	NA	NA	NA	NA	NA	NA

Table A-12: Summary of Statistical Test Results

Well Pad **Sampling Station**	**Dawson Creek #1-25** **State-01B Well**					
			Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean <= Sample 2 Mean H_a: Sample 1 Mean > Sample 2 Mean		Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean = Sample 2 Mean (Two Sided Alternative) H_a: Sample 1 Mean <> Sample 2 Mean	
Analyte	**Mann-Kendall / CF(%)**	**F-Test**	**T-Test (one tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**	**T-Test (two tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**
Alkalinity, Bicarbonate as CaCO3	Increasing / 99.9	Inequal Variance	Sample 1 Mean > Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 mean	Same Result
Alkalinity, Carbonate as CaCO3	NA	NA	NA	NA	NA	NA
Alkalinity, Total as CaCO3	Increasing / 99.4	Equal Variance	Sample 1 Mean > Sample 2 Mean	Same Result	NA	NA
Arsenic	Decreasing / 99.8	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Barium	Increasing / 96.4	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Sample 1 Mean > Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Same Result
Boron	Increasing / 99.9	Inequal Variance	Sample 1 Mean > Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <> Sample 2 mean
Bromide	Increasing / 99.9	Inequal Variance	Sample 1 Mean > Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <> Sample 2 mean
Cadmium	Stable / 66.2	Not Calculated	Not Calculated	Not Calculated	Not Calculated	Not Calculated
Calcium	Decreasing / 99.8	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Cation-Anion Balance	NA	NA	NA	Same Result	NA	Same Result
Chloride	Increasing / 99.9	Inequal Variance	Sample 1 Mean > Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <> Sample 2 mean
Chromium		Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Copper	Stable / 54.2	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Fluoride	Decreasing / 99.8	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Hardness as CaCO3	Decreasing / 99.9	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Hydroxide as CaCO3	NA	NA	NA	NA	NA	NA
Iron	Prob. Increasing / 94	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Lead	No Trend / 83.4	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Magnesium	Decreasing / 99.9	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Manganese	Decreasing / 98.1	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Mercury	Decreasing / 95.4	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Same Result
Nitrate/Nitrite as N	No Trend / 75.2	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Phosphorus, Total	No Trend / 84	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Potassium	Decreasing / 100	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Selenium	Decreasing / 99.9	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Silica	Increasing / 99.9	Inequal Variance	Sample 1 Mean > Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Silicon	NA	NA	NA	NA	NA	NA
Silicon as SiO2	NA	NA	NA	NA	NA	NA
Silver	Stable / 74.4	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Sodium	Prob. Decreasing / 92.2	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Sodium Adsorption Ratio	NA	NA	NA	NA	NA	NA
Solids, Total Dissolved	Decreasing / 99.9	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Strontium	Prob. Decreasing / 91.8	Inequal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean = Sample 2 Mean	Same Result
Sulfate	Decreasing / 99.9	Equal Variance	Sample 1 Mean <= Sample 2 Mean	Same Result	Sample 1 Mean <> Sample 2 Mean	Same Result
Sum of Anions	NA	NA	NA	NA	NA	NA
Sum of Cations	NA	NA	NA	NA	NA	NA

Table A-12: Summary of Statistical Test Results

Well Pad **Sampling Station**	**Gnat Hill #1-29** **Tuttle-01A Well**					
			Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean = Sample 2 Mean (Two Sided Alternative) H_a: Sample 1 Mean <> Sample 2 Mean		Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean <= Sample 2 Mean H_a: Sample 1 Mean > Sample 2 Mean	
Analyte	**Mann-Kendall / CF(%)**	**F-Test**	**T-Test (two tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**	**T-Test (one tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**
Alkalinity, Bicarbonate as CaCO3	Prob increasing / 93.6	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Alkalinity, Carbonate as CaCO3	No trend / 52.6	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Alkalinity, Total as CaCO3	No trend / 88.3	Inequal Variance	NA	NA	NA	NA
Arsenic	Stable / 78	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Barium	Decreasing / 96.8	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Boron	Prob decreasing / 92.7	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Bromide	No trend / 68.5	Not Calculated	Not Calculated	Not Calculated	Not Calculated	Not Calculated
Cadmium	Stable / 78	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Calcium	No trend / 58.9	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Cation-Anion Balance	NA	NA	NA	Same Result	NA	Same Result
Chloride	No trend / 63.8	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Sample 1 Mean > Sample 2 Mean
Chromium	Decreasing / 97.9	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Copper	Prob decreasing / 94.4	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Fluoride	Decreasing / 99.9	Not Calculated	Not Calculated	Not Calculated	Not Calculated	
Hardness as CaCO3	Prob decreasing / 94.4	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Not Calculated
Hydroxide as CaCO3	NA	NA	NA	NA	NA	NA
Iron	No trend / 68.5	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Lead	Stable / 70.7	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Magnesium	Decreasing / 98.2	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Manganese	Decreasing / >99.9	Equal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Mercury	Stable / 71.8	Not Calculated	Not Calculated	Not Calculated	Not Calculated	Not Calculated
Nitrate/Nitrite as N	No trend / 55.1	Not Calculated	Not Calculated	Not Calculated	Not Calculated	Not Calculated
Phosphorus, Total	Decreasing / >99.9	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Potassium	Stable / 87.7	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Selenium	Stable / 52.6	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Silica	Stable / 69.8	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Silicon	NA	NA	NA	NA	NA	NA
Silicon as SiO2	NA	NA	NA	NA	NA	NA
Silver	No trend / 89.6	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Sodium	Decreasing / 100	Equal Variance	Sample 1 Mean <> Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Sodium Adsorption Ratio	NA	NA	NA	NA	NA	NA
Solids, Total Dissolved	No trend / 78.9	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Strontium	Increasing / 97.3	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Sulfate	Increasing / 96	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Sum of Anions	NA	NA	NA	NA	NA	NA
Sum of Cations	NA	NA	NA	NA	NA	NA

Table A-12: Summary of Statistical Test Results

Well Pad **Sampling Station**	**Gnat Hill #1-29** **Tuttle-01B Well**					
			Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean = Sample 2 Mean (Two Sided Alternative) H_a: Sample 1 Mean <> Sample 2 Mean		Sample 1 = Post Drill, Sample 2 = Baseline H_0: Sample 1 Mean <= Sample 2 Mean H_a: Sample 1 Mean > Sample 2 Mean	
Analyte	**Mann-Kendall / CF(%)**	**F-Test**	**T-Test (two tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**	**T-Test (one tail), 95%**	**Welch-Satterthwaite (Unequal Variance)**
Alkalinity, Bicarbonate as CaCO3	Stable / 72.1	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Alkalinity, Carbonate as CaCO3	Stable / 70.2	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Alkalinity, Total as CaCO3	Stable / 48.7	Equal Variance	NA	NA	NA	NA
Arsenic	Decreasing / 99.9	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Barium	Decreasing / >99.9	Equal Variance	Sample 1 Mean <> Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Boron	Prob Decreasing / 93.6	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Bromide	No trend / 73.9	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Cadmium	Stable / 66.2	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Calcium	Decreasing / 97.5	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Cation-Anion Balance	NA	NA	NA	NA	NA	NA
Chloride	Stable / 75.7	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Chromium	Decreasing / 98.4	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Copper	No trend / 87.5	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Fluoride	No trend / 62.1	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Hardness as CaCO3	Decreasing / 98.4	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Hydroxide as CaCO3	NA	NA	NA	NA	NA	NA
Iron	No trend / 79.1	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Lead	No trend / 48.9	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Magnesium	Decreasing / 96.5	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Manganese	Decreasing / >99.9	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Mercury	Stable / 79.9	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Nitrate/Nitrite as N	No trend / 77.5	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Phosphorus, Total	Increasing / 99.9	Equal Variance	Sample 1 Mean <> Sample 2 Mean	Same Result	Sample 1 Mean > Sample 2 Mean	Same Result
Potassium	Decreasing / 95.8	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Selenium	Prob Decreasing / 92.4	Equal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Silica	Decreasing / 98.6	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Silicon	NA	NA	NA	NA	NA	NA
Silicon as SiO2	NA	NA	NA	NA	NA	NA
Silver	Decreasing / 97.3	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Sodium	Decreasing / 96.5	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Sodium Adsorption Ratio	NA	NA	NA	NA	NA	NA
Solids, Total Dissolved	Stable / 50	Inequal Variance	Sample 1 Mean <> Sample 2 Mean	Sample 1 Mean = Sample 2 Mean	Sample 1 Mean <= Sample 2 Mean	Same Result
Strontium	Prob Decreasing / 92.8	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Sulfate	No trend / 71.1	Inequal Variance	Sample 1 Mean = Sample 2 Mean	Same Result	Sample 1 Mean <= Sample 2 Mean	Same Result
Sum of Anions	NA	NA	NA	NA	NA	NA
Sum of Cations	NA	NA	NA	NA	NA	NA

APPENDIX B

Piper Diagrams

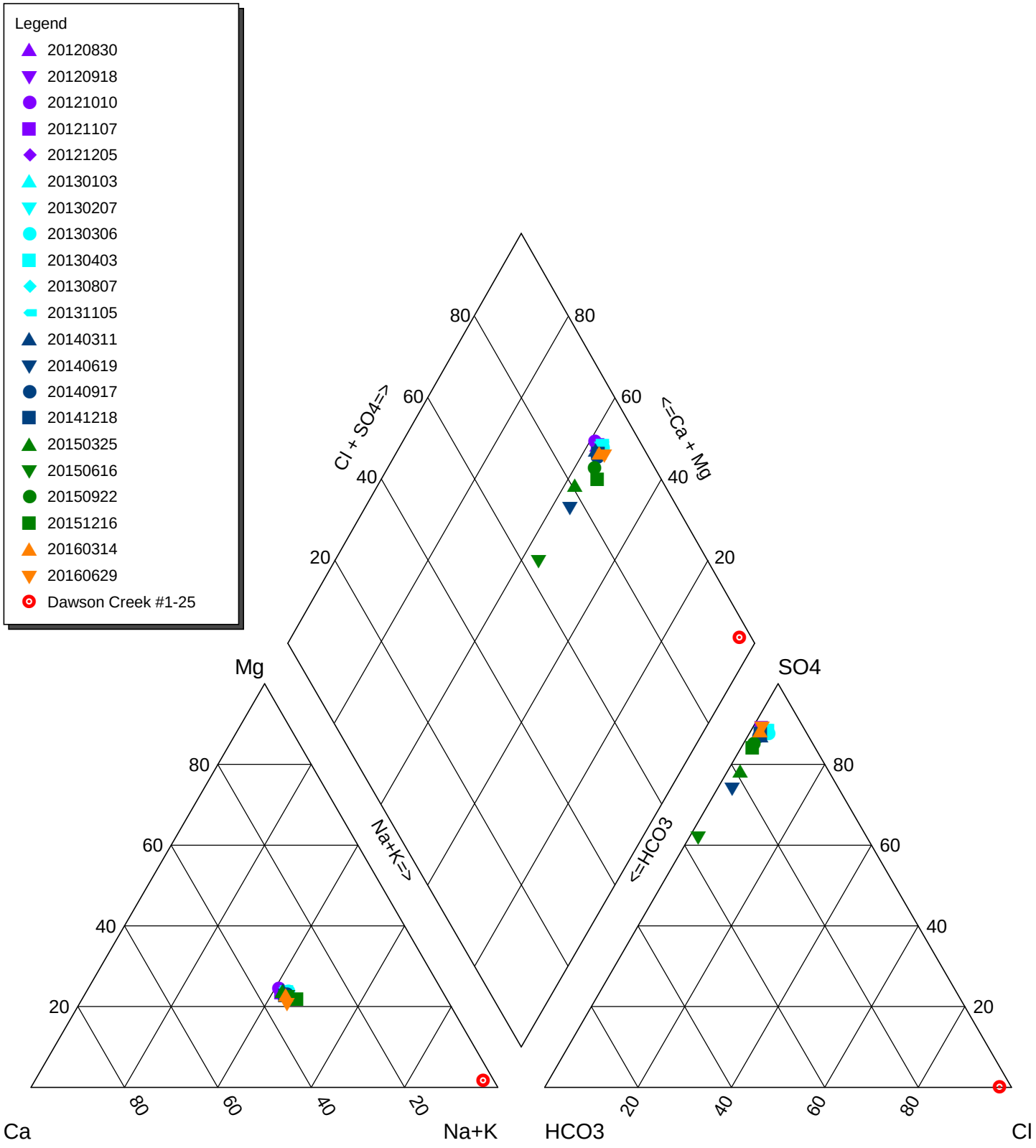


Figure B-1: Fralick-01 Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Dawson Creek #1-25 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/16/2016

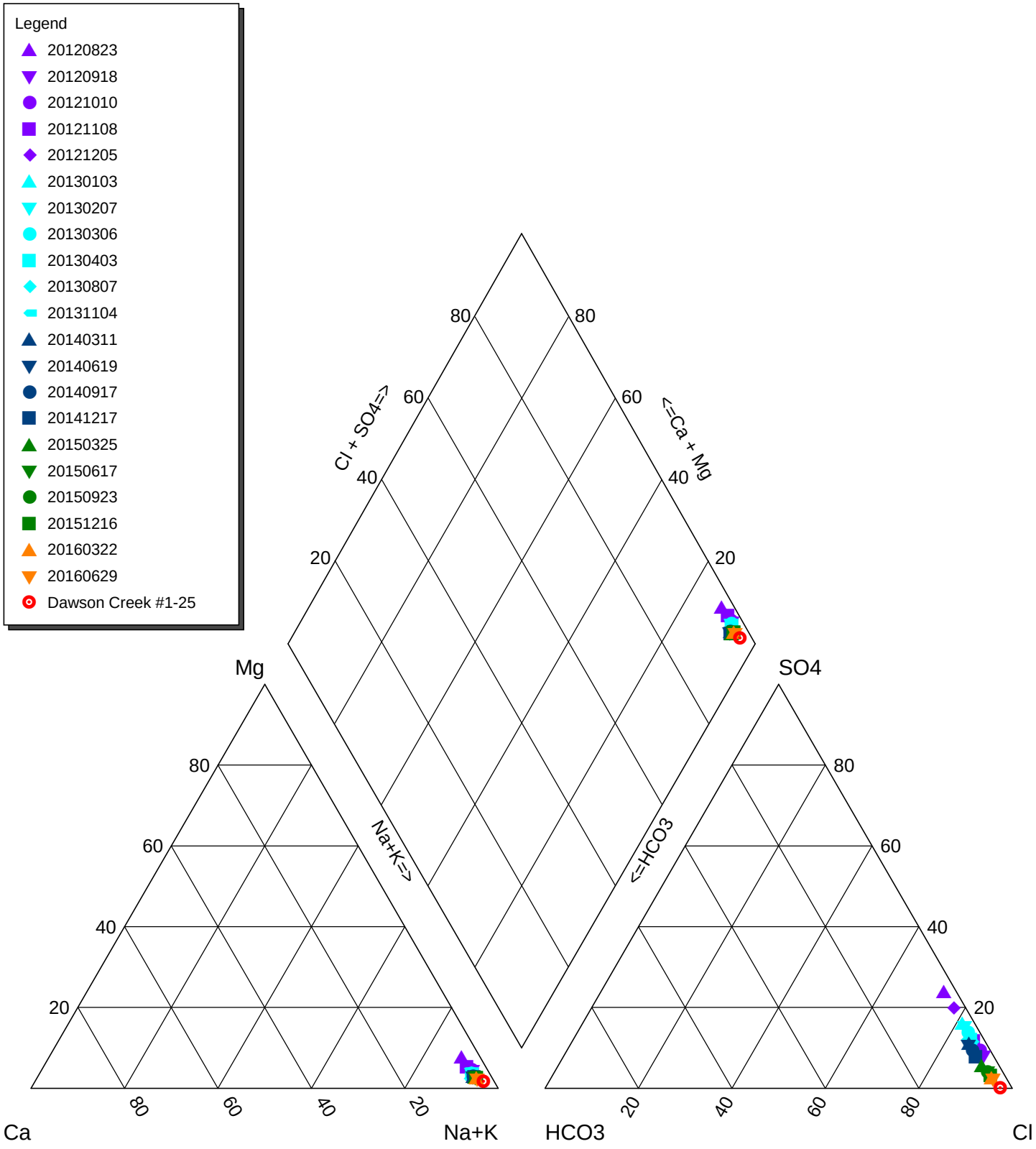


Figure B-2: State-01B Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Dawson Creek #1-25 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/16/2016

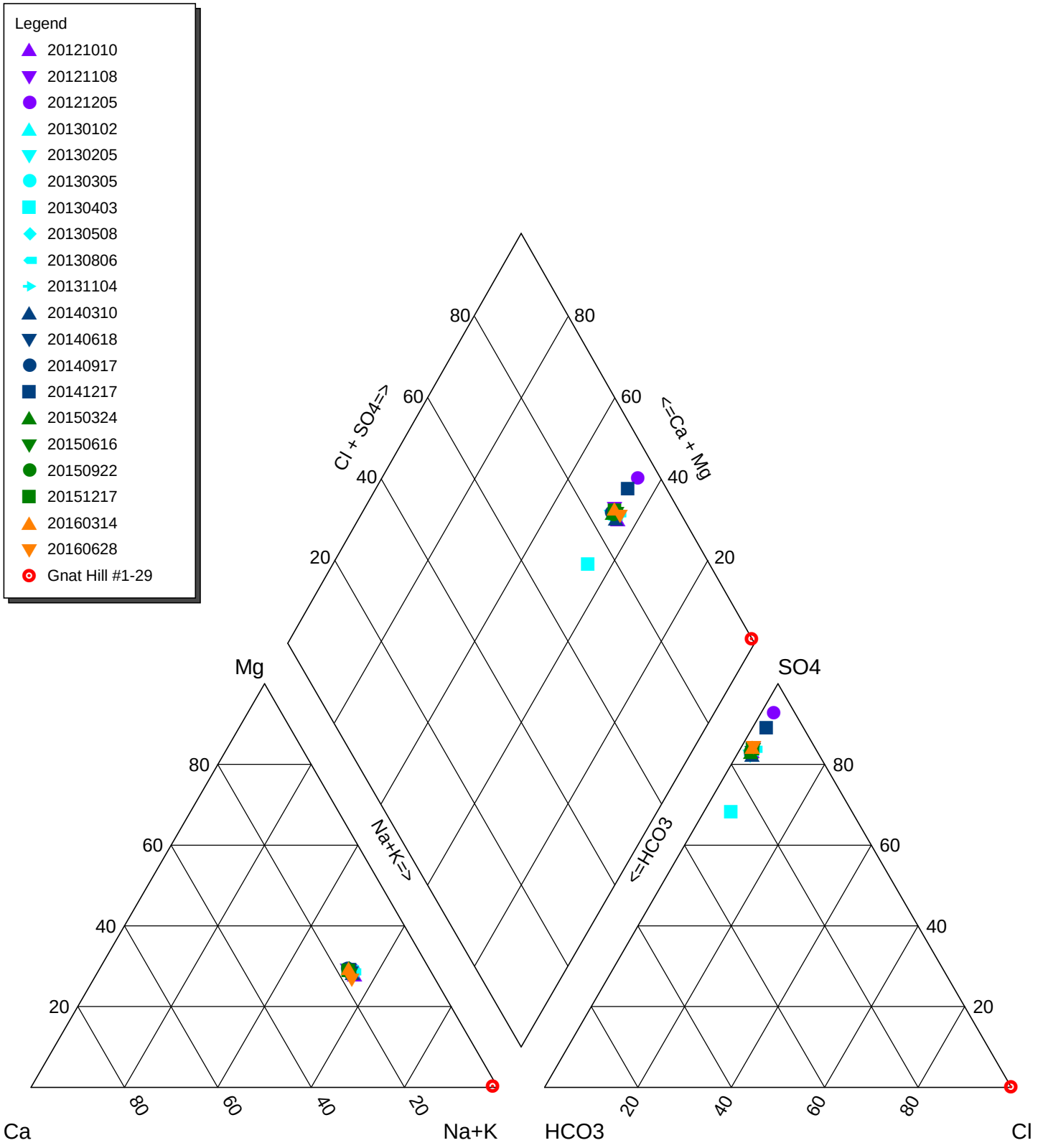


Figure B-3: Tuttle-01A Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Gnat Hill #1-29 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/22/2016

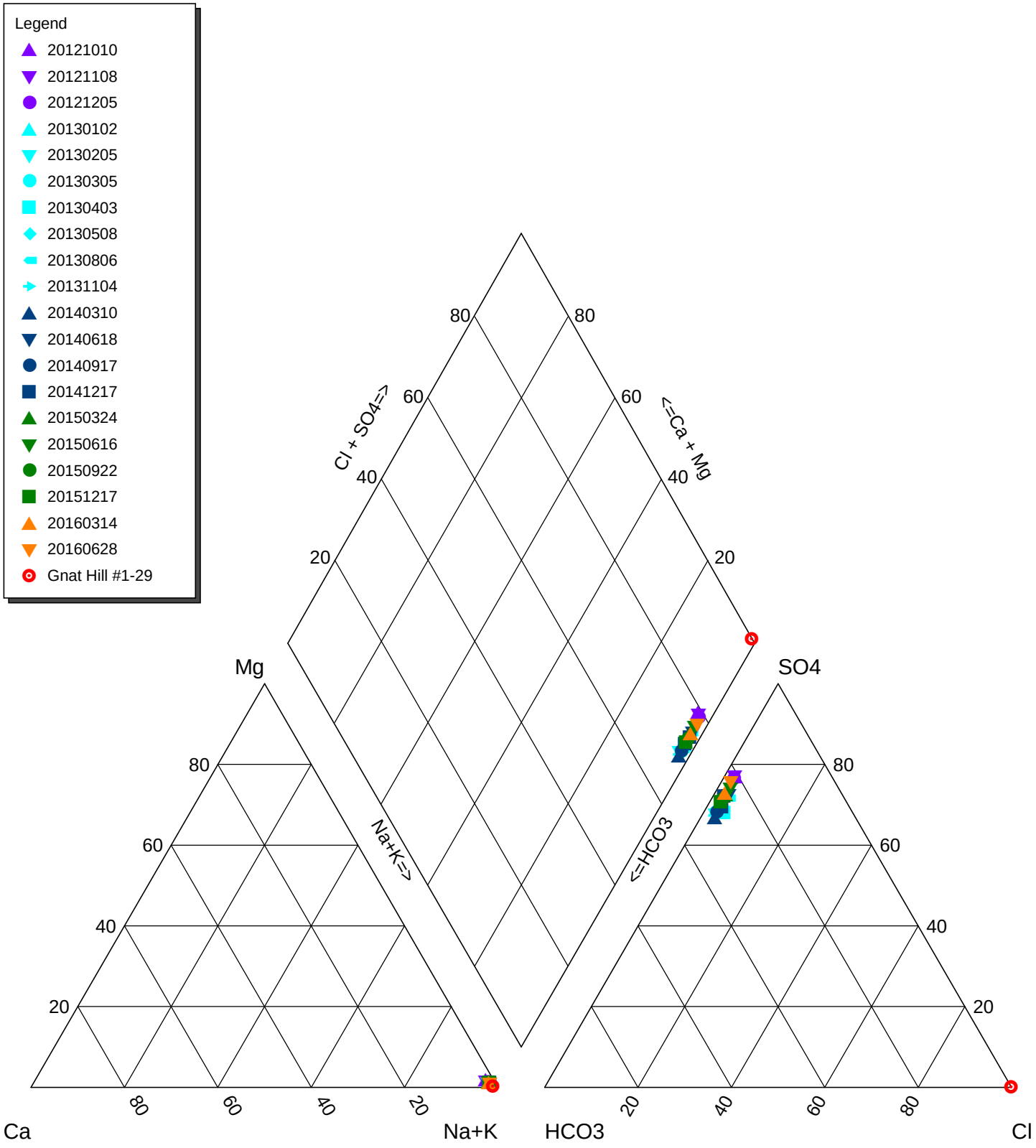


Figure B-4: Tuttle-01B Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Gnat Hill #1-29 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/22/2016

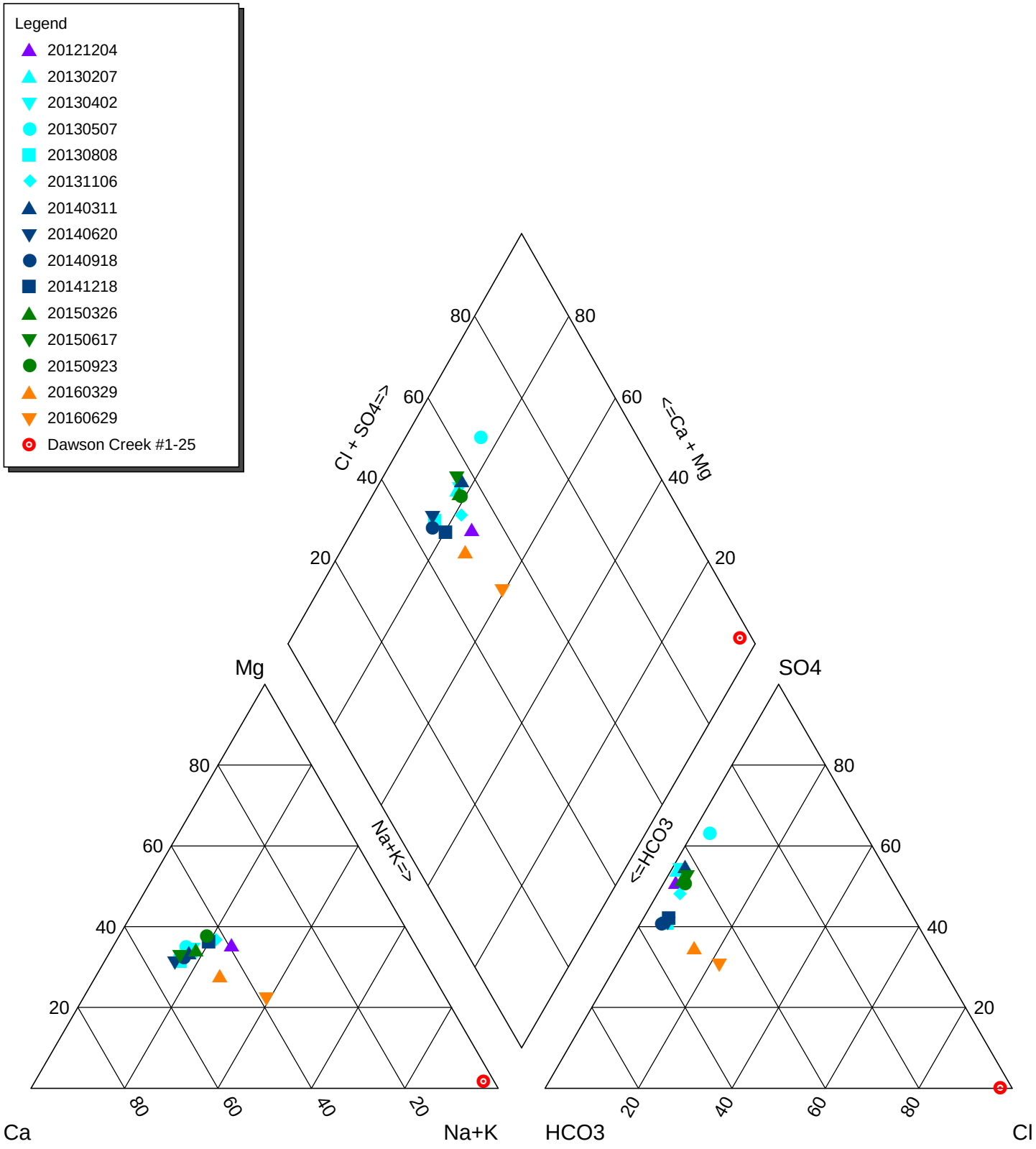


Figure B-5: Jones-01 Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Trout Creek #1-30 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/16/2016

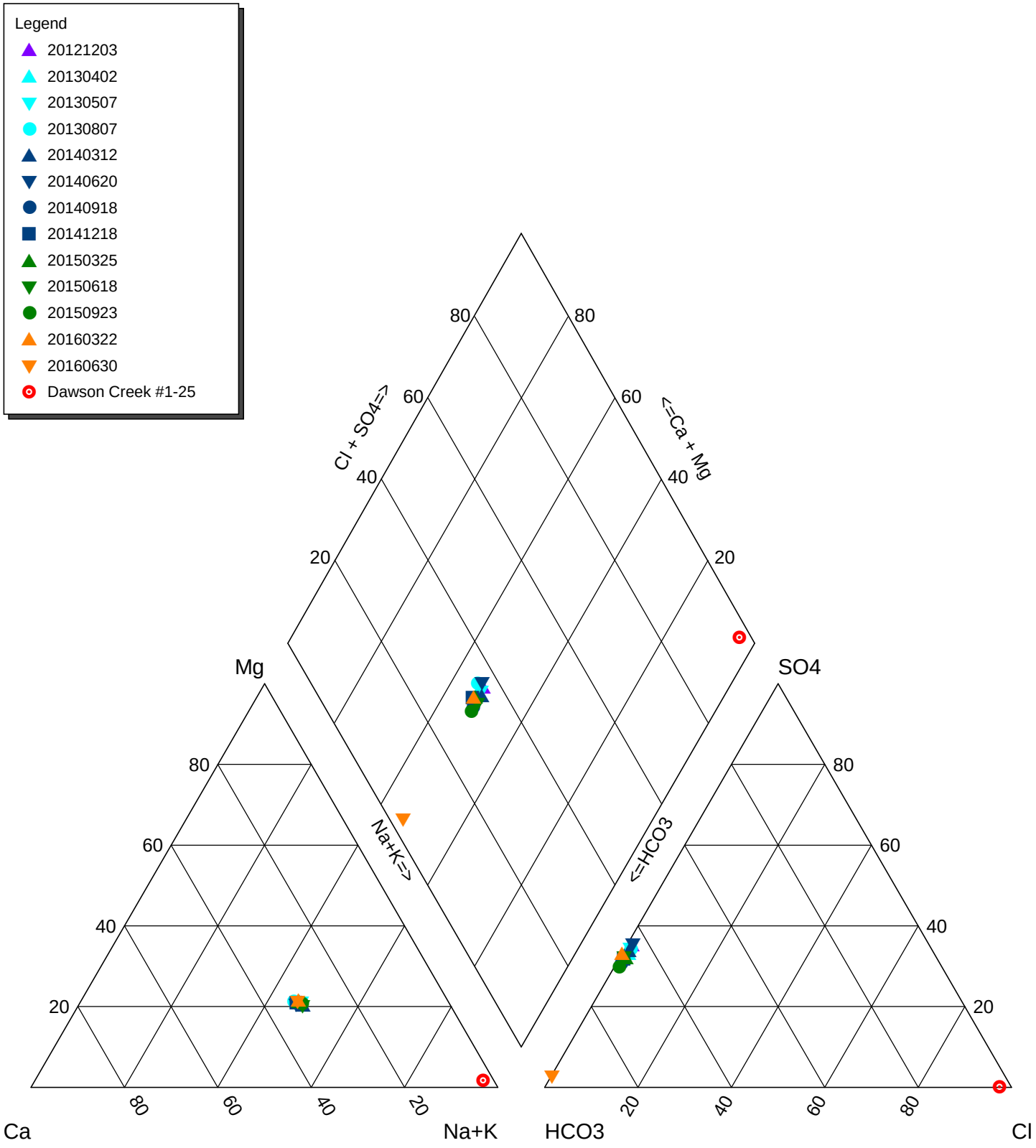


Figure B-6: Myhre-01 Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Trout Creek #1-30 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/22/2016

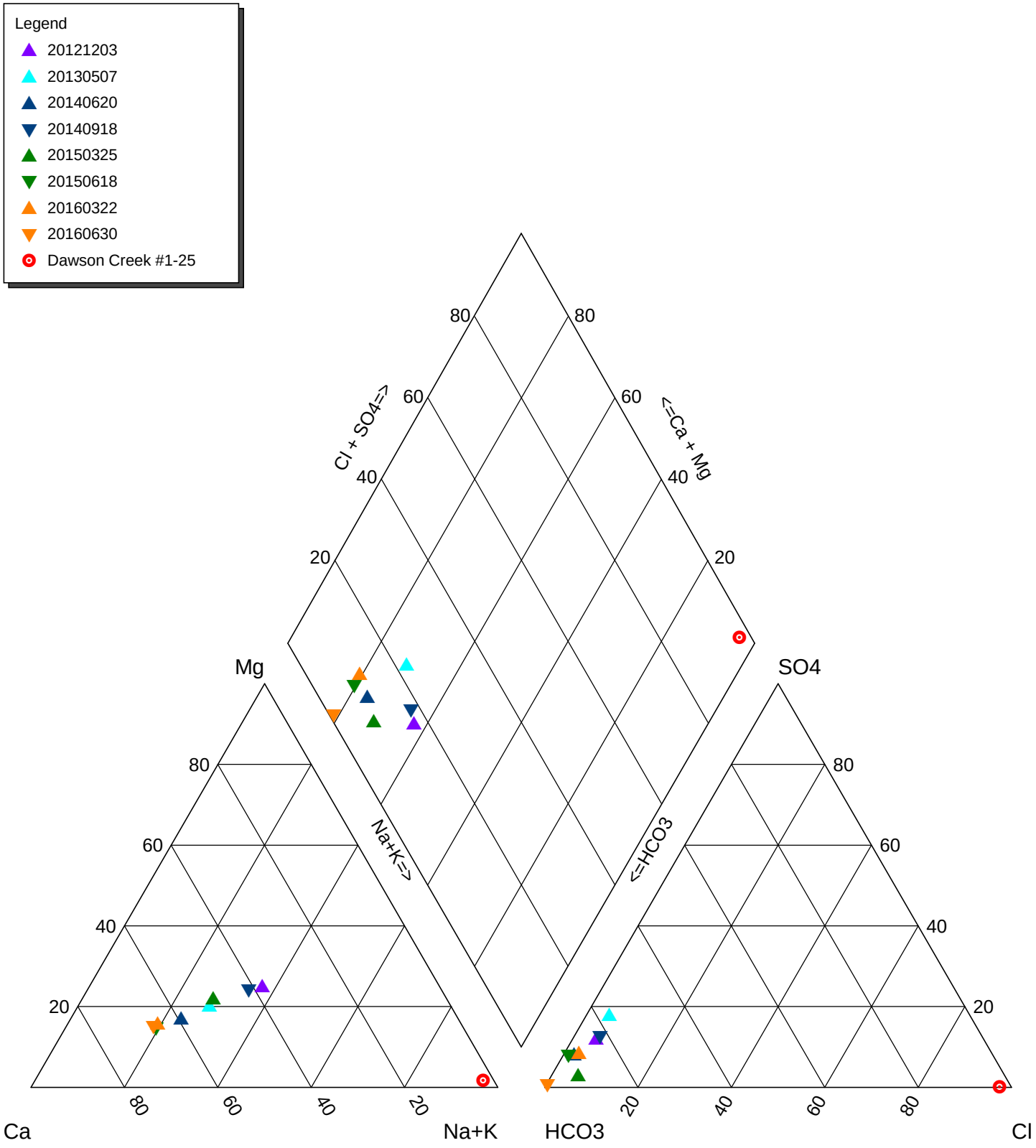


Figure B-7: Myhre-02 Spring Piper Diagram

Western Water & Land, Inc.	PROJECT: Trout Creek #1-30 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/22/2016

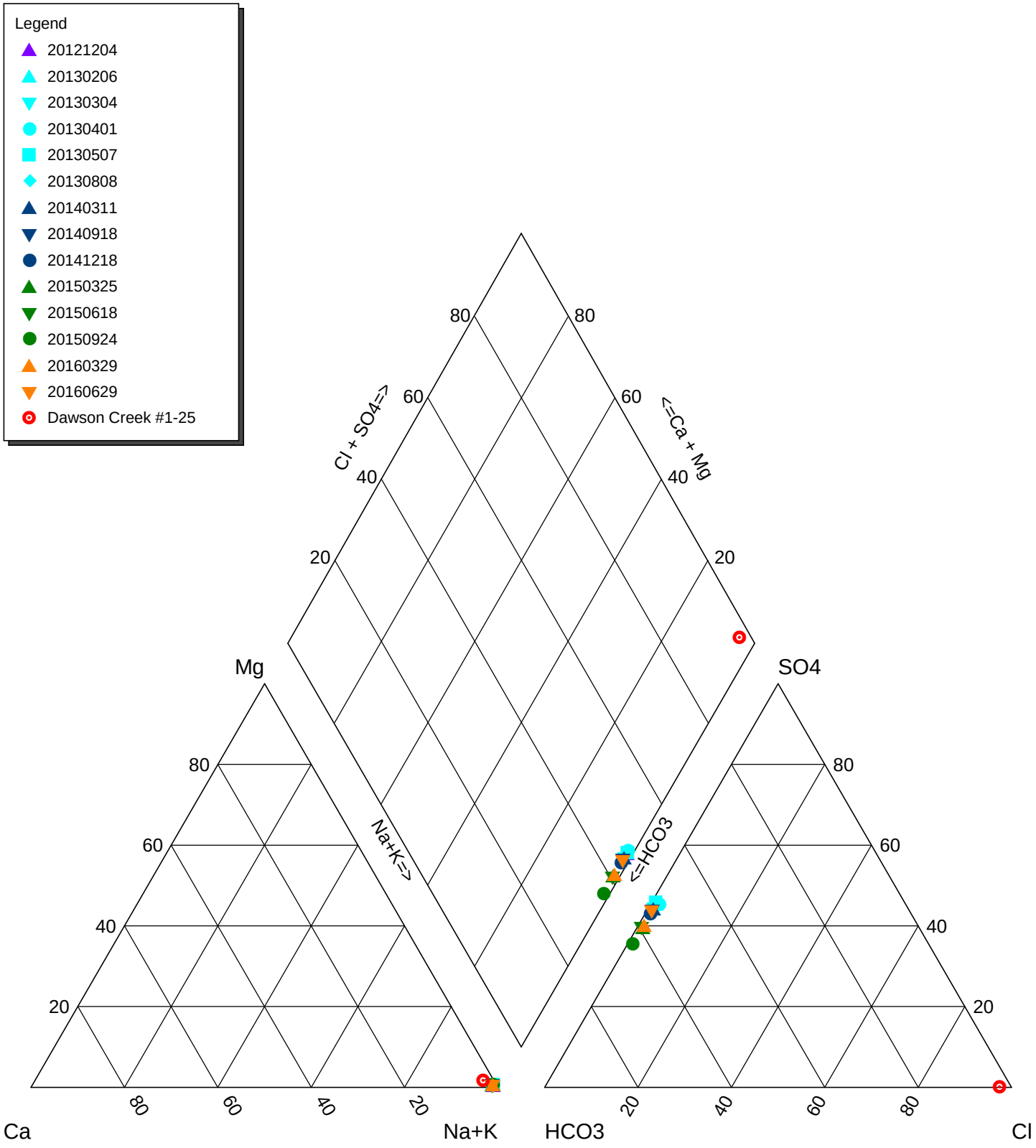


Figure B-8: Saddleback-01 Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Trout Creek #1-30 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/22/2016

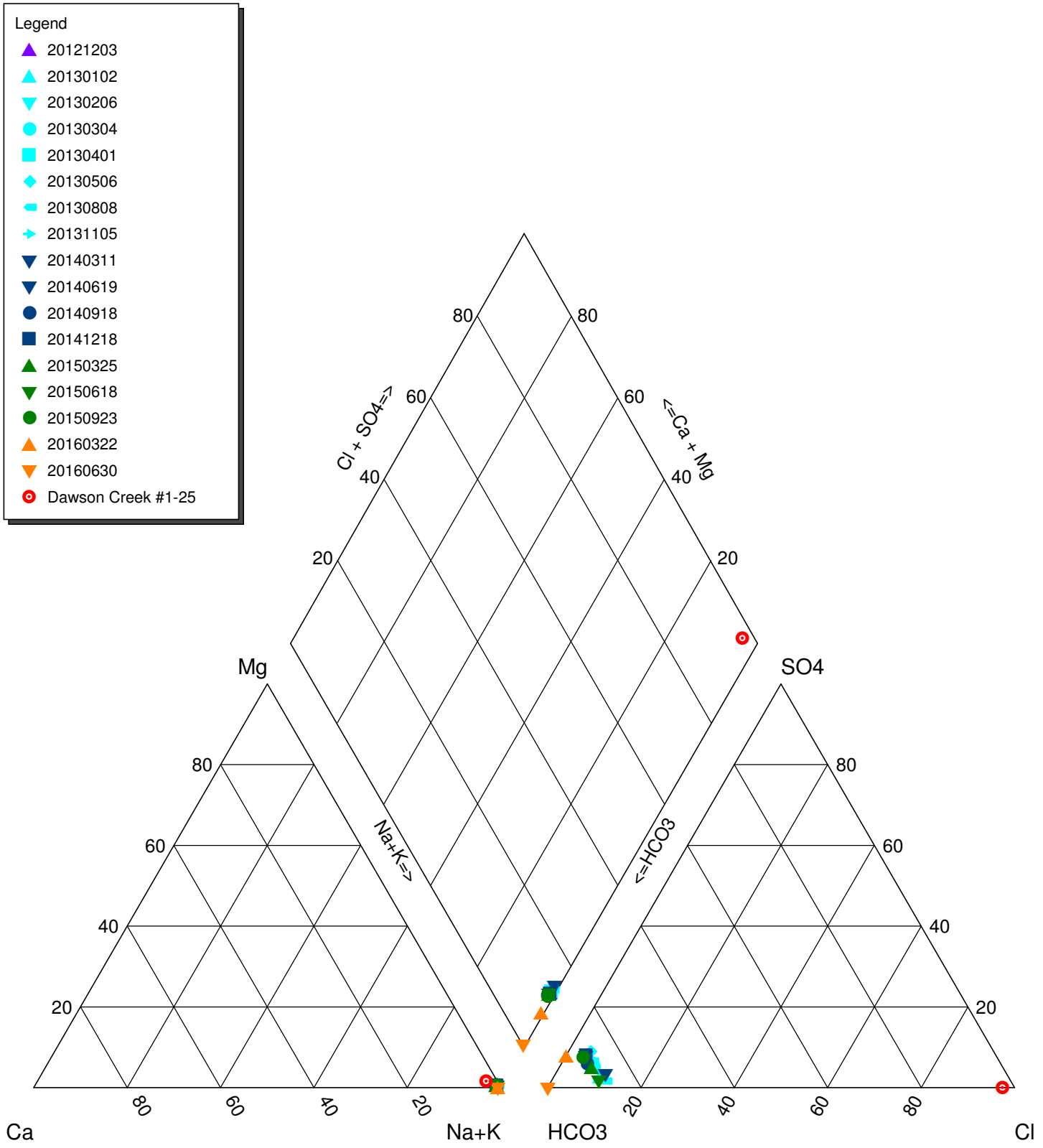


Figure B-9: Walsh-01 Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Trout Creek #1-30 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/22/2016

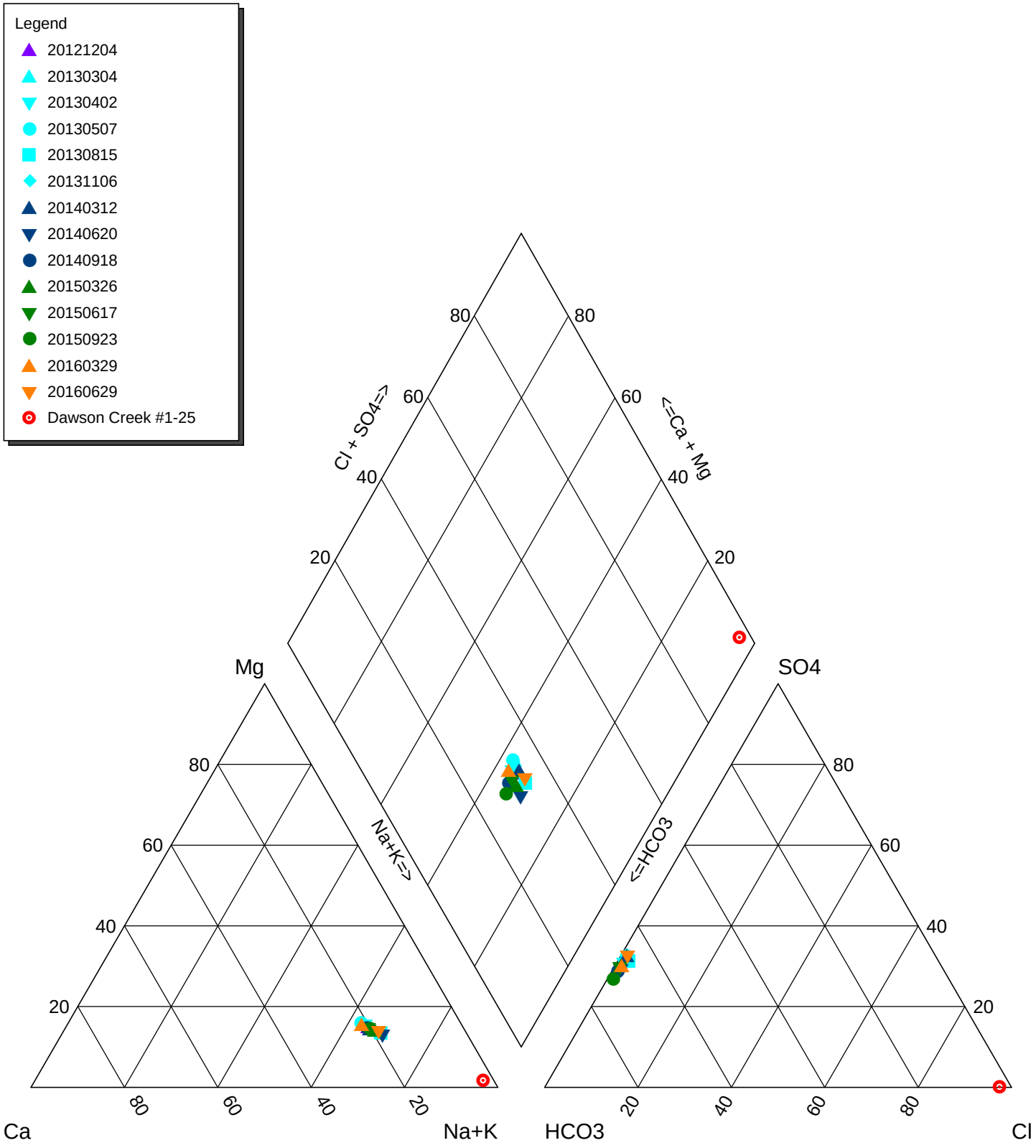


Figure B-10: Werner-01 Well Piper Diagram

Western Water & Land, Inc.	PROJECT: Trout Creek #1-30 Water Quality Evaluation	PROJECT NO: 34000.01
	CLIENT: SWN Production Company, LLC	DATE: 12/22/2016

APPENDIX C

Concentration Versus Date Plots

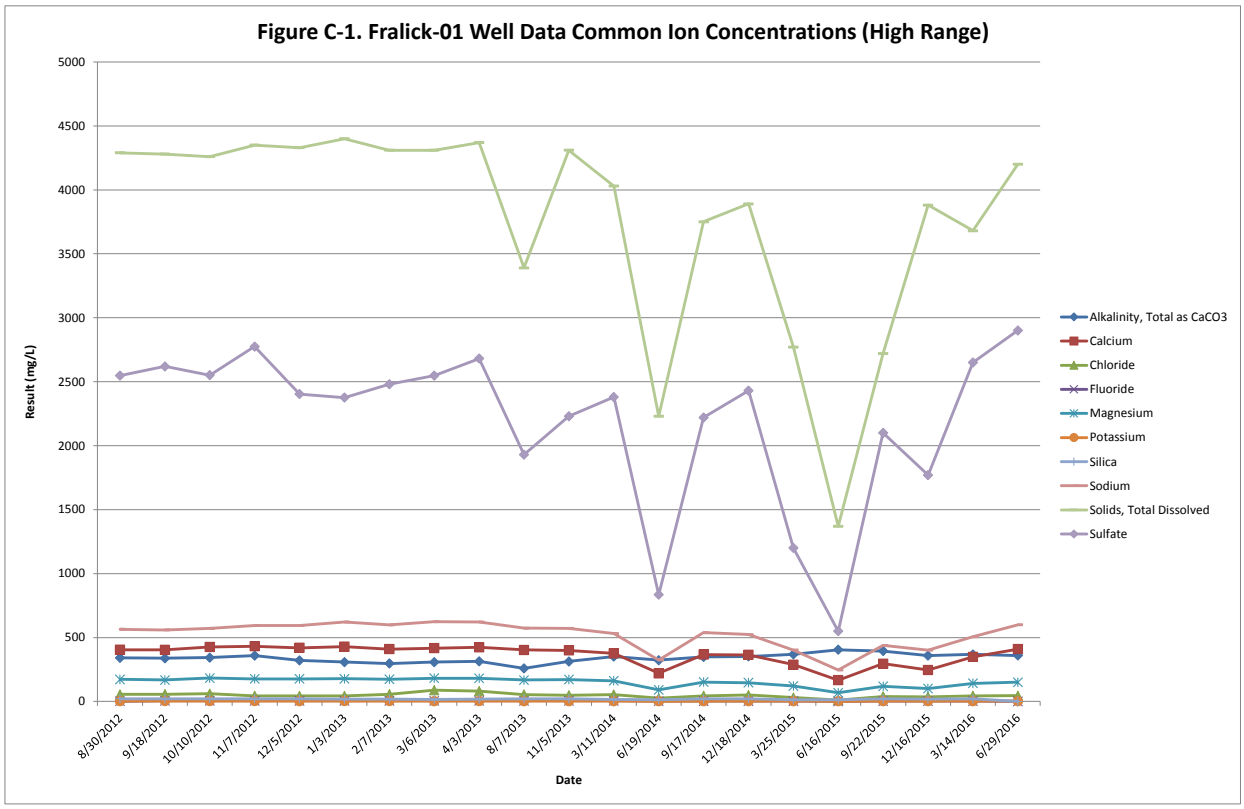


Figure C-1. Fralick-01 Well Data Common Ion Concentrations (High Range)
Result (mg/L)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
8/30/2012
9/18/2012
10/10/2012
11/7/2012
12/5/2012
1/3/2013
2/7/2013
3/6/2013
4/3/2013
8/7/2013
11/5/2013
3/11/2014
6/19/2014
9/17/2014
12/18/2014
3/25/2015
6/16/2015
9/22/2015
12/16/2015
3/14/2016
6/29/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

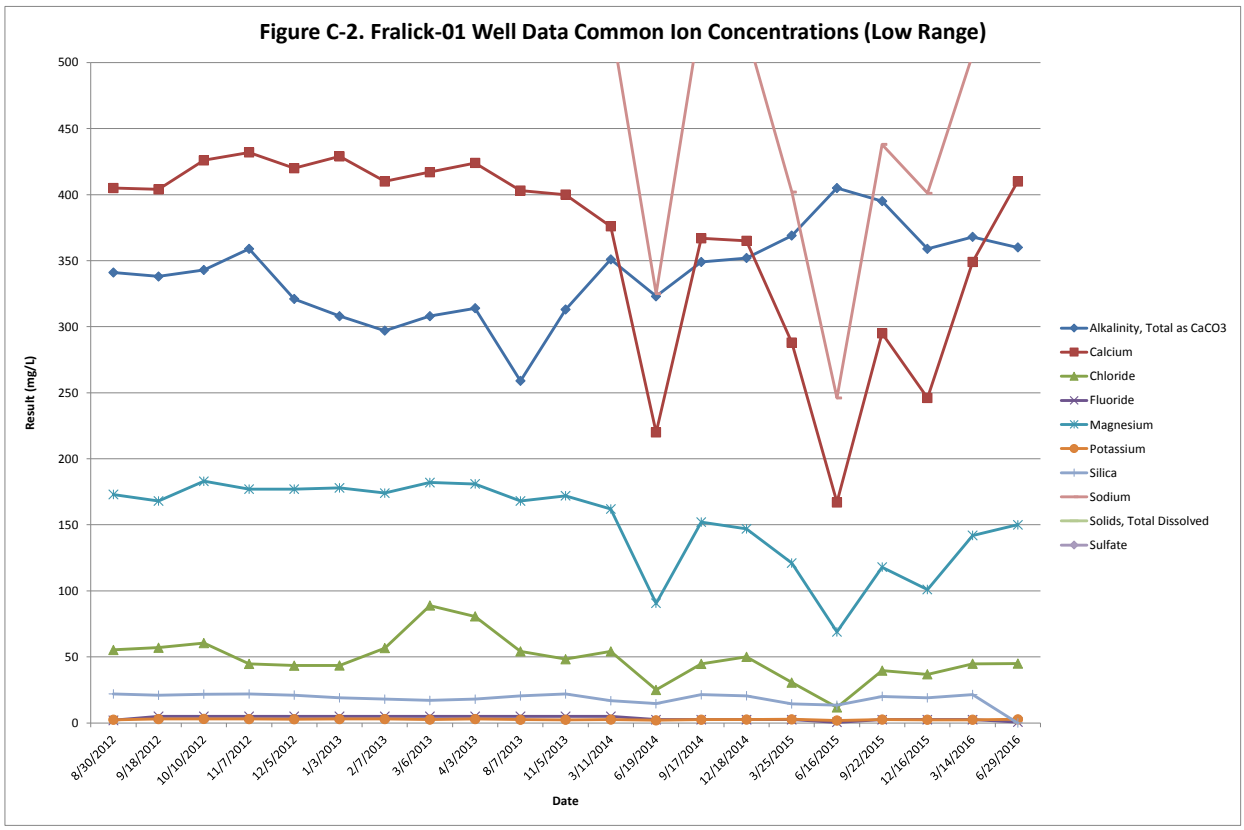


Figure C-2. Fralick-01 Well Data Common Ion Concentrations (Low Range)
Result (mg/L)
500
450
400
350
300
250
200
150
100
50
0
8/30/2012
9/18/2012
10/10/2012
11/7/2012
12/5/2012
1/3/2013
2/7/2013
3/6/2013
4/3/2013
8/7/2013
11/5/2013
3/11/2014
6/19/2014
9/17/2014
12/18/2014
3/25/2015
6/16/2015
9/22/2015
12/16/2015
3/14/2016
6/29/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

Figure C-3. State-01B Well Data Common Ion Concentrations (High Range)

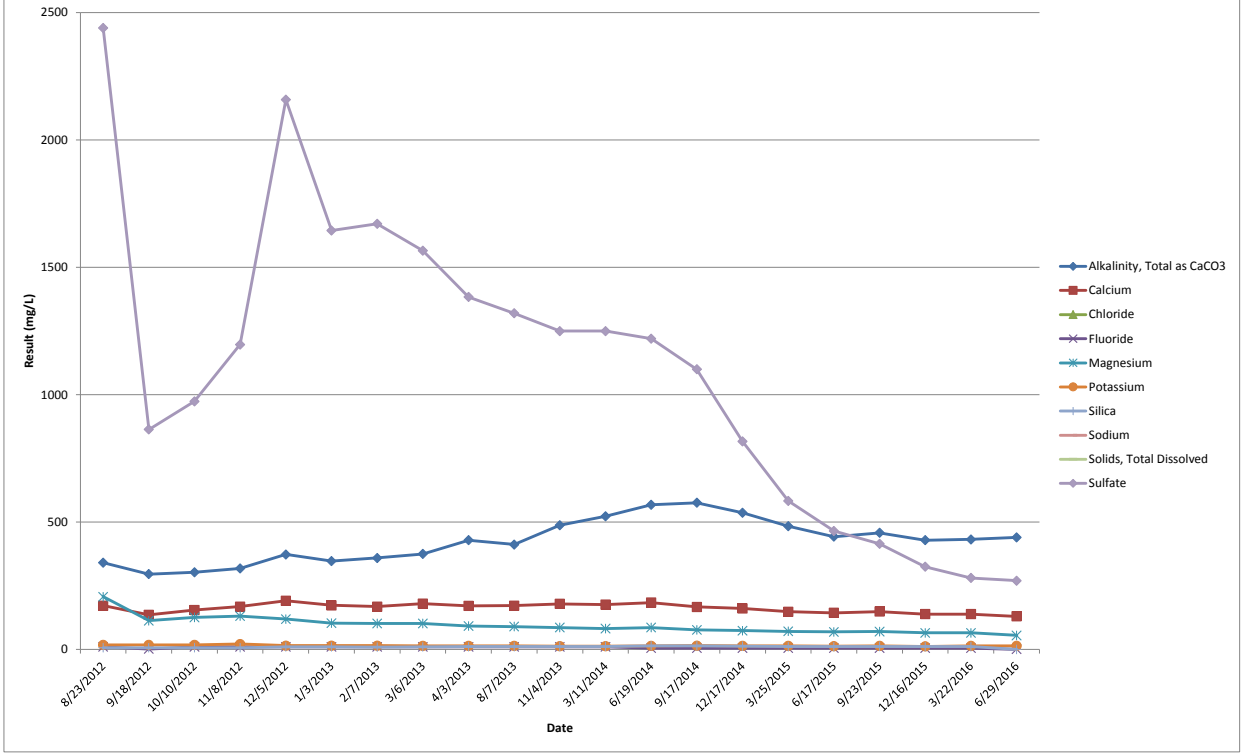
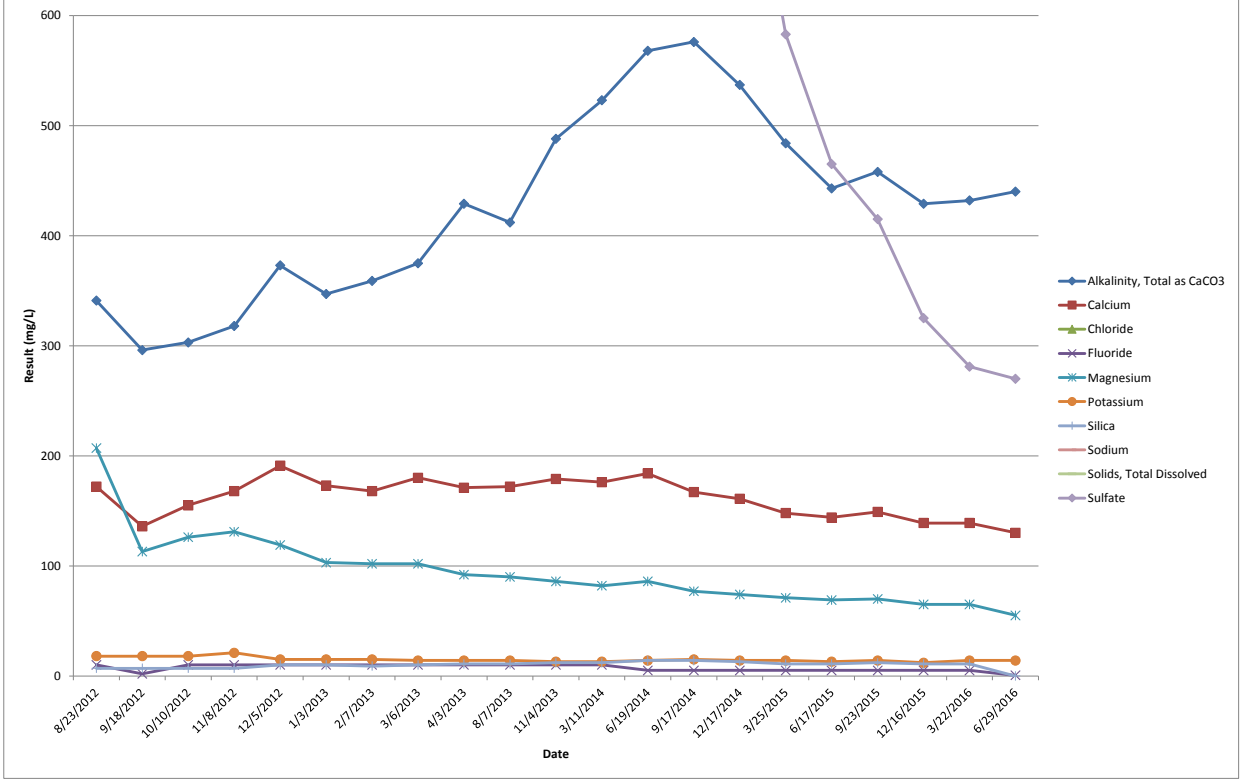


Figure C-4. State-01B Well Data Common Ion Concentrations (Low Range)



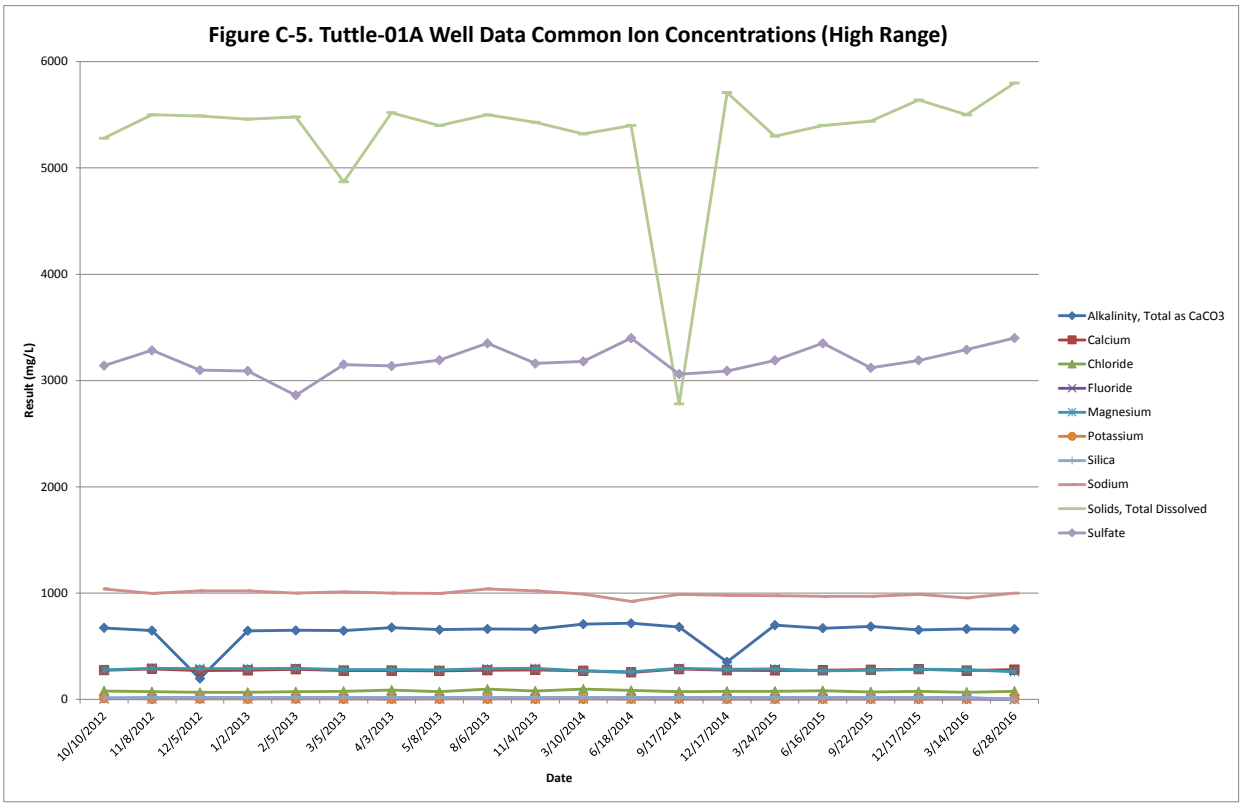


Figure C-5. Tuttle-01A Well Data Common Ion Concentrations (High Range)
Result (mg/L)
6000
5000
4000
3000
2000
1000
0
10/10/2012
11/8/2012
12/5/2012
1/2/2013
2/5/2013
3/5/2013
4/3/2013
5/8/2013
8/6/2013
11/4/2013
3/10/2014
6/18/2014
9/17/2014
12/17/2014
3/24/2015
6/16/2015
9/22/2015
12/17/2015
3/14/2016
6/28/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

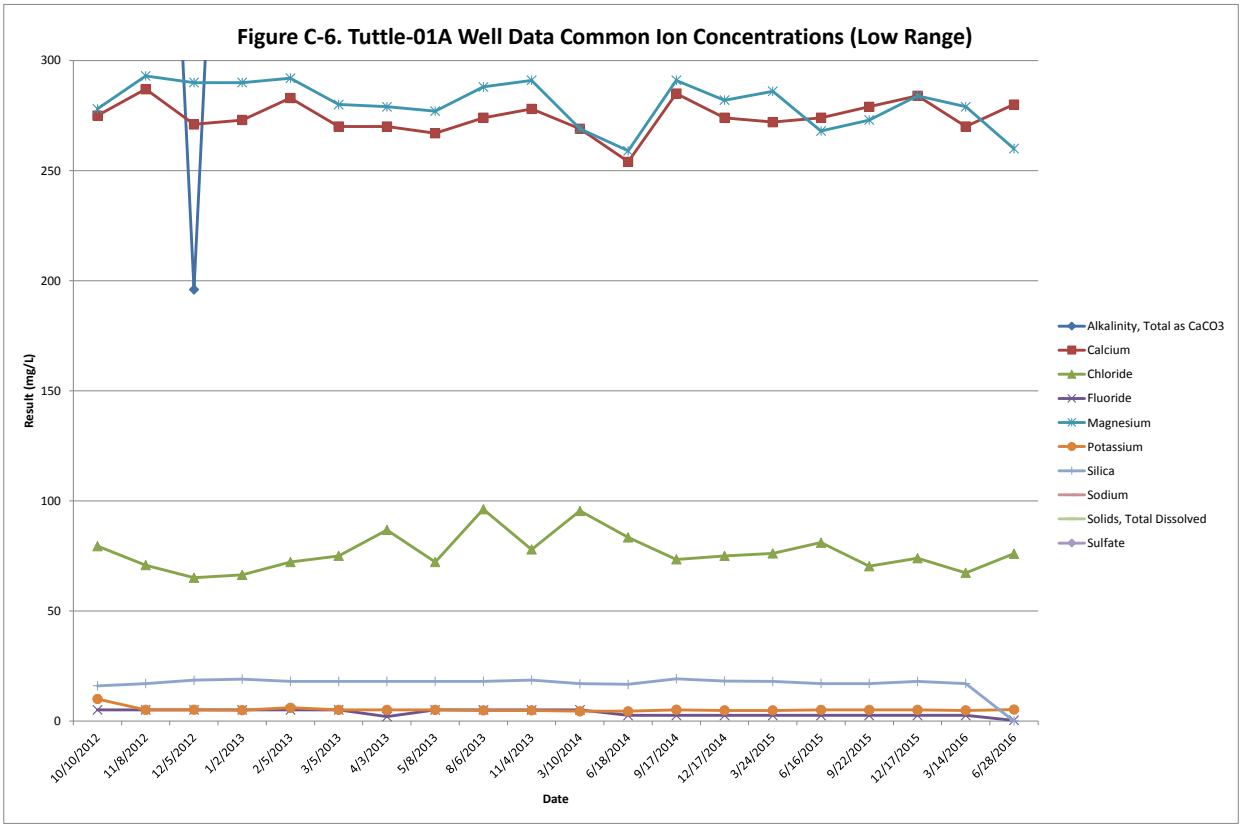


Figure C-6. Tuttle-01A Well Data Common Ion Concentrations (Low Range)
Result (mg/L)
300
250
200
150
100
50
0
10/10/2012
11/8/2012
12/5/2012
1/2/2013
2/5/2013
3/5/2013
4/3/2013
5/8/2013
8/6/2013
11/4/2013
3/10/2014
6/18/2014
9/17/2014
12/17/2014
3/24/2015
6/16/2015
9/22/2015
12/17/2015
3/14/2016
6/28/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

Figure C-7. Tuttle-01B Well Data Common Ion Concentrations (High Range)

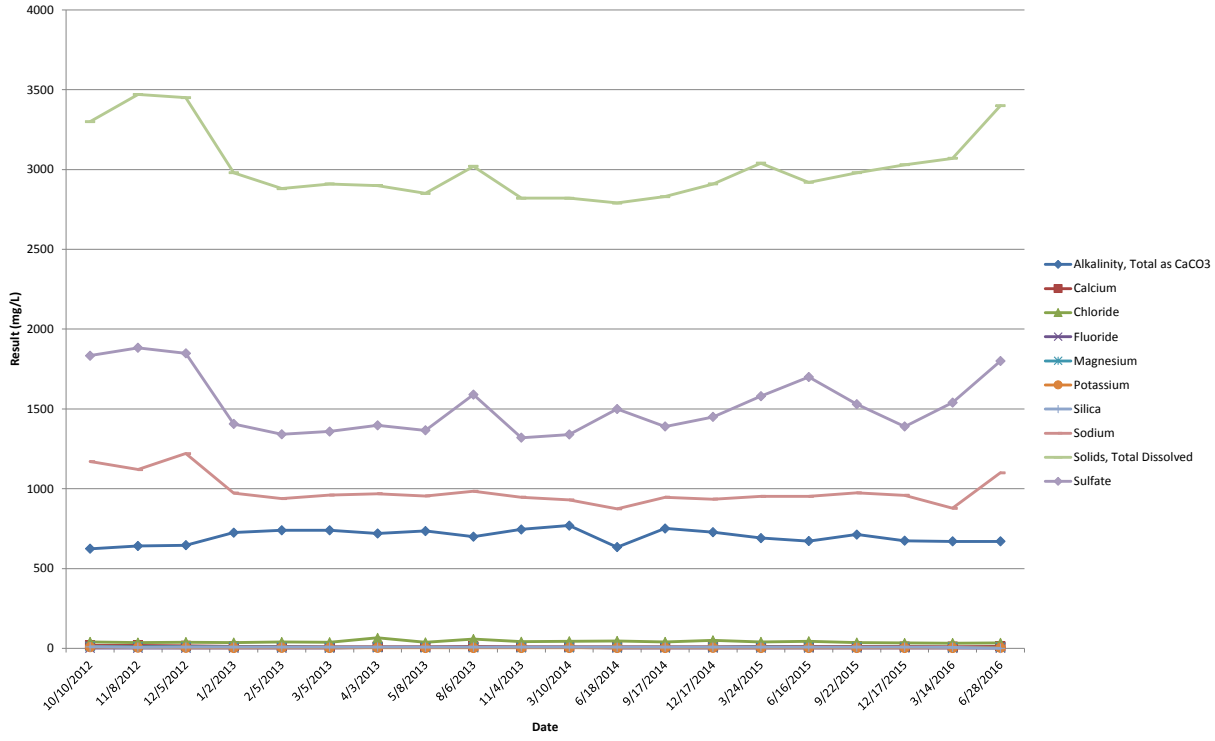
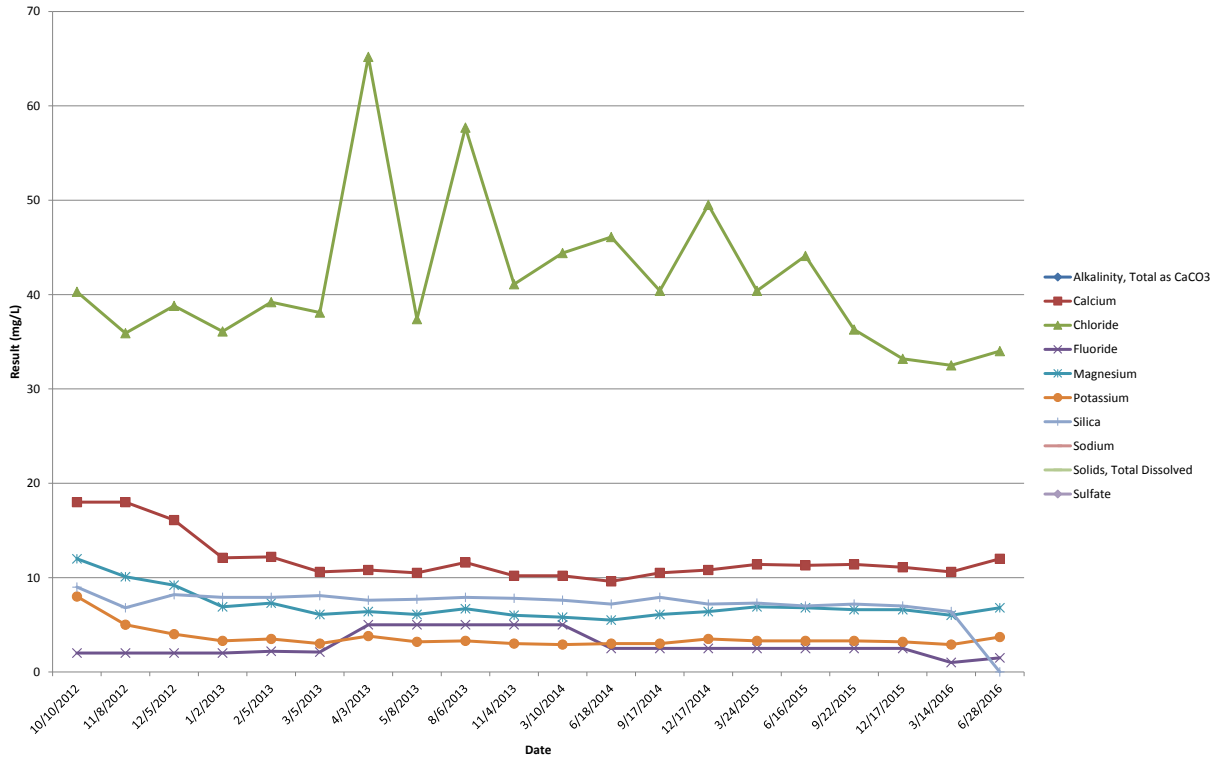


Figure C-8. Tuttle-01B Well Data Common Ion Concentrations (Low Range)



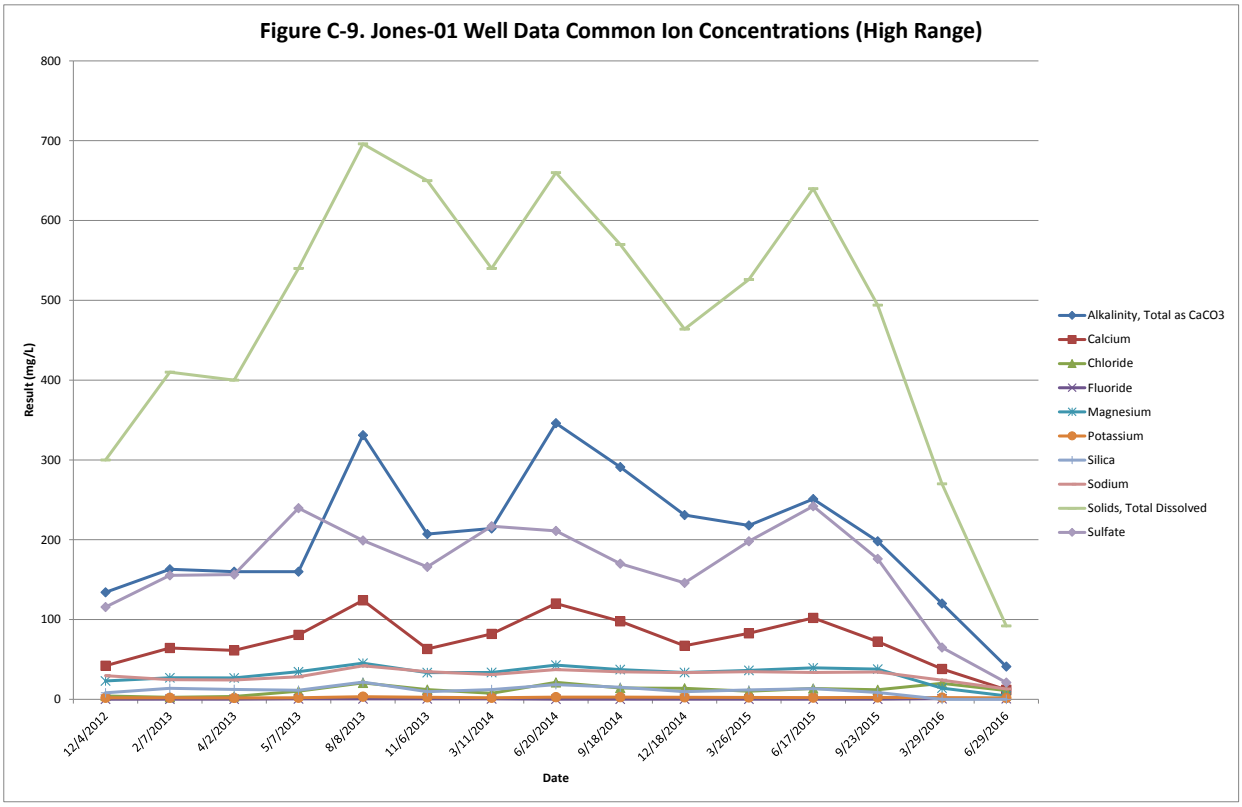


Figure C-9. Jones-01 Well Data Common Ion Concentrations (High Range)
Result (mg/L)
800
700
600
500
400
300
200
100
0
12/4/2012
2/7/2013
4/2/2013
5/7/2013
8/8/2013
11/6/2013
3/11/2014
6/20/2014
9/18/2014
12/18/2014
3/26/2015
6/17/2015
9/23/2015
3/29/2016
6/29/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

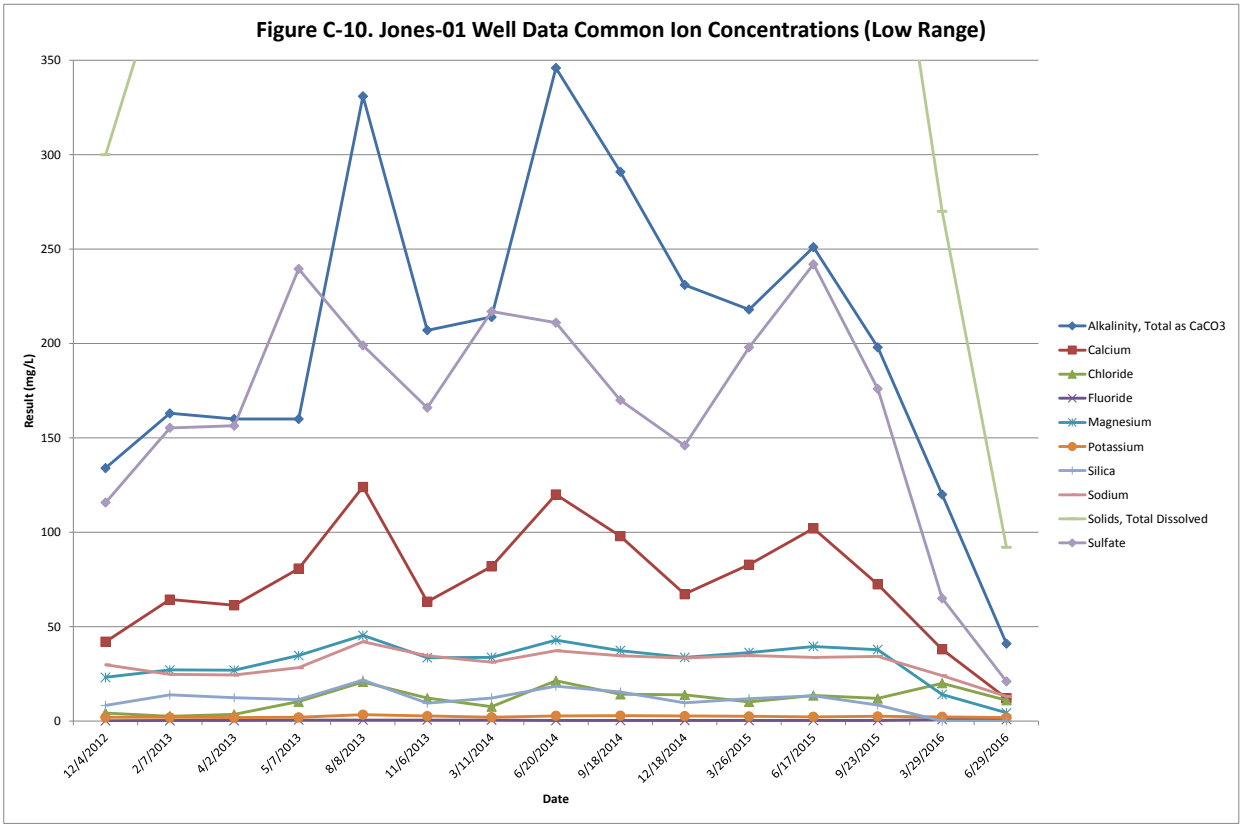


Figure C-10. Jones-01 Well Data Common Ion Concentrations (Low Range)
Result (mg/L)
350
300
250
200
150
100
50
0
12/4/2012
2/7/2013
4/2/2013
5/7/2013
8/8/2013
11/6/2013
3/11/2014
6/20/2014
9/18/2014
12/18/2014
3/26/2015
6/17/2015
9/23/2015
3/29/2016
6/29/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

Figure C-11. Myhre-01 Well Data Common Ion Concentrations (High Range)

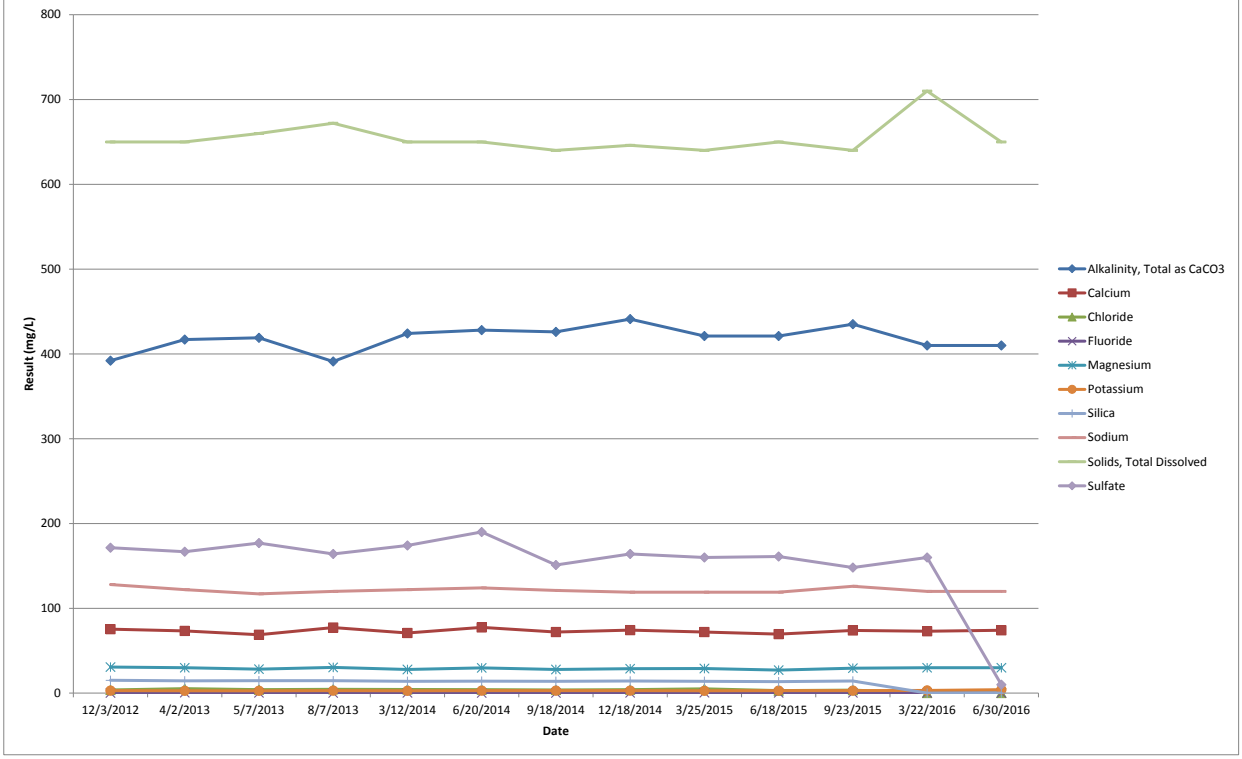


Figure C-12. Myhre-01 Well Data Common Ion Concentrations (Low Range)

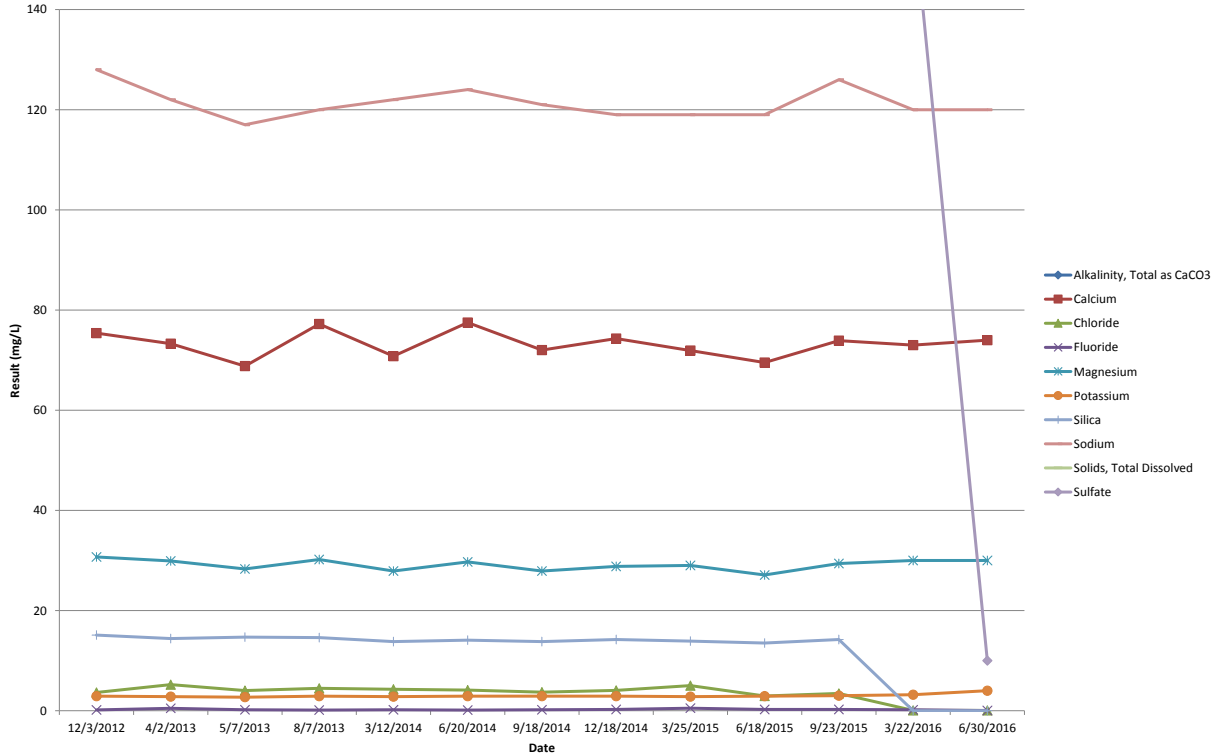


Figure C-13. Myhre-02 Spring Data Common Ion Concentrations (High Range)

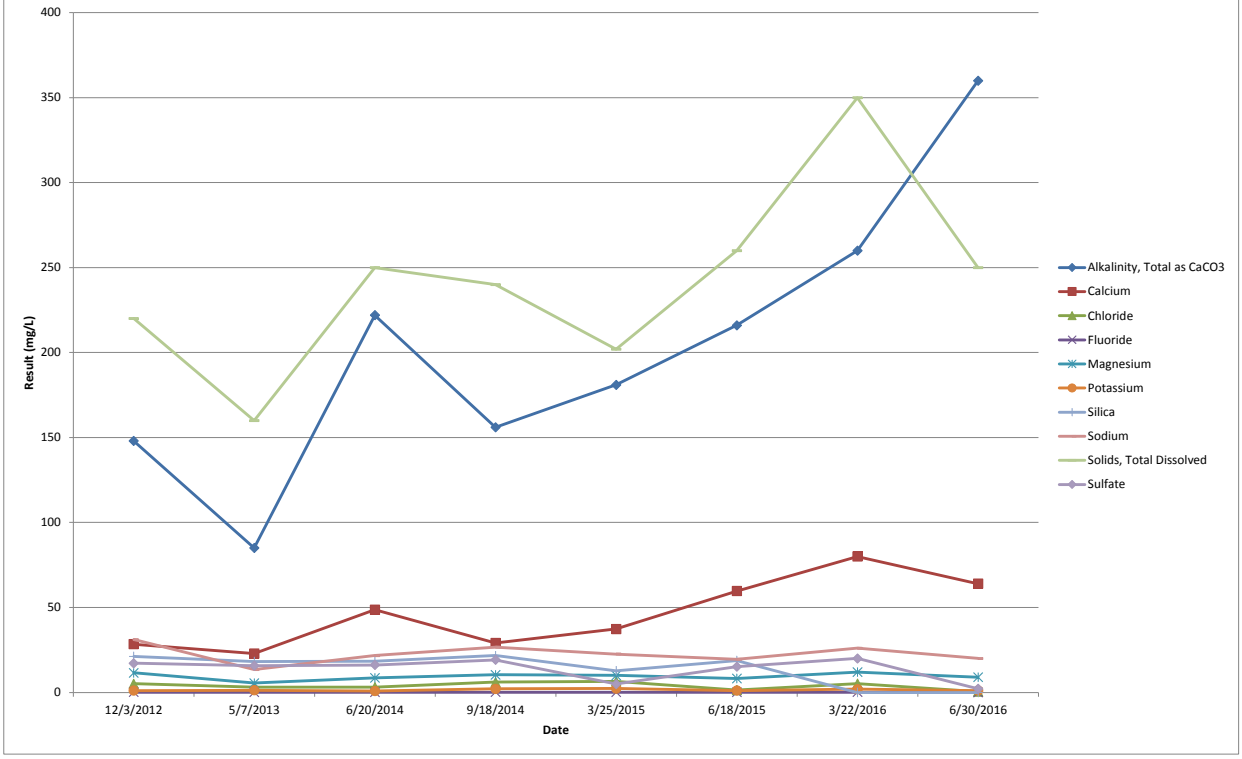


Figure C-14. Myhre-02 Spring Data Common Ion Concentrations (Low Range)

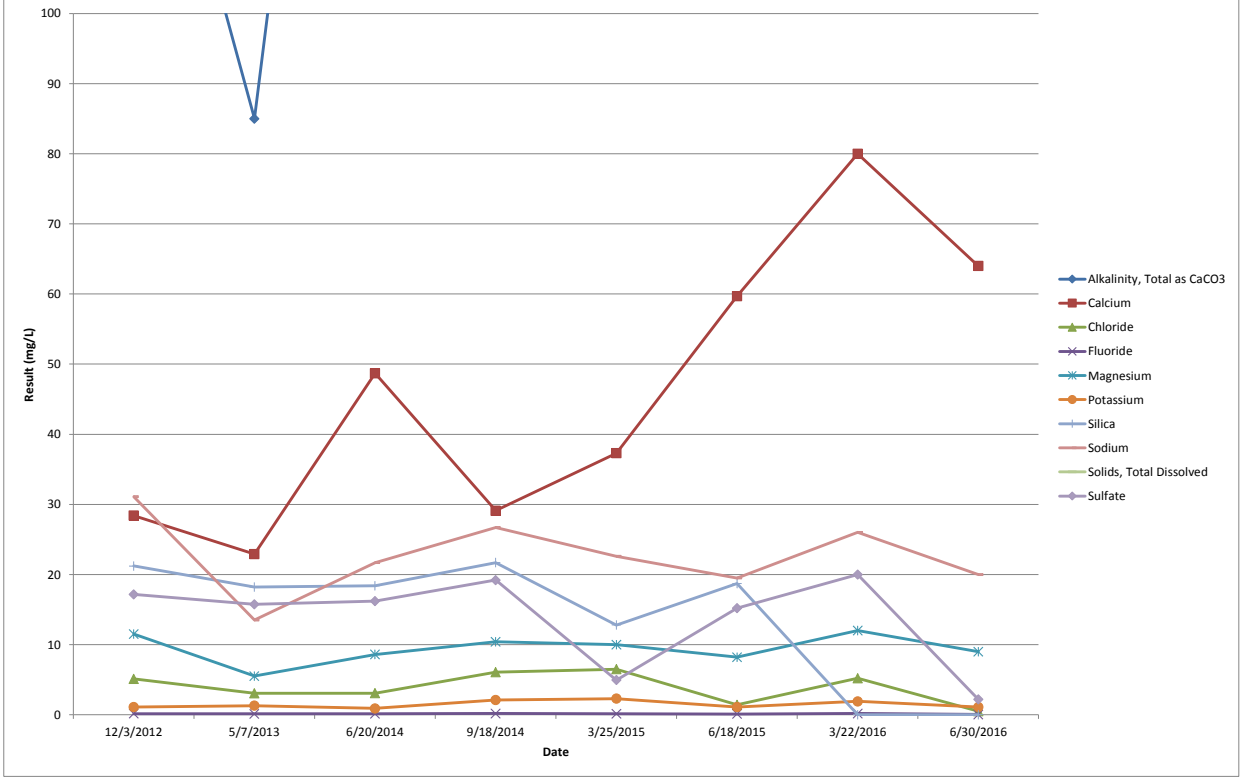


Figure C-15. Saddleback-01 Well Data Common Ion Concentrations (High Range)

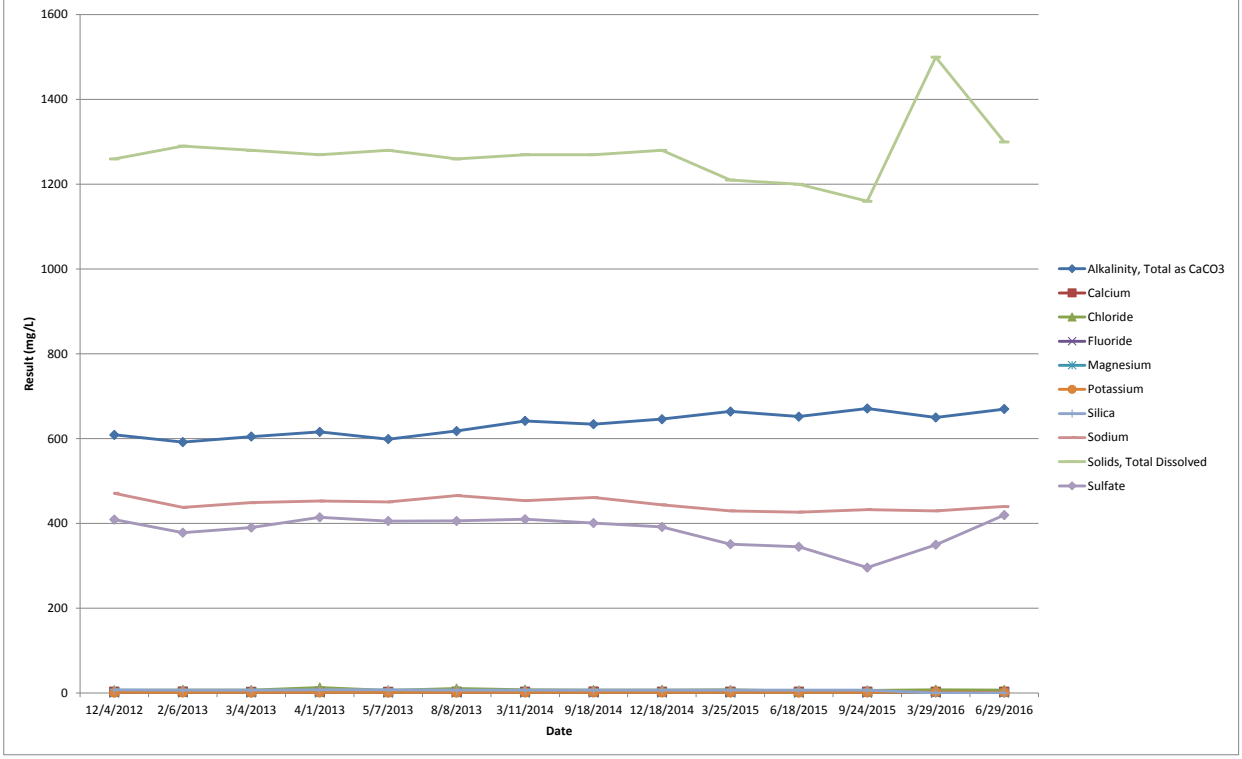
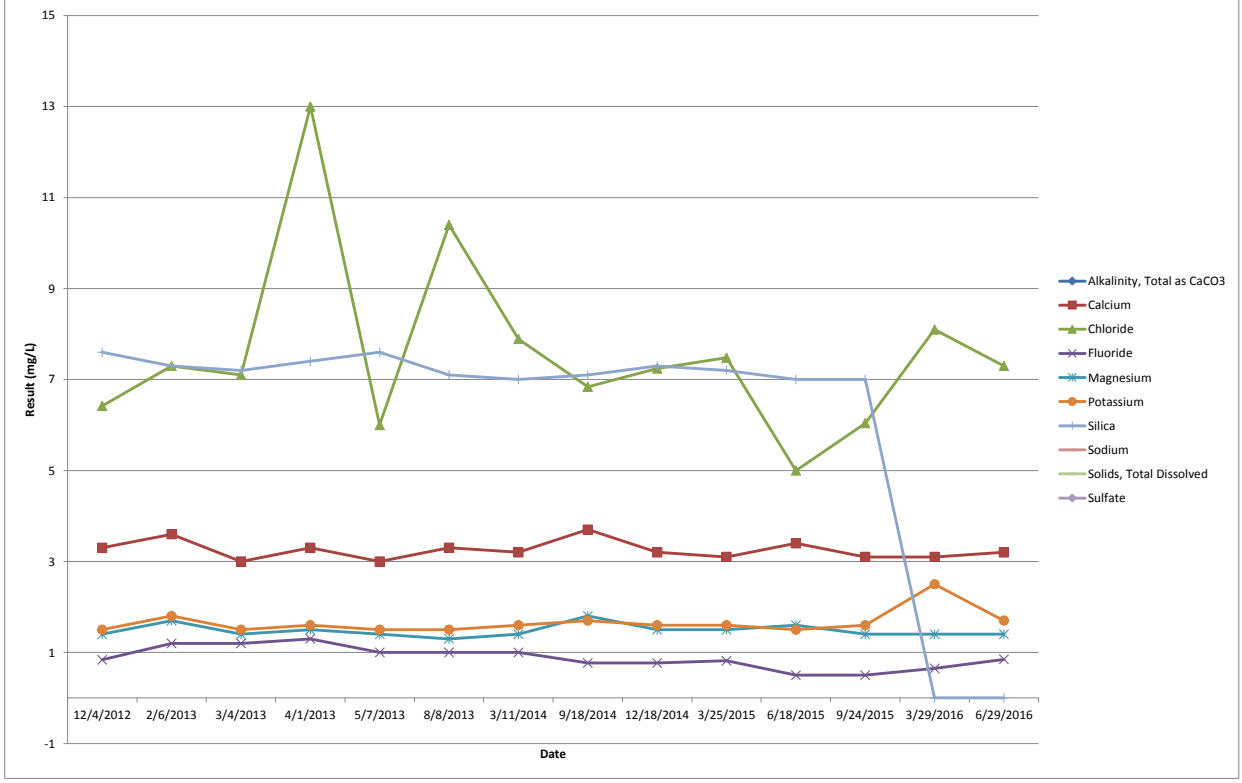


Figure C-16. Saddleback-01 Well Data Common Ion Concentrations (Low Range)



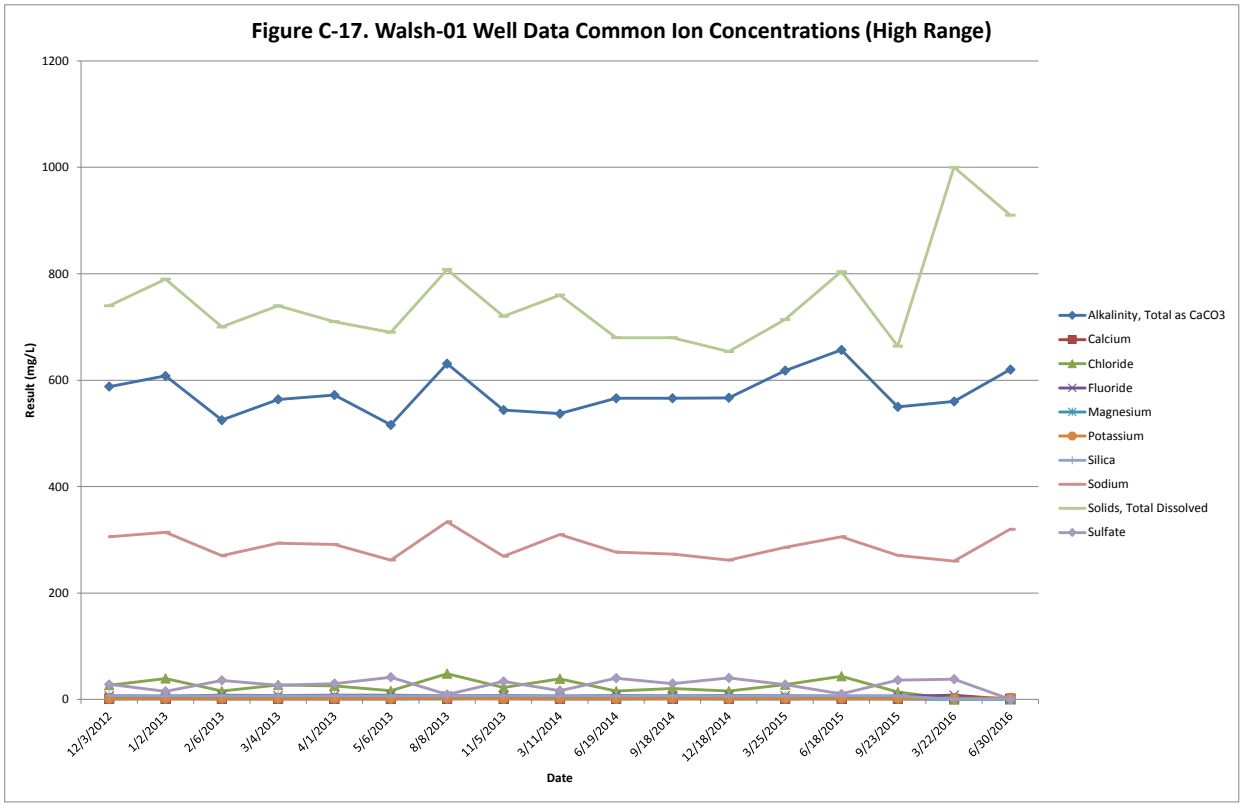


Figure C-17. Walsh-01 Well Data Common Ion Concentrations (High Range)
Result (mg/L)
1200
1000
800
600
400
200
0
12/3/2012
1/2/2013
2/6/2013
3/4/2013
4/1/2013
5/6/2013
8/8/2013
11/5/2013
3/11/2014
6/19/2014
9/18/2014
12/18/2014
3/25/2015
6/18/2015
9/23/2015
3/22/2016
6/30/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

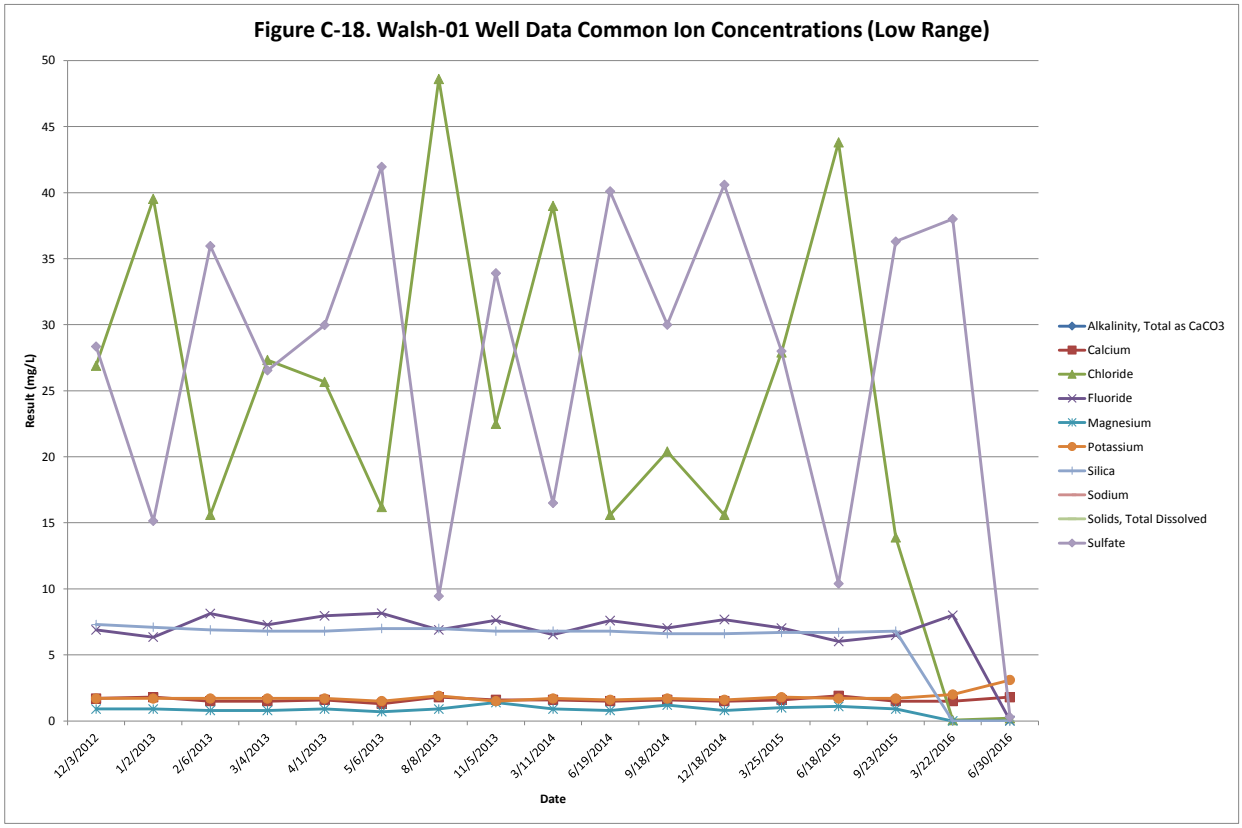


Figure C-18. Walsh-01 Well Data Common Ion Concentrations (Low Range)
Result (mg/L)
50
45
40
35
30
25
20
15
10
5
0
12/3/2012
1/2/2013
2/6/2013
3/4/2013
4/1/2013
5/6/2013
8/8/2013
11/5/2013
3/11/2014
6/19/2014
9/18/2014
12/18/2014
3/25/2015
6/18/2015
9/23/2015
3/22/2016
6/30/2016
Date
Alkalinity, Total as CaCO3
Calcium
Chloride
Fluoride
Magnesium
Potassium
Silica
Sodium
Solids, Total Dissolved
Sulfate

Figure C-19. Werner-01 Well Data Common Ion Concentrations (High Range)

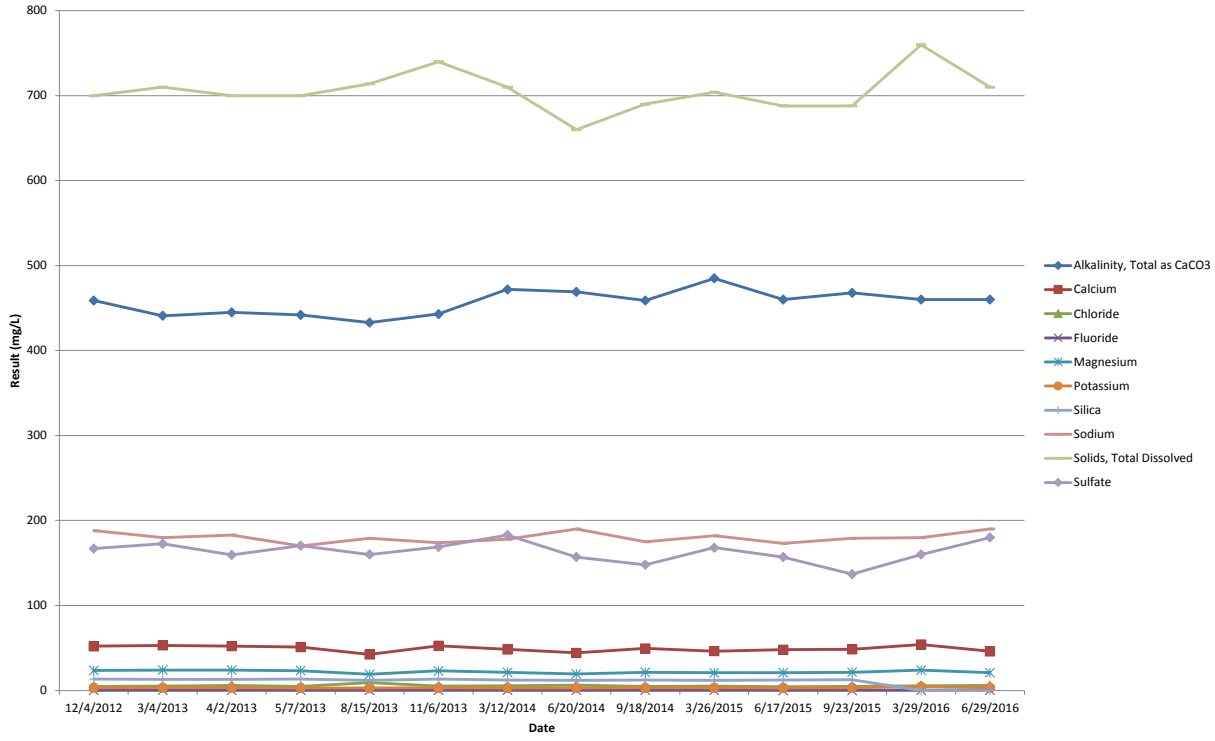


Figure C-20. Werner-01 Well Data Common Ion Concentrations (Low Range)